

Microwave Digital Archive

IEEE Microwave Theory and Techniques Society

1971-1974

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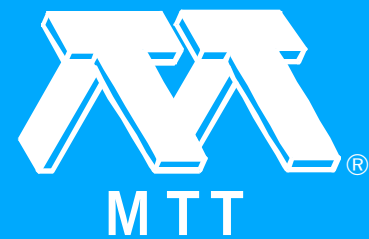
The Microwave Theory and Techniques Society of the IEEE has finished a complete archive of all reviewed and published material since 1953. Yearly updates of the published material will be compiled in the future. As digital media changes over the years, it will be necessary to update the format of the material, so this initial electronic release blazes a trail into the future.

The section "Getting Started" tells you how to optimize the Acrobat Reader Preferences to improve the readability of the document. If you need customer support before January 2001, call 831.657.2420 or 800.447.9100. If you find errors in the CD-ROM, e-mail a note to c.jackson@ieee.org, or mail a comment to the current President of the MTT Society.

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All papers were electronic files or images scanned from hard copy and converted to Adobe Acrobat PDF file format for cross-platform access. Since some of the papers were scanned from hard copy, the viewing quality will vary with the size and quality of fonts used. Even though the viewing quality on your monitor may vary, all papers print clearly.

Thank You and Enjoy!



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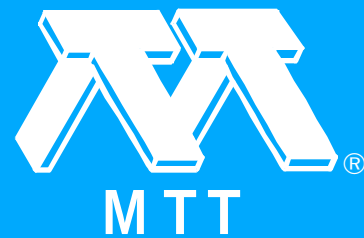
ACKNOWLEDGMENTS

This CD- ROM was assembled from the electronic files provided to us by Adam Philippidis at IEEE headquarters and from scanned originals provided by Ted Saad. Many people have contributed to the entire CD-ROM Archival effort. Most notably, Ted Saad provided nearly all the hard copy material, and sacrificed his entire collection of journals for the project. He also wrote a number of the original articles. Another notable contributor, Roger Pollard convinced the Society that this was a worthwhile project. The team at Sony Electronic Publishing Services, and Adam Philippidis, at the IEEE Headquarters, have also provided substantial amounts of help in completing this archival project.

REFERENCES

IEEE Catalog Number: JP-17-0-0-C-0

ISBN: 0-7803-9906-4



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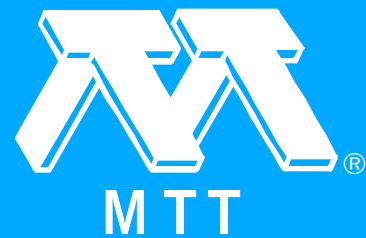
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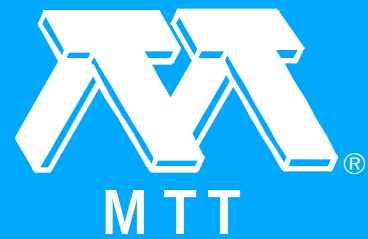
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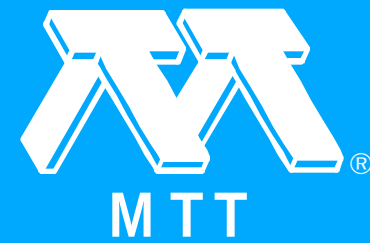
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INTRODUCTION

This Electronic Guide file contains hypertext links to separate article files. Links are represented by colored text (e.g. a name or title); clicking on the text activates the link.

Before you start browsing and using the information on this CD-ROM, you will need to install Adobe Acrobat Reader + Search 3.0. If you already have Acrobat Reader installed on your system, make sure it is version 3.0 or higher and includes the Search plug-in.

In many instances, we refer to the “menu bar”, shown here for reference.

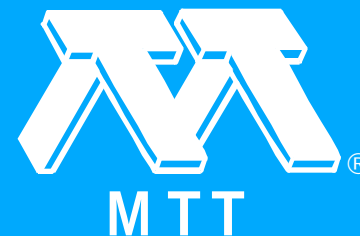


ACROBAT PREFERENCES

To make viewing and searching easier, we recommend changing two default Acrobat Preferences (found under File > Preferences on the menu bar.)



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In the dialog box shown for **General** Preferences, turn OFF the “Open Cross-Document Links in Same Window” option; this will keep the Guide file open when you view article files and allows you to return to the same page in the Guide when you close an article.

In the dialog box shown for **Search** Preferences, turn ON the “Show Fields” option so that Title, Author, Keywords, and Subject fields are visible when specifying search criteria. If for some reason this preference option is not present on your system, check to see that you have the Search plug-in installed. The

Search icon  will be present on the Acrobat Toolbar if the function is properly installed. Specifics of the Search function are described later in this section.

EXITING AN ARTICLE

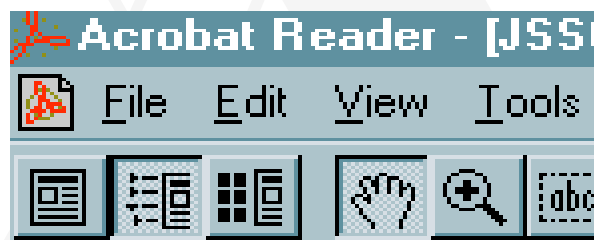
To exit an article after viewing, and return to the electronic guide, select File > Close from the menu bar. To switch between the article and the electronic guide or any other PDF file that is open, select “Window” and pick the open file you wish to return to.



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USING BOOKMARKS

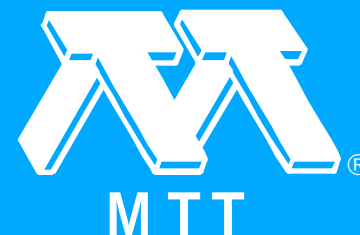
In addition to links, you can navigate through the Electronic Guide using Bookmarks. If they are not already visible, choose View > Bookmarks and Page from the menu bar or press the “Display Page and Bookmarks” button on the tool bar. A panel opens on the left side of the screen displaying Bookmarks in a hierarchy.



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Each Bookmark corresponds to a page in the Guide. Click on the text in a Bookmark to go to that page.

Entries with lower level Bookmarks show an arrowhead, pointing down when subordinate Bookmarks are visible, pointing right when hidden. To view subordinate Bookmarks, click on the arrowhead. To hide them, click on the arrowhead again. Dragging the right margin of the bookmark panel resizes it.



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PRINTING ARTICLES

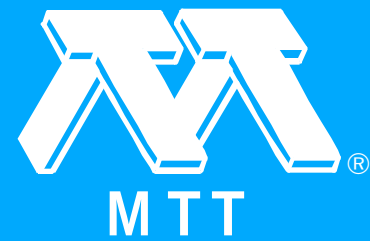
Articles may have text outside normal print-area defaults. We recommend selecting “Shrink to Fit” in the print menu (File > Print) to capture the complete image for your printout. This setting will become your new default.

SELECTING GRAPHICS

To copy graphics to the Clipboard, choose Tools > Select Graphics from the menu bar. The cursor changes to the cross-hair icon.

Drag a rectangle around the graphic to select it. When you release the mouse button, the selected graphic is highlighted.

Choose Edit > Copy from the menu bar to copy the selected graphic to the Clipboard. To view the graphic, choose Window > Show Clipboard. The graphic is copied in the WMF (Windows), PICT (Macintosh), or XPIXMAP (UNIX) format. With UNIX, the graphic is pasted in the primary selection.



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NAVIGATION BUTTONS

This Guide contains a variety of navigational aids to help you easily explore the contents.

Section Map

The Electronic Guide is constructed in sections: e.g. Sessions, Authors, Getting Started. The current section is shown at the top of each page. The “path” to this section is shown at the right. Clicking these text buttons moves you to the start of that section.

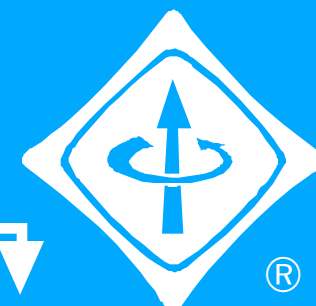
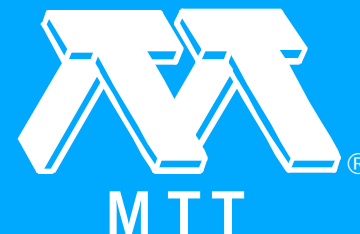
Next Page button

Click to advance to the next page in the section.

Previous Page button

Click to go back to the previous page in the section. The first and last pages of a section show only one button.

The Page Up and Page Down keys perform the same functions.



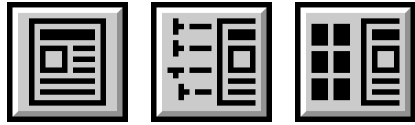
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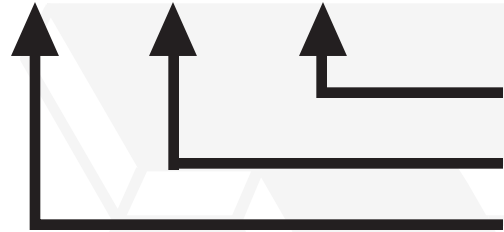


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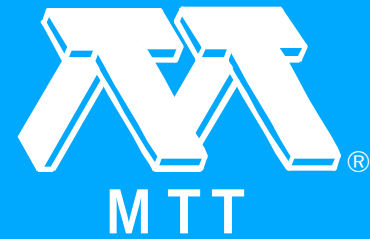
Display Thumbnails and Page
Display Bookmarks and Page
Display Page



Zoom/Selection



Select Text
Zoom In (Magnify)
Move Page Image



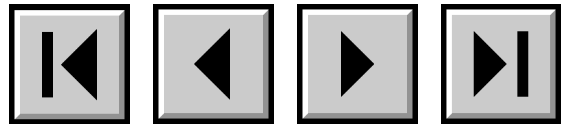
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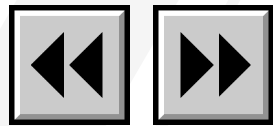
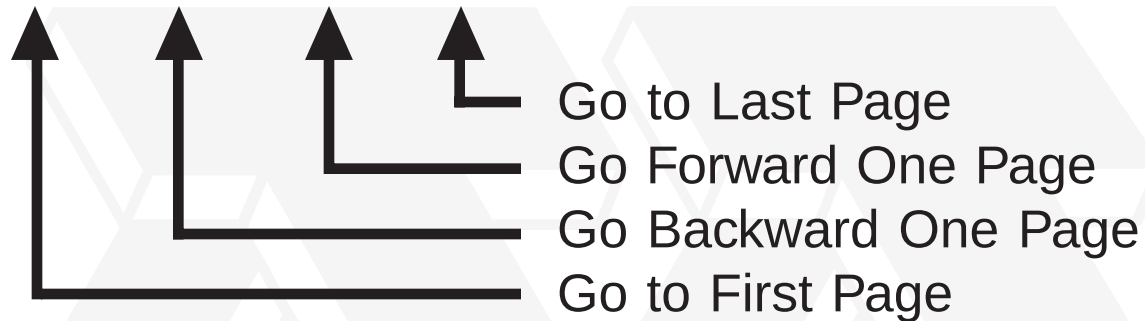


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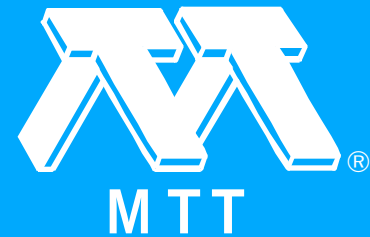
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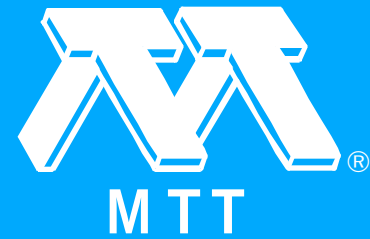
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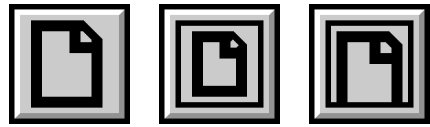
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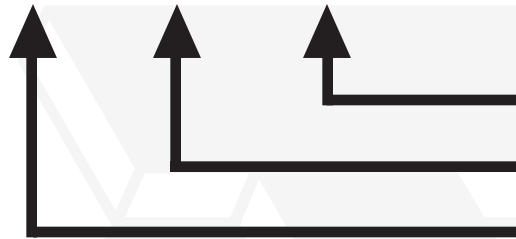
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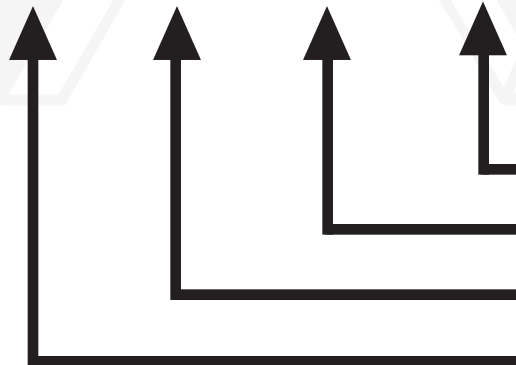
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Fit Width
Fit Page
Actual Size



Find/Search



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View Search Results
Search
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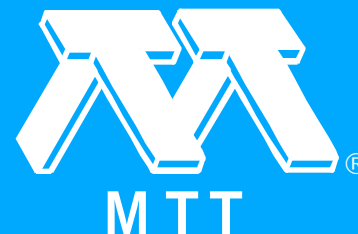
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SEARCHING

Two types of searching are possible with Acrobat: Find and full-text Search. Choosing Find (from the Toolbar or Tools > Find) opens a dialog box. Type a search string in the field provided, check the appropriate options and press the “Find” button. Find searches linearly through the currently open Acrobat file (not necessarily the entire Electronic Guide) from the cursor forward.

Choosing the Search button or Search menu item (Tools > Search), selecting the Query item, opens a dialog box from which you can access the more powerful full-text search engine (if you installed Acrobat with the Search plug-in from this CD-ROM). Its dialog box is shown on the next page.

Typing a term in the text box at the top of the Search dialog box and pressing the “Search” button causes a full-text search of all words in the body of papers in the collection. Entering a term in one or more of the fixed fields (Title, Author, Subject or Keywords) will cause a search for hits in only those fields.



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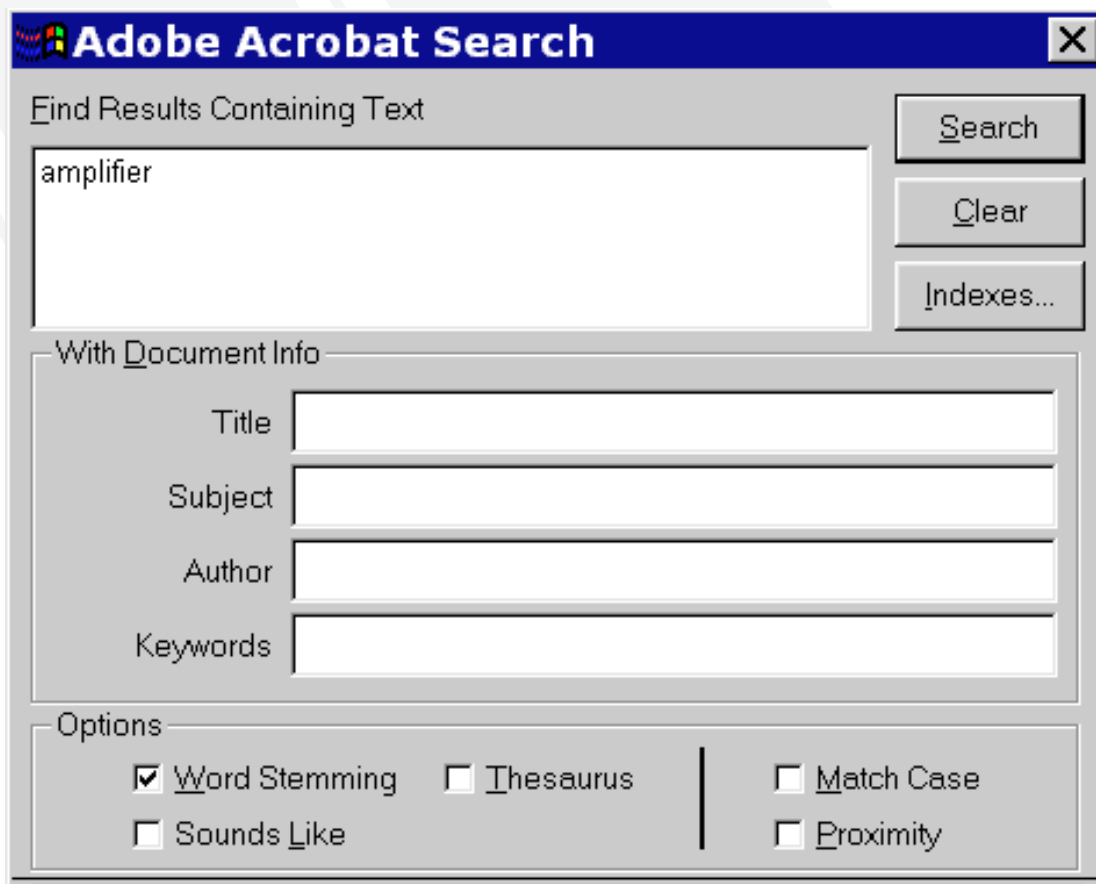
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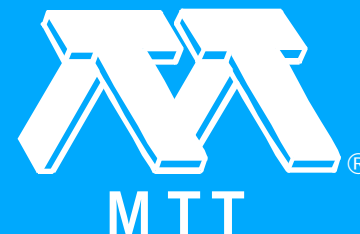
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If you are not finding files you think should show in the results list, Acrobat may not be attached to the correct index file. To check, press the “Indexes...” button for a list of available indexes. If this title is not listed, press the “Add...” button and look in the root directory of the CD-ROM for a file called “index.pdx”. Click on that file to add it to the list. If none exists, this title was not indexed.

See the Search Online Guide (on Help menu) for more complete instructions on selecting appropriate options, constructing boolean queries, etc.



The screenshot shows the 'Adobe Acrobat Search' dialog box. It has a title bar with the Adobe logo and the text 'Adobe Acrobat Search'. The main area is divided into three sections. The top section, 'Find Results Containing Text', has a text input field with 'amplifier' and three buttons: 'Search', 'Clear', and 'Indexes...'. The middle section, 'With Document Info', has four labeled text input fields: 'Title', 'Subject', 'Author', and 'Keywords'. The bottom section, 'Options', has four checkboxes: 'Word Stemming' (checked), 'Thesaurus' (unchecked), 'Match Case' (unchecked), and 'Sounds Like' (unchecked). The 'Proximity' checkbox is also present but is partially obscured by the bottom edge of the dialog box.

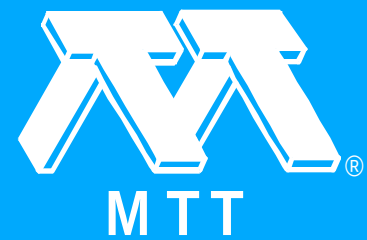


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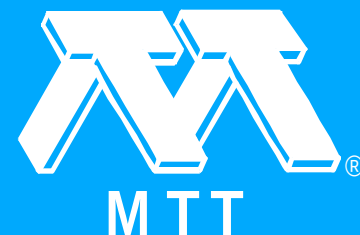
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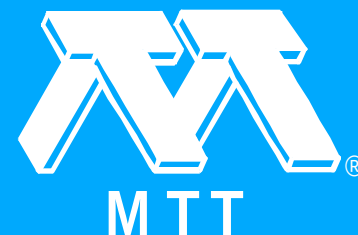
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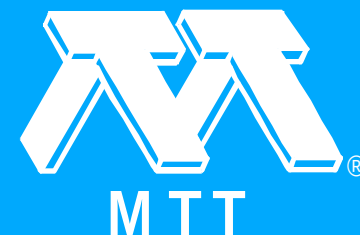
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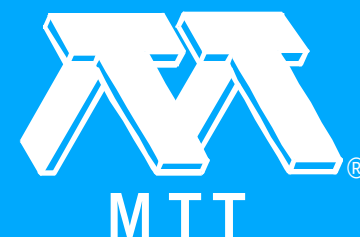
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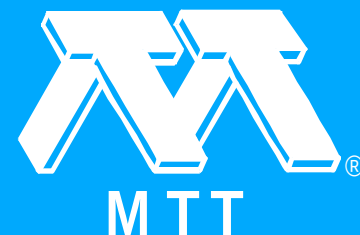
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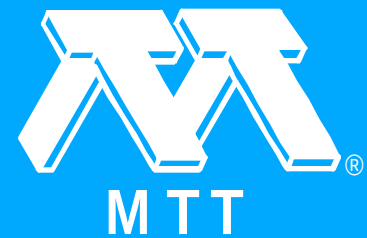
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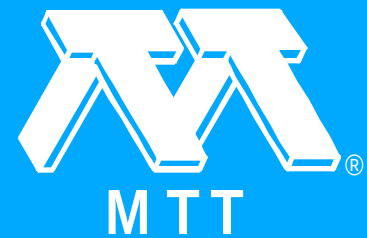
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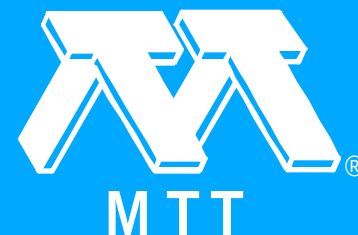
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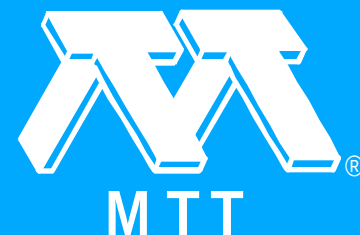
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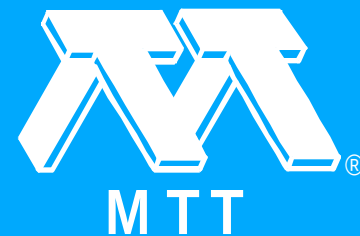
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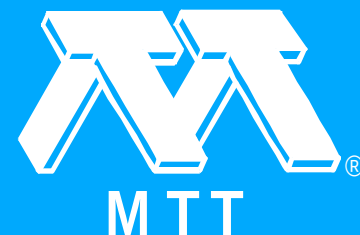
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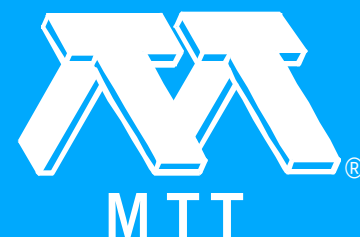
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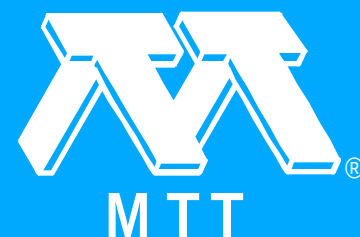
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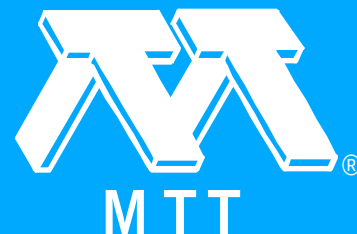


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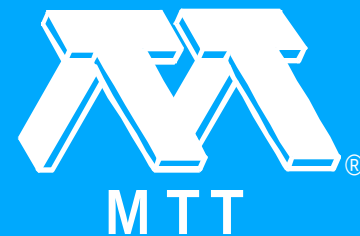
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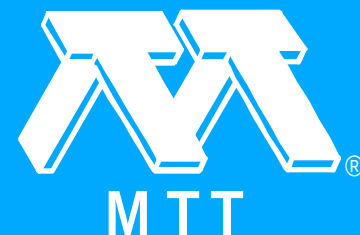
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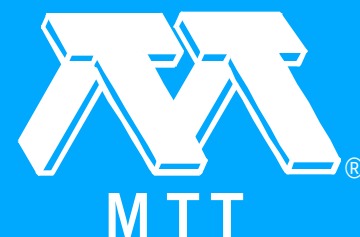
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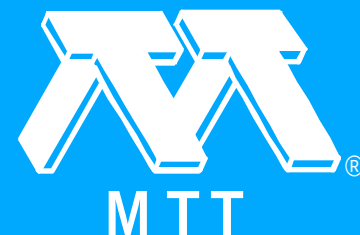
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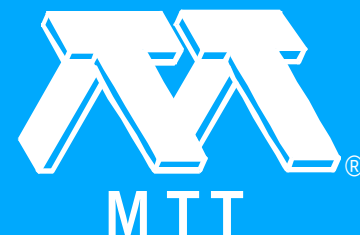
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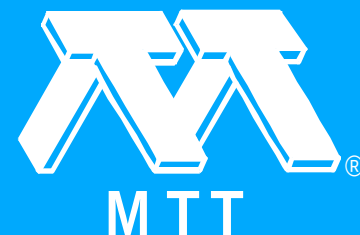
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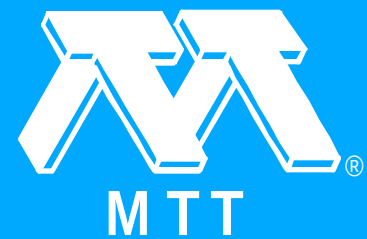
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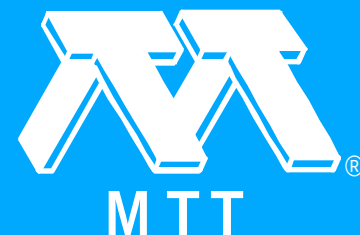
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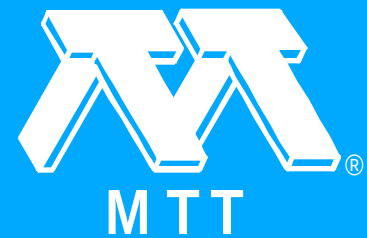
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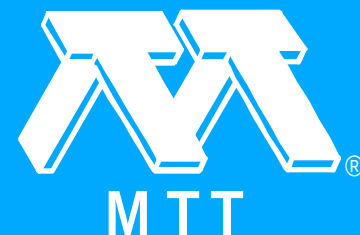
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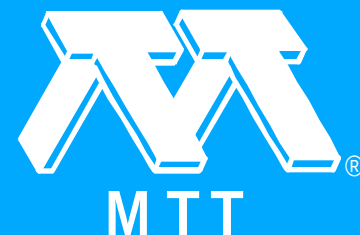
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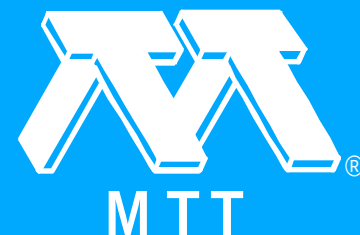
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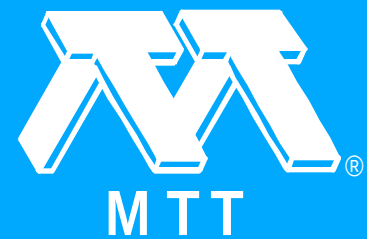
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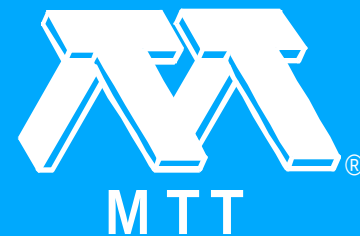
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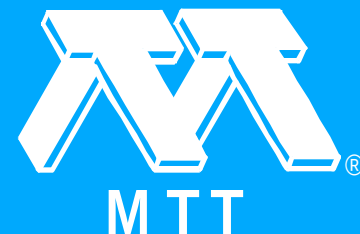
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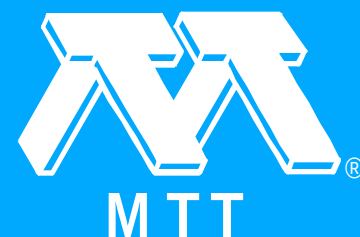
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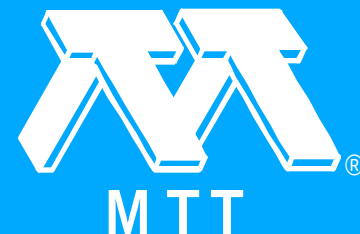
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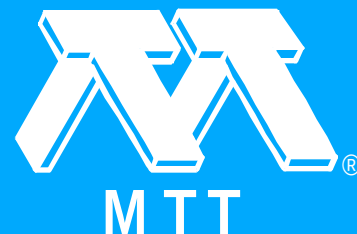


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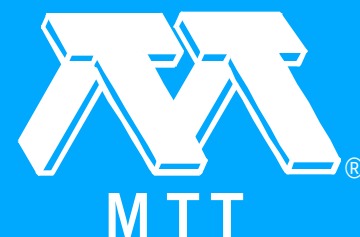
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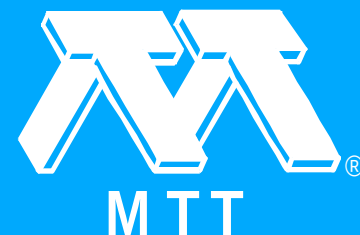
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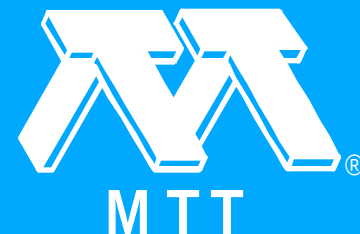
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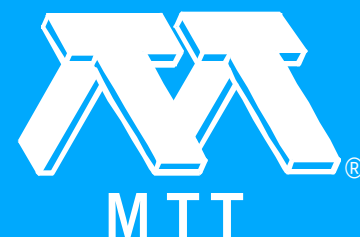
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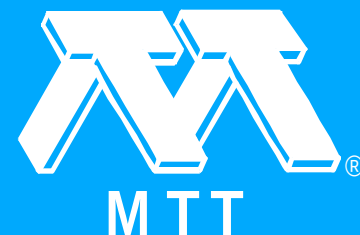
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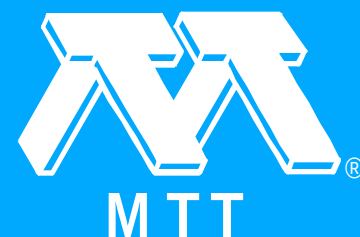
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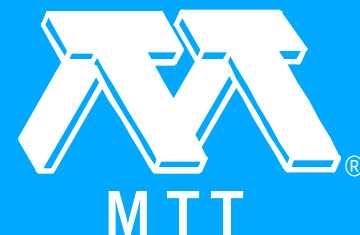
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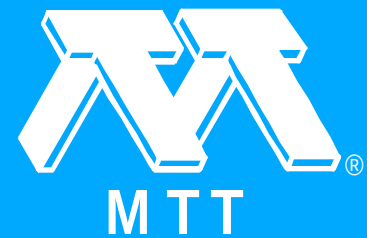
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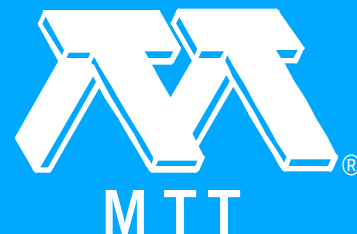


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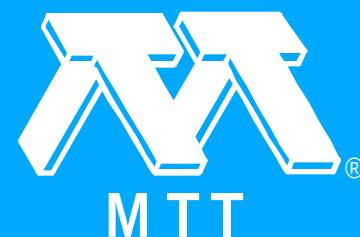
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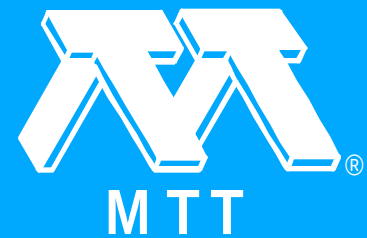
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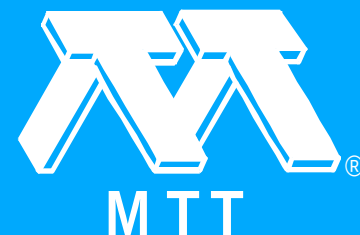
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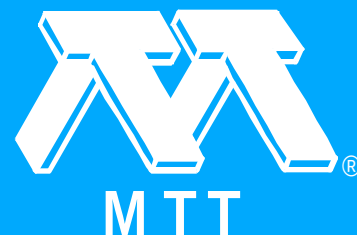
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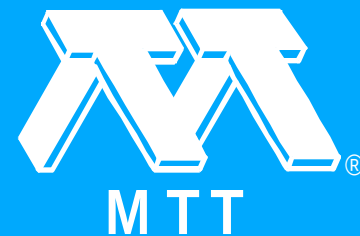
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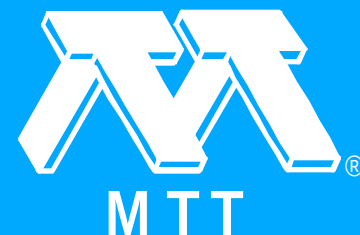


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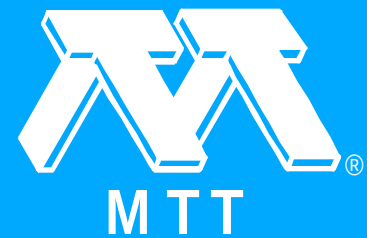
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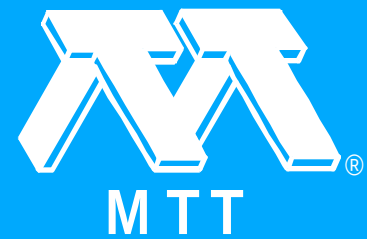
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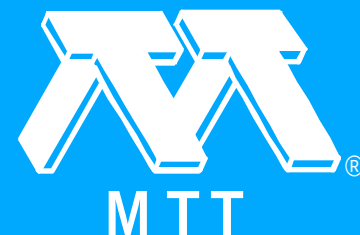
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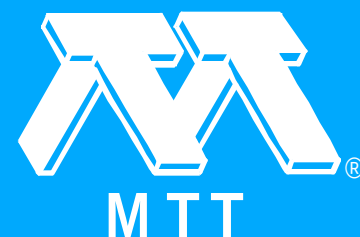
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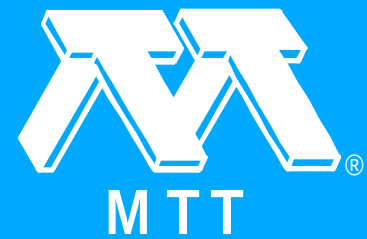
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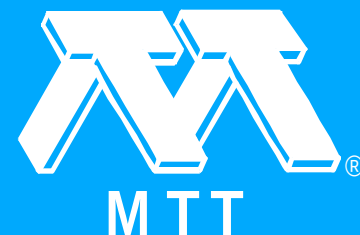
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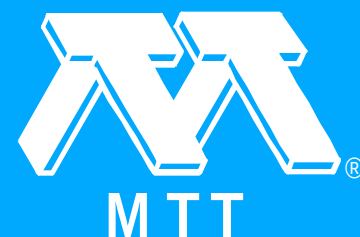
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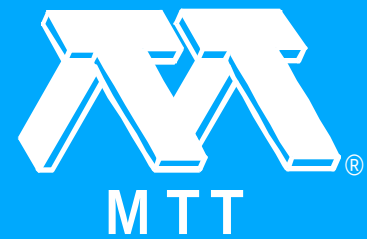
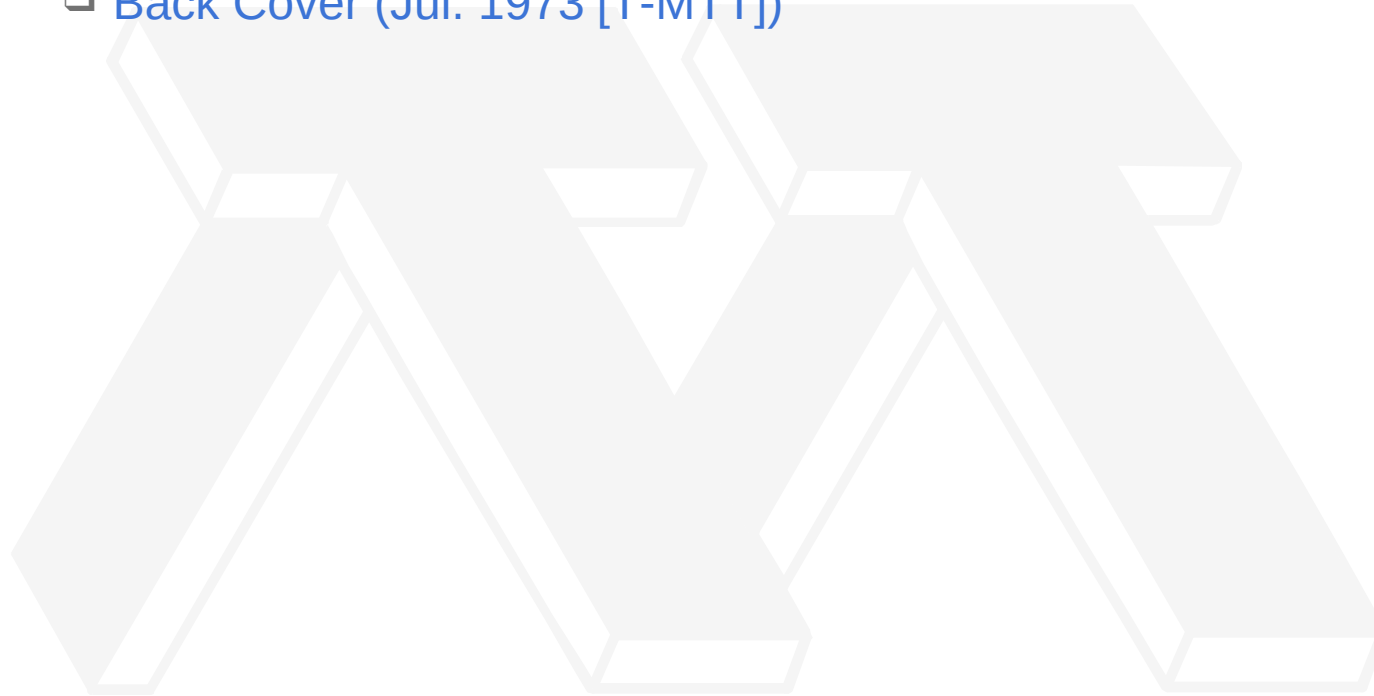
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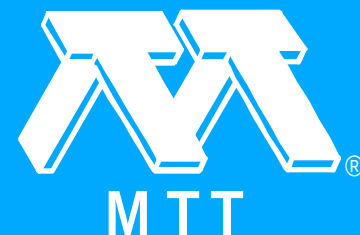
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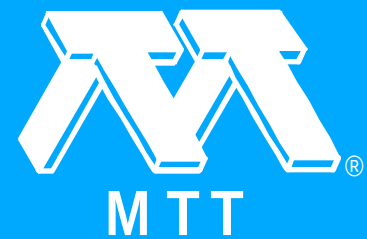
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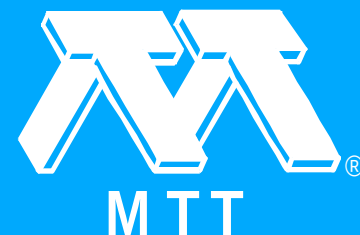
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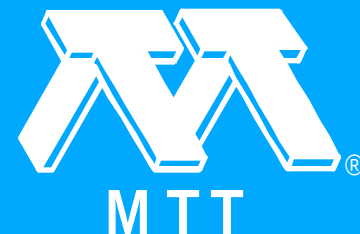
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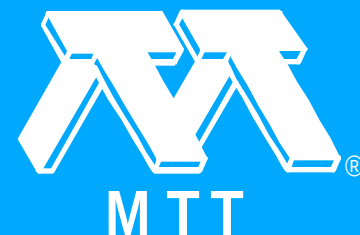
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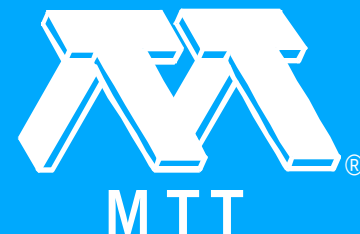


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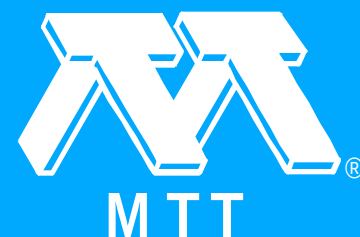
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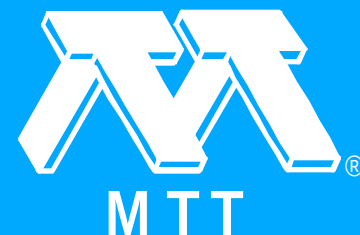


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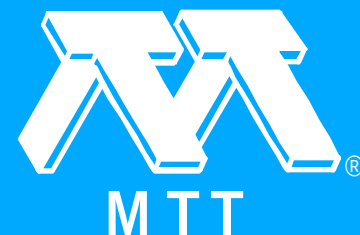
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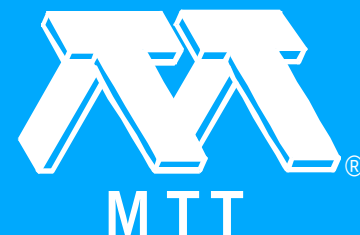
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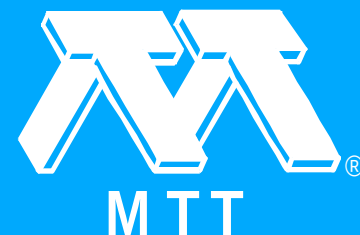
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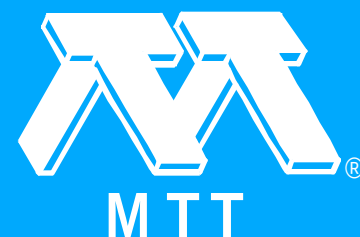
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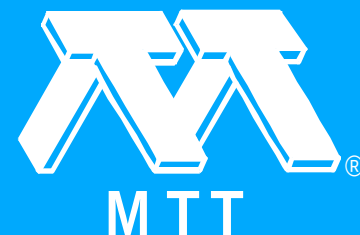
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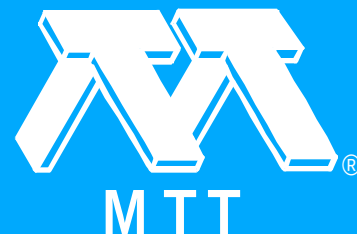
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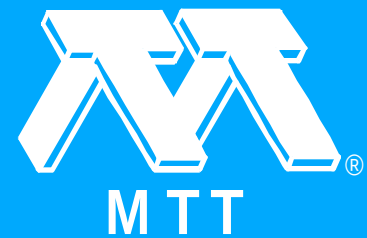
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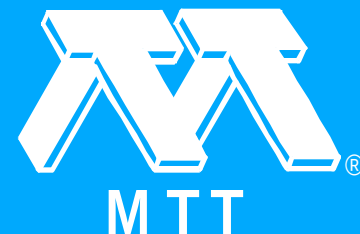
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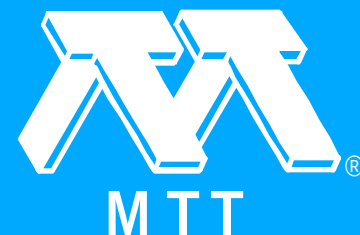
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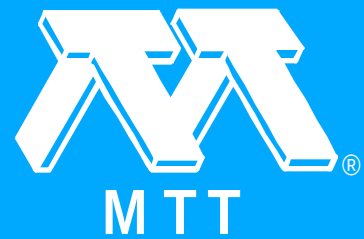
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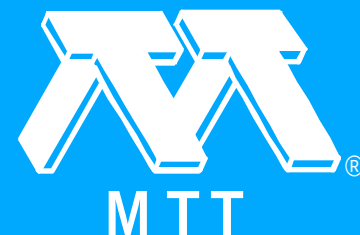
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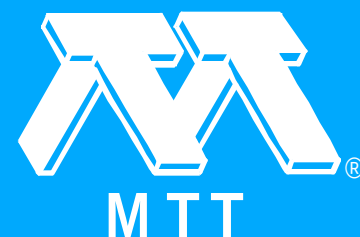
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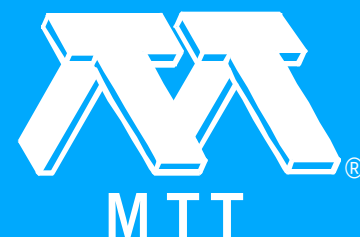
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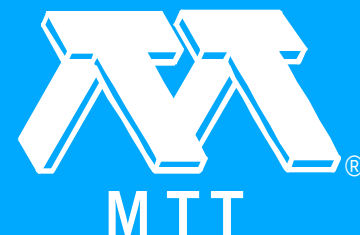
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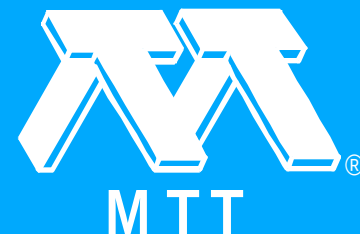
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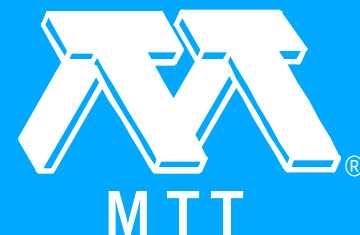
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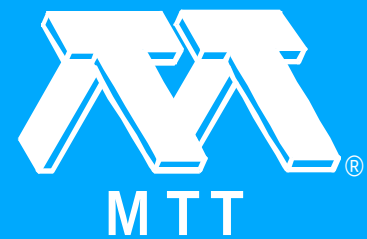
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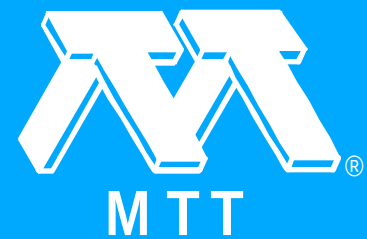
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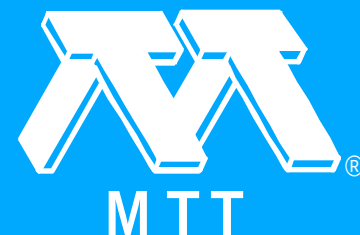
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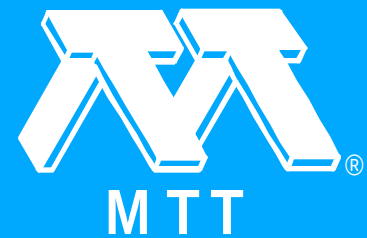
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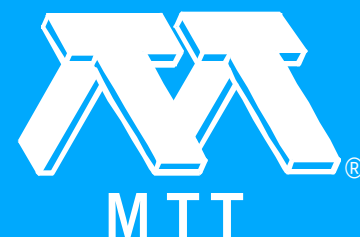
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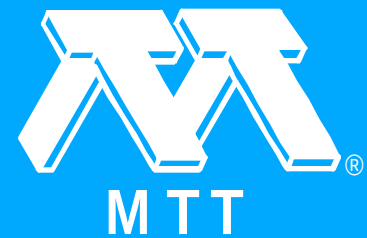
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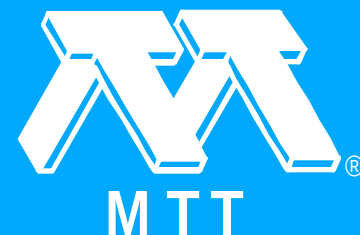


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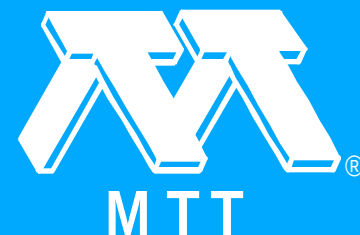
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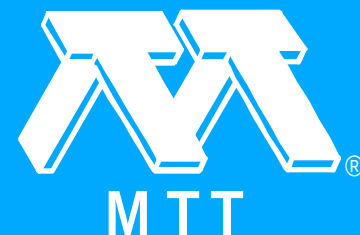
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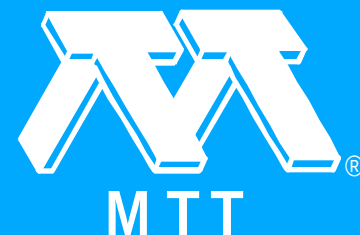
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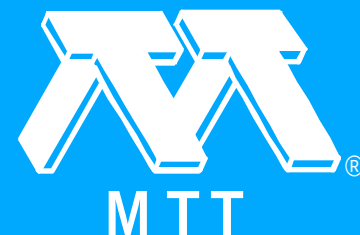
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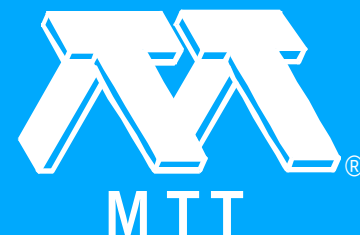
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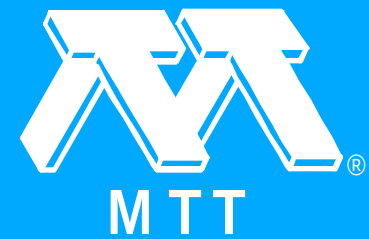
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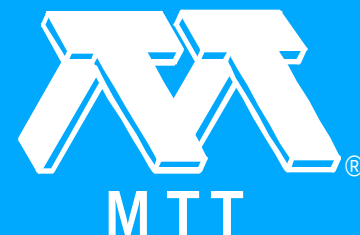


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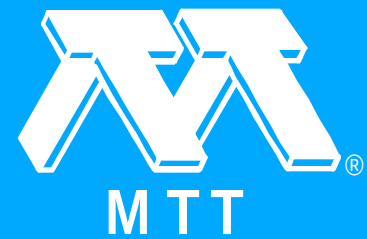
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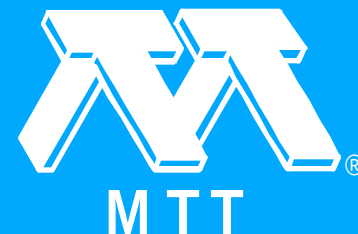
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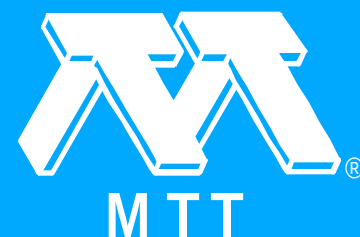
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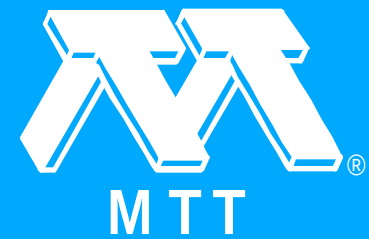
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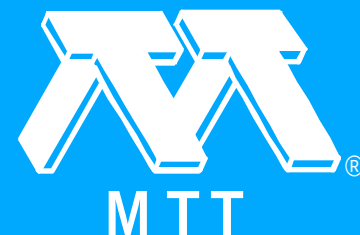
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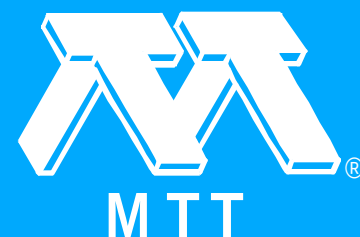
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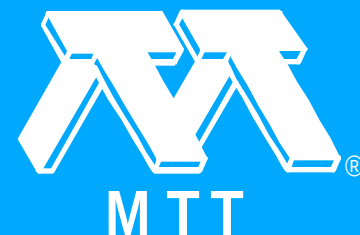
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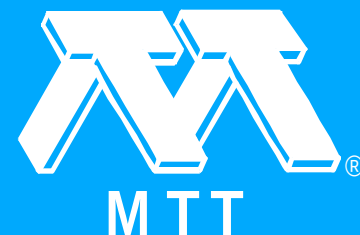
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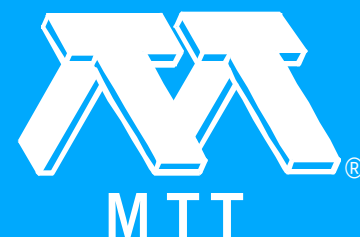
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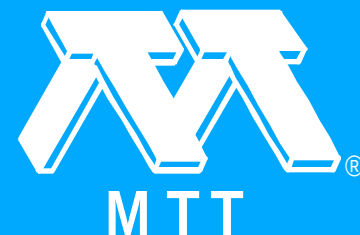
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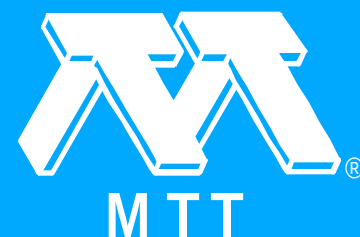
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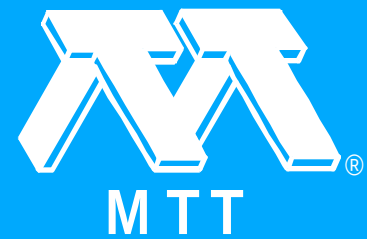
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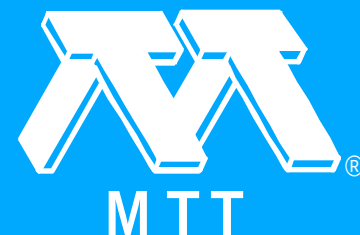
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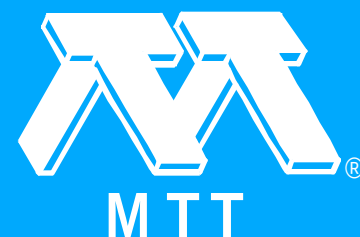
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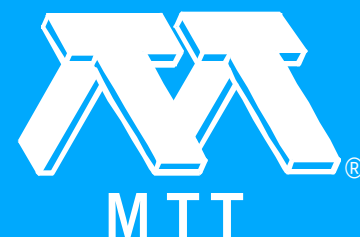
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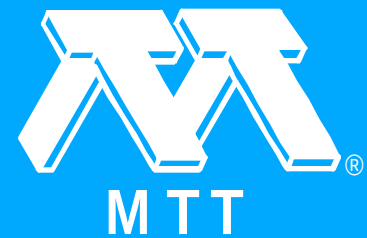
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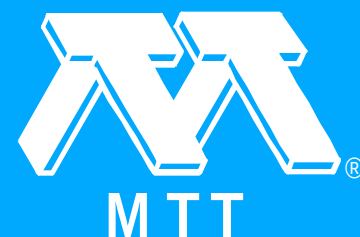
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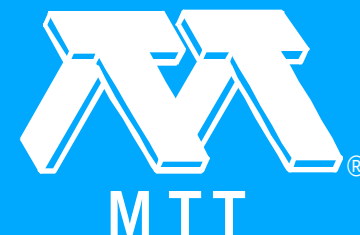
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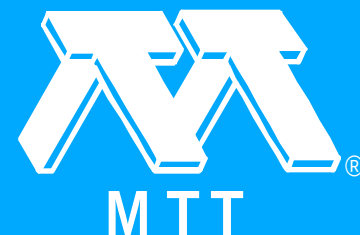


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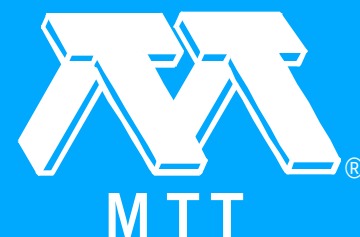
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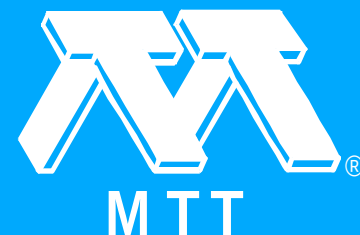
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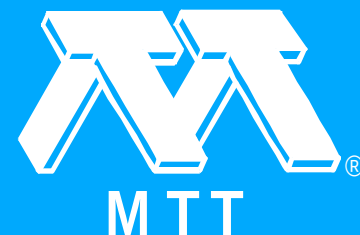
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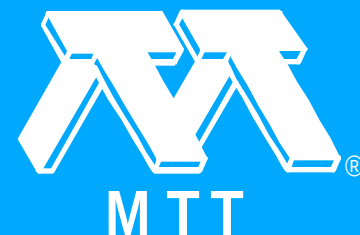
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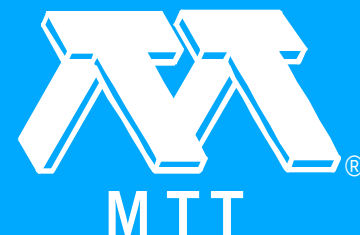
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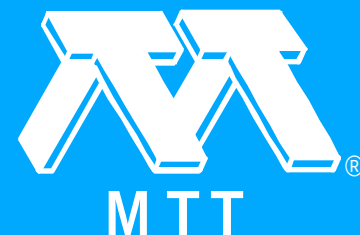
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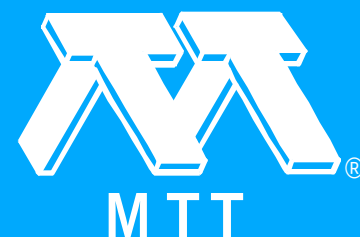
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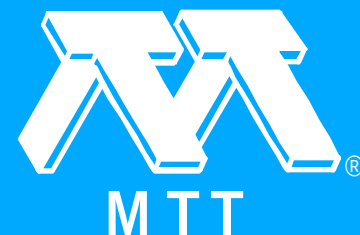
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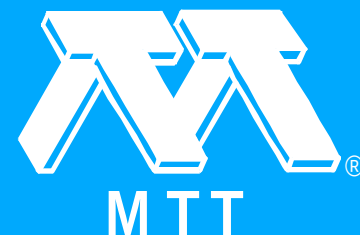


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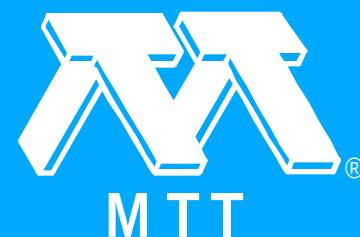
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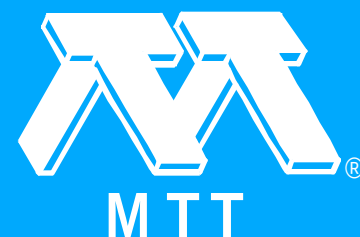
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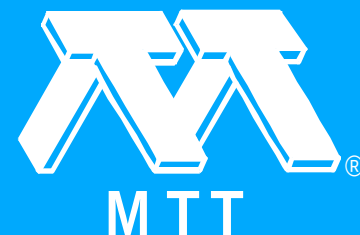
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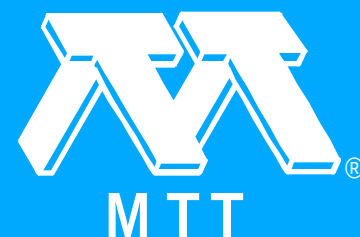
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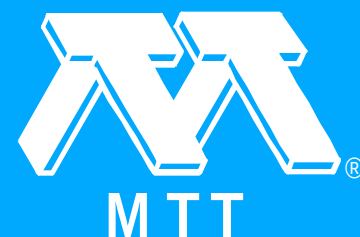
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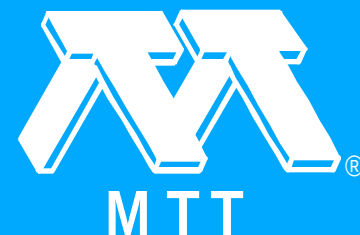
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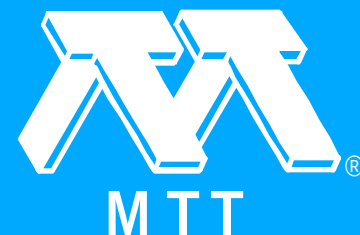
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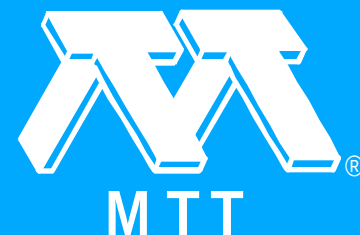
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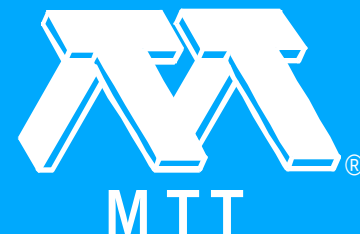
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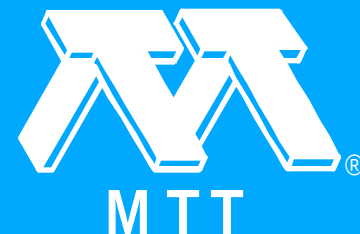
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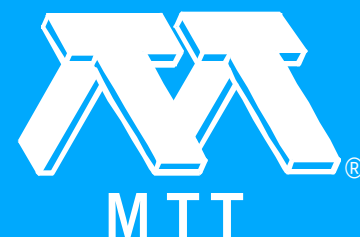
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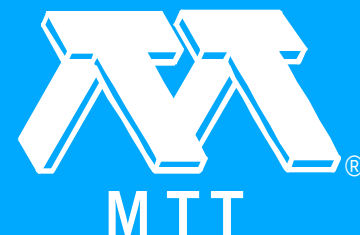
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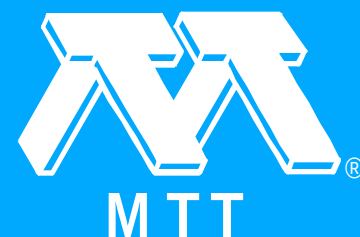
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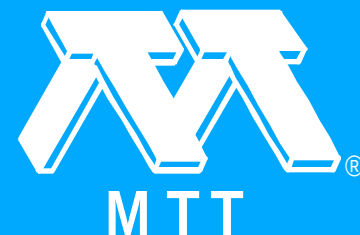
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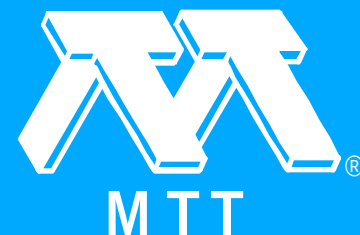
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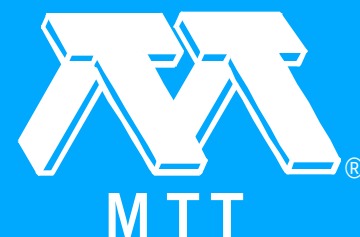
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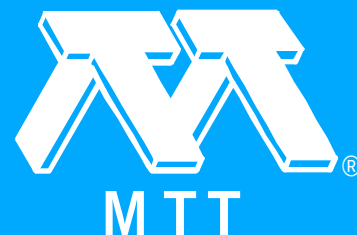
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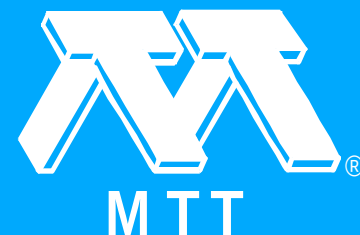
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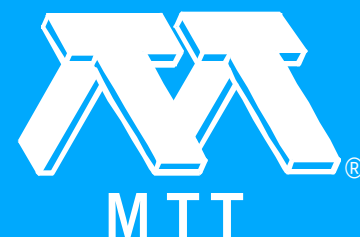
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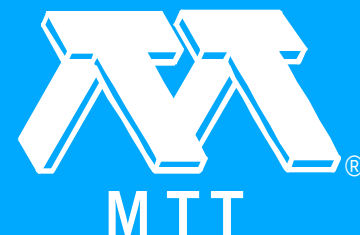
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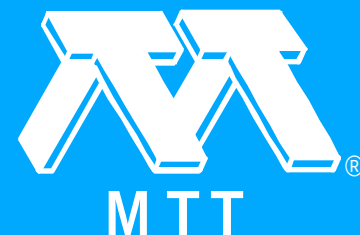
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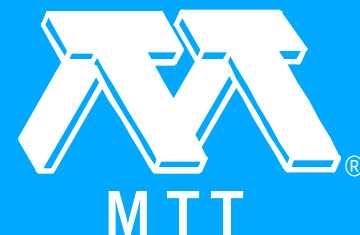
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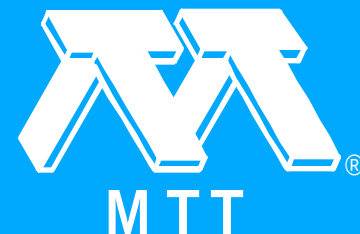
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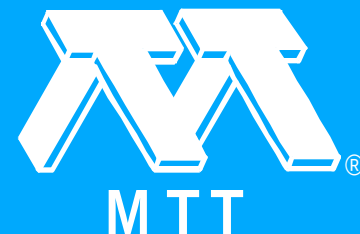
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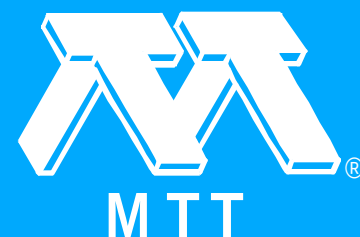
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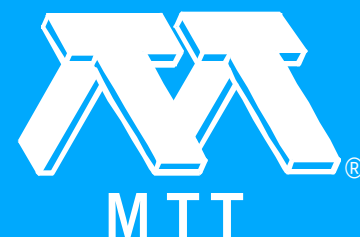
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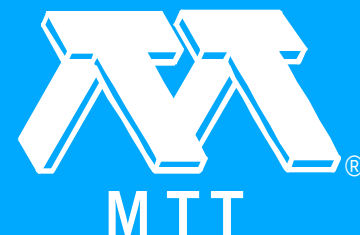
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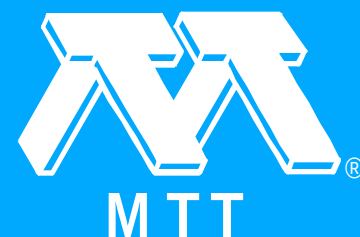
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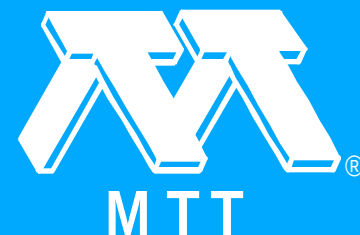
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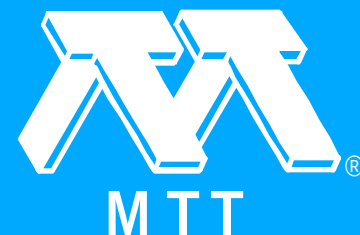
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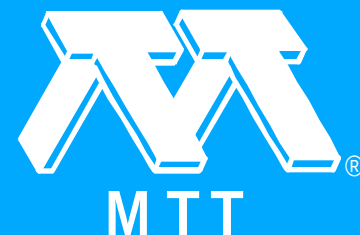
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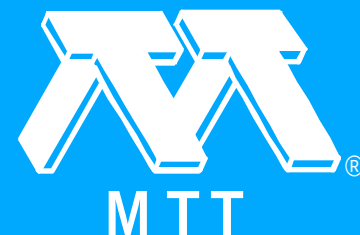
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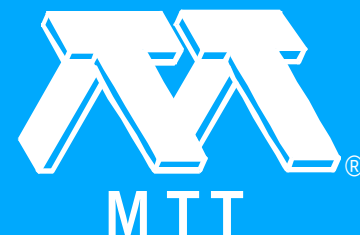
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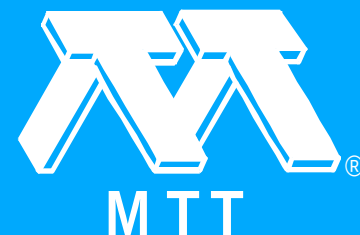
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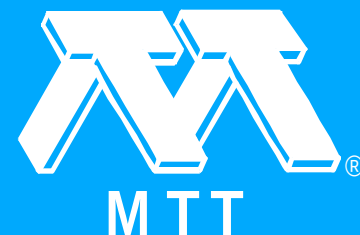
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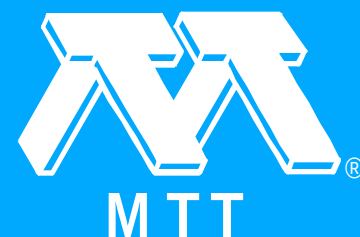
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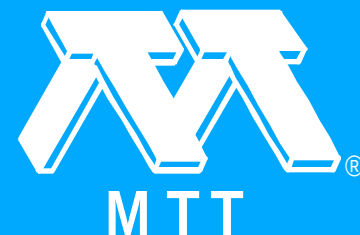
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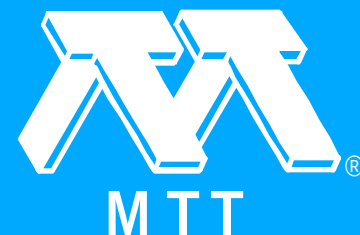
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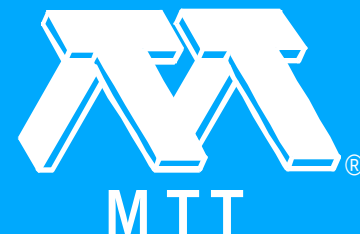
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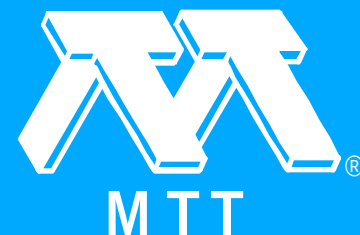
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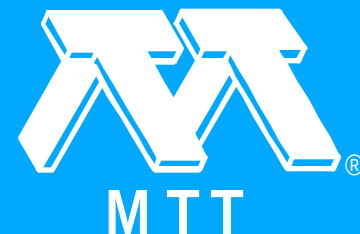
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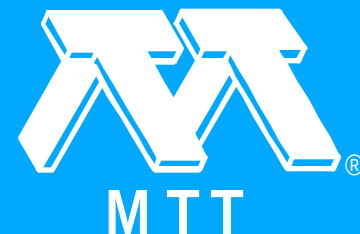
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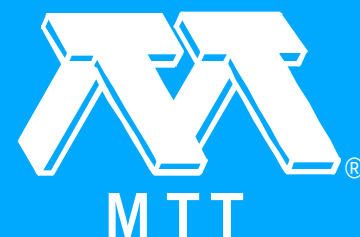
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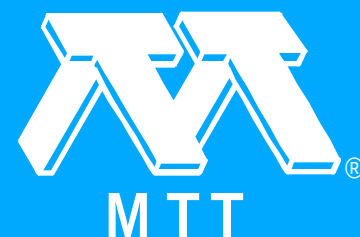
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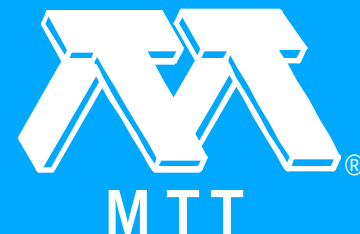
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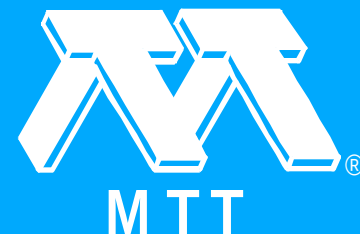
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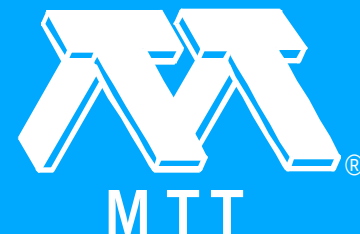
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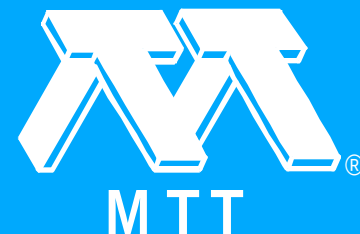
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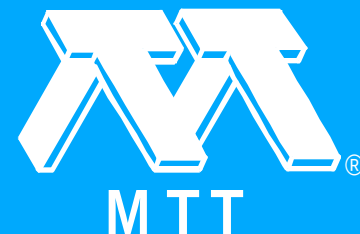
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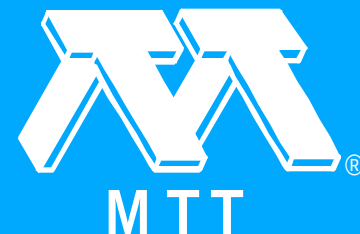
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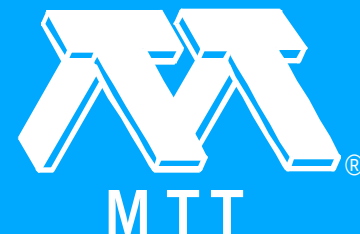
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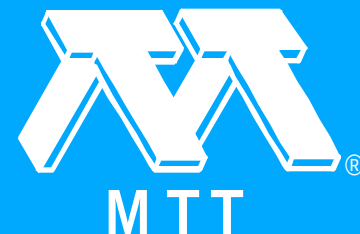
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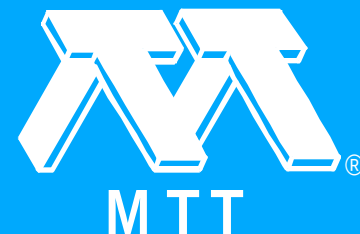
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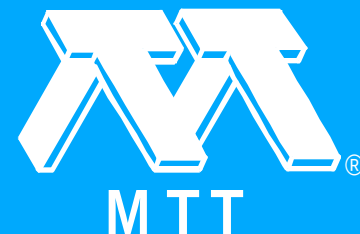
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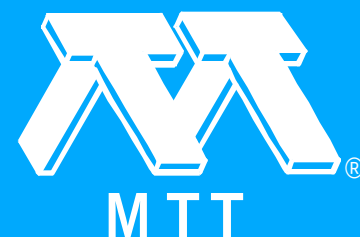
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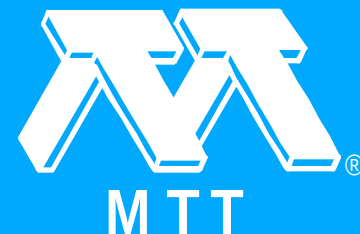
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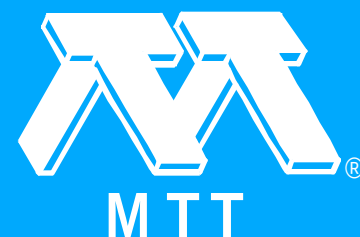
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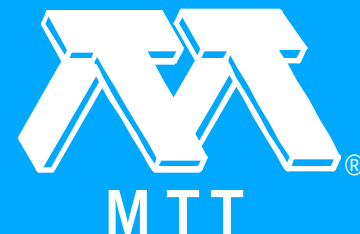
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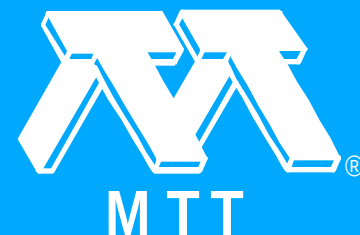
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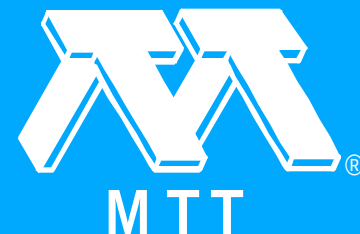
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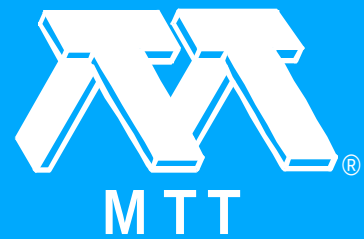
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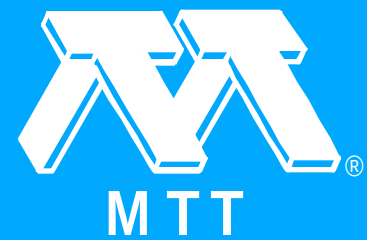
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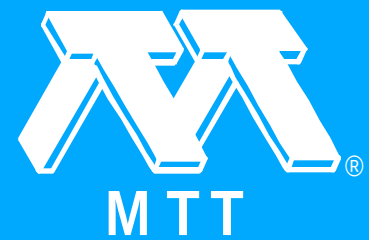
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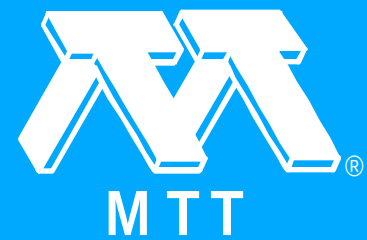
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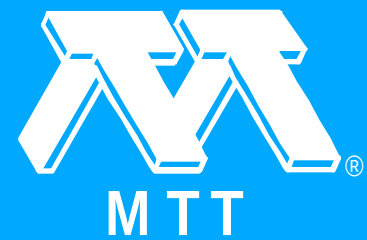
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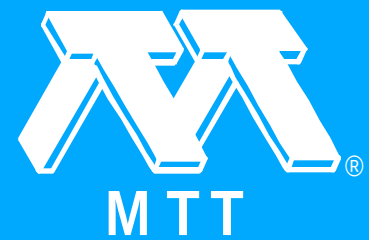
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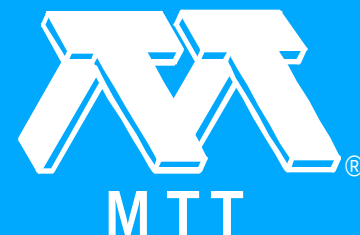


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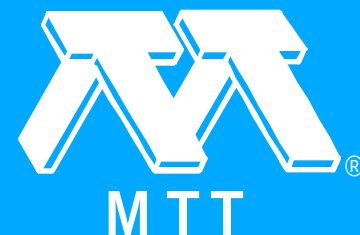
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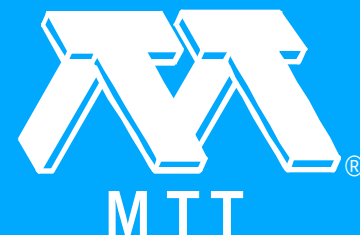
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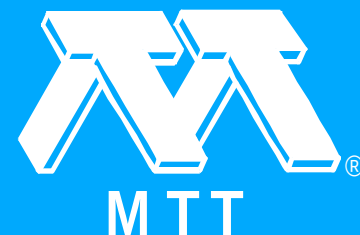
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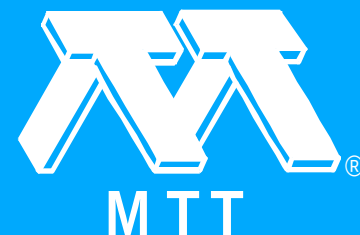
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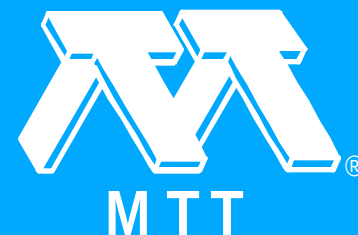
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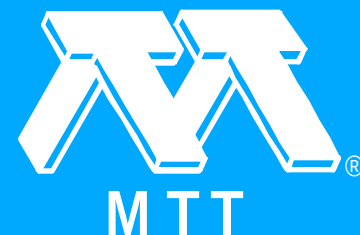
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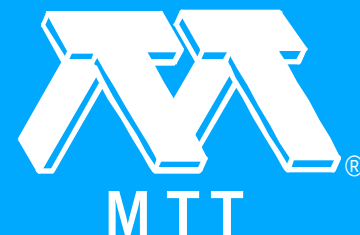
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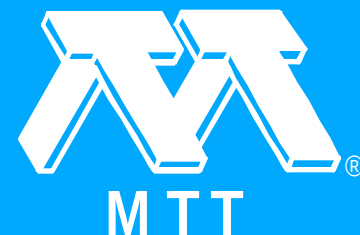
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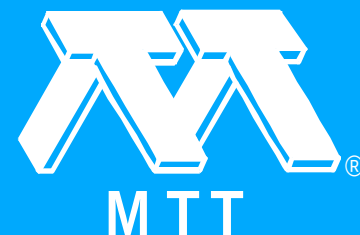
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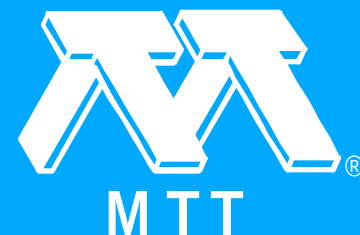
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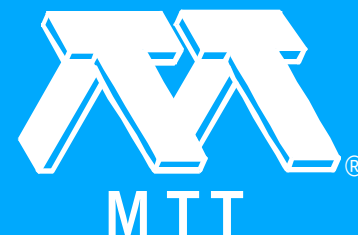
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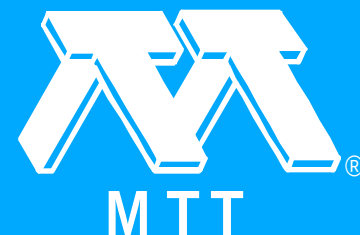


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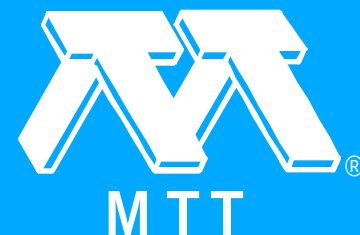
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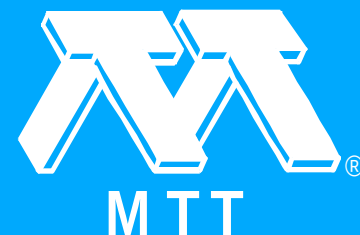


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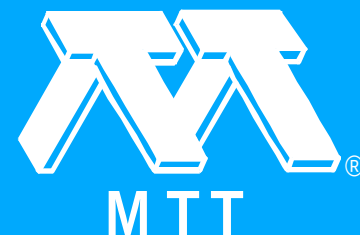
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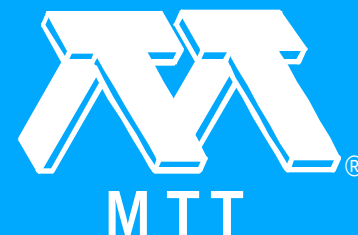


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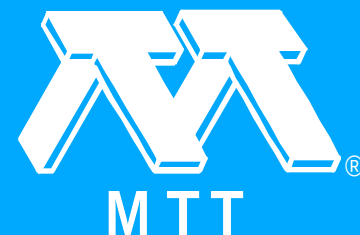
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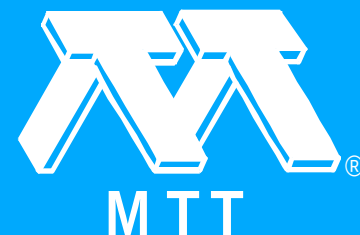
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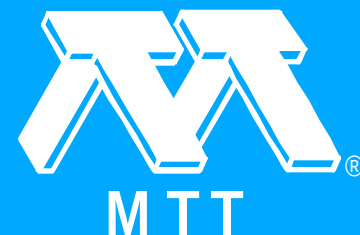
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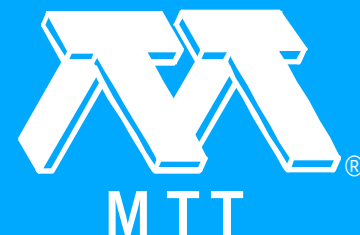
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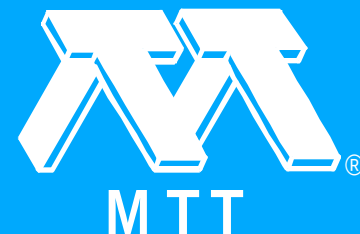
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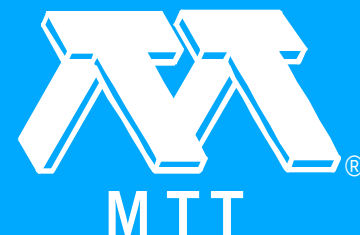
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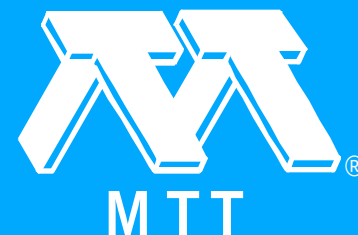
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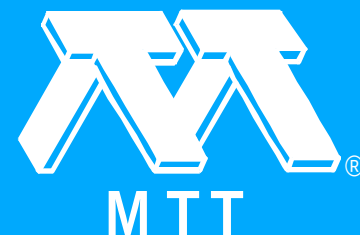
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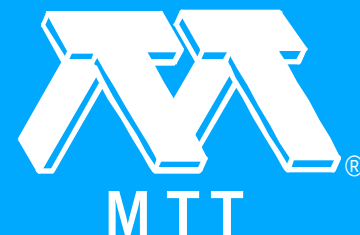
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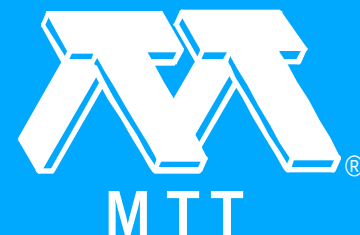
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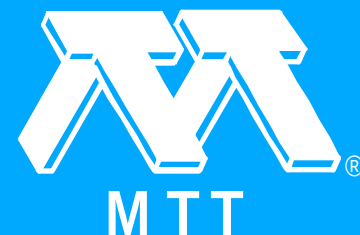
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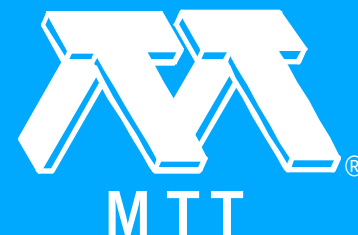
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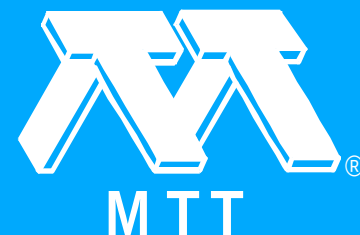
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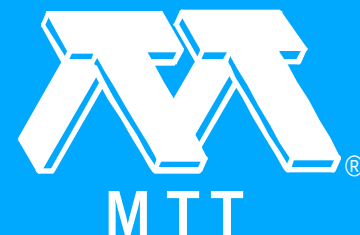
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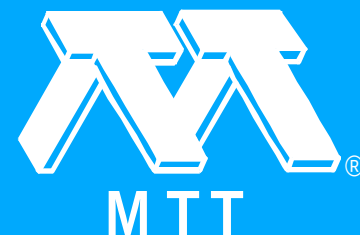
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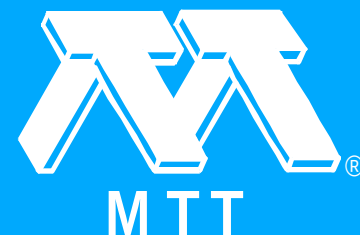


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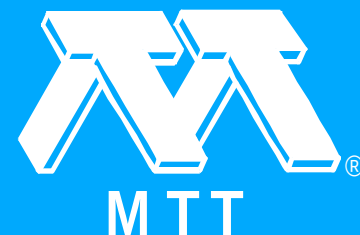
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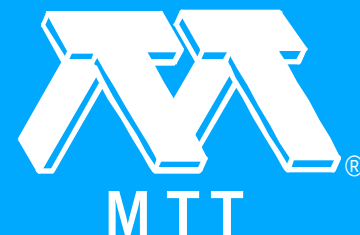
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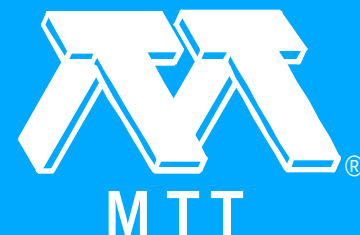
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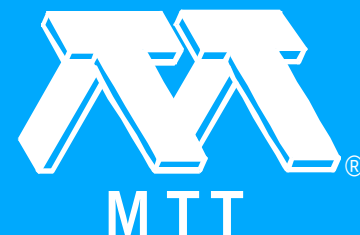
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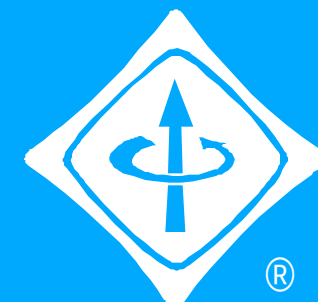
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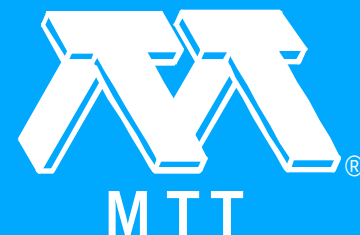
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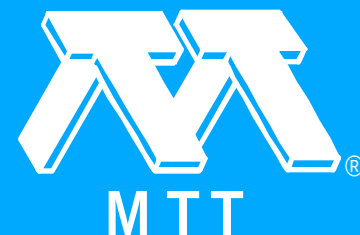
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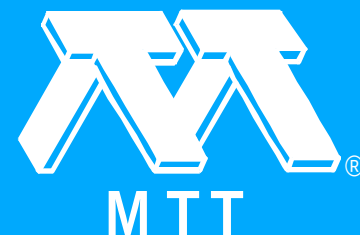
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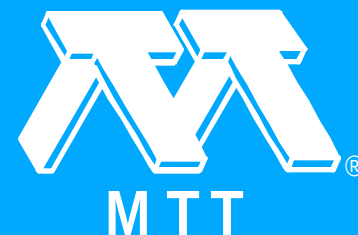
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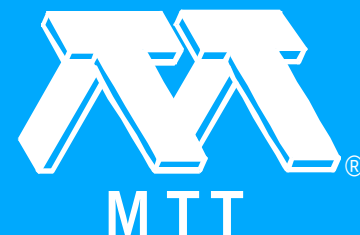
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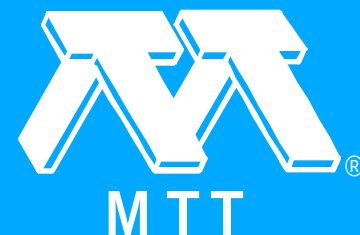
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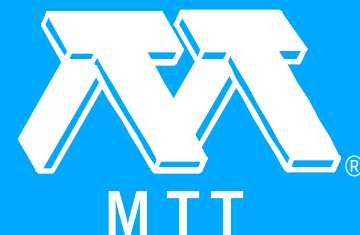
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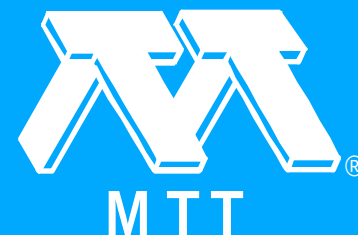
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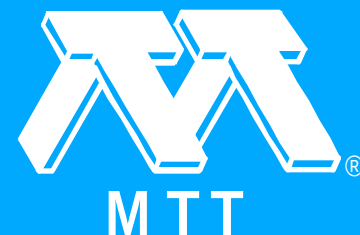
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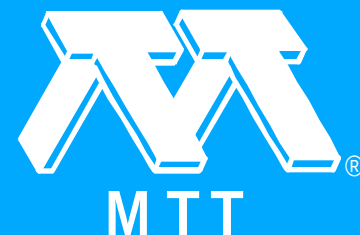
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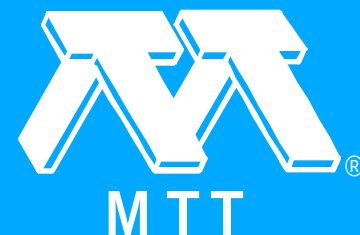
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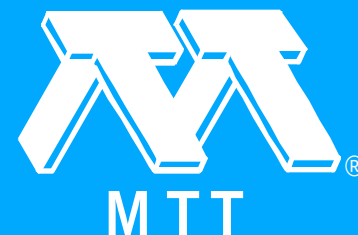
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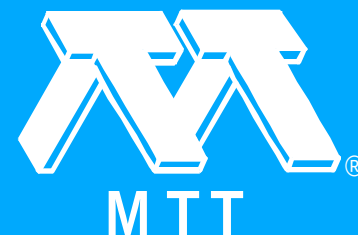
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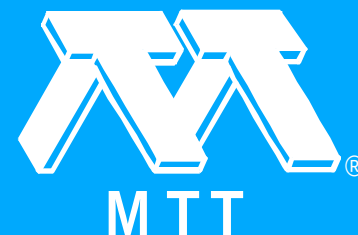
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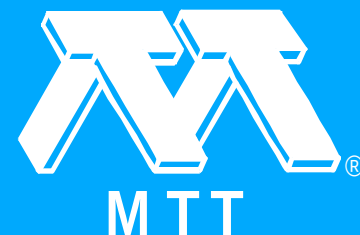
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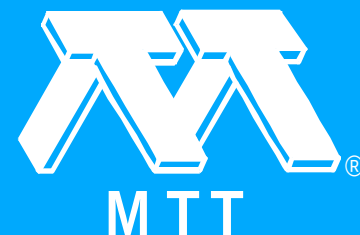
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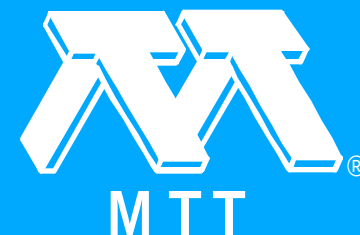
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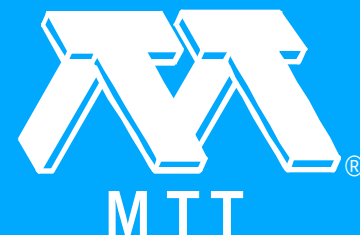
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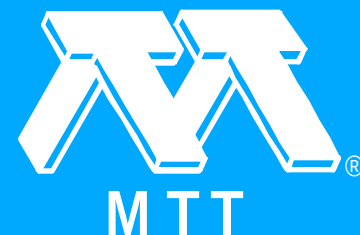
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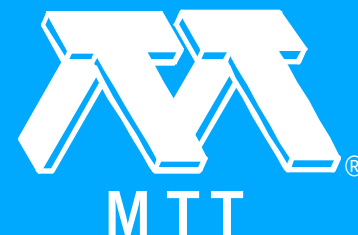
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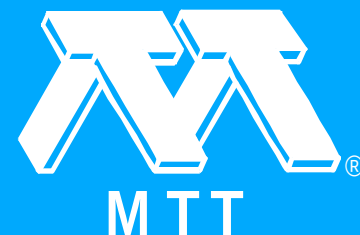
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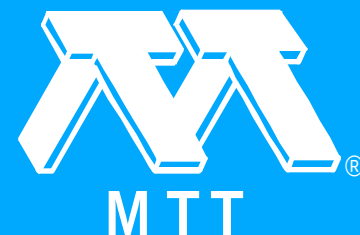
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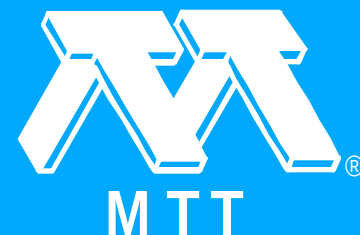


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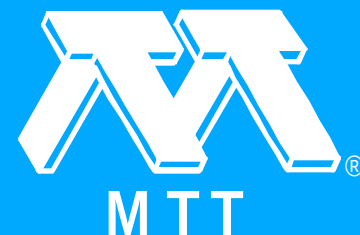


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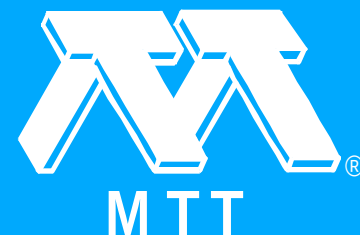


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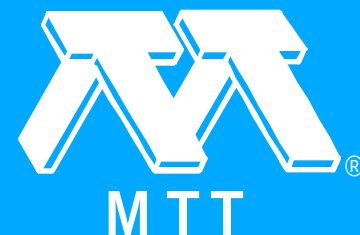
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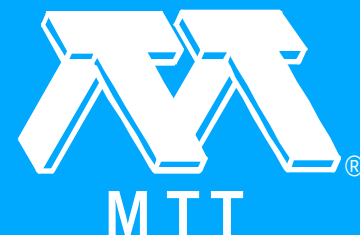
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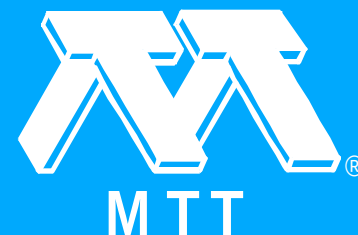
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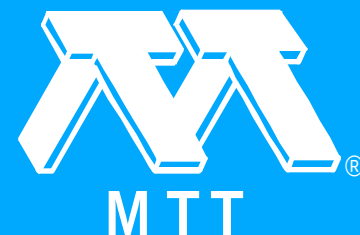
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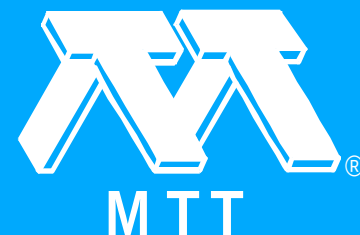
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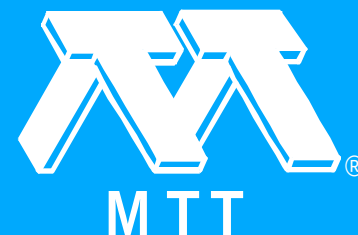
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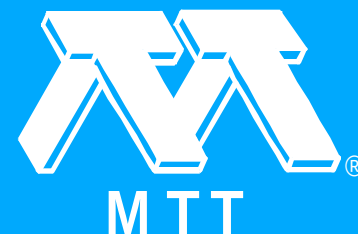
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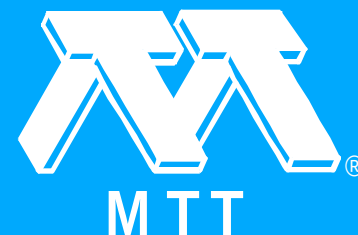
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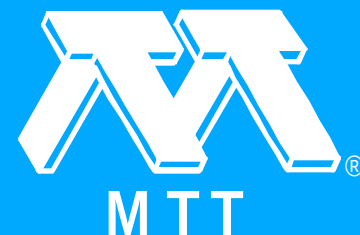


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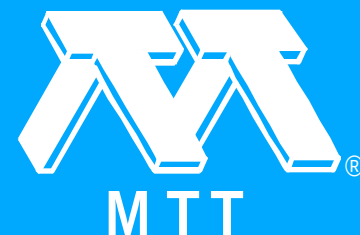
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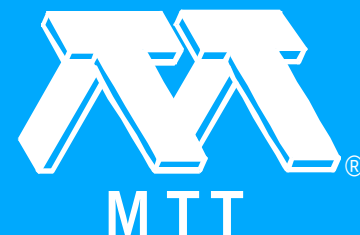
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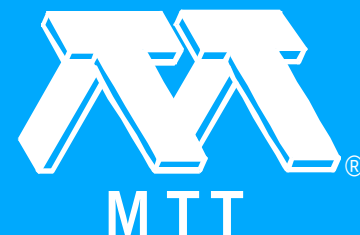
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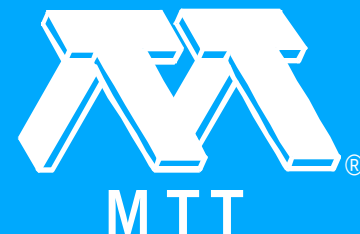
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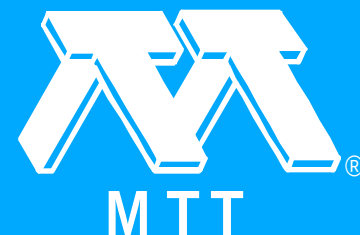


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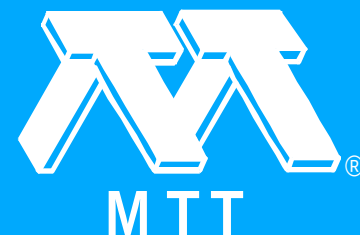
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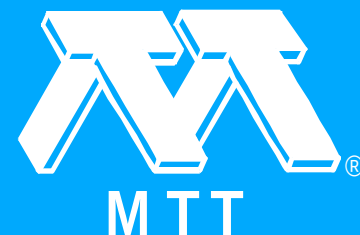
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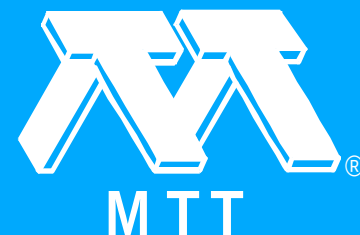
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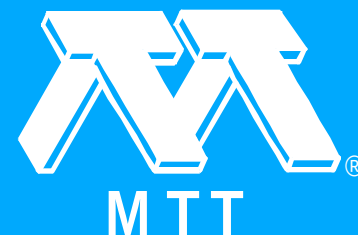
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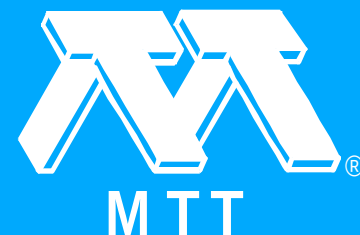
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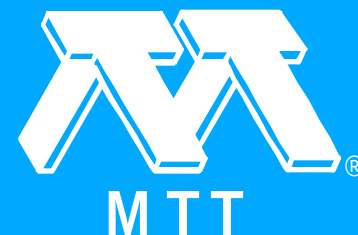
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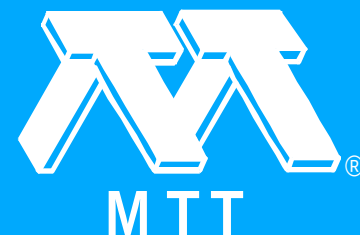
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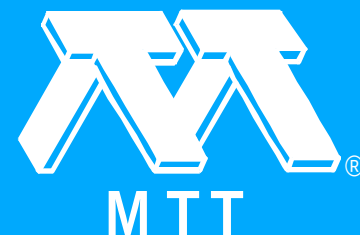
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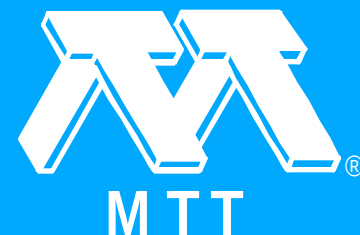
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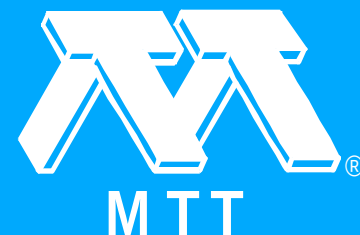
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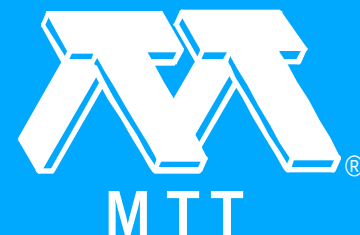
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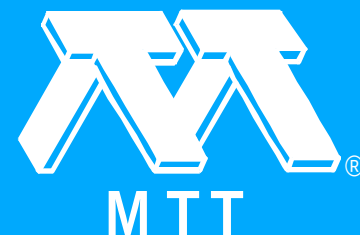
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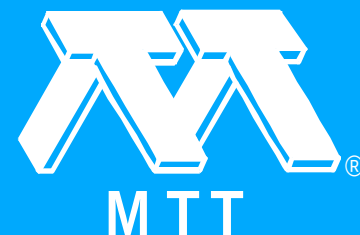
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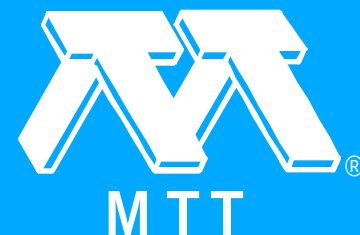
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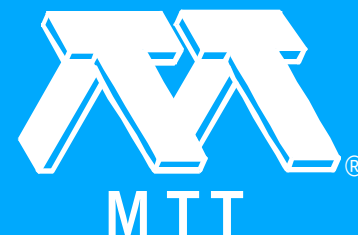
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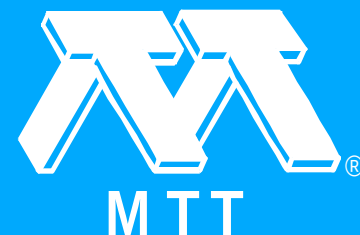
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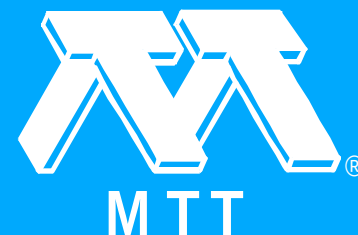
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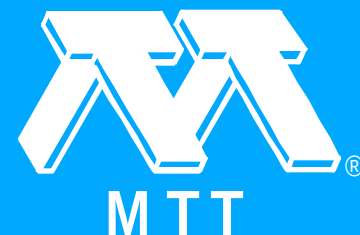
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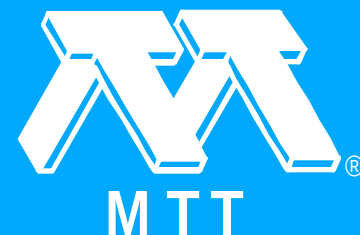


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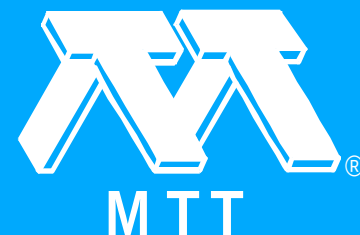
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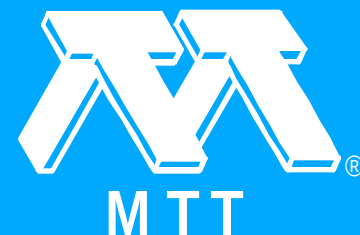
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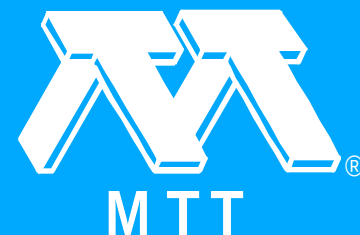
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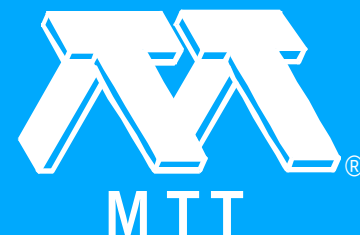
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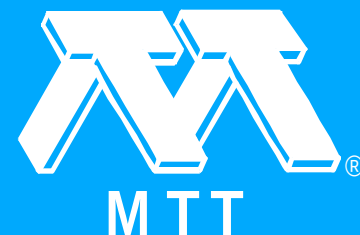
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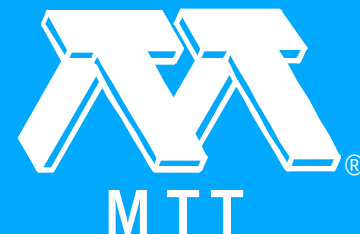
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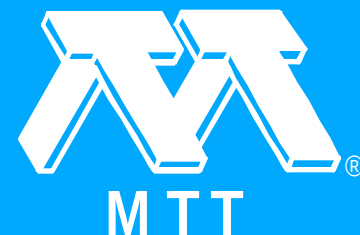
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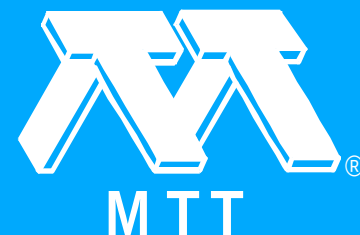
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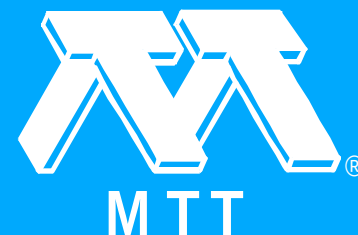
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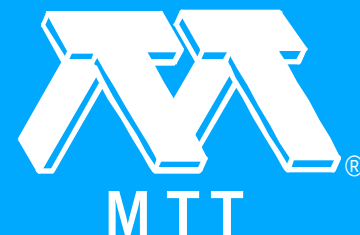
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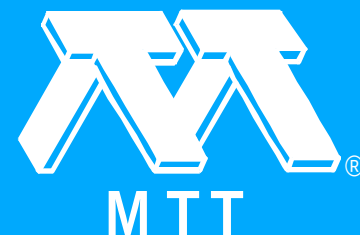
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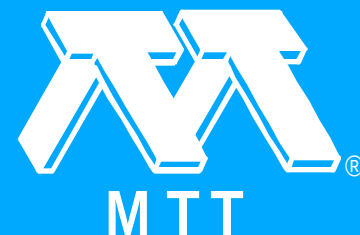
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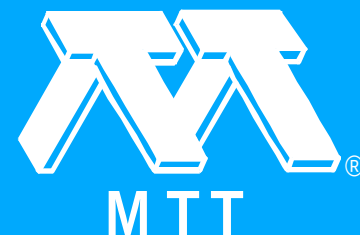
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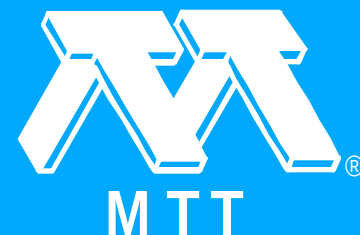


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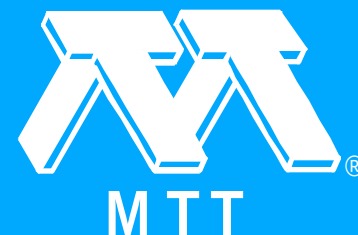
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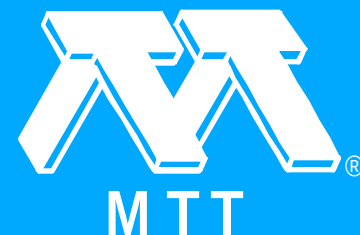
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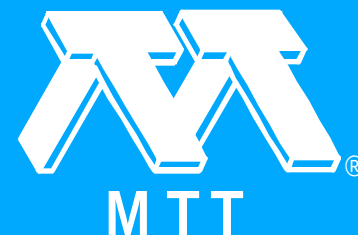
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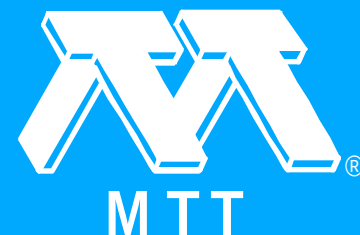
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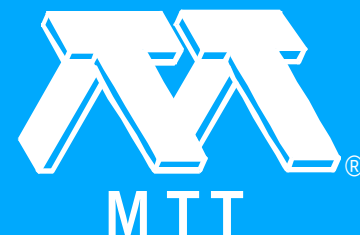
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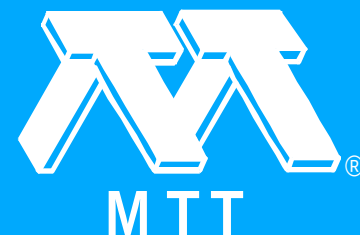
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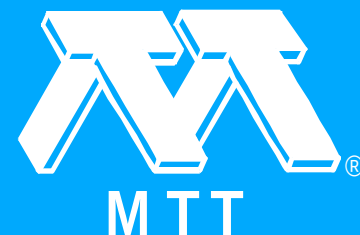
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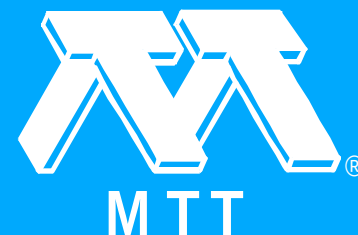
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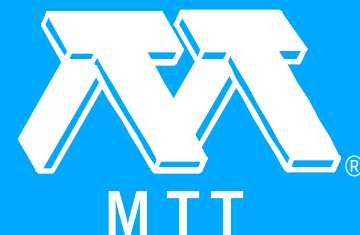
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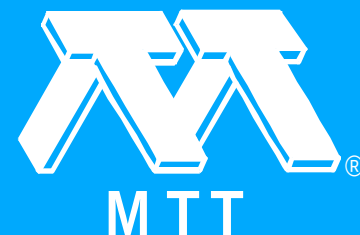
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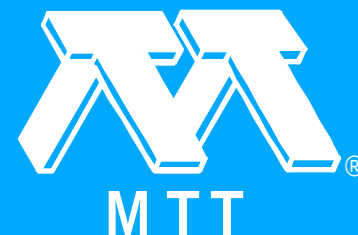
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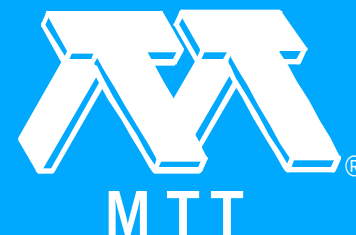
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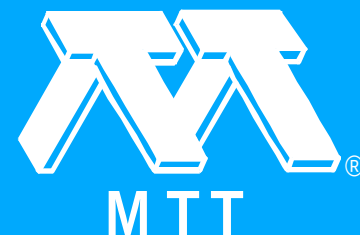
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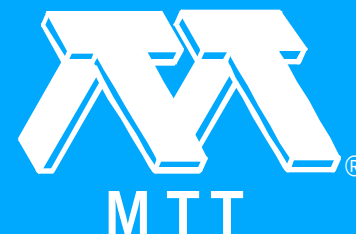
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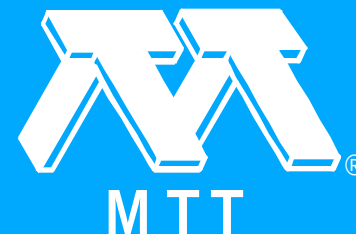
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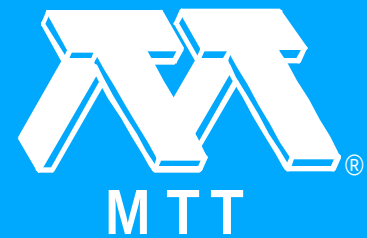


Abstracts

Guest Editorial (Jan. 1972 [T-MTT])

H.E. Stinehelfer. "Guest Editorial (Jan. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 2-2.

In the last decade almost all electrical measurements have been automated, computerized, or made obsolete by such changes. Microwave measurement techniques I taught ten years ago, using slotted lines, are almost a forgotten art. Users today are not buying much nonautomatic equipment for microwave measurements. I do not wish to imply that nonautomatic laboratory measurements are not of value, only that time and money does not allow such time-consuming methods to be used. The network analyzer, impedance plotter, antenna pattern recorders, and similar devices controlled by minicomputers have changed the microwave measurement techniques so that special training courses have had to be given to instruct engineers to use these new modern techniques.



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Abstracts

Applications of Time-Domain Metrology to the Automation of Broad-Band Microwave Measurements

A.M. Nicolson, C.L. Bennett, Jr., D. Lamensdorf and L. Susman. "Applications of Time-Domain Metrology to the Automation of Broad-Band Microwave Measurements." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 3-9.

It is only recently that measurement of the transient response of microwave systems directly in the time domain has become practicable. It has led to growing interest in the concept of specifying broad-band performance solely by a transient-response measurement. Results of the use of time-domain techniques to obtain, within the range 0.1 to 10 GHz, such data as the S parameters of networks, the constitutive parameters of microwave materials, the driving-point impedance and transfer function of microwave antennas, and the frequency-domain scattering parameters of conducting surfaces in free space are described.



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Automated Test Equipment for Phased-Array Modules

C.H. Dale and A.R. Howland. "Automated Test Equipment for Phased-Array Modules." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 10-17.

A computer-controlled production test system for air-borne phased-array microwave modules is described. In the transmit mode accurate measurements of module output power and phase as a function of input power and frequency are made automatically on a pulse basis, and with 4:1 frequency translation from module input to output. Module receiver gain, IF output phase, and noise figure are measured as a function of frequency and local oscillator input power in the receive mode. Other measurements under computer control include dc levels, input and output VSWRS, gain compression, output pulse characteristics, spurious levels, and spectral purity. All test parameters are automatically compared to unit-specification limits as well as reference-standard (unit-to-unit) limits. The system errors are measured periodically through use of calibration standards, stored in memory, and applied as corrections to the measured data on the module under test. Input power, derived from a coherent microwave synthesizer, is automatically adjusted to the required level prior to each test. All test data are recorded on magnetic tape and available to the operator by means of a line printer when desired. The module test fixture incorporates precision (APC)-7 to module adapters, dc connections, an array simulator, and temperature control.

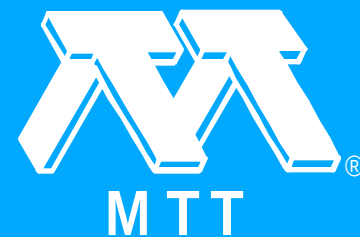


Abstracts

Automated Attenuation Test in Multimodal Waveguides by Resonance Return-Loss or Insertion-Loss Measurements

G.A. Mastellari, C.G. Sameda and F. Valdoni. "Automated Attenuation Test in Multimodal Waveguides by Resonance Return-Loss or Insertion-Loss Measurements." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 17-21.

Two methods for testing short lengths of multimodal circular waveguides, working in the TE/sub 01/ mode accompanied by many spurious modes are described. One method is based on the measurement of the return loss of a resonant one-port cavity; the second one measures the insertion loss of a cavity coupled to the rectangular main waveguide. Automatic data selection and manipulation are emphasized.



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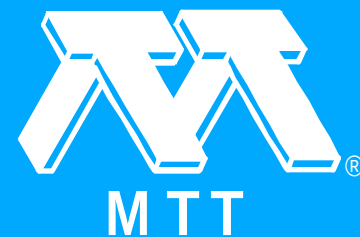


Abstracts

A Numerical Method for Calibrating Microwave Cavities for Plasma Diagnostics---Part I

M.E. Fein, L.A. Schlie, J.T. Verdeyen and B.E. Cherrington. "A Numerical Method for Calibrating Microwave Cavities for Plasma Diagnostics---Part I." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 22-30.

Computer programs are described which generate calibration curves for TE/sub 0np/ and TM/sub 0n0/ cylindrical microwave cavities used in plasma diagnostics. The programs provide data for electron densities well above those at which perturbation theory fails, and can be used for any specified variation of electron density with radius.



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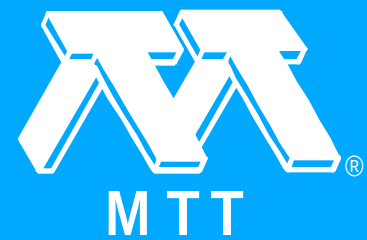
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Automatic Digital Method for Measuring the Permittivity of Thin Dielectric Films

M.A. Rzepecka and M.A.K. Hamid. "Automatic Digital Method for Measuring the Permittivity of Thin Dielectric Films." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 30-37.

One of the most promising techniques for measuring the electric permittivity at microwave frequencies of thin dielectric materials of the order of 0.1 to 10 μm , is the cavity perturbation method. For thin films of this type, it is necessary to determine accurately and display small changes in the resonant frequency and Q factor of the cavity in the presence of the material sample. A circuit for the simultaneous measurement and digital readout of the resonant frequency and Q factor of microwave cavity is described. For the resonant frequency measurement, a very efficient automatic frequency circuit, with a homodyne modulation-detection bridge and frequency stabilization loop, is applied. Theoretical analysis and experiments results with this circuit show that an accuracy of 5×10^{-7} can be achieved in the resonant frequency measurement. For measuring the Q factor, two similar circuits are described. The technique is based on measuring the phase shift of the envelope of an amplitude modulated microwave signal when this signal is transmitted through a resonant cavity at resonance. Although an accuracy of 0.5 percent in the Q factor can be achieved, it is shown that the main limiting factor in both circuits is the accuracy of phase shift determination at RF frequencies.

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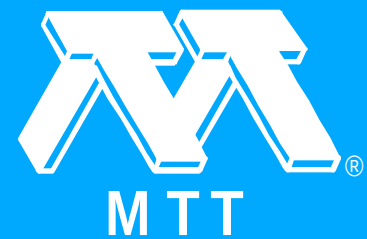


Abstracts

Automatic Microwave Q Measurement for Determination of Small Attenuations

A. Uhler, Jr.. "Automatic Microwave Q Measurement for Determination of Small Attenuations." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 38-41.

The Q's of a waveguide transmission cavity with and without insertion of a length of waveguide give the insertion loss. Least-squares fitting of transmission versus frequency data have been used to determine Q and resonant frequency f_r with computer-controlled equipment in an iterative process. Preliminary values of Q and f_r are used to calculate an improved set of test frequencies, and so on. A rapid least-squares method is described which minimizes truncation errors.



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Impedance Measurements of Microwave Lumped Elements from 1 to 12 GHz

R.E. DeBrecht. "Impedance Measurements of Microwave Lumped Elements from 1 to 12 GHz." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 41-48.

The impedance measurement of small, microwave lumped elements of the order of 1 mm has been extended up to 12 GHz by a technique in which the frequency and Q of a resonant transmission line are perturbed by the connection of a lumped element. With the use of low-loss resonant coaxial lines, the technique has been applied to the measurement of lumped-element capacitors ranging from 0.4 to 3.6 pF and inductors ranging from 1.1 to 4.3 nH. Conductor Q values for capacitors as high as 1700 at 1.4 GHz and 100 at 12 GHz have been measured and estimates of dielectric Q values for capacitors of over 5000 have been obtained. Single-turn 1.1-nH inductor Q's of 40 at 1 GHz and 90 at 7 GHz have also been measured. The capacitors and single-turn inductors are found to have constant C and L values up to 12 GHz.

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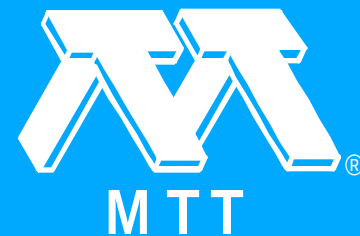


Abstracts

Digitized Antenna Measurements

J. Dijk, C. Kramer, E.J. Maanders and A.C.A. van der Vorst. "Digitized Antenna Measurements." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 48-51.

A low-cost automated measuring method is presented to determine the directive gain and relative phase of microwave antenna feed systems in digital form. Using large existing computer facilities, the output data may be used as input data to compute secondary patterns of arbitrary reflector antennas. The use of stepping motors is a key for cheaper and easier operations.



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Frequency-Domain Characterization of Microwave Delay Lines

A. Uhler, Jr.. "Frequency-Domain Characterization of Microwave Delay Lines." 1972 *Transactions on Microwave Theory and Techniques* 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 51-53.

Techniques for evaluating delay lines with an automatic network analyzer are described. Extremely precise values of the delay can be obtained by an iterative process which uses final measurement frequencies spaced by integral multiples of the reciprocal delay. The magnitude of leakage and triple-delayed transmissions are determined from measurements which are also necessary to obtain accurate values of insertion loss.

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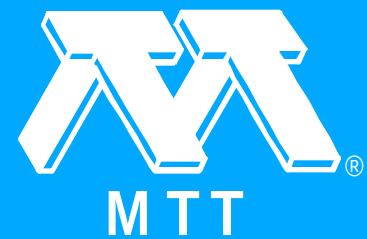


Abstracts

A Fast Data-Acquisition System for a Time-Shared Computer

M.J. Schindler. "A Fast Data-Acquisition System for a Time-Shared Computer." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 54-60.

Computer-aided testing is usually performed with a dedicated computer, typically adding a five-digit number to the cost of the test equipment. In such systems the computer sets the test conditions and then records the test results from digital meters. This approach can lead to intolerably slow measurements when the dedicated computer is replaced by a remote time-shared computer. This paper discusses a solution to the problem in which an inexpensive interface (under 1000 dollars) sets the test conditions locally, so that a long string of data can be transmitted to the computer when the telephone line is open. A typical application is the evaluation of high-power microwave transistors, using a standard network analyzer. Connected to a Teletype, the system covers up to 40 frequency points in about 20 s, and displays the calculated and corrected S-parameters within another 20 s. If connected to the computer line through a 1200 Bd line, the system is speeded up by a factor of approximately 10.



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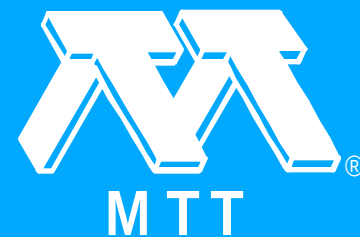


Abstracts

Errors in S_{11} Measurements Due to the Residual Standing-Wave Ratio of the Measuring Equipment

R.V. Garver, D.E. Bergfried, S.J. Raff and B.O. Weinschel. "Errors in S_{11} Measurements Due to the Residual Standing-Wave Ratio of the Measuring Equipment." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 61-69.

Errors in measurement of S_{11} due to the residual SWR of the slotted line or directional coupler are calculated using admittance considerations. This more complete treatment produces, for some practical conditions, major differences from prior references for phase errors.



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Application of Computer-Controlled Spectrum Surveillance Systems to Crime Countermeasures

H.D. McKay. "Application of Computer-Controlled Spectrum Surveillance Systems to Crime Countermeasures." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 69-74.

A computer-controlled spectrum surveillance system, and application of such a system to crime countermeasures, is described. The system covers the frequency range of 5 kHz to 12 GHz. All functions are controlled via mini-computer, with output directly compatible with batch processing computers.



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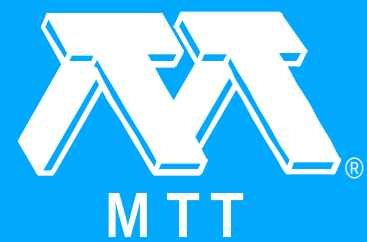
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A Discrete Point Approach to the Measurement of Radiated Power of Planar Apertures

A.C. Kak. "A Discrete Point Approach to the Measurement of Radiated Power of Planar Apertures." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 74-81.

It is shown that for a high-gain circular aperture with linearly polarized and rotationally symmetric excitation the total real radiated power can be expressed as a weighted sum of radiation intensities in N direction, where N is equal to the first integer greater than $2.14D/\lambda$. D/λ is the diameter of the aperture in wavelengths. In an N -point measurement scheme the N directions and the weights involved in the weighted sum of radiation intensities are completely independent of the parameters of the radiation system and can be obtained from the well-known and tabulated properties of the Legendre polynomials. The criterion that N be equal to the first integer greater than $2.14D/\lambda$ is independent of any specific distribution in the aperture so long as it is of the type parabolic-on-a-pedestal. Such aperture distributions satisfy most needs and cover typical behavior of actual dish antennas. Even though the result of the theoretical formulation is that the above mentioned criterion for N holds good only for high directivity apertures, computational results show that for D/λ as small as 5 the error involved when N satisfies this criterion is less than 0.02 percent, and for D/λ equal to 7 the error reduces to 0.005 percent. This not only indicates that the criterion that N be equal to the first integer greater than $2.14D/\lambda$ holds good even for small values of D/λ , but it also shows the rapid decrease of error with increase in D/λ . A knowledge of the total radiated power is required for the determination of gain and radiation efficiency of an aperture. The discrete point approach to the measurement of total radiated power eliminates the need for using the conventional method of graphical integration of radiation patterns for the determination of the total radiated power. The method of graphical integration has been known to give erroneous results for high-gain apertures. Measurement of radiation intensities in the fine sidelobe structure is another source of error in the conventional method. In the discrete point approach the directions in which the radiation intensity need be measured tend to cluster around the normal to the aperture. This means fewer measurements in the fine sidelobe structure.

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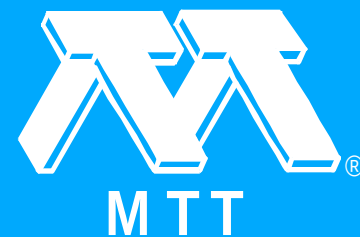


Abstracts

A Technique to Measure Accurately Antenna Efficiency (Correspondence)

W.D. Eden. "A Technique to Measure Accurately Antenna Efficiency (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 82-83.

A technique is described to determine accurately antenna efficiency by comparing integrated isotropic levels of two antennas, one of which is a lossless reference antenna. Standard automated antenna-range instrumentation was utilized to obtain isotropic levels of Apollo scimitar antennas to ± 0.1 dB by reducing or eliminating sources of error due to specular ground reflections as well as results based on a single measurement.



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Abstracts

Digitized Antenna Measurements of the Directive Gain (Computer Program Descriptions)

C. Kramer. "Digitized Antenna Measurements of the Directive Gain (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 83-83.

This program computes a circularly symmetrical averaged-directive gain pattern from measurements carried out in E and H planes combined with cross-polarization measurements if desired.



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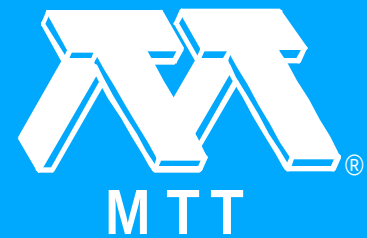


Abstracts

A Numerical Method for Calibrating Microwave Cavities for Plasma Diagnostics---Part II (Computer Program Descriptions)

M.E. Fein, L.A. Schlie, J.T. Verdeyen and B.E. Cherrington. "A Numerical Method for Calibrating Microwave Cavities for Plasma Diagnostics---Part II (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 83-83.

This program generates calibration curves for TE/sub 0np/ and TM/sub 0n0/ cylindrical microwave cavities used in plasma diagnostics,



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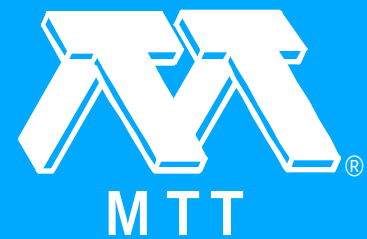
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Abstracts

Contributors (Jan. 1972 [T-MTT])

C.L. Bennett, Jr., D.E. Bergfried, B.E. Cherrington, C.H. Dale, R.E. DeBrecht, J. Dijk, M.E. Fein, R.V. Garver, M.A.K. Hamid, A.R. Howland, A.C. Kak, C. Kramer, D. Lamensdorf, E.J. Maanders, H.D. McKay, G.A. Mastellari, A.M. Nicolson, S.J. Raff, M.A. Rzepecka, M.J. Schindler, L.A. Schlie, C.G. Someda, L. Susman, A. Uhler, Jr., F. Valdoni, A.C.A. van der Vorst, J.T. Verdeyen and B.O. Weinschel. "Contributors (Jan. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): 84-88.



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"Back Cover (Jan. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.1 (Jan. 1972 [T-MTT] (Special Issue on Automated Microwave Measurements)): b1-b2.



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Dissipative Parameters in Ferrites and Insertion Losses in Waveguide Y-Circulators Below Resonance

R. Roveda, C. Borghese and G. Cattarin. "Dissipative Parameters in Ferrites and Insertion Losses in Waveguide Y-Circulators Below Resonance." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 89-96.

Extensive microwave loss measurements have been performed at frequencies from 1.3 to 11 GHz on below-resonance waveguide Y circulators loaded with a wide variety of ferrite and garnet compositions. Dissipative internal and external magnetic parameters have been measured on the same compositions. Also, dielectric loss measurements have been carried out. Two classes have been distinguished, defined by the following conditions: $\omega/\omega_M \leq 0.8$ and $0.85 \leq \omega/\omega_M \leq 1.05$. It is inferred that the (insertion loss) IL of such devices is independent of ΔH and mainly depends on the internal dissipative susceptibility χ'' and on the dielectric loss $\tan \delta$. The relation of the IL versus χ'' and $\tan \delta$ in the case $\omega/\omega_M \leq 0.8$ is independent of frequency and given by the semiempirical equation $IL = 10 \log_{10} [1 - 2.85 \chi'' - 1.60 \tan \delta - 0.017]^{-1}$.

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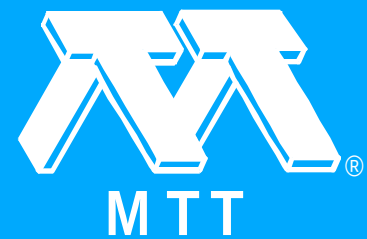


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Analytical and Numerical Studies of the Relative Convergence Phenomenon Arising in the Solution of an Integral Equation by the Moment Method

R. Mittra, T. Itoh and T.-S. Li. "Analytical and Numerical Studies of the Relative Convergence Phenomenon Arising in the Solution of an Integral Equation by the Moment Method." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 96-104.

The relative convergence phenomenon that occurs in the numerical solution of the integral equation for the iris discontinuity problem is studied both analytically and numerically. It is shown that the solution for the aperture field can be highly dependent upon the manner in which the kernel and the unknown function are approximated in the process of constructing a matrix equation by the moment method. An analytical explanation is provided for the above phenomenon and the theoretical predictions are verified numerically. Also included is a suggested numerical algorithm for detecting and alleviating the relative convergence behavior for more general problems.



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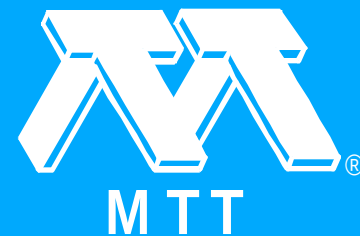


Abstracts

The Locating Reflectometer

P.I. Somlo. "The Locating Reflectometer." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 105-112.

A microwave measuring instrument which is capable of producing a visual or graphical record of the reflection coefficient Γ along the length of a waveguide component is described. The principle of operation is the evaluation, in real time by an analog method, of the Fourier transform of Γ as a function of frequency, resulting in Γ as a function of distance.



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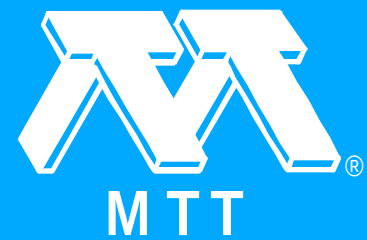
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Theory and Operation of a Reciprocal Faraday-Rotation Phase Shifter

W.E. Hord, F.J. Rosenbaum and J.A. Benet. "Theory and Operation of a Reciprocal Faraday-Rotation Phase Shifter." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 112-119.

The operation of a longitudinally magnetized fully filled square-waveguide reciprocal-ferrite phase shifter is described. The frequency characteristics of the phase shifter are predicted and measured. An error analysis, including rotational errors incurred in wide-band operation and manufacturing tolerances, is used to predict the loss performance of the device. The effect of the ferrite parameters and the waveguide geometry on phase-shifter performance may be calculated using this analysis. The variation of the phase shift with temperature as well as high-power effects are presented, and design considerations, including choice of ferrite saturation magnetization for wide-band performance, are discussed. Experimental results closely confirm the key aspects of this theory.

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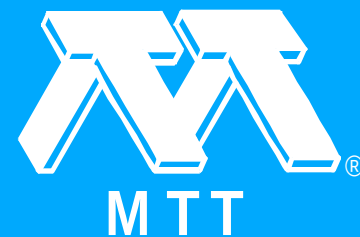


Abstracts

Computer-Aided Determination of the Small-Signal Equivalent Network of a Bipolar Microwave Transistor

K. Hartmann, W. Kotyczka and M.J.O. Strutt. "Computer-Aided Determination of the Small-Signal Equivalent Network of a Bipolar Microwave Transistor." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 120-126.

The actual technology for the production of transistors is now suitable for bipolar transistors in the 10-GHz range. In order to obtain amplifier circuits in this microwave range, the knowledge of the exact equivalent circuit is essential. A computer method for the determination of the equivalent network is given. The final application and accuracy are shown for a particular microwave transistor.



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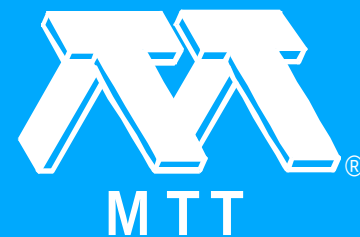


Abstracts

Cavity Perturbation Techniques for Measurement of the Microwave Conductivity and Dielectric Constant of a Bulk Semiconductor Material

I.I. Eldumiati and G.I. Haddad. "Cavity Perturbation Techniques for Measurement of the Microwave Conductivity and Dielectric Constant of a Bulk Semiconductor Material." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 126-132.

Cavity perturbation techniques offer a very sensitive highly versatile means for studying the complex microwave conductivity of a bulk material. A knowledge of the cavity coupling factor in the absence of perturbation, together with the change in the reflected power and the cavity resonance frequency shift, are adequate for the determination of the material properties. This eliminates the need to determine the Q-factor change with perturbation which may lead to appreciable error, especially in the presence of mismatch loss. The measurement accuracy can also be improved by a proper choice of the cavity coupling factor prior to the perturbation.



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Traveling-Wave Coherent Light-Phase Modulator

M.E. El-Shandwily and S.M. El-Dinary. "Traveling-Wave Coherent Light-Phase Modulator." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 132-137.

The use of a rectangular waveguide partially loaded with electrooptic material as a laser beam phase modulator is analyzed theoretically. The characteristic equation, fields, power, and attenuation are obtained in terms of normalized parameters. Design procedure of the modulator is given with particular reference to KDP.



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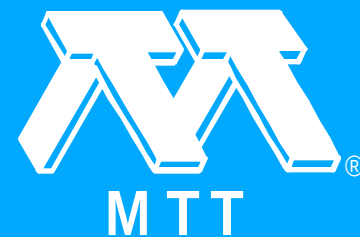


Abstracts

Wave Sensitivities of Networks

J.W. Bandler and R.E. Seviara. "Wave Sensitivities of Networks." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 138-147.

A theoretical foundation is presented for the efficient computation of first- and second-order sensitivities of networks with respect to network parameters in terms of wave variables. The concept of the adjoint network is used. First-order sensitivity formulas for a wide variety of elements are presented, including lumped and uniformly distributed elements, active and passive elements, and reciprocal and nonreciprocal elements. Parameters include electrical quantities, geometrical dimensions, and frequency. It is shown how gradients related to wave-based least pth and minimax objective functions can be computed. A comparison with a method which avoids the need for analysis of adjoint networks is made. Applications in the computer-aided design of networks using efficient gradient minimization methods are envisaged.



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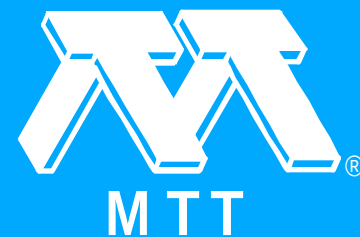


Abstracts

Attenuation Due to Ohmic Losses in Periodic Dipole and Slot Arrays

N. Amitay and H. Zucker. "Attenuation Due to Ohmic Losses in Periodic Dipole and Slot Arrays." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 148-155.

The analysis of the attenuation due to ohmic losses in periodic linear arrays of metallic cylinders, ribbons, and slots in a metallic ground plane is presented. Calculations indicate that the loss per unit length of the ribbon and cylinder arrays is comparable to that of a standard rectangular waveguide operated in the TE/sub 10/ mode. With a proper choice of parameters, the loss per unit length of the slot array can be brought to within a factor of 2 of that of rectangular waveguides.



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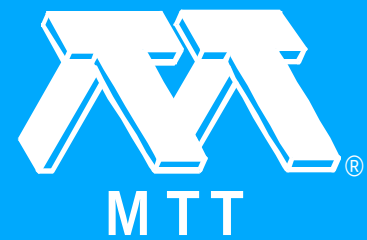


Abstracts

Microwave Integrated Oscillators for Broad-Band High-Performance Receivers

H.C. Okean, E.W. Sard and R.H. Pflieger. "Microwave Integrated Oscillators for Broad-Band High-Performance Receivers." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 155-164.

The design and development of a variety of microwave integrated circuit oscillators for use in integrated broad-band high-performance receiving systems is described. Examples of various thin-film microstrip oscillators directed to this application are provided including: 1) fixed-frequency Gunn-effect oscillators covering C to Ku band; 2) X-band varactor-tuned Gunn-effect oscillators providing up to 15 percent tuning bandwidth; 3) S-band step-tuned transistor oscillator assembly with better than half-octave digital tuning range; 4) L-band varactor-tuned transistor oscillator with almost an octave tuning range.



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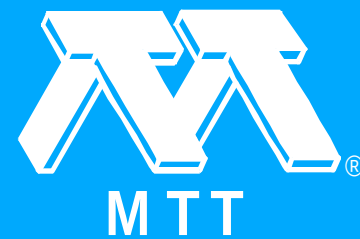


Abstracts

Microwave Integrated Tunnel-Diode Amplifiers for Broad-Band High-Performance Receivers (Feb. 1972 [T-MTT])

H.C. Okean and P.J. Meier. "Microwave Integrated Tunnel-Diode Amplifiers for Broad-Band High-Performance Receivers (Feb. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 165-172.

The design and development of microwave integrated-circuit (MIC) tunnel-diode amplifiers for use in integrated broad-band high-performance receivers is described. In particular, this paper describes the design, construction, and performance of thin-film microstrip tunnel-diode amplifiers operating in the 8-to 12- and 6-to 8-GHz bands, respectively, with noise figures in the 5-to 7-dB range.



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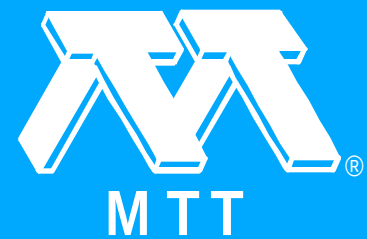


Abstracts

Slot-Line Field Components (Correspondence)

S.B. Cohn. "Slot-Line Field Components (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 172-174.

Formulas derived by mode summation give the six B- and H-field components in the various air and dielectric regions of a slot-line cross section. These formulas are valid except when very close to the slot, where approximations in the analysis cause a large error. A quasi-static method yields a second set of formulas that apply near the slot. Thus the field is determined satisfactorily in all parts of the cross section. Graphs of the H components show that elliptical polarization exists, with the best approach to circularity near the slot and near the opposite surface of the substrate. Quantitative field data are useful for analysis and design of slot-line components, such as ferrite devices, dielectric-resonator filters, directional couplers, and broad-band transitions to coaxial line or microstrip.



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Abstracts

A Highly Stabilized K/sub a/-Band Gunn Oscillator (Correspondence)

S. Nagano and S. Ohnaka. "A Highly Stabilized K/sub a/-Band Gunn Oscillator (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 174-176.

The construction and experimental results of a highly stabilized K/sub a/-band Gunn oscillator are described. The frequency stability is 3×10^{-5} at 25 GHz over the temperature range from 0 to 50°C. An output power of more than 20 mW has been obtained in the frequency range up to 30 GHz. The frequency-saturation effect is also described.



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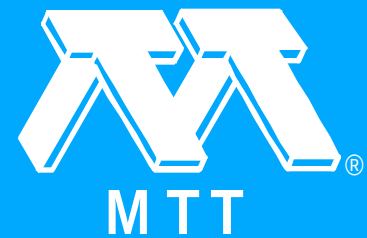


Abstracts

Broad-Band Parametric Amplifier Design (Correspondence)

G.R. Branner, E.R. Meyer and P.O. Scheibe. "Broad-Band Parametric Amplifier Design (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 176-178.

A computerized optimization technique is employed to provide design values for broad-band parametric amplifiers. Some results of the procedure are presented.



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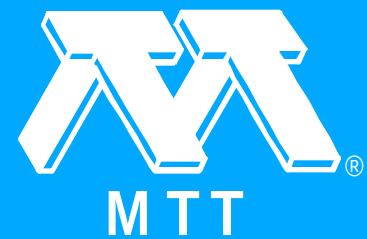


Abstracts

Loss Calculations for Coupled Transmission-Line Structures (Correspondence)

V.K. Tripathi. "Loss Calculations for Coupled Transmission-Line Structures (Correspondence)." 1972 *Transactions on Microwave Theory and Techniques* 20.2 (Feb. 1972 [T-MTT]): 178-180.

Expressions are derived for computing loss in coupled TEM structures in terms of complex even- and odd-mode propagation constants and characteristic impedances of the lines. The attenuation due to conductor (series) and dielectric (shunt) losses in a given structure can be determined utilizing these expressions. The results may be particularly useful for computing conductor loss in microwave circuits with a large number of sections used in traveling-wave devices and as microwave circuit elements. The method is applied to some typical structures for computing conductor loss.



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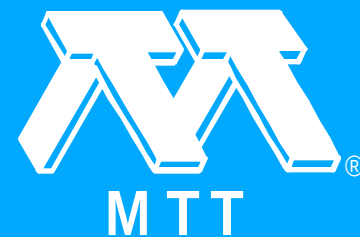


Abstracts

Computer-Aided Renormalized Perturbation Method for the Inhomogeneously Loaded Waveguide (Correspondence)

T. Hidaka. "Computer-Aided Renormalized Perturbation Method for the Inhomogeneously Loaded Waveguide (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 180-181.

The renormalized perturbation method is applied to the inhomogeneously loaded waveguide. The second-order term in the usual Rayleigh-Schrodinger perturbation method is divergent with respect to increasing the concerned mode number. Introducing the phenomenological parameter by analogy to the quantum electro-dynamics, we have the nondivergent second-order perturbation term.



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Abstracts

Gunn-Effect Power Limiter (Correspondence)

C.S. Aitchison and R. Davies. "Gunn-Effect Power Limiter (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 181-182.

The possibility of using the nonlinearity of the Gunn device current-voltage characteristic to provide microwave power limiting is discussed. Initial pulsed and CW results are presented which demonstrate limiting action.



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Abstracts

Top-Wall and Branch-Waveguide Hybrids for Millimeter Wavelengths (Correspondence)

M.F. Bottjer and H.E. King. "Top-Wall and Branch-Waveguide Hybrids for Millimeter Wavelengths (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 182-184.

Top-wall and multiple-branch waveguide couplers were developed as hybrid junctions for millimeter wavelengths, and their electrical characteristics were measured. For construction of the 55-GHz top-wall coupler, electroforming techniques were used; for the 94-GHz branch-guide coupler, the branch lines were cut directly into the wall of the main guide. Copper losses were less than 0.2 dB for the two types of couplers.



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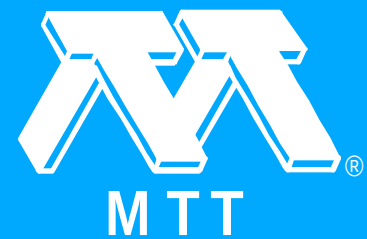


Abstracts

High-Efficiency High-Power TRAPATT Operation of a Single "Poor Man's" Diode (Correspondence)

E.D. Cohen. "High-Efficiency High-Power TRAPATT Operation of a Single "Poor Man's" Diode (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 184-186.

The operation of a single Fairchild FD-300 diode at approximately 40-percent efficiency is reported. Peak power output was 90 W at 502 MHz. These diodes are of particular interest because they are exceptionally inexpensive commercially available diodes which have been found to exhibit TRAPATT behavior.



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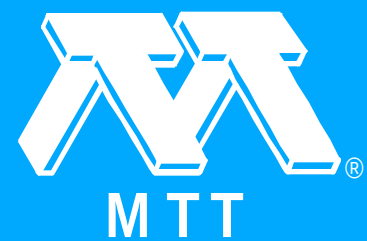


Abstracts

Application of Deschamps' Graphical Method to Measurements of the Scattering Coefficients of Multiport Waveguide Junctions (Correspondence)

C.T.M. Chang. "Application of Deschamps' Graphical Method to Measurements of the Scattering Coefficients of Multiport Waveguide Junctions (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 186-187.

A method for measuring scattering coefficients of a multiport waveguide junction is presented. It is based on the application of Deschamps' graphical technique to reduced multiport junctions, and analysis of measurements done with either matched or nearly matched loads terminated at all but the input and output ports. Averaging and least-square fitting are introduced to reduce errors from measurements.



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Mode Chart for E-Plane Circulators (Correspondence)

J. Helszajn and M. McDermott. "Mode Chart for E-Plane Circulators (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 187-188.

The mode chart of the E-plane junction circulator is given. The geometry considered consists of two ferrite disks placed against the narrow walls at the plane of symmetry of a symmetrical 3-port E-plane waveguide junction. It is experimentally found to exhibit two modes. One of these modes has a resonant frequency which increases with the spacing between the two ferrite disks. The other mode has a resonant frequency which decreases with the spacing between the disks. Both modes are independent of the disk spacing when the spacing is large. It is also found that the frequency of both modes is proportional to the thickness of the ferrite disks. Finally, circulators obtained by magnetizing each of the two modes circulate in opposite directions. Experimental results on a circulator obtained in this way are included.

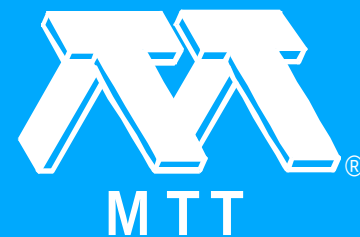


Abstracts

Phase Corrections for Weighted Acoustic Surface-Wave Dispersive Filters (Correspondence)

H.M. Gerard, G.W. Judd and M.E. Pedinoff. "Phase Corrections for Weighted Acoustic Surface-Wave Dispersive Filters (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 188-192.

Phase errors incurred by a surface acoustic wave propagating through or generated by an apodized interdigital array have been found to cause severe distortions of the filter response. The amount of error is a function of the piezoelectric coupling constant of the delay material and it is found that the distortions are most severe in high-coupling materials. A simple modification to the current method of array design is presented which corrects this phase error. Experimental results for a pulse-compression loop using apodized lithium-niobate surface-wave filters are presented which demonstrate the effectiveness of this method of phase correction.



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Abstracts

An Accurate Junction Circulator Design Procedure (Correspondence)

S.J. Salay and H.J. Peppiatt. "An Accurate Junction Circulator Design Procedure (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 192-193.

A two-step design procedure for the accurate synthesis of a junction circulator is given. The procedure is accurate to within a few decibels for isolation in the 20- to 40-dB range.



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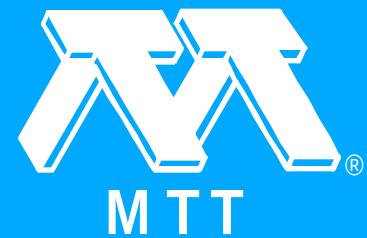


Abstracts

A Compact Subsidiary-Resonance Limiter (Correspondence)

J.L. Allen. "A Compact Subsidiary-Resonance Limiter (Correspondence)." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 193-194.

A compact subsidiary-resonance limiter with a dynamic range of greater than 200 kW is described. The structure consists of a multilayer ferrite-dielectric "sandwich" placed on the narrow wall of a reduced-height reduced-width rectangular waveguide. Below-the-threshold insertion loss is less than 0.5 dB over the 5.4-5.9-GHz band, and the threshold level is about 20 W.



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Abstracts

Contributors (Feb. 1972 [T-MTT])

N. Amitay, J.W. Bandler, J.A. Benet, C. Borghese, G. Cattarin, S.M. El-Dinary, I.I. Eldumiati, M.E. El-Shandwily, G.I. Haddad, K. Hartmann, W.E. Hord, T. Itoh, W. Kotyczka, T.-S. Li, P.J. Meier, R. Mittra, H.C. Okean, R.H. Pflieger, F.J. Rosenbaum, R. Roveda, E.W. Sard, R.E. Seviara, P.I. Somlo, M.J.O. Strutt and H. Zucker. "Contributors (Feb. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 195-197.



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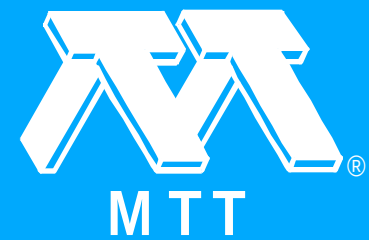
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Information on Computer Program Descriptions (Feb. 1972 [T-MTT])

"Information on Computer Program Descriptions (Feb. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.2 (Feb. 1972 [T-MTT]): 200-200.



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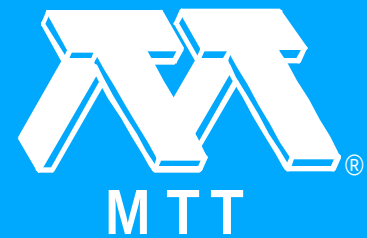


Abstracts

Editorial - MTT Editorial Policy Statement (Mar. 1972 [T-MTT])

F.J. Rosenbaum. "Editorial - MTT Editorial Policy Statement (Mar. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 201-201.

New financial and professional realities are facing the Group on Microwave Theory and Techniques, the IEEE, and the engineering community at large. Certain technical areas have grown from the experimental stage into widely accepted mature technologies. Others already have played their part in advancing the microwave art, and now may not be as important as they once were. Moreover, the easy honeymoon between high technology and society is past: the difficult, but hopefully workable, union remains.



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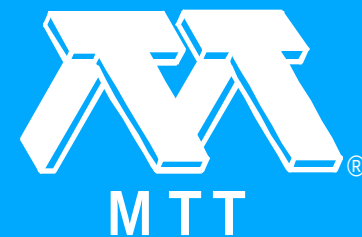


Abstracts

Iterated Solid-State Microwave Power Amplifier

S.F. Paik. "Iterated Solid-State Microwave Power Amplifier." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 202-209.

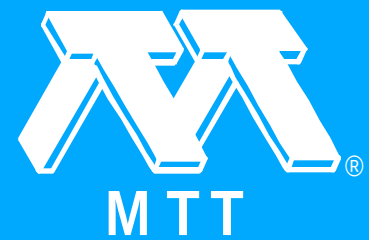
A theoretical analysis is presented of a solid-state power amplifier consisting of a unidirectional transmission line loaded by a series of negative-resistance diodes. Numerical calculations of the large-signal amplifier characteristics are carried out assuming a cubic nonlinear relationship between the diode current and the RF voltage. Diode parameters used in these calculations are chosen to approximate those of available IMPATT diodes. A bandwidth in excess of 30 percent and a saturated CW power output of more than 20 watts are predicted for 10-diode amplifiers.



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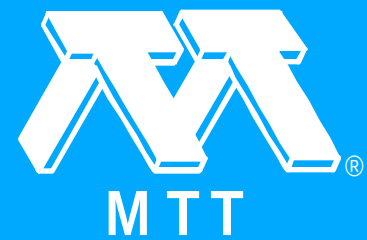
Modes of Propagation in a Coaxial Waveguide with Lossless Reactive Guiding Surfaces

R.K. Arora, S. Vijayaraghavan and R. Madhavan. "Modes of Propagation in a Coaxial Waveguide with Lossless Reactive Guiding Surfaces." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 210-214.

An analysis of the modes that can propagate in a coaxial waveguide with lossless reactive guiding surfaces is presented. The cases where both the surfaces are either inductive or capacitive and the case where one of the surfaces is capacitive and the other is inductive are discussed. The results show that, in general, there are two surface waves and an infinite number of waveguide modes. Whereas all the waveguide modes show the cut off phenomenon, the surface waves may either propagate down to zero frequency or get transformed into the lowest order waveguide mode at certain critical frequencies determined by the structure parameters.

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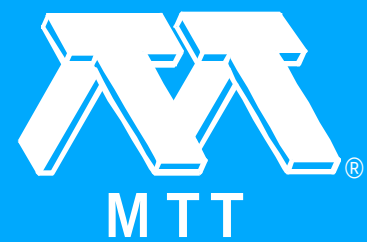
An Ordered Array of Terminated Metallic Posts as an Embedding Network for Lumped Microwave Devices

R.J. Gutmann and K.E. Mortenson. "An Ordered Array of Terminated Metallic Posts as an Embedding Network for Lumped Microwave Devices." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 215-223.

An ordered array of metallic posts is proposed as an embedding network for lumped devices at microwave frequencies. The individual metallic posts, terminated in a lumped device, extend across a parallel-plane transmission line excited by the TEM mode. In the analysis the impedance discontinuity for an individual terminated metallic post in a transmission line bounded on two sides by electric walls and two sides by magnetic walls is evaluated. Design concepts useful in employing these results with a two-dimensional array of metallic posts terminated with semiconductor devices are described.

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Synthesis of Mixed Lumped and Distributed Impedance-Transforming Filters

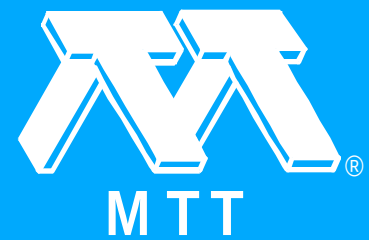
R. Levy. "Synthesis of Mixed Lumped and Distributed Impedance-Transforming Filters." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 223-233.

The design of a class of impedance-transforming filters in the form of very compact and convenient mixed lumped and distributed ladder networks is presented. The synthesis utilizes the distributed prototype technique introduced in a previous paper, but here a new approximation function appropriate to the impedance transformer problem is derived. In addition to combining the properties of an impedance transformer and a low-pass filter, the new circuit represents a solution to the problem of short-line matching to an extreme impedance value without using extreme impedance values in the transformer. Broad-band designs are tabulated for a wide range of parameters. A discussion of the application of the technique in the design of mixed lumped and distributed broad-band matching networks is included. A 50-10- Ω transformer was designed for the band 3.5-7.0 GHz, having a voltage standing-wave ratio of 1.15 and giving an attenuation >20 dB in the band 10.5-21.0 GHz. The length of this transformer is 0.875 in, and the experimental results showed excellent agreement with theory.

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Measurement of Dielectric Materials Using a Cutoff Circular-Waveguide Cavity (Short Papers)

J. Hanfling and L. Botte. "Measurement of Dielectric Materials Using a Cutoff Circular-Waveguide Cavity (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 233-235.

A technique is presented for accurately determining the dielectric constant of microwave materials. The concept is to resonate a cutoff circular-waveguide cavity by inserting the dielectric-disk sample. Unlike most dielectric measurement techniques which rely on perturbation methods, this one determines the dielectric constant from the absolute measurement of the resonant frequency. Also, the use of a cutoff cavity prevents false dielectric constant readings by eliminating spurious resonances.

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A Study of Microwave Leakage through Perforated Flat Plates (Short Papers)

T.Y. Otoshi. "A Study of Microwave Leakage through Perforated Flat Plates (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 235-236.

A simple formula useful for predicting leakage through a circular hole array in a metallic flat plate is presented. A correction is given for plate thickness. The formula is applicable to arrays having either a 60° (staggered) or 90° (square) hole pattern, but is restricted to the case of 1) an obliquely incident plane wave with the E field polarized normal to the plane of incidence, and 2) large transmission loss. When theoretical values were compared to experimental data obtained on test samples having transmission losses greater than 20 dB, the agreement between theory and experiment was typically better than 1 dB at S band and 2 dB at X band.

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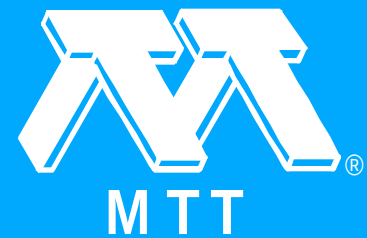


Abstracts

Hybrid-Frequency Cutoffs in Gyrotropic Waveguides (Short Papers)

P. de Santis and G. Franceschetti. "Hybrid-Frequency Cutoffs in Gyrotropic Waveguides (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 237-238.

The behavior of the Brillouin diagram ω versus β_z is analyzed for axially magnetized gyrotropic waveguides in the vicinity of the hybrid frequencies ω_k and ω_i . Starting from the exact dispersion relation for the modes in the waveguides under consideration it is shown that 1) the dispersion curves terminate at discrete cutoff points located along the $\omega = \omega_k$, ω_i line and 2) the group velocity at these points is zero. These results modify the behavior of the dispersion curves existing in the literature.



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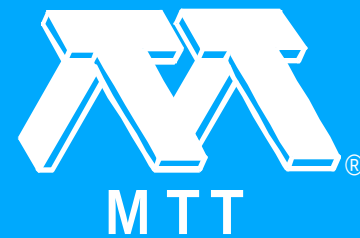


Abstracts

Tunable Frequency Range and Mismatch Adjustment for Comb-Line Bandpass Filters (Short Papers)

G.D. O'Clock, Jr.. "Tunable Frequency Range and Mismatch Adjustment for Comb-Line Bandpass Filters (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 238-239.

S-band comb-line filters can be tuned over a frequency range of approximately 200 percent of the design frequency. A simple technique is also described that compensates for impedance match and coupling deficiencies associated with the filter.



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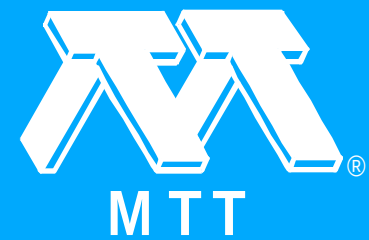
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Abstracts

Contributors (Mar. 1972 [T-MTT])

R.K. Arora, R.J. Gutmann, R. Levy, R. Madhavan, K.E. Mortenson, S.F. Paik and S. Vijayaraghavan. "Contributors (Mar. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 240-241.



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"Foreign Abstracts, Mar. 1972." 1972 Transactions on Microwave Theory and Techniques 20.3 (Mar. 1972 [T-MTT]): 241-244.



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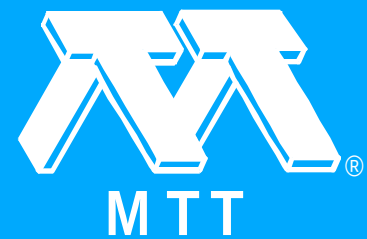


Abstracts

The Planar Circuit--An Approach to Microwave Integrated Circuitry

T. Okoshi and T. Miyoshi. "The Planar Circuit--An Approach to Microwave Integrated Circuitry." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 245-252.

Three principal categories have been known in electrical circuitry so far. They are the lumped-constant (0-dimensional) circuit, distributed-constant (1-dimensional) circuit, and waveguide (3-dimensional) circuit. The planar circuit to be discussed in general in this paper is a circuit category that should be positioned as a 2-dimensional circuit. It is defined as an "electrical circuit having dimensions comparable to the wavelength in two directions, but much less thickness in one direction." The main subject of this paper is the computer analysis of an arbitrarily shaped, triplate planar circuit. It is shown that a computer analysis based upon a contour-integral solution of the wave equation offers an accurate and efficient tool in the design of the planar circuit. Results of some computer calculations are described. It is also shown that the circuit parameters can be derived directly from Green's function of the wave equation when the shape of the circuit is relatively simple. Examples of this sort of analysis are also shown for comparison with the computer analysis.



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LSE/sub 20/-Mode Characteristics in Phase-Shifter Parametrization

G.N. Tsandoulas, F.G. Willwerth and W.J. Ince. "LSE/sub 20/-Mode Characteristics in Phase-Shifter Parametrization." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 253-258.

The validity of considering the LSE/sub 20/-mode propagation threshold as the limiting factor in selecting rectangular-wave-guide ferrite-phase-shifter dimensions is examined theoretically and experimentally using a dielectric model. Depending on the effective dielectric constant of the loading material, it is shown that the LSE/sub 20/-mode cutoff may, in many cases, be exceeded without introducing spurious mode resonances. In addition, the effect of magnetization on the y-independent modal cutoffs is investigated. It is concluded that the dielectric model represents a worst case condition as far as higher order mode propagation is concerned.

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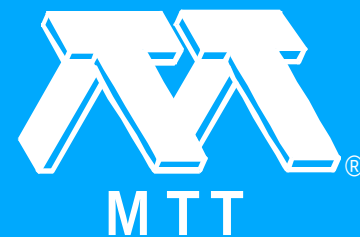


Abstracts

Narrow-Bandpass Waveguide Filters

A.E. Atia and A.E. Williams. "Narrow-Bandpass Waveguide Filters." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 258-265.

A procedure is described whereby narrow-bandpass waveguide filters having ripple in both the passbands and stopbands can be synthesized in the form of coupled waveguide cavities. Orthogonal modes in square or circular waveguides are employed to enable negative coupling elements to be realized. As a consequence, very compact filters can be constructed. Experimental results on an 8-cavity orthogonal-mode narrow-bandpass filter are shown to agree well with theory.



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Power Amplification with IMPATT Diodes in Stable and Injection-Locked Modes

Y. Takayama. "Power Amplification with IMPATT Diodes in Stable and Injection-Locked Modes." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 266-272.

The behavior of nonlinear power amplifiers using IMPATT diodes in both stable and injection-locked modes was investigated theoretically and experimentally. A method of graphical interpretation of the characteristics of negative-resistance diode simplifiers, based on the large-signal diode admittance chart, is presented. The characteristics of the simplified model of the reflection-type amplifier using an X-band Read-type IMPATT diode have been evaluated. The experimental results of power amplification using an X-band Si IMPATT diode in both stable and injection-locked modes under various circuit conditions are given. It was shown that nonlinearity of the IMPATT diode susceptance causes distortions in the amplification and injection-locking characteristics.

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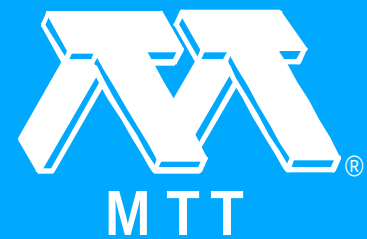


Abstracts

The Diffraction of Electromagnetic Waves by Dielectric Steps in Waveguides (Apr. 1972 [T-MTT])

E.G. Royer and R. Mittra. "The Diffraction of Electromagnetic Waves by Dielectric Steps in Waveguides (Apr. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 273-279.

The problem of determining the scattered electromagnetic fields when a dielectric step discontinuity is placed in a waveguide is considered. Although an exact method of solution is not presently known, the recently introduced modified residue-calculus technique (MRCT) can be successfully extended to obtain a very accurate and numerically efficient approximate solution of the semi-infinite dielectric step. A still further extension of the modified residue-calculus method yields the approximate solution for the case of a finite dielectric step. A unique advantage of the present methods is that the degree of accuracy obtained is independent of the relative permittivity of the dielectric material and of the frequency. Thus very high permittivities or frequencies can be considered without an attendant increase in computational complexity. Numerical data are presented which confirm the accuracy of the method.



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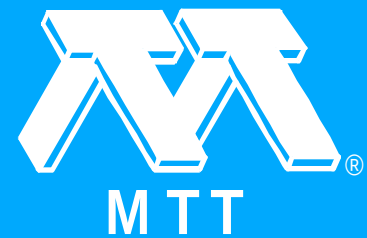


Abstracts

Attenuation Characteristics of Hollow Conducting Elliptical Waveguides

J.G. Kretzschmar. "Attenuation Characteristics of Hollow Conducting Elliptical Waveguides." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 280-284.

The first-order perturbation formula is used to obtain the attenuation factor of different TE and TM modes in hollow conducting elliptical waveguides. Normalized attenuation charts give the attenuation factor for almost each possible combination of cross-sectional dimensions, nonmagnetic wall material, and frequency of operation.



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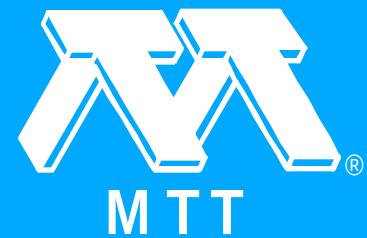


Abstracts

A Novel Design of an X-Band High-Power Ferrite Phase Shifter (Short Papers)

K.H. Hering. "A Novel Design of an X-Band High-Power Ferrite Phase Shifter (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 284-286.

A nonreciprocal analog-latching phase-shifter design at X-band is described. The device has been operated up to 250 W of average power and 50 kW of peak power. Direct liquid cooling is implemented, pumping FC-78, a dielectric coolant, through the center slot of the ferrite toroid.



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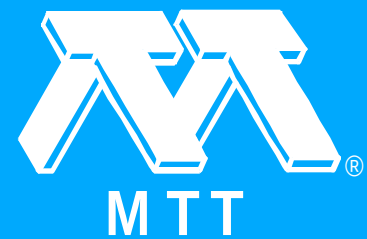


Abstracts

Wide-Band Phase Locking and Phase Shifting Using Feedback Control of Oscillators (Short Papers)

D. Rubin. "Wide-Band Phase Locking and Phase Shifting Using Feedback Control of Oscillators (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 286-289.

Two Yig-tuned Gunn oscillators have been frequency locked over a 3-GHz range in X-band. Injected power into the locked oscillator was approximately 10 dB below its output power. Analog frequency-tracking circuitry was used together with phase-comparator feedback to achieve output phase which remained within $\pm 10^\circ$ over a 1.2 GHz bandwidth. Controlled phase shifting was obtained by applying dc voltages within the feedback loop.



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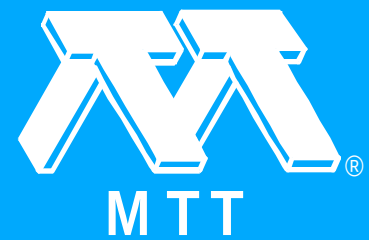
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Notes on the Conjugate Matched Two-Port as an UHF Amplifier (Short Papers)

C.S. Gledhill and M.F. Abulela. "Notes on the Conjugate Matched Two-Port as an UHF Amplifier (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 289-290.

Because of the relative simplicity of measurement of scattering parameters of active two-ports at frequencies up to the lower microwave region, investigations have been made into the application of these parameters to the design of UHF amplifiers. The theory of generalized scattering parameters has been developed by Kurokawa, applied to two-port power-flow analysis by Bodway, and used in the design of a single-stage UHF amplifier by Froehner. In this last paper, the bandwidth limitations imposed by the matching networks were not considered, nor was the capacitive matching arrangement to a purely resistive load fully developed. Both of these topics are the subject of this short paper, in which the relevant design expressions are also given.

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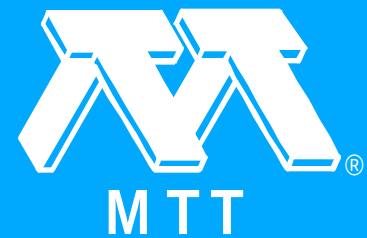


Abstracts

A Multioctave Microstrip 50-Ohm Termination (Short Papers)

D. LaCombe. "A Multioctave Microstrip 50-Ohm Termination (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 290-292.

A low-cost microstrip 50-Ohm termination is described having a maximum VSWR of 1.46 (including the mismatch contributed by a microstrip launcher) from 1 to 18 GHz. It consists of a thin-film chip resistor with a matching structure. Experimental resistor characterization, equivalent-circuit modeling, and matching considerations are presented.



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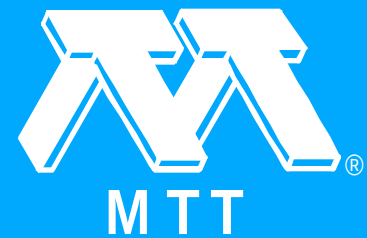


Abstracts

The Solution of Helmholtz Equation in Elliptical Domains (Short Papers)

P.A. Laura. "The Solution of Helmholtz Equation in Elliptical Domains (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 292-292.

The propagation of electromagnetic (EM) waves in hollow, perfectly conducting waveguides has been studied recently by Kretzschmar in an excellent paper. Extensive numerical data are presented for the cutoff wavelength on 19 successive modes.



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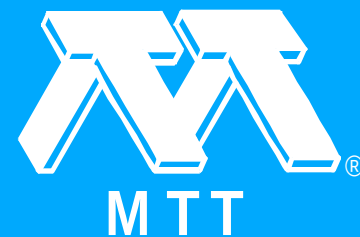


Abstracts

Instantaneous Frequency-Measuring Receivers (Letters)

N.E. Goddard. "Instantaneous Frequency-Measuring Receivers (Letters)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 292-293.

The instantaneous frequency-measuring receiver (IFR) is becoming widely known to microwave systems engineers, but as a consequence of the defense applications its origins are obscure. The pioneering work on the phase-discriminator technique, which is the basis of most modern IFR systems, was done in the Mullard Research Laboratories, Redhill, Surrey, England. A brief account of the work and a record of one of the first signal observations with this type of receiver may be of interest.



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Abstracts

Distortion Performance of the Abrupt-Junction Current-Pumped Varactor Frequency Converter (Correction)

J.G. Gardiner and S.I. Ghobrial. "Distortion Performance of the Abrupt-Junction Current-Pumped Varactor Frequency Converter (Correction)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 293-294.

In the above paper, on page 746, Fig. 5 should appear as follows.



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Computation of Lumped Microstrip Capacities by Matrix Method---Rectangular Sections and End Effect (Correction)

A. Farrar and A.T. Adams. "Computation of Lumped Microstrip Capacities by Matrix Method---Rectangular Sections and End Effect (Correction)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 294-294.

In the above correspondence, (1) is difficult to interpret in the form given. In this equation, the field point ($x_{\text{sub } i}$, $y_{\text{sub } i}$, $z_{\text{sub } i}$) is at the edge of subsection $\Delta S_{\text{sub } i}$, and the source point ($x_{\text{sub } j}$, $y_{\text{sub } j}$, $z_{\text{sub } j}$) is at the center of subsection $\Delta S_{\text{sub } j}$. Also, to (1) should be added a negative expression similar to that given in the brackets with $(2n - 2)^2$ replaced by $(2n)^2$, in order to include the images below the ground plane.

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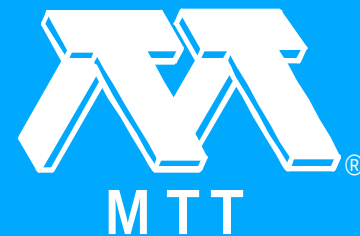


Abstracts

FINPLT: A Finite-Element Field-Plotting Program (Computer Program Descriptions)

Z. Csendes and P. Silvester. "FINPLT: A Finite-Element Field-Plotting Program (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 294-295.

FINPLT draws smooth contours on a Calcomp digital plotter for any surface for which potential values are known on an arbitrary set of points.



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Abstracts

Contributors (Apr. 1972 [T-MTT])

A.E. Atia, W.J. Ince, J.G. Kretzschmar, T. Miyoshi, T. Okoshi, E.G. Royer, Y. Takayama, G.N. Tsandoulas, A.E. Williams and F.G. Willwerth. "Contributors (Apr. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.4 (Apr. 1972 [T-MTT]): 295-296.



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Nonconventional Transmission Zeros in Distributed Rectangular Structures

B. Bianco and S. Ridella. "Nonconventional Transmission Zeros in Distributed Rectangular Structures." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 297-303.

A lossless distributed rectangular structure, composed of a dielectric layer interposed between two perfectly conductive metallic layers, is considered. This structure is endowed with two ports, whose positions and widths are variable and is connected to the environment through uniform transmission lines. A procedure is exposed to obtain the impedance matrix at the terminals of the transmission lines. The existence of transmission zeros and of filtering properties is demonstrated.

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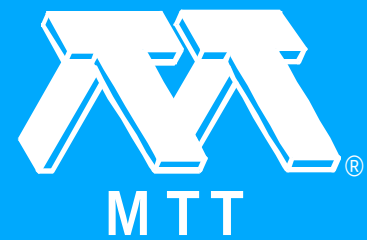


Abstracts

Microstrip Propagation on Magnetic Substrates-- Part I: Design Theory

R.A. Pucel and D.J. Masse. "Microstrip Propagation on Magnetic Substrates--Part I: Design Theory." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 304-308.

Formulas and graphs are presented for the effective relative permeability and the filling factors of magnetic substrates in microstrip. Both the propagation and the magnetic loss filling factors are included. In the calculation of these quantities, use was made of the filling factors for dielectric substrates obtained from Wheeler's analysis and a duality relationship between magnetic and dielectric substrates derived in this paper.



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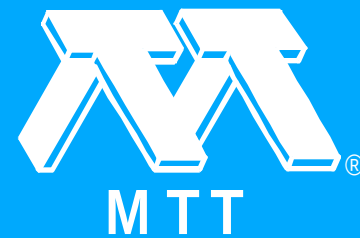


Abstracts

Microstrip Propagation on Magnetic Substrates-- Part II: Experiment

D.J. Masse and R.A. Pucel. "Microstrip Propagation on Magnetic Substrates--Part II: Experiment." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 309-313.

Experimental data taken on microstrip built on ferrite and garnet substrates are presented and compared with theoretical values calculated from formulas derived in a previous paper which were extended to gyromagnetic media. Good agreement has been obtained between experiment and theory. In particular the observed increase in wave attenuation at frequencies near ω/ω_m is fully explained when the frequency dependence of the characteristic impedance is taken into account.



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Abstracts

Broad-Band Diode Phase Shifters

R.V. Garver. "Broad-Band Diode Phase Shifters." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 314-323.

Design figures are presented for four types of diode phase shifters: switched line, reflection, loaded line, and a new type using lumped-element high-pass and low-pass circuits. Comparison of their bandwidths shows that most of them can work over an octave bandwidth.



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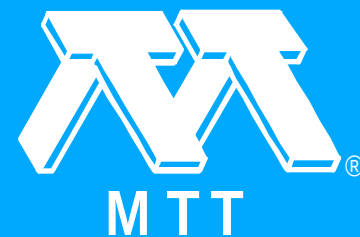
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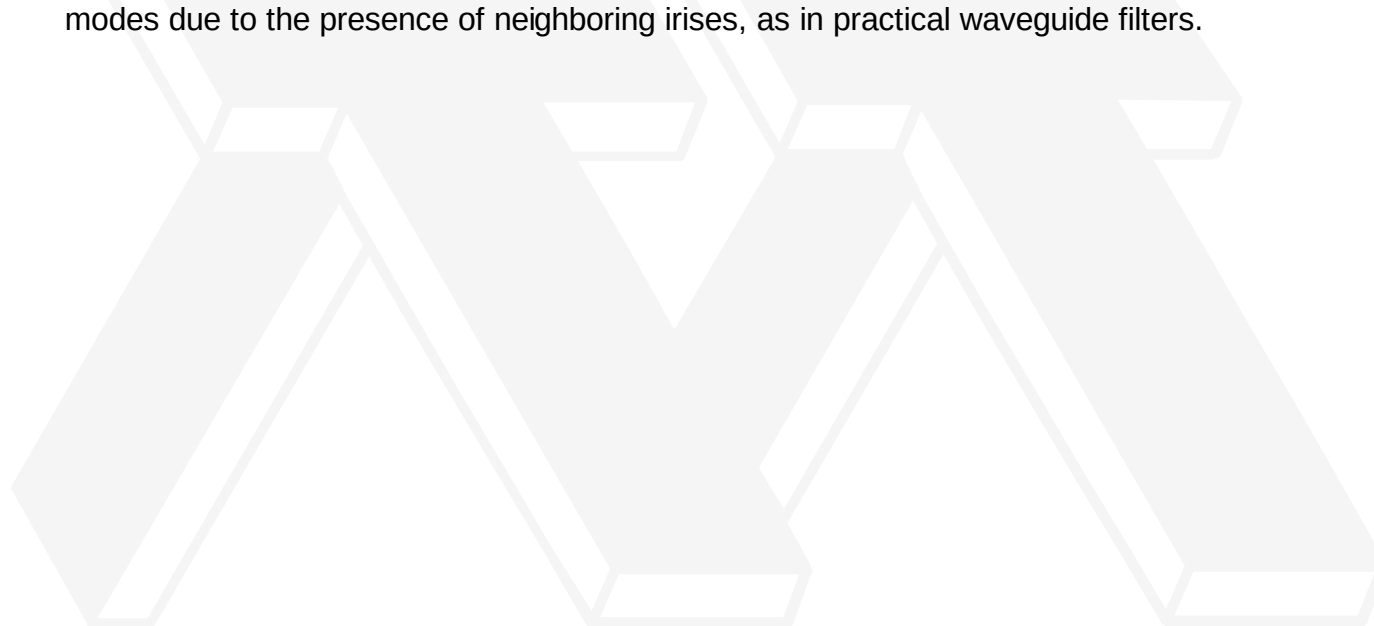
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Equivalent Network for Interacting Thick Inductive Irises

T.E. Rozzi. "Equivalent Network for Interacting Thick Inductive Irises." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 323-330.

An equivalent network is presented for symmetric inductive irises in rectangular waveguides. This model exactly describes the effects of finite thickness and interaction via higher order modes due to the presence of neighboring irises, as in practical waveguide filters.



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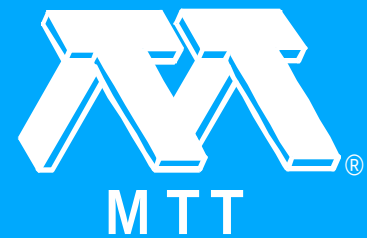


Abstracts

Square and Rectangular Waveguides with Rounded Corners

P. Lagasse and J. Van Bladel. "Square and Rectangular Waveguides with Rounded Corners." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 331-337.

Eigenfunctions, eigenvalues, and attenuation constants in waveguides are determined for the square with rounded corners, and for the cigar-shaped rectangle with rounded ends. These cross sections allow, by continuous variation of a parameter, the investigation of the deformation of the modes and attenuation curves of a circular waveguide. Particular attention is given to the H_{01} mode and its remarkable attenuation curve.



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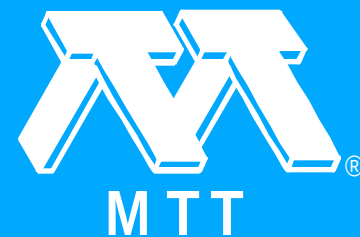


Abstracts

A Decoupled Formulation of the Vector Wave Equation in Orthogonal Curvilinear Coordinates, with Application to Ferrite-Filled and Curved Waveguides of General Cross Section

L. Lewin. "A Decoupled Formulation of the Vector Wave Equation in Orthogonal Curvilinear Coordinates, with Application to Ferrite-Filled and Curved Waveguides of General Cross Section." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 338-342.

The introduction of a double complex-number system and the combining of the transverse field components into a compact composite structure enable the wave equation to be expressed in a form in which certain mathematical combinations of field components appear as entities completely decoupled from each other. Hence the equations can be solved for these combinations and ultimately for the components themselves. The method appears limited to guides of constant cross section and of either 1) isotropic medium and curved axis, or 2) axially anisotropic nonreciprocal medium and straight axis.



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Abstracts

Theoretical Results for the Elliptic Microstrip Resonator (Short Papers)

J.G. Kretzschmar. "Theoretical Results for the Elliptic Microstrip Resonator (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 342-343.

A mode chart and a general expression for the unloaded quality factor of an elliptic microstrip resonator operating in transverse or radial TM modes are presented.



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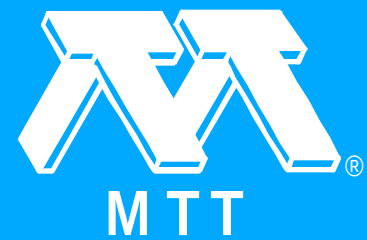
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Efficiencies of Microwave 2-Ports from Reflection Coefficient Measurements (Short Papers)

R.W. Beatty. "Efficiencies of Microwave 2-Ports from Reflection Coefficient Measurements (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 343-344.

It is well-known that one can determine the efficiency of a microwave 2-port by measuring the reflection coefficient $\Gamma_{1/}$ at the input port when the output port is terminated by a sliding short circuit. The locus of $\Gamma_{1/}$ is a circle whose radius equals the efficiency $\eta_{2m/}$ for energy entering port 2 when port 1 is terminated in a nonreflecting load. Similarly $\eta_{1m/}$ is the radius of the circle when port is terminated in a sliding short circuit. This note describes a procedure for obtaining, from the same measured data, new reflection coefficients $\Gamma_{1N/}$ and $\Gamma_{2N/}$, whose circular loci have radii $R_{1N/}$ and $R_{2N/}$ which give the efficiencies of the 2-port when connected to an arbitrary load of reflection coefficient Γ_L . Thus the $\Gamma_{1/}$ or $\Gamma_{2/}$ data may be used to obtain the efficiency of the 2-port when terminated in any arbitrary load. The method is potentially more accurate than the 3-point method since errors can be reduced by drawing a circle through many measured points.

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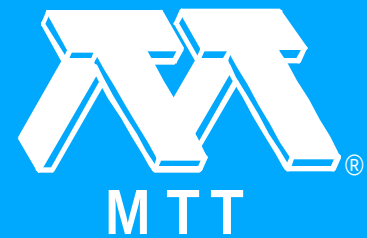


Abstracts

Focusing of 52-GHz Beams by Cylindrical Mirrors (Short Papers)

J.A. Arnaud, D.C. Hogg and J.T. Ruscio. "Focusing of 52-GHz Beams by Cylindrical Mirrors (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 344-345.

The possibility of using inexpensive commercial glass mirrors for refocusing and redirecting millimeter-wave beams has been investigated; such beams would be useful for distributing large quantities of information in cities. Interference is expected to be minimal as a result of the close confinement of the beams. We report preliminary experiments made in the 50-55-GHz band, using a swept backward-wave oscillator (BWO) as a source.



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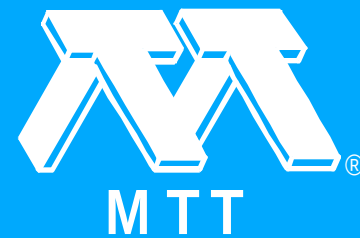


Abstracts

A 10-GHz Single Sideband Modulator with 1-kHz Frequency Shift (Correction)

J.D.E. Beynon. "A 10-GHz Single Sideband Modulator with 1-kHz Frequency Shift (Correction)." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 345-345.

In the above correspondence the fourth sentence of the fourth paragraph should read as follows: "For an error of less than 2 percent (not 1 percent) in the measurement of attenuation and 1° in that of phase shift, the unwanted sideband must be suppressed by at least 40 dB (assuming an infinite carrier suppression)." We apologize for this mistake.



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B. Bianco, R.V. Garver, P. Lagasse, L. Lewin, D.J. Masse, R.A. Pucel, S. Ridella, T.E. Rozzi and J. Van Bladel. "Contributors (May 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 346-347.



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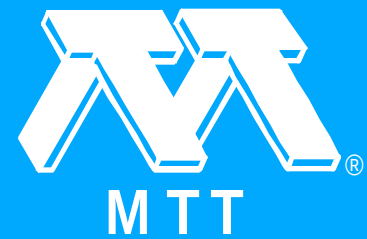
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Abstracts

Information on Computer Program Descriptions (May 1972 [T-MTT])

"Information on Computer Program Descriptions (May 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.5 (May 1972 [T-MTT]): 348-348.



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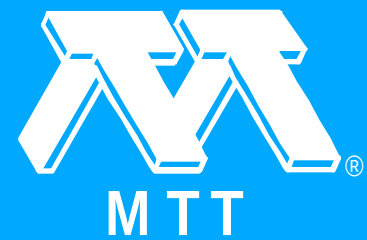
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Transmission Distortion in Multimode Random Waveguides

H.E. Rowe and D.T. Young. "Transmission Distortion in Multimode Random Waveguides." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 349-365.

We consider the coupled line equations for two-mode random media in which both modes travel in the same (forward) direction as a model for multimode millimeter waveguides and optical fibers, in which mode conversion at imperfections occurs primarily in the forward direction. Some exact general properties satisfied by the transfer function and the impulse response of such a system are given for an arbitrary coupling coefficient. A random stationary coupling coefficient with statistically independent successive values, and consequently a white spectrum (e.g., a white Gaussian or a Poisson noise), permits exact determination of transmission statistics; we obtain first- and second-order statistics in the time and frequency domains. No perturbation or other approximations are made in any of the above results, which are obtained directly from the coupled line equations. These results are used to study signal distortion in long guides. By straightforward extension of this work more complicated calculations can treat more forward modes, but not backward modes or nonwhite coupling coefficient spectra. In this paper the coupling coefficient is assumed frequency independent, and under certain conditions the signal distortion decreases as the mode conversion increases. In practical cases the coupling coefficients are frequency dependent and the above behavior is modified; the present work is extended to this important case in a companion paper.

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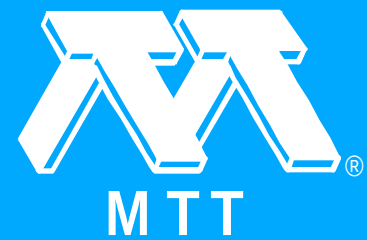
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Optimum Coupling for Random Guides with Frequency-Dependent Coupling

D.T. Young and H.E. Rowe. "Optimum Coupling for Random Guides with Frequency-Dependent Coupling." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 365-372.

We obtain exactly the covariance of the signal-signal and signal-spurious mode transfer functions of the coupled line equations with two forward-traveling modes, white random coupling with statistically independent successive values (e.g., white Gaussian or Poisson coupling), and a coupling coefficient that varies with the frequency of the signals on the line. No perturbation or other approximations are made in this work. Time-domain statistics for the corresponding impulse responses are obtained for moderate fractional bandwidths. These results are extensions of a similar treatment for frequency-independent coupling coefficients, given in a companion paper. If the coupling were independent of frequency, the signal distortion would ultimately decrease as the coupling increased, approaching zero as the coupling approached infinity. The frequency dependence of the coupling coefficient prevents the distortion from approaching zero; the optimum coupling, which achieves minimum signal distortion, is independent of guide length. Millimeter waveguides and optical fibers with random straightness deviations have coupling coefficients inversely proportional to the frequency. The above results yield the optimum random straightness deviation for such a guide. More forward modes can be treated in a straightforward way by more complicated calculations.





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Simplified Theory for Post Coupling Gunn Diodes to Waveguide

J.F. White. "Simplified Theory for Post Coupling Gunn Diodes to Waveguide." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 372-378.

There is a constant need for diode circuits employing rectangular waveguide. Coupling of the diode to the guide by using an inductive post is a popular method. The microwave circuit analysis of the equivalent circuit has been explored by complete theoretical analyses in the literature, but the results have been sufficiently difficult to apply that, in practice, recourse is often made to empiric characterization. This paper derives a simplified equivalent circuit based on a small perturbation approximation. The method is verified by experiment and is then used to evaluate a practical Gunn oscillator cavity.

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Abstracts

On the Relation Between Modes in Rectangular, Elliptical, and Parabolic Waveguides and a Mode-Classifying System

T. Larsen. "On the Relation Between Modes in Rectangular, Elliptical, and Parabolic Waveguides and a Mode-Classifying System." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 379-384.

The class of waveguides with rectangular, elliptical, and parabolic cross sections and their transition shapes has been investigated. The transition shapes have been described by hyperelliptic functions. By a numerical procedure based on the finite-element method, the cutoff wavelength and the mode patterns of 12 of the lowest-order TM modes and 14 of the lowest-order TE modes of this class have been found. On the basis of the investigation, a mode-classifying system for arbitrary waveguide cross sections is suggested.



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Variational Formulation of the Dirichlet Boundary Condition

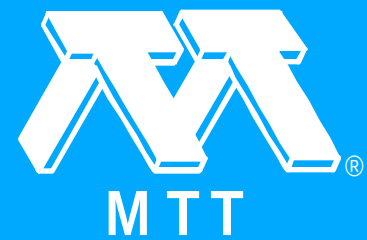
T.G. Hazel and A. Wexler. "Variational Formulation of the Dirichlet Boundary Condition." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 385-390.

The functional whose stationary point is furnished by the solution of Poisson's equation under mixed, Neumann, and Dirichlet boundary conditions within a homogeneous region is presented. The Dirichlet condition is formulated as a natural one, thus removing a considerable restriction on acceptable trial functions. Although the approach has been suggested previously, examples of its application to partial differential equations are unavailable. The practical significance of the method and its algorithmic simplicity is illustrated by means of tests on a square region. The natural Dirichlet condition is seen to be satisfied as well as the natural Neumann boundary condition. The equivalent functional for the Helmholtz eigenvalue problem is stated.

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An Analysis of Gap in Microstrip Transmission Lines

M. Maeda. "An Analysis of Gap in Microstrip Transmission Lines." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 390-396.

Although microstrip transmission lines have been widely used in microwave integrated circuits, the discontinuity structures in the microstrip transmission lines such as a gap, an abruptly ended strip conductor, and so on, have hardly been analyzed. An analytical method and numerical results for a gap capacitance in the microstrip transmission line are described. The equivalent circuit parameters are formulated with three-dimensional Green's functions, based on a variational principle. The numerical results are in good agreement with the published experimental data. The fringing effect of an abruptly ended strip conductor is also investigated.

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A Proposed Lumped-Element Switching Circulator Principle

R.H. Knerr. "A Proposed Lumped-Element Switching Circulator Principle." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 396-401.

Two different analytical methods, the complex conjugate input admittance approach and the eigenvalue analysis, show the possibility of building a fast switching lumped-element circulator. In conventional switching circulators, switching is achieved by changing the required magnetic biasing field. The proposed principle, which is valid for circulators of all types, is especially interesting for lumped-element circulators where the switching may be accomplished by simply changing two capacitor values. The capacitors could be switched by varying voltages on semiconductors thus permitting very fast switching. The analysis has been experimentally verified. No attempt to obtain optimization of a specific design was made.

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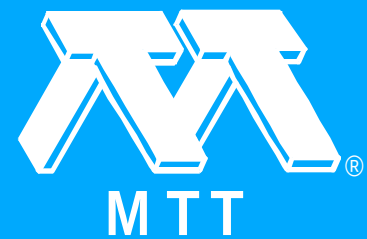


Abstracts

On the Use of Describing Functions in the Study of Nonlinear Active Microwave Circuits

L. Gustafsson, G.H.B. Hansson and K.I. Lundstrom. "On the Use of Describing Functions in the Study of Nonlinear Active Microwave Circuits." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 402-409.

It is shown that a nonlinear microwave circuit can easily be represented by a feedback model. This formalistic identity with nonlinear control systems suggests that methods and results can be borrowed from nonlinear control theory. The describing function technique, a concept that has been developed to a high degree of sophistication in control theory, is applied to the problem of phase-locking of microwave oscillators. The use of describing functions in the study of nonlinear microwave circuits may give a simple conceptual understanding of locking phenomena, for example, and thereby reduce computational efforts.



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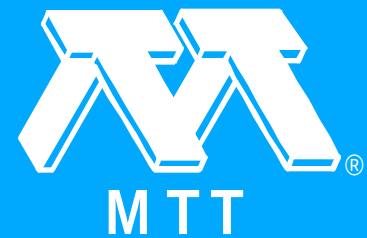


Abstracts

A Higher Order Approximation for Waveguide Circulators (Short Papers)

J.B. Castillo and L.E. Davis. "A Higher Order Approximation for Waveguide Circulators (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 410-412.

Earlier work on the analysis and experimental performance of 3-port and 4-port waveguide circulators over the waveguide bandwidth has shown some discrepancies. The computed performance tended to be too optimistic. It is shown that an extension of Davies' analysis to include higher order cylindrical modes and evanescent modes in the waveguide arms yields excellent correlation between theory and practice.



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Uniform Multimode Transmission Lines (Short Papers)

H. Guckel and Y.Y. Sun. "Uniform Multimode Transmission Lines (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 412-413.

A consistent normal-mode theory for coupled uniform transmission lines is developed which properly accounts for the fact that some propagation constants may be equal. Explicit responses are calculated. The results are interpreted in terms of transmission-line networks which consist of simple lines and which are coupled via conductor sharing.



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Computation of the Characteristics of Coplanar-Type Strip Lines by the Relaxation Method (Short Papers)

T. Hatsuda. "Computation of the Characteristics of Coplanar-Type Strip Lines by the Relaxation Method (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 413-416.

The characteristics of new strip lines (i.e., a single strip conductor and a two symmetrical strip-conductor coplanar-type strip line, which consist of single- or two-center strip conductors and ground plates on a dielectric substrate and outer ground conductor) are calculated by the relaxation method. The effect of the outer ground conductor on these lines is analyzed, and the characteristic impedance and velocity ratio are determined. The characteristic impedance is determined experimentally, and the maximum values of the discrepancies compared with the calculated values of each of the lines are 2.0-3.0 percent.



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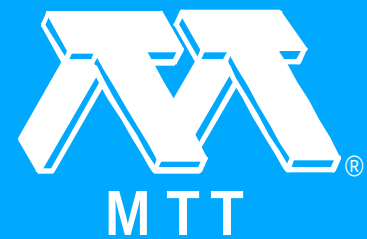


Abstracts

Solutions for Some Waveguide Discontinuities by the Method of Moments (Short Papers)

V.K. Thong. "Solutions for Some Waveguide Discontinuities by the Method of Moments (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 416-418.

The electromagnetic boundary value problem of two waveguides coupled by an aperture or an aperture in a waveguide radiating into free space may be described by an integral equation. An analytical solution to this integral equation cannot be readily found due to the complexity of the kernel. However, extremely useful results may be obtained if the method of moments is employed to reduce the integral equation to a matrix equation which can be solved by known methods. In this short paper, series and shunt slots in a rectangular waveguide are analyzed using this technique.



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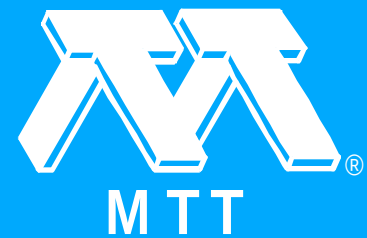


Abstracts

A Generalized Locking Equation for Oscillators (Short Papers)

J.P. Quine. "A Generalized Locking Equation for Oscillators (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 418-420.

Locking equations are derived which account for nonsinusoidal device waveforms. Locking bandwidth is related to Q values and device voltage amplitudes. Effective Q values are calculated for cavities having tuned and untuned harmonics.



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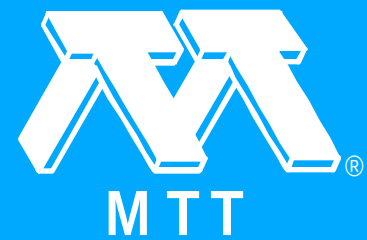
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Varactor Q Measurement (Comments)

E.W. Sard and J.M. Roe. "Varactor Q Measurement (Comments)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 420-421.

In the above letter, and in a previous one by Houlding it has been stated that less than six parameters are sufficient to characterize a lossy two-port network coupling into a varactor junction. It is my contention, however, that erroneous conclusions can thereby be drawn as to the varactor's Q. Specifically, Roe's method will be applied to a theoretical varactor and shown to give ambiguous results, which are attributed to Roe's use of less than six parameters to describe the lossy coupling network.

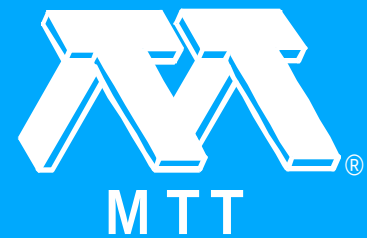


Abstracts

Papers Dealing with Dielectric-Loaded Rectangular Waveguides (Comments)

V.R. Bui and R.R. Gagne. "Papers Dealing with Dielectric-Loaded Rectangular Waveguides (Comments)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 421-422.

We have read with interest the paper of Tsandoulas, Temme, and Willwerth and that of Chatterjee and Chatterjee, dealing with rectangular waveguides loaded with dielectric. For the scientific accuracy, however, we believe a few errors have unfortunately occurred in them, and, therefore, we would like to submit the following remarks. The symbols in original sources are kept for easy comparison.



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Abstracts

Eigenmodes for Straight Circular Cylinder Microwave Resonators Containing a Coaxial Dielectric Sample (Computer Program Descriptions)

J.C. Joly and A. Poinso. "Eigenmodes for Straight Circular Cylinder Microwave Resonators Containing a Coaxial Dielectric Sample (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 422-422.

This program gives, from an exact analytic theory, either a characteristic parameter of the sample or resonance frequency for all eigenmodes which may exist in the loaded cavity.



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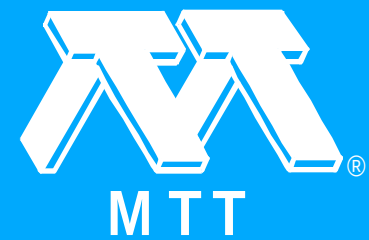
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Abstracts

Contributors (Jun. 1972 [T-MTT])

L. Gustafsson, G.H.B. Hansson, T.G. Hazel, R.H. Knerr, T. Larsen, K.I. Lundstrom, M. Maeda, H.E. Rowe, A. Wexler, J.F. White and D.T. Young. "Contributors (Jun. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.6 (Jun. 1972 [T-MTT]): 423-424.



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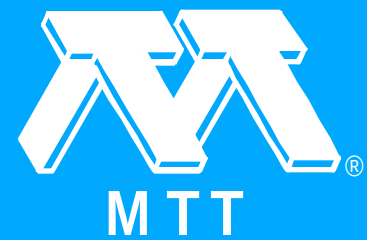
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Experimental Evaluation of Noise Parameters in Gunn and Avalanche Oscillators

M. Ohtomo. "Experimental Evaluation of Noise Parameters in Gunn and Avalanche Oscillators." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 425-437.

Equations are presented that express noise-to-carrier ratio and rms frequency deviation of a negative-resistance oscillator with a multiple-resonant circuit in terms of effective available noise power densities of both $1/f$ and white-noise sources, an effective saturation factor, and an appropriate $Q/\text{sub } L/$ of the oscillator. Experimental evaluation of the noise parameters in Gunn and avalanche oscillators by use of these equations is described. AM and FM noise measurements have been made on X-band Gunn oscillators and Si and GaAs avalanche oscillators for frequency off carriers extending from 1 kHz to 10 MHz. Both $1/f$ and white noise have been observed in these oscillators. The validity of the above equations has been verified for Gunn oscillators from the dependence of the noise spectra on $Q/\text{sub } L/$. For Gunn oscillators and Si and GaAs avalanche oscillators, the effective noise-temperature ratio for white noise, $N/kT/\text{sub } 0/$, has been found to be 23~29, 41~51, and 38~44 dB, and the effective saturation factor to be 2~2.9, 0.5~2.4, and 2, respectively. An increase of $N/kT/\text{sub } 0/$ with the RF voltage across the diode has been observed in Si avalanche oscillators. Parameters for $1/f$ noise have also been evaluated approximately.

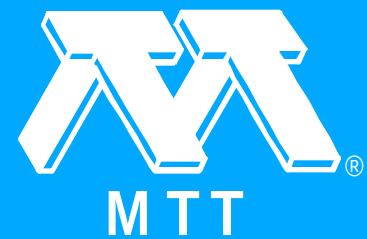


Abstracts

First-Order Nonlinear Theory in Hexagonal Ferrites with Planar Anisotropy under Perpendicular Pumping

J. Helszajn and J. McStay. "First-Order Nonlinear Theory in Hexagonal Ferrites with Planar Anisotropy under Perpendicular Pumping." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 437-446.

The first-order spinwave instability under perpendicular pumping at large signal power in an hexagonal ferrite ellipsoid with planar anisotropy biased in the easy plane is studied. The nonlinear coupling coefficient is obtained in terms of the physical variables of the unstable spinwaves and the uniform mode magnetization such as the orientation and ellipticity of the unstable spinwaves, the coordinates of the spinwave propagation vector k , and the uniform mode ellipticity. Results obtained using a computer in the case of a sphere are included. Also included are experimental results on the coincidence region with the dc field in the easy plane and with the dc field out of the easy plane. This latter arrangement leads to a new tunable coincidence limiter.



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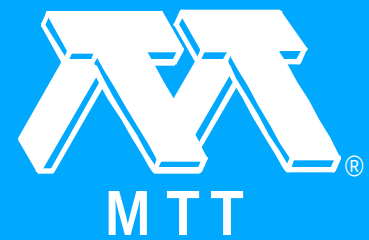
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An Improved Equivalent Circuit for the Thin-Film Lumped-Element Circulator

R.H. Knerr. "An Improved Equivalent Circuit for the Thin-Film Lumped-Element Circulator." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 446-452.

A program written for the Hewlett-Packard automatic network analyzer permits the S-parameter eigenvalue phases and magnitudes to be displayed. The thus measured eigenvalues of a lumped-element circulator lead to an improved equivalent circuit which explains the observed "double hump" characteristic. The influence of different circuit parameters on the eigenvalues is measured and found in good agreement with the author's previously published theory. It is concluded from this theory and the measurements that, for the lossy circulator in general, maximum isolation, return loss, and minimum forward loss do not occur at the same frequency.

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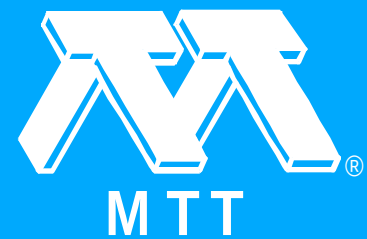


Abstracts

Broad-Band Coupling to High-Q Resonant Loads (Jul. 1972 [T-MTT])

T.M. Reeder and W.R. Sperry. "Broad-Band Coupling to High-Q Resonant Loads (Jul. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 453-458.

Broad-band coupling between a resistive source and a resonant load is considered for coupling networks consisting of a uniform transmission line of impedance Z_0 and length equal to a quarter wavelength at the load resonant frequency. An approximate analysis is used to show that either maximally flat or ripple insertion loss frequency response can be obtained by proper choice of Z_0 , and the 3-dB bandwidth obtained in either case is always greater than $1/Q$. Depending on the ratio of load and source resistances, the bandwidth may be greater than 1 octave. Network design curves for maximally flat operation with a variety of load parameters are computed without approximation. The design of lumped element approximations for the transmission line network is also described.



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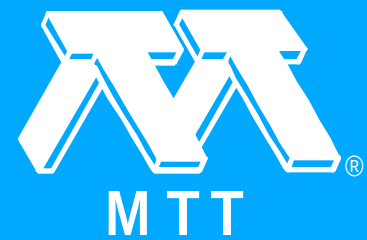
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Analysis and Design of Dispersive Interdigital Surface-Wave Transducers

W.R. Smith, H.M. Gerard and W.R. Jones. "Analysis and Design of Dispersive Interdigital Surface-Wave Transducers." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 458-471.

A comprehensive circuit model characterization of dispersive interdigital transducers with nonuniform electrode spacing is presented. The model is an extension of a three-port circuit which has been useful for representing periodic transducers. The extended model includes the effects of strong piezoelectric coupling whereby the acoustic waves and electric circuits interact, and it also accounts for reflections of acoustic waves which result from perturbations of the crystal surface by the metal electrodes. The inclusion of the latter effect is shown to be essential for explaining observed levels of triple-transit echos in filters and delay lines. The circuit model is used to derive a transducer design procedure which determines the electrode positions and the anodization function (acoustic aperture taper) required to reproduce a desired waveform. This procedure is applicable to the design of weighted dispersive filters and broad-band nondispersive delay lines. In order to verify the theory a low-loss octave-bandwidth nondispersive delay line was designed using linear FM dispersive transducers on YZ LiNbO/sub 3/. The performance of this device was found to be in good agreement with the circuit model predictions.

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Tapping of Love Waves in an Isotropic Surface Waveguide by Surface-to-Bulk Wave Transduction

H.-S. Tuan and C.-P. Chang. "Tapping of Love Waves in an Isotropic Surface Waveguide by Surface-to-Bulk Wave Transduction." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 472-477.

A theoretical study of tapping a Love wave in an isotropic microacoustic surface waveguide is given. The surface Love wave is tapped by partial transduction into a bulk wave at a discontinuity. It is shown here that, by careful design of the discontinuity, the converted bulk wave power and the radiation pattern may be controlled. General formulas are derived for the calculation of these important characteristics from a relatively general surface contour deformation.

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Elastic Waves Guided by a Solid Layer Between Adjacent Substrates

R.C.M. Li and K.-H. Yen. "Elastic Waves Guided by a Solid Layer Between Adjacent Substrates." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 477-486.

The present investigation is motivated by the problem of coupling Rayleigh waves between adjacent substrates when either substrate is nonpiezoelectric, in which case it becomes necessary to resort to some mechanical means to achieve this coupling. The use of a fluid coupling layer has been investigated and experimentally demonstrated elsewhere, while the use of a solid layer, with its inherently greater mechanical stability, has also been proposed. In this work, the operating characteristics of a specific solid-layer structure are predicted on the basis of a theoretical analysis, which furnishes the propagation characteristics and field structure of the waves which may be guided by a solid layer between two identical solids.

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Stripline Triplexer for Use in Narrow-Bandwidth Multichannel Filters (Short Papers)

R. Kihlen. "Stripline Triplexer for Use in Narrow-Bandwidth Multichannel Filters (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 486-488.

Design techniques and equivalent circuits are presented for constructing a printed-circuit narrow-bandwidth complementary triplexer filter. The techniques and circuits described allow the construction of contiguous-band multichannel filters using printed circuits with no shorted stubs. A unit was designed and constructed to give a three-percent relative bandwidth for each separate channel. The agreement between theory and experiment was in the range of measurement accuracy.

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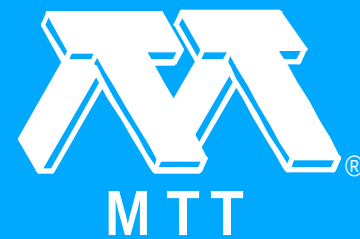


Abstracts

Implementation of Conservation-of-Energy Condition in Small Aperture and Small Obstacle Theory (Short Papers)

C.-L. Ren. "Implementation of Conservation-of-Energy Condition in Small Aperture and Small Obstacle Theory (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 488-490.

In a previous paper, Felsen and Kahn showed that the scattering matrix of small apertures and obstacles in multimode waveguide regions is conveniently calculated for general lossless structures, but observed that the scattering matrix does not satisfy the conservation-of-energy requirement. It is also to be noted that the scattering parameters could become much larger than unity or even infinite for frequencies near or at the cutoff of the coupled modes. A method is presented in this correspondence to implement the lossless condition so that the resultant scattering matrix satisfies the conservation-of-energy requirement and, consequently, can be represented as a lossless equivalent circuit for all frequencies. The corresponding impedance, admittance, and transfer matrices for general lossless symmetrical structures are given in compact form directly in terms of the scattering parameters.



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Permeability Tensor of Magnetized Ferrites from Waveguide Measurements (Computer Program Descriptions)

H. Entschladen. "Permeability Tensor of Magnetized Ferrites from Waveguide Measurements (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 490-491.

By means of this program the complex eigenvalues of the permeability tensor of magnetized ferrites can be calculated from measurements of the propagation constants of right- and left-handed rotating HE/sub 11/ waves in circular cylindrical waveguides containing axial longitudinally magnetized ferrite rods.



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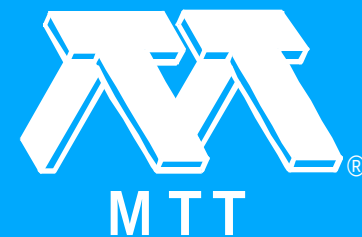
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Contributors (Jul. 1972 [T-MTT])

C.-P. Chang, H.M. Gerard, J. Helszajn, W.R. Jones, R.H. Knerr, R.C.M. Li, J. McStay, M. Ohtomo, T.M. Reeder, W.R. Smith, W.R. Sperry, H.-S. Tuan and K.-H. Yen. "Contributors (Jul. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 491-492.



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Yagi-Uda Array as a Surface-Wave Launcher for Dielectric Image Lines

W.K. McRitchie and J.C. Beal. "Yagi-Uda Array as a Surface-Wave Launcher for Dielectric Image Lines." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 493-496.

A Yagi-Uda array of monopoles is embedded in the dielectric of a dielectric image line, with the driven element fed from coaxial cable below the metallic ground plane, in order to launch the dipole-mode surface wave. The launching efficiency is a function of the array length and is relatively independent of the transverse dimension. With a six-element array, a launching efficiency of 62 percent has been achieved over an 18-percent bandwidth at 2.2 GHz. A design procedure for such arrays is described and experimental verification is given.

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Abstracts

Matrix Methods for Microstrip Three-Dimensional Problems

A. Farrar and A.T. Adams. "Matrix Methods for Microstrip Three-Dimensional Problems." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 497-504.

The matrix methods are applied to three-dimensional microstrip problems with emphasis upon the general problem of discontinuities in microstrip. Discontinuities considered are 1) open circuits, 2) change of width, and 3) gap in microstrip. Also, the capacitance of rectangular sections of microstrip is computed. Computed data agree well with experiment and data in the literature.



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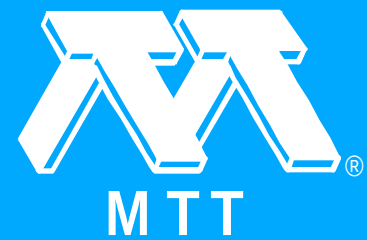
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Capacitance of Parallel Rectangular Plates Separated by a Dielectric Sheet

P. Benedek and P. Silvester. "Capacitance of Parallel Rectangular Plates Separated by a Dielectric Sheet." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 504-510.

To determine the capacitance between two rectangular parallel plates separated by a dielectric sheet, the charge distribution on the plates is formulated in terms of a Fredholm integral equation of the first kind. This equation is solved numerically by a projective method using polynomial approximants. The resulting capacitance values are given in normalized graphical form, permitting capacitance determination for any practical values of dielectric constant and geometric parameters to within a few percent.

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Equivalent Capacitances of Microstrip Open Circuits

P. Silvester and P. Benedek. "Equivalent Capacitances of Microstrip Open Circuits." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 511-516.

The integral equations that describe the charge distribution near an open-circuited microstrip end are formulated and subsequently solved by a projective method. The solution hinges on development of computationally efficient techniques for dealing with the singularities that occur by special quadrature formulas. The necessary formulas are described and tabulated. These techniques are then used to find open-circuit capacitance values for microstrip. It is found that the curves of excess capacitance versus width are easily describable by empirical equations; such equations are presented, along with the curves themselves. For strip widths between 0.1 and 10 times the substrate thickness and for dielectric constants in the range 1-51, the given data are believed accurate to within a few percent.

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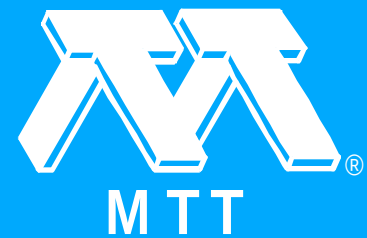


Abstracts

Circular Waveguides Lined with Artificial Anisotropic Dielectrics

C.T.M. Chang. "Circular Waveguides Lined with Artificial Anisotropic Dielectrics." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 517-523.

The propagation of electromagnetic waves inside circular waveguides lined with artificial anisotropic dielectric is investigated. Our investigation shows that the dominant hybrid electromagnetic (HEM/sub 11/) mode possesses a transverse deflecting field over the aperture of the structure and can be used as a transverse deflecting mode in a particle separator with ultrahigh energy. Expressions for power, attenuation, and transverse shunt impedance are obtained, and the effects of changing in loading on these various quantities are studied and presented in graphs.



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Propagation Mode and Scattering Loss of a Two-Dimensional Dielectric Waveguide with Gradual Distribution of Refractive Index

Y. Suematsu and K. Furuya. "Propagation Mode and Scattering Loss of a Two-Dimensional Dielectric Waveguide with Gradual Distribution of Refractive Index." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 524-531.

An analytical discussion of the mode property and the scattering loss of a two-dimensional dielectric waveguide with gradual refractive-index distribution in the transverse direction is presented. To describe scattering loss, a transverse correlation as well as an axial correlation of the irregular variation of the refractive index have been used. The field distribution, the group delay, and the maximum film thickness of a single-mode waveguide scarcely depends on the shape of the distribution. The maximum value of the film thickness in the single-mode transmission region optimizes the scattering loss and the energy confinement. The scattering loss of a waveguide with a gradual index distribution is smaller than that of a three-layer waveguide when the transverse correlation is small, but it is not much altered when the transverse correlation is large.



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The Absolute Calibration of Periodic Microwave Phase Shifters without a Standard Phase Shifter

P.I. Somlo, D.L. Hollway and I.G. Morgan. "The Absolute Calibration of Periodic Microwave Phase Shifters without a Standard Phase Shifter." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 532-537.

An absolute calibration procedure for periodic microwave phase shifters is described. Increments on the phase shifter are compared by substitution with a reproducible phase-shift step of initially unknown value. The periodic nature of the phase shifter provides a reference phase shift of 360° , and alternative methods are outlined for the derivation of the correction curve from the step measurements. It is shown that the accuracy of the calibration is governed by the precision and reproducibility of the phase shifter under test.

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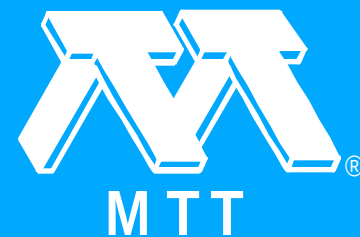


Abstracts

The Exact Dimensions of a Family of Rectangular Coaxial Lines with Given Impedance

H.J. Riblet. "The Exact Dimensions of a Family of Rectangular Coaxial Lines with Given Impedance." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 538-541.

The potential problem associated with a capacitor bounded by concentric rectangles may be solved by conformably mapping a certain L-shaped region onto the upper half plane. In certain cases, the integral, by which the Schwarz-Christoffel transformation may be expressed, can be evaluated in terms of two elliptic integrals of the first kind. Then the odd- and even-mode impedance of the related transmission line is readily found.



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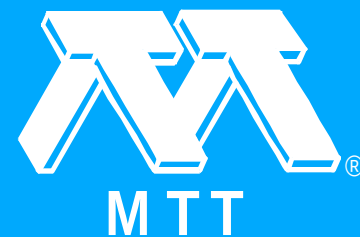


Abstracts

Coupled Power Equations for Backward Waves

D. Marcuse. "Coupled Power Equations for Backward Waves." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 541-546.

Two waves traveling in opposite directions that are coupled by a random coupling function are considered. These two waves can be described in a standard way by coupled wave equations. It is possible to derive coupled equations for the power carried by these two waves. The form of the coupled power equations differs depending on the assumptions that are made for the initial conditions. The validity of the coupled power equations has been confirmed by a computer-simulated experiment.



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On Optimum Mirrors of the Fabry-Perot Resonator Filled with Anisotropic Medium (Short Papers)

T. Tanaka and M. Suzuki. "On Optimum Mirrors of the Fabry-Perot Resonator Filled with Anisotropic Medium (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 546-547.

A Fabry-Perot resonator formed by parabolic cylindrical reflecting mirrors and filled with anisotropic medium is analyzed theoretically. For the resonance of the extraordinary wave in such a resonator, optimum shapes of the reflecting mirrors exist, which are derived from the boundary conditions on each mirror.



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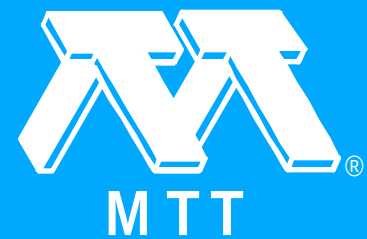


Abstracts

Use of the TEM Mode in Microwave Heating Applicators (Short Papers)

D.A. Johnston and W.A.G. Voss. "Use of the TEM Mode in Microwave Heating Applicators (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 547-549.

A combination of hot air and microwave heating is generally achieved by placing air knives alongside the waveguide applicators when drying web materials. If the air knife is placed inside the applicator, using it as the center conductor of a TEM structure, better or additional moisture removal may be achieved. The TEM mode also permits more control of the wave attenuation. Perturbation formulas are developed to compare conventional slotted waveguide applicators with two TEM systems. Experimental results are given. Improved uniformity of heating and lower leakage are indicated.



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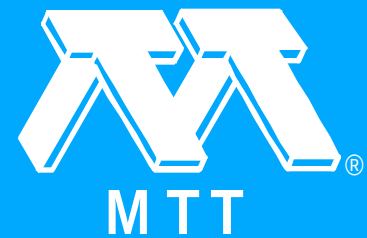


Abstracts

Feedthrough for Digital Latching Ferrite Phasers (Short Papers)

J.D. Hanfling and S.R. Monaghan. "Feedthrough for Digital Latching Ferrite Phasers (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 549-552.

Feedthroughs are used in latching ferrite phasers having control wires entering the microwave region. The feedthrough damps out the troublesome resonances that occur as a result of air gaps at the ferrite-waveguide wall interface and at the same time chokes out the radiation from the holes through which the latching wires pass. The equations and curves necessary to design the feedthrough are presented, as well as some experimental results obtained at C band on a practical production configuration.



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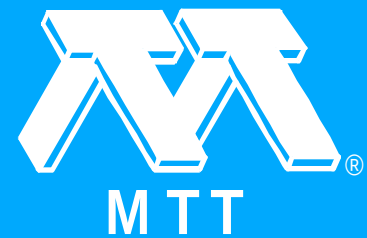


Abstracts

A Dominant Mode Analysis of Microstrip (Short Papers)

R.P. Wharton and G.P. Rodrigue. "A Dominant Mode Analysis of Microstrip (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 552-555.

A computer-aided numerical analysis of the dominant mode propagating in microstrip transmission line is reported, and the theoretical results are corroborated by experimental measurements. A region of almost complete circular polarization is found to exist at the surface of the dielectric, although most of the energy is concentrated directly beneath the strip conductor where the fields possess almost complete linear polarization.



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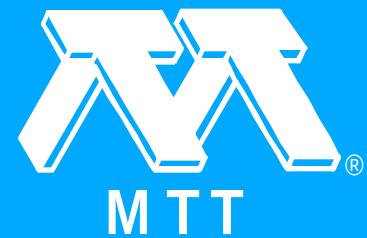


Abstracts

Octave-Band Microstrip DC Blocks (Short Papers)

D. LaCombe and J. Cohen. "Octave-Band Microstrip DC Blocks (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 555-556.

The design of octave-bandwidth microstrip interdigital dc blocks is presented. Data for a 7.75- to 16.3-GHz design are given and correlated with an approximate equivalent circuit based on even and odd mode propagation in coupled microstrip. Additional data are tabulated reflecting the ability to shift the frequency band of operation.



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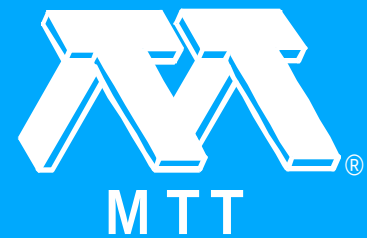


Abstracts

Wave Propagation on Nonuniform Transmission Lines (Short Papers)

A. Bergquist. "Wave Propagation on Nonuniform Transmission Lines (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 557-558.

The problem of wave propagation on nonuniform transmission lines is studied. Equations are presented not only for the reflection coefficient but for the transmission and admittance properties as well. They are valid under the assumption that only one mode of propagation exists on the line and that the properties do not change so rapidly that the fundamental transmission line equations are no longer applicable. Since all equations are derived for arbitrary load conditions, an extremely versatile solution of the problem has been obtained.



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Abstracts

The Lowest Order Mode and the Quasi-TEM Mode in a Ferrite-Filled Coaxial Line or Resonator (Short Papers)

I. Wolff. "The Lowest Order Mode and the Quasi-TEM Mode in a Ferrite-Filled Coaxial Line or Resonator (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 558-560.

The field distribution of the mode in a ferrite-filled coaxial cavity, which converges towards the TEM mode in the isotropic case, is discussed.



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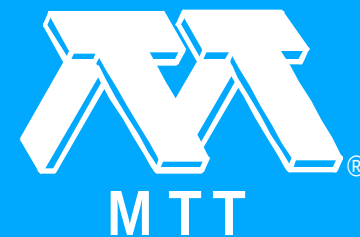
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Contributors (Aug. 1972 [T-MTT])

A.T. Adams, J.C. Beal, P. Benedek, C.T.M. Chang, A. Farrar, K. Furuya, D.L. Hollway, D. Marcuse, W.K. McRitchie, I.G. Morgan, H.J. Riblet, P. Silvester, P.I. Somlo and Y. Suematsu. "Contributors (Aug. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.8 (Aug. 1972 [T-MTT]): 561-563.



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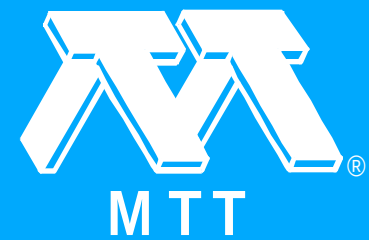
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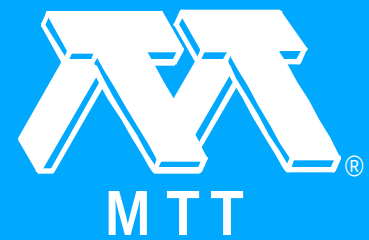


An Analytical Equivalent Circuit Representation for Waveguide-Mounted Gunn Oscillators

C.P. Jethwa and R.L. Gunshor. "An Analytical Equivalent Circuit Representation for Waveguide-Mounted Gunn Oscillators." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 565-572.

A lumped equivalent circuit is used to represent the impedance presented to the device terminals for a waveguide-mounted Gunn oscillator. Analytic expressions are used for all the lumped elements. This circuit model is used to predict tuning curves which are compared to experimental tuning curves obtained for iris coupling, for full- and reduced-height waveguides, and for various post diameters. Iris-controlled nontunable modes are reported and explained by the model. The real part of the load impedance presented at the device terminals is found to agree with Copeland's prediction for optimum loading. Experimentally observed mode switching is explained with reference to variations in device parameters.





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Discontinuities in Symmetric Striplines Due to Impedance Steps and Their Compensations

V. Nalbandian and W. Steenaart. "Discontinuities in Symmetric Striplines Due to Impedance Steps and Their Compensations." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 573-578.

The theoretically known magnitude of the series lumped reactance, as a function of impedance step ratio, resulting from an impedance step discontinuity in symmetric stripline is confirmed, and an alternative expression for the inductance is given. A reduction of this reactance has been achieved by splitting the narrower strip at the impedance step junction into a multistrip configuration, while retaining the total characteristic impedance value. A way of compensating the effect of the reactance on the pass-band characteristics of quarter-wave impedance transformers and filters is developed. This is achieved by the introduction of a lumped series capacitance at the impedance step discontinuity.

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Waveguides of Arbitrary Cross Section by Solution of a Nonlinear Integral Eigenvalue Equation (Sep. 1972 [T-MTT])

B.E. Spielman and R.F. Harrington. "Waveguides of Arbitrary Cross Section by Solution of a Nonlinear Integral Eigenvalue Equation (Sep. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 578-585.

The problem of electromagnetic wave propagation in hollow conducting waveguides of arbitrary cross section is formulated as an integro-differential equation in terms of fields at the waveguide boundary. Cutoff wave numbers and wall currents appear as eigenvalues and eigenfunctions of a nonlinear eigenvalue problem involving an integro-differential operator. A variational solution is effected by reducing the problem to matrix form using the method of moments. A specific solution of the problem is developed using triangle expansion functions in the method of moments. The solution is simplified by symmetry considerations and is implemented by two digital computer programs. Listings and full documentation of these programs are available. This solution yields accurate determinations of cutoff wave numbers, wall currents, and distributions of both longitudinal and transverse modal field components for the first several modes. Illustrative computations are presented for the single-ridge waveguide, which has a complicated boundary shape that does not lend itself to exact solution.

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Abstracts

A Network Analogue Method for Computing the TEM Characteristics of Planar Transmission Lines

B.L. Lennartsson. "A Network Analogue Method for Computing the TEM Characteristics of Planar Transmission Lines." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 586-591.

A network analogue method for calculation of the capacitance matrix of certain two-dimensional multiconductor systems is presented. The system is contained in a finite or infinite conducting rectangular boundary. An arbitrary number of parallel dielectric layers can be present, and the conductors consist of an arbitrary number of conducting strips at one or more of the dielectric interfaces. The strips are assumed to have zero thickness.



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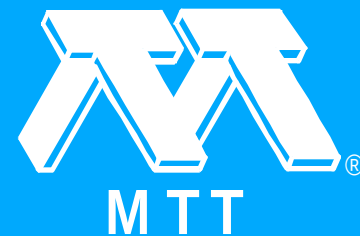


Abstracts

Dynamic Behavior of Nonlinear Power Amplifiers in Stable and Injection-Locked Modes

Y. Takayama. "Dynamic Behavior of Nonlinear Power Amplifiers in Stable and Injection-Locked Modes." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 591-595.

Dynamic equations of reflection-type nonlinear power amplifiers in both stable and injection-locked modes are derived for modulated signals. The steady-state response and the transient response of an injection-locked negative-resistance diode amplifier is evaluated. The response for an FM signal is discussed. Numerical results show that the dynamic behavior as well as the steady-state behavior is affected by nonlinearity of the diode conductance and susceptance.



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Minimax Optimization of Networks by Grazor Search

J.W. Bandler, T.V. Srinivasan and C. Charalambous. "Minimax Optimization of Networks by Grazor Search." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 596-604.

A new optimization method called grazor search has been developed. This method is suitable for nonlinear minimax optimization of network and system responses. A linear programming problem using gradient information of one or more highest ripples in the response error function to produce a downhill direction followed by a linear search to find a minimum in that direction is central to the algorithm. Unlike the razor search method due to Bandler and Macdonald, the present method overcomes the problem of discontinuous derivatives characteristic of minimax objectives without using random moves. It can fully exploit the advantages of the adjoint network method of evaluating partial derivatives of the response function with respect to the variable parameters. Sufficient details are given to enable the grazor search method to be readily programmed and used. Although the method is intended for the computer-aided solution of an extremely wide range of design problems, it is largely compared with other methods on microwave network design problems, for which the solutions are known. Its reliability and efficiency on more arbitrary problems, examples of which are also included, is thereby established.

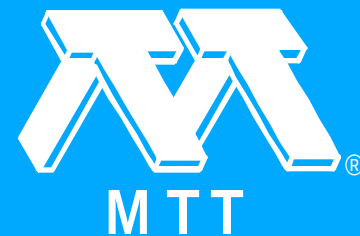


Abstracts

Anomalous Loss at a Ferrite Boundary

L. Lewin. "Anomalous Loss at a Ferrite Boundary." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 604-607.

The occurrence of anomalous loss and its explanation in terms of surface waves is discussed. For this type of explanation to be possible the region of occurrence of the surface wave must at least straddle the region of anomalous loss. It is shown that this is so, particularly for the case when there is a mixed air-ferrite surface layer for which this result is not obvious: as the air content decreases, a ferrite-metal surface wave appears and takes over the function of the layer wave. The means by which these waves are generated, and the determination of their amplitudes, appear to require a new physical principle to be applied. A new type of "edge condition" is postulated.



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Phase Step Beam Waveguide

P.F. Checcacci, R. Falciai and A. Scheggi. "Phase Step Beam Waveguide." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 608-613.

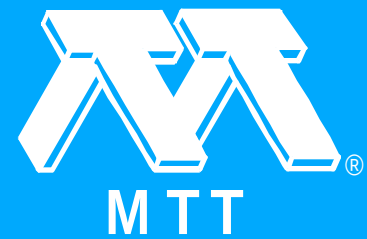
Experimental tests on a new type of beam waveguide constituted by a series of equispaced dielectric frames are described. Field-pattern and power-loss measurements have been performed on short-circuited sections of the waveguide working at 10 GHz and on the 37-GHz prototype constituted by Teflon square frames. In comparison with the more common iris and lens beam waveguides, it presents advantages concerning diffraction, reflection, and dissipation losses. In addition, it is lightweight and compact. The experimental results confirm these advantages, along with a low sensitivity to assembling and constructive imperfections. Design criteria are suggested as a result of the optimization for the lowest losses obtained through numerical computations performed on the equivalent open resonator.



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Insertion Loss of 4-Level Phase Switch (Short Papers)

W.O. Schlosser and K. Kurokawa. "Insertion Loss of 4-Level Phase Switch (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 614-616.

A 4-level phase switch using two switching diodes and one circulator is investigated and compared to a switch using two circulators. The results are as follows. 1) If one uses a lossless combining network for the two diodes, it is impossible to make the losses equal in all four switching states. 2) One can balance the losses by introducing a lossy element into the circuit. The loss of this circuit is given as a function of diode Q .

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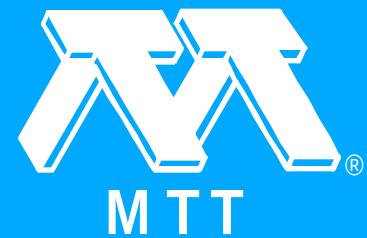


Abstracts

Self-Oscillating Tunnel-Diode Mixer Having Conversion Gain (Short Papers)

C. Toker. "Self-Oscillating Tunnel-Diode Mixer Having Conversion Gain (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 616-618.

A self-oscillating-type tunnel-diode mixer having conversion gain operating at a signal frequency of 600 MHz is demonstrated. By changing the bias, conversion gains up to infinity (oscillations) can be obtained, although gains in excess of 20 dB are typical. Variation of gain with bias is such that the maximum magnitude of the local oscillations corresponds to the minimum conversion gain (a loss of more than 30 dB). No explanation can yet be given for this unexpected phenomenon.



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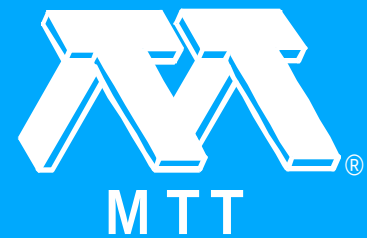


Abstracts

P-I-N Variable Attenuator with Low Phase Shift (Short Papers)

W.J. Parris. "P-I-N Variable Attenuator with Low Phase Shift (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 618-620.

A broad-band MIC current-controlled variable attenuator that exhibits small phase change versus attenuation has been developed. Design factors that effect phase shift are discussed. Performance at frequencies between 0.5 and 3.0 GHz is shown. Measured values of attenuation are shown to be independent of frequency from 0.5 to 3.0 GHz.



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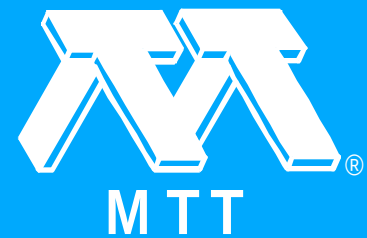


Abstracts

Exact Design of Stepped-Impedance Transformers (Short Papers)

F.-C. Chang and H. Mott. "Exact Design of Stepped-Impedance Transformers (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 620-621.

The exact solutions of the design of stepped-impedance transformers presented until now have been tedious and subject to computational error. We present here an exact synthesis procedure which requires less effort than other exact procedures. In addition, two recurrence formulas are given for determining the characteristic impedances of each section. The coefficients so obtained can be compared to eliminate computational errors.



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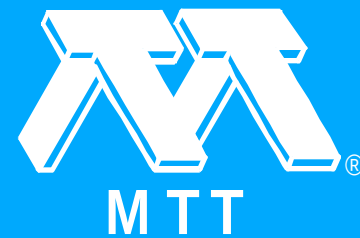


Abstracts

Dielectric Losses in an H-Plane-Loaded Rectangular Waveguide (Short Papers)

V.R. Bui and R.R.J. Gagne. "Dielectric Losses in an H-Plane-Loaded Rectangular Waveguide (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 621-623.

The attenuation constant due to dielectric losses in a rectangular waveguide loaded with a dielectric slab in the H-plane is calculated. Results for the dominant LSM/sub 11/ mode are presented graphically.



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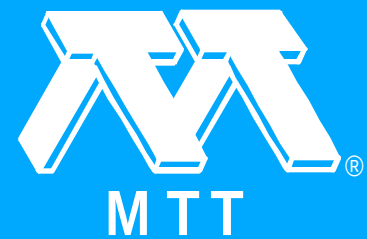


Abstracts

Analysis of Automatic Homodyne Method Amplitude and Phase Measurements (Short Papers)

B.A. Howarth and T.J.F. Pavlasek. "Analysis of Automatic Homodyne Method Amplitude and Phase Measurements (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 623-626.

A system employing RF substitution techniques for automatic phase and intensity measurement of microwave fields is described. The system uses homodyne detection to generate error signals for servomechanisms which balance the attenuation and phase secondary standards. Accuracy and dynamic range of this method of measurement can be strongly dependent on the method of modulation employed. This paper analyzes errors from this cause and indicates what means are available to minimize them. This method of measurement is less expensive than some alternate techniques, and, at the present stage in the evolution of microwave near field measurements, its errors are less serious than uncertainties introduced by absorber reflections, probe characteristics, and mechanical positioning errors.



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Abstracts

Open-End and Edge Effect in Microstrip Transmission Lines (Short Papers)

O.P. Jain, V. Makios and W.J. Chudobiak. "Open-End and Edge Effect in Microstrip Transmission Lines (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 626-628.

An empirically derived relation is reported which accurately describes the open-end effect in microstrip transmission lines on alumina substrates. This empirical equation was used to describe the edge-correction term in Wheeler's general expression for the characteristic impedance for wide lines. It is shown that with this modification there exists a distinct crossover ($w/h \approx 1$) between the narrow- and wide-line approximations.



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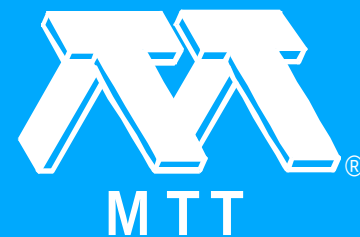


Abstracts

Extension of Digital Automatic Method for Measuring the Permittivity of Thin Dielectric Films (Short Papers)

M.A. Rzepecka and M.A.K. Hamid. "Extension of Digital Automatic Method for Measuring the Permittivity of Thin Dielectric Films (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 628-630.

The permittivity of thin dielectric films can be measured with good accuracy by employing a method recently reported by the authors, whereby the microwave oscillator frequency is automatically locked to the resonant frequency of the test cavity perturbed by the sample, thus leading to a digital readout of the frequency. However, the method is satisfactory only when the frequency shift caused by the presence of the test sample does not exceed the frequency lock-in bandwidth. By employing a search oscillator, controlled by the second harmonic of the modulation signal provided for the frequency locking, this limitation is removed, thus extending the capability of the method to thicker films and/or larger permittivities.



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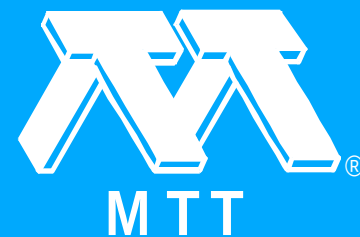


Abstracts

Anomalous Convergence of Iterative Methods in the Numerical Solution of Electromagnetic Problems (Short Papers)

M. Albani and P. Bernardi. "Anomalous Convergence of Iterative Methods in the Numerical Solution of Electromagnetic Problems (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 630-631.

Iterative methods applied to eigenvalue equations can lead to anomalous convergence. It is shown that this can occur when some of the eigenvalues are complex and the corresponding eigenvectors satisfy a particular condition. A method of distinguishing between anomalous and effective convergence is indicated.



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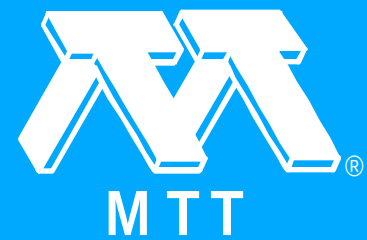
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Noise in IMPATT Diode Amplifiers and Oscillators (Comment and Authors' Reply)

B. Schiek, K. Schunemann, H.-J. Thaler, G. Ulrich and G. Weidmann. "Noise in IMPATT Diode Amplifiers and Oscillators (Comment and Authors' Reply)." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 631-632.

In the above paper, an extensive contribution on the noise of IMPATT oscillators was presented, which is based on the theory of Kurokawa. In our opinion, however, the theoretical results of this work do not apply in all cases to the experiments reported. The authors define a load angle Θ (15a) which appears in the equations for the AM and FM noise [(16b) and (17b)] and the correlation coefficient [(18b). Eqs. (16b), (17 b), and (18b)] describe the noise of the current through the diode, which is of minor interest and difficult to measure. The AM noise of the load current, which in reality was measured, differs considerably from the noise of the diode current if $\Theta \neq 90^\circ$. In this case, an additional FM - AM conversion term appears which, under certain conditions, cancels exactly the load-angle-dependent terms in the expression for the AM noise of the diode current. These conditions are as follows.

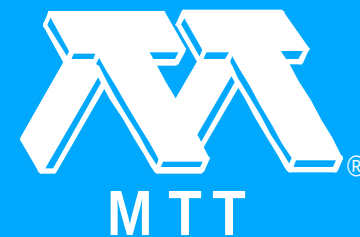
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Contributors (Sep. 1972 [T-MTT])

J.W. Bandler, C. Charalambous, P.F. Checcacci, R. Falciai, R.L. Gunshor, R.F. Harrington, C.P. Jethwa, B.L. Lennartsson, L. Lewin, V. Nalbandian, A. Scheggi, B.E. Spielman, T.V. Srinivasan, W. Steenaart and Y. Takayama. "Contributors (Sep. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 632-634.



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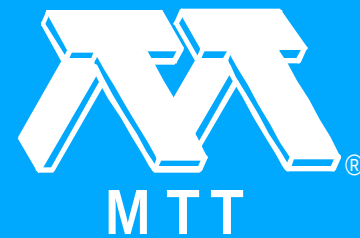


Abstracts

Noise of Negative Resistance Oscillators at High Modulation Frequencies

B. Schiek and K. Schunemann. "Noise of Negative Resistance Oscillators at High Modulation Frequencies." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 635-641.

The theory of AM and FM noise in oscillators of the negative resistance type is extended to higher modulation frequencies, i.e., to modulation frequencies beyond the bandwidth of the stabilizing cavity. The results are expressed in terms of the input impedance of the stabilizing cavity and are found to agree well with measurements.



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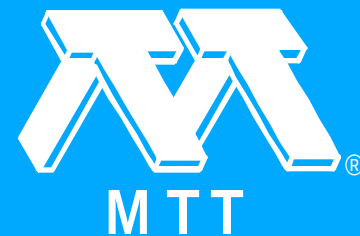


Abstracts

Stability Criteria for Phase-Locked Oscillators

G.H.B. Hansson and K.I. Lundstrom. "Stability Criteria for Phase-Locked Oscillators." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 641-645.

Stability criteria for negative conductance oscillators or amplifiers are derived in terms of the total circuit admittance. A figure of merit for phase locking at small injected powers is derived. The influence of large injected signals is studied. The conclusions drawn from the calculations are in good qualitative agreement with experimental observations on phase-locked IMPATT-diode oscillators.



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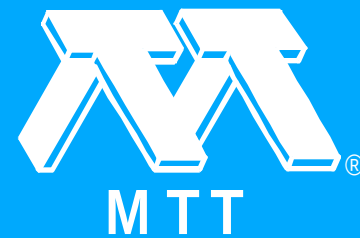


Abstracts

A Wide-Band Gunn-Effect CW Waveguide Amplifier

A. Sone and F.J. Rosenbaum. "A Wide-Band Gunn-Effect CW Waveguide Amplifier." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 645-650.

Broad-band CW amplification with Gunn diodes in waveguide circuits has been obtained, with power gains typically between 10 and 15 dB and half-power bandwidths of more than 1 GHz. It is found that amplifier performance can be modeled with fair accuracy using a rough characterization for the diode parameters.



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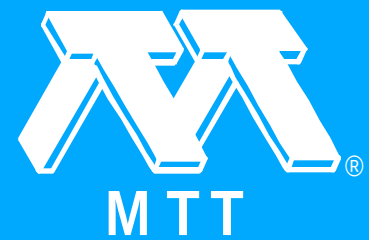
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Finite-Element Solutions within Curved Boundaries

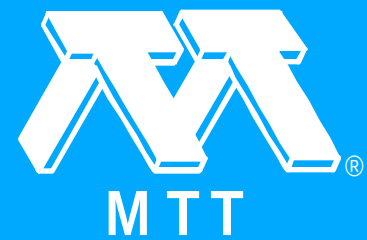
D.J. Richards and A. Wexler. "Finite-Element Solutions within Curved Boundaries." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 650-657.

The paper shows that a curved boundary need not be approximated by a small number of finite-element sides, resulting in a coarse polygonal approximation to the shape of the region and consequent inaccuracies, but may be defined as accurately as desired. An algorithm and associated mathematics are presented for locating the stationary point of a functional by the Rayleigh-Ritz method with a two-variable power series as a trial function. As a particular example, the functional employed is one that is made stationary by the solution of Poisson's equation under mixed, Dirichlet, or Neumann boundary conditions. The technique is based on the fact that the three boundary conditions are natural ones. Results are presented for a problem involving curved boundaries under mixed and Neumann conditions and for the capacitance calculations of a pair of noncoaxial cylinders having specified potentials.

Comparisons are made with the finite-difference method. It is concluded that the finite-element method is, in nearly all aspects, superior to finite differences--particularly when curved boundary modeling errors are reduced. It is expected that the method described will be equally useful for, and quite simple to adapt to, the solution of the Helmholtz equation in an enclosed region.

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Null-Field Method for Waveguides of Arbitrary Cross Section

F.L. Ng and R.H.T. Bates. "Null-Field Method for Waveguides of Arbitrary Cross Section." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 658-662.

It is shown how to obtain accurate numerical values for waveguide characteristics using the null-field method, which is derived using Waterman's extended boundary condition. Computational results are presented for the sector waveguide (for which the field is known in closed form), the cross section of which possesses a sharp re-entrant corner. It is demonstrated that explicitly satisfying the edge conditions at this corner significantly improves the computational accuracy. In agreement with a previous conjecture it is shown, by example using the sector waveguide, that the straightforward point-matching method sometimes gives completely erroneous fields, even when predicting cutoff wavenumbers with moderate accuracy.

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Broadside-Coupled Strips in a Layered Dielectric Medium

J.L. Allen and M.F. Estes. "Broadside-Coupled Strips in a Layered Dielectric Medium." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 662-669.

Coupling coefficient, odd- and even-mode impedances, and the mode phase velocities are calculated for a pair of broadside-coupled strips embedded in a layered dielectric medium and enclosed by a rectangular shield. Large ratios of mode phase velocities can be achieved with this structure leading to novel performance characteristics for familiar coupled-line configurations such as the microwave C section.

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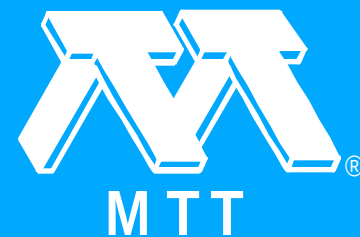


Abstracts

Computer Analysis of the Fundamental and Higher Order Modes in Single and Coupled Microstrip

D.G. Corr and J.B. Davies. "Computer Analysis of the Fundamental and Higher Order Modes in Single and Coupled Microstrip." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 669-678.

By means of finite difference methods, dispersion curves are obtained for the fundamental and higher order hybrid modes in both single and coupled microstrip. Structures of realistic proportions are investigated by the use of a graded finite difference mesh. Variational methods are used in deriving the finite difference equations. The higher order modes are found to be similar to LSM slab line modes. A spurious nonphysical class of solutions is found to exist in this and similar formulations, the characteristics of which are described.



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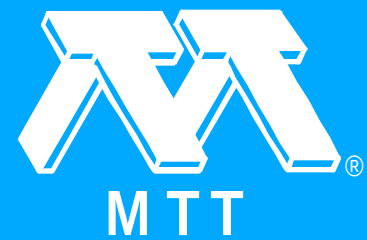
Frequency-Dependent Characteristics of Microstrip Transmission Lines

M.K. Krage and G.I. Haddad. "Frequency-Dependent Characteristics of Microstrip Transmission Lines." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 678-688.

A method for determining the frequency-dependent characteristics of both single and coupled lines in shielded microstrip is presented. Numerical results are given for a variety of dielectric configurations and the effects of geometry on the dispersion characteristics are examined in detail. Of particular interest are the characteristics of coupled lines on compensated dielectric structures, i.e., structures that are capable of achieving equal even- and odd-mode phase velocities, and the effects of dispersion on the directivity characteristics of such lines are discussed. In addition, the variation of impedance as a function of frequency, where the impedance is defined as the ratio of the power to the square of the longitudinal current, is presented for representative cases of single and coupled lines.

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Electric and Magnetic Coupling through Small Apertures in Shield Walls of Any Thickness

N.A. McDonald. "Electric and Magnetic Coupling through Small Apertures in Shield Walls of Any Thickness." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 689-695.

A method is presented for evaluating the coupling between two identical resonant cavities coupled by a small aperture in a plane common wall of arbitrary thickness. The coupling is related to the frequencies of the symmetric and asymmetric modes of oscillation of the coupled cavity structure, and a variational technique is used to determine those frequencies. The method is applied to circular and rectangular apertures, and it is shown that the coupling is separable into electric and magnetic terms. The results enable theoretical solutions to be obtained for the electric and magnetic polarizabilities of circular and rectangular apertures in walls of zero thickness, and equivalent polarizabilities to be obtained when the wall thickness is nonzero. Curves of numerical values are given for circular and rectangular apertures. With zero wall thickness, the results obtained are the same as those of Bethe for a circular aperture and give good agreement with Cohn's experimental results for rectangular apertures.

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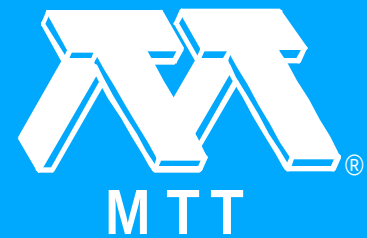


Abstracts

Design Equations for a Class of Wide-Band Bandpass Filters (Short Papers)

E.G. Cristal. "Design Equations for a Class of Wide-Band Bandpass Filters (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 696-699.

Design equations and experimental data for a class of bandpass filters having up to two attenuation poles at finite frequencies in the stopband are presented. The new designs are obtained by a relatively simple modification of only the end sections of conventional interdigital and half-wave parallel coupled-line filters. Practical realizability constraints generally limit the design technique to wide-band filters.



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Abstracts

An Approximate Analysis of Dielectric-Ridge Loaded Waveguide (Short Papers)

R.M. Arnold and F.J. Rosenbaum. "An Approximate Analysis of Dielectric-Ridge Loaded Waveguide (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 699-701.

The dielectric-ridge loaded waveguide is analyzed approximately in terms of coupled empty waveguide modes. Using this technique the propagation constant can be easily computed, thus allowing the prediction of the properties of a type of dielectric phase shifter. Experimental evidence is presented which indicates that a two-mode approximation yields reasonable accuracy if the dielectric ridge is on center, is relatively thin compared to the width of the waveguide, and has a low dielectric constant relative to that of free space ϵ_0 .



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Abstracts

A Single-Tuned Oscillator Circuit for Gunn Diode Characterizations (Short Papers)

P.W. Dorman. "A Single-Tuned Oscillator Circuit for Gunn Diode Characterizations (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 701-702.

A Gunn diode oscillator circuit with predictable performance has been developed based on a concept already shown to be practical with IMPATT diodes. Frequency jumps, multifrequency output, and tuning difficulties are eliminated without sacrificing circuit efficiency. The circuit is quite versatile and well suited for Gunn diode characterizations.



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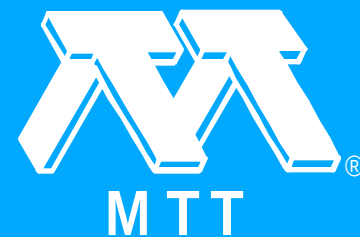


Abstracts

The Accuracy of AM and FM Noise Measurements Employing a Carrier Suppression Filter and Phase Detector (Short Papers)

J.L. Fikart, J. Nigrin and P.A. Goud. "The Accuracy of AM and FM Noise Measurements Employing a Carrier Suppression Filter and Phase Detector (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 702-703.

The accuracy of a commonly used noise-measuring system at microwave frequencies is calculated under actual measuring conditions. Serious deviations are shown to occur, which impose a lower and upper frequency limit on "double-channel" AM and FM noise measurements, respectively.



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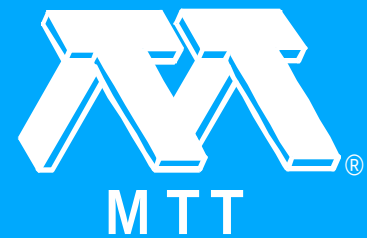


Abstracts

A Note on Designing Digital Diode-Loaded-Line Phase Shifters (Short Papers)

T. Yahara. "A Note on Designing Digital Diode-Loaded-Line Phase Shifters (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 703-704.

A note is described to design digital diode-loaded-line phase shifters. A 75° separation between the loading susceptances has been shown to give the same or better performance in VSWR, loss, and phase-shift setting than a 90° separation.



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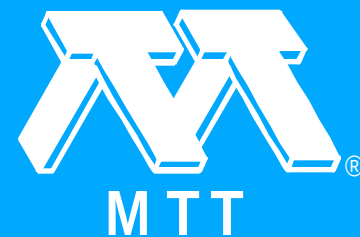


Abstracts

A Method of Fabrication for Waveguide Nonreciprocal Toroidal Ferrite Phasers (Short Papers)

W.J. Ince, D.H. Temme, F.G. Willwerth and J. DiBartolo. "A Method of Fabrication for Waveguide Nonreciprocal Toroidal Ferrite Phasers (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 705-707.

An improved technique for latching ferrite-phaser construction is described. It is particularly attractive when magnetostrictive ferrites or garnets are employed and for configurations utilizing high-dielectric-constant loading. The technique is capable of yielding phasers with very uniform characteristics, large figures of merit, low loss, and excellent average power capability.



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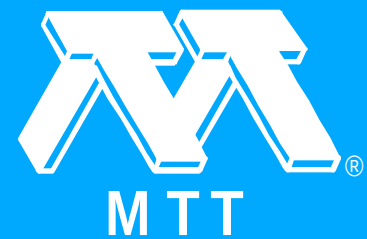


Abstracts

Applications of Time-Domain Metrology to the Automation of Broad-Band Microwave Measurements (Comments)

A.M. Nicolson, C.L. Bennett, Jr., D. Lamensdorf and L. Susman. "Applications of Time-Domain Metrology to the Automation of Broad-Band Microwave Measurements (Comments)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 707-707.

At the suggestion of E. H. Fooks of the University of New South Wales in Australia, we would like to comment on the errors involved in the time-domain metrology measurement techniques as applied to measuring the electrical properties of materials. Mr. Fooks pointed out that the negative values of μ_r which are given in fig. 8 amplification of the signal. Obviously some experimental error is present.



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Abstracts

Computation of Step Discontinuities in Coaxial Line (Computer Program Descriptions)

A. Jurkus. "Computation of Step Discontinuities in Coaxial Line (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 708-709.

Computation of the capacitance of discontinuities formed by coplanar steps in both conductors of a coaxial line.



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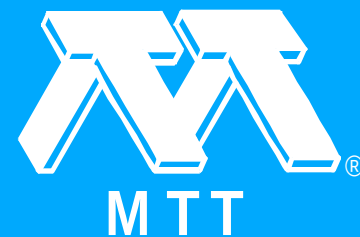


Abstracts

DISFIL, A Computer Program for the Optimum Synthesis of TEM Transmission-Line Filters (Computer Program Descriptions)

G. Hoffman and H. Vanooteghem. "DISFIL, A Computer Program for the Optimum Synthesis of TEM Transmission-Line Filters (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 709-710.

DISFIL uses exact network synthesis techniques to produce the final cascade of unit elements and LC-type resonators, for all common kinds of optimum high- or lowpass Butterworth or Chebyshev filters, terminated either at a single side or at both sides in a finite nonzero resistor.



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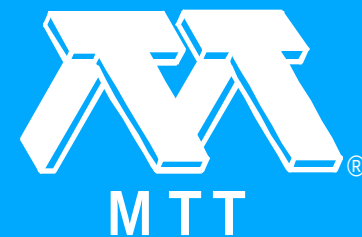
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Contributors (Oct. 1972 [T-MTT])

J.L. Allen, R.H.T. Bates, D.G. Corr, J.B. Davies, M.F. Estes, G.I. Haddad, G.H.B. Hansson, M.K. Krage, K.I. Lundstrom, N.A. McDonald, F.L. Ng, D.J. Richards, F.J. Rosenbaum, B. Schiek, K. Schunemann, A. Sone and A. Wexler. "Contributors (Oct. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 710-712.



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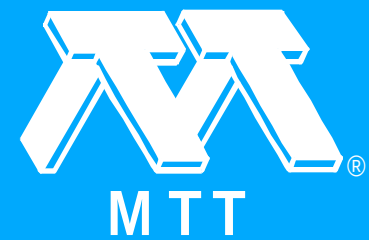
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Abstracts

Membership Application (Oct. 1972 [T-MTT])

"Membership Application (Oct. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 713-713.



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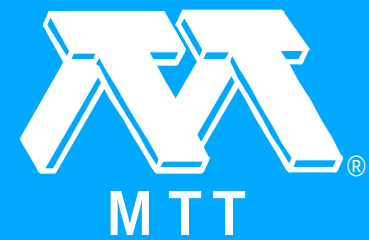
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Abstracts

Information on Computer Program Descriptions (Oct. 1972 [T-MTT])

"Information on Computer Program Descriptions (Oct. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.10 (Oct. 1972 [T-MTT]): 714-714.



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Front Cover (Nov. 1972 [T-MTT])

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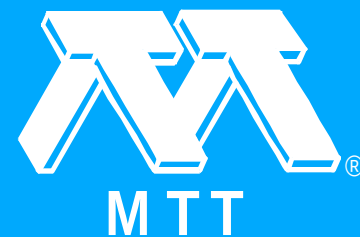


Abstracts

Waveguide Bandstop Elliptic Function Filters

J.D. Rhodes. "Waveguide Bandstop Elliptic Function Filters." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 715-718.

Using the "natural prototype" for elliptic function filters, a design procedure is presented for a class of waveguide bandstop filters, which exhibit equiripple passband and stopband responses. Due to the availability of explicit formulas for element values in the natural prototype elliptic function filter, the design procedure is entirely analytic and does not require numerical synthesis techniques. The resulting physical structure is the familiar uniform guide with iris-coupled series stubs. Unlike the bandstop filters designed from maximally flat or Chebyshev prototypes, the elliptic function design results in stubs that are not exactly three-quarter-wave coupled.



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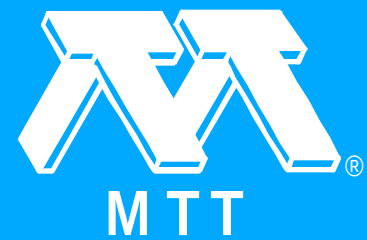
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Hairpin-Line and Hybrid Hairpin-Line/Half-Wave Parallel-Coupled-Line Filters

E.G. Cristal and S. Frankel. "Hairpin-Line and Hybrid Hairpin-Line/Half-Wave Parallel-Coupled-Line Filters." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 719-728.

A new class of microwave filters, hairpin-line and hybrid hairpin-line/half-wave parallel-coupled-line filters, is reported. This class of filters is particularly well suited for microstrip and TEM printed-circuit realizations because grounding of the filter resonators is generally not required. Hairpin-line filters have been divided into two types. The first (Type A) is characterized by having its input and output lines open-circuited at their ends. The Type A filter has been found to yield practical impedance levels for narrow to approximately 25-percent bandwidths. The second (Type B) is characterized by having its input and output lines short-circuited at their ends. However, because of space limitations, details of the Type B filter are not presented in this paper. Theoretical background and design equations for Type A bandpass filters are presented. Experimental data for several stripline filters of 5- and 20-percent bandwidths are given. Experimental results for two microwave-integrated-circuit (MIC) filters are discussed.

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Equivalent Capacitances for Microstrip Gaps and Steps

P. Benedek and P. Silvester. "Equivalent Capacitances for Microstrip Gaps and Steps." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 729-733.

The excess charge density distribution near gaps and steps in microstrip transmission lines is calculated by the solution of singular integral equations. Data are presented for gaps in microstrips of width-to-substrate-thickness ratios of 0.5, 1.0, and 2.0 and relative dielectric constants ranging from 1.0 to 15.0. For steps in a microstrip line results are given for width-to-thickness ratio of unity, relative dielectric constants of 1.0 and 9.6, while the change of width-to-height ratio is from 0.1 to 10.0. The excess charges are calculated explicitly in relatively short computing times, and the results are believed to be accurate to within a few percent.

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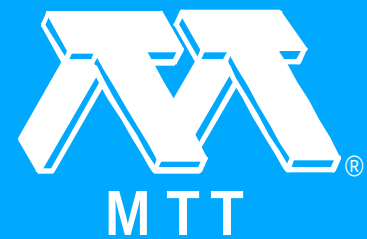


Abstracts

A Near-Optimum Matching Section without Discontinuities

R.P. Hecken. "A Near-Optimum Matching Section without Discontinuities." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 734-739.

The optimum tapered matching section requires impedance steps at the taper ends, which exclude in most cases its application for synthesizing waveguide tapers. A new "near" optimum design is described which avoids the impedance steps and yields tapers only a fractional part longer in taper length (or narrower in bandwidth) than the exactly optimum taper. A table of values of a transcendental function has been calculated to simplify the synthesis. An example compares both types of matching sections.



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Propagation Characteristics of a Rectangular Waveguide Containing a Cylindrical Rod of Magnetized Ferrite

T. Yoshida, M. Umeno and S. Miki. "Propagation Characteristics of a Rectangular Waveguide Containing a Cylindrical Rod of Magnetized Ferrite." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 739-743.

With an axially magnetized cylindrical ferrite rod inserted into a rectangular waveguide parallel to the E-field of the dominant (TE/sub 10/) mode, the electromagnetic field amplitudes inside the ferrite rod and the transmission and reflection coefficients are numerically obtained by means of a digital computer and their results are shown in figures. At resonance, the distributions of RF magnetization and electric field have good symmetrical patterns in the cross section of the rod. The experimental results of the transmission and reflection coefficients agree well with the theoretical values.

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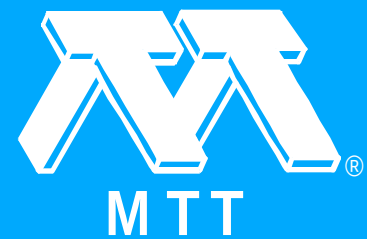


Abstracts

An Application of the Moment Method to Waveguide Scattering Problems

S.-C. Wu and Y.L. Chow. "An Application of the Moment Method to Waveguide Scattering Problems." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 744-749.

A moment method is suggested to solve scattering problems in waveguides. It takes advantage of the localized nature of the evanescent waves to assure the convergence of the solutions. The method chooses the point-matching approach with pulse basis functions so that it may be versatile and can be applied to discontinuities of an arbitrary shape. To illustrate this method, examples are given for open-ended parallel-plane waveguides, both flanged and unflanged, and for waveguides with obstacles of various shapes. Comparisons are made with solutions by other approaches and, whenever possible, with exact solutions. The agreements are good.



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Diffraction of a Wave Beam by an Aperture

K. Tanaka, M. Shibukawa and O. Fukumitsu. "Diffraction of a Wave Beam by an Aperture." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 749-755.

The diffraction field of a wave beam from a circular and a rectangular aperture is obtained in the Fresnel region by using the Huygens-Kirchhoff approximation. The diffraction field in the Fraunhofer region can be obtained simply by replacing a parameter. The diffraction field is then expanded into a series of beam mode functions. From the field distributions and the expansion coefficients, which represent the coupling of the incident beam to the various modes in the diffraction field, the effects of an aperture on the incident beam can be known. With this mode expansion method, the conditions for optimum coupling between fundamental modes are obtained and solved numerically.

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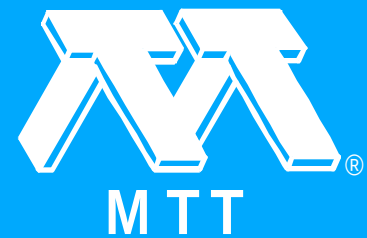


Abstracts

Electrostatics of the Microstrip-Revisited (Short Papers)

P. Silvester and P. Benedek. "Electrostatics of the Microstrip-Revisited (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 756-758.

The well-known integral-equation formulation of the microstrip problem is solved by a projective method using trial functions that preserve the essential singularity in charge distribution at the strip edges. Suitable computer programs are presented. This formulation is believed particularly useful in the analysis of strip discontinuities, where details of the charge distribution cannot easily be traded off against speed of computation.



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Abstracts

Analysis of the Power Loss in the Coupling Mechanism of a Cavity Resonator (Short Papers)

M. Danielsen. "Analysis of the Power Loss in the Coupling Mechanism of a Cavity Resonator (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 758-760.

An analysis of a lossy coupling mechanism is presented. It is found that the reciprocal internal Q factor is augmented by a contribution $(1/2)\zeta(|Q_{\text{sub ex}}|)$, where ζ depends on the Parameters of the coupling mechanism and $Q_{\text{sub ex}}$ is the external Q factor. The theory is applied to analyze the coupling to a superconducting high-Q cavity.



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Abstracts

A Microstripline Slot Antenna (Short Papers)

Y. Yoshimura. "A Microstripline Slot Antenna (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 760-762.

A microstripline slot antenna is treated experimentally at X-band frequency. First, the input impedances of the slots for various geometries and the radiation patterns for the matched slots are measured. Second, the dependence of input impedances and radiation patterns on the slot-to-reflector spacing is tested. Finally, a two-dimensional X-band Dolph-Chebyshev slot-array antenna is designed and fabricated as an application of this type of slot.



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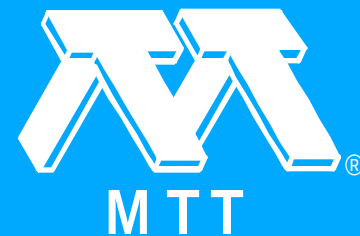


Abstracts

Note on an E-Plane Waveguide Step with Simultaneous Change of Media (Short Papers)

J.P. Montgomery and L. Lewin. "Note on an E-Plane Waveguide Step with Simultaneous Change of Media (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 763-764.

A simple quasi-static formula for the discontinuity susceptance of a 2:1 E-plane waveguide step with a simultaneous change of media is found using the theory of singular integral equations. An important difference from previous solutions by this method comes from the determination of the constants in the solution.



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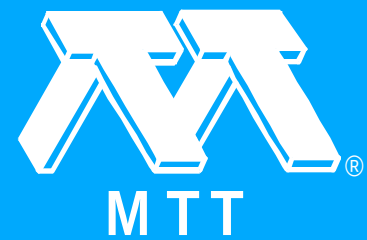


Abstracts

The Synthesis of Quarter-Wave Coupled Circulators with Chebyshev Characteristics (Short Papers)

J. Helszajn. "The Synthesis of Quarter-Wave Coupled Circulators with Chebyshev Characteristics (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 764-769.

The purpose of this short paper is to give an exact theory of quarter-wave coupled circulators with Chebyshev characteristics. The synthesis starts by replacing the lumped-element equivalent shunt resonator of the circulator by a distributed one that has the same susceptance slope parameter as the original circuit. In this way the overall network involves commensurate transmission lines only. The bandwidth over which the assumed form of the equivalent circuit applies is carefully discussed in terms of the two split frequencies of the magnetized junction. Tables for the required circulator parameters and transformer admittances for one and two transformer sections as a function of VSWR and bandwidth are included. The realizable solution for the latter arrangement is severely restricted by the equivalent circuit of the basic junction. Experimental results on an octave-band stripline circulator, with a two-section transformer, are also included.



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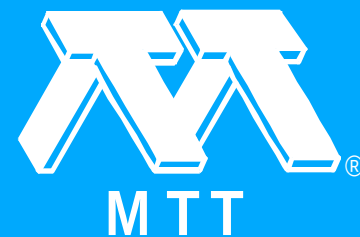


Abstracts

A Series Transformation for Diaphragm-Type Discontinuities in Waveguide (Short Papers)

T.E. Rozzi and G. de Vrij. "A Series Transformation for Diaphragm-Type Discontinuities in Waveguide (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 770-771.

In treating the problem of the inductive/capacitive diaphragm in waveguide with the integral equation or the moments method, it is often necessary to compute the matrix elements of the guide dyadic in terms of the aperture eigenmodes of the diaphragm. A transformation of the original series is presented that displays superior convergence properties of the numerical solution.



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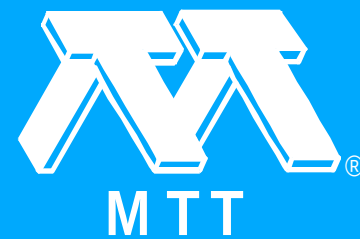


Abstracts

Time-Delay Limits Set by Dispersion in Magnetostatic Delay Lines (Short Papers)

M. Bini, L. Millanta, N. Rubino and V. Tognetti. "Time-Delay Limits Set by Dispersion in Magnetostatic Delay Lines (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 771-773.

Analysis and experiments show the extreme dispersion of magnetostatic delay lines. A suitable parameter to characterize the amount of dispersion present has been found to be the maximum output energy contained in a time interval equal to the input pulse duration. The time occurrence of this maximum value gives a convenient measure of the group delay. The pulse shape and energy content versus delay have been determined both theoretically and experimentally for axially magnetized circular rods. The results show that delays beyond two to three times the input pulse duration cannot be obtained with more than 50 percent of the output energy contained within the original pulse duration.



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Electronic Tuning of the Punch-Through Injection Transit-Time (PITT) Microwave Oscillator (Short Papers)

N.B. Sultan and G.T. Wright. "Electronic Tuning of the Punch-Through Injection Transit-Time (PITT) Microwave Oscillator (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 773-775.

Experimental results of the dynamic resistance and capacitance of p+-n-p+ punch-through injection transit-time (PITT or BARRITT) diodes are presented. A method of predicting the oscillator electronic tuning from the change in the device capacitance is outlined and verified experimentally at X band.



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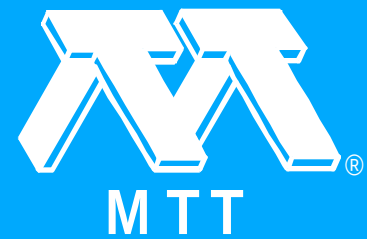


Abstracts

Anisotropy in Alumina Substrates for Microstrip Circuits (Short Papers)

J.H.C. van Heuven and T.H.A.M. Vlek. "Anisotropy in Alumina Substrates for Microstrip Circuits (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 775-777.

By determining up to 16 GHz the effective dielectric constant for microstrip lines with various strip widths, it has been found that anisotropy in alumina substrates considerably affects the wavelength and is responsible for most of the discrepancy between theory and experiments,



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Abstracts

The Green's Function for Poisson's Equation in a Two-Dielectric Region (Short Papers)

A.F. dos Santos and V.R. Vieira. "The Green's Function for Poisson's Equation in a Two-Dielectric Region (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 777-777.

The validity of the reciprocity relation satisfied by the Green's function for Poisson's equation in a two-dielectric region is briefly discussed.



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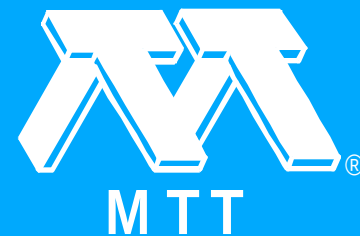


Abstracts

Unfolding the Lange Coupler (Short Papers)

R. Waugh and D. LaCombe. "Unfolding the Lange Coupler (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 777-779.

The broad-band microstrip quadrature coupler described by Lange is shown in Fig. 1(a). True quadrature coupling over an octave is realized as a consequence of the interdigital coupling section which compensates for even- and odd-mode phase velocity dispersion over the wide frequency range.



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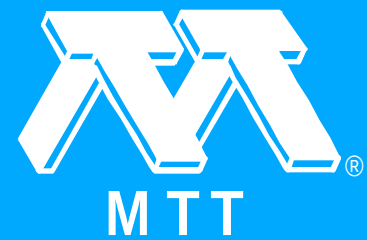
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Dissipation and Scattering Matrices of Lossy Junctions (Short Papers)

J. Helszajn. "Dissipation and Scattering Matrices of Lossy Junctions (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 779-782.

The purpose of this short paper is to construct the dissipation and scattering matrices of lossy junctions in terms of the eigenvalues of the dissipation matrix. This removes the need to rely on inequality relations between the scattering parameters of lossy circulators. The eigenvalues of the dissipation, scattering, and admittance matrices are related. The eigenvalues of the dissipation matrix give the dissipation associated with each possible way of exciting the junction. The ones of the scattering matrix give the reflection coefficients associated with these different excitations. The admittance eigenvalues define in each instance the eigennetworks of the junction. This leads to the definition of the entries of the dissipation matrix in terms of the loaded and unloaded Q-factors of the junction eigennetworks. The scattering matrices of a number of lossy 3-port junctions are also constructed directly in terms of the elements of the eigennetworks.

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Abstracts

Scattering by a Ferrimagnetic Circular Cylinder in a Rectangular Waveguide (Correction)

N. Okamoto and Y. Nakanishi. "Scattering by a Ferrimagnetic Circular Cylinder in a Rectangular Waveguide (Correction)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 782-783.

In the above paper, $\sin/\sup -1/ t$ in (17) (Section III-B, p. 524) should be interpreted as $\pi -- \sin/\sup -1/ t$, where $\sin/\sup -1/ t$ denotes the principal value of $\sin/\sup -1/ t$.



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Abstracts

The Grazer Search Program for Minimax Objectives (Computer Program Descriptions)

J.W. Bandler and T.V. Srinivasan. "The Grazer Search Program for Minimax Objectives (Computer Program Descriptions)." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 784-785.

The grazor search program is a package of subroutines that optimizes the designable parameters of networks or systems to meet minimax objectives.



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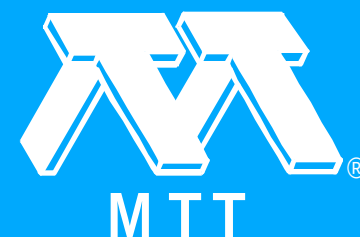
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Contributors (Nov. 1972 [T-MTT])

P. Benedek, Y.L. Chow, E.G. Cristal, S. Frankel, O. Fukumitsu, R.P. Hecken, S. Miki, J.D. Rhodes, M. Shibukawa, P. Silvester, K. Tanaka, M. Umeno, S.-C. Wu and T. Yoshida.
"Contributors (Nov. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 786-787.



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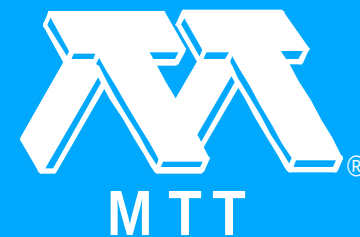
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Call for Papers - Special Issue on Solid-State Microwave Power Amplifiers (Nov. 1972 [T-MTT])

"Call for Papers - Special Issue on Solid-State Microwave Power Amplifiers (Nov. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.11 (Nov. 1972 [T-MTT]): 788-788.



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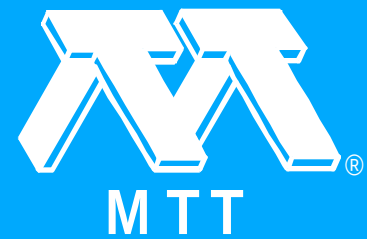
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Table of Contents (Dec. 1972 [T-MTT])

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In Memoriam (Dec. 1972 [T-MTT])

T.S. Saad. "In Memoriam (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 792-792.

The year 1972 marks the end of an era, for it was during this year that we learned of the passing of two of our great microwave people, Mr. Andre G. Clavier and Dr. George C. Southworth. Their pioneer contributions to our technology are known to most of us and have been recited countless times.



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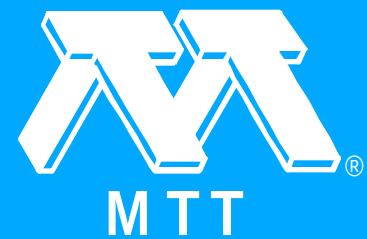


Abstracts

International Microwave Symposium (Dec. 1972 [T-MTT])

R.M. Knox. "International Microwave Symposium (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 794-797.

The Arlington Park Towers Hotel, Arlington Heights, Ill., was the scene of the 1972 IEEE-G-MTT International Microwave Symposium, May 22-24, 1972. This was the first occasion in the history of this technical forum that the Chicago Chapter of the G-MTT has been privileged to serve as host to Symposium attendees. Highlights of the 1972 Symposium included the introduction of microwave industrial exhibits, the panel session, "Microwave State-of-the-Art International," and the banquet address, "Technology and National Goals," by William M. Magruder.



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G-MTT National Lectureship (Dec. 1972 [T-MTT])

T.S. Saad. "G-MTT National Lectureship (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 797-798.



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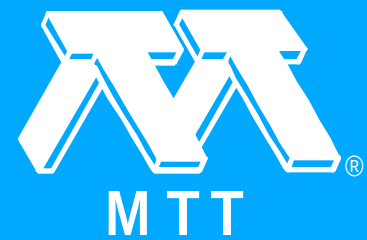
K-Band High-Power Single-Tuned IMPATT Oscillator Stabilized by Hybrid-Coupled Cavities (Dec. 1972 [T-MTT])

Y. Ito, H. Komizo, T. Meguro, M. Shinoda, T. Oya and Y. Daido. "K-Band High-Power Single-Tuned IMPATT Oscillator Stabilized by Hybrid-Coupled Cavities (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 799-805.

A K-band high-power and highly stable power source has been developed using a cavity-stabilized IMPATT-diode oscillator followed by a one-stage high-power reflection-type IMPATT-diode amplifier. The power source shows an output power of 0.7 W, a temperature coefficient of $6 \times 10^{-5} / ^\circ\text{C}$, and an FM noise level of 92-Hz rms/1-kHz /bar BW/ at 100 kHz from the carrier. To achieve a highly stable oscillation, free from mode jumping, a new hybrid-coupled cavity circuit with a passivating absorber is applied to stabilize the oscillation. The high-power amplifier is designed using a measured large signal device admittance and a power-adding concept.

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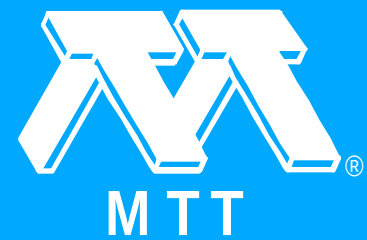
Intermodulation Characteristics of X-Band IMPATT Amplifiers (Dec. 1972 [T-MTT])

R.J. Trew, N.A. Masnari and G.I. Haddad. "Intermodulation Characteristics of X-Band IMPATT Amplifiers (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 805-812.

The intermodulation products produced when two equal-amplitude signals are applied to the input of an X-band IMPATT-diode amplifier have been measured. An Si p+nn+ IMPATT diode was operated in a double-slug-tuned coaxial reflection amplifier circuit that was tuned to provide 20 dB of small-signal gain at 9.340 GHz. The intermodulation tests consist of measurements of the magnitudes and frequencies of the amplifier output signals as a function of the input-signal drive levels and frequency separations. The gain and single-frequency characteristics of the amplifier were also measured, and are used along with the theoretical device and circuit admittance characteristics as a basis for explanation of the intermodulation results. A low-frequency dominance mechanism is found to exist in which the low-frequency signals are amplified more than the high-frequency signals. This mechanism becomes more significant as the amplifier drive level is increased.



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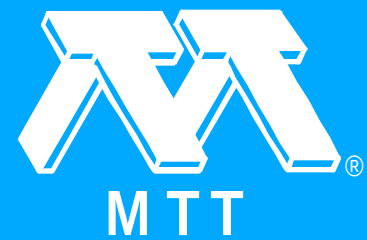
18-GHz Paramps with Triple-Tuned Gain Characteristics for Both Room- and Liquid-Helium-Temperature Operation

T. Okajima, M. Kudo, K. Shirahata and D. Taketomi. "18-GHz Paramps with Triple-Tuned Gain Characteristics for Both Room- and Liquid-Helium-Temperature Operation." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 812-819.

The design and experimental performance of a wide-band K-band parametric amplifier (paramp) for the experimental domestic satellite communication earth station are described. An optimum idler frequency for a minimum noise temperature is derived taking into account the varactor diode skin effect. Wide-band paramps with a double-tuned signal circuit are discussed and it is shown that triple-tuned gain characteristics are realizable with this configuration. Finally, an 18-GHz paramp is described, which can be operated from room- to liquid-helium (LHe) temperature, only requiring adjustment of pumping power and bias voltage and using lithium ferrite circulators. Triple-tuned gain characteristics with a bandwidth of 1300 MHz at a gain of 10 dB are obtained using a miniature pill prong packaged varactor.

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Design of a Channel Diplexer for Millimeter-Wave Applications (Dec. 1972 [T-MTT])

C.-L. Ren. "Design of a Channel Diplexer for Millimeter-Wave Applications (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 820-827.

The design of millimeter-wave filters is, in principle, no different from the design of conventional waveguide filters. In practice, however, several factors impose limitations on the choice of the filter structure. As a result, new filter structures must be used requiring new synthesis techniques for their design. In this paper, a new channel diplexer structure is described and a synthesis technique for its design is given. The expected electrical performance of the filter, designed using the proposed technique, is verified by measuring the performance of a scaled filter model centered at 3.95 GHz. The results of these measurements are given. The design procedure is also applicable to other waveguide filter structures.

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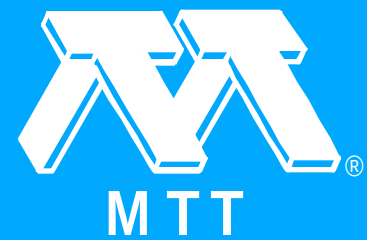
Properties of a Four-Port Nonreciprocal Circuit Utilizing YIG on Stripline--Filter and Circulator

M. Igarashi and Y. Naito. "Properties of a Four-Port Nonreciprocal Circuit Utilizing YIG on Stripline--Filter and Circulator." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 828-833.

Experimental results of the 4-port nonreciprocal band-stop-pass filter and the tunable resonance type circulator with the properties of the 4-port filter are reported, and the theory of the new nonreciprocal circuit is discussed. The filter operates over a two-octave frequency range and the over about a one-octave frequency range.

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Practical Least pth Optimization of Networks

J.W. Bandler and C. Charalambous. "Practical Least pth Optimization of Networks." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 834-840.

A new and practical approach to computer-aided design optimization is presented. Central to the process is the application of least pth approximation using extremely large values of p , typically 1,000 to 1,000,000. It is shown how suitable and reasonably well conditioned objective functions can be formulated, giving particular emphasis to more general approximation problems as, for example, in filter design. It is demonstrated how easily and efficiently extremely near minimax results can be achieved on a discrete set of sample points. Highly efficient gradient methods can be employed and, in network design problems, the use of the adjoint network approach for evaluating gradients results in greater savings in computer effort. A comparison between the Fletcher-Powell method and the more recent Fletcher method is made on the application of least pth approximation, using a range of values of p up to 1,000,000,000,000 on transmission-line transformer problems for which optimal minimax solutions are known. This is followed by filter design examples subject to certain constraints.

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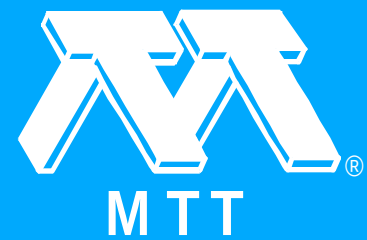


Abstracts

Finite-Element Solution of Unbounded Field Problems

B.H. McDonald and A. Wexler. "Finite-Element Solution of Unbounded Field Problems." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 841-847.

An unbounded region is divided into local picture-frame regions where a partial differential-equation solution is obtained, with the remaining unbounded region represented by an integral equation. (The method permits the use of free-space Green's functions, and thus special problem-dependent Green's functions need not be found.) The integral equation is formulated as a constraint upon the local picture-frame solutions, whence these local solutions are solved directly by a variational method, using finite elements, in a manner such that the problem of the Green's-function singularity is side-stepped. The technique is applicable where sources and media inhomogeneities and anisotropies are local, and can all be placed within one or several picture frames. It is in these cases that the integral-equation approach is at a particular disadvantage, and the use of a partial differential-equation technique is advisable if not necessary. Examples presented include the static and harmonic fields of a parallel-plate capacitor, a microstrip line on a dielectric substratum, and a radiating antenna with dielectric obstacles.



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Abstracts

A Method for Computing Edge Capacitance of Finite and Semi-Infinite Microstrip Lines (Short Papers)

T. Itoh, R. Mittra and R.D. Ward. "A Method for Computing Edge Capacitance of Finite and Semi-Infinite Microstrip Lines (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 847-849.

This short paper describes a method for computing the edge capacitance of finite or semi-infinite sections of microstrip transmission lines. The approach is based on Galerkin's method applied in the Fourier-transform domain. It is mathematically simple and requires the inversion of rather small-size matrices.



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Abstracts

A Quasi-Dynamic Method of Solution of a Class of Waveguide Discontinuity Problems (Short Papers)

L. Lewin and J.P. Montgomery. "A Quasi-Dynamic Method of Solution of a Class of Waveguide Discontinuity Problems (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 849-852.

It is shown that, if expansion terms of all the modes appearing in the Green's function for the problem are retained, the singular integral equation method can be made to apply by generating a differential equation for this integral. The solution of the differential equation is straightforward, and the inversion of the resulting integral equation then follows standard methods. The process is applied in detail to the case of the capacitive diaphragm, and the results compared to the quasi-static method with correction terms. The results are close for small guide widths, but the present method should give superior results if the guide width permits some overmoding.



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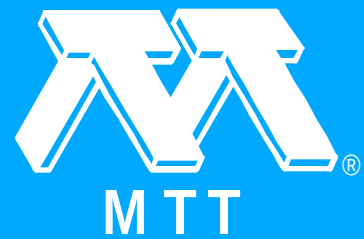


Abstracts

Automatic Rieke Diagram Drawing System (Short Papers)

Y. Kosugi and Y. Naito. "Automatic Rieke Diagram Drawing System (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 852-855.

The development of a system which provides power-constant loci on a Smith chart automatically is presented. The system consists of phase shifters terminated with p-i-n diodes, and a network analyzer.



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Abstracts

An RF Time-Domain Reflectometer Not in Real Time (Short Papers)

L.A. Robinson, W.B. Weir and L. Young. "An RF Time-Domain Reflectometer Not in Real Time (Short Papers)." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 855-857.

A nanosecond radar system was developed, in which each line of the pulse spectrum was radiated in turn, their reflections measured and stored in a computer, and finally added up to compute the echo.



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J.W. Bandler, C. Charalambous, Y. Daido, G.I. Haddad, M. Igarashi, Y. Ito, H. Komizo, M. Kudo, N.A. Masnari, B.H. McDonald, T. Meguro, Y. Naito, T. Okajima, T. Oya, C.-L. Ren, M. Shinoda, K. Shirahata, D. Taketomi, R.J. Trew and A. Wexler. "Contributors (Dec. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.12 (Dec. 1972 [T-MTT] (1972 Symposium Issue)): 858-860.



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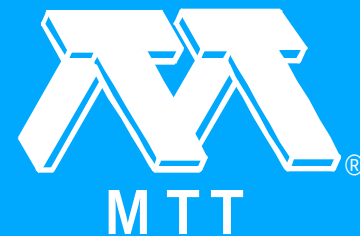
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Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-20, 1972

*"Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-20, 1972."
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Abstracts

Transmission of Microwave Through Perforated Flat Plates of Finite Thickness

C.-C. Chen. "Transmission of Microwave Through Perforated Flat Plates of Finite Thickness." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 1-6.

Transmission characteristics of a thick conducting plate perforated with either circular or rectangular holes are presented. Simple explicit formulas for predicting energy leakage through a reflector surface are derived.



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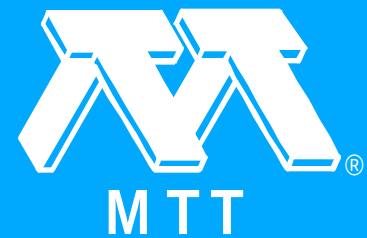


Abstracts

Cutoff Wavelengths of Ridged, Circular, and Elliptic Guides

A.-M.A. El-Sherbiny. "Cutoff Wavelengths of Ridged, Circular, and Elliptic Guides." 1973 *Transactions on Microwave Theory and Techniques* 21.1 (Jan. 1973 [T-MTT]): 7-12.

Cutoff wavelengths of TE and TM modes in doubly ridged guides of elliptical cross section have been calculated using an exact method. Closed-form expressions in terms of Mathieu functions have been obtained for the cutoff frequencies and eigenfunctions describing the field distribution for different modes. These solutions are further extended to include the case of doubly and quadruply ridged guides of circular cross section and to calculate the slot coupling of two waveguides with semielliptical or circular cross sections. The dual problem of the coaxial strip guide has also been treated using the same method.



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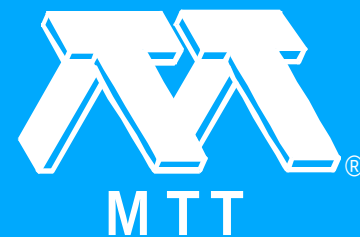


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On the Numerical Reconstruction of Images from a Microwave Hologram

K. Nagai, Y. Aoki and M. Suzuki. "On the Numerical Reconstruction of Images from a Microwave Hologram." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 13-18.

A new technique for the numerical reconstruction of images from a long-wavelength hologram is proposed. The technique is to calculate images by the fast Fourier transform (FFT) algorithm with the hologram data sampled by a straight line approximation. This sampling technique is convenient to reduce the number of the sampling points, and the image can be reconstructed with less data than the conventional equally spaced sampling method. A one-dimensional hologram is constructed at S band and an image is reconstructed by the proposed method. These results are discussed and compared with the results of the conventional numerical reconstruction.



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Circuit Model for Characterizing the Nearly Linear Behavior of Avalanche Diodes in Amplifier Circuits

D.F. Peterson and D.H. Steinbrecher. "Circuit Model for Characterizing the Nearly Linear Behavior of Avalanche Diodes in Amplifier Circuits." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 19-27.

A nonlinear circuit model for avalanche diodes is proposed. The model was derived by assuming that the bias dependence of the elements in a known small-signal equivalent-circuit model for existing diodes arises in a manner consistent with the theory of an idealized "Read-type" device. The model contains a nonlinear RL branch, a controlled source, and a linear depletion capacitance. The model is used in the nearly linear sense to predict intermodulation distortion (IMD) and gain compression in avalanche diode amplifiers. Computed results for amplifiers with existing diodes are shown to be in good agreement with experiment.

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Basic Properties of Subharmonic Injection Locking

L. Gustafsson, K.I. Lundstrom and G.H.B. Hansson. "Basic Properties of Subharmonic Injection Locking." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 28-34.

Basic properties of subharmonic injection locking, as well as differences between subharmonic and fundamental injection locking, are studied with the describing function technique. The consequences of including a nonlinear capacitance as well as linear frequency-dependent parameters in the active element is investigated. The importance of the broad-band characteristics of the tuning circuit is studied. The detailed analysis is given for locking to the third subharmonic, but necessary expressions for generalizing the treatment to other than third subharmonic locking are provided. Finally, a note on stability of subharmonic locking is given.

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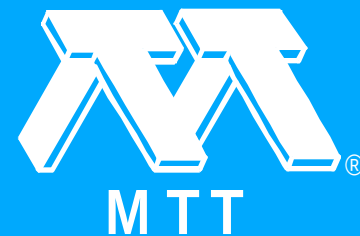


Abstracts

Microstrip Dispersion Model

W.J. Getsinger. "Microstrip Dispersion Model." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 34-39.

The assumption that the quasi-TEM mode on microstrip is primarily a single longitudinal-section electric (LSE) mode leads to a transmission line model whose dispersion behavior can be analyzed and related to that of microstrip. Appropriate approximations yield simple, closed-form expressions that allow slide-rule prediction of microstrip dispersion.



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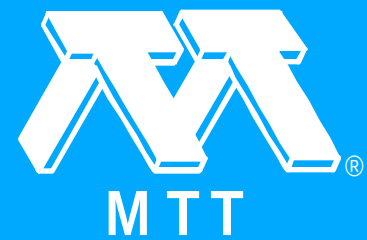
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Nonlinear Analysis of the Schottky-Barrier Mixer Diode

D.A. Fleri and L.D. Cohen. "Nonlinear Analysis of the Schottky-Barrier Mixer Diode." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 39-43.

The waveshape of the local-oscillator voltage component that exists across the nonlinear junction of a Schottky-barrier diode is a fundamental determinant of mixer performance. This waveshape significantly differs from that of the total local-oscillator voltage impressed across the diode terminals since it is influenced by parasitic, particularly spreading resistance and contact inductance, which exist in series with the junction. The junction-voltage waveshapes resulting from a 9.375-GHz sinusoidal local-oscillator generator voltage are computed for three common equivalent-circuit models of the diode. In the first model the diode is represented by a nonlinear conductance in series with a fixed spreading resistance. The second model includes the nonlinear capacitance associated with the junction, and the third additionally includes the contact inductance. In each case, the junction-voltage waveshape is significantly nonsinusoidal. It is shown that the contact inductance can induce a peak inverse junction voltage that greatly exceeds the peak voltage impressed across the diode terminals. This parasitic reactance thus can have an important bearing on the burnout properties of the mixer diode.

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Design of Evanescent-Mode Waveguide Diplexers

C.K. Mok. "Design of Evanescent-Mode Waveguide Diplexers." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 43-48.

A novel design procedure for diplexers built in waveguides below cutoff is presented. The design permits the integral construction of a diplexer--the whole unit is built in a single waveguide, thereby dispensing with the T junction and connecting flanges--if coaxial termination is used at the common junction. The design utilizes foreshortened bandpass filters, and is valid for bandwidths of up to a few percent. Simple expressions on calculating the connecting lengths are arrived at. A satellite telemetry diplexer designed using the derived expressions yields results which are in agreement with computed values.

[Click on title for a complete paper.](#)



Abstracts

Equivalent Circuit of Reentrant Cavity (Short Papers)

K. Uenakada. "Equivalent Circuit of Reentrant Cavity (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 48-51.

In order to develop a design formula for a reentrant cavity, as it changes from the very flat to very long form, the admittance of the cavity at the gap is derived. For the resonant frequency of an air-filled cavity, the theoretical value by the formula derived here agrees well with the experimental value.



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Abstracts

Resistivity of Thin Metal Films (Short Papers)

H.K. Chaurasia and WA.G. Voss. "Resistivity of Thin Metal Films (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 51-52.

It is shown that the sheet resistance, and hence the resistivity, of very thin metal films (<100 Å) can be determined conveniently and accurately by microwave measurements. Accuracy is limited by VSWR measurement, film-holder design, and short-circuit quality. DC and microwave resistivity measurements are given for gold films on cleaved mica.



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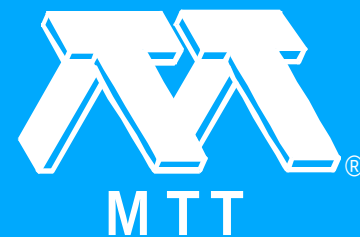


Abstracts

Compact YIG Bandpass Filter with Finite-Pole Frequencies for Applications in Microwave Integrated Circuits (Short Papers)

P. Roschmann. "Compact YIG Bandpass Filter with Finite-Pole Frequencies for Applications in Microwave Integrated Circuits (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 52-57.

A miniaturized, narrow-bandwidth, two-stage YIG bandpass filter is described that can be incorporated into microstrip circuits. The selectivity is increased by introducing finite-pole frequencies. This is realized by additional coupling between the input and output lines leading to the YIG-coupling section.



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Computer Analysis of Latching Phase Shifters in Rectangular Waveguide (Short Papers)

F.E. Gardiol. "Computer Analysis of Latching Phase Shifters in Rectangular Waveguide (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 57-61.

Latching phase shifters, consisting of a waveguide section containing a ferrite toroid, are widely used as digital steering elements in microwave array antennas. The theoretical determination of device performance cannot be obtained exactly, since these structures are inhomogeneous along both transverse directions. The present study presents an approximate method to evaluate phase shift and losses in the case of a rectangular toroid. An approximately equivalent structure (twin slab), for which an exact resolution method is available, is considered first. The changes due to the upper and lower sections of the toroid are then evaluated by means of a variational principle. Experimental results show good agreement with computed values for several practical cases considered. Finally, the range of validity for this approximate method is determined.

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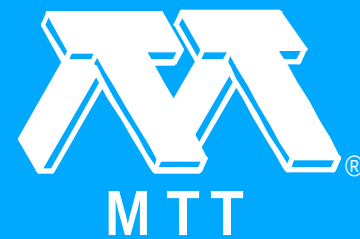


Abstracts

Modes of Propagation in a Coaxial Waveguide with Lossless Reactive Guiding Surfaces (Comments and Author's Reply)

R.A. Waldron and R.K. Arora. "Modes of Propagation in a Coaxial Waveguide with Lossless Reactive Guiding Surfaces (Comments and Author's Reply)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 61-62.

Many authors have attempted to simplify the study of the mode spectrum of a waveguide with a complicated wall structure by the use of a surface-impedance boundary condition, and the above paper is a classic example of the exercise. The method depends on two assumptions—that it is proper to express a ratio between the tangential E and H fields as a boundary condition, and that such a ratio can be expressed unambiguously in terms of the form of the waveguide wall. That these assumptions are valid is always taken for granted by users of the method, including the present authors, but I have never seen a proof of their validity. Unless such a proof can be given, the results of calculations by the surface-impedance method cannot be trusted.



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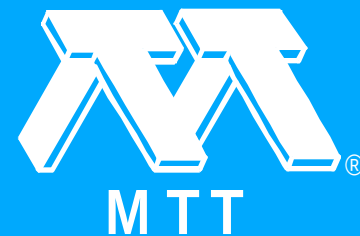


Abstracts

Prefabricated Multilayer Section Design Program (Computer Program Descriptions)

D.L. Huffman. "Prefabricated Multilayer Section Design Program (Computer Program Descriptions)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 62-63.

PMSDP searches within the transitional section of an electromagnetic window configuration for the arrangement of prefabricated multilayers that yields the best broad-band frequency-matching condition.



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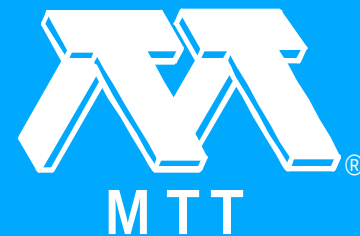


Abstracts

Electrostatic Microstrip Analysis Programs-- MICRO and INFSTR (Computer Program Descriptions)

P. Silvester and P. Benedek. "Electrostatic Microstrip Analysis Programs-- MICRO and INFSTR (Computer Program Descriptions)." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 63-63.

Each program determines the electrostatic capacitance of microstrip transmission lines. MICRO also returns characteristic impedance and relative phase velocity, INFSTR the charge density distribution.



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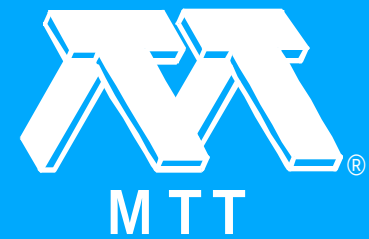
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Abstracts

Contributors (Jan. 1973 [T-MTT])

Y. Aoki, C.-C. Chen, L.D. Cohen, A.-M.A. El-Sherbiny, D.A. Fleri, W.J. Getsinger, L. Gustafsson, G.H.B. Hansson, K.I. Lundstrom, C.K. Mok, K. Nagai, D.F. Peterson, D.H. Steinbrecher and M. Suzuki. "Contributors (Jan. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 64-66.



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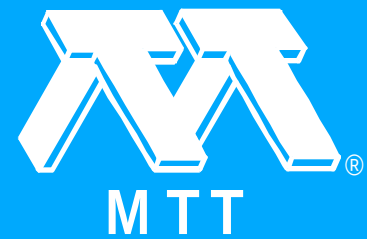
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Membership Application (Jan. 1973 [T-MTT])

"Membership Application (Jan. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 67-67.



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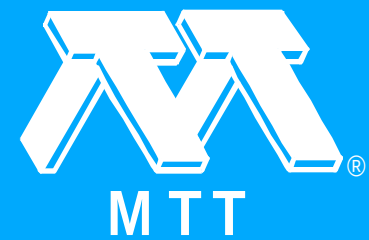
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Information for Authors (Jan. 1973 [T-MTT])

"Information for Authors (Jan. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.1 (Jan. 1973 [T-MTT]): 68-68.



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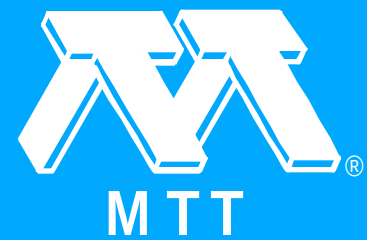
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Meander-Line and Hybrid Meander-Line Transformers (Feb. 1973 [T-MTT])

E.G. Cristal. "Meander-Line and Hybrid Meander-Line Transformers (Feb. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 69-76.

The application of meander lines to impedance transformers is described. Meander-line transformers have less bandwidth than stepped-impedance transformers for a given passband VSWR, but can have greatly superior shape factors in stripline and microwave-integrated-circuit (MIC) realizations. Hybrid meander-line transformers allow circuit designers greatly increased flexibility in choosing transformer shape factors, while allowing (basically) the same electrical performance as with either stepped-impedance or meander-line transformers. Experimental confirmations of a trial three-turn meander-line transformer and a fourth-order hybrid meander-line transformer are presented. A comprehensive design table of nearly equal-ripple meander-line transformers of from two to six turns, incorporating a wide range of bandwidths and impedance transformations has been deposited with the ASIS National Auxiliary Publications Service.

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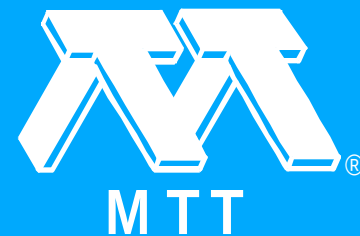


Abstracts

Efficient Capacitance Calculations for Three-Dimensional Multiconductor Systems

A.E. Ruehli and P.A. Brennan. "Efficient Capacitance Calculations for Three-Dimensional Multiconductor Systems." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 76-82.

The design and packaging of integrated circuits requires the calculation of capacitances for three-dimensional conductors located on parallel planes. An integral-equation (IE) computer-solution technique is presented, which provides accurate results. The solution technique minimizes computer storage requirements while maintaining calculating efficiency computation times.



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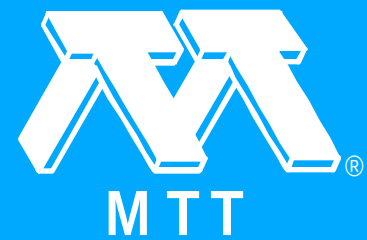
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The Variational Treatment of Thick Interacting Inductive Irises

T.E. Rozzi. "The Variational Treatment of Thick Interacting Inductive Irises." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 82-88.

The problem of two thick interacting inductive irises in waveguide is treated with a variational approach. Using the appropriate Green's functions in the continuity equations of the transverse magnetic fields yields two coupled integral equations for the magnetic currents on the apertures. Solving one equation by Fourier expansion and introducing in the remaining equation, a variational expression for the driving-point admittance is obtained. This is treated with a Rayleigh-Ritz procedure and matrix methods, avoiding the explicit computation of field amplitudes. The analysis is carried out in terms of an eigenmode expansion, as well as in terms of an expansion a la Schwinger on the aperture and the features of the two methods are contrasted. In spite of its somewhat greater mathematical complexity, the latter generally provides a superior solution for a given order of the trial field. In both cases the solutions are very accurate, uniformly convergent to their common limit value, and require manipulations with small-order matrices only. The agreement with the experiment is excellent.

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Doppler Signal Detection with Negative-Resistance Diode Oscillators

Y. Takayama. "Doppler Signal Detection with Negative-Resistance Diode Oscillators." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 89-94.

A theory is presented for the Doppler signal detection with a negative-resistance diode oscillator operating simultaneously as a signal source and Doppler signal detector. The theory is based on a realistic model of the oscillator, including an object passing in front of an antenna, and includes the previous treatments as the limiting cases. The effect of the bias circuit taking out the Doppler signal on the RF operation of the oscillator is taken into account self-consistently. The frequency down-conversion with a free-running oscillator is also investigated. Conversion gain is demonstrated by the experiment using a Gunn oscillator with a movable load.

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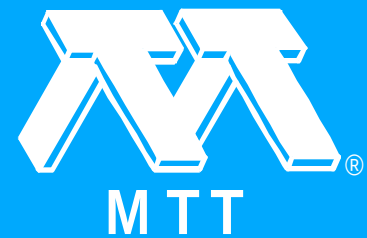


Abstracts

Zolotarev Branch-Guide Couplers

R. Levy. "Zolotarev Branch-Guide Couplers." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 95-99.

A new theory for the design of branch-guide couplers, which enables the designer to optimize the internal impedance level, is presented. This overcomes previous difficulties associated with design of branch-guide couplers for tight-coupling values. Results are demonstrated for couplings as tight as 1.5 dB and give exact agreement between computer predictions and measured results. The theory was used to design a complex matched power divider employing many branch-guide couplers of 14 different coupling values and gave practical results in close agreement with theory.



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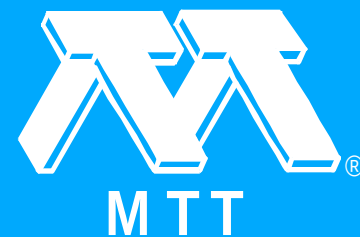


Abstracts

A Least-Squares Boundary Residual Method for the Numerical Solution of Scattering Problems

J.B. Davies. "A Least-Squares Boundary Residual Method for the Numerical Solution of Scattering Problems." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 99-104.

An explicit least-squares criterion is put forward as an alternative to the point-matching method of numerically solving scattering problems. While being an established method of functional approximation, it has been largely ignored in numerical approaches to electromagnetic scattering. In contrast to point matching, the least-squares approach has a rigorous proof of convergence. An electric/magnetic weighting factor is found useful in optimizing convergence. Finally, it allows use of perhaps the fastest and most compact matrix inversion algorithm.



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Finite Element Analysis of Planar Microwave Networks

P. Silvester. "Finite Element Analysis of Planar Microwave Networks." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 104-108.

The port admittance matrix of a planar network is formulated in terms of certain harmonic functions related to the port voltages and the network geometry, together with the natural modes of the network with all ports shorted. The necessary harmonic functions and eigenfunctions are found using a finite element technique, for which general-purpose computer programs already exist. An advantage of the method is that the admittance matrix appears in partial-fraction form with geometric data separated from frequency, leading to inexpensive computations where recalculation at various frequencies is required.

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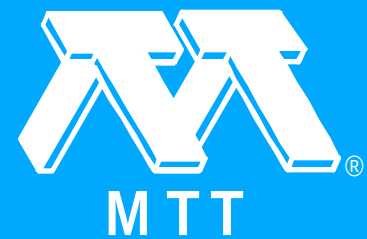


Abstracts

DC and Microwave-Biased Photoconductive Response in CdS Crystals (Short Papers)

P.R. Herczfeld and L.R. Hanlon. "DC and Microwave-Biased Photoconductive Response in CdS Crystals (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 109-111.

DC and microwave-biased measurements of the photoresponse spectrum of sulfur-sensitized CdS single crystals were made in a K-band (22-GHz) reflection bridge. The experimental arrangement was such that both dc and microwave measurements could be performed at different temperatures without changing the rest of the sample's environment. For the microwave measurements, the response spectra were narrower and shifted toward shorter wavelengths than for the dc measurements.



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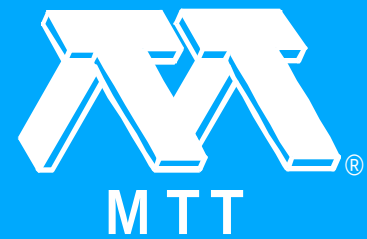


Abstracts

Wave Propagation in Multilayered Drifted Solid-State Plasmas (Short Papers)

A.C. Baynham, A.D. Boardman, M.R.B. Dunsmore and J. Tierney. "Wave Propagation in Multilayered Drifted Solid-State Plasmas (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 111-113.

The problem of the propagation of transverse magnetoplasma waves in drifted, stratified, media consisting of periodically distributed homogeneous slabs of solid-state plasmas is investigated. The action of the drifting carriers is to introduce an asymmetry into the propagation characteristics while the influence of the periodic structure introduces space harmonics. A detailed assessment of the possibility of a synchronous space-harmonic interaction for on-axis waves, which leads to wave amplification, has been performed. It is found that, contrary to the results of some prior work in the field, the gain that occurred could not be attributed directly to the periodic structure.



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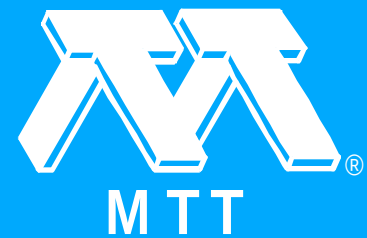


Abstracts

Variational Expressions, Pseudoenergy, and Power (Short Papers)

P. Daly. "Variational Expressions, Pseudoenergy, and Power (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 113-114.

A variational expression involving the longitudinal fields in an inhomogeneous lossless waveguide, which acts as the starting point for numerical procedures, is shown to be equivalent to a simple relationship between power flow, stored energy, and phase velocity.



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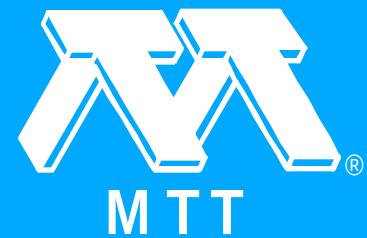


Abstracts

Q-Dependence of Gunn Oscillator FM Noise (Short Papers)

H. Herbst and A. Ataman. "Q-Dependence of Gunn Oscillator FM Noise (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 114-115.

Measurements of FM noise and the external quality factor $Q_{\text{sub ex}}$ of X-band Gunn oscillators are reported which show that both unconverted and intrinsic FM noise vary inversely as $Q_{\text{sub ex}}$, if bias voltage, RF power, and frequency are kept constant.



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Temperature Stability of an MIC Gunn-Effect Oscillator (Short Papers)

J. Cohen and M. Gilden. "Temperature Stability of an MIC Gunn-Effect Oscillator (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 115-116.

A technique to temperature stabilize a Gunn-effect CW oscillator (C band) in microstrip, has been developed.



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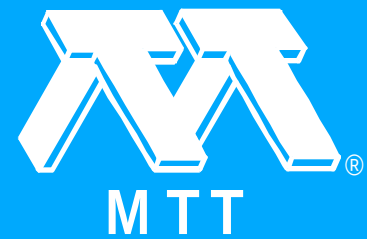


Abstracts

A Waveguide to Suspended Stripline Transition (Letters)

B. Glance and R. Trambarulo. "A Waveguide to Suspended Stripline Transition (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 117-118.

A launcher for coupling a 50- Ω suspended stripline to a waveguide by means of a probe has been built and tested at 30 GHz. Matching has been obtained between 28.8 and 32.6 GHz with a return loss better than 35 dB. The launcher can be fabricated as an integral part of the stripline components.



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Abstracts

On the Definitions of Parameters in Ferrite-Electromagnetic Wave Interactions (Letters)

D.M. Bolle and L. Lewin. "On the Definitions of Parameters in Ferrite-Electromagnetic Wave Interactions (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 118-118.

Conflicting definitions of the parameters characterizing the material in ferrite-electromagnetic wave interactions occur in the current literature, as well as do actual sign errors that are difficult to detect because of the variety of signs appended to the relevant quantities by different authors. A harmonious set of definitions are set out and their consistency illustrated using the case of a uniform circularly polarized plane wave.



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P.A. Brennan, E.G. Cristal, J.B. Davies, R. Levy, T.E. Rozzi, A.E. Ruehli, P. Silvester and Y. Takayama. "Contributors (Feb. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.2 (Feb. 1973 [T-MTT]): 119-120.



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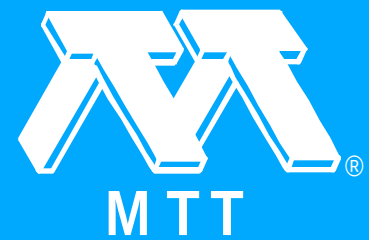
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J-Band Transferred-Electron Oscillators

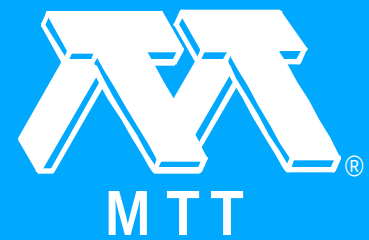
M. Dean and M.J. Howes. "J-Band Transferred-Electron Oscillators." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 121-127.

An equivalent circuit for a J-band transferred-electron oscillator containing lumped and distributed elements is proposed. Using element values obtained independently, the equivalent circuit is shown to have broad-band applicability and is capable of explaining, in a strictly quantitative fashion, frequency saturation and the loss or absence of circuit-controlled oscillation. It is shown that the S4 type of encapsulation places severe constraints on the mounting structure and is not ideally suited to the J-band waveguide oscillator for optimum power-frequency characteristics over a broad band. The analysis of the full equivalent circuit given does, however, permit analytic solutions for important oscillator design parameters such as mounting post diameter, which enables simple post-mounted J-band oscillators that are free from frequency saturation and loss of circuit-controlled oscillation in the band to be easily designed.

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Noise in Single-Frequency Oscillators and Amplifiers

R.L. Kuvas. "Noise in Single-Frequency Oscillators and Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 127-134.

A generalization of previous oscillator noise analyses has been developed to permit reliable noise characterization of active nonlinear devices. Effects due to sideband correlation in the equivalent noise source are included. A rotating wave approximation (RWA) developed by Lax is used in obtaining the amplitude and phase noise spectra. Conditions are given for phase stabilization of free-running oscillators and for minimum phase noise in phase-locked oscillators and amplifiers. Stability criteria, discussion of spurious sidetones, and effects of a noisy synchronizing signal are given. The noise measure is used to obtain alternative expressions for the noise spectra and the carrier-to-noise ratios of locked oscillators and amplifiers. It is shown that the noise power gain of AM fluctuations is usually much lower than the corresponding gain for FM noise. The theory should be useful in optimizing the noise performance of nonlinear RF generators, such as IMPATT, BARITT, and Gunn diode oscillators.

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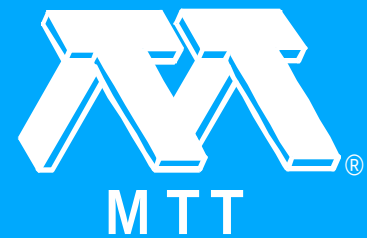


Abstracts

Coaxial Impedance Inverter Design (Short Papers)

A. Giefing. "Coaxial Impedance Inverter Design (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 135-135.

It is shown that the effects of discontinuity capacitances associated with the abrupt change in the center conductor diameter of a coaxial bandpass filter can readily be anticipated at the designing stage.



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Abstracts

A Relationship Between the Scattering Parameters of a Passive Lossy Nonreciprocal Two-Port (Comments)

J.I. Glaser. "A Relationship Between the Scattering Parameters of a Passive Lossy Nonreciprocal Two-Port (Comments)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 135-136.

An inequality relating the scattering coefficients of a passive lossy-reciprocal or nonreciprocal two-port is derived. For the reciprocal two-port the inequality reduces to that presented by Uhler.



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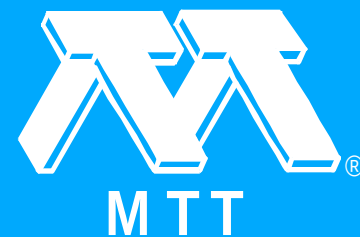


Abstracts

MIC Ku-Band Upconverter (Short Papers)

P. Bura. "MIC Ku-Band Upconverter (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 136-137.

An MIC S- to Ku-band upper-sideband upconverter has shown a pump efficiency of 25 percent and 3.8-dB signal gain. When used as a lower-sideband upconverter, gains of 13 dB and 100-MHz bandwidth were measured.



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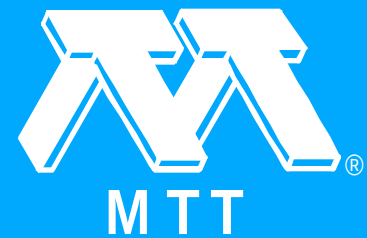


Abstracts

Wide-Band Varactor-Tuned X-Band Gunn Oscillators in Full-Height Waveguide Cavity (Short Papers)

J.S. Joshi. "Wide-Band Varactor-Tuned X-Band Gunn Oscillators in Full-Height Waveguide Cavity (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 137-139.

Some results on X-band varactor-tuned Gunn oscillators in a full-height waveguide cavity are presented. It is shown that it is possible to obtain an electronic tuning range of over 1 GHz at X band with an appreciable output power level, which is also nearly constant with frequency. Results of FM noise measurements on one such oscillator are also reported.



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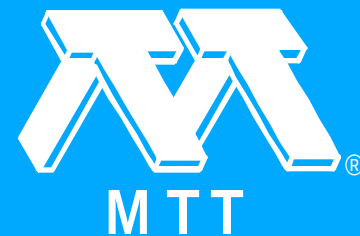


Abstracts

Propagation Along Transversely Inhomogeneous Coaxial Transmission Lines (Short papers)

R.E. McIntosh and L.J. Turgeon. "Propagation Along Transversely Inhomogeneous Coaxial Transmission Lines (Short papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 139-142.

Numerical "shooting" methods are employed in obtaining the dispersion curves of a coaxial waveguide loaded with a radially inhomogeneous dielectric. The utility of this technique is tested by comparing results with known analytical solutions. The method is also used to find the dispersion curves of a coaxial waveguide loaded with a radially Gaussian-distributed plasma.



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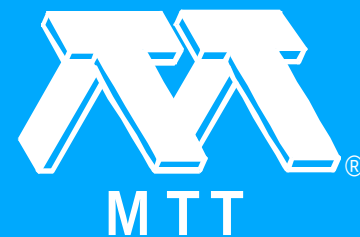


Abstracts

A Quick Accurate Method to Measure the Dielectric Constant of Microwave Integrated-Circuit Substrates (Short Papers)

J.Q. Howell. "A Quick Accurate Method to Measure the Dielectric Constant of Microwave Integrated-Circuit Substrates (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 142-144.

A technique is described that makes possible the accurate measurement of the dielectric constant of microwave integrated-circuit substrates. The substrate is metallized on all sides, hence forming a tiny resonant cavity, and the resonant frequencies are determined either from transmission or reflection. The dielectric constant is then calculated to an accuracy of better than 1 percent.



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Abstracts

Dispersion of Parallel-Coupled Microstrip (Short Papers)

W.J. Getsinger. "Dispersion of Parallel-Coupled Microstrip (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 144-145.

Dispersion predictions for the even and odd modes of parallel-coupled microstrip obtained by using the LSE-mode model for microstrip are found to be in good agreement with recently published measurements. Both the basic dispersion relationship and the empirical factor G appear to be the same as for single microstrip lines if the even- and odd-mode impedances used are those of the total parallel-coupled configuration rather than those of a single line of the coupled pair.



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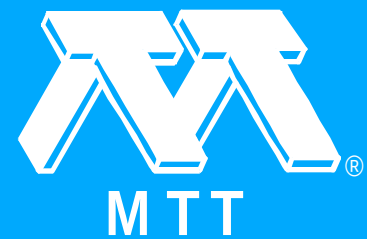


Abstracts

Effects of the T-Junction Discontinuity on the Design of Microstrip Directional Couplers (Short Papers)

R.W. Vogel. "Effects of the T-Junction Discontinuity on the Design of Microstrip Directional Couplers (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 145-146.

The influence of the T-junction effect on the microstrip 3-dB branchline and rat-race directional couplers design has been described. In the proposed method, the T-junction equivalent circuit similar to the circuit used by Franco and Oliner for the symmetric stripline junction is applied. Simple design expressions that combine the modified characteristic impedance and electrical length of the coupler arm with the equivalent parameters of the T-junction are given. These expressions are helpful in the determination of the microstrip coupler dimensions. The experimental verification of an improvement of the design procedure is also included.



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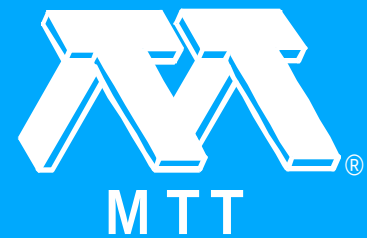


Abstracts

Precise Frequency and Phase Control of LSA Oscillators (Short Papers)

W.L. Wilson, Jr.. "Precise Frequency and Phase Control of LSA Oscillators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 146-149.

It is shown that consideration of both the external microwave circuit and the dc bias applied to the diode are necessary in order to obtain satisfactory locking results with an LSA oscillator. When both are properly arranged, good control of both the operating frequency and the phase of an LSA oscillator at 3 GHz is demonstrated.



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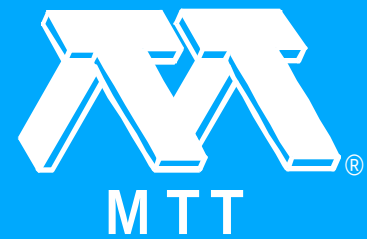
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Precision Temperature Reference for Microwave Radiometry (Short Papers)

W.N. Hardy. "Precision Temperature Reference for Microwave Radiometry (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 149-150.

The calibration of microwave radiometers is normally achieved by replacing the antenna with a cooled reference termination and then applying corrections for ohmic and reflective losses of the antenna, and for the nonideality of the reference termination. The uncertainty in this correction is the dominating factor in the precision of many high-quality radiometers, and for some applications it is unacceptably large. An alternative is to point the antenna at a target of known temperature. To the extent that this temperature is known and the target is reflectionless and encompasses the full view of the antenna, the calibration is exact and no further corrections are required. A target suitable for high-precision radiometry has been developed that has an accurately known radiometric temperature, a very low reflection coefficient, and whose geometry is well suited to the calibration of horn antennas.

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Abstracts

A 4-GHz Lumped-Element Circulator (Short Papers)

R.H. Knerr. "A 4-GHz Lumped-Element Circulator (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 150-151.

The successful application of thin-film lumped-element circulators (LEC) at L band has led to the following question: How far can these devices be extended in frequency using our present beam-crossover technology? An exploratory study aimed at building an LEC at approximately 4 GHz was successfully completed. Preliminary tests showed a 20-dB band from 4.2 to 5 GHz with an insertion loss <1 dB (minimum, 0.5 dB). This includes fixture losses, which account for about 0.2 dB. The device has been tuned to operate above 5 GHz, and from the experiments it is concluded that a device of this type could be built at frequencies as high as X band. These devices are very small; at 4 GHz, the circulator junction is a 0.075- in diam.



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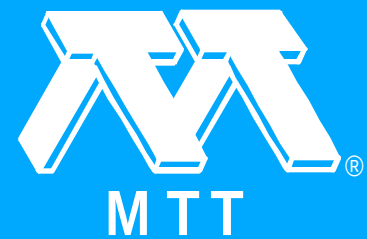


Abstracts

An Analytical Expression for the Limits of Error in the Measurement of Reflection-Coefficient Phase (Short Papers)

T.Y. Otoshi. "An Analytical Expression for the Limits of Error in the Measurement of Reflection-Coefficient Phase (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 151-154.

An exact analytical expression for calculating the limits of phase error that can occur when the reflection coefficient of a load is measured through a lossless two-port network is presented. An empirical expression previously reported by Garver et al. agrees well with the exact expression, except when the reflection coefficients of the lossless two-port and the load are nearly the same in magnitude.



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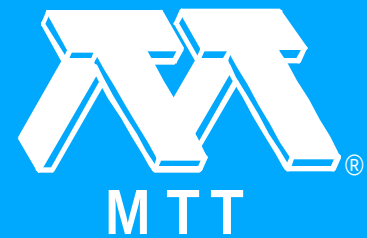


Abstracts

Attenuation Characteristics of Hollow Conducting Elliptical Waveguides (Comments and Author's Reply)

G. Falciasecce, C.G. Sameda, F. Valdoni and J.G. Kretzschmar. "Attenuation Characteristics of Hollow Conducting Elliptical Waveguides (Comments and Author's Reply)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 154-154.

In the above paper, attenuation constants for several modes of a metal elliptical waveguide are computed by means of two basic formulas. These expressions do not coincide with those that Chu obtained long ago. Several numerical discrepancies are pointed out.



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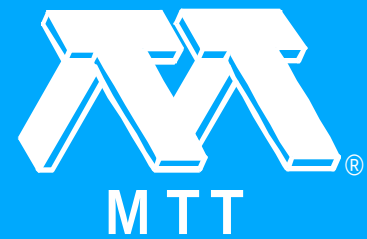


Abstracts

Focusing of 104-GHz Beams by Cylindrical Mirrors (Letters)

J.T. Ruscio. "Focusing of 104-GHz Beams by Cylindrical Mirrors (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 154-155.

The use of cylindrical mirrors to focus 52-GHz beams over a 85-m-long path has been previously reported. We shall report in this letter the results of tests made at 52 and 104 GHz over an extended 350-m-long path incorporating 10 refocuses (20 mirrors). The arrangement is shown in Fig. 1.



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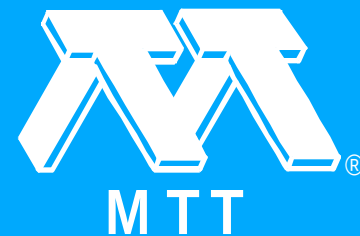


Abstracts

Fast Parameters Calculation of the Dielectric-Supported Air-Strip Transmission Line (Letters)

E. Costamagna. "Fast Parameters Calculation of the Dielectric-Supported Air-Strip Transmission Line (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 155-156.

The method presented by Smith in [1] for the evaluation of the fringing capacitances in microstrip and suspended substrate structures is very useful in analysis and optimization problems and permits fast and accurate calculations.



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Abstracts

Conditions for Approximating the Limit-TEM Mode by a Quasi-TEM Mode in a Ferrite-Filled Coaxial Line (Letters)

M.M. Weiner. "Conditions for Approximating the Limit-TEM Mode by a Quasi-TEM Mode in a Ferrite-Filled Coaxial Line (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 156-157.

Sufficient conditions for the quasi-TEM mode in a ferrite-filled coaxial line are reviewed.



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Two-Mode Waveguide for Equal Mode Velocities (Correction)

N.G. Alexopoulos and M.E. Armstrong. "Two-Mode Waveguide for Equal Mode Velocities (Correction)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 157-158.

The T-septum waveguide was analyzed by Elliott using the orthonormal block method. The numerical results did not compare favorably with experimental measurements and it was suggested that the disparity was related primarily to the assumption of zero-thickness membranes for the septum. Later, Silvester analyzed the T-septum waveguide using a finite-element method and found very good agreement with the measured points, yet the septum thickness was again assumed to be infinitesimal. This letter is being written to dispel the implication that the orthonormal block method of analysis of the T-septum waveguide suffers for lack of accuracy. The universal curves as shown by Elliott will be presented here in corrected form along with experimental results further corroborating both Elliott's and Silvester's work.

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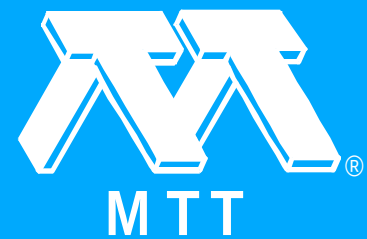


Abstracts

On the Solution of the Circularly Cylindrical Coordinate Wave Equation in Homogeneous Isotropic Regions Containing the Coordinate Axis (Letters)

D.M. Bolle. "On the Solution of the Circularly Cylindrical Coordinate Wave Equation in Homogeneous Isotropic Regions Containing the Coordinate Axis (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 158-159.

In a number of well-known texts, misleading statements are made concerning the reason for eliminating the Neumann or Bessel function of the second kind from the solution of the wave equations in circular cylindrical coordinates for a homogeneous region containing the coordinate axis. This letter discusses the conditions that are required to arrive at a unique solution.



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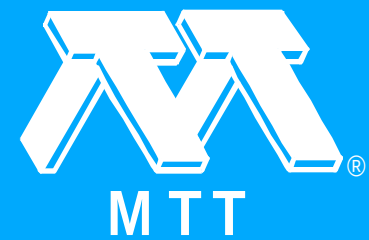
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Abstracts

Contributors (Mar. 1973 [T-MTT])

M. Dean, M.J. Howes and R.L. Kuvas. "Contributors (Mar. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.3 (Mar. 1973 [T-MTT]): 159-159.



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Abstracts

Front Cover (Apr. 1973 [T-MTT])

"Front Cover (Apr. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): f1-f2.



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Abstracts

Foreword (Apr. 1973 [T-MTT])

T.M. Reeder. "Foreword (Apr. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 161-161.

Our goal in preparing this G-MTT/SU Special Issue is to highlight recent progress in research and development of microwave acoustic devices that perform signal-processing operations. The composition of this issue reflects the current research emphasis on surface acoustic wave devices; the papers presented here are largely concerned with surface-wave devices and their signal-processing applications.



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Abstracts

Impulse Model Design of Acoustic Surface-Wave Filters

C.S. Hartmann, D.T. Bell, Jr. and R.C. Rosenfeld. "Impulse Model Design of Acoustic Surface-Wave Filters." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 162-175.

The design of surface acoustic wave bandpass filters which utilize interdigital electrode transducers is reviewed. The impulse-response description of interdigital transducers is extended to allow calculation of transducer input admittance and filter frequency response with much less effort than required by earlier equivalent-circuit model approaches. The application of the impulse model to the straightforward design of VHF and higher frequency bandpass filters is discussed and several examples of high-performance surface-wave bandpass filters are given.



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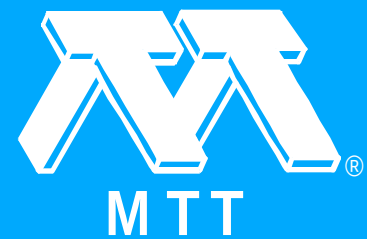


Abstracts

The Design and Applications of Highly Dispersive Acoustic Surface-Wave Filters

H.M. Gerard, W.R. Smith, W.R. Jones and J.B. Harrington. "The Design and Applications of Highly Dispersive Acoustic Surface-Wave Filters." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 176-186.

The development of a low-loss broad-band linear FM dispersive filter having a time-bandwidth (TB) product of 1000 is discussed. Two systems applications for highly dispersive linear FM filters--pulse compression radar and a microscan receiver--are discussed with emphasis on filter performance requirements. The principal factors which influence the design of surface-wave filters are reviewed and theoretical design procedures are outlined. The 1000:1 filters, which are implemented on strong-coupling YZ lithium niobate, typically meet the design goal of a 100-MHZ rectangular passband and have a CW insertion loss of less than 35 dB. Measured data are presented for the filter performance in a pulse-compression loop and in a prototype broad-band microscan (compressive) receiver.



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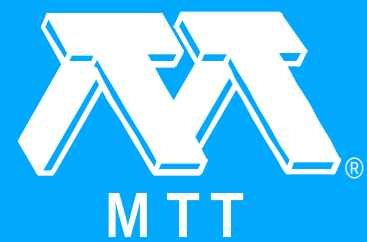
The IMCON Pulse Compression Filter and its Applications

T.A. Martin. "The IMCON Pulse Compression Filter and its Applications." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 186-194.

The IMCON is a reflection-mode dispersive delay line capable of high performance in large time-bandwidth product pulse compression systems. As developed in this paper, the unique characteristics of the IMCON are obtained by reflection from a double grating array that is applied to the surface of a strip. Current models of the device have center frequencies in the 4-30-MHz range with bandwidth up to 15 MHz, dispersion to 320 μ s time sidelobes on the order of --40 dB (with equalization), and other spurious signals at least 70 dB below the compressed output. The characteristics of IMCON operation are developed from a consideration of the device's transfer function. In particular, the IMCON'S high linearity and low sensitivity to fabrication and propagation problems are shown to be due to a unique error rejection effect. By comparison, the error rejection characteristics of single grating and dispersive transducer devices are found to be inferior to the IMCON. Data derived from operating pulse compression systems are utilized to demonstrate the low time sidelobe and high time-bandwidth capability of the IMCON.

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The Use of Surface-Elastic-Wave Reflection Gratings in Large Time-Bandwidth Pulse-Compression Filters

R.C. Williamson and H.I. Smith. "The Use of Surface-Elastic-Wave Reflection Gratings in Large Time-Bandwidth Pulse-Compression Filters." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 195-205.

A new type of surface-wave device has been developed which uses the reflection of surface elastic waves to achieve a desired transfer function. A series of experiments on the reflection of surface waves at normal and oblique incidence from periodic arrays of grooves and overlayer stripes provided guidelines for the choice of the type of reflector, the reflection angle, and the depth of grooves. A prototype pulse-compression filter with a time-bandwidth product of 1500 ($T=30 \mu\text{S}$, $\Delta f=50 \text{ MHz}$) has been developed. The grooves were etched into LiNbO₃ by a neutralized argon ion beam in a manner which provided precise depth control and a desired amplitude response. This reflective-array compressor (RAC) has proved to be relatively free of spurious signals and second-order effects and, as a result, large capacities have been obtained. In the prototype device, rms phase errors were 3.5 deg or less and, as a result, the compressed-pulse sidelobe structure was near ideal. A compression ratio of 1500 was demonstrated. The same device, when operated over a wider bandwidth, yielded a compression ratio of about 4000 with only a modest sacrifice in the level of the time sidelobes.

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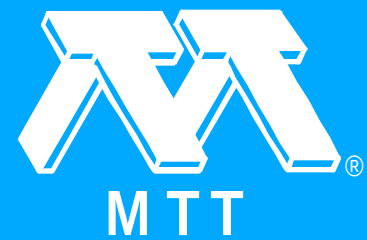
Theory and Design of the Surface Acoustic Wave Multistrip Coupler

F.G. Marshall, C.O. Newton and E.G.S. Paige. "Theory and Design of the Surface Acoustic Wave Multistrip Coupler." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 206-215.

The multistrip coupler performs the function of a directional coupler for freely propagating surface acoustic waves on a piezoelectrically active substrate. Its operation is analyzed in terms of a transmission line based equivalent circuit. Expressions are obtained for the directionality (transmission and reflection) in terms of the number of coupler strips and the acoustic frequency. Theory and experiment are shown to be in very good agreement. 50-percent metallization is found to give optimum performance; progressive increase in the proportion of the coupler area covered with metal is shown to involve a progressive change from an inline field model to a crossed-field model. Outside a stopband region it is found that a simplified expression for the directionality is valid; this greatly facilitates component design. Design criteria for multistrip components are discussed in terms of substrate and bandwidth requirements. An analysis is included of resistive and capacitive effects on coupling, and problems associated with coupling between dissimilar materials are discussed.

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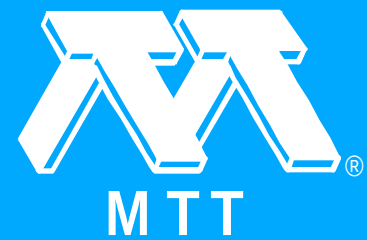
Surface Acoustic Wave Multistrip Components and Their Applications

F.G. Marshall, C.O. Newton and E.G.S. Paige. "Surface Acoustic Wave Multistrip Components and Their Applications." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 216-225.

The multistrip coupler is a directional coupler which operates on freely propagating surface acoustic waves with broad bandwidth and low loss. The applications of simple multistrip couplers with straight strips are discussed together with descriptions and properties of a family of multistrip components that can perform particular operations. Stepped couplers can perform the function of collinear beamwidth compression and a surface-wave "magic T" may be constructed. Bent, U-shaped, and J-shaped structures are considered that may redirect or reflect acoustic beams, and results are presented for a multistrip unidirectional transducer. Complex acoustic circuits may be built up using these elements. A beam may be reflected and stepped to the side by one track width, and both directions of a delay line may be used sequentially to double its capacity. The spurious triple transit signal of a delay line is shown to be virtually eliminated at the expense of an extra 3-dB single transit loss.

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Acoustic Surface Waveguides--Analysis and Assessment

P.E. Lagasse, I.M. Mason and E.A. Ash. "Acoustic Surface Waveguides--Analysis and Assessment." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 225-236.

The properties of acoustic surface waveguides are reviewed, with particular reference to topographic structures in which guiding is achieved by drastic deformation of the substrate surface. A numerical technique, capable of computing efficiently and with high accuracy the mode spectrum of an anisotropic piezoelectric heterogeneous waveguide of arbitrary cross section, is described. Characteristics of both the ridge guide and the recently discovered wedge waveguide are discussed in some detail. Techniques for the fabrication of and transduction onto acoustic surface waveguides are discussed, and a preliminary assessment is made of potential linear and nonlinear waveguide applications. A number of experimental devices are described.

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Acoustic Surface-Wave Recirculating Memory

H. van de Vaart and L.R. Schissler. "Acoustic Surface-Wave Recirculating Memory." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 236-243.

An acoustic surface-wave memory is described, operating at a bit rate of 220 MHz and storage capacity of 1280 bit-per recirculation loop. The transducers are coded using orthogonal pairs of Golay complementary sequences to obtain pulse-in pulse-out behavior. The shape of the delayed pulse is analyzed and compared with the pulse shape that is obtained using a simple single finger pair transducer. The recirculation electronics uses standard MECL-III logic for both the amplifier and the write, read, inhibit, and reclocking functions. The cost of the recirculating memory and the feasibility of constructing larger capacity stores are also discussed.

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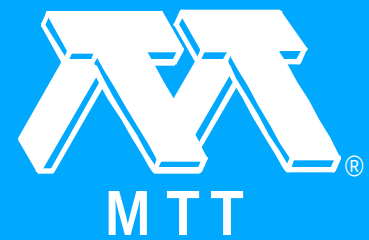
Signal Processing by Parametric Interactions in Delay-Line Devices

G.S. Kino, S. Ludvik, H.J. Shaw, W.R. Shreve, J.M. White and D.K. Winslow. "Signal Processing by Parametric Interactions in Delay-Line Devices." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 244-255.

A new type of signal-processing device which employs the parametric interaction between surface or volume acoustic waves passing in opposite directions through an acoustic delay line is described. These devices are capable of giving the real-time convolution of two modulated signals, and the time inversion of an arbitrary signal. As one signal acts as the reference for the other, a virtually infinite range of electronically variable signal-processing functions, such as recognition of digital codes, pulse compression of an FM chirp, and the realization of a fast Fourier transform, is possible. Early devices which employed the nonlinearity of the acoustic medium tended to give outputs of the order of 60 dB less than the input signal. Recent developments, in which a semiconductor placed near the piezoelectric medium interacts with the acoustic wave, have yielded results where the loss from input to output is of the order of 30 dB.

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Signal Processing by Electron-Beam Interaction with Piezoelectric Surface Waves

A.G. Bert, B. Epsztein and G. Kantorowicz. "Signal Processing by Electron-Beam Interaction with Piezoelectric Surface Waves." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 255-263.

A new type of device is described in which an acoustoelectric surface wave interacts with low energy free charges created on the surface of a piezoelectric material. The experimental results obtained show that one of the most promising applications is an analog RF storage device for which several minutes of storage time have been achieved at 30 MHz on quartz with an internal insertion loss of 63 dB. If the width of the current pulse is large enough, direct attenuation of the surface wave may be measured due to the energy absorbed by the motion of secondary electrons. Experimental and theoretical results are presented. The limitations and the applications of the device to signal processing are discussed.

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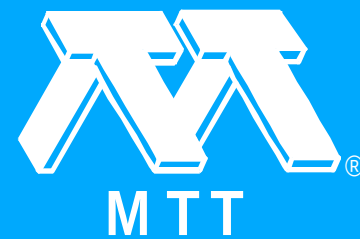


Abstracts

Application of Acoustic Surface-Wave Technology to Spread Spectrum Communications

D.T. Bell, Jr., J.D. Holmes and R.V. Ridings. "Application of Acoustic Surface-Wave Technology to Spread Spectrum Communications." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 263-271.

Spread spectrum transmission is being proposed for an increasing number of digital communication, navigation, and radar systems. One of the reasons is the simplicity and availability of surface-wave devices (SWD) for performing the necessary signal generation and processing. The properties of spread spectrum signals, the operation of SWD's, and their advantages and limitations when used in communication systems are discussed. Spread spectrum terminology and basic concepts are defined in terms common to both systems engineers and device designers.



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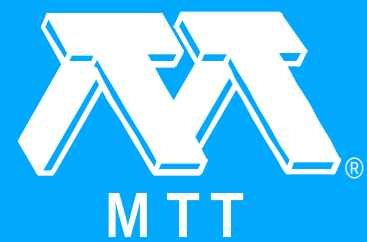
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Ranging and Data Transmission Using Digital Encoded FM-"Chirp" Surface Acoustic Wave Filters

J. Burnsweig and J. Wooldridge. "Ranging and Data Transmission Using Digital Encoded FM-"Chirp" Surface Acoustic Wave Filters." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 272-279.

A digital encoded multislope chirp modem/demodem unit has been implemented using two 3-port surface acoustic wave filters. Each filter operating at a 30-MHz center frequency provides either positive or negative slopes as digital 1's or 0's with a time-bandwidth product of 280, an unweighed bandwidth of 5.6 MHz, and a time dispersion of 50 μ s. The modems were used to calibrate and compare the operational performance of the conventional multitone CW ranging system with a multislope chirp ranging system. Range measurements and range-rate observations were made to a synchronous satellite with both systems using a ground communication satellite terminal. Both ranging techniques provided accuracies well within the predictable satellite range of 20,000 nmi; the multitone system provided a theoretical range resolution of 1 m, and the chirp system 0.4 m. Data transmission was also accomplished, using 12-bit binary code at a 1.25-Mbit rate. The significant advantage to be noted with the chirp system is the ability to obtain continuous range data from the satellite repeater simultaneously while other modes of information are being transmitted, and to combine the ranging and data-link transmission on a time-order basis using digital encoded chirp sequences. The chirp system was found the more desirable technique, since it provides a more direct range measurement, with minimal calibration requirements, and provided greater processing gain with relative ease and reliability. The data transmission at low data rates provided little deterioration in theoretical compressive gain. However, at the higher data rate a greater loss was encountered due to power sharing of the overlapping chirp coded carriers in the limiting satellite.

Click on title for a complete paper.



Abstracts

A Review of Device Technology for Programmable Surface-Wave Filters

E.J. Staples and L.T. Claiborne. "A Review of Device Technology for Programmable Surface-Wave Filters." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 279-287.

A review of programmable surface acoustic wave filters is presented. The elementary theory, fabrication procedures, and device performance are described in light of recent technological advances. Both hybrid and monolithic structures are considered. The relative advantages of programming techniques which utilize diode switching are compared to those that make use of solid-state, three-terminal, and acoustic wave detectors.



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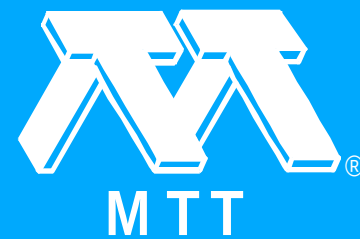


Abstracts

Potential Applications of Acoustic Matched Filters to Air-Traffic Control Systems

P.M. Grant, J.H. Collins, B.J. Darby and D.P. Morgan. "Potential Applications of Acoustic Matched Filters to Air-Traffic Control Systems." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 288-300.

The potential role of acoustic matched filters in the demanding field of civil and military air-traffic control (ATC) systems is examined. Highlighted are the problems of current ATC systems and the significant aspects of acoustic matched filters and their expeditious usage in modems employing band spreading for a multisubscriber environment and certain envisaged ATC systems deemed necessary for future traffic growth that could benefit materially from acoustic technology.



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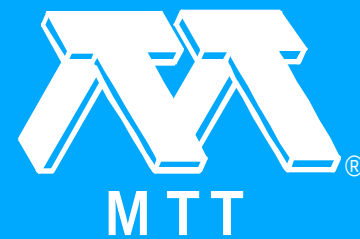


Abstracts

Surface Elastic Wave Bandpass Filters for Frequency Synthesis (Short Papers)

F.S. Hickernell, A.J. Kline, D.E. Allen and W.C. Brown. "Surface Elastic Wave Bandpass Filters for Frequency Synthesis (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 300-302.

Surface elastic wave bandpass filter techniques have been applied to the development of a minaturized frequency synthesizer for satellite communications systems. A bandpass filter centered at 247 MHz has been developed exhibiting less than 7-dB insertion loss over a 6-MHz 1-dB band, with sidelobe rejection greater than 45 dB.



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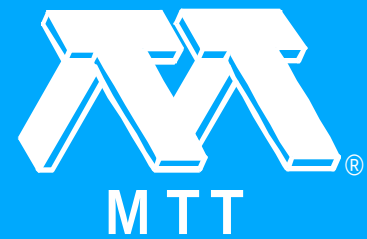


Abstracts

Bandpass Filters Using Nonlinear FM Surface-Wave Transducers (Short Papers)

J.C. Worley. "Bandpass Filters Using Nonlinear FM Surface-Wave Transducers (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 302-303.

A generalized FM method of obtaining bandpass filters using surface-wave delay lines is discussed. Two identical FM transducers are used as input and output. The FM function of the transducers is determined by the required passband.



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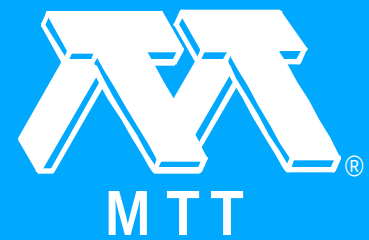
Authors

A Programmable Surface Acoustic Wave Matched Filter for Phase-Coded Spread Spectrum Waveforms (Short Papers)

P.J. Hagon, F.B. Micheletti, R.N. Seymour and C.Y. Wrigley. "A Programmable Surface Acoustic Wave Matched Filter for Phase-Coded Spread Spectrum Waveforms (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 303-306.

A programmable surface acoustic wave (SAW) matched filter for biphase-coded spread spectrum waveforms has been constructed using a temperature-stable ST-cut quartz tapped delay line (TDL) and silicon-on-sapphire integrated control circuits. Construction is hybrid with wire stitch bond interconnections between the acoustic and microelectronic portions of the device. The SAW TDL operates at 120-MHz center frequency with 100-ns spacing between adjacent taps for a 10-MHz chip rate. The output of each tap can be individually switched to a load with 0 or 180° phase shift by the silicon-on-sapphire integrated control circuits. The high-speed capability of silicon-on-sapphire integrated circuits allows programming (code changing) to be achieved with a serial data input at 10-MHz rates, while the low temperature coefficient of ST-cut quartz allows satisfactory operation over a wide temperature range (-25°C to +85°C).





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Generation of Pseudonoise Sequences Using Surface Acoustic Waves (Short Papers)

D.P. Morgan and J.G. Sutherland. "Generation of Pseudonoise Sequences Using Surface Acoustic Waves (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 306-306.

Pseudonoise sequences can be generated by using a surface acoustic wave delay line in place of a shift register. Modulo-2 addition is achieved by combining the outputs of two transducers and using envelope detection. A 31-bit pseudonoise sequence was generated with a bit period of 1.1 μ s.

[Click on title for a complete paper.](#)



Abstracts

Contributors (Apr. 1973 [T-MTT])

E.A. Ash, D.T. Bell, Jr., A.G. Bert, J. Burnsweig, L.T. Claiborne, J.H. Collins, B.J. Darby, B. Epsztein, H.M. Gerard, P.M. Grant, J.B. Harrington, C.S. Hartmann, J.D. Holmes, W.R. Jones, G. Kantorowicz, G.S. Kino, P.E. Lagasse, S. Ludvik, F.G. Marshall, T.A. Martin, I.M. Mason, D.P. Morgan, C.O. Newton, E.G.S. Paige, R.V. Ridings, R.C. Rosenfeld, L.R. Schissler, H.J. Shaw, W.R. Shreve, H.I. Smith, W.R. Smith, E.J. Staples, H. van de Vaart, J.M. White, R.C. Williamson, D.K. Winslow and J. Wooldridge. "Contributors (Apr. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 307-312.



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Scattering from a Round Metal Post and Gap

J.A. Bradshaw. "Scattering from a Round Metal Post and Gap." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 313-322.

Improved expressions are derived for the microwave fields scattered by a uniform electric-field incident on and parallel to a round metal post, with gap, in waveguide and in two related structures. A pair of variational expressions are found for the scattering and for the gap reactance under even excitation. The results are compared with those due to Lewin, and with data in the Waveguide Handbook.

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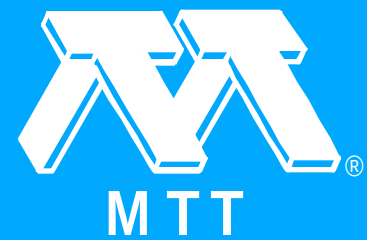
Gain-Bandwidth Limitations of Microwave Transistor Amplifiers

R.S. Tucker. "Gain-Bandwidth Limitations of Microwave Transistor Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 322-327.

Gain-bandwidth limitations of broad-band single-stage microwave transistor amplifiers are related to a simple transistor circuit model, to constraints on characteristic impedance in a distributed-element equalizer, and to the line lengths of this equalizer. The gain-bandwidth performance of commensurate distributed-element equalizers is compared with the performance of a lumped-element equalizer, and four distributed-element design examples are presented, including two commensurate equalizers and two computer-optimized networks.

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Accurate Determination of Varactor Resistance at UHF and Its Relation to Parametric Amplifier Noise Temperature

K. Inal and C. Toker. "Accurate Determination of Varactor Resistance at UHF and Its Relation to Parametric Amplifier Noise Temperature." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 327-333.

A thorough investigation is made on the frequency-dependent properties of a varactor diode loss resistance at UHF. The variation of the losses with frequency in a varactor diode mounted cavity has been theoretically investigated, and it is shown that the previously reported inverse-squared frequency dependence of the varactor loss resistance can be attributed to the distributed cavity losses transformed across the varactor diode. A new measurement technique is introduced in which the circuit losses are first matched to the input line instead of the varactor loss resistance as an application of the relative impedance method.

Measurements carried out with this technique for five different varactor diodes showed that the loss resistances of these diodes are not frequency dependent. It is also shown that the choice of the varactor diode capacitance plays an important role on the parametric amplifier noise temperature at UHF. In an experimental parametric amplifier the effect of varactor diode capacitance on the noise temperature has been demonstrated. It has been theoretically and experimentally shown that, generally, varactor diodes having higher capacitances result in better noise temperature at UHF.

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A Moment Method with Mixed Basis Functions for Scatterings by Waveguide Junctions

Y.L. Chow and S.-C. Wu. "A Moment Method with Mixed Basis Functions for Scatterings by Waveguide Junctions." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 333-340.

A moment method with mixed basis functions is introduced. In this formulation, modal basis functions are used for the expansion of the currents corresponding to the scattered propagating modes, while pulse basis functions are used for the expansion of the current corresponding to the scattered evanescent waves. This, together with the Dirac delta weighting functions, reduces the number of total basis functions needed while retaining the simplicity and versatility of the method to cover junctions of an arbitrary shape. This method is applied to study examples of homogeneous and inhomogeneous waveguide junctions of parallel-plate waveguide propagating TE waves. It is found that for junctions that are not electrically large the convergence of the solutions is good. An appendix is included to transform and quicken the numerical integration of the modal basis functions.

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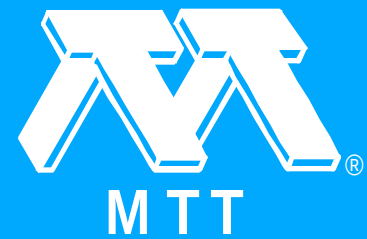


Abstracts

Microstrip Discontinuity Capacitances for Right-Angle Bends, T Junctions, and Crossings

P. Silvester and P. Benedek. "Microstrip Discontinuity Capacitances for Right-Angle Bends, T Junctions, and Crossings." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 341-346.

The integral equations governing the electrostatics of the excess charge distribution near microstrip rightangle bends, T junctions, and crossings are formulated and subsequently solved by a projective method. Extensive discontinuity capacitances are presented in graphical form. Where possible, the data are compared to the available experimental results.



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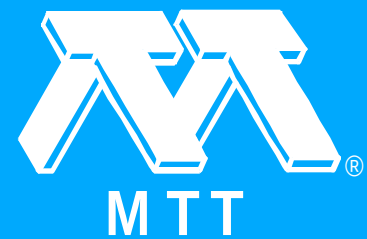


Abstracts

Microwave Measurement Techniques for Below-Resonance Junction Circulators (Short Papers)

J. Helszajn. "Microwave Measurement Techniques for Below-Resonance Junction Circulators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 347-351.

To have a full understanding of the experimental behavior of a junction circulator it is necessary to be able to measure the gyrator conductance, the susceptance slope parameter, and the frequencies of the two split resonant modes of the junction. It is also useful to be able to construct mode charts to determine the geometry of the device. The purpose of this short paper is to give simple methods by which each of these parameters may be measured in the case of the below-resonance stripline circulator. The techniques developed here all stem from the scattering and immittance matrices of the device. They are therefore quite general. They also require no phase information which makes them ideally suitable for reflectometer-type measurement. All measurements described here are made in the input transmission line of the device with the other two ports connected to similar transmission lines terminated in their characteristic impedance. The results obtained here apply to lossless circulators for which the two resonant modes are symmetrically split by the magnetic field, and for which the frequency variation of the third mode can be omitted.



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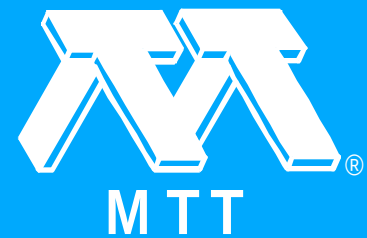


Abstracts

End Effects of Half-Wave Stripline Resonators (Short Papers)

R.O.E. Lagerlof. "End Effects of Half-Wave Stripline Resonators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 351-353.

The end effects of an open-circuited TEM transmission line make the line electrically longer than its physical length. In this short paper a half-wave resonator of a balanced strip transmission line has been analyzed and the required foreshortening of the line to achieve a prescribed resonance frequency has been calculated. Also the decrease in the characteristic impedance of the stripline caused by the end effects has been determined. The theory is in reasonably good agreement with measurements performed, especially for narrow stripline resonators.



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Abstracts

Maximum Phase-Locking Bandwidth Obtainable by Injection Locking (Short Papers)

L. Gustafsson, K.I. Lundstrom and G.H.B. Hansson. "Maximum Phase-Locking Bandwidth Obtainable by Injection Locking (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 353-355.

A simple rule is presented for the determination of the locking region of an oscillator with a general tuning circuit.



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Broad-Band Twisted-Wire Quadrature Hybrids (Short Papers)

R.E. Fisher. "Broad-Band Twisted-Wire Quadrature Hybrids (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 355-357.

A symmetrical 3-dB quadrature hybrid, consisting chiefly of a bifilar pair of twisted wires, is described. A cascade of two such hybrids can achieve an octave bandwidth with a 0.7-dB coupling error. Since this class of hybrid is simple, compact, and low in cost, its use may be preferred over the more common coaxial line or printed-circuit types in the frequency region below 1 GHz.

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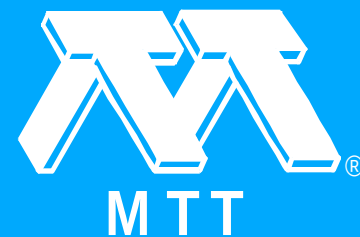


Abstracts

Resolution of the Paradox Concerning Energy Flow on Nonlinear Transmission Lines (Short Papers)

A.E. Karbowiak and R.H. Freeman. "Resolution of the Paradox Concerning Energy Flow on Nonlinear Transmission Lines (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 357-358.

The energy relations and the constitutive relations pertaining to a nonlinear transmission line are examined in detail. It is concluded that mathematical models which have been used in certain studies and which lead to the paradox concerning energy dissipation in the shock front are inadmissible. Correct models are free from such paradoxes. The work leads to the formulation of the hypothesis of realization: it is impossible to realize a continuous loss-free transmission medium which would be characterized by nonlinear distributed inductance $L(I)$ and capacitance $C(V)$, unless the medium is dispersive.



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Abstracts

Characterization of a Bulk P-I-N Switch Using Iris Mounting for Added Isolation (Short Papers)

P.E. Cottrell. "Characterization of a Bulk P-I-N Switch Using Iris Mounting for Added Isolation (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 358-359.

The electromagnetic characteristics of a P-I-N switching window mounted in a resonant iris are derived. The results are used to evaluate tradeoffs between these windows and silicon switching windows mounted across the entire waveguide.



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Abstracts

Loss Calculations of Coupled Microstrip Lines (Short Papers)

R. Horton. "Loss Calculations of Coupled Microstrip Lines (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 359-360.

Loss calculations have been performed to yield useful data relevant to the complementary odd and even modes propagating along a pair of identical coupled microstrip lines. The calculations are based on methods applied to the single-line case and indicate substantial differences in attenuation occurring between the odd and even modes for particular geometries.



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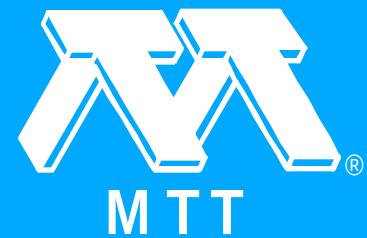


Abstracts

Microwave Four-Mirror Ring Resonator (Short Papers)

P.F. Checcacci, R. Falciai and A.M. Scheggi. "Microwave Four-Mirror Ring Resonator (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 361-362.

Experiments on an X-band four-mirror ring resonator are described. Measured frequency spacing and quality factor values are given. Clockwise and counterclockwise circulating modes are excited with different amplitudes. Fundamental mode patterns are shown across the circulating beam and across a mirror. They indicate that such modes are similar to those of a two-mirror Fabry-Perot (FP) resonator.



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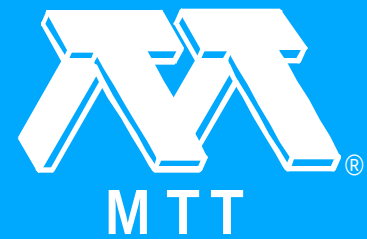


Abstracts

Beam Waveguides with Minimized Dielectric Structures (Short Papers)

P.F. Checcacci, R. Falciai and A.M. Scheggi. "Beam Waveguides with Minimized Dielectric Structures (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 362-363.

An experimental study of dielectric beam waveguides with minimized dielectric structure is presented. Such structures are derived from the square-frame beam waveguide described elsewhere. The experimental results show that even very much reduced structures maintain guiding properties. In particular, the helix structure results are competitive with the complete-frame beam waveguide.



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Abstracts

Errors in S_{11} Measurements Due to the Residual Standing-Wave Ratio of the Measuring Equipment (Comments)

R.W. Beatty and G.E. Schafer. "Errors in S_{11} Measurements Due to the Residual Standing-Wave Ratio of the Measuring Equipment (Comments)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 364-364.

In the above paper, we are concerned that an unsuspecting reader might conclude from the wording in its acknowledgment that we endorse the analysis and conclusions of the authors. This is not the case.



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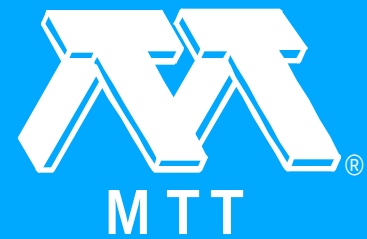
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A Transmission Line Taper of Improved Design (Correction)

D. Kajfez and J.O. Prewitt. "A Transmission Line Taper of Improved Design (Correction)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 364-364.

The optimum tapered transition formulated by Klopfenstein fails to meet the end values of impedance when the transformation ratio is large. A minor correction of Klopfenstein's formula corrects the inconvenience.

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Abstracts

A Program Using the Successive Extrapolated Relaxation (SER) Method to Solve Laplace's Equation (Computer Program Descriptions)

W. Kinsner and E. Della Torre. "A Program Using the Successive Extrapolated Relaxation (SER) Method to Solve Laplace's Equation (Computer Program Descriptions)." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 365-365.

This program determines fields satisfying Laplace's equation with Dirichlet and/or Neumann boundary conditions. Subroutine SER may be applied to other iterative methods.



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Contributors (May 1973 [T-MTT])

P. Benedek, J.A. Bradshaw, Y.L. Chow, K. Inal, P. Silvester, C. Toker, R.S. Tucker and S.-C. Wu. "Contributors (May 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 365-366.



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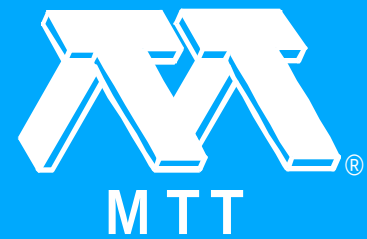
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Information on Computer Program Descriptions (May 1973 [T-MTT])

"Information on Computer Program Descriptions (May 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.5 (May 1973 [T-MTT]): 367-367.



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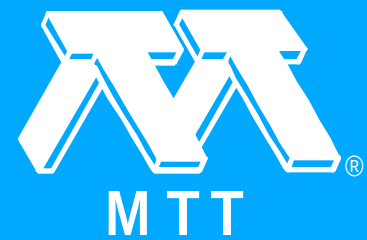
Quenched-Domain Mode Oscillation in Waveguide Circuits

W.R. Curtice. "Quenched-Domain Mode Oscillation in Waveguide Circuits." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 369-374.

An experimental study of pulsed transferred-electron oscillators operating in waveguide circuits is reported. Quenched-domain mode operation is shown to be present for short (less than 20- μm) supercritically doped GaAs samples operating at X-band frequencies (8.2-12.4 GHz) and for bias-voltage values up to six times threshold value. Analysis of the waveguide circuit shows that the chip sees a parallel resonant circuit, and theoretical computations with a sinusoidal voltage waveform are shown to be reasonably accurate. The load admittance presented to the chip is experimentally evaluated.

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On the Optimum Design of Tapered Waveguide Transitions

R.P. Hecken and A. Anuff. "On the Optimum Design of Tapered Waveguide Transitions." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 374-380.

It has been found experimentally that the conventional optimization of waveguide tapers for the interconnection of circular waveguides with different diameters fails if the ratio in the diameters becomes too large. With the aid of an accurate numerical analysis program, the reason for the failure was found to be the reconversion from the unwanted mode to the main mode, which is neglected in all known synthesis procedures. The performance of tapers can be considerably improved by the implementation of other design equations and establishing new design criteria. This results in somewhat longer tapers. Various tapers were designed according to these procedures for a maximum of -40-dB H/sub 02/-mode level between 40 and 110 GHz, and preliminary measurements on fabricated units substantiate the improvement. It is further shown that the mode conversion at cutoff does not exhibit any singularity.

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Calculation of Inductance of Finite-Length Strips and its Variation with Frequency

A. Gopinath and P. Silvester. "Calculation of Inductance of Finite-Length Strips and its Variation with Frequency." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 380-386.

The inductances of finite-length strips over a ground plane are calculated by the Galerkin method. The formulation is in terms of the quasi-static skin-effect equation. The numerical technique used is discussed and sample results are presented.

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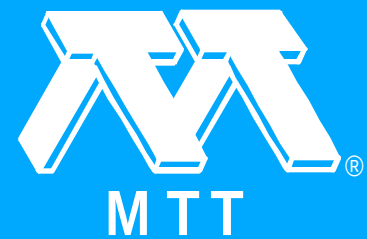


Abstracts

Effect of Upper Sideband Impedance on a Lower Sideband Up-Converter

W.A. Davis and P.J. Khan. "Effect of Upper Sideband Impedance on a Lower Sideband Up-Converter." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 386-392.

An analysis is given of a lower sideband up-converter which includes a finite circuit reactance X_{33} at the upper sideband frequency, in addition to the circuit impedances at the input signal and output lower sideband frequencies. The expressions developed for the gain, gain sensitivity to pump power variation, and noise figure show the extent to which gain and gain sensitivity decrease, and noise figure increases when X_{33} is finite, as compared to the case when X_{33} is infinite. For a simple circuit configuration the gain-bandwidth product changes markedly when X_{33} is small at the center frequency. In addition, when second-harmonic pump power is allowed to flow through the varactor diode, the performance of the lower sideband up-converter can be improved.



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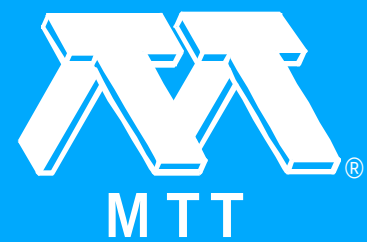
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General Field Theory Treatment of H-Plane Waveguide Junction Circulators

M.E. El-Shandwily, A.A. Kamal and E.A.F. Abdallah. "General Field Theory Treatment of H-Plane Waveguide Junction Circulators." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 392-403.

In this paper an exact field theory treatment for the waveguide junction circulators is presented. The treatment is general, being dependent on neither the geometrical symmetry of the junction nor the number of ports. The electromagnetic fields in the joining waveguides are written in the form of infinite summation of waveguide modes. The solutions of the wave equations in the ferrite rod and in the surrounding air are obtained in the form of infinite summation of cylindrical modes. The fields at the ferrite air interface and at an imaginary boundary chosen arbitrarily between the air region and the waveguides are then matched. This process leads to an infinite system of nonhomogeneous equations in the field amplitudes. Three types of waveguide junction circulators using this technique are analyzed: the simple ferrite-rod Y junction, the simple ferrite-rod T junction, and the latching Y junction. Point-matching techniques are used to get numerical results for the field distributions and the circulator characteristics. Excellent agreement has been found between the published experimental measurements and the numerical results obtained by this technique.

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Equivalent Circuit for Partially Dielectric-Filled Rectangular-Waveguide Junctions

C.T.M. Chang. "Equivalent Circuit for Partially Dielectric-Filled Rectangular-Waveguide Junctions." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 403-411.

The problem of electromagnetic-wave propagation in junctions between two symmetrically, partially dielectric-filled waveguides was investigated, and the solution is presented in the form of a two-port equivalent circuit. This equivalent circuit includes an ideal 1:1 transformer, which is connected to transmission lines with impedances equal to those of the two waveguides, in cascade with a T network. Elements of the T network and the characteristic wave impedances of these partially dielectric-filled waveguides have been studied, and the results are presented in graphs for different dielectric constants, slab thicknesses, and operating frequencies.

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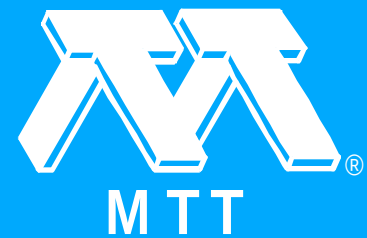


Abstracts

A Mathematical Model of a Varactor Package in Microstrip Line (Short Papers)

J. Cohen and M. Gilden. "A Mathematical Model of a Varactor Package in Microstrip Line (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 412-413.

Modeling of special configurations in microstrip becomes very important where computer-aided design is to be used. In order to develop the full capacity of the Gunn diode, the circuit must be understood. The following presentation concerns development of a model for a diode package mounted in a shunt configuration so that impedances can be referred to the semiconductor chip.



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Abstracts

The Impedance and Scattering Properties of a Perfectly Conducting Strip Above a Plane Surface-Wave System (Short Papers)

E.S. Gillespie and F.J. Kilburg. "The Impedance and Scattering Properties of a Perfectly Conducting Strip Above a Plane Surface-Wave System (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 413-419.

The impedance and scattering properties of a perfectly conducting strip above a dielectric-coated conducting plane is investigated both theoretically and experimentally. An integral equation for the induced current is presented and solved numerically using a point-matching technique. The values of the reflection and transmission coefficients are calculated from the computed current distributions. The results of the computations are compared to the measured values and the agreement is quite good. In addition the impedance and fractions of power reflected, radiated, and transmitted are computed and displayed graphically.



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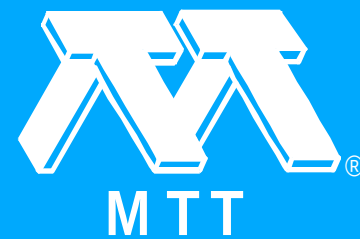


Abstracts

Experimental Gain and Noise Parameters of Microwave GaAs FET's in the L and S Bands (Short Papers)

A. Anastassiou and M.J.O. Strutt. "Experimental Gain and Noise Parameters of Microwave GaAs FET's in the L and S Bands (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 419-422.

The design of microwave amplifiers with GaAs FET's assumes the knowledge of the four gain and the four noise parameters as a function of the biasing conditions. The gain parameters at three different bias conditions have been calculated by computer from the measured scattering parameters. The noise figures as a function of the same bias conditions have also been measured. The four fundamental noise parameters have been determined. The GaAs FET's are units from Plessey (England). At present, these are the only units which are commercially available.



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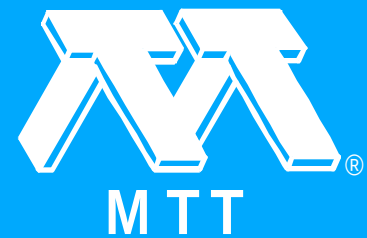


Abstracts

State-Space Analysis of a Magnetically Tuned IMPATT Oscillator Lumped Model (Short Papers)

I.J.H.S. Moore and J.A.C. Stewart. "State-Space Analysis of a Magnetically Tuned IMPATT Oscillator Lumped Model (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 422-425.

One method of frequency modulating an IMPATT-diode oscillator uses a ferrite whose susceptibility is a function of applied dc magnetic field. Octave band tuning of Gunn oscillators using yttrium garnet (YIG) has been reported by several authors. YIG comprised the principal energy-storage element apart from active device. For applications requiring relatively small frequency deviations (500 MHz), a YIG sphere can be used to perturb resonant frequency of the oscillator cavity, and hence to vary oscillation frequency. This short paper describes the derivation analysis of a lumped model of the YIG tuned cavity IMPATT oscillator.



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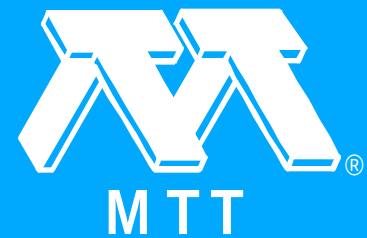


Abstracts

A Magnetically Tunable Microstrip IMPATT Oscillator (Short Papers)

B. Glance. "A Magnetically Tunable Microstrip IMPATT Oscillator (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 425-426.

Magnetically tunable resonators have been constructed in microstrip on a ferrite substrate. A large tuning range is obtained with an external magnetic field applied in the direction of the RF propagation, 17 MHz/Oe for magnetic fields from 0 to 30 Oe. A variable frequency microstrip oscillator which uses this effect is described; measurements made on an X-band IMPATT oscillator illustrate a tuning range from 9.4 to 10.5 GHz with an output power of 330 mW $\pm$ 0.5 dB.



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Abstracts

Double-Amplification Mode Maser (Short Papers)

S. Dmitrevsky and P.C. Kremer. "Double-Amplification Mode Maser (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 426-427.

A chromium-doped rutile traveling-wave maser utilizing simultaneously two signal frequency transitions has been designed and a prototype section tested.



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Abstracts

The Electrical Characterization of a Right-Angled Bend in Microstrip Line (Short Papers)

R. Horton. "The Electrical Characterization of a Right-Angled Bend in Microstrip Line (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 427-429.

An approach to the solution of the equivalent electrical length, and the additional capacitance, associated with a right-angled bend in microstrip line are outlined. The calculations were performed under static assumptions, corresponding to a quasi-TEM mode of propagation of the fields. Although little theoretical work existed for comparison at the time of writing, encouraging reinforcement was gained with experimental results cited from the literature.



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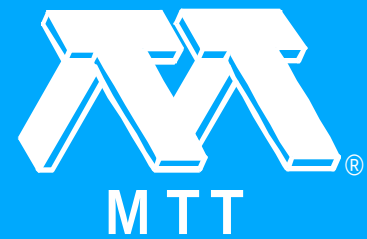


Abstracts

A Numerical Observation on the Self-Oscillating Tunnel-Diode Mixer (Short Papers)

C. Toker. "A Numerical Observation on the Self-Oscillating Tunnel-Diode Mixer (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 430-431.

The anomalous behavior previously observed in a self-oscillating tunnel-diode mixer has been analyzed numerically. The theoretical results obtained explain the phenomena of the corresponding conversion loss becoming infinite when the oscillation magnitude of a self-oscillating tunnel-diode mixer is maximum.



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A New Method for Calculating the Capacitance of a Circular Disk for Microwave Integrated Circuits (Short Papers)

T. Itoh and R. Mittra. "A New Method for Calculating the Capacitance of a Circular Disk for Microwave Integrated Circuits (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 431-432.

A method for calculating the capacitance of a circular disk on a dielectric substrate backed by a ground plane is presented. Hankel transforms and Galerkin's method are used to derive the expression for the capacitance. Numerical results are compared with the experimental data and good agreement is reported.



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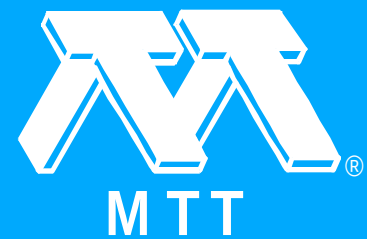


Abstracts

Analysis of Automatic Homodyne Method Amplitude and Phase Measurements (Comments)

G.E. Schafer. "Analysis of Automatic Homodyne Method Amplitude and Phase Measurements (Comments)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 432-432.

In the above short paper, on page 623, the authors state: "Phase quadrature between the homodyne and the modulated carriers produces a null in the detector output.... " This is only true if the modulated carrier is completely suppressed, which is the ideal case discussed by Robertson. Inspection of the phasor when the carrier is not suppressed, as in Schafer, shows that the null is produced when the modulated carrier is in phase quadrature with the resultant of the homodyne and modulated carriers. The error introduced by the authors' assumption of quadrature conditions varies from less than 0.01° for a 90-dB ratio to 90° for equality of the two signals. In most applications this error is less than 0.6° (40 dB or greater ratio), and for moderate accuracies it can be ignored. For more precise measurements, however, one must use the resultant and modulated carrier in phase-quadrature analysis.



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Abstracts

Program for Investigating Minimax Optimality Conditions (Computer Program Descriptions)

J.W. Bandler and T.V. Srinivasan. "Program for Investigating Minimax Optimality Conditions (Computer Program Descriptions)." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 433-433.

This program is a package of subprograms which investigates the optimality of a design or a proposed solution to an approximation problem in the minimax sense.



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Abstracts

Contributors (Jun. 1973 [T-MTT])

E.A.F. Abdallah, A. Anuff, C.T.M. Chang, W.R. Curtice, W.A. Davis, M.E. El-Shandwily, A. Gopinath, R.P. Hecken, A.A. Kamal, P.J. Khan and P. Silvester. "Contributors (Jun. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.6 (Jun. 1973 [T-MTT]): 434-435.



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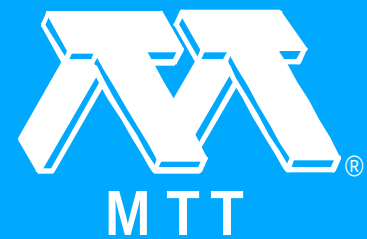


Abstracts

A New Technique for Synthesis of Broad-Band Parametric Amplifiers

G.R. Branner and S.-P. Chan. "A New Technique for Synthesis of Broad-Band Parametric Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 437-444.

A new synthesis technique for providing precise design values for the realization of broad-band parametric amplifiers incorporating practical varactor diode models is presented. The method provides the designer considerable flexibility in choosing the topology of matching networks employed. An integral part of the synthesis scheme is the application of a least-squares optimization procedure which employs exact partial derivatives of the objective function. The partial derivatives are used in the optimization to compute the gain sensitivity of the amplifier with respect to all matching network and diode parameters. For the first time, sensitivity data is presented which quantitatively shows the effect of the device and matching network parameter variations on overall amplifier response. This permits the determination of critical parameters and provides a means for establishing tolerances for various circuit parameters. In comparison with conventional procedures, significantly improved broad-band designs are shown to result.



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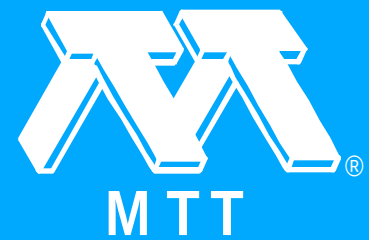
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An Octave-Band Switched-Line Microstrip 3-b Diode Phase Shifter

R.P. Coats. "An Octave-Band Switched-Line Microstrip 3-b Diode Phase Shifter." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 444-449.

The design of an octave-band (2.5-5.0-GHZ) switched-line diode phase shifter is described. An analysis showing the need for a choice of the shunt-diode switch configuration for broad-band operation is presented. Curves of even- and odd-mode impedance of parallel coupled microstrip lines employed in Schiffman differential phase shifters are presented. The configuration and performance characteristics of the phase shifter are described.

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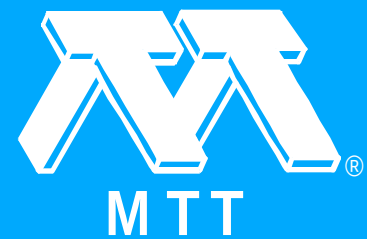


Abstracts

Propagation Modes, Equivalent Circuits, and Characteristic Terminations for Multiconductor Transmission Lines with Inhomogeneous Dielectrics

K.D. Marx. "Propagation Modes, Equivalent Circuits, and Characteristic Terminations for Multiconductor Transmission Lines with Inhomogeneous Dielectrics." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 450-457.

The theory of wave propagation on lossless multiconductor transmission lines with inhomogeneous dielectrics is developed using matrix analysis. The treatment is concise and complete and has the advantage of identifying propagation modes in a way that permits straightforward physical interpretation. The equivalent circuit for the general line is derived and its application to the solution of wave problems with reflections is demonstrated. Special consideration is given to the problem of characteristically terminating a multiconductor line, i.e., terminating without reflections. The realizability of such a characteristic termination network is discussed, and proofs of realizability are given for the important cases of all lines with homogeneous dielectrics and all three-conductor lines, regardless of dielectric inhomogeneities. Symmetric three-conductor lines are discussed to exemplify the general theory, and an application to the problem of mode conversion on symmetric and asymmetric shielded strip lines is given.



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Excess Losses in H-Plane Loaded Waveguides

F.E. Gardiol and O. Parriaux. "Excess Losses in H-Plane Loaded Waveguides." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 457-461.

The attenuation in a waveguide partially filled with absorbing material can become larger than that of the same waveguide completely filled with that same material. Theoretical and experimental results are presented together with field distributions showing that this excess loss is due to a large concentration of electric field within the lossy dielectric in the partially filled configuration.

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Abstracts

Analysis of Thick Rectangular Waveguide Windows with Finite Conductivity

R.J. Luebbers and B.A. Munk. "Analysis of Thick Rectangular Waveguide Windows with Finite Conductivity." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 461-468.

The modal analysis method is used to calculate the reflection and transmission properties of a thick rectangular window centrally located in a rectangular waveguide. Excellent agreement is obtained between calculated and measured values for windows of intermediate thickness. For thicker windows made of finitely conducting materials, the results obtained using perfectly conducting waveguide modes are inaccurate. However, by modifying the modes so as to include some of the mode-coupling effects caused by the surface currents, good agreement between calculated and measured data is obtained for a very thick, finitely conducting window.



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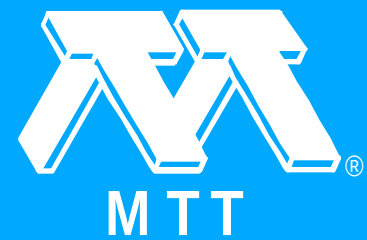
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Negative TEO-Diode Conductance by Transient Measurement and Computer Simulation

H.L. Hartnagel and M. Kawashima. "Negative TEO-Diode Conductance by Transient Measurement and Computer Simulation." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 468-477.

A new method based on slow microwave transients due to steep bias-voltage steps gives a detailed negative-device-conductance function versus microwave-voltage amplitude $V_{\text{sub ac}}$ for Gunn diodes. Measurements of GaAs and InP devices made by different fabrication processes as used by a variety of manufacturers show that basic differences in behavior exist. Some of these are representative of high switching speeds and others of good steady-state efficiencies. Computer simulation of Gunn devices with a range of mobility and ionized-donor density profiles oscillating in a suitable resonant structure leads to similar differences in negative-conductance functions. A first correlation between experimental and theoretical behavior is attempted, and it is possible to estimate the mobility and carrier-density profiles which could most likely be responsible for a certain device behavior. It is shown that an external locking signal affects the device's negative conductance only for small values of $V_{\text{sub ac}}$, and experimental results confirm that this, in accordance with theoretical expectation, increases the switching speed only of certain types of diodes.

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Abstracts

An Experimental Study of Stabilized Transferred-Electron Amplifiers

A.K. Talwar and W.R. Curtice. "An Experimental Study of Stabilized Transferred-Electron Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 477-481.

Experimental data are presented to describe various characteristics of stabilized transferred-electron amplifiers. The effect of bias voltage upon RF gain and linearity is shown. The conditions under which gain expansion is observed are described, and the importance of lattice temperature and RF signal strength in determining dc current is shown. All results are shown to be in good agreement with the large-signal theory for these amplifiers.



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Abstracts

A Circular Waveguide "Hybrid-T" and its Applications (Short Papers)

A.K. Jain and G.P. Srivastava. "A Circular Waveguide "Hybrid-T" and its Applications (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 482-483.

A hybrid junction consisting of two mutually perpendicular rectangular waveguides, the broader side of one rotated through $\pi/2$, connected orthogonally to a circular waveguide, has been designed and its properties studied. The junction has many useful applications as a variable power divider, duplexer, tuner, and an element of an impedance bridge.



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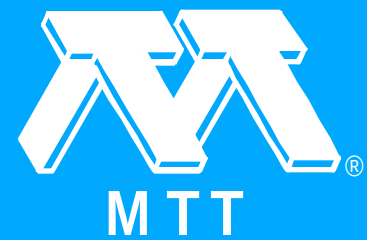
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Characteristics of a Microstrip Two-Meander Ferrite Phase Shifter (Short Papers)

W.M. Libbey. "Characteristics of a Microstrip Two-Meander Ferrite Phase Shifter (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 483-487.

A derivation for the image impedance of a microstrip line with one basic meander is presented. This shows a bandpass characteristic. A new simple technique is followed in designing a two-meander line on a G500 ferrite substrate. Scattering measurements (S-band) made on a model show excellent agreement with theory. Measured nonreciprocal differential phase shift is shown.

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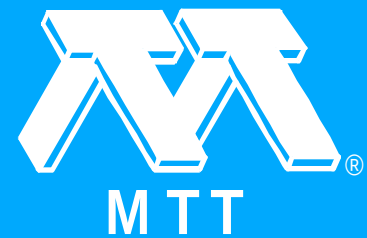


Abstracts

Mode Chart for Microstrip Ring Resonators (Short Papers)

Y.S. Wu and F.J. Rosenbaum. "Mode Chart for Microstrip Ring Resonators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 487-489.

A universal mode chart for the microstrip ring resonator, based on a radial waveguide model, is presented. The resonant frequency is related to the width of the ring conductor. Experimental results from 4 to 16 GHz are shown to be in good agreement with the theory.



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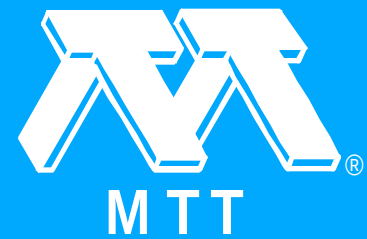


Abstracts

Solution to Waveguide Problems by Successive Extrapolated Relaxation (Short Papers)

E. Della Torre and W. Kinsner. "Solution to Waveguide Problems by Successive Extrapolated Relaxation (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 490-491.

A successive extrapolated relaxation (SER) technique has been developed to solve elliptic partial difference equations iteratively. SER is more efficient than optimized successive over-relaxation (SOR) and permits useful solutions of waveguide modes using finite difference methods.



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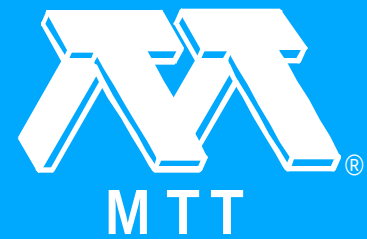


Abstracts

Highly Stabilized IMPATT Oscillators at Millimeter Wavelengths (Short Papers)

S. Nagano and S. Ohnaka. "Highly Stabilized IMPATT Oscillators at Millimeter Wavelengths (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 491-492.

Highly stabilized IMPATT oscillators at millimeter wavelengths have been developed. The IMPATT diode is mounted in the coaxial-waveguide circuit at the detuned open position, and is series-resonant at the design frequency. The frequency stability and power output of $\pm 5 \times 10^{-5}$ / $\pm 20^\circ\text{C}$ and 50 mW, respectively, have been obtained at 80 GHz.



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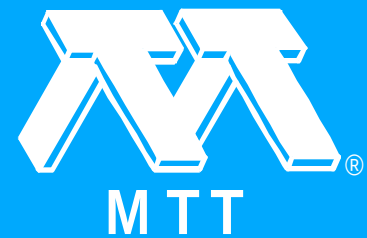


Abstracts

Channel Multiplexing Network for a 20-GHz Radio-Relay Transmission System (Short Papers)

I. Ohtomo, K. Yamada and T. Nunotani. "Channel Multiplexing Network for a 20-GHz Radio-Relay Transmission System (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 492-494.

The Nippon Telegraph and Telephone Public Corporation (NTT) plans to make a field test for the practical application of the 20-GHz radio-relay transmission system. This short paper describes channel multiplexing-demultiplexing networks fabricated for use in this test. Overall loss of the network constructed by three stages, namely, a Vertical-horizontal (V-H) polarizing filter, a transmit-receive filter, and a channel-dropping filter, is 5 dB, even though a 2-dB loss of a flexible waveguide is included.



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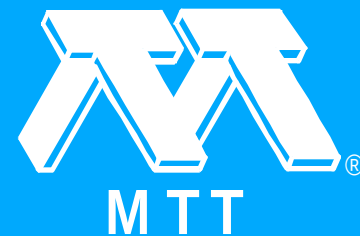


Abstracts

A Potential Theory Method for Covered Microstrip (Short Papers)

A. Farrar and A.T. Adams. "A Potential Theory Method for Covered Microstrip (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 494-496.

Matrix methods are used to analyze the properties of covered microstrip. The Green's function is calculated by a potential theory method assuming the TEM mode of propagation. Computed impedance values of covered microstrip agree closely with other experimental and theoretical data. The technique is a general one and can be used to treat multiple-layer and covered microstrip.



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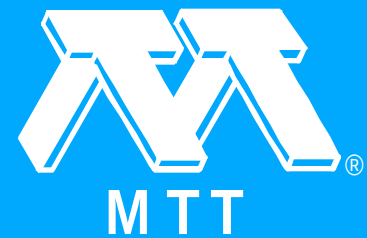


Abstracts

Spectral-Domain Approach for Calculating the Dispersion Characteristics of Microstrip Lines (Short Papers)

T. Itoh and R. Mittra. "Spectral-Domain Approach for Calculating the Dispersion Characteristics of Microstrip Lines (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 496-499.

The boundary value problem associated with the open microstrip line structure is formulated in terms of a rigorous, hybrid-mode representation. The resulting equations are subsequently transformed, via the application of Galerkin's method in the spectral domain, to yield a characteristic equation for the dispersion properties of the open microstrip line. Numerical results are included for several different structural parameters. These are compared with other available data and with some experimental measurements.



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Ridged Waveguide for Planar Microwave Circuits (Short Papers)

R.O.E. Lagerlof. "Ridged Waveguide for Planar Microwave Circuits (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 499-501.

A TE-mode planar transmission line is analyzed. It has a cross section as a ridged waveguide where the ridges are very thin. It is easily fabricated by photoetching of copper-clad dielectric boards, but can also be made without dielectrics for low-loss applications. Thus, it can be integrated together with other planar transmission lines like, for example, striplines. Besides the simplicity in feeding by stripline, the guide can be made smaller than an ordinary rectangular waveguide. It has applications in filters, resonators, balun-transitions, antenna feeds, etc. The characteristic impedance of the transmission line and its free-space cutoff wavelength are calculated and given in a diagram.

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Abstracts

An Approximate Comparison Between n⁺-p-p⁺ and p⁺-n-n⁺ Silicon TRAPATT Diodes (Short Papers)

G.I. Haddad, C.M. Lee and W.E. Schroeder. "An Approximate Comparison Between n⁺-p-p⁺ and p⁺-n-n⁺ Silicon TRAPATT Diodes (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 501-502.

The difference in the ionization rates of holes and electrons in Si results in different properties of n⁺-p-p⁺ and p⁺-n-n⁺ TRAPATT diodes. An approximate analysis is presented which shows these differences and indicates superior performance in the n⁺-p-p⁺ structure.



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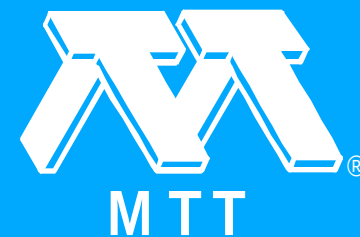
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Contributors (Jul. 1973 [T-MTT])

G.R. Branner, S.-P. Chan, R.P. Coats, W.R. Curtice, F.E. Gardiol, H.L. Hartnagel, M. Kawashima, R.J. Luebbers, K.D. Marx, B.A. Munk, O. Parriaux and A.K. Talwar. "Contributors (Jul. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.7 (Jul. 1973 [T-MTT]): 503-505.



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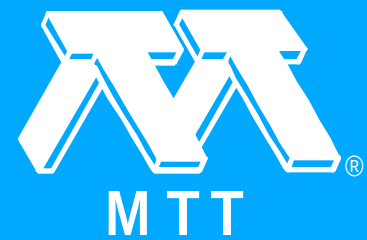
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Linear Signal Processing by Acoustic Surface-Wave Transversal Filters

C. Atzeni and L. Masotti. "Linear Signal Processing by Acoustic Surface-Wave Transversal Filters." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 505-519.

The impulse response of acoustic surface-wave (ASW) filters is determined by the configuration of an array of planar transducers tapping the acoustic signal propagated in the piezoelectric substrate. The transducer configuration is derived here by applying the general procedure used for the synthesis of linear transversal filters, which consists in time sampling the required impulse response and arranging the spacing and weights of the taps according to the time intervals and amplitudes of the impulse-response samples. The design of the tapping structure that synthesizes the impulse response of ASW transversal filters is based on a nonuniform sampling procedure, previously developed by the authors, that meets the particular requirements of ASW device operation. The features of this design procedure are presented, and several geometries of tapping transducers corresponding to impulse responses of different characteristics are discussed. The application of the procedure to the design of typical ASW filters is illustrated by the results of experimental models.

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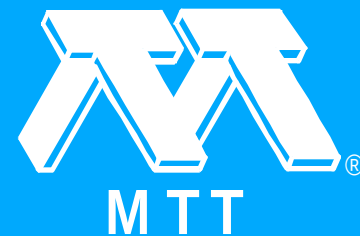


Abstracts

A Generalized Design Technique for Practical Distributed Reciprocal Ladder Networks

R. Levy. "A Generalized Design Technique for Practical Distributed Reciprocal Ladder Networks." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 519-526.

A generalized design approach is presented for ladder networks consisting of a cascade of constituent two-port networks connected by short lengths of transmission lines. The design is made possible by the derivation of simple equations which define the inverter impedance and associated reference planes of any passive lossless reciprocal two-port. This enables the general ladder network to be equated to a prototype network at a reference frequency. An example is given of the design of a coaxial low-pass filter where fringing capacitances are compensated automatically.



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Abstracts

Tapered Corrugated Waveguide Low-Pass Filters

R. Levy. "Tapered Corrugated Waveguide Low-Pass Filters." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 526-532.

Several new synthesis techniques are described for the design of tapered corrugated waveguide low-pass filters. Previous techniques are based on image-parameter methods which are both nonoptimum and difficult to apply to new specifications. The new synthesis methods give filters which can be constructed to work directly from dimensions generated by a computer. The impedance tapering implies that the terminating impedance transformers used in the image-parameter designs may be either eliminated or reduced in length.



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Frequency Response of Quarter-Wave Coupled Reciprocal Stripline Junctions

J. Helszajn. "Frequency Response of Quarter-Wave Coupled Reciprocal Stripline Junctions." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 533-537.

The frequency response of quarter-wave coupled reciprocal 3-port symmetrical junctions for which the reference eigennetwork appears as a short circuit at the reference terminals is presented. The equivalent circuit of such reciprocal junctions is constructed in terms of the reciprocal parts of the split admittance eigenvalues of the ideal 3-port circulator. Since the two circuits are related, the element values selected for the matching networks are the ones which apply to an ideal circulator with an overall Chebyshev response. This is done for $n = 1, 2$, and 3 . An important conclusion of this paper is that the design of wideband circulators is closely related to the design of wideband reciprocal 3-port junctions. The paper includes experimental results obtained on a stripline device in its magnetized and demagnetized states.

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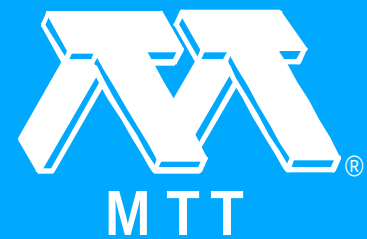


Abstracts

High-Order Finite Elements for Inhomogeneous Acoustic Guiding Structures

G.O. Stone. "High-Order Finite Elements for Inhomogeneous Acoustic Guiding Structures." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 538-542.

Silvester's high-order finite-element formulation for potential problems is extended to enable the analysis of acoustic wave propagation in lossless isotropic, uniform, and inhomogeneous guiding structures. The formulation allows a large class of problems to be solved using elements of any desired order, with only minimal computer coding. Three examples are cited---one involving a simple homogeneous region having an analytic solution, and two inhomogeneous problems. Good agreement with other methods and with limiting cases is obtained in each case.



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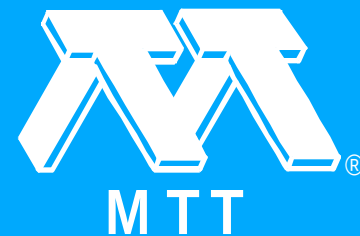


Abstracts

Phase and Loss Characteristics of High Average Power Ferrite Phasers (Short Papers)

J.L. Allen. "Phase and Loss Characteristics of High Average Power Ferrite Phasers (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 543-544.

An analysis is presented of the propagation characteristics of some waveguide latching ferrite phaser structures useful for high average power applications. Calculated results show the effects on the loss and differential phase shift of adding vertical slab or T-shaped cooling structures of dielectrics, such as beryllium oxide and boron nitride. Typical design data are presented.



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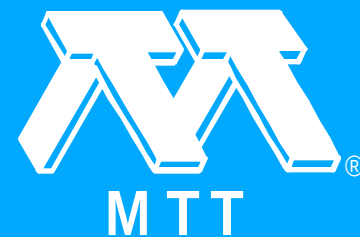


Abstracts

Low-Noise Microwave Down-Converter with Optimum Matching at Idle Frequencies (Short papers)

G.B. Stracca, F. Aspesi and T. D'Arcangelo. "Low-Noise Microwave Down-Converter with Optimum Matching at Idle Frequencies (Short papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 544-547.

A low-noise balanced down-converter for microwave radio-link applications is described. Down-converters of this type have been realized with typical noise figures of 3.5 dB at 4 GHz, 4 dB at 7 GHz, and 5 dB at 13 GHz. These results are obtained mainly by taking into account high order sideband frequencies of the pump harmonics up to the third, by properly terminating the image frequency, by matching the input port of the mixer and by optimizing the mixer-preamplifier interface. The experimental results are compared with the theoretical ones obtainable with ideal purely resistive diodes.



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Matching Considerations of Lossless Reciprocal 5-Port Waveguide Junctions (Short Papers)

A.L. Hieber and R.J. Vernon. "Matching Considerations of Lossless Reciprocal 5-Port Waveguide Junctions (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 547-552.

Some of the restrictions imposed on general 5-port junctions (or networks) by losslessness and reciprocity are discussed as well as considerations of restrictions due to physical symmetry. It is proven that if a lossless reciprocal 5-port junction (or network) is completely matched, then all off-diagonal elements of the scattering matrix are nonzero; i.e., if the junction is matched, no port is decoupled from any of the others. It is also shown that all off-diagonal scattering coefficients of a lossless reciprocal 5-port junction (or network) have a magnitude of one half if and only if the junction is completely matched. Those physical symmetries which preclude complete matching of 5-port junctions are given and a general theorem concerning the matching of junctions and physical symmetry is proven.

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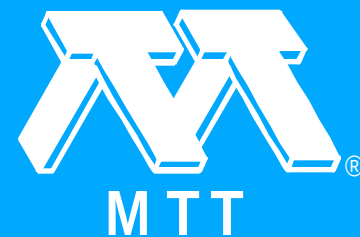


Abstracts

Faster Impedance Estimation for Coupled Microstrips with an Overrelaxation Method (Short Papers)

R. Daumas, D. Pompei, E. Rivier and A. Ros. "Faster Impedance Estimation for Coupled Microstrips with an Overrelaxation Method (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 552-556.

Using the Frankel-Young method, fast estimation of the potential distribution for a microstrip structure is obtained when an accelerating factor ω is introduced in the finite-differences (relaxation) method. It is possible to calculate such a factor by an iterative technique, but the time of computation needed to find ω annihilates the theoretical gain. In this short paper, the authors present a method which gives an analytical expression for ω . The realistic case examined here, as an illustration, is that of the suspended microstrip couplers for which odd and even impedances are the interesting parameters. Given an analytical expression for ω , the overrelaxation method appears as a very powerful and attractive method for finding the solution of any type of microstrip structure.



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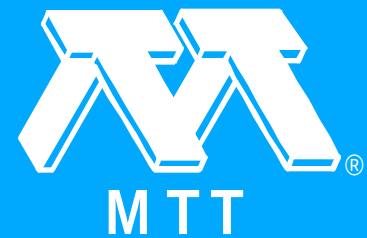


Abstracts

On Uniform Multimode Transmission (Short Papers)

C.R. Paul. "On Uniform Multimode Transmission (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 556-558.

In a recent short paper, a method for constructing solutions to the classical uniform multiwire transmission-line equations was given which was intended to include the case of partial eigenvalue degeneracy. This development appears to be incorrect and a correct development will be given. In addition, a complete method for constructing the matrix chain parameters of a section of line will be presented.



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On the Surface-to-Bulk Mode Conversion of Rayleigh Waves (Short Papers)

C.-P. Chang and H.-S. Tuan. "On the Surface-to-Bulk Mode Conversion of Rayleigh Waves (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 558-560.

The surface-to-bulk wave conversion phenomena occurring at a discontinuity characterized by a surface contour deformation may be used as a means for tapping Rayleigh waves in a nonpiezoelectric solid. For this purpose, the mode conversion problem is treated in this short paper with the use of a boundary perturbation technique. A systematic procedure is obtained to calculate not only the first-order scattered waves which include the reflected surface wave and the converted bulk wave, but also the higher order terms. With careful design of the surface contour, the converted bulk-wave power and the direction of propagation into the substrate may be controlled.

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Abstracts

Coupling Errors in Cavity-Resonance Measurements on MIC Dielectrics (Short Papers)

P.H. Ladbrooke, M.H.N. Potok and E.H. England. "Coupling Errors in Cavity-Resonance Measurements on MIC Dielectrics (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 560-562.

Measurements on MIC dielectrics have been made by applying the theory of resonant cavities to either wholly or partly metallized substrates. Two different schemes of coupling are employed, depending upon the metallization. Errors occur in the derived value of epsilon, due to the coupling, and are of opposite sense for the two methods discussed. They may be averaged to improve the overall measurement precision (0.5 percent).



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Abstracts

Equivalent Representation of an Abrupt Impedance Step in Microstrip Line (Short Papers)

R. Horton. "Equivalent Representation of an Abrupt Impedance Step in Microstrip Line (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 562-564.

The equivalent electrical lengths of uniform microstrip line associated with an abrupt impedance step are first evaluated, under static assumptions. The importance of these results in establishing a reference plane for the step, and in the application of calculations of capacitance associated with the step, is then demonstrated. Furthermore, some interesting dualities are discerned from the results.



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Discontinuity Capacitance of a Coaxial Line Terminated in a Circular Waveguide: Part II--Lower Bound Solution (Short Papers)

E.W. Risley, Jr.. "Discontinuity Capacitance of a Coaxial Line Terminated in a Circular Waveguide: Part II--Lower Bound Solution (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 564-566.

This calculation provides a lower bound (complementing the upper bound solution given earlier) to the discontinuity capacitance of a coaxial line terminated in a circular waveguide. A 50- Ω 0.9525-cm (3/4-in) open-circuited coaxial termination with a solid center conductor was fabricated with center- and outer-conductor diameters of 0.82723 ± 0.00005 and 1.90487 ± 0.00005 cm (1 cm=0.393703 in), respectively. The measured value of capacitance of this termination at 1000 Hz was 216.4 ± 1.0 fF, as compared with the calculated lower bound of 215.0 fF. (The upper bound for this case was 217.7 fF.)

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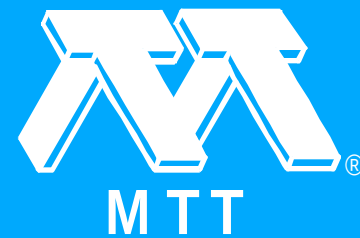


Abstracts

On Inhomogeneously Filled Rectangular Waveguides (Short Papers)

K.F. Cafsey. "On Inhomogeneously Filled Rectangular Waveguides (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 566-567.

A method is given for determining the characteristic equations and field components of the LSE and LSM modes in rectangular waveguides filled with a dielectric which is inhomogeneous in one transverse dimension. The method is exact and yields solutions for a nearly arbitrary variation in permittivity across the waveguide.



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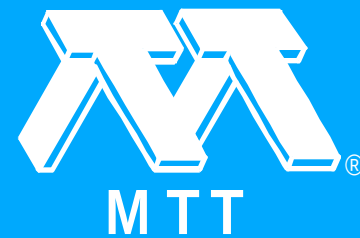


Abstracts

Attenuation and Phase-Shift Coefficients in Dielectric-Loaded Periodic Waveguides (Letters)

B. Minakovic and S. Gokgor. "Attenuation and Phase-Shift Coefficients in Dielectric-Loaded Periodic Waveguides (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 568-568.

Attenuation in a waveguide, periodically loaded with dielectric disk, i.e., partially filled, can be considerably higher than when it is completely filled. For a relatively small dielectric loss, phase coefficients are negligibly affected.



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Abstracts

Calculation of Capacitance Coefficients for a System of Irregular Finite Conductors on a Dielectric Sheet (Comments)

A.B. Birtles and B.J. Mayo. "Calculation of Capacitance Coefficients for a System of Irregular Finite Conductors on a Dielectric Sheet (Comments)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 568-569.

An improvement in Patel's method using triangular conductor subsections is presented.



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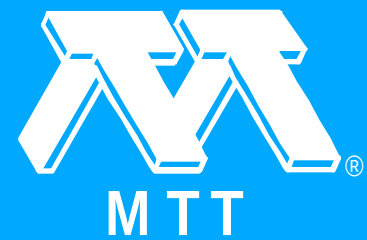
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An Analytical Equivalent Circuit Representation for Waveguide-Mounted Gunn Oscillators (Comments and Authors' Reply)

D.N. Singh, C.P. Jethwa and R.L. Gunshor. "An Analytical Equivalent Circuit Representation for Waveguide-Mounted Gunn Oscillators (Comments and Authors' Reply)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 569-569.

In the above paper, the authors have tried to explain the experimentally observed mode-switching phenomenon in waveguide-mounted Gunn oscillators on the basis of nonlinear behavior of the device. It has been shown in Fig. 6(a) that the device susceptance decreases to zero at 8.18 GHz, as a result of which the condition of oscillation given by (4) cannot be satisfied. This leads to the mode switching observed at this frequency. In our opinion, the device susceptance cannot become zero over the entire frequency band of interest. It is not possible for the dynamic nonlinearities to make the device susceptance go to zero, even at the mode-switching frequency. In fact, the device susceptance will always remain capacitive, while the load susceptance presented to the device chip can become zero, inductive, or capacitive, depending upon the operating frequency and the particular circuit parameters. For steady-state oscillations, the load susceptance presented to the device chip should always be inductive, and the frequency switching may occur once the load susceptance becomes capacitive. However, the load conductance presented to the device chip should also be lower than the device conductance for the steady-state oscillations to build up. It is just possible that the load conductance may be more favorable for $\lambda/4$ mode of operation rather than for $\lambda/2$ mode of operation. This may also cause mode switching, as pointed out by Eisenhart and Khan. It is highly probable that the mode switching is caused by this effect, rather than due to the nonlinearity of the device parameter as pointed out by Jethwa and Gunshor.

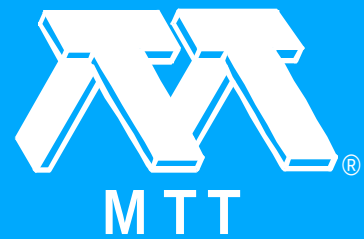


Abstracts

Trigonometric Functions and the Smith Chart (Letters)

J.T. Senise. "Trigonometric Functions and the Smith Chart (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 569-570.

Sines and cosines can be read directly on the Smith chart.



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Abstracts

A Quick Accurate Method to Measure the Dielectric Constant of Microwave Integrated-Circuit Substrates (Comments and Authors' Reply)

P.H. Ladbroke, M.H.N. Potok, E.H. England and J.Q. Howell. "A Quick Accurate Method to Measure the Dielectric Constant of Microwave Integrated-Circuit Substrates (Comments and Authors' Reply)." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 570-571.

If, in the above short paper, the data for open-edged resonators are plotted to a base of $1/\text{spl} \text{ radic}/m^2+n^2$, where (n, m) , characterizes the cavity mode, an excellent comparison is found. Such a plot is given in Fig. 1. It can therefore be asked whether Howell's frequency errors are of reactive origin, not resistive as he suggests. His results do not properly support the notion of resonant frequency change due to radiation loss, since there is no apparent correlation between the mode Q's and the frequency (or dielectric constant) errors for open sidewalls in Table I.



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Abstracts

Contributors (Aug. 1973 [T-MTT])

C. Atzeni, J. Helszajn, R. Levy, L. Masotti and G.O. Stone. "Contributors (Aug. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.8 (Aug. 1973 [T-MTT]): 571-572.



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Electromagnetic Resonances and Q-Factors of Lossy Dielectric Spheres

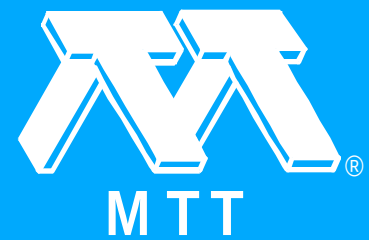
P. Affolter and B. Eliasson. "Electromagnetic Resonances and Q-Factors of Lossy Dielectric Spheres." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 573-578.

A theoretical and experimental study of the electromagnetic resonances of spheres is presented. In particular, the scattering characteristics of spheres inside rectangular waveguides are investigated at and around the resonant frequencies. The approach is based on the scattering theory developed by Mie in 1908. Mie's theory is valid for scattering of a plane electromagnetic wave by a homogeneous and isotropic sphere of arbitrary diameter. It encompasses both lossless and lossy spheres. Three continuous functions of frequency are presented. They contain information on the resonant frequencies, the Q-factors, and the output power losses of the sphere. The effect of losses on the resonant behavior was also studied. The theoretical results were compared to experimental data. The agreement between theory and experiment is excellent. An experimental study of the effect of inhomogeneities and irregularities of the sphere's material and shape was also made.

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End Effect in a Shorted Slot (Short Papers)

J.B. Knorr and J. Saenz. "End Effect in a Shorted Slot (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 579-580.

An investigation of the end effect in a shorted-slot line is described. It is shown that the apparent position of the short is a small fraction of a wavelength beyond the end of the slot. The reactance seen at the end of the slot is, therefore, inductive. Experimental curves are presented which show normalized inductive reactance versus frequency for substrates with $\epsilon_r = 12$ and $\epsilon_r = 20$ for several slot widths.

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Abstracts

Slot Line with Thick Metal Coating (Short Papers)

T. Kitazawa, Y. Fujiki, Y. Hayashi and M. Suzuki. "Slot Line with Thick Metal Coating (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 580-582.

Formulas and curves are given for the phase constant of slot line with metal-coating thickness greater than zero. Change in the phase constant is about a 1-percent decrease even though metal-coating thickness is 2 percent of the slot width.



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Abstracts

Some General Observations on the Tuning Characteristics of "Electromechanically" Tuned Gunn Oscillators (Short Papers)

J.S. Joshi and J.A.F. Cornick. "Some General Observations on the Tuning Characteristics of "Electromechanically" Tuned Gunn Oscillators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 582-586.

The nature of mechanical and electronic (varactor) tuning characteristics of "electromechanically" tuned Gunn oscillators in waveguide and coaxial configurations has been investigated and their interactions studied. Some general conclusions about the family of electromechanically tuned Gunn oscillators have been drawn and their limitations pointed out. It is suggested that these limitations are imposed by a distributed circuit on a point source.



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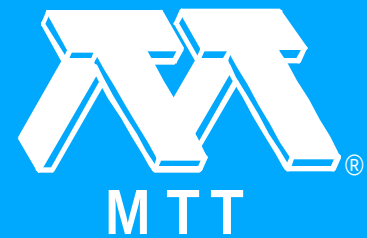


Abstracts

Two Oversize Waveguide-Polarization Diplexers (Short Papers)

J.T. Mendonca. "Two Oversize Waveguide-Polarization Diplexers (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 586-587.

Two new types of quasi-optical waveguide-polarization diplexers are described. They are based on the use of a metal grating, or a dielectric plate at Brewster's angle, placed in an oversize circular 3-port junction. Their performances are measured at a wavelength of 4.28 mm in a standard microwave circuit and at 337 μm with the HCN laser beam.



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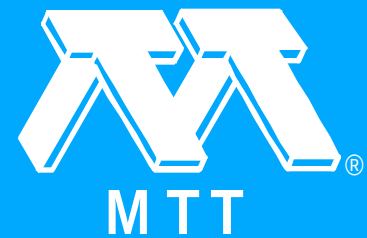


Abstracts

Modified H Guide for Millimeter and Submillimeter Wavelengths (Short Papers)

A. Doswell and D.J. Harris. "Modified H Guide for Millimeter and Submillimeter Wavelengths (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 587-589.

A theoretical and experimental investigation is being made of a modified form of H guide as a possible guided wave structure for millimeter and submillimeter wavelengths. The effects of channels in the conducting planes to support a dielectric film has been studied by scaled-up models at 3-cm wavelength. Low losses, even at the shorter wavelengths, are predicted. The channels may be used to filter unwanted higher order modes, and the use of high-permittivity dielectric is suggested to further reduce the guide attenuation.



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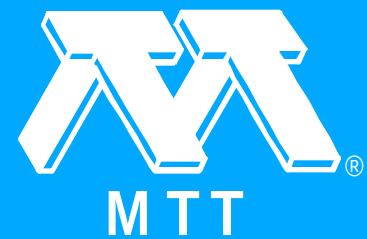


Abstracts

A Simplified Circuit Model for Microstrip (Short Papers)

H.J. Carlin. "A Simplified Circuit Model for Microstrip (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 589-591.

The advantage of a network model for a physical structure is that the model, if correctly established, implicitly contains the physical constraints of the actual system, and these constraints need not subsequently be called into play for every new case. A recent example is the use of coupled lines to model longitudinally uniform but transversely inhomogeneous waveguides. The network model for a cylindrical waveguide loaded concentrically with a dielectric rod comprised a TE and a TM transmission line coupled together, and the properties of this model demonstrated that, surprisingly, the smooth lossless waveguide structure could support complex eigenvalues as well as backward waves. The general network idea stems from Schelkunoff who established that uniform metallic-bound lossless guide structures can be represented by an infinite number of coupled TE and TM transmission lines. The practical approximating network model is obtained by appropriately truncating the infinite Shelkunoff representation.



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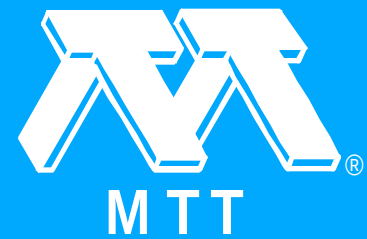


Abstracts

A Small-Signal and Noise Equivalent Circuit for IMPATT Diodes (Short Papers)

M.-S. Gupta. "A Small-Signal and Noise Equivalent Circuit for IMPATT Diodes (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 591-594.

A frequency-independent small-signal equivalent circuit for an IMPATT diode is proposed. It incorporates five circuit elements, including a negative resistance, and is valid over an octave range of frequency. With the addition of two white noise sources it also serves as a noise equivalent circuit.



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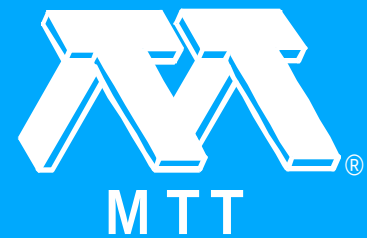


Abstracts

Finite-Boundary Corrections to the Coplanar Waveguide Analysis (Short Papers)

M.E. Davis, E.W. Williams and A.C. Celestini. "Finite-Boundary Corrections to the Coplanar Waveguide Analysis (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 594-596.

Conformal mapping calculations of impedance and effective dielectric constant are presented for coplanar waveguide (CPW) lines with finite-substrate thickness. These calculations and experimental data show a departure from the infinite dielectric approximation as the substrate thickness approaches the guide slot width. The quasi-TEM approximation is retained and calculations of static energy density within the substrate are given. This approximation agrees well with field calculations using a finite-element solution to Laplace's equation.



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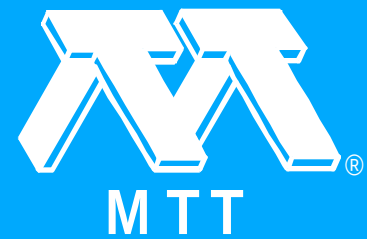


Abstracts

Analysis of Microwave Circuit for Characterization of Negative-Conductance Devices by Transients (Letters)

K. Tomizawa, T. Hariu and H. Hartnagel. "Analysis of Microwave Circuit for Characterization of Negative-Conductance Devices by Transients (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 596-598.

The assumptions required for the transient method of measuring Gunn-diode conductance are shown to be valid if either the diode susceptance or the characteristic admittance of the resonator transmission line are larger than the modulus of the negative conductance of the device.



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Abstracts

Variational Formulation of the Dirichlet Boundary Condition (Comments and Author's Reply)

S. Coen and A. Wexler. "Variational Formulation of the Dirichlet Boundary Condition (Comments and Author's Reply)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 597-598.

In the above paper, (21) does not satisfy Neumann's boundary condition.



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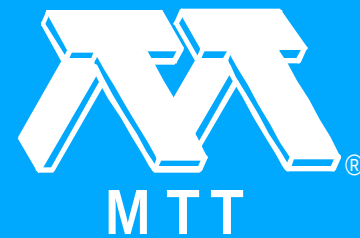


Abstracts

Design Equations for a Class of Wide-Band Bandpass Filters (Correction)

E.G. Cristal. "Design Equations for a Class of Wide-Band Bandpass Filters (Correction)." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 598-598.

In the above short paper, the following corrections should be noted: 1) Table III given here should replace Table III on p. 697. 2) In Table V on p. 698, the denominators of the expressions for Y_{2l} and Y_{n-1l} , should be C_{11l} and C_{NNl} , respectively.



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Abstracts

Contributors (Sep. 1973 [T-MTT])

P. Affolter and B. Eliasson. "Contributors (Sep. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 599-599.



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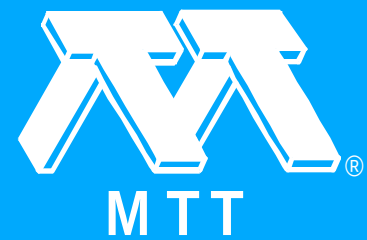
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Abstracts

IEEE Groups and Societies (Advertisement) (Sep. 1973 [T-MTT])

"IEEE Groups and Societies (Advertisement) (Sep. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.9 (Sep. 1973 [T-MTT]): 600-600.



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Normal Transmission-Line Networks and Their Lumped LC Presentation

K.K. Pang. "Normal Transmission-Line Networks and Their Lumped LC Presentation." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 601-607.

A previous result is extended and a new presentation is described for Richards' transmission-line (TL) networks. The new presentation is in a lumped LC form; therefore, classical analysis and synthesis techniques are directly applicable. The class of networks for which this presentation is possible is studied in detail. This class of networks, called normal TL networks, is found to be a necessary and sufficient condition for driving-point immittance functions to be rational positive real functions of $\lambda = \tanh \tau \rho$. The effectiveness of this representation is further demonstrated by applying it to graph-transformation analysis method. It simplifies the procedure considerably and reveals additional physical insight into the TL network.

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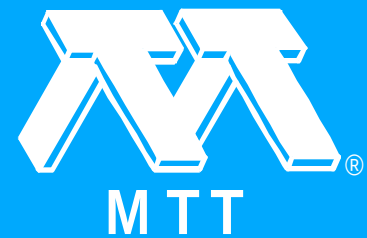


Abstracts

Design of Microwave Filters by Sine-Plane Approach

K.K. Pang. "Design of Microwave Filters by Sine-Plane Approach." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 607-611.

Using a new sine-plane approach, an easy-to-use design procedure for microwave filters is developed. The design formulas are very simple and are valid for filters of wide bandwidths. Furthermore, the new design offers many advantages over other presently available designs.



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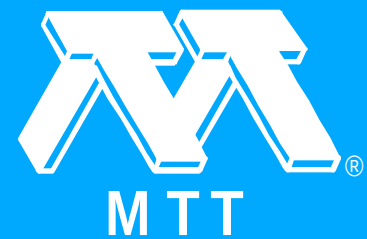


Abstracts

Design of Acoustic Surface-Wave Devices Using an Admittance Formalism

A.S. Burgess and P.H. Cole. "Design of Acoustic Surface-Wave Devices Using an Admittance Formalism." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 611-618.

The advantages of an admittance formalism for the derivation of performance characteristics of transversal filters and one-port information stores using acoustic surface-wave delay lines are described. An expression for the transadmittance between transducer pairs in the weak-coupling approximation is derived using a normal mode theory. The formulation is found to give good agreement with measurements of the passband response of a wide-band logarithmically frequency-tapered transducer pair on YX-quartz. A brief discussion of the limitations of the model is included.



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Nonlinear Behavior and Bias Modulation of an IMPATT Diode Oscillator

C. Chao and G.I. Haddad. "Nonlinear Behavior and Bias Modulation of an IMPATT Diode Oscillator." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 619-630.

Experimental results of the nonlinear behavior of an IMPATT diode oscillator under free-running and bias-modulated conditions are presented and correlated with theoretical results. Amplitude and frequency behavior of a free-running IMPATT diode oscillator such as: 1) power-frequency characteristic, 2) jump and hysteresis, 3) temperature dependence, 4) harmonic content, and 5) electronic tuning characteristics are discussed. The bias-modulation properties and their relation to the free-running behavior are described. The effects of the operating point, external Q, and injection locking on the modulation properties are presented.

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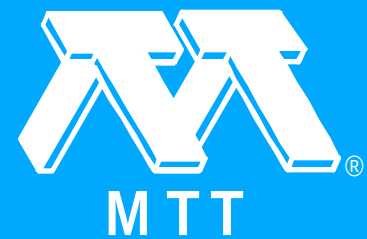


Abstracts

Waveguide and Stripline 4-Port Single-Junction Circulators (Short Papers)

J. Helszajn. "Waveguide and Stripline 4-Port Single-Junction Circulators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 630-633.

The modal and eigenvalue approaches of 4-port single-junction circulators are combined to describe the theory and construction of a waveguide device and a stripline device. The three independent variables used in the case of the waveguide one are a pair of $HE_{\pm 1,1,1}$ open dielectric resonances in a demagnetized ferrite disk, a $TM_{0,1,1}$ resonance on a metal post, and the magnitude of a direct field to remove the degeneracy between the $HE_{\pm 1,1,1}$ modes. The eigenvalue approach is used to establish systematically each condition one at a time. The variables used in the construction of the stripline junction are a pair of radial $n = \pm 3$ degenerate resonances, a radial $n = 0$ resonance, and the amplitude of a direct field to split the degeneracy between the former modes. In this case a circulation condition is found in which it is possible to omit one of the circulation adjustments.



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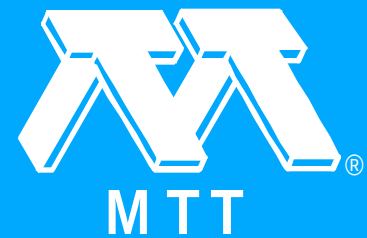


Abstracts

The Circular Waveguide Step-Discontinuity Mode Transducer (Short Papers)

W.J. English. "The Circular Waveguide Step-Discontinuity Mode Transducer (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 633-636.

Power conversion coefficients and the launch phase of propagating modes excited by a symmetric step-discontinuity in circular waveguide are accurately predicted by a modal analysis of the discontinuity which includes only a few evanescent modes. The relative power in transmitted and reflected propagating modes is presented as a function of normalized frequency for two step-discontinuity ratios to indicate typical solution results.



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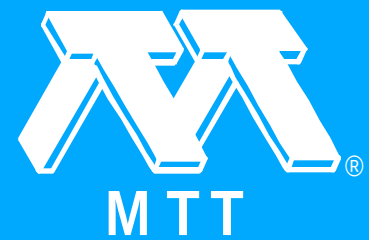
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Radiation Loss from Open-Circuited Dielectric Resonators (Short Papers)

J. Watkins. "Radiation Loss from Open-Circuited Dielectric Resonators (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 636-639.

The Q factor of an open-circuited resonator is influenced by dielectric, conductor, and radiation losses. This short paper discusses these losses and shows that insight into the radiation loss can be obtained by an extension to the analysis given by Lewin. This shows that the radiation loss is a maximum for the dominant mode and that provided the permittivity is not less than 9.0 the radiation losses are at a minimum for the second mode. It is suggested that these results may be applied to the design of filters based on dielectric resonators. The application of the results to stripline resonators in which the dielectric extends past the termination of the upper conducting strip is more difficult, and it is suggested that experimental work is required to investigate postulated improvements. Finally, some of the radiation patterns of the open-circuited dielectric resonators, obtained in this paper, show interesting directional properties which may be applied to the design of antenna systems.

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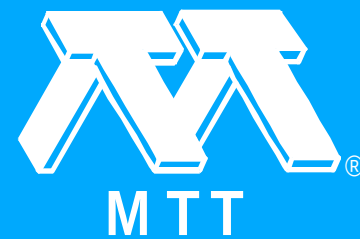


Abstracts

A Numerical Method for the Solution of the Junction of Cylindrical Waveguides (Short Papers)

H. Oraizi and J. Perini. "A Numerical Method for the Solution of the Junction of Cylindrical Waveguides (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 640-642.

In order to solve the waveguide junction problem numerically, we express the fields in the guides by truncated modal expansions and construct an error function which is a measure of the mean-square error in the matching of the boundary conditions at the junction. The minimum of this error leads to a set of linear equations for the modal amplitudes. Offset rectangular waveguides with amplitude and current excitations are studied. A weighting factor which multiplies the error contribution due to the magnetic field is studied, and a criterion for its selection given.



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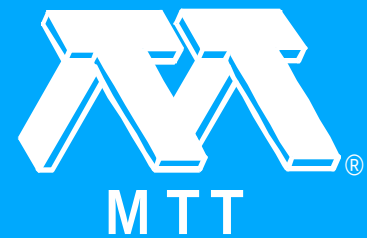


Abstracts

The Effect of Surface Metal Adhesive on Slot-Line Wavelength (Short Papers)

J.B. Knorr and J. Saenz. "The Effect of Surface Metal Adhesive on Slot-Line Wavelength (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 642-644.

An investigation of the dependence of slot-line wavelength upon a thin layer of adhesive between metal and substrate is described. It is shown that the presence of adhesive will cause an increase in wavelength when the dielectric constant of the adhesive is less than that of the substrate. Experimental results are presented which show this dependence for a variety of surfaces and adhesives. A perturbation expression is given which permits correction of experimental data for comparison with theory when this effect occurs.



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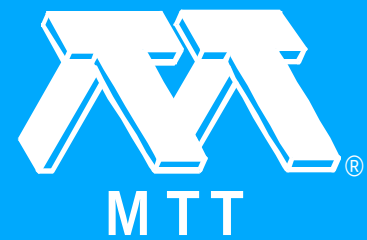


Abstracts

The Limiting Value of the Interaction Between Symmetrical Fringing Capacitances (Short Papers)

H.J. Riblet. "The Limiting Value of the Interaction Between Symmetrical Fringing Capacitances (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 644-647.

It is well known that the fringing capacitances determined for rectangular bars between parallel plates interact with each other when $w/(b - t) \rightarrow 0$. The limit of this interaction as $s \rightarrow 0$ for fixed w , b , and t is determined for symmetrical odd-mode fringing capacitances. This limit, together with an exact value known from one rectangular section and the known asymptotic value as $s \rightarrow 0$, permits one to estimate the values for all s . The same is true for the interaction of the symmetrical even-mode fringing capacitances, except that their interaction is readily shown to tend to zero as $s \rightarrow 0$.



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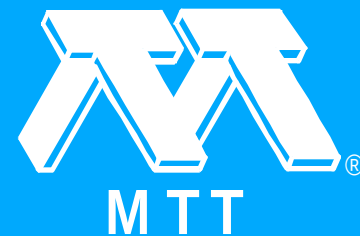


Abstracts

Swept Frequency Impedance Indicator Using Directional Couplers (Short Papers)

S. Egami. "Swept Frequency Impedance Indicator Using Directional Couplers (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 647-648.

A swept frequency impedance indicator which consists of directional couplers and detectors is described. Experimental equipment was made at a 17.5-19.5-GHz band, and successfully operated.



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Abstracts

High-Power Frequency Multiplier Using MIS Varactors (Short Papers)

F. Schumacher. "High-Power Frequency Multiplier Using MIS Varactors (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 648-649.

The experiment described demonstrates the applicability of MIS varactors in microwave power circuits. A frequency doubler with 55-percent overall efficiency and pulsed output power of 5.5 W at 5.4 GHz with a duty cycle of 50 percent has been built by using two MIS varactors in parallel. The multiplier has a coaxial low-pass filter at the input and a waveguide output, allowing a 3-dB bandwidth of 8 percent.



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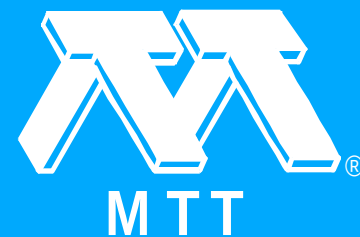


Abstracts

Metallic Frame Beam Waveguide (Short Papers)

P.F. Checcacci and A.M. Scheggi. "Metallic Frame Beam Waveguide (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 649-651.

Experimental tests performed on metallic frame beam waveguides are described. Two types of metallic structures have been considered. The first one constituted by thin annular frames has the same attenuation value as that of an iris beam waveguide (infinite slit) of the same aperture, but presents guiding properties which are polarization sensitive. The second type of a more complex structure is essentially a dielectric frame beam waveguide in which the dielectric of suitable refraction index is simulated by metallic parallel plate waveguide sections.



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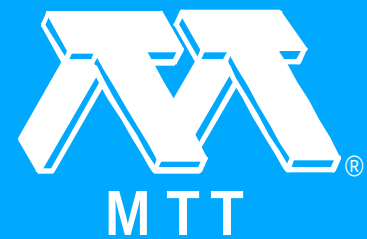


Abstracts

Bandwidth Enhancement in Dielectric-Lined Circular Waveguides (Short Papers)

G.N. Tsandoulas. "Bandwidth Enhancement in Dielectric-Lined Circular Waveguides (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 651-654.

The increase in TE/sub 11/-TM/sub 01/ mode bandwidth obtained by inhomogeneously loading (dielectric lining) a circular waveguide is systematically documented. Maximum bandwidth is about 31.83 percent of center frequency (up from about 26.54 percent for fully filled or empty circular waveguides). This makes circular waveguides competitive with square waveguides (bandwidth/spl aprox/ 34.3 percent) as radiators in wide-band dual-polarization arrays. Certain interesting symmetries involving the TE/sub 21/-TM/sub 01/ modal inversion are also examined.



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Accurate Determination of Varactor Resistance at UHF and its Relation to Parametric Amplifier Noise Temperature (Comments)

A. Uhler, Jr.. "Accurate Determination of Varactor Resistance at UHF and its Relation to Parametric Amplifier Noise Temperature (Comments)." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 654-654.

In the above paper, a letter written by me is cited as erroneously suggesting that the series resistance of varactor diodes varies inversely as the square of the frequency. Anyone who refers to my letter will see that the opposite is the case. I showed that such a result could be explained as a measurement artifact, the frequency-dependent transformation of losses in a distributed circuit.

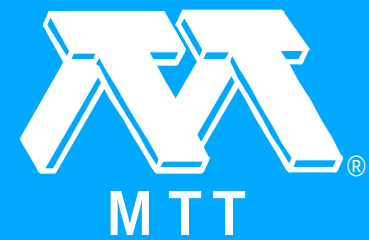
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Contributors (Oct. 1973 [T-MTT])

A.S. Burgess, C. Chao, P.H. Cole, G.I. Haddad and K.K. Pang. "Contributors (Oct. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.10 (Oct. 1973 [T-MTT]): 655-655.



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"Front Cover (Nov. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): f1-f2.



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Foreword (Nov. 1973 [T-MTT])

M.E. Hines. "Foreword (Nov. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 657-659.

During the past 10-15 years, there has been a revolution in microwave techniques brought about by the invention, development, and application of various new microwave solid-state devices. This has paralleled, in time, other revolutions brought about by solid-state devices in other fields of electronics. During this period, the most significant of the new microwave semiconductor devices have been the varactor diode, the tunnel diode, the PIN diode, the Schottky-barrier diode, the Gunn-effect diode, and the IMPATT diode. Dramatic improvements in transistors have also occurred, pushing their useful frequency frontier above 10 GHz. Applications of these devices include several types of low-noise and power amplifiers, varactor harmonic generator power sources, variable attenuators, phase shifters, microwave switches, oscillators, tuning elements, detectors, frequency converters, and modulators. Some of these devices appear to be useful at frequencies as high as 100 GHz.

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Broad-Band Microwave Class-C Transistor Amplifiers

O. Pitzalis, Jr. and R.A. Gilson. "Broad-Band Microwave Class-C Transistor Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 660-668.

Useful techniques for large-signal transistor characterization and the design of broad-band input- and output-matching structures are described. The techniques are particularly oriented to computer-aided design. Useful topologies for realizing broad-band matching networks are provided. Measured performance data for a 13-W, 1010- to 1460-MHz stage are included. An assessment of broad-band utilization of two circuits is graphically undertaken in conjunction with the Bode constant-resistance integral theorem.

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Characteristics of IMPATT-Diode Reflection Amplifiers (Nov. 1973 [T-MTT])

R.W. Laton and G.I. Haddad. "Characteristics of IMPATT-Diode Reflection Amplifiers (Nov. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 668-680.

The results of an investigation of the gain, stability, phase shift, power addition, saturation, and bandwidth properties of microwave reflection amplifiers which employ IMPATT diodes as the active element, together with the dependence of all these properties upon the device material, doping profile, and operating conditions, are presented. Both Si and GaAs diodes are considered and experimental results demonstrating the validity of the model are provided, together with other experimentally determined characteristics relating gain, saturation, and bandwidth to current density and tuning conditions. Finally, measurements illustrating the degradation of response as a result of subharmonic oscillation are given.

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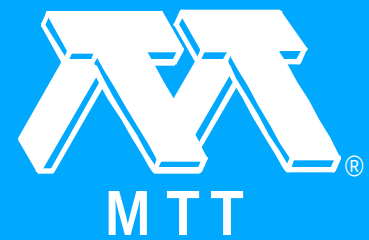
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A Device Characterization and Circuit Design Procedure for Realizing High-Power Millimeter-Wave IMPATT-Diode Amplifiers

D.F. Peterson. "A Device Characterization and Circuit Design Procedure for Realizing High-Power Millimeter-Wave IMPATT-Diode Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 681-689.

A measurement and characterization technique is presented which allows design and realization of IMPATT amplifiers operating at maximum generation efficiency. Diodes mounted in a stable reduced-height waveguide circuit are characterized by their complex reciprocal scattering coefficient as a function of frequency, dc bias, and RF drive power level. In particular, terminal conditions which correspond to a maximum power exchange between the active one-port network and the source are identified and then used to design and realize controlled-gain maximum generation-efficiency amplifiers. Simple equalization networks are shown to provide a wide range of available amplifier gains between limits set by stability requirements. As an example, the technique is effectively used with silicon diodes at K/sub a/-band (33-40 GHz) to realize a 7-dB gain 250-mW power amplifier with 5-GHz bandwidth.





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Large-Signal Equivalent Circuit for IMPATT-Diode Characterization and Its Application to Amplifiers

M.-S. Gupta. "Large-Signal Equivalent Circuit for IMPATT-Diode Characterization and Its Application to Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 689-694.

A frequency-independent lumped equivalent circuit is proposed for characterizing the large-signal behavior of IMPATT diodes. It has five elements including a negative resistance, two of which are quadratic functions of the single-frequency RF voltage across the device. It is used for computer-aided analysis and the design of reflection-type negative-resistance amplifiers employing IMPATT diodes. The frequency response of the amplifier is calculated for different input power levels and the nature of the results is found to be in agreement with published experimental results.

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Analysis of Nonlinear Characteristics and Transient Response of IMPATT Amplifiers

H.J. Kuno. "Analysis of Nonlinear Characteristics and Transient Response of IMPATT Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 694-702.

Nonlinear characteristics, large-signal effects, and transient response of IMPATT amplifiers are analyzed leading to clear understanding of various nonlinear and large-signal phenomena which are often observed experimentally on IMPATT diodes operated as stable (linear) amplifiers or injection-locked oscillators. Effects of bandwidth on transient response of the IMPATT amplifiers as applied to phase-modulated signals and amplitude-modulated signals are investigated in detail. The relationship between the transition (switching) time and the amplifier bandwidth is derived. Capabilities and limitations of IMPATT diodes operated as stable amplifiers or injection-locked oscillators are discussed.

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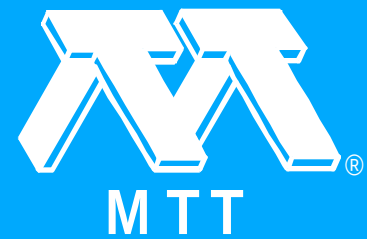


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Nonlinear and Large-Signal Characteristics of Millimeter-Wave IMPATT Amplifiers

H.J. Kuno and D.L. English. "Nonlinear and Large-Signal Characteristics of Millimeter-Wave IMPATT Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 703-706.

Experimental results obtained with millimeter-wave IMPATT amplifiers are presented. Nonlinear and large-signal characteristics of stable IMPATT amplifiers and injection-locked IMPATT oscillators are described. Amplifier circuit configuration, diode characteristics, and measured effects of bias current, temperature, and large-signal level on gain, bandwidth, power saturation, and phase-delay characteristics are discussed in detail.



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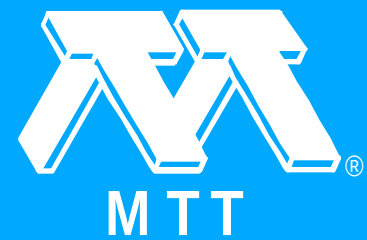
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A Two-Stage IMPATT-Diode Amplifier

H.A. Willing. "A Two-Stage IMPATT-Diode Amplifier." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 707-716.

The system aspects and packaging of a two-stage FM IMPATT-diode amplifier are described. The amplifier combines the output power of 4 IMPATT diodes in the final stage to provide an output power of greater than 4 W at 6 GHz. The system has a locking bandwidth of greater than 200 MHz with a 16-dB gain and a noise figure of less than 50 dB. Both the design and the experimental performance of the amplifier and each of its stages are discussed. The noise characterization of IMPATT-diode amplifiers, operating as injection-locked oscillators or stable amplifiers, determined the mode of operation for each stage. Included in the paper are experimental results of large-signal noise characterization of both Si and GaAs IMPATT diodes, as are the noise characteristics related to the output power and gain.

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IMPATT-Diode Power Amplifiers for Digital Communication Systems

S.F. Paik, P.J. Tanzi and D.J. Kelley. "IMPATT-Diode Power Amplifiers for Digital Communication Systems." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 716-720.

IMPATT-diode amplifiers with a power output of 1.0 W have been developed for use in an 11-GHz digital radio. Two types of amplifiers, a multistage reflection amplifier and a hybrid amplifier containing an injection-locked oscillator stage, have been evaluated by measuring the bit error rate degradation due to the amplifier. System test data show that the stable amplifier introduces little or no errors while the injection-locked oscillator (ILO) often introduces an error-rate floor.

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Improvement of Nonlinear Distortion in an IMPATT Stable Amplifier

H. Komizo, Y. Daido, H. Ashida, Y. Ito and M. Honma. "Improvement of Nonlinear Distortion in an IMPATT Stable Amplifier." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 721-728.

More than a 40-dB third-order intermodulation product (IMP) has been achieved in a 13-GHz-band 2-stage IMPATT stable amplifier with 21-dBm output level and 11-dB gain, using a diode bias-current compensation technique. Theoretical calculations also verified the experimental data. This technique will enable the IMPATT stable amplifier to be used in a multicarrier AM transmission system.



Abstracts

Analysis of Phase Characteristics as a Function of Ambient Temperature of IMPATT Amplifiers

L.I. Yarrington and P.W. Hawkins. "Analysis of Phase Characteristics as a Function of Ambient Temperature of IMPATT Amplifiers." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 728-730.

Experimental data on phase characteristics as a function of ambient temperatures for GaAs IMPATT amplifiers are presented. An evaluation is given to show the impact of ambient temperature on an amplifier design used in phased-array radars.



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The Effects of Package Parasitics on the Stability of Microwave Negative Resistance Devices

J.W. Monroe. "The Effects of Package Parasitics on the Stability of Microwave Negative Resistance Devices." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 731-735.

The results of investigations of the effect of parasitic package elements on the behavior of negative resistance amplifiers are presented. Three different package styles were considered. Also two different lead configurations were used. The packages were all mounted in 7-mm coaxial transmission line. The impedance of packages with and without leads was measured from 4 to 18 GHz using a manual network analyzer. These data were used as the basis for calculations to determine the values of elements in a simple three-element equivalent circuit model of the package. Using the equivalent circuit model experimentally derived for each package style, the impedance seen by the chip through the package to a 50-Ohm load was calculated. Broad-band curves of the impedance seen by the chip are presented. The experimentally derived model of the package permits matching of chip and package for stability.

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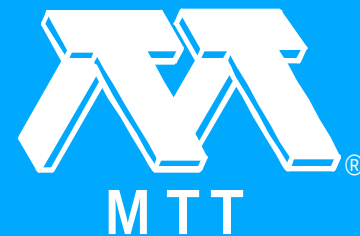


Abstracts

An X-Band LSA Amplifier

F.J. Lidgley and K.W.H. Foulds. "An X-Band LSA Amplifier." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 736-738.

Linear reflection gain has been observed from a GaAs diode oscillating in the LSA mode with gain occurring at a frequency not harmonically related to the fundamental oscillation frequency. The characteristics of the amplifier are presented together with measurements of the circuit load as seen by the device. The mechanism of operation is also discussed.



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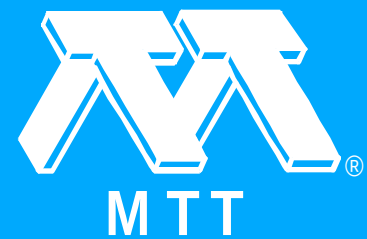


Abstracts

Hysteresis Effects in Microwave Amplifiers and Phase-Locked Oscillators Caused by Amplitude-Dependent Susceptance (Short Papers)

B. Hansson. "Hysteresis Effects in Microwave Amplifiers and Phase-Locked Oscillators Caused by Amplitude-Dependent Susceptance (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 739-741.

A possible explanation for a type of experimentally observed amplitude instability for amplifiers and locked oscillators is given. The results obtained are in good agreement qualitatively with measurements on IMPATT-diode amplifiers. The theory shows that the susceptance of the active element has to be amplitude dependent to create the actual type of instability.



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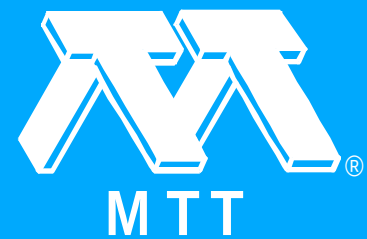
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H. Ashida, Y. Daido, D.L. English, K.W.H. Foulds, R.A. Gilson, M.-S. Gupta, G.I. Haddad, P.W. Hawkins, M. Honma, Y. Ito, D.J. Kelley, H. Komizo, H.J. Kuno, R.W. Laton, F.J. Lidgley, J.W. Monroe, S.F. Paik, D.F. Peterson, O. Pitzalis, Jr., P.J. Tanzi, H.A. Willing and L.I. Yarrington. "Contributors (Nov. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.11 (Nov. 1973 [T-MTT] (Special Issue on Solid-State Microwave Power Amplifiers)): 742-744.



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Abstracts

President's Message--Microwaves of the 70's

J.B. Horton. "President's Message--Microwaves of the 70's." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 746-746.

J. B. Horton, President of G-MTT, in his keynote address at the 1973 G-MTT International Microwave Symposium, outlined three directions which G-MTT and the microwave industry should take for future growth. A summary of his talk is presented below.



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International Microwave Symposium (Dec. 1973 [T-MTT])

D.F. Wait and R.W. Beatty. "International Microwave Symposium (Dec. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 747-751.

The 1973 IEEE-G-MTT International Microwave Symposium was held on the campus of the University of Colorado, Boulder, Colo., June 4-6, 1973. The Group on Microwave Theory and Techniques has now finished its 21st year, and it is still vigorous, mature, and is entering into a new era of civil applications. In spite of the greatest competition for microwave papers ever experienced, this year's technical program was the largest yet, and for the first time included three simultaneous sessions.



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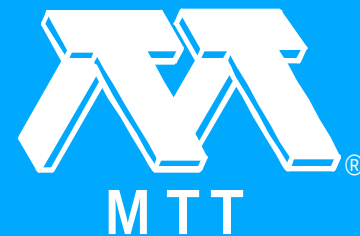


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The 1973 G-MTT National Lectureship

J.L. Allen. "The 1973 G-MTT National Lectureship." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 752-752.

The concept of an all solid-state radar was founded upon the premise that such a radar should be inherently more reliable than conventional radars utilizing a transmitter tube and a mechanically scanned antenna. Despite the expenditure of some 50 million in system and transmit-receive module development, the fundamental premise remains unvalidated. An investigation of the fundamental physics and test procedure design that will allow confidence in the prediction of device lifetime is needed.



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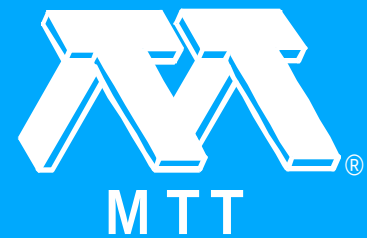


Abstracts

Adapting Microwave Techniques to Help Solve Future Energy Problems (Dec. 1973 [T-MTT])

W.C. Brown. "Adapting Microwave Techniques to Help Solve Future Energy Problems (Dec. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 753-763.

The relationship between microwave techniques and the growing concern for future sources of energy is reviewed. The relationship is specifically explored in the use of a microwave beam to efficiently transport power from an array of solar photovoltaic cells in space to the earth's surface. The transition from a laboratory technology of microwave power transmission to a 10-GW 23 200-mi transmission system is examined in detail.



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Military Applications of Fiber Optics and Integrated Optics

R.A. Andrews, A.F. Milton and T.G. Giallorenzi. "Military Applications of Fiber Optics and Integrated Optics." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 763-769.

A general discussion of military applications of integrated optics and fiber optics is presented. Specific applications discussed are: 1) a multiterminal multiplexed data highway for aircraft and shipboard use; 2) optical fibers as tethers; 3) a 10.6- μm heterodyne detector; and 4) integrated optical phased arrays.



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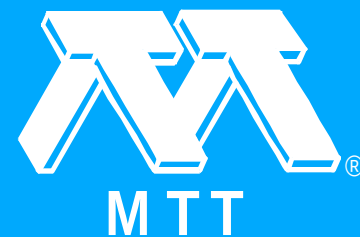


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Faraday Optical Isolator/Gyrator Design in Planar Dielectric Waveguide Form

J. Warner. "Faraday Optical Isolator/Gyrator Design in Planar Dielectric Waveguide Form." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 769-775.

The possibilities of using the magnetic Faraday effect to provide a planar dielectric waveguide isolator or circulator are studied. At least two active elements which couple the TE and TM waveguide modes are required. One of these is magnetooptic. Preliminary design data for a dielectric waveguide isolator in which the mode-converting media forms the substrate and top layer of a single waveguide structure are reported. This design should prove more practical than the optical tandem structures proposed previously.



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Abstracts

Periodic Structures and Their Application in Integrated Optics

W.S.C. Chang. "Periodic Structures and Their Application in Integrated Optics." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 775-785.

Periodic structures are used widely in integrated optics for input-output couplers, bandstop filters, modulators, directional couplers, and distributed feedback lasers. An analytical discussion and review of these devices is given based upon the coupled-mode transmission-line analysis. Experimental results and performance characteristics are presented to illustrate the special features of each type of device. Finally, the usefulness of transmission-line analysis to the understanding and the design of these devices is pointed out.



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Abstracts

Nonreciprocal Reflection-Beam Isolators for Far-Infrared Use

M. Kanda and W.G. May. "Nonreciprocal Reflection-Beam Isolators for Far-Infrared Use." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 786-790.

Magnetoplasma reflection-beam isolators for submillimeter-wave use are discussed in theory and experiment. The basic device uses the Kerr transverse magnetooptic effect (plane of polarization of the EM wave in the plane of incidence, which is perpendicular to a dc magnetic field) in InSb near room temperature. When the semiconductor slab is covered with a thin dielectric layer acting as a matching transformer, improved performance is predicted and observed at 337 μm , and very efficient isolator performance is predicted for 118 μm . Physical arguments are presented to explain the nonreciprocal phenomenon and lead to better device design.



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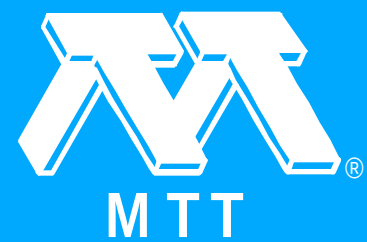
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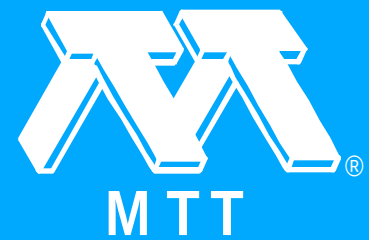
Power Deposition in a Spherical Model of Man Exposed to 1-20-MHz Electromagnetic Fields (Dec. 1973 [T-MTT])

J.C. Lin, A.W. Guy and C.C. Johnson. "Power Deposition in a Spherical Model of Man Exposed to 1-20-MHz Electromagnetic Fields (Dec. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 791-797.

The induced fields and the associated power deposition in man exposed to HF electromagnetic (EM) fields have been investigated theoretically using spherical models. The induced electric fields inside the model exposed to either plane wave or near fields can be described adequately by a combination of quasi-static electric and magnetic induction solutions. It is shown that for field impedances less than $1200 \pi \Omega$ the magnetically induced energy absorption predominates. Therefore, H fields must be measured to obtain any estimate of the hazards due to HF exposure. For a 70-kg model of man exposed to a plane wave field, the theory indicates that the time-average power absorption per unit volume is less than 2.5×10^{-3} mW/g for each milliwatt per square centimeter incident at 20 MHz and below. This suggests that the thermal safe-exposure levels for the HF band are many orders of magnitude in excess of the 10-mW/cm² level recommended for the microwave region.

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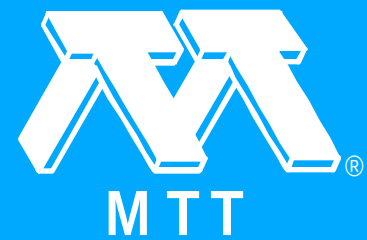
Characterization of Nonlinearities in Microwave Devices and Systems

G.L. Heiter. "Characterization of Nonlinearities in Microwave Devices and Systems." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 797-805.

A simple model to describe a nonlinear device or system is proposed which extends the power series expansion, conventionally restricted to amplitude nonlinearities, to include phase nonlinearities as well. Four different test methods are selected for which the experimentally observed nonlinearity parameters are related to the "gain" and "phase" coefficients of the extended series. A set of simplified relationships is derived where the "1-dB gain compression point" represents gain contributions only while phase nonlinearities are included in the "intercept point," the "third-order intermodulation (IM) coefficients," and the "noise-power-ratio (npr)." For a TWT amplifier in which phase nonlinearities dominate, the third-order IM coefficient was measured. The results are compared with those calculated from single-tone and noise-loading tests using the relationships derived from the model. Agreement to ± 1 dB is found over a 15-dB power range.

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Broad-Band Microwave Measurements on GaAs "Traveling-Wave" Transistors

R.H. Dean, A.B. Dreeben, J.J. Hughes, R.J. Matarese and L.S. Napoli. "Broad-Band Microwave Measurements on GaAs "Traveling-Wave" Transistors." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 805-809.

Instantaneous gain, noise figure, reverse attenuation, and gain and phase control measurements in the frequency range 8-18 GHz have been performed on GaAs traveling-wave transistors. The broad-band high-gain nature of the device together with the requirement for several bias connections precluded the use of standard test fixtures, and resulted in a package design exhibiting less than 1-dB insertion loss over the band together with 75- to 90-dB internal isolation. Untuned X-band gain, noise figure, and reverse attenuation were 12 dB, 18 dB, and 32 dB, respectively, and the gain and phase could be electronically varied over a 35-dB and 360° range. When RF tuning was employed, the gain, on the average, improved by 10 dB.

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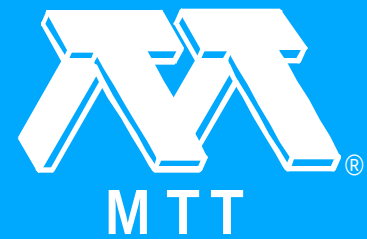


Abstracts

RF Amplifier Design with Large-Signal S-Parameters

W.H. Leighton, R.J. Chaffin and J.G. Webb. "RF Amplifier Design with Large-Signal S-Parameters." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 809-814.

High-power UHF transistors have been characterized through the use of large-signal S-parameters. These S-parameters have been used successfully to design UHF power amplifiers. Waveform measurements show that due to the Q of the package parasitic, most class C operated UHF power transistors have nearly sinusoidal waveforms at their package terminals. Experimental evidence presented shows that the large-signal S-parameters are relatively independent of power once the device is turned on. These two observations make it possible to extend modified small-signal S-parameter design techniques to large-signal power amplifiers.



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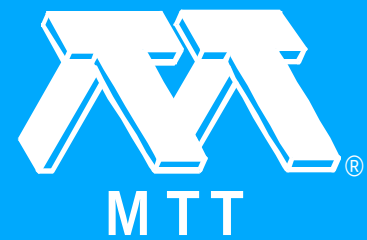


Abstracts

New Algorithms for Network Optimization (Dec. 1973 [T-MTT])

C. Charalambous and J.W. Bandler. "New Algorithms for Network Optimization (Dec. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 815-818.

Two new algorithms suitable for computer-aided optimization of networks are presented. They are both based on the nonlinear least squares approximation approach, which has been successfully applied by the authors to microwave network design problems requiring minimax or near-minimax solutions. A basic difference here is that, instead of requiring very large values of ρ , any finite value of ρ , greater than 1 can be used to produce extremely accurate minimax solutions. This paper discusses a six-variable transformer example where values of ρ equal to 2, 4, 6, 10, 100, 1000, and 10 000 have all been used separately to obtain substantially the same solution. Both the adjoint network method for gradient evaluation and the Fletcher method are employed for greater efficiency. Comparisons with the razor search and grazer search methods are made. Some far-reaching observations concerning minimax design are also made.



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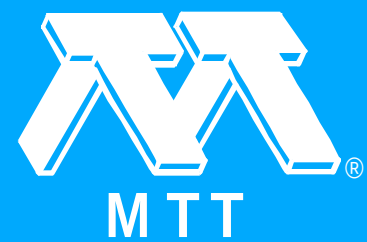
Rectangular and Annular Modal Analyses of Multimode Waveguide Bends

E. Bahar and G. Govindarajan. "Rectangular and Annular Modal Analyses of Multimode Waveguide Bends." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 819-824.

Spurious modes in multimode H-plane waveguide bends of nonuniform curvature are computed on the basis of rectangular and annular waveguide modal analyses. The sets of coupled differential equations for the wave amplitudes are solved numerically using both an iterative approach and the Runge-Kutta method. The advantages and limitations of the different approaches to this problem are considered in detail.

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Mutual Coupling Between Parallel-Plate Waveguides (Dec. 1973 [T-MTT])

Y.E. Elmoazzen and L. Shafai. "Mutual Coupling Between Parallel-Plate Waveguides (Dec. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 825-833.

The radiation field and mutual coupling between two identical parallel-plate waveguides having the same axis of symmetry are investigated. Jones' method of formulation is applied and a modified Wiener-Hopf equation is obtained. Expressions for the radiated field in free space, reflected field in the exciting waveguide, and transmitted field in the coupled waveguide are obtained and the reflected and transmitted fields are expressed in terms of waveguide modes. The reflection coefficient for each mode is represented by three terms, two of which are due to reflections at the open end of the exciting waveguide and are constant along the waveguide. The third term is the contribution from the field scattered by the open end of the coupled waveguide and decays along the waveguide according to the radiation condition. Similarly, the transmission coefficient of each mode is represented by three terms, two of which decay along the coupled waveguide and the third one is constant. The radiation field is also divided into three terms. One of them is due to the radiation from the open end of the exciting waveguide and the other two are the contribution of multiple interactions between the two waveguides. Computed results for the reflection and transmission coefficients and the radiation field are shown for TE/sub 0,1/ excitation and various separation distance of the waveguides. The results for the reflection and transmission coefficients are oscillating functions of period π , and approach gradually the well-known final values of a single excited waveguide.



Abstracts

Rate Effects in Isolated Hearts Induced by Microwave Irradiation (Short Papers)

J.L. Lords, C.H. Durney, A.M. Borg and C.E. Tinney. "Rate Effects in Isolated Hearts Induced by Microwave Irradiation (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 834-836.

Continuous 960-MHz microwave irradiation of isolated poikilothermic hearts in Ringer's solution causes bradycardia, in contrast to the tachycardia usually produced by generalized heating. The effect appears to occur only over a narrow power range in the neighborhood of an estimated 3 mW absorbed by the heart. It is hypothesized that the bradycardia is produced by stimulation of the nerve remnants in the heart.



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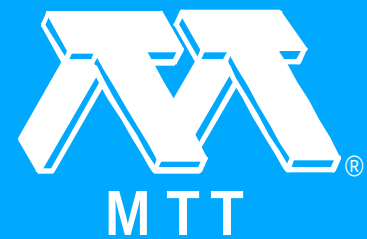


Abstracts

Microwave Effects on Thermoluminescence and Thermally Stimulated Exoelectron Emission (Short Papers)

D.R. Elle, D.J. Fehringer, R.J. Vetter and P.L. Ziemer. "Microwave Effects on Thermoluminescence and Thermally Stimulated Exoelectron Emission (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 836-837.

In a pilot study to determine phosphor response after microwave exposure, a reduction in the expected amount of light emitted during thermoluminescent (TL) analysis was observed after exposure to microwave radiation of a phosphor preirradiated with cobalt-60 gamma radiation. Investigation of the thermoluminescent response of some high dielectric-constant materials after microwave exposure revealed the fading phenomenon in the powdered and ceramic states of the phosphors.



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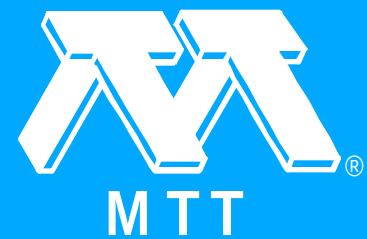


Abstracts

Environmentally Controlled Waveguide Irradiation Facility (Short Papers)

H.S. Ho, E.I. Ginns and C.L. Christman. "Environmentally Controlled Waveguide Irradiation Facility (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 837-840.

Research has shown that the determination of absorbed microwave energy as well as the control of environmental parameters are important in relating biological-effect data to, radiation protection. This short paper describes the development of an environmentally controlled waveguide irradiation facility for the exposure of small animals to 2450-MHz CW microwave energy. Integral dose rate is determined without perturbing the microwave field interacting with the irradiated animal.



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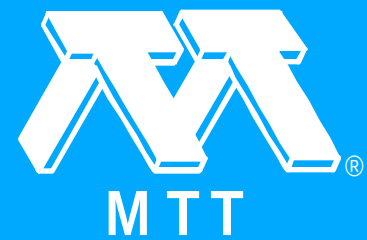
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High-Power S-Band Junction Circulator (Short Papers)

R.A. Stern. "High-Power S-Band Junction Circulator (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 840-842.

The design of a high-power air-cooled microwave Y-junction circulator which is capable of operation at peak and average power levels of 800 kW and 800 W, respectively, is described. The unit is an H-plane waveguide circulator which is externally air cooled. The circulator design employs a full-height substituted YIG rod with a center metal pin together with boron nitride matching transformers. The circulator exhibits an insertion loss of less than 0.4 dB, isolation greater than 22 dB, and a VSWR <1.26:1 over a 400-MHz bandwidth centered at 3.3 GHz. At high-power levels, the device exhibits insertion loss of less than 0.9 dB, isolation greater than 20 dB, and VSWR <1.25:1 at an indicative frequency within the operating bandwidth.

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The Digital Twin-Ferrite-Toroid Circular Waveguide Phaser (Short Papers)

F.J. Bernues and D.M. Bolle. "The Digital Twin-Ferrite-Toroid Circular Waveguide Phaser (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 842-845.

A new microwave structure is proposed, consisting of a circular waveguide loaded with two ferrite toroids circumferentially magnetized at remanence in opposite direction. It is shown that nonreciprocal parameters such as differential phase shift can be doubled with respect to the single toroid configuration. A method for biasing the toroids at remanence in opposite directions by means of a single wire passing through the axis of the waveguide is proposed. Modal purity is taken into account in order to select dielectric loading parameters which ensure operation within the modal inversion window in which the TE_{01} mode is dominant. The propagation factor and differential phase shift are computed under these conditions, and their variation with several parameters such as remanent magnetization, toroid location, and toroid thickness is shown.

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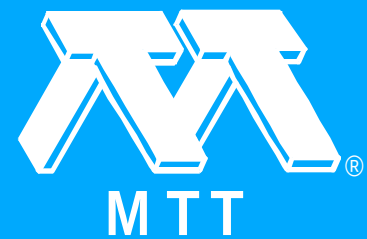


Abstracts

A Reference Noise Standard for Millimeter Waves (Short Papers)

W.C. Daywitt. "A Reference Noise Standard for Millimeter Waves (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 845-847.

The WR15 thermal noise standard that is used as the national reference standard of noise power in the frequency range from 56 to 64 GHz is described in this short paper. The source forms a basis for both the noise-power comparison service and noise-figure service offered by the National Bureau of Standards in this frequency range.



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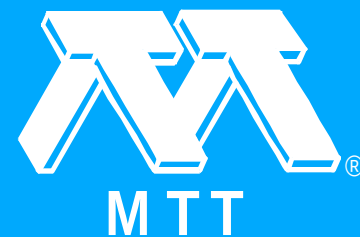


Abstracts

Metrological Application of a Stationarity Property in Rectangular Cavities Containing a Dielectric Slab (Short Papers)

C.E. Eugene. "Metrological Application of a Stationarity Property in Rectangular Cavities Containing a Dielectric Slab (Short Papers)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 847-850.

A stationarity property for the resonant frequency of a rectangular cavity as a function of the thickness of a low-loss dielectric slab inserted within is used for the accurate determination of the microwave permittivity of the sample. The accuracy estimated to a few promille in X band has been confirmed by experimentation on a standard material.



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Possible Mechanisms for the Biomolecular Absorption of Microwave Radiation with Functional Implications (Letters)

J.R. Rabinowitz. "Possible Mechanisms for the Biomolecular Absorption of Microwave Radiation with Functional Implications (Letters)." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 850-851.

A theoretical analysis of several possible modes of molecular absorption of microwave radiation suggests that interference with some stereospecific biomolecular processes may result from microwave irradiation.



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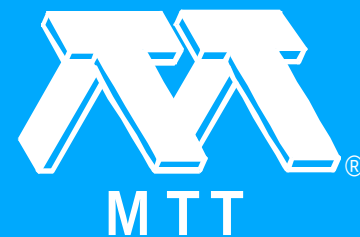
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Contributors (Dec. 1973 [T-MTT])

R.A. Andrews, E. Bahar, J.W. Bandler, W.C. Brown, R.J. Chaffin, W.S.C. Chang, C. Charalambous, R.H. Dean, A.B. Dreeben, Y.E. Elmoazzen, T.G. Giallorenzi, G. Govindarajan, A.W. Guy, G.L. Heiter, J.J. Hughes, C.C. Johnson, M. Kanda, W.H. Leighton, J.C. Lin, R.J. Matarese, W.G. May, A.F. Milton, L.S. Napoli, L. Shafai, J. Warner and J.G. Webb.
"Contributors (Dec. 1973 [T-MTT])." *1973 Transactions on Microwave Theory and Techniques* 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 851-855.



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Overseas Abstracts (Dec. 1973 [T-MTT])

"Overseas Abstracts (Dec. 1973 [T-MTT])." 1973 Transactions on Microwave Theory and Techniques 21.12 (Dec. 1973 [T-MTT] (1973 Symposium Issue)): 856-857.



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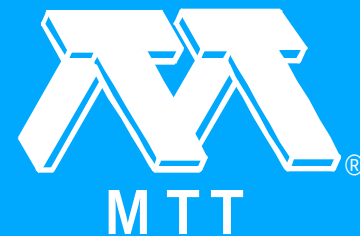
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Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-21, 1973

*"Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-21, 1973."
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Front Cover (Jan. 1974 [T-MTT])

"Front Cover (Jan. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): f1-f2.



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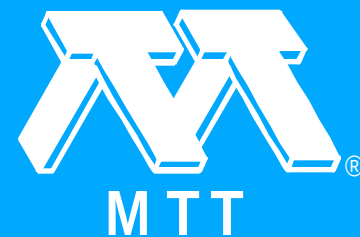


Abstracts

In-Line Waveguide Selective Linear Phase Filters

J.D. Rhodes and M.Z. Ismail. "In-Line Waveguide Selective Linear Phase Filters." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 1-5.

A procedure is described whereby narrow-band waveguide selective linear phase filters may be designed from a low-pass prototype linear phase network. The structure is comprised of a cascade connection of basic sections, each containing a direct-coupled cavity together with a dual-mode resonator. Each dual-mode resonator takes the form of a square guide mounted on the broad wall of the main rectangular guide and coupled to this guide by a small aperture. Explicit formulas for the susceptance of the coupling apertures and electrical lengths of the cavities are given in terms of the low-pass prototype.



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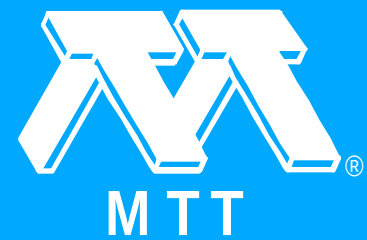
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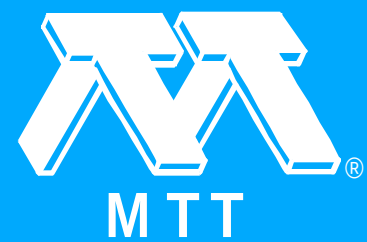
Launching Efficiency of the HE/sub 11/, Surface-Wave Mode on a Dielectric Tube

G.L. Yip and T. Auyeung. "Launching Efficiency of the HE/sub 11/, Surface-Wave Mode on a Dielectric Tube." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 6-14.

A theoretical investigation into the launching of dipolar surface waves on a dielectric tube is presented. The source under consideration is a transversely oriented point electric dipole situated on the axis of the tube. It is found that the source excites only the dominant HE/sub 11/ mode when the outer radius of the tube is sufficiently small. Phase and group characteristics as well as some field distributions are given for the source-free case; however, these are independent of the choice of the source, and are dependent only on the particular mode being excited. Surface-wave as well as radiated powers are obtained in terms of the current in the source dipole, and the launching efficiency of the surface waves is determined as a function of the tube radius, wall thickness, and permittivity of the material. Finally, comparisons are made between the dielectric tube and the solid rod which was investigated previously as possible surface-wave transmission lines, and also the launching efficiencies for these two cases.

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Systematic Design of Stacked-Crystal Filters by Microwave Network Methods

A. Ballato, H.L. Bertoni and T. Tamir. "Systematic Design of Stacked-Crystal Filters by Microwave Network Methods." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 14-25.

A class of novel frequency-selective devices, called stacked-crystal filters, is discussed in terms of a microwave network approach that leads to a systematic procedure for their analysis and design. These devices consist of two or more crystal plates that are stacked together, with thin electrodes being provided between some or all of the adjacent interfaces for the purpose of translating mechanical properties into electrical signals via piezoelectric coupling. In such a configuration, the electromechanical coupling that occurs at the plate surfaces produces selective interactions between the elastic modes in each crystal plate, as well as between these modes and all of the modes in the other plates included in a stack. A judicious combination of materials and dimensions can therefore provide a very wide range of desired filtering characteristics. For stacks with thin plates, only three thickness modes appear in each plate and they can be described in terms of three transmission lines; their coupling at the plate surfaces is then expressible in terms of ideal transformers that represent the mechanical junction between two adjacent plates. The interface electrodes appear as a set of terminals, to which are attached capacitors and another set of ideal transformers that represent the piezoelectric drive. In this manner, each plate can be rigorously described in terms of a well-defined network that serves as a building block. A stack consisting of any number of plates can therefore be regarded as the connection of an appropriate number of such building blocks, thus reducing a complicated mathematical problem to a systematic representation that can readily be handled by conventional techniques. A simple example of a two-layer quartz device operating on these principles is given. The simulated behavior obtained from the exact equivalent network discloses that wide-band filters may be designed. Construction of such devices can be expected to yield robust, miniature filters of high performance possessing a large diversity of desired characteristics.

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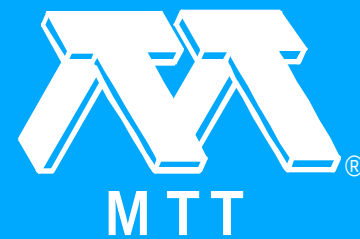


Abstracts

Design of Unapodized Surface-Wave Transducers with Spectral Weighting

G.R. Nudd, M. Waldner and R.L. Zimmerman. "Design of Unapodized Surface-Wave Transducers with Spectral Weighting." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 25-32.

The technique commonly employed to provide a wide-band surface-wave transducer with a specific conversion loss as a function of frequency uses the linear frequency-modulation (LFM) (quadratic-phase) design. This provides the necessary dispersion, and anodization is then employed to obtain the required conversion loss. In some applications the anodization presents complications in that the beam generated has nonuniform width, and diffraction and phase-front problems can result. An alternate technique is described that relies on varying the number of effective transducer elements as a function of frequency to provide the conversion-loss variation. As examples of this technique, a flat bandpass filter for a nonlinear convolver and a very large fractional-bandwidth transducer (with spectral weighting to provide sidelobe control) for a memory application are described.



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High-Permittivity Dielectrics in Waveguides and Resonators

J. Van Bladel. "High-Permittivity Dielectrics in Waveguides and Resonators." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 32-37.

Resonators and waveguides containing a region of high dielectric constant are considered. The dielectric constant is first assumed to be infinite, but is later given a high, but finite value. Perturbation formulas are derived for the resulting shift in either the resonant frequency of the resonator or the wavenumber of the waveguide mode.

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Abstracts

Noise Considerations in Self-Mixing IMPATT-Diode Oscillators for Short-Range Doppler Radar Applications

M.-S. Gupta, R.J. Lomax and G.I. Haddad. "Noise Considerations in Self-Mixing IMPATT-Diode Oscillators for Short-Range Doppler Radar Applications." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 37-43.

The influence of the oscillator noise on the minimum detectable signal of a Doppler radar with a self-mixing IMPATT-diode oscillator is evaluated. For very short-range radars, it is the AM noise which limits the signal-to-noise ratio and thus the range.



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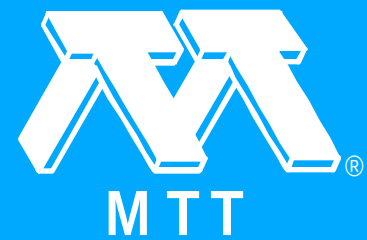
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Scattering Parameter Approach to the Design of Narrow-Band Amplifiers Employing Conditionally Stable Active Elements (Short Papers)

C.S. Gledhill and M.F. Abulela. "Scattering Parameter Approach to the Design of Narrow-Band Amplifiers Employing Conditionally Stable Active Elements (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 43-48.

In terms of scattering parameters, the equation transducer power gain is shown to be capable of representation as a family of circles of constant gain from which the design of load and source terminations to achieve a restricted bandwidth can be obtained. This is an extension of an earlier approach which only allowed either load reflection coefficient or source reflection coefficient to be considered in a given design. Through the use of a specification statement of VSWR, it is shown how a marginal stability factor can be derived. From the study of the interaction between the input and output reflection coefficients, a detuning factor is analytically derived to correlate the interaction between the input and output reflection coefficients. Either of these factors can be chosen and used to select optimum input and output reflection coefficients which provide stable operation for an amplifying stage that is to employ a conditionally stable active element. An example using these factors is given.





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Equivalent Circuits of Microstrip Impedance Discontinuities and Launchers

J.S. Wight, O.P. Jain, W.J. Chudobiak and V. Makios. "Equivalent Circuits of Microstrip Impedance Discontinuities and Launchers." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 48-52.

Experimental results obtained indicate that an excess phase shift is the most pronounced high-frequency parasitic effect resulting from a microstrip quarter-wave transformer impedance discontinuity. An empirically derived design-oriented model describing the dominant parasitic reactance associated with a microstrip impedance discontinuity at X-band frequencies is described. A description is also given of the dominant parasitic reactance associated with a number of commercially available coaxial-to-microstrip launchers.

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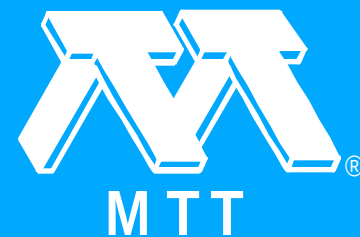


Abstracts

Microwave Measurement of Dielectric Constant of Liquids and Solids Using Partially Loaded Slotted Waveguide (Short Papers)

I.J. Bahl and H.M. Gupta. "Microwave Measurement of Dielectric Constant of Liquids and Solids Using Partially Loaded Slotted Waveguide (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 52-54.

An accurate method is described for the measurement of the dielectric constant of liquids and solids. The dielectric material partially loads a slotted rectangular waveguide and the guide wavelength is measured for two different thicknesses of the dielectric. The guide wavelengths are related to the dielectric constant of the material through a characteristic equation which can be solved graphically or numerically. Some experimental results are obtained and found to be in close agreement with the values of the dielectric constant available in the literature.



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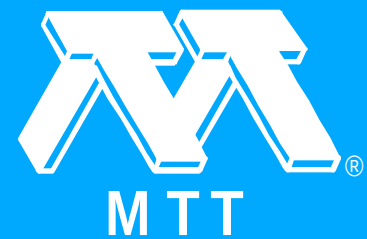


Abstracts

A Finite Difference Method for the Solution of Electromagnetic Waveguide Discontinuity Problems

G. Mur. "A Finite Difference Method for the Solution of Electromagnetic Waveguide Discontinuity Problems." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 54-57.

A finite difference method for the numerical solution of electromagnetic waveguide discontinuity problems is presented. The method of boundary relaxation is applied, using finite difference techniques in the nonuniform section of the waveguide and using a modal representation of the field in the uniform sections of the waveguide. To illustrate the process some two-dimensional diffraction problems in an electromagnetic waveguide with rectangular cross section are solved.



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Finite-Gap Stripline-Latching Circulator

M.E. El-Shandwily and E.A.F. Abdallah. "Finite-Gap Stripline-Latching Circulator." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 57-60.

The stripline-latching circulator with finite gap is analyzed theoretically. The normalized resonant frequencies of the first-order modes and the normalized circulation frequencies are obtained numerically for different values of the gapwidth and dielectric constant of the ceramic filling the nonmagnetic gap.



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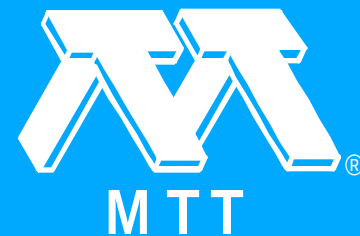


Abstracts

Curved-Rim Open Resonators

A. Consortini. "Curved-Rim Open Resonators." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 60-63.

Field configurations and resonant frequencies are analytically derived for some low-loss modes of a Fabry-Perot (FP) open resonator having curved rims along the edges. Since the low-loss modes are limited by a caustic surface, the problem can be simply treated by neglecting the diffraction due to the finite dimensions of the mirrors. The results are compared with those obtained by numerically solving the integral equation of the open cavity.



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Circularly Polarized Equalizer Networks

R.D. Wanselow and D.A. Taggart. "Circularly Polarized Equalizer Networks." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 63-66.

Characteristics of the cross slot coupling aperture applicable to circularly polarized equalizer networks is presented. This coupling mechanism is analyzed and experimental results indicate good agreement between theory and practice. Extension of the single-cavity unit to multiple direct-coupled dual-mode equalizer networks is also discussed.

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Abstracts

Mode Compensation Applied to Parallel-Coupled Microstrip Directional Filter Design

Y.S. Lee. "Mode Compensation Applied to Parallel-Coupled Microstrip Directional Filter Design." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 66-69.

A simple mode-compensation technique is introduced into the design of a pair of parallel-coupled microstrip lines and applied to a microstrip traveling-wave loop-directional filter. The compensated design of the filter shows a substantial improvement in its performance.



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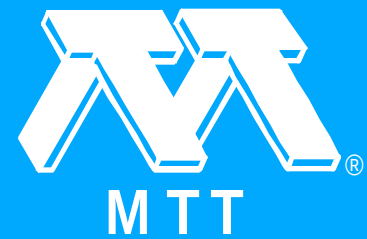


Abstracts

A Small MIC Coupler with Good Directivity (Letters)

R.R. Weirather. "A Small MIC Coupler with Good Directivity (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 70-71.

The results of tests made on a novel coupler design suitable for MIC's are described. The design utilizes resistive termination of fields above the dielectric. Directivity of 14 dB was achieved with a $\lambda/16$ coupler at 3.6 GHz. Uses for this design technique are signal sampling where very flat coupling is not required.



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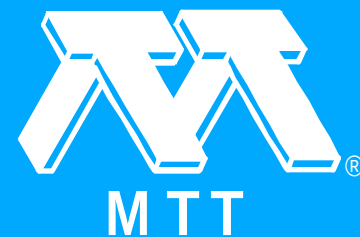


Abstracts

A New Concept for Broadbanding the Ferrite Substrate Circulator Based on Experimental Modal Analysis (Comments and Authors' Reply)

S. March, T. Miura and T. Hashimoto. "A New Concept for Broadbanding the Ferrite Substrate Circulator Based on Experimental Modal Analysis (Comments and Authors' Reply)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 71-74.

In the above paper the authors concluded, from a modal analysis of microstrip ferrite circulators, that the combination of two adjacent modes should be used for broad-banding circulators, which do not require quarter-wavelength matching transformers. Upon careful examination of their results, it can be shown that Miura and Hashimoto actually produced conventional below resonance circulators---transformers included.



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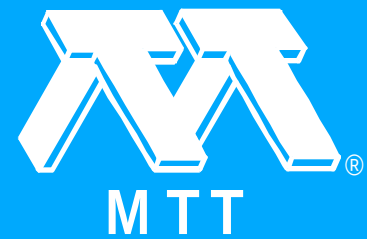


Abstracts

Dissipation and Scattering Matrices of Lossy Junctions (Comments)

E. Schwartz. "Dissipation and Scattering Matrices of Lossy Junctions (Comments)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 75-75.

In the above short paper, some errors should be corrected and some remarks seem to be of interest.



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Abstracts

A Special Program for Least p th Approximation Including Interpolation (Computer Program Descriptions)

J. Popovic and J.W. Bandler. "A Special Program for Least p th Approximation Including Interpolation (Computer Program Descriptions)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 76-76.

Minimization of a least p th objective function of k variables using gradient methods. Interpolation brings the discrete problem closer to the continuous minimax approximation problem.



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A General Program for Discrete Least pth Approximation (Computer Program Descriptions)

J.R. Popovic and J.W. Bandler. "A General Program for Discrete Least pth Approximation (Computer Program Descriptions)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 76-77.

To minimize an objective function of k variables defined as the generalized discrete least pth objective using gradient methods.



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Abstracts

DICOSY (Directional Coupler Synthesis) (Computer Program Descriptions)

M. Hoffmann and G. Morler. "DICOSY (Directional Coupler Synthesis) (Computer Program Descriptions)." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 77-77.

This program performs a synthesis procedure for N-stepped asymmetric TEM-transmission-line directional couplers of any desired mean voltage coupling and coupling tolerance.



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T. Auyeung, A. Ballato, H.L. Bertoni, M.-S. Gupta, G.I. Haddad, M.Z. Ismail, R.J. Lomax, G.R. Nudd, J.D. Rhodes, T. Tamir, J. Van Bladel, M. Waldner, G.L. Yip and R.L. Zimmerman.

"Contributors (Jan. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.1 (Jan. 1974 [T-MTT]): 78-80.



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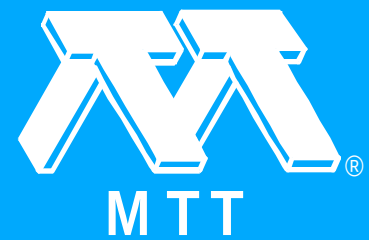
Transmission of an Optical Wave Beam Through a System of Two Aperture Stops

K. Tanaka and O. Fukumitsu. "Transmission of an Optical Wave Beam Through a System of Two Aperture Stops." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 81-86.

The beam-mode expansion method used in the discussions of the diffraction of a Gaussian wave beam through an aperture is applied to a system of two circular or square aperture stops, and the analytical expressions of the power transmission and conversion coefficients of a fundamental mode through the system are obtained. By using these expressions, the optimum incidence conditions that maximize the power transmission coefficient of the fundamental mode can be known. These conditions coincide formally with those obtained by Kogelnik and Yariv for an incident wave having a prolate spheroidal-wave function distribution. Both circular and square geometries can be analyzed in the same way.

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Analysis of Electromagnetic-Wave Modes in Anisotropic Slab Waveguide

Y. Satomura, M. Matsuhara and N. Kumagai. "Analysis of Electromagnetic-Wave Modes in Anisotropic Slab Waveguide." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 86-92.

Electromagnetic-wave modes propagating in anisotropic slab waveguide are analyzed theoretically in detail. The propagation conditions are derived under which waves can propagate along the axis of the guide. A two-dimensional three-layered waveguiding structure consisting of an anisotropic dielectric slab coated on, or immersed in, isotropic surrounding substrate materials is considered as a typical configuration of the guide. Field-intensity distributions of the propagating modes and their propagation constants are obtained by numerical computations. Techniques for achieving the mode discrimination and the single-mode operation are given. Some possible applications in integrated optics are suggested.

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Electromagnetic-Wave Propagation in the Shielded Ring Line

Y. Garault and C. Fray. "Electromagnetic-Wave Propagation in the Shielded Ring Line." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 92-99.

A theoretical analysis is presented of a periodic structure consisting of equally spaced perfectly conducting rings. The dispersion relation satisfied by the different modes of the shielded ring line is determined. This analysis shows that cylindrically symmetric modes identical with those of smooth guides and hybrid modes can travel in this periodical structure. The asymptotic values of the dispersion relation show the different properties of these hybrid modes. The EH_{n1} modes can be slow, fast, or can travel at light velocity according to the frequency. The EH_{nq} ($q > 1$) modes are fast modes and exchange their cutoff frequencies for particular values of the geometrical parameters of the structure. These theoretical predictions are verified experimentally by recording the dispersion characteristics of the first modes. For deflecting radio-frequency structures, the fundamental EH_{11} mode is interesting. This deflection constant is measured on a $\pi/2$ wave structure.

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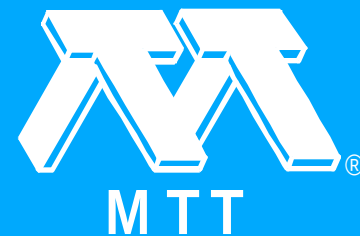


Abstracts

Resonance Conditions of Open Resonators at Microwave Frequencies

T. Itoh and R. Mittra. "Resonance Conditions of Open Resonators at Microwave Frequencies." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 99-102.

This paper presents an extension of Vajnshtejn's approach for computing the resonance frequencies and loss factors of Fabry-Perot (FP) resonators at microwave frequencies. Numerical results are presented for FP resonators operated at microwave through millimeter frequency range.



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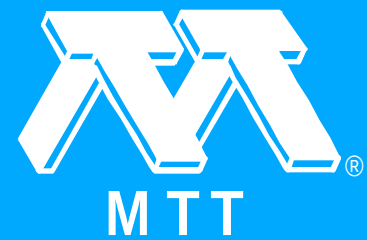
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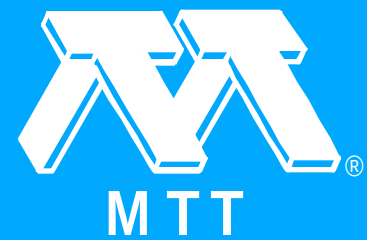
A Vibrating-Dipole Technique for Measuring Millimeter-Wave Fields in Free Space

N.A. Mathews and H. Stachera. "A Vibrating-Dipole Technique for Measuring Millimeter-Wave Fields in Free Space." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 103-110.

EM field measuring techniques, based on the modulated-scattering principle, are well established at microwave frequencies. The main difficulty in extending measurements to the millimeter-wave region is that of scaling the scatterer for operation at these wavelengths. The technique of modulated scattering described in this paper overcomes this limitation. A thin metallic dipole, attached to a vibrating nylon cord, forms the modulated scatterer which interacts with the electric field and gives rise to a phase-modulated reflected wave. The reflected wave is then combined with preference wave in a coherent detection system. The detected signal contains information about the amplitude and phase of the field at the midpoint of the dipole's vibration. An analysis of the technique is presented and the factors affecting the accuracy of measurement are fully discussed. It is shown how the measurement errors can be minimized. Amplitude and phase measurements, taken at a wavelength of 4.8 mm, verify the validity and accuracy of the technique.

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Semicircular Waveguide-Type Diplexers Used for the Millimeter-Wave Waveguide Transmission System

S. Shimada and N. Suzuki. "Semicircular Waveguide-Type Diplexers Used for the Millimeter-Wave Waveguide Transmission System." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 111-118.

A semicircular waveguide-type diplexer consisting of semicircular hybrids and high-pass filters as a band-splitting filter for millimeter-wave multiplexing-demultiplexing networks has been newly developed. The construction and the operating principles of the diplexer are described; the design method and the experimental results are also discussed. The branching characteristics for a diplexer for dividing the frequency band 43.4-86.8 GHz into two equal parts have proved tolerably flat, with the resulting branching loss amounting to as small as 1.2-1.4 dB. The total length for the experimental model is 1.17 m, which is one-half to one-third shorter than the conventional Michelson interferometer-type diplexer. It is concluded that the semicircular waveguide-type diplexer can be effectively used for millimeter-wave waveguide transmission system.



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A Design Theory for Wide-Band Parametric Amplifiers

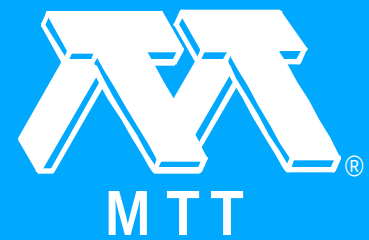
S. Egami. "A Design Theory for Wide-Band Parametric Amplifiers." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 119-125.

A new exact design theory for a nondegenerate parametric amplifier with double-tuned signal circuit and single-tuned idler circuit is described. If the resistance of the signal circuit, which is neglected in previous papers, is considered, there exists a frequency band in which the amplifier gain is positive. In this paper the band characteristics of the gain are related to this frequency band. Slope parameters of the idler and signal circuits are normalized by the slope parameters which are associated with the diode itself. These normalized slope parameters are used to relate the actual circuit and gain-bandwidth characteristics. The slope parameter of the external signal resonator is related to the negative slope parameter of the diode, and bounds on this ratio are given over which stable amplification is possible. A design table which gives the coupling ratio and slope parameter of the external signal resonator is derived by computer calculation. Experiments were made at 19 GHz. Positive-gain bandwidth was around 4.0 GHz, and flat bandwidth at 10-dB gain was 2.4 GHz. The ratio of these bandwidths coincided with the theory.

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Average Output Power of an Incident Wave Randomly Coupled to a Reflected Wave

J.A. Morrison. "Average Output Power of an Incident Wave Randomly Coupled to a Reflected Wave." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 126-130.

Two waves traveling in opposite directions in a lossless waveguide, which are coupled by a random coupling function, are considered. It is assumed that no power is allowed to enter the reflected wave at the output end of the guide. The asymptotic value of the expected output power in the incident wave, when the input power is prescribed, is calculated in the limit of weak coupling and a long guide. The result is compared with that predicted by Marcuse on the basis of coupled power equations. It is found that the two results are quite close, so long as the expected output power is, greater than half the input power, but past that point Marcuse's approximation to the asymptotic value becomes increasingly poorer as the waveguide length increases. Some computer simulated results obtained by Marcuse tend to confirm the validity of the asymptotic value of the expected output power.

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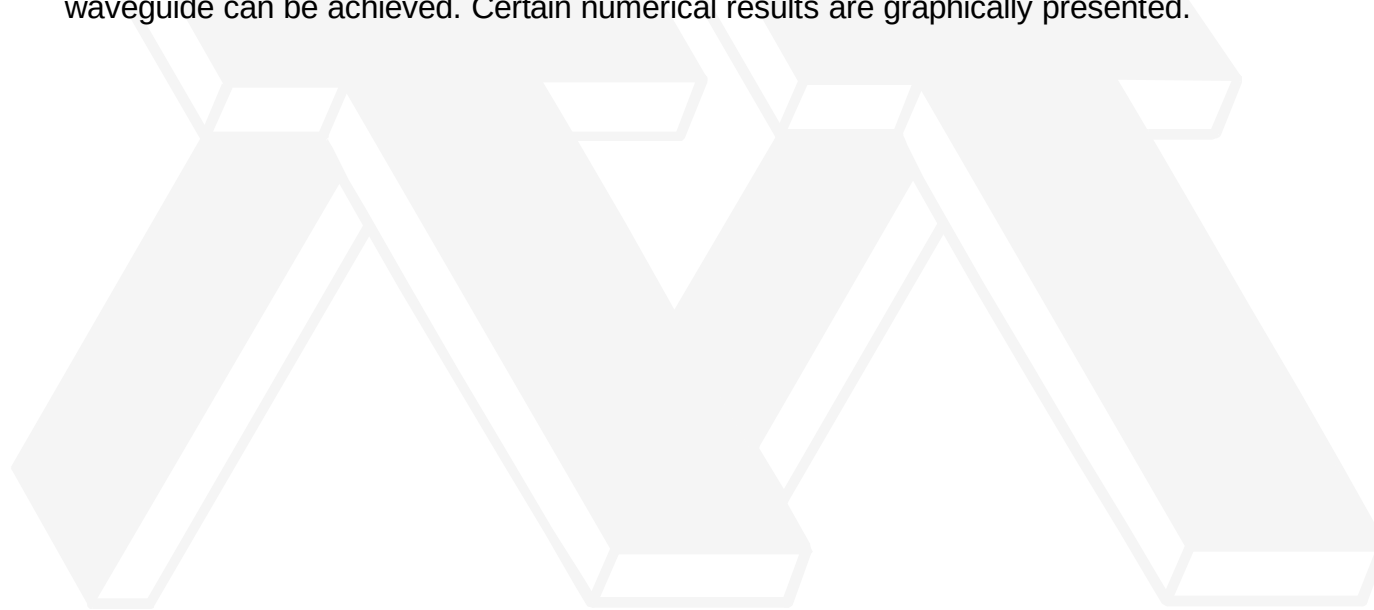
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Ridged Circular Waveguide (Short Papers)

Y. Shiau and R.F.H. Yang. "Ridged Circular Waveguide (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 130-132.

Characteristics of wave propagation inside a ridged circular waveguide are studied. The waveguide is a hollow, conducting circular cylinder with a pair of semicircular conducting ridges diametrically attached to its inside wall. Results of a perturbation analysis suggest that in this device a lower attenuation and a wider bandwidth than those of a conventional circular waveguide can be achieved. Certain numerical results are graphically presented.



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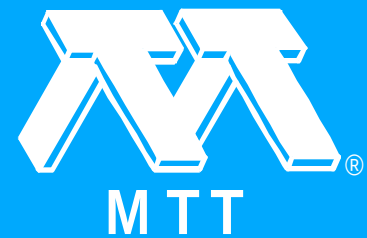


Abstracts

Magnetostatic Surface Waves in Ferrite Slab Adjacent to Semiconductor (Short Papers)

M. Masuda, N.S. Chang and Y. Matsuo. "Magnetostatic Surface Waves in Ferrite Slab Adjacent to Semiconductor (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 132-135.

Magnetostatic surface waves propagating along the ferrite slab adjacent to a semiconductor are discussed in this paper. Our numerical results indicate that the conductivity of the semiconductor plays an important role in the determination of the dispersion relation in the case of nondrifting carriers. The backward wave appears for a finite value of the conductivity.



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Coupled-Mode Analysis of Longitudinally Magnetized Ferrite Phase Shifters (Short Papers)

W.E. Hord and F.J. Rosenbaum. "Coupled-Mode Analysis of Longitudinally Magnetized Ferrite Phase Shifters (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 135-138.

Application of a coupled-mode formalism to longitudinally magnetized ferrite phase shifters provides an explanation of the increase or decrease of insertion phase with increasing magnetization which is observed in different types of phase shifters. If the higher order mode is TM, the phase shift increases with magnetization while the reverse happens if the higher order mode is TE. The generalized telegraphists' equations are used to analyze the TEM phase shifter. The maximum phase shift that can be obtained is determined by the effective permeability of the ferrite. However, coupling to higher order cutoff modes reduces the phase shift significantly.

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Abstracts

Experimental and Computed Four Scattering and Four Noise Parameters of GaAs FET's Up to 4 GHz (Short Papers)

A. Anastassiou and M.J.O. Strutt. "Experimental and Computed Four Scattering and Four Noise Parameters of GaAs FET's Up to 4 GHz (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 138-140.

The four scattering parameters, operating in the pinch-off mode, of a Schottky-barrier-gate FET (MESFET) are investigated with the aid of an appropriate equivalent circuit. The dependence of the electron drift velocity on the electric field of the channel has been simplified to be piecewise linear by Turner and Wilson. Hot electron effects have therefore been neglected. The four noise parameters of the device have also been computed using the noise sources of van der Ziel. All computed parameters are compared with their measured values in the frequency region 0.5-4 GHz. Investigated GaAs FET's are commercial units.



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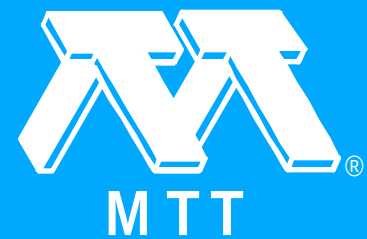


Abstracts

All Automatic System for Simultaneous Measurement of Amplitude and Phase of Millimeter-Wave Fields (Short Papers)

N.A. Mathews and H. Stachera. "All Automatic System for Simultaneous Measurement of Amplitude and Phase of Millimeter-Wave Fields (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 140-142.

A measuring system for the simultaneous determination of amplitude and phase distributions of EM fields is described. The system employs the vibrating-dipole technique, which is based on the principle of modulated scattering. The phase-modulated wave scattered by the vibrating dipole contains information about the amplitude and phase of the EM field at the midpoint of the dipole's vibration. The system has been made automatic by the inclusion of a servo loop. The measured free-space distributions compare well with those calculated from theory.



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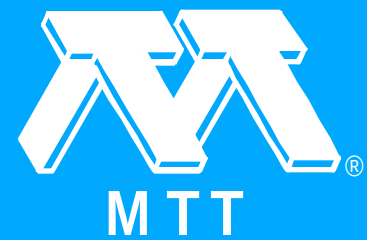
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High-Frequency Gunn Oscillators (Short Papers)

T.G. Ruttan. "High-Frequency Gunn Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 142-144.

Recent work to achieve high output power of fundamental mode Gunn-effect oscillators at frequencies ranging from 25 to 71 GHz is described. Ambient powers of 370 mW at 6.7-percent efficiency at 25 GHz, 260 mW at 4.5-percent efficiency at 38 GHz 150 mW at 4-percent efficiency at 54 GHz, and 30 mW at 1-percent efficiency at 71 GHz were obtained from single-diode structures. Combining two diodes in a push-pull circuit yielded 400 mW at 3.5-percent efficiency at 32 GHz and 260 mW at 4.0-percent efficiency at 42 GHz. This represents some of the highest powers and efficiencies reported to date from millimeter-wave Gunn-effect oscillators.

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Abstracts

Application of Quarter-Wave Transformers for Precise Measurement of Complex Microwave Conductivity of Semiconductors (Short Papers)

P.K. Roy and A.N. Datta. "Application of Quarter-Wave Transformers for Precise Measurement of Complex Microwave Conductivity of Semiconductors (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 144-146.

The utility of a quarter-wave transformer for precise measurement of complex microwave conductivity of semiconductors has been demonstrated. It has been shown for a chosen conductivity of $9 \text{ } \Omega \cdot \text{cm}$ that the improvement in measurement accuracy is nearly by a factor of 3 over the conventional reflection measurement using a Teflon transformer.



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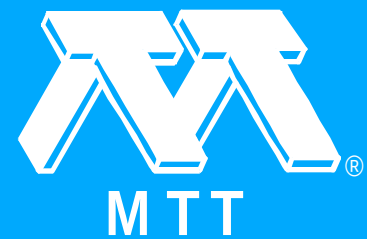


Abstracts

Factors Limiting the Signal-to-Noise Ratio of Negative-Conductance Amplifiers and Oscillators in FM/FDM Communications Systems (Short Papers)

A.A. Sweet. "Factors Limiting the Signal-to-Noise Ratio of Negative-Conductance Amplifiers and Oscillators in FM/FDM Communications Systems (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 146-149.

A derivation is presented for the signal-to-noise ratio of negative-conductance amplifiers and oscillators in FM/frequency division multiplexing (FDM) communications applications. Results indicate the limiting value of signal-to-noise ratio depends on the semiconductor properties and channel loading only. This means circuit adjustments, such as Q, cannot increase the signal-to-noise ratio without bounds. Typical specifications are given. Limiting values of signal-to-noise ratio for Gunn and Si IMPATT devices are given in typical applications. Results indicate that Gunn devices have a clear advantage over Si IMPATT'S in a signal-to-noise sense.



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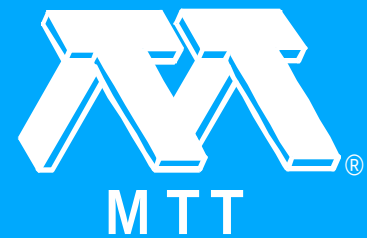


Abstracts

Wave Propagation on Nonuniform Transmission Lines (Comments)

S.C. Dutta Roy. "Wave Propagation on Nonuniform Transmission Lines (Comments)." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 149-150.

It is shown that the solutions for wave propagation on a nonuniform transmission line, recently proposed by Bergquist, are alternative forms of, or easily derivable from, the results of Protonotarios and Wing, given earlier.



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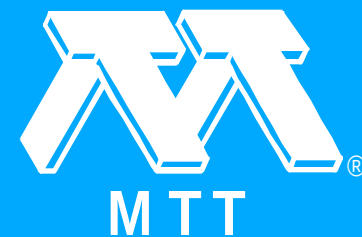
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Contributors (Feb. 1974 [T-MTT])

S. Egami, C. Fray, O. Fukumitsu, Y. Garault, T. Itoh, N. Kumagai, N.A. Mathews, M. Matsuhara, R. Mittra, J.A. Morrison, Y. Satomura, S. Shimada, H. Stachera, N. Suzuki and K. Tanaka. "Contributors (Feb. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): 151-152.



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Back Cover (Feb. 1974 [T-MTT])

"Back Cover (Feb. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.2 (Feb. 1974 [T-MTT]): b1-b2.



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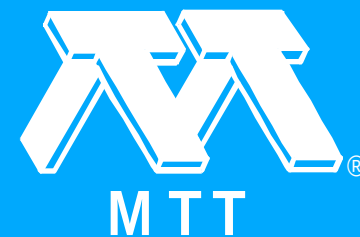
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Abstracts

Front Cover (Mar. 1974 [T-MTT])

"Front Cover (Mar. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): f1-f2.



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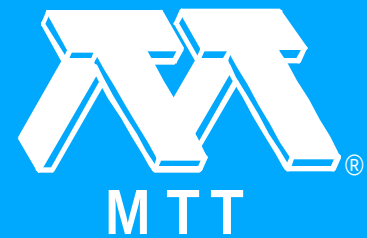


Abstracts

Editorial (Mar. 1974 [T-MTT])

J.W. Bandler. "Editorial (Mar. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 153-154.

Being somewhat at a focal point of computer-oriented microwave practices in the capacity of Associate Editor (Computer Program Descriptions) of this Transactions, as well as Guest Editor of this Special Issue, I am exposed to a wide range of opinions held by contributors to the field as well as by users. A representative sample of these opinions is in evidence in the Panel Discussion that follows this Editorial.



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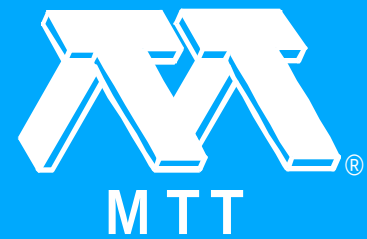


Abstracts

The Status of Computer-Oriented Microwave Practices (Panel Discussion)

I.A. Cermak, W.J. Getsinger, B.W. Leake, A.S. Vander Vorst and D. Varon. "The Status of Computer-Oriented Microwave Practices (Panel Discussion)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 155-160.

The panel members were asked to respond to the Guest Editor's questions, given below. They were then given copies of each other's comments and asked to respond with a second round of opinions.



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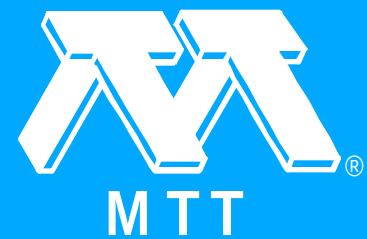


Abstracts

Semiconductor Device Simulation

C.M. Lee, R.J. Lomax and G.I. Haddad. "Semiconductor Device Simulation." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 160-177.

Two of the numerical methods most widely used in solving the set of partial differential transport equations for holes, electrons, and electric field in semiconductor devices and the various numerical instability phenomena which can be encountered are described in detail. Also presented are approaches, using these methods, to calculate dc static solutions and small-signal solutions, and to simulate devices in voltage-driven, current-driven, and circuit-loaded operation. Sample results are given for each mode of operation for the case of Si avalanche-diode oscillators. The numerical methods and approaches are those developed at our laboratory and sufficient detail is presented to permit the development of similar Fortran codes by others.



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Abstracts

Computer Simulation of Small-Signal and Noise Behavior of Microwave Bipolar Transistors Up to 12 GHz

K. Hartmann and M.J.O. Strutt. "Computer Simulation of Small-Signal and Noise Behavior of Microwave Bipolar Transistors Up to 12 GHz." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 178-182.

Computer-aided determination and optimization of lumped elements of equivalent circuits based on experimental data, application to the lumped equivalent circuit including noise sources of microwave bipolar transistors, and calculation of gain, noise, and stability from the said computer simulation are dealt with. As an example, a special microwave transistor mount and aspects of a new rugged metal-ceramic package are considered.



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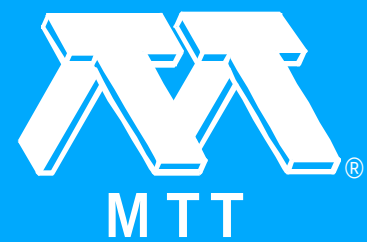
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A Theoretical Study of the High-Frequency Performance of a Schottky-Barrier Field-Effect Transistor Fabricated on a High-Resistivity Substrate

G.D. Alley and H.E. Talley. "A Theoretical Study of the High-Frequency Performance of a Schottky-Barrier Field-Effect Transistor Fabricated on a High-Resistivity Substrate." 1974 *Transactions on Microwave Theory and Techniques* 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 183-189.

The short-circuit admittance parameters for a silicon Schottky-barrier field-effect transistor (SBFET) fabricated on a high-resistivity substrate are calculated from first principles ignoring the effects of minority carriers. The calculations show the maximum frequency of oscillation for a device with a 1- μm gate to be 17.9 GHz, neglecting the parasitic associated with the contact metallizations, and 14.7 GHz when the parasitic are included. In order to describe the dynamic behavior of the device, the static properties must first be obtained. The simultaneous solution of Poisson's equation and the continuity equation, both in two dimensions, gives the static charge and potential distribution in the device. The effects of a field-dependent mobility are included in the continuity equation. Using the results of static two-dimensional solutions, a one-dimensional device model is developed that permits the dynamic device behavior to be described by a one-dimensional linear ordinary differential equation. By solving this equation under appropriate boundary conditions, the device y parameters are found as functions of frequency. Calculated results are shown to be in good agreement with published experimental data.

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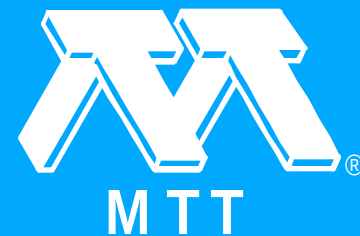


Abstracts

Numerical Modeling of Passive Microwave Devices

P. Silvester and Z.J. Csendes. "Numerical Modeling of Passive Microwave Devices." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 190-201.

Passive linear bilateral microwave devices principally include guided wave transmission structures, their junctions, and interconnections, as well as such complex devices as resonant cavities and planar networks. The computational methods for analyzing the behavior of this class of structures and for characterizing them for purposes of network design are briefly reviewed.



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Abstracts

Polar Geometry Waveguides by Finite-Element Methods

P. Daly. "Polar Geometry Waveguides by Finite-Element Methods." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 202-209.

For waveguides whose geometries are described as coordinate surfaces in circular polar coordinates, a finite-element method is used to derive base matrices over a triangular element in the polar geometry. These matrices are used to solve, mode problems in circular, sector, double-ridged circular, and spiral waveguides. The discussion is mainly in terms of cutoff frequency, bandwidth, and convergence.



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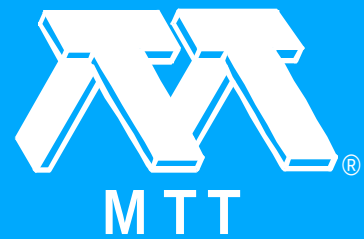


Abstracts

The Solution of Inhomogeneous Waveguide Problems Using a Transmission-Line Matrix

P.B. Johns. "The Solution of Inhomogeneous Waveguide Problems Using a Transmission-Line Matrix." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 209-215.

A method of applying the transmission-line matrix method to inhomogeneous waveguide structures is described. The technique uses open-circuit stubs of variable characteristic impedance at each node in the matrix, thereby providing an analog for a dielectric. LSE and LSM modes in rectangular waveguides, and problems involving a step of dielectric are solved. Results are given in terms of the cutoff frequency and field pattern for continuous waveguides, and the waveguide input impedance for scattering problems.



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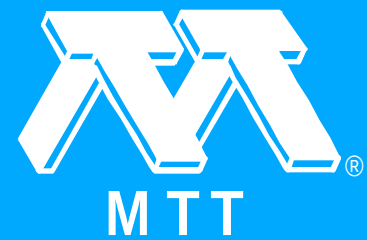
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Equivalent Circuit Models for Three-Dimensional Multiconductor Systems

A.E. Ruehli. "Equivalent Circuit Models for Three-Dimensional Multiconductor Systems." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 216-221.

Multiconductor or multiwire arrangements find many applications in electronic systems. Examples are interconnections between digital circuits or integrated microwave circuits. Equivalent circuit models are derived here from an integral equation to establish an electrical description of the physical geometry. The models, which are appropriately called partial element equivalent circuits (PEEC), are general in that they include losses. Models of different complexity can be constructed, to suit the application at hand.

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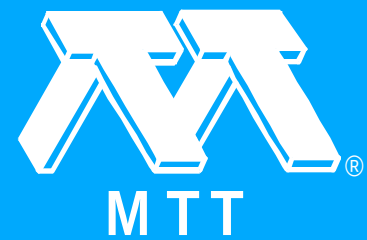


Abstracts

An Iterative Approach to the Finite-Element Method in Field Problems

W. Kinsner and E. Della Torre. "An Iterative Approach to the Finite-Element Method in Field Problems." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 221-228.

An iterative approach to the finite-element method is presented. Several finite-element formulations are presented for the Laplace, Poisson, and Helmholtz equations. These formulations permit iterative solutions. The convergence of the vector sequences generated by the iterative method is accelerated using successive extrapolation and other methods. Accuracy and convergence of the solutions are discussed.



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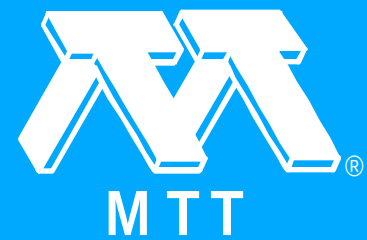
Application of a Variation-Iteration Method to Waveguides with Inhomogeneous Lossy Loads

A.A. Laloux, R.J.M. Govaerts and A.S. Vander Vorst. "Application of a Variation-Iteration Method to Waveguides with Inhomogeneous Lossy Loads." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 229-236.

An approximate technique for solving eigenvalue equations, the variation-iteration method, is commonly used in theoretical physics. A previous paper presented the application of this method to the scalar case of a dielectric slab loaded rectangular waveguide. This paper presents its extension to the complex vector case of a lossy dielectric insert loaded waveguide. Starting from an initial trial function, iterates are calculated in which the components relative to the unwanted eigenfunctions are eliminated. Both an upper and a lower bound for the unknown eigenvalues are available. Each iterate is the solution of a system of algebraic simultaneous equations. This system is solved by the successive overrelaxation method using an automatically computed optimal accelerating factor. An extrapolation technique further accelerates the convergence. This yields the attenuation and propagation coefficients for the dominant as well as several other modes, together with the electric and magnetic field configurations.

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Variational Solution of Integral Equations

B.H. McDonald, M. Friedman and A. Wexler. "Variational Solution of Integral Equations." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 237-248.

A variational solution of the Fredholm integral equation of the first kind resulting from Laplace's equation with Dirichlet boundary conditions is discussed. Positive-definiteness of the integral operator is used to guarantee convergence. The square parallel plate capacitor is given as an example with several different types of trial functions. Special singular functions to handle known field behavior are shown to result in improved accuracy with reduced computing cost. The air-dielectric interface condition is related to a general Neumann-mixed boundary condition for which a variational method with a positive-definite integral operator is presented. Multiple boundary conditions are handled by mutually constraining separate variational expressions for each boundary condition. A T-shaped conductor on a dielectric slab, representative of quasi-static solutions of microstrip discontinuities, is presented as a three-dimensional example with multiple boundary conditions. Generally, it is shown how the finite-element method for the solution of partial differential equations may be extended to handle integral equation formulations.

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Computer-Aided Analysis of Microwave Circuits

V.A. Monaco and P. Tiberio. "Computer-Aided Analysis of Microwave Circuits." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 249-263.

The most relevant techniques that have either found or should find useful application in analyzing microwave circuit performances in the frequency domain are surveyed. The particular needs of the microwave engineer are briefly discussed. Circuit equation formulations in terms of voltages and currents and wave variables are presented and the solution of the set of circuit equations by sparse-matrix techniques is illustrated. Methods based on multiport connection are also reviewed. The techniques for computing the first- and second-order sensitivity are illustrated and a comparison is made between the direct method and the transpose-matrix method, which is in certain cases similar to the method based on the adjoint circuit.

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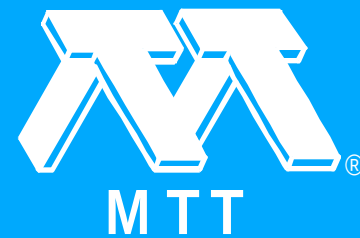


Abstracts

Microwave Circuit Analysis by Sparse-Matrix Techniques (Mar. 1974 [T-MTT])

F. Bonfatti, V.A. Monaco and P. Tiberio. "Microwave Circuit Analysis by Sparse-Matrix Techniques (Mar. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 264-269.

Linear microwave circuit analysis by sparse-matrix techniques is discussed. Optimum equation ordering and pivoting are proposed to reduce execution time, storage requirement, and to improve accuracy. A direct first-order sensitivity method using sparse-matrix techniques is proposed and compared with the adjoint network method. Details on the implemented program and a numerical example are given.



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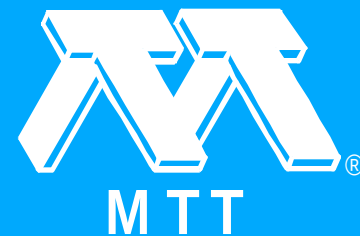


Abstracts

Nonlinear, Linear Analysis and Computer-Aided Design of Resistive Mixers

S. Egami. "Nonlinear, Linear Analysis and Computer-Aided Design of Resistive Mixers." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 270-275.

Nonlinear large-signal analysis of local current shape and linear small-signal analysis of small-signal products are made for resistive mixers. Iteration adapted from Newton's method was used in the nonlinear analysis. The conjugate match method was used in the linear analysis to find the minimum conversion loss. These theories were applied to a new type spurious suppressed mixer and a reliable computer simulation was made.



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Time-Domain Oscillographic Microwave Network Analysis Using Frequency-Domain Data

M.E. Hines and H.E. Stinehelfer, Sr.. "Time-Domain Oscillographic Microwave Network Analysis Using Frequency-Domain Data." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 276-282.

Oscillographic plots of various time-domain responses of microwave networks are generated by computer simulation, based upon measurements taken in the frequency domain. Frequency-response data are obtained with a computer-controlled automatic network analyzer, this information is processed in an associated computer, and selected time-domain responses are plotted immediately on an x-y recorder. Voltage versus time responses have been simulated for various excitations including impulse, step, and pulse-modulated RF waves. When impedance data are used, the plots are interpretable as from a time-domain reflectometer with high precision, high sensitivity, and high resolving power. As an oscillograph the rise time may be as short as 0.04 ns. In transmission 70 dB or more loss can be tolerated. In reflection measurements, the results are interpretable for discrete discontinuities with 40 dB or more return loss, and with separations on the order of 1 cm in space. In certain types of circuits, time-domain data can be used to reconstruct the frequency-domain response data in an approximate manner for separate parts of a network without separate measurements. In this manner, the interference of generator, load, and transducer mismatches can be substantially reduced.



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De-Embedding and Underminating

R.F. Bauer and P. Penfield, Jr.. "De-Embedding and Underminating." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 282-288.

De-embedding is the process of deducing the impedance of a device under test from measurements made at a distance, when the electrical properties of the intervening structure are known. Underminating is the process of deducing the electrical properties of the intervening structure from a series of measurements with known embedded devices. The mathematical steps necessary for de-embedding and underminating with theoretically redundant measurements in order to minimize the effect of experimental errors.

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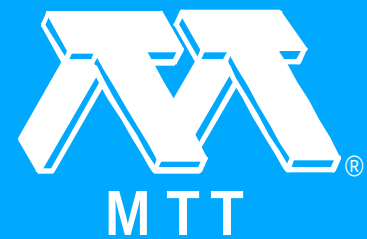


Abstracts

A Unified Review of Optimization

C. Charalambous. "A Unified Review of Optimization." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 289-300.

The main objective of this paper is to give a survey of recent automatic optimization methods which either have found or should find useful application in the area of computer-aided network design. Huang's family of algorithms for unconstrained optimization is reviewed. The Fletcher method and the Charalambous family of algorithms for unconstrained optimization, which abandon the "full linear search," are presented. Special emphasis is devoted to algorithms by Bandler and Charalambous on least pth and minimax optimization which can be readily programmed and used. Due to work by Bandler and Charalambous, it is shown how constrained minimax problems can be solved exactly as unconstrained minimax problems by using a new approach to nonlinear programming. The application of minimax optimization on the design of lumped-distributed active filters, problems for future investigation, and a select list of references are also included.



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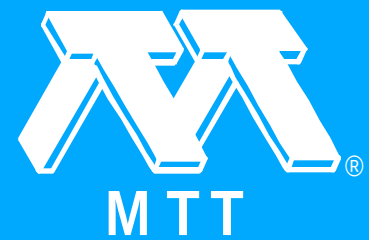
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Cascaded Network Optimization Program

J.W. Bandler, J.R. Popovic and V.K. Jha. "Cascaded Network Optimization Program." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 300-308.

A user-oriented computer program package is presented that will analyze and optimize certain cascaded linear time-invariant electrical networks such as microwave filters and all-pass networks. The program is organized in such a way that future additions or deletions of performance specifications, constraints, optimization methods, and circuit elements are readily implemented. Presently, a variety of two-port lumped and distributed elements, all-pass C-type sections and all-pass D-type sections can be treated as fixed or variable between upper and lower bounds on the parameters. Adjoint network sensitivity formulas are incorporated. The Fletcher-Powell or Fletcher optimization methods can be called to optimize in the least pth sense of Bandler and Charalambous an objective function incorporating simultaneously, at the user's discretion, input reflection coefficient, insertion loss, group delay, and the parameter constraints (if any). The program is particularly flexible in the way in which response specifications are handled at any number of, in general, overlapping frequency bands. The package, which is written in Fortran IV, has been tested on a CDC 6400 digital computer.

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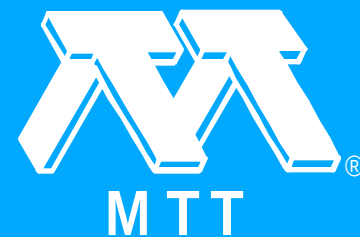


Abstracts

CADMIC--Computer-Aided Design of Microwave Integrated Circuits

E. Sanchez-Sinencio and T.N. Trick. "CADMIC--Computer-Aided Design of Microwave Integrated Circuits." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 309-316.

A computer program for the analysis and design of distributed lumped circuits, including microwave integrated circuits, is discussed. It is capable of frequency-domain analysis, optimization of transducer power gain, reflection coefficient, and/or noise figure. Also, the program can compute the return difference with respect to any admittance parameter so that the stability of the circuit can be determined by the Nyquist criterion. The program handles complex impedances, resistors, capacitors, inductors, transmission lines, independent current sources and grounded voltage sources, voltage-controlled current sources, and multiport elements, such as transistors and circulators, described by their scattering or admittance parameters. It contains a free-format input. The implementation is based on the indefinite admittance matrix, sparse matrices, adjoint networks, the Fletcher-Powell or Fletcher minimization algorithm, and Bode's feedback theory.



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Method of Synthesizing Nonuniform Waveguides

K. Gruner. "Method of Synthesizing Nonuniform Waveguides." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 317-322.

A method is proposed for the synthesis of continuous nonuniform waveguides with rectangular cross section so that they show desired electromagnetic properties for discrete frequencies when excited by the TE/sub 10/ mode. Starting from a uniform structure with known properties, the shape of the nonuniform waveguide is attained step by step by small systematic deformations. To show the feasibility of the method proposed, the mathematical formalism and numerical results are presented for reactive one-ports and filters with simple properties. In these cases, the problem is reduced to the solution of an equivalent resonator problem, i.e., a nonuniform waveguide resonator is developed for which a certain set of resonance modes occur at desired frequencies.

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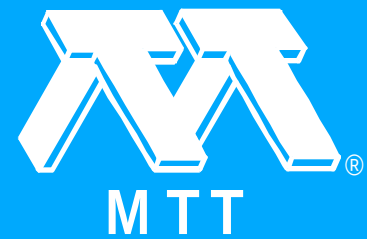


Abstracts

Tabulation of Methods for the Numerical Solution of the Hollow Waveguide Problem (Short Papers)

F.L. Ng. "Tabulation of Methods for the Numerical Solution of the Hollow Waveguide Problem (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 322-329.

A comparison of methods for the numerical solution of the hollow waveguide problem is presented in tabular form. Another table lists waveguide shapes and their cutoff characteristics that have been presented in the literature. These tables and the bibliography afford an aid towards the selection of a method.



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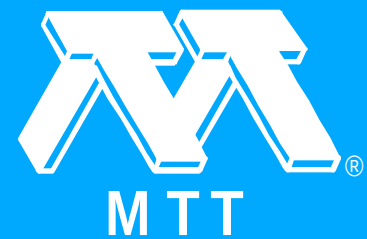


Abstracts

Numerical Solution of Surface Waveguide Modes Using Transverse Field Components (Short Papers)

C.G. Williams and G.K. Cambrell. "Numerical Solution of Surface Waveguide Modes Using Transverse Field Components (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 329-330.

The computation of surface waveguide modes is facilitated by reducing the surface waveguide field problem to a conventional eigenvalue problem that has no spurious solutions. This is achieved by formulating the field problem in terms of transverse field components and by using impedance boundary conditions on an auxiliary boundary with a specified value of the exterior cutoff wavenumber.



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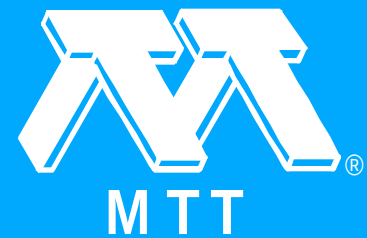


Abstracts

Correction for Adapters in Microwave Measurements (Short Papers)

A. Uhler, Jr.. "Correction for Adapters in Microwave Measurements (Short Papers)." 1974 *Transactions on Microwave Theory and Techniques* 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 330-332.

A measurement on a standard termination provides sufficient information for making corrected measurements through an adapter, if the dissipative loss of the adapter can be neglected. This approximation often gives more consistent results than calibration techniques that require highly reflecting standards.



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Computer-Aided Design of Waveguide Multiplexer (Short Papers)

A.E. Atia. "Computer-Aided Design of Waveguide Multiplexer (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 332-336.

A procedure based on an analysis algorithm and practical rules is described for the design of waveguide multiplexer. Simple rules, which enable the designer to quickly find a near-optimum solution in a small number of iteration steps, are given. An example of a 6-channel communications multiplexer, which utilizes narrow-bandpass elliptic function waveguide filters, is also included.



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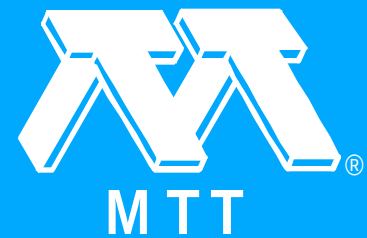


Abstracts

Microwave Circuit Optimization Employing Exact Algebraic Partial Derivatives (Short Papers)

G.R. Branner. "Microwave Circuit Optimization Employing Exact Algebraic Partial Derivatives (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 336-339.

A technique for the optimization and sensitivity analysis of broad classes of electrical networks is illustrated. The method utilizes the exact algebraic partial derivatives of functions with respect to any desired independent variable. This completely automated technique has the obvious advantage that the derivatives of any circuit response function with respect to any desired component parameter may be obtained with no additional analytical effort on the part of the designer. Several examples are given to illustrate the procedure.



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Abstracts

Group-Delay Smoothing by Noncentral Statistics (Letters)

A. Uhler, Jr.. "Group-Delay Smoothing by Noncentral Statistics (Letters)." 1974 *Transactions on Microwave Theory and Techniques* 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 339-340.

Automatic network analyzer group-delay measurements are improved by simple hardware substitutions, more exact frequency calculations, and a discounting of group-delay variations that fail to persist through several settings of the reference path length.



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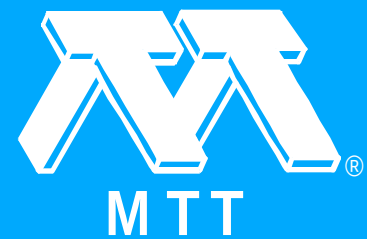


Abstracts

MICTPT--A Minicomputer General-Purpose Microwave Two-Port Analysis Program (Letters)

D.H. Olson and F.J. Rosenbaum. "MICTPT--A Minicomputer General-Purpose Microwave Two-Port Analysis Program (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 340-342.

General-purpose microwave network-analysis programs are typically organized on a time-shared basis using large-scale computers. As minicomputers become widely available, it is desirable to have a compatible general-purpose analysis program to assist the microwave engineer in his design efforts. The purpose of this letter is to describe the implementation of one such program for machines with 4K words of memory. Although MICTPT was designed for a Digital Equipment Corporation PDP-5 computer with 4K (4096) of 12-bit word core storage, the approaches used are applicable to any similar small computer.



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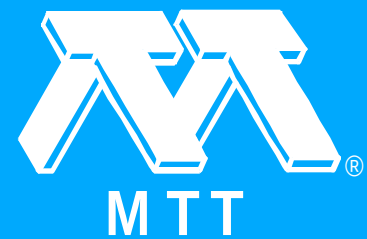


Abstracts

Computation of Dielectric Properties from Short-Circuited Waveguide Measurements on High- or Low-Loss Materials (Computer Program Descriptions)

S.O. Nelson, C.W. Schlaphoff and L.E. Stetson. "Computation of Dielectric Properties from Short-Circuited Waveguide Measurements on High- or Low-Loss Materials (Computer Program Descriptions)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 342-343.

Computation of the relative complex permittivity components ϵ_r' and ϵ_r'' loss tangent, and conductivity from measurements data on materials in coaxial, rectangular, or cylindrical waveguides.



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Abstracts

The Complex Program for Constrained Minimization (Computer Program Description)

K.F. Schenk. "The Complex Program for Constrained Minimization (Computer Program Description)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 343-344.

The complex program is a package of subroutines that minimizes a nonlinear objective function subject to nonlinear inequality constraints.



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Abstracts

CANOPT--Cascaded Network Optimization Package (Computer Program Description)

J.W. Bandler and J.R. Popovic. "CANOPT--Cascaded Network Optimization Package (Computer Program Description)." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 344-344.

The program analyzes and optimizes certain cascaded linear time-invariant networks in the frequency domain made up of two-port elements such as resistors, inductors, capacitors, lossless transmission lines, lossless short-circuited, and open-circuited transmission line stubs, series and parallel RLC resonant circuits and microwave allpass C- and D-sections.



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G.D. Alley, R.F. Bauer, F. Bonfatti, I.A. Cermak, C. Charalambous, Z.J. Csendes, P. Daly, E. Della Torre, S. Egami, M. Friedman, W.J. Getsinger, R.J.M. Govaerts, K. Gruner, G.I. Haddad, K. Hartmann, M.E. Hines, V.K. Jha, P.B. Johns, W. Kinsner, A.A. Laloux, B.W. Leake, C.M. Lee, R.J. Lomax, B.H. McDonald, V.A. Monaco, P. Penfield, Jr., J.R. Popovic, A.E. Ruehli, E. Sanchez-Sinencio, P. Silvester, H.E. Stinehelfer, Sr., M.J.O. Strutt, H.E. Talley, P. Tiberio, T.N. Trick, A.S. Vander Vorst, D. Varon and A. Wexler. "Contributors (Mar. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 345-351.



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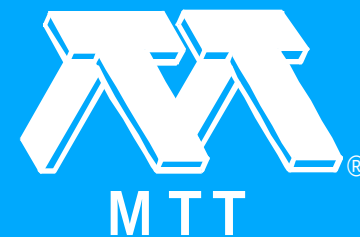
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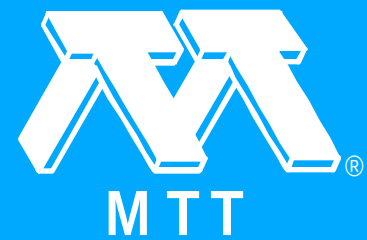
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A Restatement of Mathematical Considerations of TEM Modes on an n-Wire Line

N. Nagai and A. Matsumoto. "A Restatement of Mathematical Considerations of TEM Modes on an n-Wire Line." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 353-359.

A restatement of mathematical considerations of TEM modes on an n-wire line is presented. An n-wire line inside a shielding conductor or over a ground plane supports n independent TEM modes which can be determined by obtaining eigenvectors on the n-wire line deduced from the characteristic admittance matrix. It is shown conclusively that the TEM modes are determined by the geometrical arrangement of the n wires as well as by the manner of excitation on the n-wire line. Power division ratios on each wire and terminating admittances for output ports of each wire are also discussed, and it is shown that one can excite a TEM mode similar to an even mode and $n - 1$ TEM modes, each of which resembles an odd mode, on the n-wire line.

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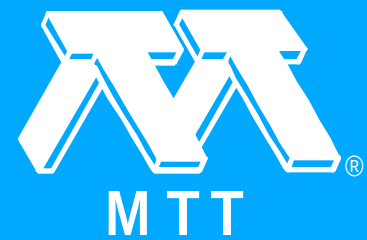
Optimum Filling of Ferrite Phase Shifters of Uniform Dielectric Constant

H.C. Bell, Jr. and C.R. Boyd, Jr.. "Optimum Filling of Ferrite Phase Shifters of Uniform Dielectric Constant." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 360-364.

Approximation methods are used to calculate the phase shift and loss for phase shifters containing ferrite and dielectric, with a uniform dielectric constant throughout the waveguide. If the RF magnetic loss in the ferrite is a significant fraction of the total loss, the overall performance of a phase shifter that is partially filled with ferrite may be superior to the fully filled case. Theoretical results relating performance to the amount of partial filling are presented for Faraday rotators in square and circular waveguides and a twin-slab phase shifter. Experimental results were obtained for a circular Faraday rotator.

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Microwave Measurement of a Complex Dielectric Constant Over a Wide Range of Values by Means of a Waveguide-Resonator Method

C. Das Gupta. "Microwave Measurement of a Complex Dielectric Constant Over a Wide Range of Values by Means of a Waveguide-Resonator Method." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 365-372.

A new method of measuring complex dielectric constants at microwave frequencies by introducing a resonant circuit comprised of the experimental sample within a waveguide is described. The theoretical evaluation of working equations for the complex dielectric constant under the quasi-stationary distribution of the field within the sample is given. In this case, the equations are derived 1) considering the elements as lumped parameters and 2) distributed parameters are treated by means of transmission line equations. The two sets of equations are compared. The working equations are also derived for the condition when the experimental sample takes up the form of a radial line. The accuracy of determining the parameters is computed and experimental results are provided as verification of the applicability of the given method.

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Abstracts

A Spectral Domain Analysis for Solving Microstrip Discontinuity Problems

Y. Rahmat-Samii, T. Itoh and R. Mittra. "A Spectral Domain Analysis for Solving Microstrip Discontinuity Problems." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 372-378.

A general approach for deriving quasi-static equivalent circuits for discontinuities in microstrip lines is presented. The formulation is based upon Galerkin's method applied in the Fourier transform domain. Numerical results are presented for a number of different configurations and compared with data available from other sources.



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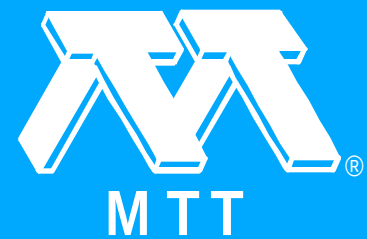


Abstracts

Theory of Coupled Open Transmission Lines and its Applications

M. Matsuhara and N. Kumagai. "Theory of Coupled Open Transmission Lines and its Applications." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 378-382.

A technique is presented which is applicable to any uniform coupled open transmission lines such as coupled optical integrated circuits. The proposed technique is as follows. The electromagnetic fields of the wave propagating along a coupled line is expressed in terms of a linear combination of the fields associated with the individual lines, as a zero-order approximation. Inserting this trial field description into the variational expression for the propagation constant β and applying the well-known Rayleigh-Ritz's procedure, accurate solutions for the propagation constants of the coupled lines are obtained. This method can be applied generally to analyze coupled structures in microwave, millimeter wave, and optical wave circuitry. As an illustrative example, the coupling between two optical transmission lines consisting of lens-like dielectric media has been analyzed by means of the proposed technique.



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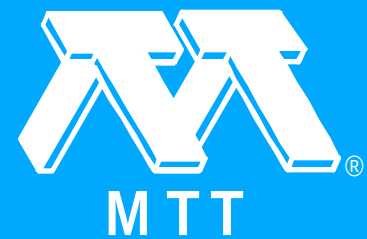


Abstracts

An S-Band Radiometer Design with High Absolute Precision

W.N. Hardy, K.W. Gray and A.W. Love. "An S-Band Radiometer Design with High Absolute Precision." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 382-390.

A radiometer for the remote measurement of sea surface temperature is described. Two requirements are necessary for the attainment of an absolute accuracy of 1 or 2 K in molecular temperature. Although the first is inappropriate for discussion here, it is clear that corrections must be developed to account for perturbations caused by surface effects (roughness, foaming, and salinity changes) and for atmospheric effects (absorption and scattering). The second requirement, namely, the development of an instrument capable not only of high relative accuracy (i.e., resolution) but also of high absolute precision, is the subject of this paper. The concepts underlying the design of an instrument capable of an absolute accuracy of a few tenths degrees Kelvin in the measurement of brightness temperature at S band are described. The role of the antenna is discussed and the importance of high ohmic and beam efficiencies is stressed. The hardware itself is fully described, along with an outline on the design of a unique cryogenically cooled termination used to calibrate the whole radiometer, including antenna. Finally, some test results are presented that show that the design goals for the instrument have been closely approached.



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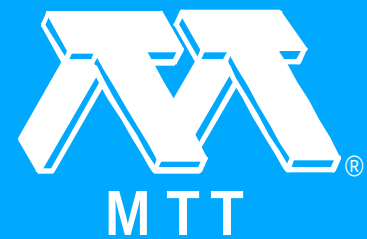


Abstracts

Influence of Surface Metallization on the Propagation Characteristics of Surface Magnetostatic Waves in an Axially Magnetized Rectangular YIG Rod

K. Kawasaki and M. Umeno. "Influence of Surface Metallization on the Propagation Characteristics of Surface Magnetostatic Waves in an Axially Magnetized Rectangular YIG Rod." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 391-394.

It has been shown that the boundary conditions strongly influence the propagation characteristics of surface magnetostatic waves propagating in the direction of the external dc magnetic field; the frequency spectrum narrows and the cutoff wavenumber decreases continuously as the gap between the sample surfaces and metal walls increases in the direction in which the magnetic potential decays exponentially. Experimental results obtained at X band agree well with the theoretical estimates.



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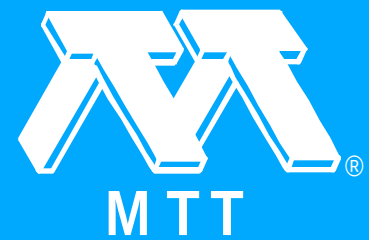
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Waveguide Sandwich Filters

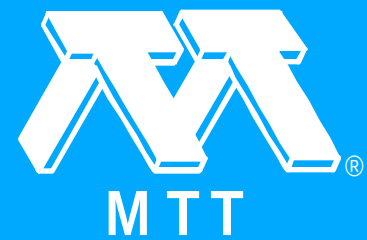
J.D. Rhodes. "Waveguide Sandwich Filters." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 394-399.

A new class of waveguide filters is introduced, constructed from several thin plates sandwiched together. The combination of alternate plates having large and small rectangular apertures leads to a propagating structure which possesses a bandstop response and prescribed characteristic impedance. This basic element may be used as a simple compact bandstop filter, particularly where the main passband and stopband are well separated, such as in harmonic rejection. For filters with many stopbands, combinations of several waveguide sandwich filter elements are used to provide the main passband and the required attenuation characteristics in the prescribed stopbands. Although the filter is ideally suited for bandstop filtering due to its small size, low cost, low loss, and high power handling capability, additional applications to bandpass filtering and dispersive delay line operation are also cited.



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Composite-Junction Circulators Using Ferrite Disks and Dielectric Rings

J. Helszajn. "Composite-Junction Circulators Using Ferrite Disks and Dielectric Rings." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 400-410.

Since most junctions do not use the full available magnetic splitting of the ferrite material, it is possible to replace part of it by a dielectric. The theoretical and experimental development of such composite stripline circulators using ferrite disks surrounded by dielectric rings is given in this paper. Theoretical calculations and experimental results on the circulation frequency, gyrator admittance, and split frequencies of such circulators are included. The case of a partially magnetized ferrite disk on a ferrite substrate is treated separately. The susceptance slope parameter of this circulator geometry is also derived and measured. The results obtained in this paper show to what extent the ferrite disk behaves as a dielectric at the edge of the disk. The geometry leads to considerable saving in ferrite material, which is particularly important in UHF circulators. The experimental results are in good agreement with the theory.

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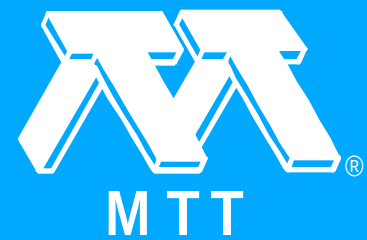
Electronic Phase Shifter for Millimeter-Wave Semiconductor Dielectric Integrated Circuits

H. Jacobs and M.M. Chrepta. "Electronic Phase Shifter for Millimeter-Wave Semiconductor Dielectric Integrated Circuits." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 411-417.

A new system is proposed for millimeter-wave integrated circuits. It is suggested that high-resistivity silicon be used as a medium for a dielectric waveguide. With the advent of high-resistivity silicon, propagation can occur with relatively low loss. Furthermore, since the medium is a semiconductor compatible with active devices, it is proposed that active devices can be constructed directly in the semiconductor dielectric guide or appendaged directly on the surface. The basic approach is similar to that used in integrated optics, except that the medium for millimeter-wave guidance is a semiconductor and the control devices rely on conductivity modulation rather than on electrooptical effects. Some particular devices suggested are oscillator, mechanical and electronic phase shifters, amplitude modulators (switches), and detectors. The first of such devices investigated has been the electronic phase shifter. Related theory and experiments are reported here. In addition, preliminary results on oscillators imbedded in a dielectric resonator are presented.

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Electrode Resistance Effects in Interdigital Transducers

K.M. Lakin. "Electrode Resistance Effects in Interdigital Transducers." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 418-424.

A distributed RC circuit model is used to describe an interdigital electrode transducer (IDT) having finite conduction in the electrode stripes. The distributed circuit is described by a set of differential equations whose solutions yield the current and voltage distributions along the aperture of the IDT. It is found that the electrode resistance causes a distortion of the excited wave amplitude and phase due to the nonuniform voltage and current distribution. An equivalent circuit for the terminal properties is also derived which illustrates the effects of conduction loss. The theory is also used to predict electrode efficiency, effective aperture weighting, and phase shift in weighted arrays.

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Abstracts

Nonminimum-Phase Optimum-Amplitude Bandpass Waveguide Filters

A.E. Atia and A.E. Williams. "Nonminimum-Phase Optimum-Amplitude Bandpass Waveguide Filters." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 425-431.

The synthesis of narrow-bandpass waveguide filters having flat group delay and optimum-amplitude characteristics is described. The design utilizes either single- or dual-mode waveguide cavities. Experimental results for a 40-MHz-bandwidth filter centered at 4 GHz show excellent agreement with theory.



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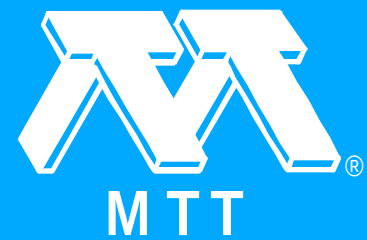
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Continuous Exposure of Chicks and Rats to Electromagnetic Fields

A.J. Giarola and W.F. Krueger. "Continuous Exposure of Chicks and Rats to Electromagnetic Fields." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 432-437.

Growth rate and feed consumption depressions were observed in groups of 25 day-old male chicks when exposed in metal cage environments to the following CW fields: 1) a UHF wave at 880 MHz in a very low-Q cavity resonator energized by a 220-mW power source (values of electric field square E^2 divided by the intrinsic impedance of free space $\eta = 377 \Omega$ were measured resulting in a maximum value of $550 \mu W cm^2$ with a "hot spot" of $900 \mu W cm^2$); 2) a VHF wave at 260 MHz in a very low-Q cavity resonator, energized by a 220-mW power source (values of $E^2\eta$ were not measured, but the values should have been similar to those measured in the UHF facility); 3) an extremely low frequency (ELF) electric field at either 45 or 60 Hz with calculated electric field strength of 3500 V/m; 4) an ELF magnetic field at either 45 or 60 Hz with 1.3 G was measured. Adrenal glands of chicks exposed to the 880-MHz wave were compared with those from control chicks. Smaller adrenals were observed in the treated group of birds. Growth depression was also observed in rats exposed to the UHF field at 880 MHz. Mean adrenal weights of the treated and control rats did not differ significantly; however, spleen and thymus weights of the treated rats were notably larger. Potential causes of the growth responses observed are discussed.





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A Microwave Decoupled Brain-Temperature Transducer

L.E. Larsen, R.A. Moore and J. Acevedo. "A Microwave Decoupled Brain-Temperature Transducer." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 438-444.

Bench test studies of conventional temperature transducers in microwave environments have demonstrated artifacts responsible for errors of several degrees centigrade. These findings led to a program for the development of systematic test procedures and the design of electrodes with artifact reduced to 0.1°C.

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Microwave Oscillator Noise Measuring System Employing a YIG Discriminator (Short Papers)

K. Watanabe and I. Takao. "Microwave Oscillator Noise Measuring System Employing a YIG Discriminator (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 444-446.

A microwave oscillator noise measuring system employing a YIG discriminator has been developed. The resonant frequency of the YIG discriminator is automatically tuned to follow the drift of the carrier frequency of the oscillator under test. This arrangement permits an accurate measurement of FM noise spectra near the carrier frequency as close as several tens of Hz off the carrier. The drift of the carrier frequency is measured over a wide range by monitoring fluctuations of the feedback current in the compensation coil that supports a part of the biasing magnetic field for the YIG discriminator.

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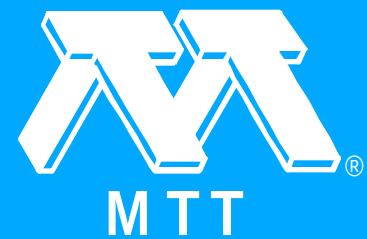


Abstracts

A Numerical Method Based on the Discretization of Maxwell Equations in Integral Form (Short Papers)

M. Albani and P. Bernardi. "A Numerical Method Based on the Discretization of Maxwell Equations in Integral Form (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 446-450.

A method is described for the solution of the electromagnetic field inside resonant cavities and waveguides of arbitrary shape, whether homogeneously or inhomogeneously filled. The method, suitably programmed for use with a digital computer, is based on the direct discretization of the Maxwell equations in integral form. Since the method works with the components of the electromagnetic field, the numerical solution directly gives the distributions of the field in the structure, in addition to the resonant frequencies of cavities or the propagation constants of waveguides. Some numerical applications of the method are given.



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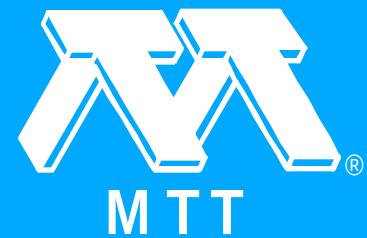


Abstracts

Low-Noise Mixer in Oversized Microstrip for 5-mm Band (Short Papers)

P.J. Meier. "Low-Noise Mixer in Oversized Microstrip for 5-mm Band (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 450-451.

This short paper summarizes the design and performance of a low-noise 5-mm mixer constructed in oversized microstrip--a new type of transmission line which is superior to microstrip at millimeter wavelengths. Including a 5-dB IF contribution, the measured noise figure was 9-10.5 dB over a wide range of LO frequencies and drive levels.



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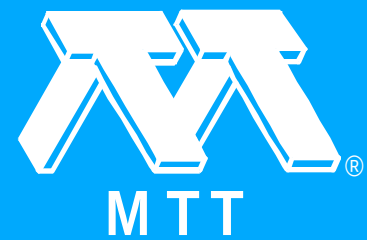


Abstracts

Simplified 12-GHz Low-Noise Converter with Mounted Planar Circuit in Waveguide (Short Papers)

Y. Konishi, K. Uenakada, N. Yazawa, N. Hoshino and T. Takahashi. "Simplified 12-GHz Low-Noise Converter with Mounted Planar Circuit in Waveguide (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 451-454.

A 12-GHz low-noise converter consisting of a planar circuit mounted in waveguide is described. This circuit consists of a metal sheet with proper patterns that is inserted in the middle of a waveguide parallel to the E plane. All circuit elements required for the converter are pressed or etched. This circuit is very useful for low-cost mass production and good performance. A measured noise figure of 4.5 dB was obtained with a 12-GHz signal frequency and a 420-MHz intermediate frequency.



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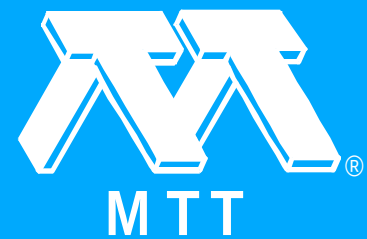


Abstracts

Efficient Numerical Computation of the Frequency Response of Cables Illuminated by an Electromagnetic Field (Short Papers)

C.R. Paul. "Efficient Numerical Computation of the Frequency Response of Cables Illuminated by an Electromagnetic Field (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 454-457.

Computationally efficient numerical methods for determining the frequency response of uniform transmission lines consisting of a large number of mutually coupled conductors in homogeneous and inhomogeneous media, and illuminated by an electromagnetic (EM) field are presented.



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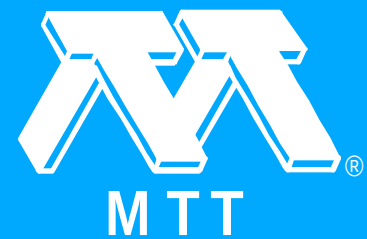


Abstracts

On the Calibration Process of Automatic Network Analyzer Systems (Short Papers)

S. Rehnmark. "On the Calibration Process of Automatic Network Analyzer Systems (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 457-458.

Formulas are presented for the direct calculation of the scattering parameters of a linear two-port, when it is measured by an imperfect network analyzer. Depending on the hardware configuration of the test set, the measurement system is represented by one of two flowgraph models. In both models presented, leakage paths are included. The error parameters, i.e., the scattering parameters of the measuring system, are six respective ten complex numbers for each frequency of interest. A calibration procedure, where measurements are made on standards, will determine the error parameters. One of many possible calibration procedures is briefly described. By using explicit formulas instead of iterative methods, the computing time for the correction of the scattering parameters of the unknown two-port is significantly reduced. The addition of leakage paths will only have a minor effect on computational complexity while measurement accuracy will increase.



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Abstracts

Design of Optimum Acoustic Surface Wave Delay Lines at Microwave Frequencies (Short Papers)

A.J. Slobodnik, Jr. and T.L. Szabo. "Design of Optimum Acoustic Surface Wave Delay Lines at Microwave Frequencies (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 458-462.

Optimum procedures for designing microwave acoustic surface wave delay lines are given. Combined beam steering fraction loss curves are provided as a function of the basic material parameter, the slope of the power flow angle, to allow optimum choice of material for a given application. Methods for designing uniform periodic interdigital transducers including finger ohmic loss, lossy tuning elements, and parasitic capacitance have been extended to account for beam steering and diffraction.



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Abstracts

Application of Microstrip Analysis to the Design of a Broad-Band Electrooptical Modulator (Short Papers)

E. Yamashita, K. Atsuki and T. Akamatsu. "Application of Microstrip Analysis to the Design of a Broad-Band Electrooptical Modulator (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 462-464.

This short paper describes a proposed structure of a broad-band electrooptical modulator and an application of existing microstrip analysis programs to determine dimensions of the structure for a broad-band property. Results of numerical computations indicate that it is possible to obtain a broad-band modulator by using LiNbO₃ or LiTaO₃.



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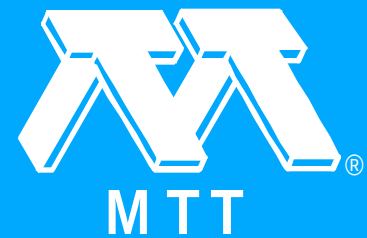


Abstracts

A MIC Phase-Locked Loop Avalanche Oscillator in X Band (Short Papers)

J. Salmon. "A MIC Phase-Locked Loop Avalanche Oscillator in X Band (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 464-466.

This short paper describes the design and performances of a MIC phase-locked loop X-band avalanche oscillator. The output power (500 mW/CW), the input reference level (1 mW), the locking time (80 ns), and the simplicity of digital phase control makes it very attractive as a primary element of an active phased array.



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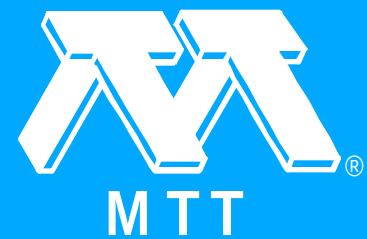


Abstracts

The Determination of an Excess Capacitance (Short Papers)

H.J. Riblet. "The Determination of an Excess Capacitance (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 467-467.

In the evaluation of "fringing capacitances" one is required to map the specified geometry in the z plane onto the upper half t plane and then to determine the limiting value of the capacitance between the two segments of the real axis--corresponding to the two conductors in the z plane--when one or both of the gaps between them approaches zero. The usual procedure of mapping the upper half t plane onto an infinite parallel plate configuration, which is often more involved than the first mapping, can be eliminated if one recognizes that the capacitance obtained by mapping the upper half t plane onto a rectangle by means of a well-known elliptic function exceeds, in the limit, the correct value by $(\log 2)/\pi$, for each gap involved.



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Abstracts

The Exact Numerical Evaluation of the Complex Dielectric Constant of a Dielectric Partially Filling a Waveguide (Letters)

P.I. Somlo. "The Exact Numerical Evaluation of the Complex Dielectric Constant of a Dielectric Partially Filling a Waveguide (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 468-469.

The simultaneous, complex, transcendental equations linking the dielectric constant of a slab partially filling a rectangular waveguide, and the propagation constant of the composite guide have been solved by iteration. Typical results of $\epsilon = f(\gamma)$ are presented.



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Abstracts

The Impedance and Scattering Properties of a Perfectly Conducting Strip Above a Plane Surface-Wave System (Letters)

J. Brown. "The Impedance and Scattering Properties of a Perfectly Conducting Strip Above a Plane Surface-Wave System (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 469-469.

Gillespie and Kilburg have postulated that the fraction of the incident surface-wave power radiated by a conducting strip does not exceed 0.5. This result is shown to be a consequence of the representation of the strip by a shunt impedance.



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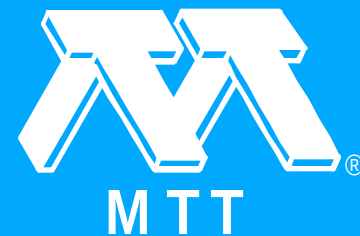


Abstracts

Measured Noise Temperature Versus Theoretical Electron Temperature for Gas Discharge Noise Sources (Comments)

R.E. Guentzler. "Measured Noise Temperature Versus Theoretical Electron Temperature for Gas Discharge Noise Sources (Comments)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 469-470.

Previously published microwave noise temperatures from wall-contained argon discharges at 200 mA dc are compared with the electron temperatures predicted by von Engel and Steenbeck. A good agreement between data and theory results if the ionization efficiency is modified to account for stepwise ionization.



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Abstracts

Microwave Dielectric Properties of an Amorphous Semiconductor System (Letters)

L.K. Wilson, G.T. O'Reilly and D.L. Kinser. "Microwave Dielectric Properties of an Amorphous Semiconductor System (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 470-471.

Experimental results are presented for the microwave dielectric properties of the glass system (x) As/sub 2/Te/sub 3/(1 - x)As/sub 2/Se/sub 3/ under temperature and compositional variations. The results indicate that the material exhibits potentially useful microwave properties.



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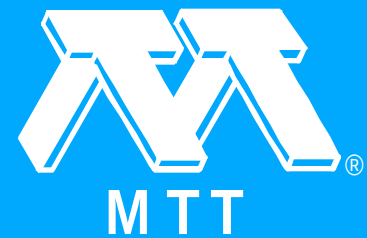


Abstracts

Anomalies in Duplexing Very Short Pulses (Letters)

D.J. Fitzgerald and J.M. Proud. "Anomalies in Duplexing Very Short Pulses (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 471-473.

The advent of nanosecond pulse sources with multikilowatt power at X band has created a need for a suitable duplexing scheme for incorporation into a monostatic radar configuration. The advantages and disadvantages of various ferrite and diode duplexer structures have been evaluated. It is the purpose of this letter to report these results and to indicate several phenomena that were observed to be unique to short-pulse operation.



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Abstracts

The Exact Dimensions of a Family of Rectangular Coaxial Lines with Given Impedance (Addenda)

H.J. Riblet. "The Exact Dimensions of a Family of Rectangular Coaxial Lines with Given Impedance (Addenda)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 473-474.

When the above paper was written, it was the writer's opinion that the Bowman reference was the best available. Quite by chance, while searching the literature in another connection, he encountered a reference made by Anderson to a paper by Bergmann in which the same problem is solved with the same results and methods. Oddly enough Bergmann's paper, considering the general case, predates Bowman's solution of the special case by ten years.



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Abstracts

Fast Parameters Calculation of the Dielectric-Supported Air-Strip Transmission Line (Correction)

E. Costamagna. "Fast Parameters Calculation of the Dielectric-Supported Air-Strip Transmission Line (Correction)." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 474-474.

In the above letter, on page 156, second column, line 1, the words "relative phase velocity" should read "phase velocity in m/s X 10/sup -9/"



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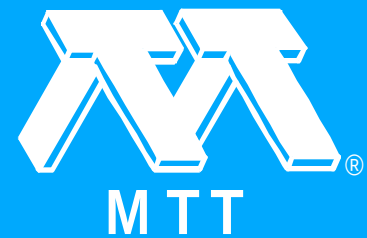
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Abstracts

Contributors (Apr. 1974 [T-MTT])

J. Acevedo, A.E. Atia, H.C. Bell, Jr., C.R. Boyd, Jr., M.M. Chrepta, C. Das Gupta, A.J. Giarola, K.W. Gray, W.N. Hardy, J. Helszajn, T. Itoh, H. Jacobs, K. Kawasaki, W.F. Krueger, N. Kumagai, K.M. Lakin, L.E. Larsen, A.W. Love, M. Matsuhara, A. Matsumoto, R. Mittra, R.A. Moore, N. Nagai, Y. Rahmat-Samii, J.D. Rhodes, M. Umeno and A.E. Williams.
"Contributors (Apr. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 475-479.



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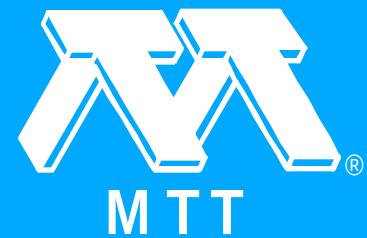


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Information on Computer Program Descriptions (Apr. 1974 [T-MTT])

"Information on Computer Program Descriptions (Apr. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): 480-480.

This section of the IEEE Transactions On Microwave Theory And Techniques carries descriptions of computer programs which have specific relevance to the microwave art and are available to the microwave community. The purpose of Computer Program Descriptions is to provide a means by which microwave engineers may share useful computer programs with their colleagues.



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"Back Cover (Apr. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.4 (Apr. 1974 [T-MTT]): b1-b2.



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"Front Cover (May 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): f1-f2.



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Partially Dielectric-Slab-Filled Waveguide Phase Shifter

C.T.M. Chang. "Partially Dielectric-Slab-Filled Waveguide Phase Shifter." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 481-485.

An equivalent circuit of a waveguide junction between two asymmetrically filled waveguides is obtained. This equivalent circuit is applied to the design of single-section impedance-matching transformers for a dielectric-slab-filled waveguide phase shifter. Calculation and measurement indicated that when a thin alumina slab is employed, a 360° phase shift can be accomplished in a section approximately 1.1 times the unloaded waveguide wavelength at 2.7 GHz, and that the VSWR between 2.7 and 3.0 GHz is kept to less than 1.15.

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Walk-Off Effects in Fabry-Perot Diplexers

J.A. Arnaud, A.A.M. Saleh and J.T. Ruscio. "Walk-Off Effects in Fabry-Perot Diplexers." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 486-493.

Fabry-Perot (FP) resonators working under oblique incidence can be used in the millimeter and far infrared bands as diplexers or channel dropping filters. The response of two-grid Fabry-Perot resonators under Gaussian beam excitation is evaluated by adding the fields of the successive passes of the beam. The results coincide with those obtained from a plane wave expansion of the incident field. Closed form expressions are obtained for the losses due to diffraction walk-off, geometrical walk-off, and mismatch. Excellent agreement is obtained with experiments in the 70-80-GHz band. For a 1-GHz-bandwidth filter, working at an incidence angle of 15 degrees, and an incident beam waist radius of 40 mm, the transmission loss at resonance does not exceed 1 dB. The reflection loss off-resonance is about 0.1 dB. This type of diplexer is particularly useful when used in conjunction with quasioptical guiding systems.



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Sensitivity of Doppler Radar with Sell-Detecting Diode Oscillators

T. Nygren and A. Sjolund. "Sensitivity of Doppler Radar with Sell-Detecting Diode Oscillators." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 494-498.

The behavior of Doppler radar with self-detecting diode oscillators is described. Conditions for the frequency deviation to contain only the first harmonic of the Doppler shift frequency are given. The conversion gain and the signal-to-noise (S/N) ratio including both intrinsic LF and RF noise are calculated. An equivalent LF circuit is obtained. The shape of the I-V characteristic of the oscillating diode is shown to be important for the design of a Doppler module.

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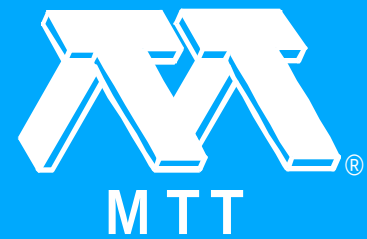


Abstracts

A Compact Channel-Dropping Filter for Stripline and Microwave Integrated Circuits

E.G. Cristal and U.H. Gysel. "A Compact Channel-Dropping Filter for Stripline and Microwave Integrated Circuits." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 499-504.

A compact channel-dropping filter geometry is described that is particularly suited for stripline and microwave integrated circuits (MIC). The channel-dropping filter is comprised of a hairpin bandpass filter and a new bandstop filter, referred to herein as a folded-line bandstop filter. Design parameters for the latter filter for a range of bandwidths are tabulated. Analytical and experimental data for a trial channel-dropping filter are presented and discussed.



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The Effect of Cross-Section Curvature on Attenuation in Elliptic Waveguides and a Basic Correction to Previous Formulas

L. Lewin and A.M.B. Al-Hariri. "The Effect of Cross-Section Curvature on Attenuation in Elliptic Waveguides and a Basic Correction to Previous Formulas." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 504-509.

It is shown that a certain asymptotic expansion of the Mathieu function of the fourth kind has almost certainly been inappropriately applied to previous elliptic waveguide calculations. An appropriate expansion is discussed at some length, and leads to a substantial modification of the published formulas. The need for a correction is demanded by a physical requirement to give the limit of the conventional surface impedance expression at the broad face of a very elongated elliptical shape. A curvature effect, the subject of some recent technical discussions, survives the change, and a discussion is given of an unsuccessful attempt to create a generalized form that replaces the ellipse parameters by differentials of the local curvature of the surface. An attempt is also made to justify the reality of such a substantial curvature effect. However, no effect occurs for flat surfaces or those of uniform curvature, confirming the validity of the usual perturbation technique of calculating waveguide attenuation in those cases. An anomalous property of the characteristic numbers of the Mathieu functions is discussed insofar as it relates to the present problem.

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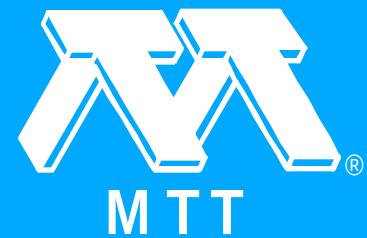


Abstracts

Design and Performance of Microwave Amplifiers with GaAs Schottky-Gate Field-Effect Transistors

C.A. Liechti and R.L. Tillman. "Design and Performance of Microwave Amplifiers with GaAs Schottky-Gate Field-Effect Transistors." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 510-517.

The design and performance of an X-band amplifier with GaAs Schottky-gate field-effect transistors are described. The amplifier achieves 20 ± 1.3 -dB gain with a 5.5-dB typical noise figure (6.9 dB maximum) over the frequency range of 8.0-12.0 GHz. The VSWR at the input and output ports does not exceed 2.5:1. The minimum output power for 1-dB gain compression is +13 dBm, and the intercept point for third-order intermodulation products is +26 dBm. The design of practical wide-band coupling networks is discussed. These networks minimize the overall amplifier noise figure and maintain a constant gain in the band.



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AM and FM Noise of BARITT Oscillators

J.L. Fikart. "AM and FM Noise of BARITT Oscillators." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 517-523.

AM, FM, and baseband noise of a BARITT diode oscillator in the range 100 Hz-50 kHz off the carrier has been measured under various operating conditions. A simple calculation has been made, relating the baseband noise to the oscillator AM and FM noise via measured amplitude and frequency modulation sensitivities and the results have been compared with the noise measured. It is shown that, depending on the bias current applied, both AM and FM noise performance can be degraded by up-conversion. Complete removal of up-converted noise requires a high-impedance low-noise bias supply since both the diode noise and bias supply noise at baseband frequencies may be significant when up-converted. Even with all modulation suppressed, the AM and FM noise has a flicker component almost completely correlated with the diode flicker noise at baseband frequencies. The RF power dependence of the AM and FM noise has also been investigated. It is shown that the BARITT oscillator noise compares very favorably with that of IMPATT's and TEO's. Values of -142 dB/100 Hz (AM noise) and 3.5 Hz/(100 Hz)^{1/2} for $Q_{ext} = 200$ (FM noise) have been measured at 30 kHz off the carrier.

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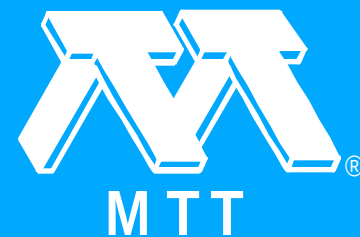


Abstracts

New Theory and Design for Hairpin-Line Filters

U.H. Gysel. "New Theory and Design for Hairpin-Line Filters." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 523-531.

Hairpin-line and hybrid hairpin-line/half-wave parallel-coupled-line filters are preferred filters for microstrip and TEM printed-circuit realizations. This class of filters offers small size and, in general, needs no ground connections for resonators. A new design theory is presented that is based on a sparse capacitance matrix for the array of coupled lines that constitute the filter, as opposed to a sparse-inductance-matrix assumption in previous theories that is much harder to satisfy. It is shown that to a good approximation, hairpin-line filters result from frequency-scaling half-wave parallel-coupled-line filters. Because of this; the bandwidth can be accurately predicted. Design procedures are given for Type-A filters, which are useful up to 20-percent bandwidth. A variety of hybrid hairpin-line/half-wave parallel-coupled-line filters is possible, and their design is explained. Numerical results for a number of designs and experimental results for a 5-percent bandwidth filter are included.



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Abstracts

Holographic Imaging with Object Synthesized Apertures

N.H. Farhat and P.C. Wang. "Holographic Imaging with Object Synthesized Apertures." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 531-535.

A method for imaging remote moving objects with a giant thinned holographic array by monitoring the range and range-rate (Doppler) histories of a coherently illuminated object at the various elements of the array is discussed. Electrooptic processing and image retrieval from the raw data collected are described together with a technique that compensates for image distortion arising from irrotational object maneuvers. Results of confirming experiments are also given together with remarks on practical implementation.



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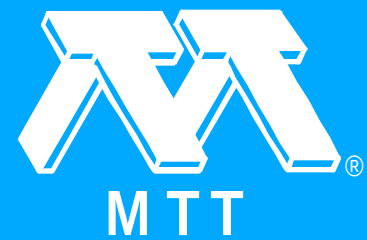
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Analysis of a Narrow Capacitive Strip in Waveguide

K. Chang and P.J. Khan. "Analysis of a Narrow Capacitive Strip in Waveguide." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 536-541.

A theoretical determination is made for the susceptance of a narrow conducting strip inserted vertically into a waveguide. The theory is based upon a variational form for the susceptance. A suitable current distribution along the strip is obtained for the variational equation, and is found to be similar to that determined from analysis of backscattering by a cylindrical obstacle irradiated from an incident plane wave. Accurate theoretical results may be obtained using a sinusoidal current distribution having a phase constant of $\pi/2d$, where d is the strip depth. Experimental results agree closely with the theory in the dominant-mode range and also at frequencies below cutoff.

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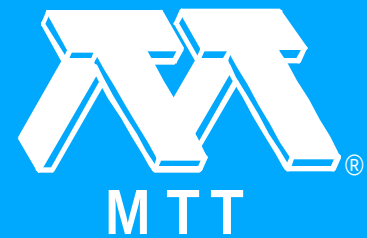


Abstracts

Microwave Permittivity Measurement Using a Multipoint Technique (Short Papers)

M. Rodriguez-Vidal, E. Martin and M. Sancho. "Microwave Permittivity Measurement Using a Multipoint Technique (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 542-544.

A multipoint technique for complex permittivity measurements is described. This method is based on experimental determination and fitting of the field pattern existing in the sample placed inside a short-circuited slotted waveguide and verified with experimental results.



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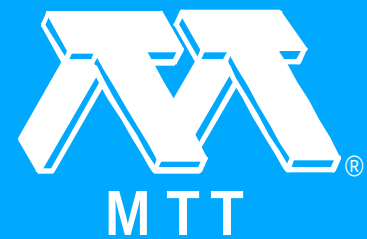


Abstracts

A Lumped-Element Circulator without Crossovers (Short Papers)

R.H. Knerr. "A Lumped-Element Circulator without Crossovers (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 544-548.

It is proposed to construct a simple "crossoverless" lumped-element circulator, which can be made without sophisticated thin-film processing. The circulator can be described by a "delta connected" equivalent circuit. A simple capacitor arrangement can be used to influence the three eigenvalue phases of the circulator independently, thus permitting this circulator to be maximized systematically. A set of computer-generated eigenvalues gives insight into the behavior of the device under varying operating conditions. Preliminary measurements using a very simple pattern on a 0.650-in-diam ferrite substrate show a 20-dB bandwidth of 10 percent and an insertion loss < 1 dB (0.3 dB/min) at L band.



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Abstracts

Slot-Line Transitions (Short Papers)

J.B. Knorr. "Slot-Line Transitions (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 548-554.

Coax-slot and microstrip-slot transitions are discussed. Experimental VSWR and impedance data are presented and compared with values computed using equivalent circuits for these transitions. Thick-film chip terminations are also investigated.



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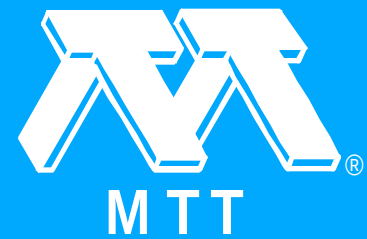


Abstracts

Analytic Model for Varactor-Tuned Waveguide Gunn Oscillators (Short Papers)

A.S. Templin and R.L. Gunshor. "Analytic Model for Varactor-Tuned Waveguide Gunn Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 554-556.

An analytic model for electronic tuning of an X-band waveguide transferred-electron oscillator is presented. The oscillator is electronically tunable by a varactor, and mechanically tunable by movement of a short circuit. The model is used to predict oscillation frequency, maximum electronic tuning range, and electronic tuning versus varactor bias voltage. Two different methods, the "zero reactance theory" and the Slater perturbation theory, are used to calculate the electronic tuning. The results of these calculations are compared to experimental results for two different oscillator configurations.



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Abstracts

Computation of the Impedance of an Infinitely Long Helical Transmission Line by Numerical Methods (Short Papers)

D.C. Wynn and C.T. Carson. "Computation of the Impedance of an Infinitely Long Helical Transmission Line by Numerical Methods (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 556-559.

A numerical method is given for the determination of the impedance of an infinitely long thin-wire helix. The propagation constant of the current for zero tangential electric field is found and used in a variational expression for impedance. Asymptotic values of resistance versus pitch are compared with resistances of infinitely long straight-wire antennas.



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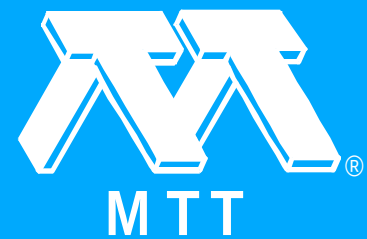


Abstracts

The Match Checker--A Simple Instrument for Matching Impedances in Waveguide and Coaxial Systems (Short Papers)

D.L. Hollway and P.I. Somlo. "The Match Checker--A Simple Instrument for Matching Impedances in Waveguide and Coaxial Systems (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 560-561.

The match checker is a self-contained passive device, which, when inserted between ports of a waveguide or coaxial-line system, provides an indication of the mismatch at each port. It does not require tuning, and internal reflections from components of the match checker do not limit the accuracy of the match which may be obtained. It is therefore suitable for use in matching ports with the high precision needed for calibration systems.



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Abstracts

Design Equations and Bandwidth of Loaded-Line Phase Shifters (Short Papers)

W.A. Davis. "Design Equations and Bandwidth of Loaded-Line Phase Shifters (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 561-563.

Design equations for a loaded-line phase shifter are derived for any susceptance spacing. An analysis based on these relations shows that maximum bandwidth is obtained when the spacing between the switched susceptances is 90° .



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Circularly Polarized Electric Field in Rectangular Waveguide (Short Papers)

F.E. Gardiol. "Circularly Polarized Electric Field in Rectangular Waveguide (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 563-565.

The electric field in a waveguide partially filled with a low-loss slab of dielectric in the H plane presents a circularly polarized component at the air-dielectric interface over a limited frequency range. This effect could be used to improve the performance of nonreciprocal devices utilizing the gyroelectric effect in magnetized semiconductors.

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Abstracts

A 40-120-GHz Michelson Interferometer-Type Band-Splitting Filter (Short Papers)

N. Suzuki. "A 40-120-GHz Michelson Interferometer-Type Band-Splitting Filter (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 565-566.

The experiments of a Michelson interferometer-type filter with a superbroad frequency range 40-120 GHz are described. The branching loss is 1.2-2.2 dB within this frequency range. The filter can be used for a 40-120-GHz millimeter-wave waveguide transmission system.



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Abstracts

Excess Surface Resistance Due to Surface Roughness at 35 GHz

F.J. Tischer. "Excess Surface Resistance Due to Surface Roughness at 35 GHz." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 566-569.

The increase of the surface resistance of plane copper surfaces caused by mechanically generated surface roughness has been determined at 35 GHz by measuring and evaluating the Q values of an H-guide cavity with removable sidewalls. The sidewalls were ground one-directionally by using abrasive papers of various grades to produce various degrees of roughness. The rms values of roughness were measured mechanically and optically after calibration by microphotography.



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Microwave Amplifier Using Several IMPATT Diodes in Parallel (Short Papers)

R.H. Knerr and J.H. Murray. "Microwave Amplifier Using Several IMPATT Diodes in Parallel (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 569-572.

IMPATT diode amplifiers are described that use several packaged diodes in parallel in a coaxial housing. With a pair of GaAs Schottky-barrier diodes, a power output of 8 W (input locking power equals 300 mW) was obtained at 4 GHz without exceeding safe operating temperatures. Similarly, three-diode circuits produced 15 W (locking power equals 3.5 W) at 4 GHz and >10 W (locking power equals 2.7 W) at 6 GHz under safe operating conditions. The maximum power obtained from the pair was 11 W. The maximum power obtained from the 4 GHz three-diode circuit was 21 W. The efficiency of the diodes at the maximum power level was 12-13 percent. The characteristics of the pair are compared with those of the individual diodes and it is concluded that this power-combining scheme is very efficient and should be economically advantageous. The scheme permits the total diode area utilized in a single cavity to be increased significantly beyond that which is practical in a single diode package. The use of parallel operation permits efficient heat sinking of each diode package, which is impractical with series operation. The technique employed has been shown to be suitable for extension to three or more diodes for higher power. It is required that each set of diodes be matched for similar I-V characteristics. With this constraint, the close RF coupling of the diodes in conjunction with appropriate stabilizing resistor(s) assures that the diodes operate cooperatively as a unit capable of being powered from a single current-regulated source.

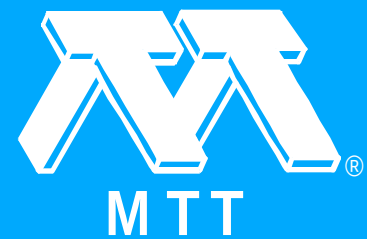


Abstracts

A New Method for Measuring Properties of Dielectric Materials Using a Microstrip Cavity (Short Papers)

T. Itoh. "A New Method for Measuring Properties of Dielectric Materials Using a Microstrip Cavity (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 572-576.

A new nondestructive method has been developed for measuring the dielectric constant and the loss factor of a slab-type material using a microstrip cavity. The method, which uses a simple and rapid substitution procedure, yields accurate results and has a number of advantages over currently available techniques. Experimental details and the theoretical basis are explained and experimental data are presented.



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Circular Bends in Dielectric Frame Beam Waveguides (Short Papers)

P.F. Checcacci, R. Falciai and A.M. Scheggi. "Circular Bends in Dielectric Frame Beam Waveguides (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 576-578.

An investigation is described on circular bends in beam waveguides constituted by dielectric frames. A uniform bending of the guide axis is obtained by tilting each frame by a small angle; however, due to the phase correction performed by the dielectric frame, the losses introduced by the bending can be made lower than those of an analogously bent iris waveguide. A numerical analysis is performed on the basis of the analogy between beam waveguides and open resonators which permits the assessment, in a number of cases, of the maximum permissible amount of tilting and the corresponding optimum frame dimensions in view of acceptable losses. The losses due to mode conversion are also evaluated when considering the connection between a straight and a curved section of the waveguide.

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Abstracts

Q Degradation in Varactor-Tuned Oscillators (Short Papers)

S.F. Paik. "Q Degradation in Varactor-Tuned Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 578-579.

A general analysis of varactor-tuned negative-resistance oscillators is presented to show the varactor loading effect on the oscillator Q. The external Q of the varactor loaded circuit normalized with respect to the unperturbed external Q is plotted as a function of the tuning range for several values of the varactor Q and the capacitance ratio.



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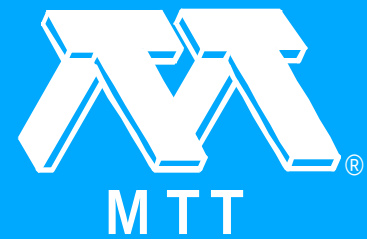


Abstracts

Binary Power-Divider Design Approach (Letters)

H.F. Chapell. "Binary Power-Divider Design Approach (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 580-581.

Utilizing all sections of binary power dividers in a single transformer yields a reduced circuit length for a specified electrical performance.



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Abstracts

A Coolable Degenerate Parametric Amplifier for Millimeter Waves (Letters)

J. Edrich. "A Coolable Degenerate Parametric Amplifier for Millimeter Waves (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 581-583.

The first 20-K-cooled degenerate parametric amplifier for 46 GHz is described. New 20-K-cooled circulators and Schottky-barrier varactors are used. Its noise temperature of less than 60 K means almost an order-of-magnitude improvement over previous uncooled amplifiers.



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Abstracts

A Frequently Reinvented Circuit (Letters)

R.W. Beatty. "A Frequently Reinvented Circuit (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 583-583.

Attention is called to published work describing an impedance-measuring circuit that is frequently reinvented.



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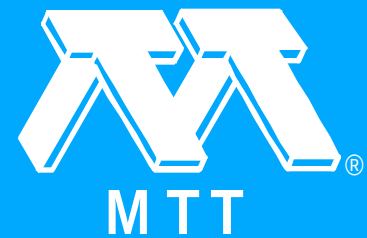


Abstracts

Generation of Acoustic Signals by Pulsed Microwave Energy (Letters)

J.C. Sharp, H.M. Grove and O.P. Gandhi. "Generation of Acoustic Signals by Pulsed Microwave Energy (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 583-584.

A discussion of the production of sound when short microwave pulses are directed at an absorber is presented. Possible mechanisms of the phenomenon are presented. These mechanisms may be important for a better understanding of the so-called microwave "hearing" effect.



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Abstracts

Computation of the Equivalent Circuit Parameters for a Junction Between Empty and Side-Slab-Filled Rectangular Waveguides (REACTANS) (Computer Program Descriptions)

C.T.M. Chang. "Computation of the Equivalent Circuit Parameters for a Junction Between Empty and Side-Slab-Filled Rectangular Waveguides (REACTANS) (Computer Program Descriptions)." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 585-585.

To obtain the equivalent circuit parameters for a junction between empty and side-slab-filled rectangular waveguides.



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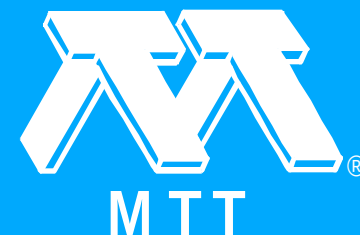
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Contributors (May 1974 [T-MTT])

A.M.B. Al-Hariri, J.A. Arnaud, C.T.M. Chang, K. Chang, E.G. Cristal, N.H. Farhat, J.L. Fikart, U.H. Gysel, P.J. Khan, L. Lewin, C.A. Liechti, T. Nygren, J.T. Ruscio, A.A.M. Saleh, A. Sjolund, R.L. Tillman and P.C. Wang. "Contributors (May 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 586-588.



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"Back Cover (May 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): b1-b2.



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Abstracts

Front Cover (Jun. 1974 [T-MTT])

"Front Cover (Jun. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): f1-f2.



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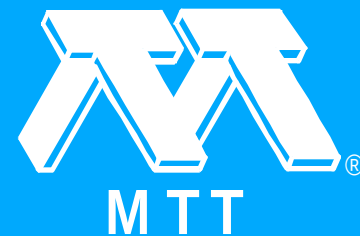


Abstracts

Foreword (Jun. 1974 [T-MTT])

L.R. Whicker. "Foreword (Jun. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 589-590.

During the past ten years, need for phased array antennas for radar, communications, and electronic warfare systems has promoted extensive effort in the development of fast switching ferrite and diode phase shifters. This effort has resulted in many good papers. The goal of this Special Issue is to survey the present state of the art in diode and ferrite phasers through invited papers and to consider new innovations in these areas through contributed papers.



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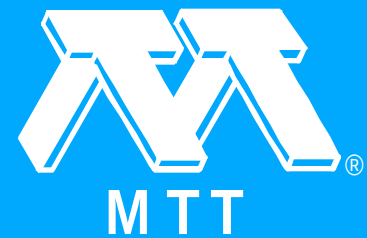


Abstracts

Effective Phase-Shifter Cost as a Selection Criterion

R.W. Long. "Effective Phase-Shifter Cost as a Selection Criterion." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 591-593.

In order to select a phase shifter for a given application, it is necessary to weigh a number of performance factors such that the device selected will result in the lowest overall system cost. This may be accomplished by defining an effective phase-shifter cost in terms of the initial cost of the phase shifter and driver, and dollar factors resulting from insertion loss, phase error, and quantization level.



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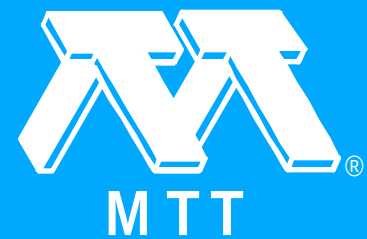


Abstracts

The Design and Manufacture of Dual-Mode Reciprocal Latching Ferrite Phase Shifters (Comments)

C.R. Boyd, Jr.. "The Design and Manufacture of Dual-Mode Reciprocal Latching Ferrite Phase Shifters (Comments)." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 593-601.

The design principles for dual-mode reciprocal latching ferrite phase shifters are relatively well understood at present. Discussions of a few selected topics not previously studied are presented in this paper. A tradeoff analysis is carried out for X-band units to show the interrelation between phase-shifter weight and insertion loss. An interesting consequence of this analysis is the theoretical prediction of an optimum range of values for the saturation moment of the ferrite material. Switching energy in the presence of shorted-turn damping is also analyzed and related to the geometry and hysteresis loss of the ferrite material. Finally, a discussion of manufacturing considerations and unit cost at high rates of production is carried out. The major conclusion is that unit cost levels approaching \$10.00 are possible for a production run sufficiently large to justify the substantial cost of engineering and tooling for high rates of manufacture.



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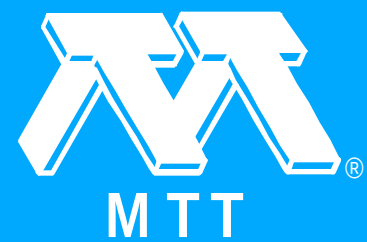
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Computer Analysis of Microwave Propagation in a Ferrite Loaded Circular Waveguide-- Optimization of Phase-Shifter Longitudinal Field Sections

A.M. Duputz and A.C. Priou. "Computer Analysis of Microwave Propagation in a Ferrite Loaded Circular Waveguide--Optimization of Phase-Shifter Longitudinal Field Sections." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 601-613.

A theoretical analysis of the microwave propagation in a circular TE/sub 11/ waveguide partially or completely loaded with an axially magnetized ferrite rod is presented. This study is based upon an exact analytical treatment of the Maxwell's equations, together with an original numerical method of solving transcendental equations with a complex variable. The introduction of the complex propagation constant $\Gamma = \alpha + j\beta$, taking in account the losses in the filling medium, had never been attempted because of the mathematical difficulties involved making essential the use of a large capacity computer. The developed program not only supplies all the propagation characteristics for a given structure but also enables us to optimize a phase-shift section in accordance with the user's requirements. This study is a first step towards the theoretical optimization of two types of reciprocal phasers: the dual mode phaser (DMP) and the polarization insensitive phaser (PIP), both widely used in array antenna systems. The computed results obtained for the basic section of such phasers operating at a central frequency of 9.5 GHz are given. Obviously, this work is still incomplete since it does not include the optimization of all the components of a practical phase shifter, for example, the polarizers. Moreover, we have assumed the ferrite partially magnetized by a continuously variable bias field, although the PIP and the DMP are normally operated in a latching configuration; we presently complete our study according to these practical considerations.



Abstracts

A Low-Cost Construction Technique for Garnet and Lithium-Ferrite Phase Shifters

D.A. Charlton. "A Low-Cost Construction Technique for Garnet and Lithium-Ferrite Phase Shifters." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 614-617.

Low-cost construction techniques for S-band twin-slab ferrite phase shifters are presented along with an experimental comparison of garnet and lithium-ferrite materials. A 3-bit phase shifter with lithium-ferrite material, which is approximately half the price of garnet material, had a measured loss of 0.4 dB and a peak power handling of 4.5 kW.



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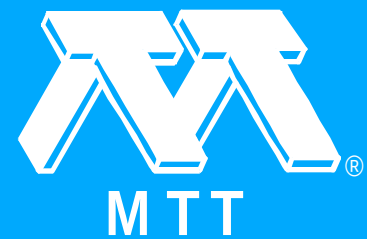


Abstracts

Practical Aspects of Phase-Shifter and Driver Design for a Tactical Multifunction Phased-Array RADAR System

N.R. Landry, H.C. Goodrich, H.F. Inacker and L.J. Lavedan, Jr.. "Practical Aspects of Phase-Shifter and Driver Design for a Tactical Multifunction Phased-Array RADAR System." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 617-625.

Three microwave garnet phase-shifter designs are used in the AEGIS weapons system. The microwave design is straight-forward except that the toroid assembly is potted with silicone rubber to increase its power-handling capability and the magnetizing wires are shielded with a spiral-wrapped wire to prevent the propagation of higher order modes. The driver circuit uses a new "flux-feedback" concept for improved accuracy and employs monolithic circuits, hybrid circuits, and discrete components. Mechanical and electrical design of the interfaces with mating components are important cost considerations and the chosen designs are described in detail. Several techniques for improving production yield are discussed and a table of production statistics is provided. Performance histograms and data averages as a function of time and operating frequency are also presented.



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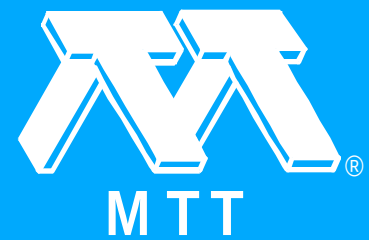
High Average Power S-Band Digital Phase Shifter

R.A. Moore, G.M. Kern and L.F. Cooper. "High Average Power S-Band Digital Phase Shifter." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 626-634.

A 100-kW-peak Z-kW-average-power liquid-cooled ferrite digital phase shifter has been constructed using beryllia cooling of the ferrite toroid to meet single axis scanned array requirements. The phase-shift cross section external to the ferrite toroids is completely filled with the beryllia. Experiments indicate that the maximum temperature rise in the ferrite is no greater than 45° C. In tests using flux drive to 2 kW, the phase shifter exhibits a maximum phase drift of $\pm 6^\circ$ for 90° differential phase shift. The differential phase shift versus frequency varies less than $\pm 0.5^\circ$ for a 3-percent bandwidth.

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Periodically Loaded Nonreciprocal Transmission Lines for Phase-Shifter Applications

M.M.Z. Kharadly. "Periodically Loaded Nonreciprocal Transmission Lines for Phase-Shifter Applications." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 635-640.

Nonreciprocal transmission lines periodically loaded with thin metallic diaphragms are analyzed using the wave transmission matrix approach. An approximate equivalent circuit representation of the diaphragm is proposed and discussed. Using this representation, the differential phase-shift and impedance characteristics of the periodically loaded line are computed for assumed parameters, for "shunt-capacitance" and "shunt-inductance" loading. The range of validity of the approximate results is examined using a certain criterion. The differential phase shift for both capacitive and inductive loading is found to be greater than that of the unloaded line and the results show the same general trends as those previously observed experimentally.

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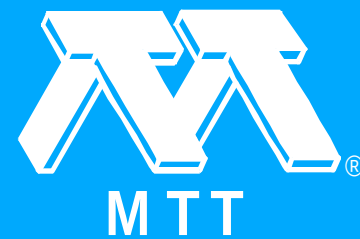


Abstracts

Microwave Characterization of Partially Magnetized Ferrites

J.J. Green and F. Sandy. "Microwave Characterization of Partially Magnetized Ferrites." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 641-645.

In order to assist the microwave engineer in predicting the performance of partially magnetized devices, we have characterized the microwave permeability of partially magnetized materials. The real part of the tensor permeability elements, μ , κ , and $\mu_{z/}$, depends primarily on the parameters $\gamma 4\pi M/\omega$ and $\gamma 4\pi M_{\text{sub } s}/\omega$. Empirical formulas have been developed which show the dependence. At frequencies sufficiently below $\omega = \pi 4\pi M_{\text{sub } s}$, the loss can be characterized by the value of μ'' at $4\pi M = 0$. μ' , κ' , and $\mu_{z/}'$ depend weakly on composition, whereas μ'' ($4\pi M = 0$) does depend upon the chemical composition.



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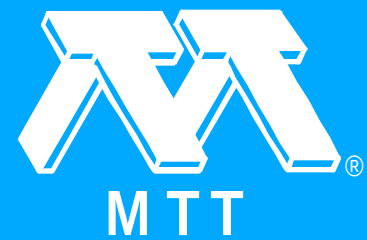
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A Catalog of Low Power Loss Parameters and High Power Thresholds for Partially Magnetized Ferrites

J.J. Green and F. Sandy. "A Catalog of Low Power Loss Parameters and High Power Thresholds for Partially Magnetized Ferrites." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 645-651.

The low power loss and high power threshold properties have been measured on a number of candidate ferrite phase-shifting materials. The low power loss is characterized by μ'' , the imaginary part of the diagonal component of the permeability tensor for the completely demagnetized state. μ'' was measured from 3.0 to 16.8 GHz. The high power properties are characterized by the parallel pump threshold at a bias field corresponding to $H_{\text{eff}}/H_{\text{crit}}$ and to $4\pi M/\text{equiv}$ and to $4\pi M/\text{equiv}$. The threshold was measured between 3.0 and 16.8 GHz. For the purposes of computer calculation μ'' and H_{crit} were fit to an equation of the form $A(\gamma^4 \pi M/\text{equiv} \omega)^{1/N}$. Translating μ'' and H_{crit} to ΔH_{eff} and ΔH_{crit} gives the YIG plus Al as the lowest loss and lowest threshold materials followed by the Gd garnets and MgMn spinels. The Ni spinels are very lossy.

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Microwave Lithium Ferrites: An Overview

G.M. Argentina and P.D. Baba. "Microwave Lithium Ferrites: An Overview." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 652-658.

Lithium ferrites are discussed and compared with other spinel microwave ferrites and rare earth-iron garnets. Points of comparison are saturation magnetization, temperature performance, hysteresis loop properties, stress sensitivity, insertion loss, power handling capability, resonance linewidth, and cost. The main points of discussion deal with the relative effectiveness of lithium ferrites, nickel ferrites, magnesium ferrites, and garnets as elements employed in latching applications at frequencies in the S, C, X, and K/sub u/ bands. A section is devoted to the compositional modifications necessary for: 1) adjusting magnetization, spin-wave line width, coercive force, and magnetic anisotropy; 2) the minimization of stress sensitivity and dielectric loss; and 3) the improvement of microstructural characteristics.

[Click on title for a complete paper.](#)



Abstracts

Diode Phase Shifters for Array Antennas

J.F. White. "Diode Phase Shifters for Array Antennas." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 658-674.

This paper contains considerations for diode phase shifters used for phased array antenna control. The categories are: 1) areas in which ferrite and diode phase shifters differ, 2) diode phase-shifter circuits, 3) the nature and typical performance of p-i-n diodes, 4) the requirements of a driver and a typical circuit, and 5) measured performance of phase shifters in L, S, C, and X bands.



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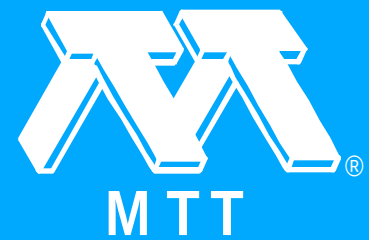
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Low Cost Design Techniques for Semiconductor Phase Shifters

R.W. Burns, R.L. Holden and R. Tang. "Low Cost Design Techniques for Semiconductor Phase Shifters." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 675-688.

The design and performance of two microstrip semiconductor phase shifters operating at S band and UHF are described. The S-band diode phase shifter uses thick-film metallization on a 99.5-percent alumina substrate and uses series coupled diodes for the small bits and constant phase frequency switched life bits for the three large bits. The 4-bit UHF phase shifter uses eight p-i-n diodes mounted in a low dielectric constant microstrip circuit and operates at a power level of 8 kW peak, 240 W average, and has an average insertion loss of 0.7 dB. Phase and VSWR distributions on 800 units produced are also given. The characteristics of two new microwave semiconductor switching devices, the field-effect diode (FED) and the resistive gate switch are described. These devices operate with only a voltage change. Design and performance of an SP2T switch and 3-bit phase shifter using the field-effect diode are presented.

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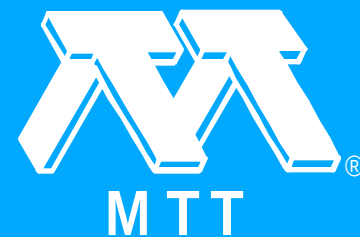


Abstracts

A Low Cost P-I-N Diode Phase Shifter for Airborne Phased-Array Antennas

F.G. Terrio, R.J. Stockton and W.D. Sato. "A Low Cost P-I-N Diode Phase Shifter for Airborne Phased-Array Antennas." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 688-692.

This paper presents a description of a p-i-n diode phase shifter that was designed for low cost production for use in X-band phased-array systems. The phase shifter is designed to make maximum use of photoetched circuit components and low cost materials, and is well suited for assembly on a fully automated assembly line. The salient features of this phase shifter are a printed-circuit transmission structure and inexpensive RF connectors that are integrated into the circuit package. The microwave performance characteristics are generally superior to those of equivalent devices; a useful bandwidth of 40 percent with an average insertion loss of 1.6 dB has been demonstrated with 3-bit units.



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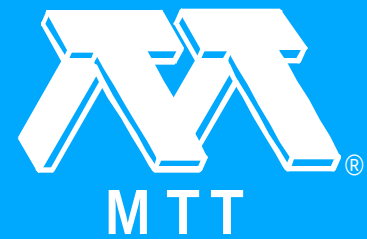


Abstracts

Design of a Broad-Band 4-Bit Loaded Switched-Line Phase Shifter

G.D. Lynes, G.E. Johnson, B.E. Huckleberry and N.H. Forrest. "Design of a Broad-Band 4-Bit Loaded Switched-Line Phase Shifter." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 693-697.

A 4-bit p-i-n diode switched-line phase shifter was fabricated for use in the 2.0- to 4.0-GHz frequency range. Extremely good phase characteristics were easily obtained over two octaves by employing a resistive loading technique to eliminate resonance problems. A single bit was modeled and analyzed on a computer from 1.5 to 6.0 GHz. Test results of a microstrip realization of this bit, which correlates well with the computer model, are presented. A unique compatible driver used with the phase shifter, and the microstrip fabrication process used in constructing the phase shifter are also presented.



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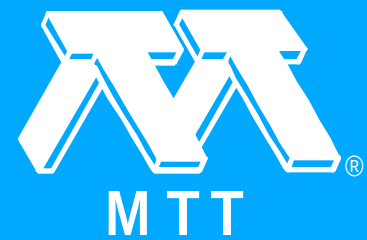
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A Phase-Locking Method for Beam Steering in Active Array Antennas

A.H. Al-Ani, A.L. Cullen and J.R. Forrest. "A Phase-Locking Method for Beam Steering in Active Array Antennas." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 698-703.

A new principle for phase shifting, and hence beam steering, on an active array antenna is described. Each individual RF source is phase locked by a stable locking signal which is close in frequency to the n th harmonic of its free-running frequency. Pulses of appropriate amplitude and duration applied to the dc circuitry cause the fundamental output frequency of the RF source to shift in phase by increments of $2\pi/n$. The construction and testing of a four-element L-band (1-GHz) array using transistor oscillators locked at S-band (4 GHz) to give 90° phase increments is described.

[Click on title for a complete paper.](#)



Abstracts

Contributors (Jun. 1974 [T-MTT])

A.H. Al-Ani, G.M. Argentina, P.D. Baba, C.R. Boyd, Jr., R.W. Burns, D.A. Charlton, L.F. Cooper, A.L. Cullen, A.M. Duputz, J.R. Forrest, N.H. Forrest, H.C. Goodrich, J.J. Green, R.L. Holden, B.E. Huckleberry, H.F. Inacker, G.E. Johnson, G.M. Kern, M.M.Z. Kharadly, N.R. Landry, L.J. Lavedan, Jr., R.W. Long, G.D. Lynes, R.A. Moore, A.C. Priou, F. Sandy, W.D. Sato, R.J. Stockton, R. Tang, F.G. Terrio and J.F. White. "Contributors (Jun. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.6 (Jun. 1974 [T-MTT] (Special Issue on Microwave Control Devices for Array Antenna Systems)): 704-708.



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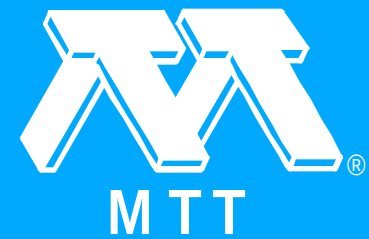
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Back Cover (Jun. 1974 [T-MTT])

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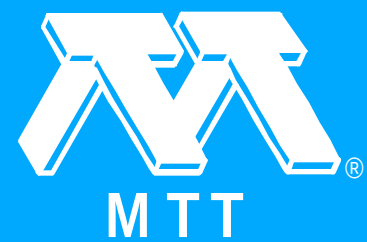
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Broad-Band Small-Signal Impedance Characterization of Silicon (Si) P⁺/N⁺ IMPATT Diodes

M. Ohtomo. "Broad-Band Small-Signal Impedance Characterization of Silicon (Si) P⁺/N⁺ IMPATT Diodes." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 709-718.

A method is described that permits a broad-band small-signal characterization of an IMPATT diode mounted in a package. From automatic-network-analyzer measurements on a package-shaped metal dummy, an empty package, and the diode under test biased below and above breakdown, the method allows first determination of a coupling-circuit parameter, bonding-wire inductance, and diode series resistance, and then evaluation of junction admittance above breakdown. Experimental results on silicon (Si) p⁺/n⁺ IMPATT diodes over 2.5-15 GHz are shown. Nearly frequency-independent bonding-wire inductance is observed. Avalanche frequency squared (f_a^2) is found to be sublinear with respect to dc current density (I_d), possibly due to a variation of junction temperature (T_j). An experimental formula for f_a^2 / I_d is obtained in terms of T_j . Detailed comparisons of the measured junction admittance with an existing analytical theory indicate a good agreement, if a suitable amount of saturation current is postulated, and also suggest that the estimated amount is in excess of the prebreakdown saturation current.

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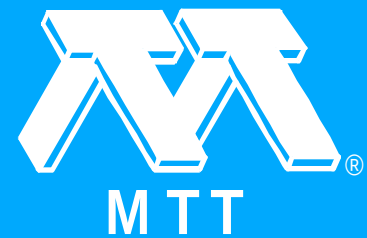


Abstracts

Radiation from Curved Dielectric Slabs and Fibers

L. Lewin. "Radiation from Curved Dielectric Slabs and Fibers." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 718-727.

The form taken by the radiation condition in the local coordinate system, pertinent to the determination by perturbation methods of the radiation from curved radiating structures, is not the same as it is at very great distances. Specifically, it may contain a term that appears as if it were an incoming or growing wave. A detailed analysis is made of the appropriate form of the condition in cylindrical and toroidal systems, and is applied to the calculation of radiation from curved dielectric slabs and fibers.



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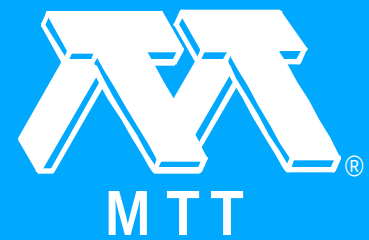
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An Adjustable Quasi-Optical Bandpass Filter-- Part I: Theory and Design Formulas

A.A.M. Saleh. "An Adjustable Quasi-Optical Bandpass Filter--Part I: Theory and Design Formulas." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 728-734.

A quasi-optical bandpass filter suitable for millimeter and submillimeter wavelengths and in the far infrared region is described. It consists of three or more wire-grid polarizers with quarter-wave spacings. The filter has the advantage over conventional quasi-optical filters, e.g., Fabry-Perot filters, that its bandwidth and the shape of its frequency response are adjustable. This is achieved by changing the angular orientations of the wires of the different polarizers. The filter requires the input electric field to be linearly polarized in a direction perpendicular to the wires of the first grid. The theory of operation is presented and design formulas for the filter are given, under the assumption that ideal wire-grid polarizers are employed. The effects of using realistic grids on the performance of the filter are dealt within another paper.

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Abstracts

An Adjustable Quasi-Optical Bandpass Filter-- Part II: Practical Considerations

A.A.M. Saleh. "An Adjustable Quasi-Optical Bandpass Filter--Part II: Practical Considerations." 1974 *Transactions on Microwave Theory and Techniques* 22.7 (Jul. 1974 [T-MTT]): 734-739.

This paper investigates the effects of using realistic grids on the performance of the adjustable quasi-optical bandpass filter presented in Part I. The theory given here is in excellent agreement with measurements performed on a three-grid filter in the 50-75-GHz band.



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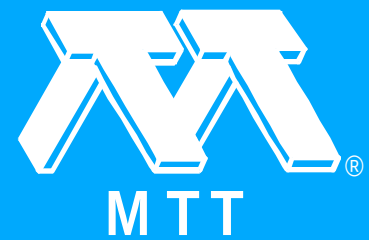
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Reduction of the Attenuation Constant of Microstrip (Short Papers)

I.J. Albrey and M.W. Gunn. "Reduction of the Attenuation Constant of Microstrip (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 739-742.

Modifications to a normal microstrip transmission line are proposed, with the aim of reducing the attenuation constant of the line. The results of a computer analysis of a structure containing multilayers of dielectric show that significant reductions in attenuation appear possible.

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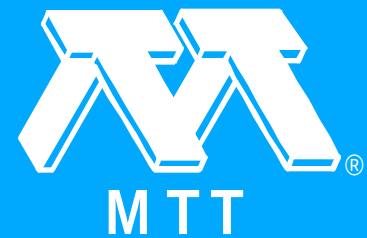


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Waves Guided Between Open Parallel Concave Reflectors (Short Papers)

F.J. Tischer and J.R. Potukuchi. "Waves Guided Between Open Parallel Concave Reflectors (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 742-743.

Wave propagation between two open parallel concave reflectors is usually considered by a wave-beam or a multiple-reflection approach. It is shown that the field distribution in elliptic waveguides, for specific wave modes, approaches that in open reflector waveguides.



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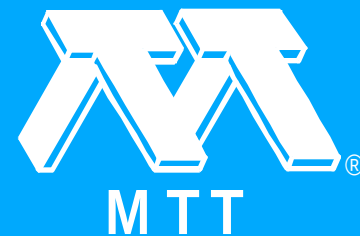


Abstracts

Surface Wave on a Ferrite Magnetized Perpendicular to the Interface (Short Papers)

D.F. Vaslow. "Surface Wave on a Ferrite Magnetized Perpendicular to the Interface (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 743-745.

A semi-infinite ferrite magnetized perpendicular to the interface is found to support a nonmagnetostatic surface wave. The wave exists within a finite wavelength band and a finite frequency band. Since the wavelength is typically of the order of 1 cm, large samples of polycrystalline ferrite material may be used for the experiments.



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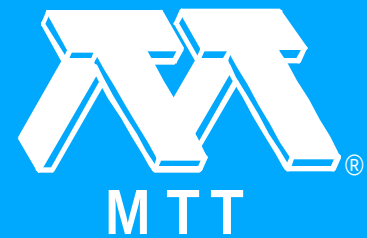


Abstracts

RF Burnout of Ku-Band Mixer Diodes (Short Papers)

G.E. Morris and G.A. Hall. "RF Burnout of Ku-Band Mixer Diodes (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 745-746.

This short paper describes the experiments conducted to determine the burnout capability of various types of Ku-band mixer diodes when subjected to narrow RF spikes. This condition results frequently in pulsed microwave systems where the receiver is not adequately protected or where the system's limiting devices degrade or fail. The maintenance problems resulting from mixer failures are severe and may become more so with increased usage of Schottky barrier diodes.



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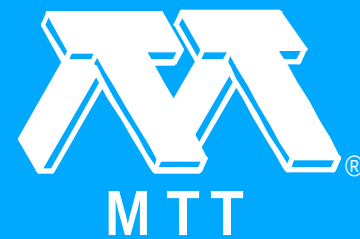


Abstracts

Effect of Loss and Frequency Dispersion on the Performance of Microstrip Directional Couplers and Coupled Line Filters (Short Papers)

B.R. Rao. "Effect of Loss and Frequency Dispersion on the Performance of Microstrip Directional Couplers and Coupled Line Filters (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 747-750.

The effect of ohmic and dielectric losses, conductor thickness, and frequency dispersion on the performance of edge-coupled microstrip directional couplers and interdigital filters have been determined in this short paper. The odd- and even-mode attenuation constants due to ohmic losses in the conductor have been calculated using Wheeler's inductance formula. The theoretical results for the characteristic impedance and propagation constants are in good agreement with the experimental results of Napoli and Hughes. Among the parameters that can be calculated from this theory are the isolation, directivity, and coupling coefficients of lossy directional couplers and the midband insertion loss of interdigital filters.



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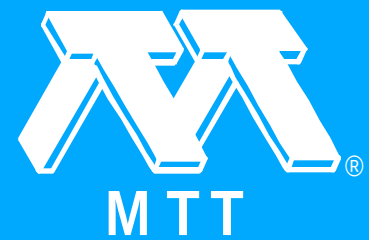
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Modes and Losses of a Four-Mirror Ring Resonator (Letters)

P.F. Checcacci, R. Falciai and A.M. Scheggi. "Modes and Losses of a Four-Mirror Ring Resonator (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 751-752.

An investigation is reported on modes and losses of a square ring resonator that consists of the numerical solution of the appropriate integral equation for a number of values of the mirrors' aperture and spacing. It turns out that two sets of modes can exist: circulating modes and modes between two facing mirrors. The circulating modes are of the Fabry-Perot type, and their losses can be evaluated on the basis of the losses of suitably equivalent Fabry-Perot resonators.

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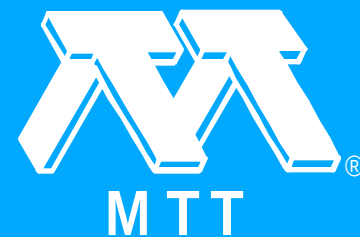


Abstracts

Dissipative Parameters in Ferrites and Insertion Losses in Stripline Y Circulators Below Resonance (Letters)

G. Cattarin and R. Roveda. "Dissipative Parameters in Ferrites and Insertion Losses in Stripline Y Circulators Below Resonance (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 752-754.

Extensive microwave loss measurements have been performed at the frequency of 1.3 GHz on below resonance stripline Y circulators loaded with aluminum doped YIG. External x'' have been measured on the same compositions. Also, dielectric loss measurements have been carried out. A relation is found which correlates insertion loss in stripline circulators with loss parameters x'' and $\tan \delta$.



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Low-Loss Two-Dimensional GaAs Epitaxial Waveguides at 10.6- μ m Wavelength

B.L. Sopori, W.S.C. Chang and R. Vann. "Low-Loss Two-Dimensional GaAs Epitaxial Waveguides at 10.6- μ m Wavelength." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 754-755.

The successful fabrication of low-loss two-dimensional GaAs epitaxial waveguides by chemical etching for use in integrated optics at 10.6 μ m is reported. Selective excitation of specific E_{pq}/y modes was observed by placing the prism at specific angles in the horizontal plane. Loss measurements showed no increase in attenuation for lower order E_{pq}/y modes (as compared to corresponding one-dimensional waveguide modes) when the guide width is 50 μ m. As the guide width is reduced, there is a significant increase in attenuation as p increases.

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Abstracts

Contributors (Jul. 1974 [T-MTT])

L. Lewin, M. Ohtomo and A.A.M. Saleh. "Contributors (Jul. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 756-756.



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Surface Electromagnetic Modes of a Ferrite Slab

T.J. Gerson and J.S. Nadan. "Surface Electromagnetic Modes of a Ferrite Slab." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 757-763.

The dispersion relationship describing the propagation of electromagnetic (EM) surface modes supported by a ferrite slab of finite thickness magnetized parallel to the planes of its air-ferrite-air or air-ferrite-metal interfaces is investigated. Surface wave propagation at frequencies greater than the ferrite-metal mode resonance is predicted for thick grounded ferrite slabs thereby clarifying prior results based upon semi-infinite and magnetostatic analyses. The relative energy densities of the electromagnetic surface modes is examined at the air-ferrite interfaces of an ungrounded slab.

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A New Interdigital Electrode Transducer Geometry

K.M. Lakin, D.W.T. Mih and R.M. Tarr. "A New Interdigital Electrode Transducer Geometry." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 763-768.

A new interdigital electrode transducer geometry has been conceived and its theoretical performance verified experimentally. The transducer is composed of sets of electrodes which are connected in series through an offset or "dog-leg" electrode, thereby significantly increasing the electrical impedance of the transducer over that of a conventional one having the same aperture. This transducer radiates and receives a uniform straight-crested wavefront. The transducer is shown to have unique impedance properties suited for wide-aperture surface-wave devices or those requiring some form of wave-amplitude weighting. Experiments have been conducted on YZ LiNbO/sub 3/ which verify that the terminal impedance of the transducer is proportional to the square of the number of equal-aperture constant-amplitude sections.

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Impedance Characterization of a Two-Post Mounting Structure for Varactor-Tuned Gunn Oscillators

O.L. El-Sayed. "Impedance Characterization of a Two-Post Mounting Structure for Varactor-Tuned Gunn Oscillators." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 769-776.

A lumped equivalent circuit is used to characterize a two-post waveguide mounting structure frequently utilized in varactor-tuned Gunn oscillators. Analytical expressions for the different elements are derived. Comparison with experimental results enabled us to refine the model by the introduction of correction factors which compensate for the simplifying assumptions of the theoretical model. This equivalent circuit would facilitate the optimization of the performance of this type of oscillator.

[Click on title for a complete paper.](#)



Abstracts

Modal Analysis of a Planar Dielectric Strip Waveguide for Millimeter-Wave Integrated Circuits

T.T. Fong and S.-W. Lee. "Modal Analysis of a Planar Dielectric Strip Waveguide for Millimeter-Wave Integrated Circuits." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 776-783.

A novel planar waveguide which is suitable for guiding electromagnetic (EM) energy in the millimeter-wave and submillimeter-wave regions is studied. By using Wiener-Hopf techniques, we first determine the reflection coefficient at the open ends of the guide. Next, a transverse resonance condition is applied to determine the dispersion relation of the modal field. The propagation constant is found to be complex. Its imaginary part accounts for the edge diffraction loss of the strip through the open ends of the guide. Extensive numerical results are given for the dispersion characteristics and modal field distributions for silicon and fused quartz substrates. The planar strip waveguide should have the advantages of simplicity in processing, a lower random diffraction loss, and accessibility to monolithic integration techniques.



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Circuit Conditions to Prevent Second-Subharmonic Power Extraction in Periodically Driven IMPATT Diode Networks

D.F. Peterson. "Circuit Conditions to Prevent Second-Subharmonic Power Extraction in Periodically Driven IMPATT Diode Networks." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 784-790.

The small-signal characteristics at the second subharmonic (half-frequency) of a periodically pumped IMPATT diode are presented. Theoretical analysis using an appropriate model indicates these characteristics can be interpreted as a "phase-sensitive admittance" which clarifies subharmonic oscillation conditions and suggests a method for their measurement. Measured data on silicon and GaAs diodes de-embedded to the active wafer are in good agreement with theoretical predictions based on the equivalent nonlinear model for each device. Circuit conditions that eliminate second subharmonic and thus prevent fundamental power robbing are given which can be readily obtained for existing devices. An example demonstrating the efficiency-limiting properties of subharmonic is given.

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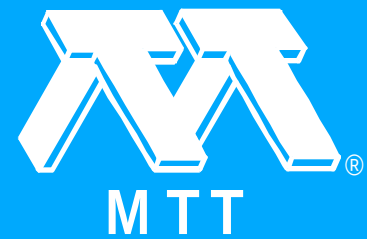


Abstracts

Further Experiments Seeking Evidence of Nonthermal Biological Effects of Microwave Radiation (Short Papers)

G.A. Lindauer, L.M. Liu, G.W. Skewes and F.J. Rosenbaum. "Further Experiments Seeking Evidence of Nonthermal Biological Effects of Microwave Radiation (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 790-793.

Carpenter and Livstone's experiments on beetle pupae are repeated and extended. In the experiments conducted, increased incidence of abnormal development occurred due to exposure to microwave energy, both CW and pulsed. This effect was observed at the power level of 8.6 mW/cm/sub 2/. Measurements are reported which specify the microwave environment encountered by the insect.



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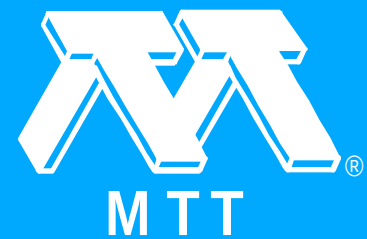


Abstracts

Comparison of Diode Noise Under RF and DC Excitations (Short Papers)

Y. Lipkin and S. Maniv. "Comparison of Diode Noise Under RF and DC Excitations (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 793-796.

Comparison between the low-frequency noise spectra measurements in microwave diodes under RF and dc excitations are reported. The frequency-dependent noise temperature ratio t measured over a range of low frequencies was approximately 3 dB less with RF excitation than with dc excitation, when the dc bias level was identical in the two cases.



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Abstracts

Influence of the Harmonics on the Power Generated by Waveguide-Tunable Gunn Oscillators (Short Papers)

E.M. Bastida and G. Conciauro. "Influence of the Harmonics on the Power Generated by Waveguide-Tunable Gunn Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 796-798.

It has been observed that in many cases the power generated by waveguide-tunable Gunn oscillators varies irregularly and rapidly with the tuning. These power variations, which are not to be confused with those deriving from mode switching, markedly depend on the components connected to the oscillator, and are present in spite of their good matching in the operating band. Theoretical evaluations and an experimental test have been performed which allows one to ascribe this phenomenon to the interaction between the fundamental and harmonic signals due to the diode nonlinearity. The understanding of this phenomenon allows one to design the oscillator in such a way as to reduce its effects.



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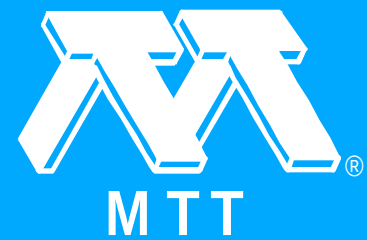
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Broad-Band Impedance Matching a Shunt Slot Radiator Using an Improved Computer-Aided Technique (Short Papers)

R.S. Gordy and G.P. Rodrigue. "Broad-Band Impedance Matching a Shunt Slot Radiator Using an Improved Computer-Aided Technique (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 799-801.

A broad-band computer-aided impedance-matching technique using a comparison reflectometer has been established. The technique is capable of resolving points in a waveguide which generate reflected energy. The comparison reflectometer determines the mean amplitude of the reflection coefficient as a function of distance along the guide and the complex-reflection coefficient of a specific discontinuity in the guide as a function of frequency. A computer program has been developed which is capable of impedance matching the characteristics of each disturbance independent of other reflections in the guide. A shunt slot radiator was fabricated and its complex-reflection coefficient measured with a comparison reflectometer. Application of the computer-aided matching technique resulted in a VSWR of less than 1.16 to 1.0 for the slot radiator over the frequency band from 8.5 to 10.5 GHz.

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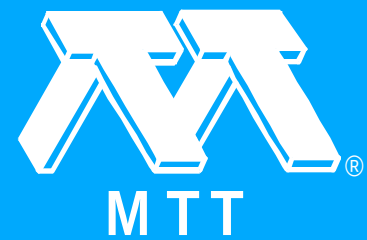


Abstracts

Modal Characteristics of Quadruple-Ridged Circular and Square Waveguides (Short Papers)

M.H. Chen, G.N. Tsandoulas and F.G. Willwerth. "Modal Characteristics of Quadruple-Ridged Circular and Square Waveguides (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 801-804.

A theoretical study, backed by experimental verification, was undertaken to determine the modal characteristics of quadruple-ridged circular and square waveguides. Field lines for the first few important modes and cutoff frequencies were determined. It is shown that for square waveguides quadruple-ridge loading always decreases the TE/sub 10/-TE/sub 11/ bandwidth whereas for circular waveguides only a small amount of additional separation between the first two fundamental modes may be obtained over a limited parameter range. Symmetrical excitation will not excite the asymmetrical higher-order modes. This feature makes these waveguides acceptable as feeds for wide-band reflector antennas and for similar applications but raises a question mark regarding their use as radiators in wide-band phases arrays.



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Abstracts

Experimental Study of Series Connected TRAPATT Diodes (Short Papers)

K. Gleason, C.T. Rucker, N.W. Cox, A.C. Macpherson and E.D. Cohen. "Experimental Study of Series Connected TRAPATT Diodes (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 804-806.

The results of experiments using TRAPATT diodes connected in series at 0.5, 2, and 8 GHz are described. These experiments demonstrate that successful series operation of TRAPATT's at frequencies up to at least 2 GHz can be achieved in a configuration suitable for long pulsewidth or CW operation. An 8-GHz operation of series stacked TRAPATT'S yielded high power outputs at the same efficiency achieved with single devices but no well heat sunk configuration was found that yielded good efficiency.



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Abstracts

Characterization of Microwave Oscillator and Amplifier Circuits Using an IMPATT Diode Biased Below Breakdown (Short Papers)

R.C. Tozer, R. Charlton and G.S. Hobson. "Characterization of Microwave Oscillator and Amplifier Circuits Using an IMPATT Diode Biased Below Breakdown (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 806-808.

A convenient laboratory technique is described to measure the internal circuit loss, the load conductance, and equivalent circuit susceptances of microwave diode oscillators and amplifiers using an IMPATT diode biased just below its breakdown voltage.



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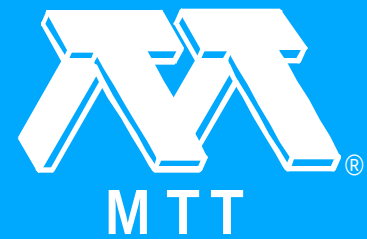


Abstracts

Very Large Impedance Steps in Microstrip (Short Papers)

R.E. Neidert and G.T. O'Reilly. "Very Large Impedance Steps in Microstrip (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 808-810.

Experimental determination of an equivalent circuit for very large impedance steps in microstrip is described. The equivalent circuit is shown to be valid in the frequency range from 1 to 2 GHz on 0.0635-cm-thick alumina substrate, although the experimental method used is applicable to any frequency range and any geometry.



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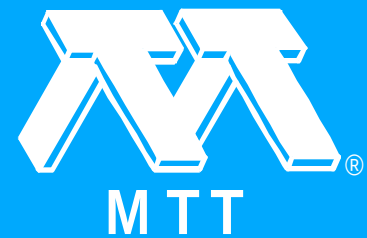


Abstracts

Design of Partial Height Ferrite Waveguide Circulators (Short Papers)

E.J. Denlinger. "Design of Partial Height Ferrite Waveguide Circulators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 810-813.

This short paper presents a design procedure for the widely used three-port waveguide circulator that has a partial height ferrite post in the junction region. Design formulas and curves are derived for two configurations of partial height circulators: one has a short circuit at one end of the ferrite post, while the other has dielectric spacers at both ends. The design method was used to build two circulators for operation at 38 GHz and 60 GHz, respectively. Excellent agreement between theory and experiment was obtained in predicting the center frequency and required matching structure of these devices.



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Abstracts

Guided Waves Along Graded Index Dielectric Rod (Letters)

R. Yamada and Y. Inabe. "Guided Waves Along Graded Index Dielectric Rod (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 813-814.

By a modification of the Kurtz and Streifer procedure, the coupled second-order differential equations for the field components of guided modes along a graded index dielectric rod surrounded by a homogeneous medium were solved directly. Using the results, the eigenvalue equations which are consistent with those of the simple core-cladding-type dielectric fiber in the region near the cutoffs were obtained.



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Abstracts

A Stable Microwave Integrated Circuit X-Band Gunn Oscillator (Letters)

C.K. Chan and R.S. Cole. "A Stable Microwave Integrated Circuit X-Band Gunn Oscillator (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 815-816.

A stable microwave integrated circuit (MIC) X-band Gunn oscillator is described. Frequency stability is achieved by use of a modified Pound stabilizing system. An average short-term frequency stability of 2×10^{-7} at room temperature and a thermal stability of $9 \times 10^{-7}/^{\circ}\text{C}$ between -15 and 30°C have been obtained.



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Abstracts

Mutual Coupling Between Parallel Plate Waveguides (Correction)

Y.E. Elmoazzen and L. Shafai. "Mutual Coupling Between Parallel Plate Waveguides (Correction)." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 816-816.

In the above paper, due to an error in the computer program, Figs. 5, 7, and 9 show incorrect results. The correct results are given in the revised figures shown here.



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Abstracts

Contributors (Aug. 1974 [T-MTT])

O.L. El-Sayed, T.T. Fong, T.J. Gerson, K.M. Lakin, S.-W. Lee, D.W.T. Mh, J.S. Nade, D.F. Peterson and R.M. Tarr. "Contributors (Aug. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.8 (Aug. 1974 [T-MTT]): 817-818.



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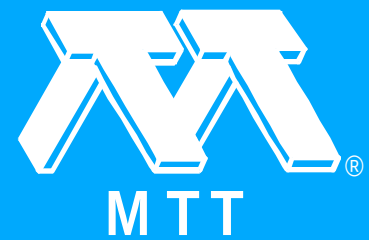
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Theoretical Analysis of Magnetic Resonance Nonreciprocal Circuits -- Limitations of 3-dB Bandwidth and Available Range

M. Igarashi and Y. Naito. "Theoretical Analysis of Magnetic Resonance Nonreciprocal Circuits -- Limitations of 3-dB Bandwidth and Available Range." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 821-829.

The general formulas for both 4-port magnetic-resonator circulators and 2-port magnetic-resonator bandpass filters (BPF's) are given. The effects of the circuit structure and the physical properties of the resonator on the characteristics of the circuit are investigated. The maximum dissipation loss of the resonator is just one half of the input power. Contrary to the results shown in previous reports, it is understood that for a given resonator, there exists an optimum value of the external Q of the circuit and also that a polycrystalline magnetic resonator may be useful for the nonreciprocal circuit, if the product of unloaded Q and saturation magnetization has a sufficiently large value. The requirements for the insertion loss (IL), the reverse loss (RL), and the reflection at the center frequency are introduced, and then the necessary conditions of resonator loss and the limitations of 3-dB bandwidth and available range are clarified.



Abstracts

A Side-Arm-Switched Directional Coupler as a Single-Step Attenuator of High Long-Term Stability

P.I. Somlo and I.G. Morgan. "A Side-Arm-Switched Directional Coupler as a Single-Step Attenuator of High Long-Term Stability." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 830-835.

This paper describes a single-step attenuator for values below 0.1 dB of very high long-term stability. This uses a directional coupler with a fixed short circuit at one coupled port and a switchable match-or-short at the other. The value of the attenuation step in the transmitting path is governed by the coupling and thus very small steps may be achieved readily. The attenuator is analyzed in full and relationships for a leaky directional coupler are given, together with a flowgraph model of a nonideal coupler.



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Abstracts

On the Existence Range of the S Parameters of a Passive Two-Port Network (Short Papers)

E. Carli and T. Corzani. "On the Existence Range of the S Parameters of a Passive Two-Port Network (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 835-837.

The existence range of the S parameters of a passive two-port is analyzed and various limitations on their moduli are deduced. In particular, it is shown that when three moduli are given, the last, in general, may be upper and lower bounded by passivity conditions.



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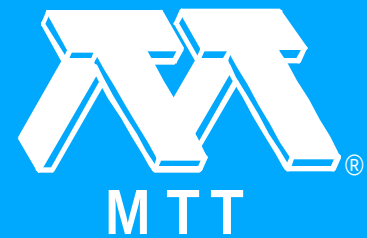


Abstracts

Multiconductor Transmission Lines and the Green's Matrix (Short Papers)

L. Gruner. "Multiconductor Transmission Lines and the Green's Matrix (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 837-839.

It is shown that the study of arbitrarily terminated multiconductor transmission lines which may in general be lossy and subjected to excitation applied at an arbitrary point along the lines, may be effectively performed with the aid of the appropriate Green's matrix. The procedure is illustrated using the Chipman method of impedance measurement as well as coupled microstrip lines.



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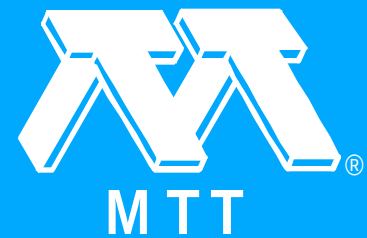


Abstracts

Design and Analysis of a Waveguide-Sandwich Microwave Filter (Short Papers)

Y. Tajima and Y. Sawayama. "Design and Analysis of a Waveguide-Sandwich Microwave Filter (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 839-841.

In 1972 Konishi proposed a unique waveguide filter of sandwich-like construction that was attractive because of its simplicity. This short paper presents an analysis of the sandwich filter that has a conductive sheet with finite thickness sandwiched between waveguide shells. An equivalent circuit is derived, design charts are proposed, and Young's technique is applied to the design of an M-band waveguide filter. The experimental results were found to be in good agreement with the theory and analysis techniques developed herein.



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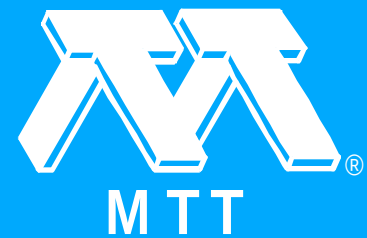


Abstracts

Conduction and Radiation Losses in Microstrip (Short Papers)

J.H.C. van Heuven. "Conduction and Radiation Losses in Microstrip (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 841-844.

Losses in microstrip on fused-silica and alumina substrates have been experimentally evaluated for various values of stripwidth. Radiation losses in circuits, commonly used for measuring losses in microstrips, depend on the dimensions of the circuit and affect the total losses considerably. Radiation and conduction losses of open-ended line resonators have been separately determined. These measurements have also drawn attention to discrepancies between published theories and our experiments. The effect of surface roughness upon conduction losses has been measured.



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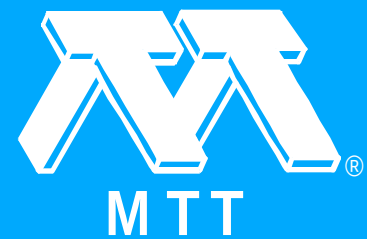


Abstracts

On the Attenuation of Monofilar and Bifilar Modes in Mine Tunnels (Short Papers)

S.F. Mahmoud. "On the Attenuation of Monofilar and Bifilar Modes in Mine Tunnels (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 845-847.

The modal equations for both the monofilar and bifilar modes of a two open wire transmission line located in a waveguide model of a rectangular mine tunnel are derived by extending an earlier general analysis. Attenuation curves of both modes in the frequency range 200 kHz-200 MHz are presented for two distinct configurations of the transmission line that may be used in practice. It is demonstrated that the proximity of the lossy tunnel wall tends to increase greatly the attenuation rate for the monofilar modes but has relatively little effect on the bifilar modes.



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M. Igarashi, I.G. Morgan, Y. Naito and P.I. Somlo. "Contributors (Sep. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.9 (Sep. 1974 [T-MTT]): 848-848.



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Wide-Band Operation of Microstrip Circulators

Y.S. Wu and F.J. Rosenbaum. "Wide-Band Operation of Microstrip Circulators." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 849-856.

Octave bandwidth operation of Y-junction stripline and microstrip circulators is predicted using Bosma's Green's function analysis. The width of the coupling transmission lines is found to be a significant design parameter. Theoretical and experimental results are presented which show that wide lines and a smaller than usual disk radius can be used to obtain wide-band operation. A microstrip circulator is reported which operates from 7-15 GHz. Also presented are an analysis of the input impedance and an approximate equivalent circuit for the Y-junction circulator which shows the relationship between Bosma's equivalent circuit and that of Fay and Comstock.

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Rectangular and Circular Microstrip Disk Capacitors and Resonators

I. Wolff and N. Knoppik. "Rectangular and Circular Microstrip Disk Capacitors and Resonators." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 857-864.

A simple method is described to calculate the capacitances of rectangular and circular microstrip disk capacitors. From the edge capacitances of the capacitors the influence of the fringing field on the resonance frequencies of microstrip disk resonators is calculated. A theory to compute the resonance frequencies of microstrip resonators with high accuracy is presented. The resonance frequencies are calculated from a resonator model employing an effective width and length or radius, respectively, filled with a medium of a "dynamic dielectric constant." Theoretical and experimental results are compared and found to be in agreement within 1 percent.

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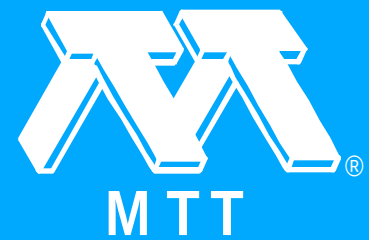
Hybrid Branchline Couplers -- A Useful New Class of Directional Couplers

B. Schiek. "Hybrid Branchline Couplers -- A Useful New Class of Directional Couplers." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 864-869.

The hybrid branchline coupler consists of two transmission lines connected alternately by $\lambda/4$ shunt and series branches. The analysis of this structure leads to a class of directional couplers of which the parallel transmission-line and the de Ronde strip-slot types may be regarded as special cases. From the precise design data thus available, a number of 3-dB strip-slot couplers have been built in C band and X band with a performance close to the predicted one.

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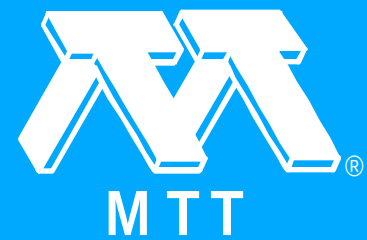
The Design of a Bandpass Filter with Inductive Strip--Planar Circuit Mounted in Waveguide

Y. Konishi and K. Uenakada. "The Design of a Bandpass Filter with Inductive Strip--Planar Circuit Mounted in Waveguide." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 869-873.

The equivalent circuit of an inductive strip inserted in the middle of a waveguide parallel to the E plane is analyzed theoretically by evaluating the inductive reactance of the equivalent T network which was obtained by the Rayleigh-Ritz variational technique. A design theory for the bandpass filter of this type is derived from this equivalent circuit. The confirmation between the design theory and the experimental results is also shown.

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A Computerized Klinger Cavity Mode Conversion Test Set

B.S. Seip and L.W. Hinderks. "A Computerized Klinger Cavity Mode Conversion Test Set." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 873-878.

A mode conversion test set utilizing the klinger cavity technique has been developed for characterizing circular waveguide components in the millimeter waveguide region. The test set incorporates a precision linear displacement optical encoder and a specially designed controller which interfaces the test set to a Hewlett-Packard 2100 series computer. Control commands of a stored computer program are used by the operator for data acquisition and analysis. Experimental results show this system has high measurement accuracy and sensitivity while maintaining an uncomplicated measurement process.

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Nonreciprocal Properties of Vacuum-Deposited InSb Films at 87 GHz (Short Papers)

R.J. Dinger, T.M. Waugh and D.J. White. "Nonreciprocal Properties of Vacuum-Deposited InSb Films at 87 GHz (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 879-880.

Room-temperature measurements were taken at 87 GHz on isolators fabricated by using thin vacuum-deposited hot-wire-recrystallized InSb films in both the Faraday-rotation mode and the field-displacement mode. In the Faraday-rotation mode, an insertion loss of 9 dB, a nonreciprocity of 10 dB, and an isolation of 19 dB were obtained in an external magnetic field of 8 kOe.

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Abstracts

Moment Method of Calculating Discontinuity Inductance of Microstrip Right-Angled Bends (Short Papers)

A. Gopinath and B. Easter. "Moment Method of Calculating Discontinuity Inductance of Microstrip Right-Angled Bends (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 880-883.

A method of estimating quasi-static discontinuity inductances in microstrip lines is outlined. Numerical results for symmetric right-angle bends are presented and compare well with experimental results.



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A Microwave Decoupled Electrode for the Electroencephalogram (Short Papers)

L.E. Larsen, R.A. Moore and J. Acevedo. "A Microwave Decoupled Electrode for the Electroencephalogram (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 884-887.

The recording of the electroencephalogram (EEG) in an amplitude-modulated microwave field presents two related but distinct problems when conventional electrodes are employed. The electrode and its associated conductors extract power from the incident radiation, resulting in increased local power deposition which confounds dosimetric arguments and imposes local thermalization; the electrode tissue interface is a nonlinear system that demodulates amplitude-modulated signals with the results that the demodulate is additively mixed with the EEG. The problems were studied in a series of bench tests with conventional and thin-film microwave integrated circuit (MIC) electrodes. The latter are decoupled from the magnetic component of the field by virtue of radically reduced dimensions of the thin-loop component of its geometry, and suppression of dipole (i.e., electric field interaction) currents by use of integrated Nichrome series resistance. The result is that the demodulation artifact is undetectable in the ensemble averaged-power spectrum from the in vitro electrode up to an S-band incident-power density of 100 mW/cm². Thermalization was studied in a dielectric brain phantom with high-resistance monofilament leads to the MIC with a result that 0.6°C heating is attributable to the electrode with prolonged exposure to a 50-mW/cm² field.

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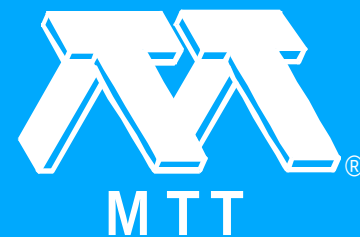


Abstracts

Error in Impedance Measurement When the Signal is Introduced Across the Slotted-Line Probe (Short Papers)

J. Barbero. "Error in Impedance Measurement When the Signal is Introduced Across the Slotted-Line Probe (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 887-889.

For some special applications impedance measurements have to be made where the test level reaching the unknown must be kept very low. In such cases, using slotted-line techniques, the detector and generator are reversed in the test setup, and the test signal is introduced across the probe of the slotted line which is terminated on one side with the load, and on the other with the detector. This short paper briefly describes this familiar method and then discusses the error calculation in the measurement of VSWR and phase when the detector is not perfectly matched.



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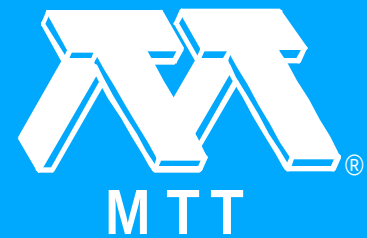


Abstracts

Multilayer Microstrip Transmission Lines (Short Papers)

A. Farrar and A.T. Adams. "Multilayer Microstrip Transmission Lines (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 889-891.

A method used to treat covered microstrip is extended to multilayer microstrip. Detailed results are obtained for the general three-layer problem. Series expansion and term-by-term integration are used to obtain a closed form expression for the Green's function. Matrix methods are then used to obtain the characteristic impedance. Data obtained agree closely with experiment.



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A Low-Loss Branching Filter for Broad Widely Spaced Bandwidths (Short Papers)

E.A. Ohm. "A Low-Loss Branching Filter for Broad Widely Spaced Bandwidths (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 891-894.

A waveguide filter which separates the 4-GHz band the combined 4-, 6-, and 11-GHz common-carrier bands with a loss of only 0.05 dB is described. The input is limited to a single polarization, but dual polarizations can be accommodated by using two such filters in combination with a polarization coupler. The filter also has low insertion losses at 6 and 11 GHz: 0.1 dB and 0.06 dB, respectively, a good return loss, 32 dB, and a short length, 2 1/2 ft. Additionally, it has high power-handling capability, good isolation properties, and good mode purity.

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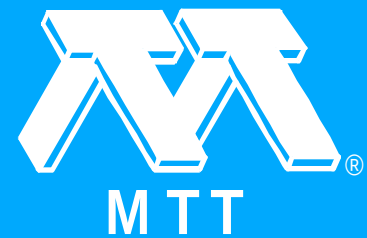


Abstracts

Pump Noise Transfer in Parametric Amplifiers (Short Papers)

W.A. Porter, D.I. Breitzer and B. Smilowitz. "Pump Noise Transfer in Parametric Amplifiers (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 894-896.

Pump noise transfer in paramps is related to the sensitivity of amplifier gain to AM and FM pump modulation. Measurements performed on an S-band paramp with an 18.4-GHz pump are described. The significance of the results is made explicit by using them to calculate the increase in amplifier noise temperature associated with an IMPATT oscillator pump.



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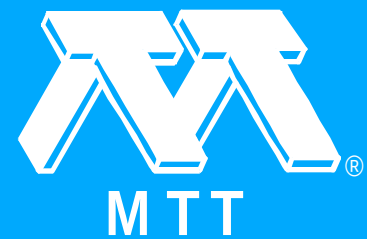


Abstracts

A Technique for Computing Dispersion Characteristics of Shielded Microstrip Lines (Short Papers)

T. Itoh and R. Mittra. "A Technique for Computing Dispersion Characteristics of Shielded Microstrip Lines (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 896-898.

The boundary value problem associated with the shielded microstripline structure is formulated in terms of a rigorous hybrid-mode representation. The resulting equations are subsequently transformed, via the application of Galerkin's method in the spectral domain, to yield a characteristic equation for the dispersion properties of shielded microstrip lines. Among the advantages of the method are its simplicity and rapid convergence. Numerical results are included for several different structural parameters. These are compared with other available data and with some experimental results.



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Abstracts

Mixed Mode Filters (Short Papers)

D.A. Taggart and R.D. Wanselow. "Mixed Mode Filters (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 898-902.

Mixed mode bandpass filters are described which utilize alternating TE/sub 011/^o and TE/sub n11/^o circular waveguide cavity modes. This novel filter configuration exhibits both excellent unloaded Q and spurious mode response characteristics. The use of mixed resonant modes makes possible the design of microwave filters for both in-line side wall connected cylindrical resonators as well as folded planar filter configurations, whereby cross-coupling between selected resonators can be realized.



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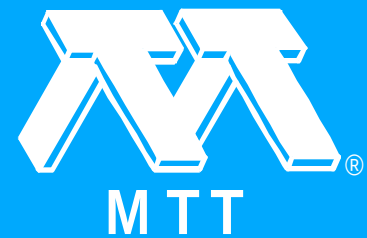


Abstracts

The Admittance Matrix of Coupled Transmission Lines (Letters)

A.I. Grayzel. "The Admittance Matrix of Coupled Transmission Lines (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 902-904.

An alternate derivation of the admittance matrix of n coupled lines is presented. The method uses the superposition of two modes of excitation analogous to the even and odd mode excitation used for the analysis of two coupled lines. Only mutual capacitance to adjacent lines is considered.



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Abstracts

A Useful Identity for the Analysis of a Class of Coupled Transmission-Line Structures (Letters)

A.I. Grayzel. "A Useful Identity for the Analysis of a Class of Coupled Transmission-Line Structures (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 904-907.

In this letter an identity is proven which allows easy analysis of many coupled transmission-line structures.



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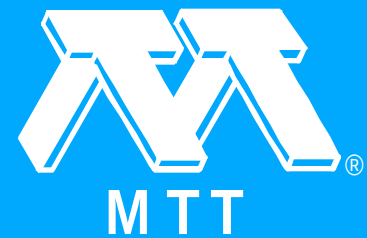


Abstracts

Distributed Feedback Acoustic Surface Wave Oscillator (Letters)

C. Elachi. "Distributed Feedback Acoustic Surface Wave Oscillator (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 907-908.

The application of the distributed feedback concept to generate acoustic surface waves is discussed. It is shown that surface corrugation of the piezoelectric boundary in a semiconductor-piezoelectric surface acoustic wave amplifier could lead to self-sustained oscillation.



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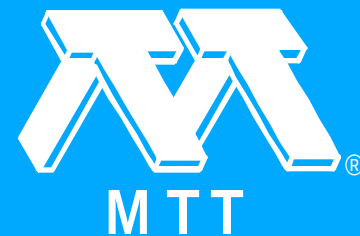


Abstracts

Surface Acoustic Wave UHF Interferometer (Letters)

G. Chao and L. Breetz. "Surface Acoustic Wave UHF Interferometer (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 908-910.

A 330-MHz surface acoustic wave (SAW) interferometer is described. The delay for the interferometer is provided by a 6.67- μ s ST quartz SAW delay line. The interferometer is capable of 50-dB nulls of 150-kHz periodicity over a 10-MHz instantaneous bandwidth.



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An Accurate Formula for the Gamma Function (Letters)

L. Lewin. "An Accurate Formula for the Gamma Function (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 910-910.

The residue calculus method of investigation of certain waveguide configurations makes use of the asymptotic properties of the gamma function. Usually the range of the variables concerned is such that this approximation is quite adequate. In a recent investigation of a very narrow waveguide junction peculiar numerical effects were traced to a condition where the variables were much too small to warrant the use of the usual asymptotic formula. A new and very simple modification extends the asymptotic form right down to zero with an error of, at most, only a few percent.

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Contributors (Oct. 1974 [T-MTT])

L.W. Hinderks, N. Knoppik, Y. Konishi, F.J. Rosenbaum, B. Schiek, B.S. Seip, K. Uenakada, I. Wolff and Y.S. Wu. "Contributors (Oct. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.10 (Oct. 1974 [T-MTT]): 911-912.



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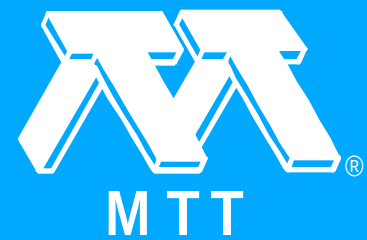
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Hollow-Cylinder Waveguide Isolators for Use at Millimeter Wavelengths

M. Kanda and W.G. May. "Hollow-Cylinder Waveguide Isolators for Use at Millimeter Wavelengths." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 913-917.

The device considered in this study is a semiconductor waveguide isolator consisting of a hollow column of a semiconductor mounted coaxially in a circular waveguide in a longitudinal dc magnetic field. An elementary and physical analysis based on the excitation of plane waves in the guide and a more rigorous mode-matching analysis (MMA) are presented. These theoretical predictions are compared with experimental results for an InSb isolator at 94 GHz and 7.5 K.

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The Interaction of Surface Magnetostatic Waves with Drifting Carriers in Semiconductors

K. Kawasaki, H. Takagi and M. Umeno. "The Interaction of Surface Magnetostatic Waves with Drifting Carriers in Semiconductors." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 918-924.

Characteristics of surface magnetostatic waves (SMW) propagating in the direction perpendicular to an external dc magnetic field and interacting with drifting carriers in semiconductors were studied. Loss of the waves was observed to be decreased due to the interaction with drifting carriers even if the drift velocity of carriers did not exceed the phase velocity of the waves.

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Passband Control of Surface Magnetostatic Waves by Spacing a Metal Plate Apart from the Ferrite Surface

K. Kawasaki, H. Takagi and M. Umeno. "Passband Control of Surface Magnetostatic Waves by Spacing a Metal Plate Apart from the Ferrite Surface." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 924-929.

The effect of a metal plate on the propagation characteristics of surface magnetostatic waves (SMW) propagating perpendicular to an external dc magnetic field was studied by varying the spacing of the metal plate from the ferrite surface. Continuous passband control is obtained by changing the spacing from zero to infinity and the existence of a partial stopband for the interchange of the input and output ports is also obtained in addition to the disappearance of nonreciprocal propagation for a finite spacing of the metal plate.

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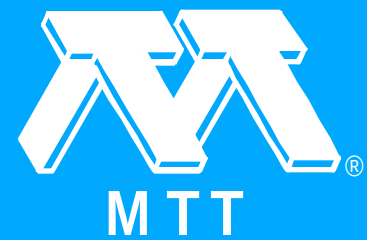
A Method for the Computation of the Characteristic Immittance Matrix of Multiconductor Striplines with Arbitrary Widths

L.J.P. Linner. "A Method for the Computation of the Characteristic Immittance Matrix of Multiconductor Striplines with Arbitrary Widths." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 930-937.

An exact method for the computation of the characteristic impedance matrix of coplanar coupled multiconductor striplines with arbitrary widths is presented. The system of conductors is enclosed in a rectangular shielding box with a homogeneous dielectric medium. Use is made of conformal mapping by hyperelliptic integrals. The reverse problem of determining the geometrical dimensions for a given characteristic impedance matrix is solved by employing an optimization procedure in conjunction with carefully determined initial approximations. This yields low computer running time compared to current methods for the treatment of multiconductor transmission lines.

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Analysis of Wave Propagation in Inhomogeneous Optical Fibers Using a Variational Method

T. Okoshi and K. Okamoto. "Analysis of Wave Propagation in Inhomogeneous Optical Fibers Using a Variational Method." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 938-945.

The variational method is used to determine the propagation characteristics of an optical fiber consisting of a core with an arbitrary refractive-index distribution and a uniform cladding. The problem is first translated into a variational problem; the functional is computed upon the TEM-approximation basis. The variational problem is then solved by using the Rayleigh-Ritz method. The computed propagation characteristics are presented for refractive-index distributions of practical interest. The single-mode condition for a quadratic self-focusing fiber is obtained as $v < 3.53$ where v denotes the conventionally used normalized frequency; this result agrees with the numerical analysis by Dil and Blok. The obtained characteristic equations for the simplest case (uniform core case) are compared with analytic solutions to ensure the validity of the analysis.

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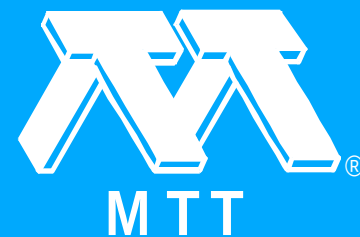


Abstracts

Analysis of Microstrip Resonators

T. Itoh. "Analysis of Microstrip Resonators." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 946-952.

An accurate and efficient method was developed for computing the resonant frequencies of microstrip resonators. The formulation of the problem was carried out rigorously using the full-wave analysis rather than the quasi-static approximation. The characteristic equation was derived using Galerkin's method applied in the Fourier transform domain. The accuracy of the method has been proven by comparing the numerical results with the experimental data. Numerical data have been provided for the microstrip resonators with different structural parameters. Finally, the results for microstrip resonators have been used for predicting the end effect at the open end of microstrip structures.



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Analysis of Lossy Inhomogeneous Waveguides Using Shooting Methods (Short Papers)

R.E. McIntosh and L.J. Turgeon. "Analysis of Lossy Inhomogeneous Waveguides Using Shooting Methods (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 952-954.

Shooting methods are used to analyze rectangular waveguides containing inhomogeneous lossy dielectrics. The technique obtains the electromagnetic fields inside the waveguide by solving Maxwell's equations using trial and error procedures to match the boundary conditions at the conducting waveguide surface. Dispersion and attenuation curves are obtained which show how continuous dielectric inhomogeneities and losses affect the transmission characteristics of these waveguides.



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Operation Modes of a Waveguide Y Circulator (Short Papers)

Y. Akaiwa. "Operation Modes of a Waveguide Y Circulator (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 954-960.

Operation modes of a waveguide Y circulator with a circular and a triangular ferrite post are investigated both theoretically and experimentally. Field analysis is carried out taking into consideration the field variation along the ferrite axis. Frequencies are calculated by assuming TM modes nearly agree with measured frequencies. It is shown that the circulator action occurs at frequencies where two HE modes interfere with each other, besides occurring at HE mode resonance frequencies. Effects of Teflon spacers on circulator performances are investigated in detail.

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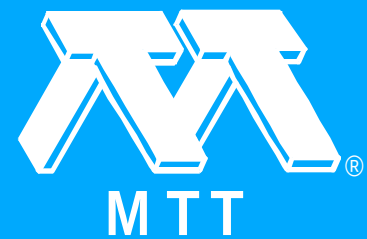


Abstracts

Experimental Distinction Between Crossed-Field and In-Line Three-Port Circuit Models for Interdigital Transducers (Short Papers)

W.R. Smith. "Experimental Distinction Between Crossed-Field and In-Line Three-Port Circuit Models for Interdigital Transducers (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 960-964.

The crossed-field and in-line Mason circuit models for interdigital surface-wave transducers give opposite predictions for the dependence of acoustic reflection coefficients on electric load resistance for purely resistive loads. Experiments described herein show that the crossed-field model correctly describes the reflections for YX quartz, ST-X quartz, and YZ lithium niobate substrates. A low-resistance load minimizes reflections for transducers with double electrodes operating at the fundamental synchronous frequency. For single electrode transducers, optimum reflection suppression may call for a load resistance comparable to the transducer impedance.



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Normalized Impedance Graphs for Exponential Transmission Lines (Short Papers)

R.P. Arnold, W.L. Bailey and R.L. Vaitkus. "Normalized Impedance Graphs for Exponential Transmission Lines (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 964-965.

Sign errors in an existing closed form solution for the reflection coefficient along an exponentially tapered transmission line have been corrected and the solution has been modified by the use of electrical line length. This allows useful graphs for the input impedance of the tapered line to be computed which are normalized with respect to frequency and system impedance. The graphs clearly demonstrate both the broad-band and narrow-band properties of the tapered line.



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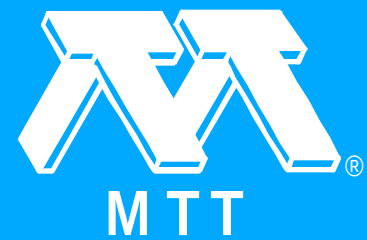
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Transmission Characteristics of Spherical TE and TM Modes in Conical Waveguides (Short Papers)

M.S. Narasimhan and K.S. Balasubramanya. "Transmission Characteristics of Spherical TE and TM Modes in Conical Waveguides (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 965-970.

The transmission properties of spherical TE and TM modes in a perfectly conducting conical waveguide are treated in detail. To start with, an analytically simple and highly accurate digital-computer based iterative algorithm has been employed to evaluate the eigenvalues associated with the spherical TE and TM modes within the guide irrespective of the flare angle ($2\alpha/\sin \theta$) of the conical waveguide ($\theta < 2\alpha/\sin \theta < 360^\circ$). Subsequently, explicit expressions for the attenuation constant, phase constant, phase velocity, and wave impedance are obtained for the spherical modes transmitted within the guide. Accurate eigenvalues obtained numerically are used to study the variation of attenuation constant, phase constant, phase velocity, and wave impedance as a function of the radial distance from the apex with $\alpha/\sin \theta$ as a parameter. Measured data on the phase constant of a conical waveguide for the TE₁₁ mode have been compared with the analytical results obtained by calculation and an excellent agreement between the two justifies the validity of the analysis presented. Finally, a study of the phase coherence between the dominant spherical TE and TM modes within the guide is presented which may be fruitfully employed in the design of dual-mode conical waveguides.



Abstracts

Simple Stabilizing Method for Solid-State Microwave Oscillators (Short Papers)

A. Kondo, T. Ishii and K. Shirahata. "Simple Stabilizing Method for Solid-State Microwave Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 970-972.

In the microwave solid-state oscillators using bulk effect and avalanche diodes, high dielectric constant ceramics have been used as a temperature compensator and excellent temperature stability is obtained. An X-band avalanche diode oscillator is tested over a wide temperature range. The frequency drift is improved to be less than +30 kHz/°C. Additional advantages of this technique are compact size and low cost.



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Rectangular Waveguides with Impedance Walls (Comments)

P.R. McIsaac. "Rectangular Waveguides with Impedance Walls (Comments)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 972-973.

In the above paper, Dybal et al. discuss the propagation characteristics of several rectangular waveguides with corrugated walls and analyze them by using impedance boundaries to simulate the corrugated walls. One of the waveguides discussed, called an E guide, has longitudinal corrugations in all four walls. The authors claim that this waveguide will support E modes but not H modes. However, this waveguide has an isotropic homogeneous dielectric surrounded by a conducting boundary which is longitudinally uniform. Therefore, if the boundary is assumed to be a perfect conductor, this waveguide must support a complete set of both E and H modes; the presence of the corrugations cannot change this conclusion.

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Rectangular Waveguides with Impedance Walls (Further Comments)

M.S. Narasimhan and V.V. Rao. "Rectangular Waveguides with Impedance Walls (Further Comments)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 973-973.

In the above paper, some comments seem to be necessary on the impedance compatibility relation $Z_{1/3} - Z_{2/3} + Z_{2/4} = 0$ where $Z_{1/}$, $Z_{2/}$, $Z_{3/}$, and $Z_{4/}$ have been defined. This relation was derived for obtaining a separable modal solution of fields. Though (1) appears to be mathematically correct, controversies arise when it is used for square or rectangular waveguides with all the four walls corrugated transversely to the direction of propagation.

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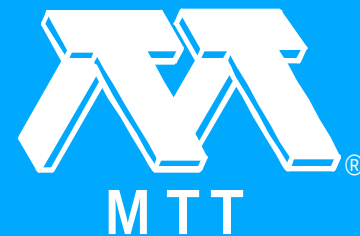


Abstracts

Surface Acoustic Wave Properties of Tantalum Pentoxide Thin Films on YX Quartz (Letters)

J.F. Weller and T.G. Giallorenzi. "Surface Acoustic Wave Properties of Tantalum Pentoxide Thin Films on YX Quartz (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 973-975.

The properties of a Rayleigh surface wave propagating in tantalum oxide thin films on YX quartz are presented. Dispersion and acoustic wave loss measurements are made using the optical probe technique.



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Abstracts

Scattering by a Ferrimagnetic Circular Cylinder in a Rectangular Waveguide (Comments)

P. Bhartia. "Scattering by a Ferrimagnetic Circular Cylinder in a Rectangular Waveguide (Comments)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 975-975.

In the above paper, the authors have arrived at a general and rigorous solution for the scattering by a demagnetized ferromagnetic cylinder in a rectangular waveguide. Corrections to the above paper have appeared separately, and a proof has been presented to show that the unitary condition on the S matrix is guaranteed for any size of truncation in the formulation of that paper. However, a number of errors still remain and for completeness, they are pointed out here.



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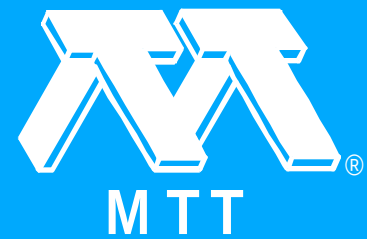


Abstracts

A Circuit for Rapid Evaluation of TRAPATT Diodes (Letters)

W.C. Jenkins and K. Gleason. "A Circuit for Rapid Evaluation of TRAPATT Diodes (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 976-977.

A parallel plate transmission line circuit has been developed which facilitates rapid testing of experimental TRAPATT diodes. In this circuit the impedance of each tuning element can be continuously varied. This is an appreciable advantage over conventional coaxial TRAPATT circuits which use fixed diameter slugs.



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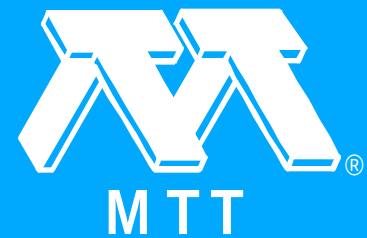


Abstracts

Transmission Line Impedance Matching Using the Smith Chart (Letters)

R.M. Arnold. "Transmission Line Impedance Matching Using the Smith Chart (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 977-978.

A graphical computation method is described for transforming complex load impedances into resistive load impedances using transmission line matching sections. The Smith chart is used even though the characteristic impedance normalizing factor is unknown.



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Abstracts

Useful Alternate to an Expression in "Sandwich Slot Line" (Comments and Author's Reply)

R.D. Moyer and S.B. Cohn. "Useful Alternate to an Expression in "Sandwich Slot Line" (Comments and Author's Reply)." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 978-978.

In the above correspondence, Cohn presented equations for the wavelength ratio, characteristic impedance, and phase to group velocity ratio observed in sandwich slot line. In this comment, an observation is offered which extends the range of application of those equations.



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Contributors (Nov. 1974 [T-MTT])

T. Itoh, M. Kanda, K. Kawasaki, L.J.P. Linner, W.G. May, K. Okamoto, T. Okoshi, H. Takagi and M. Umeno. "Contributors (Nov. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): 979-980.



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"Back Cover (Nov. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.11 (Nov. 1974 [T-MTT]): b1-b2.



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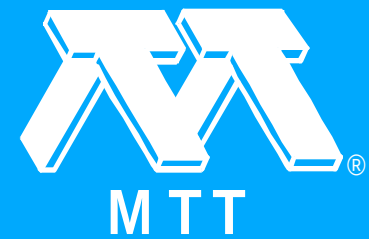
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Abstracts

Front Cover (Dec. 1974, Part I [T-MTT])

"Front Cover (Dec. 1974, Part I [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): f1-f2.



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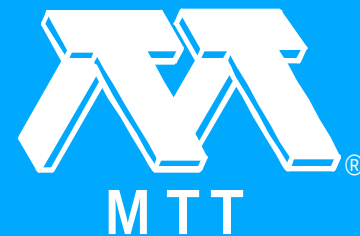


Abstracts

Memorial (Dec. 1974, Part I [T-MTT])

J. Chamberlain. "Memorial (Dec. 1974, Part I [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 981-981.

This Proceedings of the First International Conference on Submillimeter Waves and Their Applications is dedicated to our departed friend and colleague.



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Abstracts

Foreword (Dec. 1974, Part I [T-MTT])

K.J. Button. "Foreword (Dec. 1974, Part I [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 981-982.

Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications



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Abstracts

Optically Pumped Submillimeter-Wave Sources

T.Y. Chang. "Optically Pumped Submillimeter-Wave Sources." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 983-988.

Optical pumping of polar molecules by means of infrared lasers is expected to lead to thousands of laser lines throughout the submillimeter-wave region. Already, 282 new laser lines between 34 μm and 1.814 mm in 18 different molecules have been reported. Very stable CW operation, very high pulsed output, linear polarization, high gain, and many other advantages over discharge excitation are offered.



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Abstracts

High Power Optically Pumped Far Infrared Lasers

T.K. Plant, L.A. Newman, E.J. Danielewicz, T.A. DeTemple and P.D. Coleman. "High Power Optically Pumped Far Infrared Lasers." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 988-990.

Intense superradiant laser action in the far infrared (FIR) has been observed in several gases optically pumped with a CO/sub 2/ transversely excited atmospheric-pressure (TEA) laser. A maximum FIR power of 100 kW was observed from CH/sub 3/F at 496 μ m. Characteristics of the system and possibilities of scaling to higher powers are also discussed.



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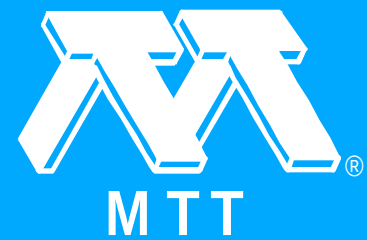
Tunable Far-Infrared Source-Detector System Based on Landau-Level Transitions in n-InSb

E. Gornik, W. Muller and F. Kohl. "Tunable Far-Infrared Source-Detector System Based on Landau-Level Transitions in n-InSb." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 991-995.

The radiative emission from impact-ionized shallow donors in n-type InSb provides a tunable far-infrared source, the properties and applications of which are investigated. To obtain optimum conditions, the radiation intensity is studied independence of the sample volume and the electric- and magnetic-field intensities. The source is applied to measure the Zeeman splitting of the shallow donors in n-InP and n-GaAs.

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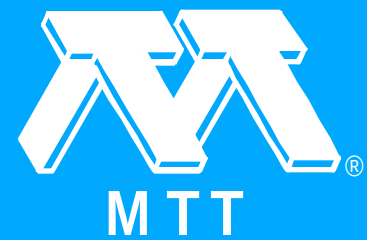
Step-Tunable Far Infrared Radiation by Phase Matched Mixing in Planar-Dielectric Waveguides

D.E. Thompson and P.D. Coleman. "Step-Tunable Far Infrared Radiation by Phase Matched Mixing in Planar-Dielectric Waveguides." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 995-1000.

The mixing of various pairs of CO/sub 2/ laser lines in a nonlinear material can produce thousands of step-tunable far infrared (FIR) signals in the range 70- μ m-7-mm wavelength with frequency spacings of less than 0.1 cm/sup -1/. The major problem in realizing these coherent signals is achieving phase matching in a suitable nonlinear material. In this paper, the interest is in generating tunable signals at the milliwatt level in a planar-dielectric integrated-optics waveguide configuration. Phase matching can be achieved with cubic materials (i.e., GaAs) by adding the waveguide dispersion to the bulk dispersion. Work on the analysis of the waveguide mixing system and its correlation with experimental data are described for a planar GaAs dielectric waveguide in the 100-1000- μ m wavelength range.

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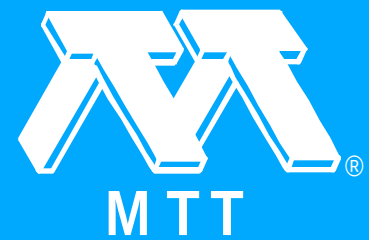
Strong Submillimeter Radiation from Intense Relativistic Electron Beams

V.L. Granatstein, M. Herndon, R.K. Parker and S.P. Schlesinger. "Strong Submillimeter Radiation from Intense Relativistic Electron Beams." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1000-1005.

Radiation from an intense relativistic electron beam at submillimeter wavelengths has been measured with bandpass and high-pass filters. Radiated power ~100 kW has been measured in the passband 390-540 μm . The generation of this radiation depends on giving the electrons a large energy component transverse to the magnetic field. Coherent wave generation mechanisms which may account for the observed radiation are discussed.

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Josephson Junctions as Heterodyne Detectors

Y. Taur, J.H. Claassen and P.L. Richards. "Josephson Junctions as Heterodyne Detectors." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1005-1009.

Heterodyne detection with a point-contact Josephson junction has been investigated both experimentally and theoretically. The measured performance of the device at 36 GHz is in good agreement with the theory. By operating vanadium point contacts at 1.4 K, we have achieved a single-sideband (SSB) mixer noise temperature of 54K with a conversion gain of 1.35 and a signal bandwidth on the order of 1 GHz. From our results we can extrapolate a potentially impressive performance for these devices at submillimeter wavelengths.

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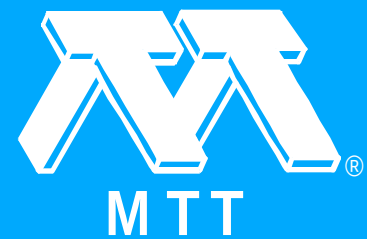


Abstracts

Material Characterization and Ultimate Performance Calculations of Compensated n-Type Silicon Bolometer Detectors at Liquid-Helium Temperatures

C.J. Summers and S. Zwerdling. "Material Characterization and Ultimate Performance Calculations of Compensated n-Type Silicon Bolometer Detectors at Liquid-Helium Temperatures." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1009-1013.

The dependence of the resistivity and far infrared (FIR) absorptance on donor concentration, compensation, and temperature in compensated n-type Si is reported. The effect of environment, time constant, and spectral passband on the noise equivalent power (NEP) of the compensated Si bolometer is examined and compared with similar calculations for the compensated Ge bolometer.



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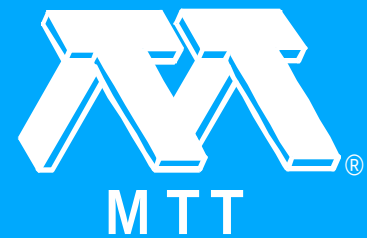


Abstracts

Submillimeter Heterodyne Detection and Harmonic Mixing Using Schottky Diodes

H.R. Fetterman, B.J. Clifton, P.E. Tannenwald, C.D. Parker and H. Penfield. "Submillimeter Heterodyne Detection and Harmonic Mixing Using Schottky Diodes." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1013-1015.

Schottky diodes have been used for submillimeter, heterodyne detection and harmonic mixing. Using a carcinotron local oscillator at 890 μm , sensitive detectors of optically pumped lasers have been demonstrated up to fifth harmonic mixing at 1757.5 GHz. The measured noise equivalent power (NEP) in fundamental mixing is approximately 10^{-16} W/Hz.



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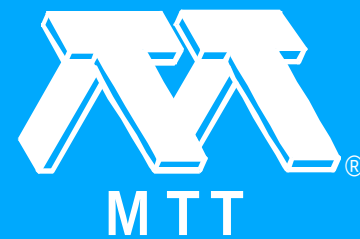


Abstracts

Present Status of the Applications of Pyroelectricity to the Detection of Far-Infrared Radiations

A. Hadni. "Present Status of the Applications of Pyroelectricity to the Detection of Far-Infrared Radiations." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1016-1018.

The best defectivity at room temperature is obtained with a TGS single-crystal plate 10 μm thick: $D^*(47^\circ\text{C}) = 6 \cdot 10^8 \text{ W/sup } -1/ \text{ Hz/sup } 1/2/ \text{ cm}$. It is shown that epitaxial layers can give as good or better detectivities.



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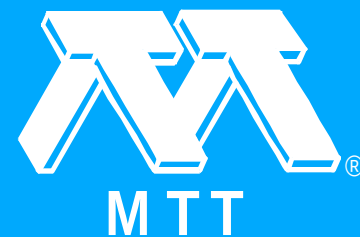


Abstracts

Recent Advances in Commercial Fourier Spectrometers for the Submillimeter Wavelength Region

R.C. Milward. "Recent Advances in Commercial Fourier Spectrometers for the Submillimeter Wavelength Region." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1018-1023.

A slow-scan "real-time" Michelson interferometer and a new rapid-scan interferometer using signal averaging techniques and fast Fourier transform (FFT) spectrum computation are described and compared. Typical performances of both instruments are illustrated.



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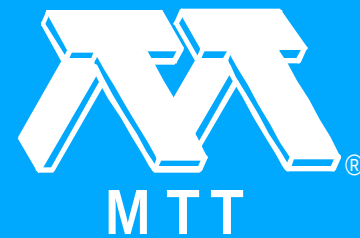


Abstracts

High-Resolution Submillimeter-Wave Fourier-Transform Spectrometry of Gases

J.W. Fleming. "High-Resolution Submillimeter-Wave Fourier-Transform Spectrometry of Gases." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1023-1025.

Modern interferometric techniques now permit the measurement of broad-band absorption spectra of gases at submillimetric wavelengths to high resolution with comparative ease. This paper describes briefly some new spectra of H_2O , N_2O , and SO_2 in the 10-40 cm^{-1} (0.33 to 1.4 THz) region, at a resolution of 0.05 cm^{-1} .



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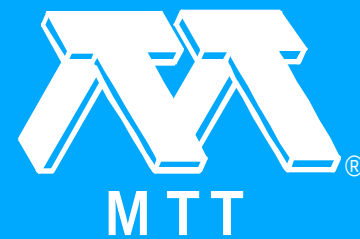


Abstracts

The Performance of an Amplitude Fourier Spectrometer for Far-Infrared Solid-State Spectroscopy

J. Gast, L. Genzel and U. Zwick. "The Performance of an Amplitude Fourier Spectrometer for Far-Infrared Solid-State Spectroscopy." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1026-1027.

A far-infrared Fourier interferometer for amplitude-phase reflection spectroscopy on solids is described. It can be used with small samples at low temperatures and with fairly high resolution ($<0.1 \text{ cm/sup -1/}$). The spectral range presently is $10\text{-}1000 \text{ cm/sup -1/}$.



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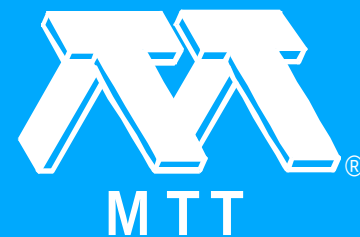


Abstracts

High-Frequency Dielectric Processes in Liquids

J. Chamberlain, M.N. Afsar, G.J. Davies, J.B. Hasted and M.S. Zafar. "High-Frequency Dielectric Processes in Liquids." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1028-1032.

Recent advances in dispersive Fourier spectrometry are described. The complex refractive indices of lossy materials are now directly measurable over a wide spectral range which extends from microwavelengths to the midinfrared. Some results for liquid ethanol and butanol are presented and interpretation of the spectra in terms of hydrogen bonding is offered.



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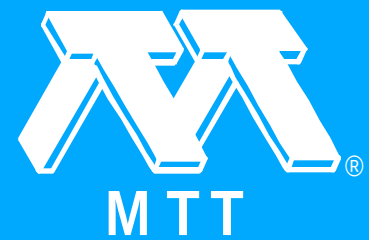
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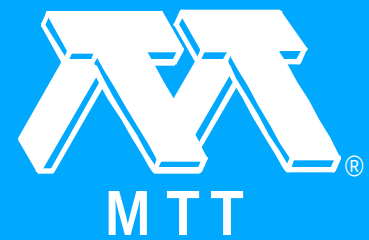
A New Technique for Dispersive-Reflection Spectroscopy in the Far Infrared

T.J. Parker and W.G. Chambers. "A New Technique for Dispersive-Reflection Spectroscopy in the Far Infrared." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1032-1036.

A new technique is described for measuring the amplitude and phase-reflection spectra of solids in the far infrared. The field of view in the fixed arm of a Michelson interferometer is divided by screens to allow the specimen and reference mirror to be placed side by side. Interferograms are then recorded by reflection from each in turn so that phase errors arising from the physical replacement of the reference mirror by the specimen are eliminated. The method is demonstrated with room-temperature and low-temperature measurements on a crystal of KBr.

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Atmospheric Noise in the Far Infrared (300-3000 μm)

S. Corsi, G. Dall'Oglio, S. Fonti, I. Guidi, B. Melchiorri, F. Melchiorri, V. Natale, F. Mencaraglia, P. Lombardini, P. Trivero and S. Sivertsen. "Atmospheric Noise in the Far Infrared (300-3000 μm)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1036-1041.

Noise measurements in the frequency regions 5-200 Hz and 5.2×10^4 - 8.3×10^5 Hz have been performed in the wavelength region between 300 and 3000 μm from the high altitude observatory of Testa Grigia, Italy (3.500 m). In the high frequency region a specially designed Ge bolometer operating in background-limited-infrared-photoconductor conditions matched to a 1.5-m telescope has been used, while at low frequency a radiometer designed for atmospheric transmittance measurements was employed. In both regions no excess noise with respect to the photon noise relative to 300-K blackbody has been detected.

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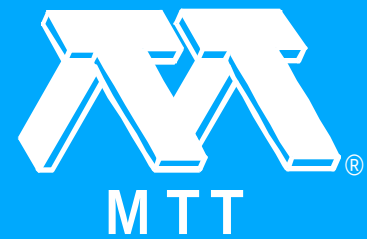
Submillimeter Spectroradiometers with n-InSb Detectors

A.N. Vystavkin, Y.I. Kolesov, V.N. Listvin and A.Y. Smirnov. "Submillimeter Spectroradiometers with n-InSb Detectors." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1041-1046.

The optimal characteristics of amplitude splitters for submillimeter radiation beams are determined. Versions of optical schemes with large light gathering power (LGP) utilizing such splitters are proposed. Using them, high sensitivity receiving devices for the 2-0.2-mm waveband region with Fabry-Perot interferometers (FPI) and Michelson interferometers (MI) and n-InSb immersion detectors (spectroradiometers) are constructed.

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Balloon-Based Measurements of the Cosmic Background Radiation

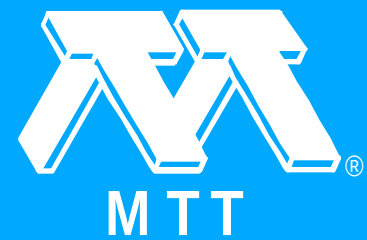
J.C. Mather, P.L. Richards and D.P. Woody. "Balloon-Based Measurements of the Cosmic Background Radiation." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1046-1048.

We have developed and flown a balloon-borne liquid-helium-cooled spectrometer to measure the cosmic background radiation in the 3 -18-cm/sup -1/ region. It features a cooled horn antenna, a polarizing Michelson interferometer, and a germanium bolometer. These design features and the performance of the instrument are discussed.

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Interaction of Intense Submillimeter Radiation with Plasmas

B. Lax and D.R. Cohn. "Interaction of Intense Submillimeter Radiation with Plasmas." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1049-1052.

Recent advances in the development of high power submillimeter lasers have opened up new areas of investigation in the study of laser plasma interactions. These areas include studies of laser-induced gas breakdown and plasma heating at cyclotron resonance, laser-induced breakdown effects in solids, and studies of laser-generated parametric instabilities in arc plasmas. In addition, high power submillimeter lasers can be used for important diagnostic measurements in Tokamak plasmas. These measurements include the determination of ion temperature by Thomson scattering and the measurement of transverse thermal conductivity by resonant local heating.

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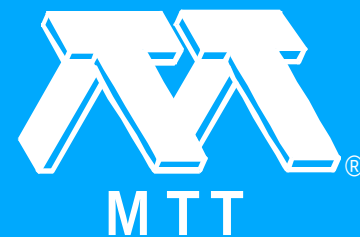


Abstracts

Interferometry at 337 μm on a Tokamak Plasma

P. Brossier and R.A. Blanken. "Interferometry at 337 μm on a Tokamak Plasma." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1053-1056.

The Alcator electron density ($10^{13} < n_e < 10^{14} \text{ cm}^{-3}$) has been measured with a 337- μm Mach-Zender interferometer. A detailed description of the interferometer is given. Results are discussed and compared with microwave interferometry data.



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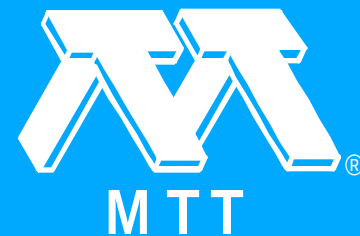


Abstracts

A Technique to Measure Submillimeter Tokamak Synchrotron Radiation Spectra

R.A. Blanken, P. Brossier and D.S. Komm. "A Technique to Measure Submillimeter Tokamak Synchrotron Radiation Spectra." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1057-1060.

A wire-mesh Fabry-Perot interferometer with millisecond response time has been constructed. The application of this instrument to study the millimeter and submillimeter synchrotrons radiation emitted by magnetically confined Tokamak plasmas is discussed.



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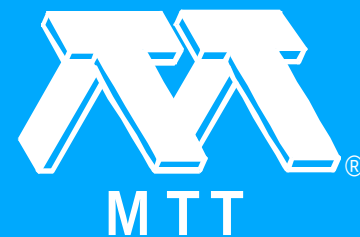


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A Heterodyne-Detection System for Measurements in Collective HCN-Laser Scattering from Thermonuclear Plasmas

O. Gehre. "A Heterodyne-Detection System for Measurements in Collective HCN-Laser Scattering from Thermonuclear Plasmas." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1061-1064.

Collective HCN-laser scattering may become a useful diagnostic for waves and fluctuations in plasmas in the parameter range of Tokamak and Stellarator. Conditions for the measurement of the scattered spectrum are given and a resulting detection system, using a whisker detector in a heterodyne mode of operation, is described.



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Submillimeter Spectroscopy of Weak Antiferromagnets in Magnetic Fields Up to 300 kOe

E.G. Rudashevsky, A.S. Prokhorov and L.V. Velikov. "Submillimeter Spectroscopy of Weak Antiferromagnets in Magnetic Fields Up to 300 kOe." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1064-1069.

The dynamic properties of antiferromagnets with Dzyaloshinsky interaction were investigated at wavelengths 0.3-14 mm, in magnetic fields up to 300 kOe and temperature 4.2-400 K. The problems of impurities, field induced phase transitions, types of spin oscillation, etc., for different types of antiferromagnets with Dzyaloshinsky interaction are discussed. Based on the investigation results, a new approach to the physics of magnetic phenomena, using the complete rational basis of invariants and avoiding potential series expansion, has been developed.

[Click on title for a complete paper.](#)



Abstracts

Low Frequency Excitations in Antiferromagnetic Tungstates (NiWO/sub 4/, CoWO/sub 4/)

V.V. Eremenko, V.M. Naumenko, A.I. Zvyagin, V.I. Kut'ko and A.I. Maslennikov. "Low Frequency Excitations in Antiferromagnetic Tungstates (NiWO/sub 4/, CoWO/sub 4/)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1069-1072.

Absorption spectra of biaxial antiferromagnets have been studied from 7.5 to 500 cm/sup -1/. Ordering directions and the g tensor are determined. A new spin-wave branch and spin-phonon interaction will be described.



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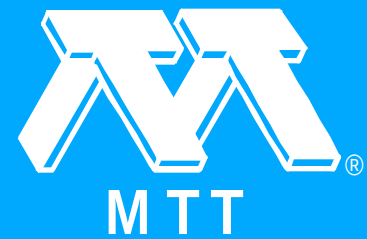
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Far-Infrared Properties of Interacting Donors in Antimony-Doped Germanium

K. Yoshihiro, M. Tokumoto and C. Yamanouchi. "Far-Infrared Properties of Interacting Donors in Antimony-Doped Germanium." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1072-1076.

Absorption and photoconductivity of 337- μm radiation in Sb-doped Ge with excess donor concentrations ranging from 1.2×10^{16} to 3.6×10^{17} cm⁻³ have been investigated at liquid-He temperatures. The result suggests the existence of a "delocalized" excited state between the conduction band and the donor ground state which arises from the overlapping of donor wave functions.

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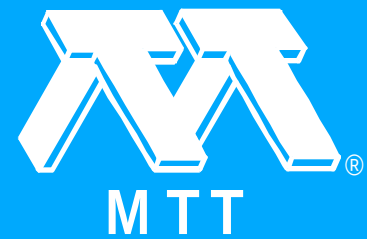


Abstracts

High Pressure Far Infrared Spectroscopy of Ionic Solids

R.P. Lowndes. "High Pressure Far Infrared Spectroscopy of Ionic Solids." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1076-1080.

A high pressure far infrared cell operating to truly hydrostatic pressures of 8 kbar is described and used to determine the anharmonic self-energies associated with the q /spl ap/ 0 transverse optic modes of ionic solids.



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Submillimeter-Laser Magnetospectroscopy in Tellurium Making Use of the Nernst Effect

M. von Ortenberg. "Submillimeter-Laser Magnetospectroscopy in Tellurium Making Use of the Nernst Effect." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1081-1085.

In contrast to magnetotransmission and magnetophotoconductivity measurements in tellurium the radiation-induced Nernst effect reveals impurity and cyclotron transitions exactly and is not obscured by other effects as demonstrated in samples of different dislocation densities.

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Submillimeter Absorption Spectra and Phase Transition of Indirect Excitons in Germanium

V.L. Kononenko, T.S. Mandel'stam, V.N. Murzin, V.S. Vavilov and V.A. Zayats. "Submillimeter Absorption Spectra and Phase Transition of Indirect Excitons in Germanium." 1974 *Transactions on Microwave Theory and Techniques* 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1086-1089.

The results are presented of the detailed studies on the exciton absorption spectra in ultrapure Ge in the spectrum regions 0.67-1.1 and 1.7-3.7 meV with a backward-wave tube radiation. It is shown that the measured spectrum corresponds to the exciton's transitions from the ground to excited states. As a result of temperature measurements at 1.6-4.2 K the phase transition of excitons into the condensed state has been observed without the formation of excitonic molecules.

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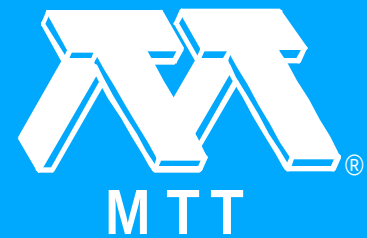


Abstracts

Waveguide and Open-Resonator Techniques for Submillimeter Waves

R.J. Batt, H.L. Bradley, A. Doswell and D.J. Harris. "Waveguide and Open-Resonator Techniques for Submillimeter Waves." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1089-1094.

Resonance techniques at 337 μm (890 GHz) are used to study the performance of modified H guide as a low-loss waveguide and of open resonators using spherical mirrors for media characteristic measurement.



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Abstracts

Design of a Blackbody Reference Standard for the Submillimeter Region

B. Carli. "Design of a Blackbody Reference Standard for the Submillimeter Region." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1094-1099.

The problems connected with the design of a blackbody reference standard for the submillimeter region are discussed. An emittance of better than 99.9 percent is obtained using a relatively small cavity.



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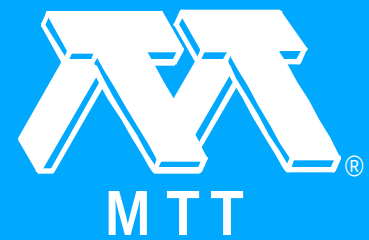
Electric-Dipole Contributions to Resonant Far-Infrared Difference-Frequency Mixing in InSb

B.S. Wherrett, C.R. Pidgeon, N. Brignall and R.A. Wood. "Electric-Dipole Contributions to Resonant Far-Infrared Difference-Frequency Mixing in InSb." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1100-1103.

Calculations have been made of the inversion-asymmetry-induced electric-dipole moment of the spin-resonance conduction-band transition in InSb. This moment leads to a second-order nonlinear polarization which resonates for difference-frequency mixing when the incident radiation frequencies differ by the spin-flip frequency. Comparison with experiments confirms that the dominant contribution to far-infrared difference mixing is from the magnetic-dipole source. However, it is shown that a value for the InSb-band parameter C may, in principle, be determined from the results of mixing experiments. It is also noted that electric fields in excess of 5 V/cm should induce stronger mixing than given by the preceding two mechanisms. Observations of far-infrared radiation tunable over the range $85\text{-}105 \text{ cm}^{-1}$ and at power levels of up to $10 \text{ }\mu\text{W}$ are reported. These are obtained by mixing $10.6\text{-}\mu\text{m}$ TEA-CO₂-laser radiation with the tunable Stokes radiation produced by spin-flip Raman-laser action in an InSb sample. It is argued that considerable improvement in the power levels should be achieved by modifying the experimental setup.



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Far-Infrared-Submillimeter Phased Arrays and Applications

V.J. Corcoran. "Far-Infrared-Submillimeter Phased Arrays and Applications." 1974 *Transactions on Microwave Theory and Techniques* 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1103-1107.

The concept of a phased array of far-infrared (FIR) or submillimeter (SMM) waveguide lasers that can be scanned electronically is presented. Grating lobe reduction by computer analysis is shown. Possible applications of SMM arrays are considered.

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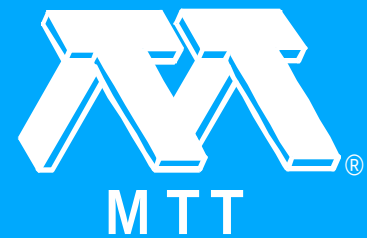


Abstracts

Assignments of Optically Pumped Laser Lines of 1,1-Difluoroethylene (Short Papers)

G. Duxbury, T.J. Gamble and H. Herman. "Assignments of Optically Pumped Laser Lines of 1,1-Difluoroethylene (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1108-1109.

The submillimeter laser transitions of CF/sub 2/CH/sub 2/ have been assigned to pure rotation transitions in the ν_9 , ν_4 , and $\nu_5 + \nu_{10}$ vibrational states using results from laser Stark spectroscopy.



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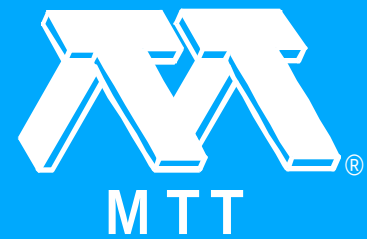
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Plasma Modulation of an HCN Gas Laser (Short Papers)

G.D. Tait, L.C. Robinson and D.V. Bartlett. "Plasma Modulation of an HCN Gas Laser (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1109-1111.

A transient plasma is located within the Fabry-Perot resonator of a dc hydrogen cyanide laser. Plasma tuning sweeps the resonator modes through the emission line of the HCN molecules and produces pulses of far-infrared output radiation. Pulse production by hydrogen, nitrogen, helium, and argon pulsed plasmas is discussed.

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Development of Megawatt-Level Narrow-Band Far-Infrared Lasers for Plasma Diagnostics (Letters)

F. Brown and D.R. Cohn. "Development of Megawatt-Level Narrow-Band Far-Infrared Lasers for Plasma Diagnostics (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1112-1113.

Required megawatt-level 30-MHz linewidth 496- μm radiation for plasma diagnostics may be achieved in CH/sub 3/F using an oscillator-pulse-amplifier combination employing transverse optical pumping (TOP). It is estimated that an upper limit of 150 J of CO/sub 2/ laser pump energy is required to produce 1-MW (0.07-J 60-ns) far-infrared (FIR) pulses.

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Optimal Design of Optics for Submillimeter Astronomy (Letters)

J.E. Beckman and J.A. Shaw. "Optimal Design of Optics for Submillimeter Astronomy (Letters)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1113-1115.

We have designed two- and three-element shaped reflecting telescopes which minimize diffraction losses and sidelobes for submillimeter radiometric and spectrometric application. New solutions for the near-field output of an off-axis paraboloid when illuminated with a beam of considerable power taper (20 dB) show the merit of using Gaussian illumination for which the feed telescope may be explicitly designed. Conventional long-focus Cassegrain telescopes can, by using a suitably positioned off-axis conic to give a condensed focal patch, be converted for submillimeter sky chopping.

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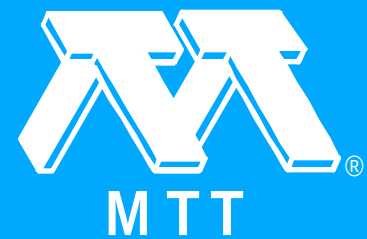


Abstracts

Measurement of Atmospheric Attenuation at 1.3 and 0.87 mm with an Harmonic Mixing Radiometer

P.F. Goldsmith, R.L. Plambeck and R.Y. Chiao. "Measurement of Atmospheric Attenuation at 1.3 and 0.87 mm with an Harmonic Mixing Radiometer." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1115-1116.

The atmospheric attenuation at 1.3 and 0.87 mm was measured above Mount Hamilton, California in the period December 5 to December 9, 1973. The measured value of the zenith attenuation varied from 1 to 5 dB at 1.3 mm over this five-day period, and was 2.5 dB at 0.87 mm on December 9, 1973. The total beamwidth of the 120" Lick Observatory telescope used in the Coudé configuration was measured to be 3' at 1.3 mm.



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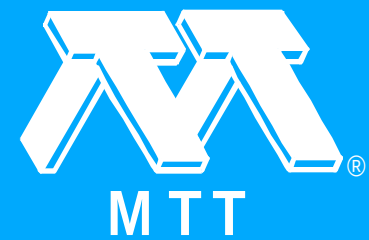
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Abstracts (Dec. 1974, Part I [T-MTT])

"Abstracts (Dec. 1974, Part I [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): 1117-1120.



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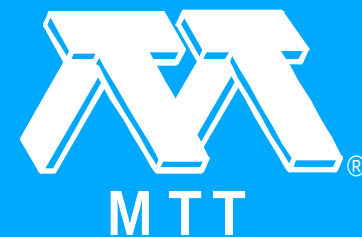
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Abstracts

Back Cover (Dec. 1974, Part I [T-MTT])

"Back Cover (Dec. 1974, Part I [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part I [T-MTT] (Special Issue on the Proceedings of the First International Conference on Submillimeter Waves and Their Applications)): b1-b2.



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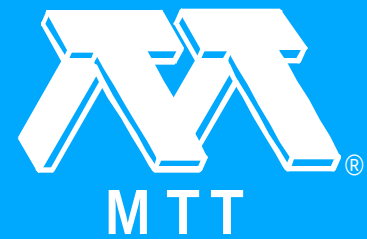
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Table of Contents (Dec. 1974 [T-MTT])

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Introductory Remarks (Dec. 1974, Part II [T-MTT])

C.T. Rucker and G.R. Harrison. "Introductory Remarks (Dec. 1974, Part II [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1122-1122.

For many years the December issue of the Transactions has been devoted to the papers presented at the International Microwave Symposium. This year, for the first time, the issue is being handled by Guest Editors who were associated with the technical program of the Symposium.



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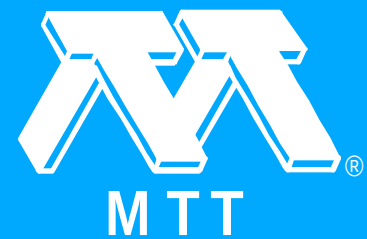


Abstracts

President's Message--The Microwave Spectrum, Our Resource for the Future

R.A. Rivers. "President's Message--The Microwave Spectrum, Our Resource for the Future." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1123-1123.

Many areas of technical activity are involved with the more effective utilization of scarce resources. New products are continually being introduced to make more efficient use of resources. Many times resources are human time and work. In the case of microwave engineering we use a resource (the electromagnetic spectrum) to acquire or transmit information. We use this resource to make more efficient use of human time and energy. In other cases we use this resource to transmit energy itself.



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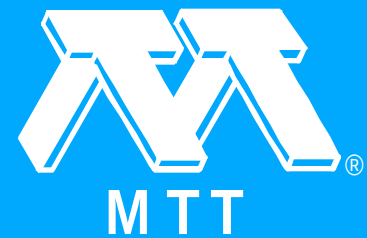


Abstracts

International Microwave Symposium (Dec. 1974 [T-MTT])

G.P. Rodrigue and G.R. Harrison. "International Microwave Symposium (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1123-1127.

The 1974 IEEE S-MTT International Microwave Symposium was hosted by the Atlanta Joint Chapter of MTT and AP and held on the campus of the Georgia Institute of Technology and at the Sheraton-Biltmore Hotel, Atlanta, Ga., June 12-14, 1974.



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"MTT Awards for 1973." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1128-1130.



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The 1974 S-MTT National Lectureship

S. Okwit. "The 1974 S-MTT National Lectureship." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1130-1130.

Noise has always played a major role in the design of microwave systems. The tradeoff problems of transmitter power versus receiver sensitivity in radar, antenna size versus receiver sensitivity in communications, system noise temperature versus bandwidth and integration time in radiometry, etc., have always challenged the design engineer in the past and will continue to do so in the future. This lecture concerns itself with these tradeoff problems and presents several points of view relative to optimum performance.



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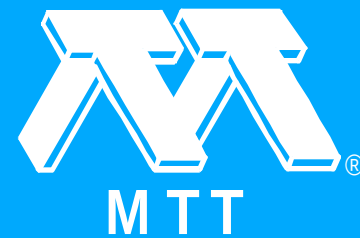


Abstracts

Keynote Address (Dec. 1974, Part II [T-MTT])

J.J. Guarrera. "Keynote Address (Dec. 1974, Part II [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1131-1133.

The following is the keynote address given on June 12, 1974 by J. J. Guarrera, President of the Institute of Electrical and Electronics Engineers, Inc., at the combined AP/MTT Special Session. Our thanks go to him and all the Georgia Tech staff and administration for serving as the host institution for the several symposia that were being held in Atlanta during this time.



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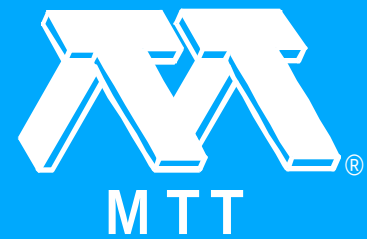
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Pulsed Double-Drift Silicon IMPATT Diodes and Their Application

G. Pfund, C.P. Snapp and A. Podell. "Pulsed Double-Drift Silicon IMPATT Diodes and Their Application." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1134-1140.

The performance and application of double-drift silicon IMPATT diodes designed for pulsed operation at frequencies between 8.5 and 18 GHz are described. Peak pulse powers greater than 18 W at 10 GHz and 13.5 W at 16.5 GHz were obtained for 800-ns pulses at a 25-percent duty cycle with the average junction-temperature, rise limited to 200°C. Conversion efficiencies were between 11 and 13.7 percent. The microwave cavity and pulsed bias circuitry are described in detail.

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Determination of Semiconductor Junction Device Package Networks (Dec. 1974 [T-MTT])

P.T. Greiling and R.W. Laton. "Determination of Semiconductor Junction Device Package Networks (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1140-1145.

A generalized method for the determination of semiconductor device package characteristics in the form of linear lumped element networks is described. The method is based upon a computer algorithm for the reduction of mean square error between measured and calculated impedance and is applicable to any package geometry in any microwave circuit media. Impedance measurements are made with the device in situ, without requiring special reference packages. Rapid convergence is obtained by an analysis of the pole-zero configuration of a lossless approximation to the measured data for obtaining initial element values. Results are given for IMPATT and TRAPATT devices in coaxial and microstrip circuits, together with an experimental demonstration of the validity of the result for a TRAPATT diode in a 20- Ω microstrip circuit.

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Abstracts

Automatic Load Contour Mapping for Microwave Power Transistors (Dec. 1974 [T-MTT])

J.M. Cusack, S.M. Perlow and B.S. Perlman. "Automatic Load Contour Mapping for Microwave Power Transistors (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1146-1152.

A technique for large signal characterization of microwave power transistors is described. A computer-controlled apparatus is used to map contours of constant power and efficiency on a Smith chart for dynamic matching of both input and output circuits.



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Abstracts

A Low-Noise 80-GHz Silicon IMPATT Oscillator Highly Stabilized with a Transmission Cavity

S. Nagano and S. Ohnaka. "A Low-Noise 80-GHz Silicon IMPATT Oscillator Highly Stabilized with a Transmission Cavity." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1152-1159.

Design consideration and experimental performance of a new transmission-cavity-controlled Silicon-IMPATT-diode oscillator for millimeter wavelengths are described. The oscillator has the frequency stability of 1×10^{-4} over a temperature variation of 0-50°C and remarkably improved noise characteristics, and is free from troublesome moding problems. Discussion is made of the circuit design that satisfies frequency stabilization, noise reduction, mode stabilization, and circuit-efficiency improvement.



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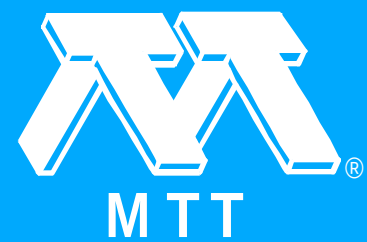
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Low-Noise Diodes and Mixers for the 1--2-mm Wavelength Region

G.T. Wrixon. "Low-Noise Diodes and Mixers for the 1--2-mm Wavelength Region." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1159-1165.

Ultralow capacitance low-noise Schottky-barrier diodes have been developed for use in the 1--2-mm-wavelength region. The diodes have been fabricated using both photolithographic and electron-beam lithographic techniques. Use of the latter technique to make diodes shaped as crossed stripes of width 0.25 μm and 0.4 μm on epitaxial GaAs resulted in a 30-percent reduction in spreading resistance over that of photolithographically formed circular diodes with approximately the same junction area and capacitance. Because of this reduction, it is suggested that in order to minimize receiver noise figure at frequencies greater than about 200 GHz, it will prove advantageous to use such shaped diodes rather than the conventional circular ones. The diodes were used in mixers operating at 140, 175, and 230 GHz. At 140 and 175 GHz the diodes were mounted in conventional Sharpless wafers. At 230 GHz, in addition to Sharpless wafers, a mixer of unique design was used which incorporated an RF matching element, low-pass filter, and IF output transmission line, all on stripline, whose performance was optimized using low-frequency scaling techniques. Mixer double side-band (DSB) noise figures of 3.8, 8.1, and 12.6 dB were measured at the three frequencies, respectively. At 175 and 230 GHz, however, mixer performance is degraded due to a lack of sufficient local oscillator (LO) power and this is currently the principal limitation to their performance.

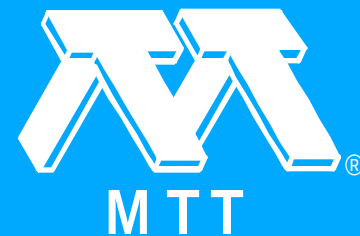


Abstracts

Optimization of S-Band TRAPATT Oscillators

R.J. Trew, N.A. Masnari and G.I. Haddad. "Optimization of S-Band TRAPATT Oscillators." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1166-1170.

The optimization of S-band TRAPATT oscillators has been investigated experimentally from both the device and circuit points of view. Methods for selecting a device for optimum operation with a given circuit are discussed. A relatively straightforward circuit optimization technique has resulted in an increase in oscillator efficiency of between 5 and 8 percentage points, representing an RF power increase of approximately 20 percent.



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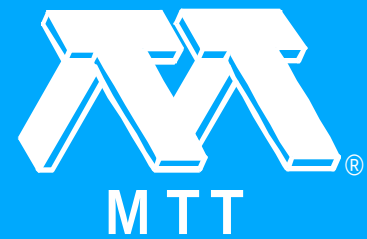


Abstracts

Practical Design Approach to Microstrip Comblne-Type Filters

A.D. Vincze. "Practical Design Approach to Microstrip Comblne-Type Filters." 1974
Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974
Symposium Issue)): 1171-1181.

A general circuit model resembling a comblne-type structure is developed using the concept of self and mutual node admittances rather than self and mutual capacitances per unit length. The merit of this approach lies in the relative simplicity of design formulas readily applicable to filters utilizing microstrip or stripline construction. It also offers easy adaptability to computer sided design. Equations are derived relating even-odd mode impedances and transmission line lengths to prototype elements and other design parameters.



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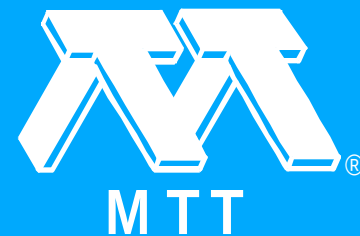


Abstracts

Inhomogeneous Coupled-Line Filters with Large Mode-Velocity Ratios

J.L. Allen. "Inhomogeneous Coupled-Line Filters with Large Mode-Velocity Ratios." 1974 *Transactions on Microwave Theory and Techniques* 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1182-1186.

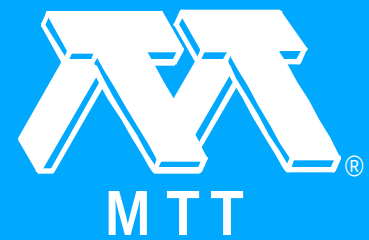
Experimental and theoretical results are presented demonstrating some novel properties of a new class of filters based on inhomogeneous coupled-line structures having large even-odd mode-velocity ratios, e.g., a single inhomogeneous coupled-line filter section with an equiripple, 3-peak stopband and passband response.



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The Ferrite-Loaded Waveguide Discontinuity Problem (Dec. 1974 [T-MTT])

F.J. Bernues and D.M. Bolle. "The Ferrite-Loaded Waveguide Discontinuity Problem (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1187-1193.

A method is presented to obtain the scattering matrix of two-port junctions consisting of a waveguide inhomogeneously loaded with ferrite. Some approximations are discussed and numerical results obtained for the dielectric-loaded twin-slab phase shifter in rectangular waveguide.

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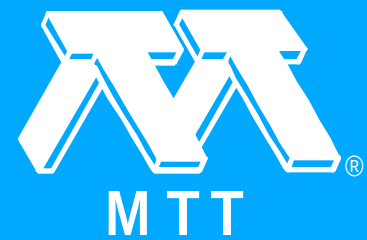
Authors

Dispersion and Field Analysis of a Microstrip Meander-Line Slow-Wave Structure (Dec. 1974 [T-MTT])

J.A. Weiss. "Dispersion and Field Analysis of a Microstrip Meander-Line Slow-Wave Structure (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1194-1201.

A structure which is important as an example of a spatially periodic medium for microwave propagation is analyzed theoretically, with rigorous consideration of its partial dielectric composition, symmetry properties; and field configuration relating to its use for electron-wave interaction in a crossed-field amplifier (CFA). The analysis is carried out in a quasi-TEM approximation, leading to determination of a complex potential function within the unit cell and the associated normal-mode parameters: effective dielectric constant, phase velocity, and characteristic impedance, as functions of phase per cell and mode symmetry. With imposition of meander-line boundary conditions, solutions of the characteristic equation for the dispersion law of the structure are computed, including the influence of the inhomogeneous dielectric-vacuum construction of microstrip. Agreement with the observed phase and stopband features of a representative structure is very good. Power distribution and group velocity are calculated, and an interaction impedance, representing the coupling between the RF field and an electron beam for estimation of CFA performance is also calculated. The method lends itself to detailed computations, including the effects of structural features of practical slow-wave circuits.





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A Class of Waveguide Filters for Over-Moded Applications

C.-L. Ren and H.-C. Wang. "A Class of Waveguide Filters for Over-Moded Applications." 1974 *Transactions on Microwave Theory and Techniques* 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1202-1209.

As the frequency spectrum extends to the millimeter wave range, the rapid rise in intrinsic loss and the diminishing physical dimensions greatly curtail the usefulness of conventional waveguide filters in dominant mode waveguide. The incentive for designing filters in over-moded waveguide is all too apparent. However, filter design in over-moded waveguide faces challenging design criteria, such as mode conversion loss and intrinsic loss, ease of being analyzed and synthesized, and feasibility for economical fabrication. A filter structure is presented which fulfills all aspects of the design objectives. The structure involves a type of discontinuity which is not only free from mode conversion but also extremely simple to characterize analytically. The latter renders feasible the use of available filter synthesis techniques. While the proposed filter structure can be designed either as a bandpass filter, a bandstop filter or a low-pass filter in an over-moded uniform waveguide of arbitrary cross section, for illustration purposes only the low-pass filter in over-moded circular waveguide is discussed in great detail. Design theories are presented which allow the proposed structure to be designed either by the image method or by operating parameter filter synthesis. Excellent agreement between the theory and measurements made on filter models is shown.

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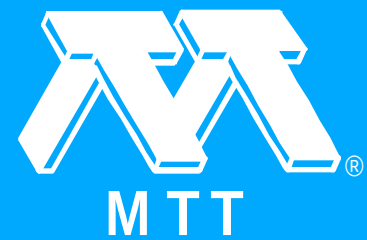


Abstracts

Integrated Fin-Line Millimeter Components (Dec. 1974 [T-MTT])

P.J. Meier. "Integrated Fin-Line Millimeter Components (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1209-1216.

This paper reviews the characteristics of integrated fine line, a low-loss transmission line which is compatible with batch-processing techniques and superior to microstrip in several respects at millimeter wavelengths. Relative to microstrip, fin-line can provide less stringent tolerances, greater freedom from radiation and higher mode propagation, better compatibility with hybrid devices, and simpler interfaces with waveguide instrumentation. Examples of solid-state and passive components are presented which illustrate the potential of integrated fin-line at millimeter wavelengths. The examples include a p-i-n attenuator which has demonstrated the capability of constructing low-loss semiconductor mounts in fin-line. A four-pole bandpass filter, which performs in close agreement with theory, is also discussed.



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Abstracts

Broad-Band Directional Couplers Using Microstrip with Dielectric Overlays

B. Sheleg and B.E. Spielman. "Broad-Band Directional Couplers Using Microstrip with Dielectric Overlays." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1216-1220.

This paper presents the development of two microwave integrated circuit (MIC) broad-band, high-performance directional couplers with dielectric overlays. The respective nominal coupling values of these components are 6 and 10 dB with useful bandwidths in excess of 3.4:1. Thorough descriptions of the design procedure, performance, and fabrication techniques are presented in sufficient detail to permit duplication of these couplers. The computer-aided design method used to develop these couplers is modeled to treat parallel-coupled microstrip lines with a dielectric overlay and is also suitable for developing directional filters and Schiffman phase shifters of similar construction. This and other design methods available for developing dielectric-overlay couplers are reviewed with particular attention given to related technological areas that warrant further investigation.



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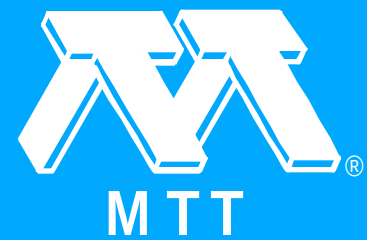
A Temperature-Stabilized Broad-Band Lumped-Element Circulator

I. Ikushima and M. Maeda. "A Temperature-Stabilized Broad-Band Lumped-Element Circulator." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1220-1225.

An equivalent circuit including the stray reactance of a microstrip-type lumped-element circulator is derived to establish the design procedure, and it is shown theoretically that a broad-band circulator with a 30-percent bandwidth can be realized. Additionally, to obtain the broad-band characteristics over a wide range of temperatures, the necessary temperature coefficients of ferrite materials and magnets are calculated. A new ferrite material with a low temperature coefficient as well as a new fabrication process for thin-film crossovers have been developed. The experiments indicate that a radial magnetizing field improves the circulator characteristics in both bandwidth and loss. An experimental circulator exhibits the following characteristics over a wide temperature range from -10 to 60°C: VSWR < 1.2, loss < 1.0 dB, and isolation >20 dB over a bandwidth of 450 MHz centered at 1.7 GHz.

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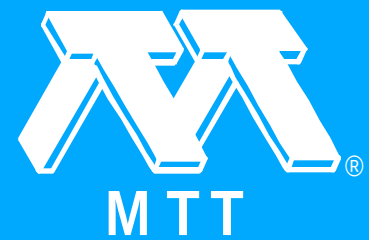
Microwave Variable-Gain Amplifier with Dual-Gate GaAs FET

M. Maeda and Y. Minai. "Microwave Variable-Gain Amplifier with Dual-Gate GaAs FET." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1226-1230.

An encapsulated dual-gate GaAs Schottky barrier gate FET has been characterized with an equivalent circuit representation. The second gate bias dependence of the transconductance has suggested that the FET can be used as a variable-gain simplifying device at microwave frequencies. The experiments on the variable-gain amplifiers with the dual-gate GaAs FET's have exhibited the following. 1) Broad-band amplification can be achieved by adopting a stagger tuning technique, although the Q's of the input and output of the GaAs FET are much higher than those of the Si bipolar transistor. 2) The gain can be controlled only by the second gate bias voltage without degradation of bandpass performance. The results have shown the feasibility of the dual-gate GaAs FET for a microwave variable-gain amplifier.

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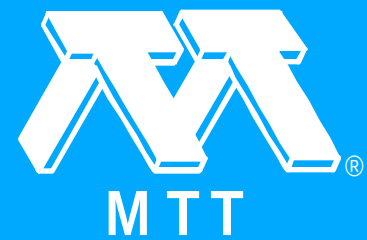
Use of Microelectronic Technology in the Design of a 3.7-4.2-GHz Portable Microwave Repeater

W.W. Raukko. "Use of Microelectronic Technology in the Design of a 3.7-4.2-GHz Portable Microwave Repeater." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1231-1239.

The use of microelectronic technology in the design of a frequency-agile portable microwave repeater (PMR) provides for light-weight compact construction without sacrifice of performance. The instrument is intended for use as an up and down converter in FM systems and operates at 20-MHz channels in the 3.7-4.2-GHz band with a 70-MHz intermediate frequency (IF). A brief discussion of its design indicates the significance of each microelectronic assembly. Key microelectronic designs include a 4-GHz transistor preamplifier with a 5-dB noise figure, a 4-GHz double-balanced mixer of coplanar construction, and a 4-GHz power amplifier with 1.5 W of output power. Comments are offered regarding the advantages and limitations of microelectronic design. Back-to-back instrument performance yields 0.2-dB flatness and 2-ns group delay over a ± 7 -MHz band measured at 70 MHz. FM noise performance is discussed.

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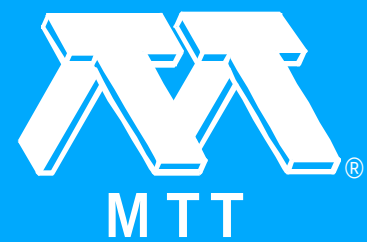
Reliability Testing of Microwave Transistors for Array-Radar Applications

B.C. Dodson, Jr. and W.H. Weisenberger. "Reliability Testing of Microwave Transistors for Array-Radar Applications." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1239-1246.

Solid-state array radar is of great current interest because of the inherent reliability of solid-state devices and the concomitant promise for improvement in system reliability. However, no extensive reliability base has been established for solid-state devices employed under radar operating requirements. In this paper some of the important factors bearing a device reliability are treated. Accelerated life tests under RF conditions are presented for L-band power transistors. Preliminary life-test and failure-analysis data are also presented with recommendations on how the information can be used by the radar systems designer.

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New Microwave-Frequency Synthesizers that Exhibit Broader Bandwidths and Increased Spectral Purity (Dec. 1974, Part II [T-MTT])

P.G. Tipon. "New Microwave-Frequency Synthesizers that Exhibit Broader Bandwidths and Increased Spectral Purity (Dec. 1974, Part II [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1246-1254.

A superior microwave-frequency synthesis technique is treated in this paper, emphasizing improved spectral purity with octave bandwidths in the microwave region. The microwave-frequency synthesizer is discussed in two sections each corresponding to a system unit. The driver unit specifications are analyzed in the first section, showing its voltage-controlled crystal oscillator (VCXO) L(f) output to be -130 dBc/Hz at 10 kHz. In the second section, the driver VCXO output is translated in the microwave unit to the final X-band frequency by means of a phase-locked loop. An analysis of this phase-locked loop, as described in this paper, shows the final L(f) equal to -101 dBc/Hz at 10 kHz. Since a worst case situation was assumed, the final L(f) is quite superior for octave bandwidth microwave-frequency synthesizers.



Abstracts

Calibration Technique for Automated Network Analyzers with Application to Adapter Evaluation

G.F. Engen. "Calibration Technique for Automated Network Analyzers with Application to Adapter Evaluation." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1255-1259.

Although conceptually straightforward, the application of existing automated network analyzers to the problem of adapter evaluation is inhibited by the limited accuracy of the detection process, the requirement for several impedance standards at each frequency, and software problems. A hardware modification, which yields improved accuracy for adapter evaluation, is described. An alternative calibration procedure is outlined which exploits this improved accuracy potential, and which requires only one impedance standard.



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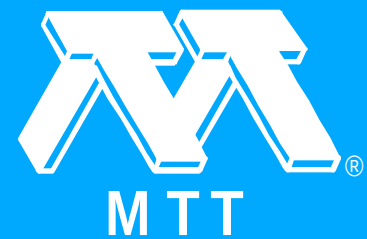


Abstracts

An Application of the Power Equation Concept and Automation Techniques to Precision Bolometer Unit Calibration (Dec. 1974 [T-MTT])

E.L. Komarek and P.V. Tryon. "An Application of the Power Equation Concept and Automation Techniques to Precision Bolometer Unit Calibration (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1260-1267.

The power equation concept has been implemented into a multioctave precision bolometer unit calibration system employing automation techniques in conjunction with an automatic network analyzer (ANA) system. Using statistical methods the system is being evaluated as a calibration transfer system operating in the 2-12.4-GHz frequency range at 1-10 mW. preliminary results reported here show a single measurement standard deviation of 0.2-1 percent from 2-10 GHz. Upon a successful evaluation, the system will be qualified as an integral part of the national measurement system.



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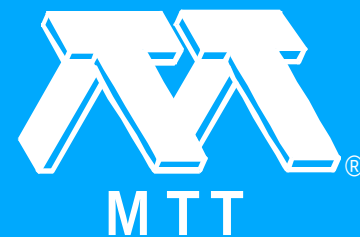


Abstracts

A Microwave Dosimetry System for Measured Sampled Integral-Dose Rate (Dec. 1974 [T-MTT])

C.L. Christman, H.S. Ho and S. Yarrow. "A Microwave Dosimetry System for Measured Sampled Integral-Dose Rate (Dec. 1974 [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1267-1272.

An interface has been developed to allow the measurement of sampled integral-dose rate, defined as the change in integral dose during a particular time interval divided by that interval, absorbed by test animals as they are exposed in a waveguide to 2450-MHz CW microwave energy. The purpose of this investigation is to quantify the variations in sampled integral-dose rate as a result of the animal movements and to compare different irradiation procedures with respect to variations in sampled integral-dose rate.



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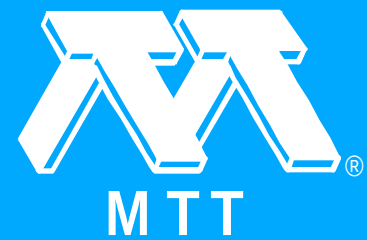
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Electromagnetic Fields Induced Inside Arbitrarily Shaped Biological Bodies

D.E. Livesay and K.-M. Chen. "Electromagnetic Fields Induced Inside Arbitrarily Shaped Biological Bodies." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1273-1280.

A theoretical method has been developed to determine the electromagnetic field induced inside heterogeneous biological bodies of irregular shapes. A tensor integral equation for the electric field inside the body was derived and solved numerically for various biological models.

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Millimeter-Wave Microstrip Oscillators (Short Papers)

B.S. Glance and M.V. Schneider. "Millimeter-Wave Microstrip Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1281-1283.

Hybrid-integrated millimeter-wave sources at 30, 60, and 100 GHz have been built using a novel oscillator configuration. The new structure features a planar microstrip circuit in a conducting channel with an IMPATT diode which is inserted into the side wall of the channel. RF efficiencies of 5 percent at an output power of a quarter-watt CW have been measured both at 30 and 60 GHz. The output power at 100 GHz is 25 mW with an efficiency of 2 percent. The oscillators can be readily tuned over a 10-percent bandwidth.

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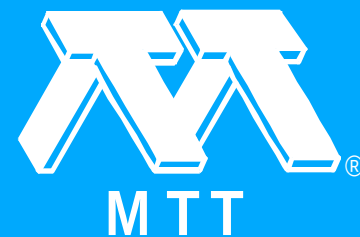


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Bandwidth Enlargement of a Millimeter-Wave Y Circulator with Half-Wavelength Line Resonators (Short Papers)

Y. Akaiwa. "Bandwidth Enlargement of a Millimeter-Wave Y Circulator with Half-Wavelength Line Resonators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1283-1286.

Half-wavelength line resonators are employed to enlarge the bandwidth of a 50-GHz Y-circulator. The bandwidth is successfully increased from 3.5 to 5.5 GHz. The characteristics of the half-wavelength line resonator are described.



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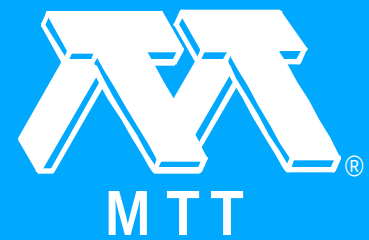
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Low-Noise Down Converter and High-Efficiency Up Converter for Transmitter-Receiver Applications in the 60-86-GHz Region (Short Papers)

N. Kanmuri, M. Akaike, H. Kato, S. Kitazume, H. Kobayashi and H. Ishihara. "Low-Noise Down Converter and High-Efficiency Up Converter for Transmitter-Receiver Applications in the 60-86-GHz Region (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1286-1290.

Design and performance of a low-noise down converter and a high-efficiency up converter for transmitter-receiver applications in the frequency range of 60-86 GHz are described in this short paper. The receiver and the transmitter are used in a guided millimeter-wave transmission system "W-40G". A wafer-type GaAs Schottky-barrier diode is used in both units. The diode mount consists of a semiconductor wafer and a whisker which are mounted in a waveguide circuit. The IF terminal is a coaxial line section which is connected to the whisker. The conversion loss of the up and down converters using the new wafer is 7.5 and 5.5 dB, respectively. The bandwidth of the frequency converters is approximately ± 10 percent in the frequency region of 60-86 GHz.

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Abstracts

Millimeter-Wave Receivers and Their Applications in Radio Astronomy (Short Papers)

T.G. Phillips and K.B. Jefferts. "Millimeter-Wave Receivers and Their Applications in Radio Astronomy (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1290-1292.

Millimeter-wave receivers are discussed from the point of view of applications to line astronomy. A heterodyne-bolometer system is described which has a noise temperature of 300 K at 230 GHz.



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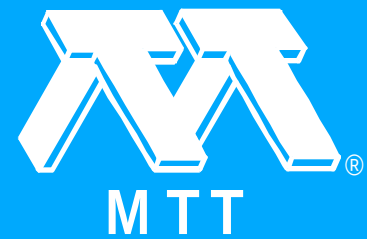


Abstracts

Millimeter Wave Solar Observations (Short Papers)

J.P. Castelli, D.A. Guidice and P.M. Kalaghan. "Millimeter Wave Solar Observations (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1292-1299.

Several categories of millimeter wave observations in the range of approximately 20-3 mm are considered. First, the general area of current "whole sun" patrol observations conducted with small antennas and simple radiometric receivers is reviewed. The type of solar information derived from such patrols and its application to solar physics and the prediction of solar-geophysical disturbances are discussed. The second area considered is that of current high-resolution solar investigations using antennas with beamwidths as small as 1'. Finally, future ultrahigh resolution work (<10") using interferometric techniques and the need for such work are discussed.



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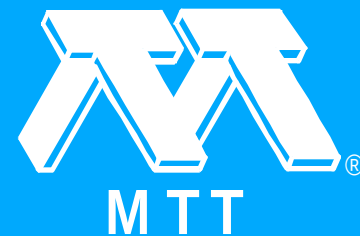


Abstracts

Molecular Millimeter Wave Astronomy (Short Papers)

L.E. Snyder. "Molecular Millimeter Wave Astronomy (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1299-1302.

Molecular millimeter wave astronomy is briefly reviewed. Particular emphasis is placed on the newer areas of research in astronomy and astrophysics which have been facilitated by radio observations of galactic molecules in the millimeter wavelength range of the spectrum.



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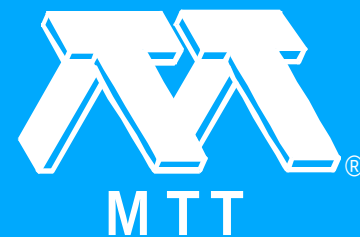


Abstracts

An International Program for Microwave Exposure Protection (Short Papers)

S.M. Michaelson and M.J. Suess. "An International Program for Microwave Exposure Protection (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1301-1302.

In the developed countries there has been a remarkable increase in the number of processes and devices that utilize or emit microwaves. Such devices are used in all sectors of our society for military, industrial, telecommunications, medical, and consumer applications. Because of the world-wide implications of the rapidly developing technology and associated health-safety considerations, development and implementation of a program for international cooperation in the use and protective measures related to microwave/radiofrequency (MW/RF) exposure is required. Activity in this respect has been initiated by the Regional office for Europe of the World Health Organization (WHO/EURO) which has developed a sector program concerned with the health effects of nonionizing radiation (NIR) as part of its long-term program in environmental pollution control. To implement this program, several steps have been taken with participation by scientists and administrators from several countries. These activities have engendered plans and proposals for facilitating exchange and evaluation of information on the biologic and health effects of microwave radiation and in focusing attention on those areas in which additional information and new approaches are needed.



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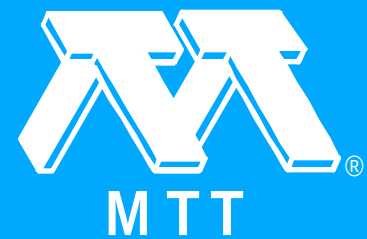


Abstracts

Possibilities for Controlling Insects with Microwaves and Lower Frequency RF Energy (Short Papers)

S.O. Nelson and L.E. Stetson. "Possibilities for Controlling Insects with Microwaves and Lower Frequency RF Energy (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1303-1305.

Principles applicable to the control of stored-product insects with radio-frequency (RF) electric energy and general research findings on this topic are reviewed. Data are presented on the frequency dependence of the dielectric constant and dielectric-loss factor of insects and grain, and use of such information is discussed in relation to RF treatment of infested products to control insects. Experimental data that confirm the usefulness of information on dielectric properties are presented. These data show that RF treatment at 39 MHz is much more effective for controlling adult rice weevils in wheat than is treatment at 2450 MHz. Some aspects of practical application are also considered.



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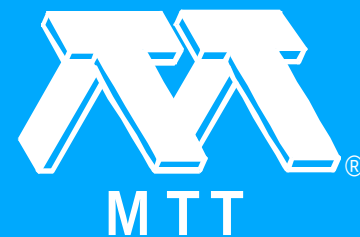


Abstracts

A More Than 4-Percent-Efficiency Solid-State Transmitter for a 4-GHz Radio Relay (Short Papers)

Y. Kitahara, T. Kyuzaki and R. Tamura. "A More Than 4-Percent-Efficiency Solid-State Transmitter for a 4-GHz Radio Relay (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1305-1308.

An FM transmitter having 220-mW output power and 5-W total dc input power and operating in the 4-GHz band has been developed. This transmitter provides a dc-to-RF signal-conversion efficiency of more than 4 percent. Featuring low power consumption and high reliability, this transmitter is suitable for use as a transmitter or an exciter for radio relay of a maximum of 1380 channels.



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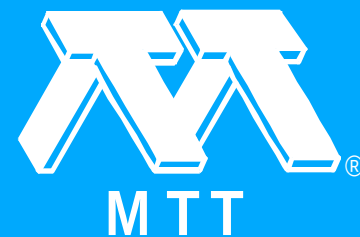


Abstracts

Development of a Pulse Compression Distance Measuring Equipment System Using Surface Acoustic Wave Devices (Short Papers)

D.W. Mellon and W.D. Daniels. "Development of a Pulse Compression Distance Measuring Equipment System Using Surface Acoustic Wave Devices (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1308-1312.

Proposed C-band distance measuring equipment (DME) requires the use of triodes to generate high-power C-band transmitted pulses. The inherent short life of these triodes necessitates placing this equipment in physically accessible areas of the aircraft, often long distances from the antenna. Losses incurred in transmitting the C-band pulse to the antenna can increase the power requirements of the system. A pulse compression system has been designed to solve the cost of maintenance problems by using reliable low-power solid-state transmitters and also allowing the equipment to be installed close to the antenna. The use of a pulse compression system allows a reduction in peak transmit power by a factor equal to the time bandwidth (BW) product of the transmit pulse. Size, weight, and reliability are also improved by implementing surface wave devices (SWD's) in the pulse compression airborne interrogator.



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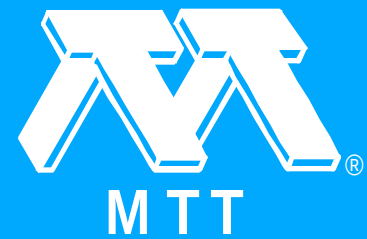


Abstracts

Folded-Line and Hybrid Folded-Line Bandstop Filters (Short Papers)

P.A. Dupuis and E.G. Cristal. "Folded-Line and Hybrid Folded-Line Bandstop Filters (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1312-1316.

The feasibility of a compact bandstop-filter geometry is demonstrated. The filter geometry is particularly suited for stripline and microwave-integrated-circuit (MIC) fabrications in that grounding is not required for any part of the filter. Hybrid geometries allow the filter designer increased flexibility in choosing a suitable shape factor without significantly affecting the filter's electrical characteristics. Folded-line filter geometries are suitable for narrow bandwidths (provided capacitive-coupled stubs are used) to wide-bandwidth applications. Experimental confirmation is presented.



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Abstracts

An Automated General Purpose Test System for Solid-State Oscillators (Short Papers)

J.R. Humphrey. "An Automated General Purpose Test System for Solid-State Oscillators (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1316-1319.

An automatic test system for determination of the tuning and output characteristics of voltage-controlled solid-state oscillators is described. Hardware, software, and functional capabilities of the broad-band modular system are presented. The utilization of a minicomputer for data collection with on-line curve fit and rapid CRT display of test and analysis results facilitates device tuning and streamlines traditionally tedious measurement tasks.



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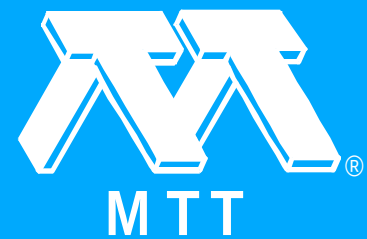


Abstracts

Measurement of the Large-Signal Characteristics of Microwave Solid-State Devices Using an Injection-Locking Technique (Short Papers)

J.C.T. Young and I.M. Stephenson. "Measurement of the Large-Signal Characteristics of Microwave Solid-State Devices Using an Injection-Locking Technique (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1320-1323.

A method for the measurement of the dynamic admittance and susceptance of "negative-resistance" diodes is described. The device under test is allowed to oscillate in a microwave cavity, and operated as an injection-locked oscillator. Injected locking signals of the same order as the free-running output power of the oscillator are used. The dynamic conductance and susceptance of the device are obtained from the phase and amplitude response of the system.



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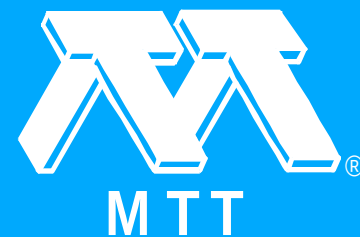


Abstracts

Designing Microstrip Matching Networks for Microwave-Transistor Power Amplifiers (Short Papers)

G.T. O'Reilly, R.E. Neidert and L.K. Wilson. "Designing Microstrip Matching Networks for Microwave-Transistor Power Amplifiers (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1323-1325.

A computer-aided design procedure is formulated for L-band-transistor power amplifiers. The procedure incorporates a precision measurement technique for transistor impedances, a model for large step discontinuities in microstrip, and an optimization routine for the direct realization of broad-band matching circuits.



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Abstracts

X-Band TRAPATT Amplifier (Short Papers)

N.W. Cox, C.T. Rucker, G.N. Hill and K.E. Gsteiger. "X-Band TRAPATT Amplifier (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1325-1328.

The design and performance of broad-band TRAPATT amplifiers in X band are described along with a discussion of critical circuit parameters. Bandwidths of 10 percent and peak powers up to 38 W have been achieved using coaxial circuits with single and multichip diodes.



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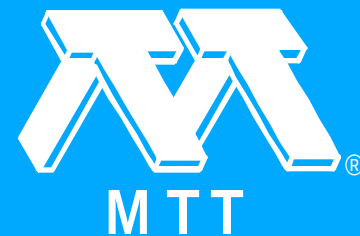


Abstracts

A Low-Noise Room-Temperature 12-GHz Parametric Amplifier (Short Papers)

S.D. Lacey, B.T. Hughes and J.C. Vokes. "A Low-Noise Room-Temperature 12-GHz Parametric Amplifier (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1329-1331.

A low-noise room-temperature wide-band parametric amplifier is described which could be used, for example, in 12-GHz satellite ground station receivers. The amplifier has a gain of 26 dB, a 1/2-dB bandwidth of 660 MHz, and a noise temperature between 156 and 171 K.



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Abstracts

An IMPATT Pump for a Low-Noise Parametric Amplifier (Short Papers)

T. Smith, B. Smilowitz, G. Irvin and R. Kaminsky. "An IMPATT Pump for a Low-Noise Parametric Amplifier (Short Papers)." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1331-1334.

Noise measurements have been made on an IMPATT pumped S-band parametric amplifier. For the properly adjusted pump, no significant increase in noise temperature was observed for interfering signal levels up to -40 dBm, 20 MHz from the noise measurement frequency.



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J.L. Allen, F.J. Bernues, D.M. Bolle, K.-M. Chen, C.L. Christman, J.M. Cusack, B.C. Dodson, Jr., G.F. Engen, P.T. Greiling, G.I. Haddad, H.S. Ho, I. Ikushima, E.L. Komarek, R.W. Laton, D.E. Livesay, M. Maeda, N.A. Masnari, P.J. Meier, Y. Minai, S. Nagano, S. Ohnaka, B.S. Perlman, S.M. Perlow, G. Pfund, A. Podell, W.W. Raukko, C.-L. Ren, B. Sheleg, C.P. Snapp, B.E. Spielman, P.G. Tipon, R.J. Trew, P.V. Tryon, A.D. Vincze, H.-C. Wang, W.H. Weisenberger, J.A. Weiss, G.T. Wrixon and S. Yarrow. "Contributors (Dec. 1974, Part II [T-MTT])." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1334-1340.



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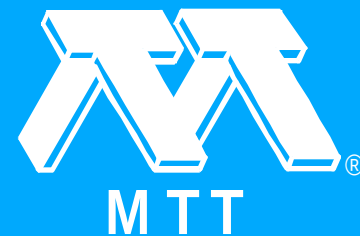
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Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-22, 1974

*"Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-22, 1974."
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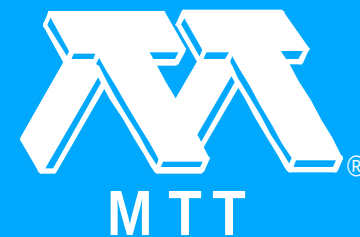
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Front Cover (1971 [MWSYM])

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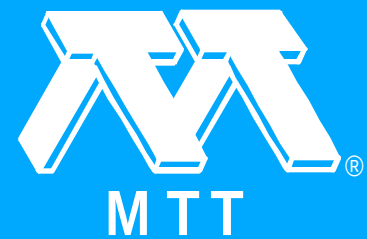


Abstracts

Foreword (1971 [MWSYM])

H.W. Cooper. "Foreword (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): iii-iii.

Much has happened in the decade since the GMTT International Symposium was last in Washington. Probably the most talked about thing at that symposium was the banquet speaker, passed off by program Chairman, Gus Shapiro, as a Soviet visiting scientist. Ted Saad and the other members of the microwave press scribbled furiously as the speaker told about the Russians generating megawatts of millimeter wave power at efficiencies greater than 50% and making many technical achievements that had eluded the western technical community for years. After the banquet, the clatter of lids flipping was deafening when it was learned that the speaker was in truth a representative of the U.S. Information Agency, spoofing us!



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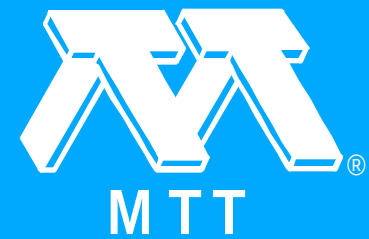
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Abstracts

Session I -- Filters and Couplers

"Session I -- Filters and Couplers." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 1-1.



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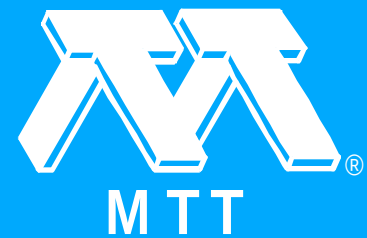


Abstracts

Technique for the Realization of Optimum Bandpass Filters

A.K. Johnson. "Technique for the Realization of Optimum Bandpass Filters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 2-3.

A technique for the planar realization of optimum bandpass filters is presented. This design method results in a coupled-line filter which can be realized by printed circuit techniques. A design example is given and the relative advantages and disadvantages of this approach are discussed.



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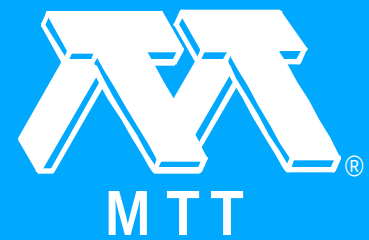
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A Graphical Method for the Design of Stepped Impedance Transformers

F.-C. Chang, H.Y. Yee and N.F. Audeh. "A Graphical Method for the Design of Stepped Impedance Transformers." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 4-5.

A graphical solution using families of generalized curves, for designing a stepped impedance transformer is presented. The error for a numerical example is less than 2.2% when number of section is seven and the accuracy improves as the number of sections increases.

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Abstracts

Microwave, Doppler Invariant, Pulse Compression Filters

J.D. Rhodes. "Microwave, Doppler Invariant, Pulse Compression Filters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 6-7.

The complete design theory, including explicit formulae for element values, is presented for waveguide or stripline pulse compression filters which approximate an ideal response in an optimum maximally flat manner. For an n th degree filter, peak power compression ratios in excess of n are shown to be possible.



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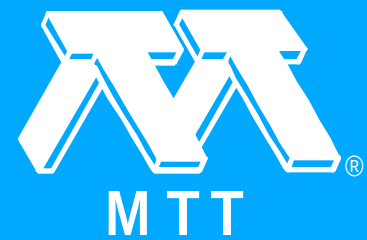
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The Virtues of Mixing Tandem and Cascade Coupler Connections

E. Carpenter. "The Virtues of Mixing Tandem and Cascade Coupler Connections." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 8-9.

The design of wideband coupled transmission line hybrids is complicated by the necessity of having the coupled lines in a close physical proximity to achieve the desired -3.01 dB coupling. The required coupling coefficient is particularly difficult to achieve for coupler designs covering greater than an octave. Several techniques have been used to overcome this limitation. The principal methods are the re-entrant coupler and the tandem coupler techniques. The re-entrant coupler employs a modification of the transmission line geometry of a single quarter-wave section to obtain the desired increase in coupling. The technique described in this paper is similar to the tandem coupler technique since a judicious connection of coupled quarter-wave line sections is employed to obtain the desired coupling enhancement rather than a modification of the line cross-section.

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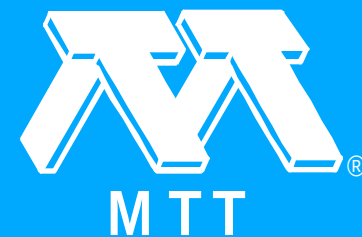


Abstracts

Multi-Port Lattice-Type Hybrid Network

T. Kuroda, T. Usui and K. Yano. "Multi-Port Lattice-Type Hybrid Network." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 10-11.

As a new method to design microwave branching or combining circuit which has many terminals, Multi-Port Lattice-type Hybrid network is proposed. We have analyzed the network, and several useful networks have been designed practically.



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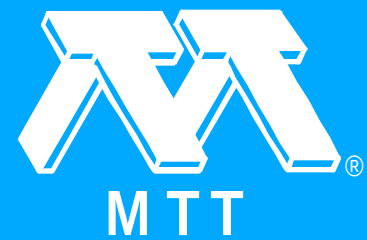
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Design of Hairpin-Line and Hybrid Hairpin-Parallel-Coupled-Line Filters

E.G. Cristal and S. Frankel. "Design of Hairpin-Line and Hybrid Hairpin-Parallel-Coupled-Line Filters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 12-13.

Hairpin-line filters are compact structures particularly suited for microstrip and TEM printed circuit realizations. Two types of hairpin-line filters are described in this paper. They are shown in Figs. 1(a) and (b). The image impedance and propagation constant for the infinite periodic hairpin-line has been given previously. Equivalent circuits for several periodically-terminated lines, including the hairpin line were discussed by one of the authors at the recently-concluded IEEE sixth region conference. However, for finite length hairpin-line filters, neither exact or approximate design equations, nor equivalent circuits have been reported. The exact equivalent circuits for the filters of Figs. 1(a) and (b) have been rigorously derived and are presented in Figs. 2(a) and (b), respectively, for the most important case in which coupling beyond nearest neighbors is negligible. These circuits are topological, but not exact, duals of the well-known interdigital and half-wave parallel-coupled-line filters. Consequently, the exact design tables and approximate design equations may be used in designing hairpin-line filters.

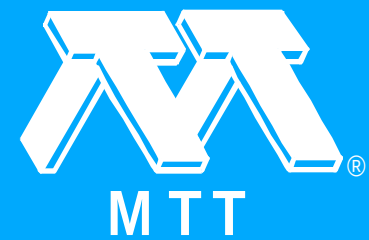
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Abstracts

Session II -- Applications of Microwave Integrated Circuits

"Session II -- Applications of Microwave Integrated Circuits." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 15-15.



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An Integrated, X-Band, Image and Sum Frequency Enhanced Mixer with 1 GHz IF

J.B. Cahalan, J.E. Degenford and M. Cohn. "An Integrated, X-Band, Image and Sum Frequency Enhanced Mixer with 1 GHz IF." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 16-17.

The integrated X-band mixer described herein has been developed for an integrated phased array system requiring a 1 GHz intermediate frequency. This high IF allows several novel design approaches. A single ended mixer is feasible since LO noise suppression is not necessary at such a high IF. Also, image ($2f_{\text{sub LO}} - f_{\text{sub s}}$) and sum frequency ($f_{\text{sub LO}} + f_{\text{sub s}}$) enhancement techniques can be used to recover a portion, of the energy normally lost in the mixing process; resulting in a conversion loss improvement of up to 1.5 dB in the enhanced mode as compared to the broadband mode of operation. To predict the "enhanced" mixer performance, to include a sum frequency port and also account for finite diode and filter losses.

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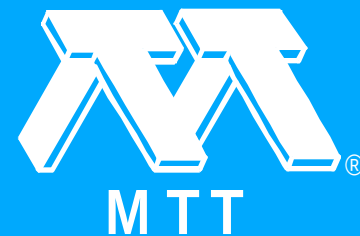


Abstracts

Integrated Mixer for 18 and 26 GHz

D. Dobramysl. "Integrated Mixer for 18 and 26 GHz." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 18-19.

Two integrated mixers on a ceramic substrate of 10 mil thickness for frequencies of 18 and 26 GHz and an IF of 1 - 2 GHz have been developed. The development of Schottky-Barrier beam lead diodes for signal frequencies of 30 GHz and higher and the high state of thinfilm technology makes it possible to build low noise integrated mixers in this frequency range. The advantages are small size and a simple way of production, the disadvantages are high ohmic losses with increasing frequency.



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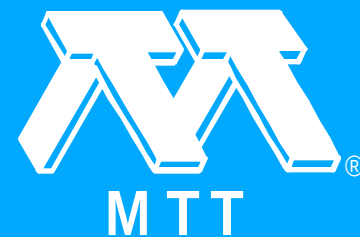


Abstracts

A 90 dB Microstrip Switch on a Plastic Substrate

B.R. Hallford. "A 90 dB Microstrip Switch on a Plastic Substrate." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 20-21.

A SPDT microstrip switch has been designed on a plastic (polyolefin) substrate to switch two 10 watt cw carriers into a common load over the frequency range 1.7 to 2.3 GHz. No tuning adjustments are used over this 30% bandwidth to obtain a 90 dB minimum isolation, a 23 dB minimum return loss, and a one dB maximum insertion loss. Units now in production typically have a .6 dB insertion loss, a 26 dB return loss and isolation levels of 105 ± 5 dB.



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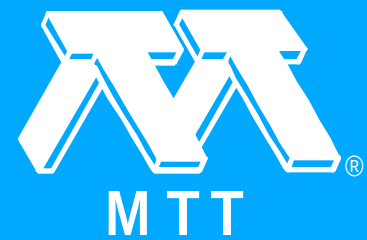
Miniature Multi-Kilowatt PIN Diode MIC Digital Phase Shifters

P. Onno and A. Plitkins. "Miniature Multi-Kilowatt PIN Diode MIC Digital Phase Shifters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 22-23.

A miniature high power, beryllia substrate, lumped element, PIN diode phase shifter has been developed. Design expressions are presented for two UHF models, which operate at kilowatt powers and exhibit 7% bandwidths with low insertion loss.

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Electronically Tuned Integrated X-Band Superheterodyne Receiver

P.J. Meier, H.C. Okean and E.W. Sard. "Electronically Tuned Integrated X-Band Superheterodyne Receiver." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 24-25.

This paper describes the development of a unique, integrated, low-noise, X-band, sweeping superheterodyne receiver. The general configuration of the receiver was dictated by the requirements for typical microwave sweeping receivers, which include low noise figure, large dynamic range, high conversion gain, good image rejection, narrow instantaneous IF bandwidth, wide tuning range, and rapid sweep capability. Figure 1 includes a wideband tunnel-diode amplifier (TDA) to provide an acceptably low noise figure, considering the relatively undistinguished noise performance typical of wideband microstrip mixers when driven by solid-state local oscillators and degraded by high-frequency IF amplifiers. The mixer is of the image-rejection type, consisting essentially of two identical balanced mixers with proper phasing at the signal, local oscillator (LO), and IF-output ports to provide image cancellation. A Gunn device was selected for the internal oscillator, as this type provides ample fundamental X-band power, and is sufficiently quiet to permit electronic tuning with a moderate resonator Q. The latter enables the oscillator to be varactor tuned, thereby avoiding the heavy, bulky, power-consuming electromagnets that are associated with YIG-tuned X-band devices.

[Click on title for a complete paper.](#)



Abstracts

Alumina Sandwich Line Filters for High Performance Integrated Circuit Application

A.F. Hinte, G. Kopcsay and J.J. Taub. "Alumina Sandwich Line Filters for High Performance Integrated Circuit Application." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 26-28.

Doubly shielded strip line, formed by the sandwiching of two alumina substrates, has been found to yield superior microwave filters than that attainable with microstrip of comparable volume.



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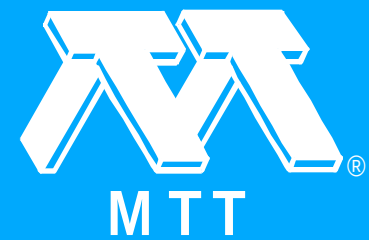
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Abstracts

Session III -- Transmission Lines and Measurements

"Session III -- Transmission Lines and Measurements." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 29-29.



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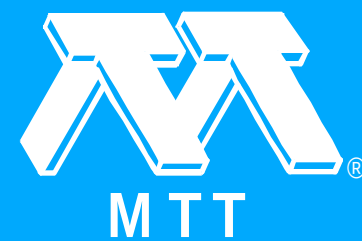


Abstracts

Fence Guide for Millimeter Waves

F.J. Tischer. "Fence Guide for Millimeter Waves." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 30-31.

In this paper a new waveguide for millimeter waves called "Fence Guide" is discussed. A description of the guide, the field distribution, and its characteristics is presented.



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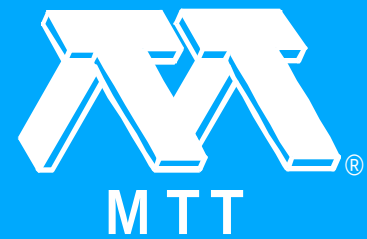


Abstracts

Propagation in a Shielded Microslot with a Ferrite Substrate (1)

J.C. Minor and D.M. Bolle. "Propagation in a Shielded Microslot with a Ferrite Substrate (1)." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 32-33.

By using the method of moments analysis is implemented for a shielded microslot, i.e., a slot line with a parallel ground plane. Accuracy in k_z of the order of 1% is obtained using matrices as small as 5x5.



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Abstracts

Propagation in a Shielded Microslot with a Ferrite Substrate (2)

J.C. Minor and D.M. Bolle. "Propagation in a Shielded Microslot with a Ferrite Substrate (2)." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): .

By using the method of moments analysis is implemented for a shielded microslot, i.e., a slot line with a parallel ground plane. Accuracy in $k_{\text{sub } z}$ of the order of 1% is obtained using matrices as small as 5×5 .



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Abstracts

The Ring-Loaded Corrugated Waveguide

Y. Takeichi, T. Hashimoto and F. Takeda. "The Ring-Loaded Corrugated Waveguide." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 36-37.

The ring-loaded corrugated waveguide is shown to be very effective to the frequency broadbanding of the corrugated waveguide and the improvement of the transformer between the corrugated and uncorrugated waveguides.



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Abstracts

Errors in S_{11} Measurements Due to Residual SWR of the Measuring Equipment

R. Garver, D. Bergfried, S. Raff and B. Weinschel. "Errors in S_{11} Measurements Due to Residual SWR of the Measuring Equipment." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 38-39.

Errors in measurement of S_{11} due to residual SWR of the slotted line or directional Coupler are calculated using admittance considerations. This more complete treatment produces, for some practical conditions, major differences from prior references for phase errors.



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Abstracts

MIC Techniques in the Design of Extremely Broadband Reflectometers

S. Hopfer, S.A. Rinkel and M. Balfour. "MIC Techniques in the Design of Extremely Broadband Reflectometers." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 40-41.

The application of MIC techniques to the construction of junction type reflectometers and the extension of the junction concept to include slightly lossy junctions makes it possible to design such devices to cover the extreme frequency range of 2 MHz to 18 GHz with equivalent directivities in excess of 40 dB through X band and in excess of 30 dB through 18 GHz.



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Characterization of Packaged Varactor Diodes

Y.S. Lee and W.J. Getsinger. "Characterization of Packaged Varactor Diodes." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 42-43.

A method is presented for determining true junction capacitance and resistance, and all package equivalent circuit element values of varactor diodes from measurements of total capacitance and microwave impedance with bias.

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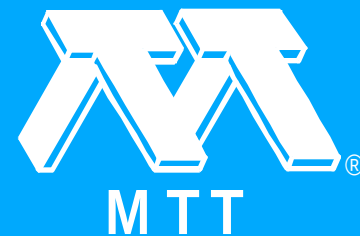


Abstracts

Impedance Measurement of a Waveguide Mount

R.L. Eisenhart and P.J. Khan. "Impedance Measurement of a Waveguide Mount." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 44-45.

A novel measurement technique is described, based upon the use of subminiature coaxial line, to gain electrical access to a terminal pair located inside the waveguide for driving point impedance measurements.



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Abstracts

Session IV -- Microwave Acoustics

"Session IV -- Microwave Acoustics." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 47-47.



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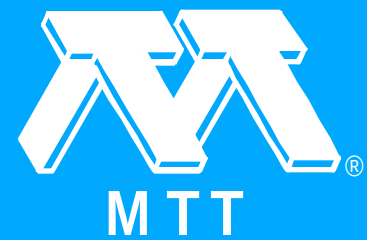
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The Role of Acoustic Surface Waves in Signal Processing

E. Stern and J.O. Taylor. "The Role of Acoustic Surface Waves in Signal Processing." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 48-49.

On Fig. 1 is shown an actual plot of wavecrests on the surface of crystal. Notice that these wavecrests are not regular, they appear to be relatively flat within the beam then they appear to fall back rapidly away from the beam center. That is because lithium niobate crystal is highly anisotropic, and the waves moving slightly off the beam direction tend to move more slowly than waves directly on the beam direction. The straight-crested surface wave is generated on lithium niobate with a transducer shown in Fig. 2. The position of the fingers in the transducer matches the position of the crests and troughs of Fig. 1, and if an electrical signal at the appropriate frequency is applied to the transducer then a surface acoustic wave beam radiates from these transducers. The transducer is relatively efficient--a bit less than half the available electrical energy is put into the desired acoustic wave with this particular design.

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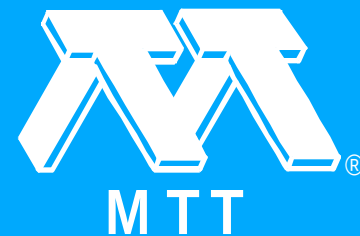


Abstracts

Design Data for Microwave Acoustic Surface Wave Devices

A.J. Slobodnik, Jr. and T.L. Szabo. "Design Data for Microwave Acoustic Surface Wave Devices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 52-53.

Sufficient quantitative information for the realization of optimum microwave frequency acoustic surface wave devices will be presented. Propagation losses, beam steering losses and diffraction losses will be listed for materials of technological importance. Figures of merit will be defined and computed.



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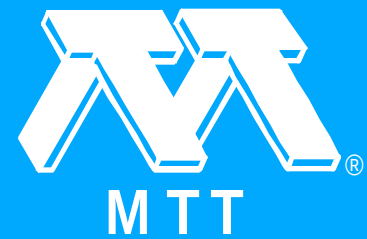


Abstracts

Properties and Applications of the Acoustic Wave Junction Between Plated and Unplated Substrates

R.C.M. Li, A.A. Oliner, K.H. Yen and H.L. Bertoni. "Properties and Applications of the Acoustic Wave Junction Between Plated and Unplated Substrates." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 54-55.

The junction between the plated and unplated portions of a substrate theoretically exhibits zeros of both transmission and reflection for acoustic surface waves incident at certain angles from either region. These properties offer some useful device possibilities.



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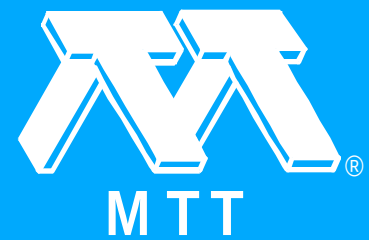
An Electronically Variable Surface Acoustic Wave Phase Shifter

B.E. Burke. "An Electronically Variable Surface Acoustic Wave Phase Shifter." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 56-57.

A surface acoustic wave phase shifter has been realized by utilizing the interaction between the piezoelectric fields of a surface wave and an adjacent semiconductor. One important feature of this interaction is that the velocity of the surface wave depends on the electrical properties of materials placed in the vicinity of, but not mechanically touching, the piezoelectric. For example, Campbell and Jones have calculated the velocity of surface waves on the y-plane of LiNbO₃ for the case of a free surface (Fig. 1, $\omega h = \infty$) and the case where an infinitesimally thin perfect conductor is placed on the surface ($\omega h = 0$). For waves propagating in the Z-direction ($\theta = 90^\circ$) the velocity decreases by about 2.5% when an electrical short is placed at the surface. This velocity change can be achieved by purely electrical means by varying the free carrier concentration at the semiconductor surface. The method we have used to accomplish this is to apply an electric field normal to the semiconductor surface as illustrated in the inset to Fig. 2. Here the semiconductor functions as one plate of a capacitor and the induced charge at the surface then varies with the applied voltage V .

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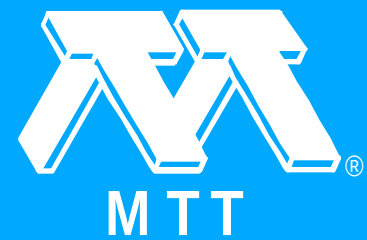
Modified Equivalent Circuit Model for Ultrasonic Surface Wave Interdigital Transducers

W.S. Jones, C.S. Hartmann and T.O. Sturdivant. "Modified Equivalent Circuit Model for Ultrasonic Surface Wave Interdigital Transducers." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 58-59.

An equivalent circuit model has been modified to include interelectrode reflections. Using this extended model, the second order effects observed experimentally for 13-bit PSK filters on YZ LiNbO/sub 3/ can be qualitatively predicted.

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Acoustic Surface Wave Sequence Generators and Matched Filters with Adjustable Taps

D.A. Gandolfo, G.D. O'Clock and C.L. Grasse. "Acoustic Surface Wave Sequence Generators and Matched Filters with Adjustable Taps." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 60-61.

A hybrid combination of an acoustic surface wave tapped delay line and semiconductor switching devices is used to generate bi-phase coded sequences and to serve as the matched filter for these sequences. The switches permit the phase of a tap to be changed by 180° so that complete code flexibility is achieved.

[Click on title for a complete paper.](#)



Abstracts

Wideband Microwave Acoustic Delay Line with Exceptionally Smooth Phase and Loss Response

W.R. Sperry, E.K. Kirchner and T.M. Reeder. "Wideband Microwave Acoustic Delay Line with Exceptionally Smooth Phase and Loss Response." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 62-64.

Design techniques for high performance microwave delay lines which have superior bandwidth, phase linearity and spurious echo characteristics are presented. Utilization of these techniques to realize a 4 μ s L-band unit which has insertion loss of 30 ± 0.5 dB over the 500 MHz band centered at 1.7 GHz, with triple-transit suppression greater than 45 dB and phase deviation from linearity of less than $\pm 2.5^\circ$, are described.



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Abstracts

Session V -- Ferrite Materials and Circulators

"Session V -- Ferrite Materials and Circulators." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 65-65.



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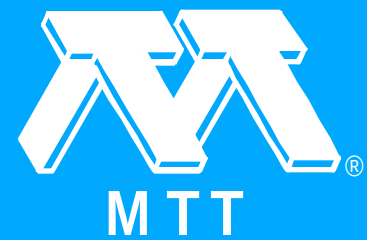
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Ferrite-Eielectric Composite Integrated Microwave Circuit Development

*C.G. Aumiller, D.H. Harris, M.C. Willson, Y.S. Wu, F.J. Rosenbaum and D.L. LaCombe.
"Ferrite-Eielectric Composite Integrated Microwave Circuit Development." 1971 G-MTT
International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 66-69.*

The Arc Plasma Spray process (APS) makes possible the fabrication of complex ferrite/dielectric composite structures suitable for use as substrates for microwave integrated circuits. A typical two layered microstrip geometry is shown in the insert of Fig. 2. The usual microstrip design problems are now complicated because of the choice possible in the selection of the ferrite and dielectric material constants (dielectric constant and permeability) and the relative heights of the two materials. As an example of the structures possible, a substrate for a non-reciprocal latching meanderline phase shifter is shown in Fig. 1. TT1-390 ferrite material was deposited in a preformed cavity of a 0.035" substrate with $\epsilon_r/\mu_r = 13$. A metallization is made and the meanderline structure is formed. Circulators, filters, etc., can be fabricated in the same fashion. Some of the advantages of this approach are: a) the design of previously unavailable circuits is now feasible, b) ferrite materials can be deposited only where they are required in a given circuit, c) the ferrite microwave properties are maintained or enhanced through the APS process, d) high power handling capability is now possible in planar MIC's and e) potential cost savings.

Click on title for a complete paper.



Abstracts

Effect of Rare-Earth Impurities on the Peak Power Capability of Garnet Type Low-Field Microwave Devices

R.G. West, A.C. Blankenship and L.P. Domingues. "Effect of Rare-Earth Impurities on the Peak Power Capability of Garnet Type Low-Field Microwave Devices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 70-73.

From recent work revealing that rare-earth ions of fixed concentration in a garnet ferrimagnet give rise to an additional spin-wave line-width term that is inversely proportional to the saturation magnetization of the host garnet, it is shown that rare-earth impurities found in commercial yttrium end gadolinium oxides used for producing ferrimagnets can contribute to unwanted variations in the peak power handling capacity of low-field microwave devices.



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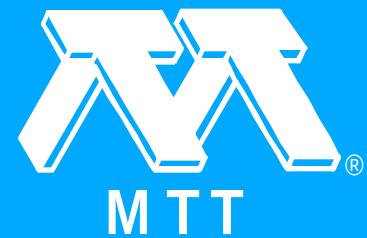


Abstracts

Lithium Ferrites for Microwave Devices

D.H. Temme, G.F. Dionne, W.E. Courtney, G. Argentina and P.D. Baba. "Lithium Ferrites for Microwave Devices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 74-75.

Lithium ferrites with properties comparable to the more expensive garnets are discussed. Hysteresis loops are square. Magnetic and dielectric losses, stress and temperature sensitivities are good. Data on phasers and a circulator are given.



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Review of Circulator Technology

G.P. Rodrigue. "Review of Circulator Technology." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 76-77.

The ferrite circulator has come a long way from its beginning as a practical application of Faraday rotation some eighteen to twenty years ago. The name, circulator, was coined by A. G. Fox, and in the process of this development, circulators have assumed many forms and an almost equal number of interpretations. Circulators to handle the duplexing function in megawatt systems have utilized differential phase shifters in conjunction with 3 dB power splitters (couplers or tees). A more compact and economical version of the circulator evolved in the use of the turnstile junction. This circulator design also depends on a split of the input power and a phase cancellation of waves due to phase shift introduced in the ferrite loaded turnstile circular guide section. While more compact and potentially cheaper, the turnstile adjustment is somewhat critical and its resulting bandwidth rather limited.

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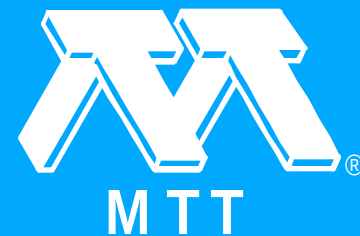


Abstracts

Stepped Ground Plane Circulator

E.J. Denlinger, D.H. Temme and J.A. Weiss. "Stepped Ground Plane Circulator." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 78-79.

A microstrip circulator employing a stepped ground plane is described. It has the advantages of giving good bandwidth, low forward loss, high peak power handling capability, and a reduction in size over conventional below-resonance devices.



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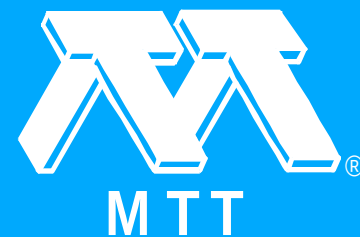


Abstracts

A New Concept for Broadbanding the Ferrite Substrate Circulator Based on Experimental Modal Analysis

T. Miura and T. Hashimoto. "A New Concept for Broadbanding the Ferrite Substrate Circulator Based on Experimental Modal Analysis." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 80-81.

The electrical characteristics of the ferrite substrate microstrip circulator having wider magnetized region than conventional one have been studied. This work enables us to compose a compact and simplified wideband circulator without the impedance matching networks. The electric field measurement shows that the wideband characteristics are realized by the combination of the conventional $n=1$ mode and a nonresonant mode different but compatible to the former. A C-band version measuring 15 mm in diameter offers more than 20 dB isolation and an insertion loss less than 0.5 dB over a bandwidth of 50 percent or more with the center frequency of 6.3 GHz.



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Abstracts

Theoretical and Practical Characteristics of a Broad Tuning Range Y.I.G. Sphere Circulator

S.R. Longley and D.H. Paul. "Theoretical and Practical Characteristics of a Broad Tuning Range Y.I.G. Sphere Circulator." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 82-84.

This paper presents a theoretical and practical evaluation of the tunable y.i.g. sphere junction circulator. The analysis has been extended to cover the circuit dual. Circuit applications are discussed and the basic design is extended to include lumped element circulators of planar form.



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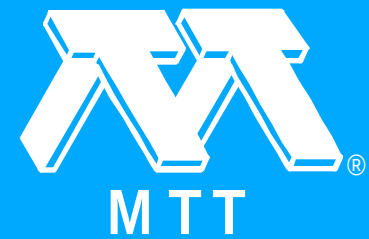
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Abstracts

Session VI -- Avalanche Diodes

"Session VI -- Avalanche Diodes." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 85-85.



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Abstracts

High-Power, Low-Noise Avalanche Diode Oscillators

F. Ivanek, V. Gopala and K. Reddi. "High-Power, Low-Noise Avalanche Diode Oscillators." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 86-87.

An approach to higher-power generation with avalanche diodes is described which uses (1) passivated devices in order to avoid the use of conventional packages, (2) multiple-diode chips for reducing the thermal resistance, and (3) cascading waveguide oscillator mounts for efficient power combining.



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Abstracts

Distributed Unidirectional Microwave Amplification

R.N. Wallace and M.E. Hines. "Distributed Unidirectional Microwave Amplification." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 88-89.

Six .7-watt IMPATT diodes, directly coupled in tandem to a microstrip isolator have demonstrated electronic amplification and power accumulation at 9 watts input. Stub coupling of the diodes is also effective for higher gain per stage.



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Abstracts

High-Power Microwave Amplifier Using Anti-Parallel Avalanche-Diode Pair (1971 [MWSYM])

H. Kawamoto. "High-Power Microwave Amplifier Using Anti-Parallel Avalanche-Diode Pair (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 90-91.

A new microstrip-circuit amplifier is composed of two high-efficiency avalanche diodes placed in anti-parallel fashion, one-half wave-length apart in a transmission line. The amplifier provides a 200 W output power with a 10 dB gain.



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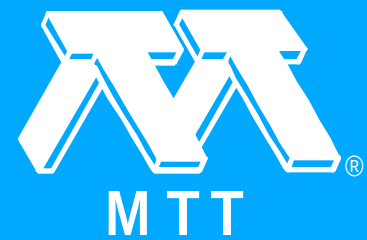
Second Harmonic Tuning Effects on IMPATT Diode Oscillator Noise Characteristics

F.J. Sullivan and W.H. From. "Second Harmonic Tuning Effects on IMPATT Diode Oscillator Noise Characteristics." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 92-93.

A method of controlling the conventionally noisy FM characteristics of an IMPATT diode oscillator by properly terminating the second harmonic frequency is described. The result is also characterized by a self-locking mechanism with a resulting mechanical tuning range, via the second harmonic circuit, of up to 100 MHz at lower X-band. Effects of second harmonic tuning on IMPATT reflection - type amplifier operating bandwidth is also discussed.

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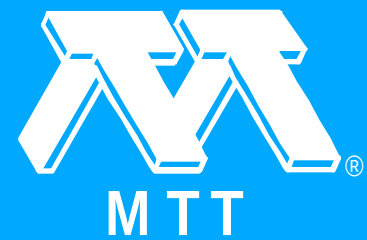
Reduction of FM Noise in Microwave Diode Oscillators by Cavity and Injection Stabilization

J.R. Ashley and F.M. Palka. "Reduction of FM Noise in Microwave Diode Oscillators by Cavity and Injection Stabilization." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 94-95.

The Avalanche or Gunn diode oscillators in simple single resonator circuits usually have considerably more FM noise than Klystron or crystal-oscillator, multiplier-chain type signal sources. Transmission cavity stabilization by TE/sub 01n/ mode cavities is applied to both Avalanche and Gunn diode X-Band oscillators to yield simple, useful signal sources with FM noise lower than most other signal sources. Some additional studies show that a cavity stabilized silicon avalanche diode oscillator used as a synchronizing signal to injection phase lock a Gunn oscillator has the best combination of low FM and AM noise.

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A Cascaded-Impedance-Inverter Model of Wide-Band Frequency Triplers

J.C. Redd and K.L. Kotzebue. "A Cascaded-Impedance-Inverter Model of Wide-Band Frequency Triplers." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 96-98.

A charge-storage diode frequency tripler can be modeled as two cascaded impedance inverters. This approach has been used to design and construct a tripler at 1.06 GHz input frequency with a measured midband efficiency of 50% and a 3 dB band-width of 38%.

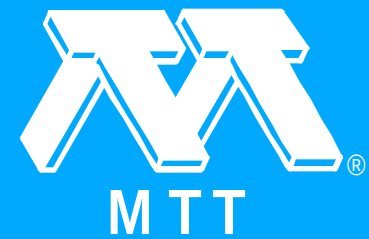
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Abstracts

Session VII -- Ferrite Limiters and Phase Shifters

"Session VII -- Ferrite Limiters and Phase Shifters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 99-99.



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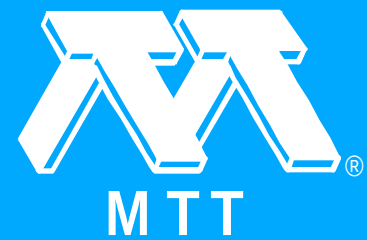
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Microwave Properties of Partially Magnetized Ferrites

J.J. Green, F. Sandy and C.E. Patton. "Microwave Properties of Partially Magnetized Ferrites." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 100-101.

With the surge of design activity of ferrite components for phased array radars, a knowledge of the microwave characteristics of partially magnetized ferrites is a very useful asset. Phase shifters, circulators, and switches are most economically designed if the biasing field can be kept small. A preferred configuration consists of the microwave ferrite being latched into a major or minor loop (flux drive) remanent state. For such operation the internal dc magnetic field is quite small (the order of the coercive force). Anisotropy and demagnetizing effects due to sample shape and local inhomogeneities such as pores and second phase prevent the material from being completely magnetized, and hence the sample is in a partially magnetized state.

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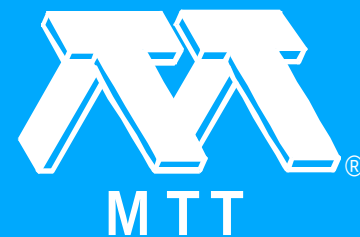


Abstracts

A New Reciprocal Phaser for Use at Millimeter Wavelengths

L.R. Whicker and C.R. Boyd, Jr.. "A New Reciprocal Phaser for Use at Millimeter Wavelengths." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 102-103.

High performance millimeter wavelength phase shifters are needed for electronically scanned phased array antenna applications. Some work has been reported on toroidal, latching, nonreciprocal phasers to operate at 35 GHz and above. However, the critical nature of the tolerances inherent in such designs makes fabrication extremely difficult above 50 GHz and leads to cost and reproducibility problems even at 35 GHz. This paper describes a new reciprocal ferrite phaser which is suited for use in the 35-100 GHz region. The phaser is simple to fabricate and exhibits electrical characteristics which compare favorably with its nonreciprocal counterpart. These phasers may be fabricated individually or in groups to form a portion of a phased array aperture.



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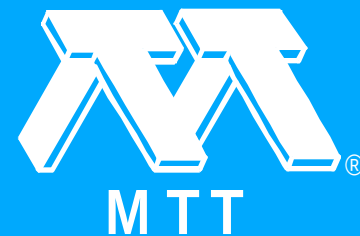


Abstracts

An Accurate Analog Ferrite Phase Shifter

C.R. Boyd, Jr.. "An Accurate Analog Ferrite Phase Shifter." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 104-105.

An analog ferrite phase shifter has been developed for applications requiring an accurate relationship between phase shift and control current. A prototype unit is described that operates over a 1.3 GHz. range at X-band with VSWR under 1.2:1, loss under 1 dB., hysteresis at ± 1 degree, and negligible frequency dispersion of phase shift.



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Abstracts

The Application of Periodic Loading to Ferrite Phase Shifter Design (1971 [MWSYM])

W.G. Spaulding. "The Application of Periodic Loading to Ferrite Phase Shifter Design (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 106-107.

The use of periodic loading to enhance the differential phase shift of a remanence ferrite phase shifter, while maintaining frequency compensation, has been reported previously. This paper reports on progress in the use of this techniques and the characteristics obtained versus the degree of periodic loading. The circuit has low cost potential and results in a reduction of the size and switching energy of the phase shifter; however, this is obtained at the expense of peak power handling capability.



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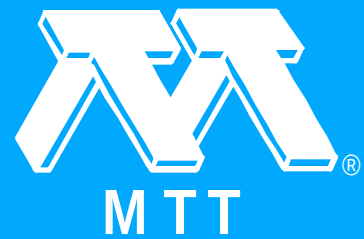


Abstracts

Ferrite Phase Shifters and Multi-Port Circulators in Microstrip and Stripline

M.E. Hines. "Ferrite Phase Shifters and Multi-Port Circulators in Microstrip and Stripline." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 108-109.

Theoretical and experimental results are presented for new ferrite stripline phase shifters and new multi-port microstrip circulators, utilizing the edge-guided mode of propagation.



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Abstracts

A 100-Kilowatt X-Band Ferrite-Diode Limiter

W.W. Siekanowicz, R.W. Paglione and R. Steinhoff. "A 100-Kilowatt X-Band Ferrite-Diode Limiter." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 110-111.

In the last few years, significant progress has been made in the development of improved transmitting-receiving (TR) devices that provide increased reliability in comparison with gas-discharge TR tubes. For example, an all-ferrite TR device consisting of a high-power limiter and three fast-switching circulators is finding increasing application in modern airborne weather radars. This paper describes still another advance in the area of TR devices: a newly-developed, all-solid-state, passive limiter.



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Abstracts

X and Ku-Band Ferrite-Diode Limiters

H.S. Maddix and R. Kalvaitis. "X and Ku-Band Ferrite-Diode Limiters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 112-114.

X and Ku-Band subsidiary resonance type of ferrite limiters have been developed for a solid state replacement for the gas tube portions of TR-limiters. When used in conjunction with PIN and varactor diode limiters, completely passive receiver protection is obtained.



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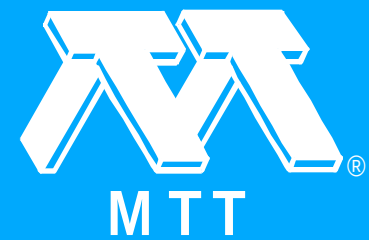
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Abstracts

Session VIII -- Computer Oriented Microwave Practices

"Session VIII -- Computer Oriented Microwave Practices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 115-115.



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Abstracts

The Application of the Theory of Equivalent Circuits to the Computer-Aided Design of Microwave Circuits

M.A. Murray-Lasso. "The Application of the Theory of Equivalent Circuits to the Computer-Aided Design of Microwave Circuits." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 116-117.

The field of equivalent circuit generation is examined in relation to microwave circuits. A method useful for microwave circuit design is explained. The method can be regarded as optimization with inequality constraints, but has the advantage of being linear, thus efficient and easy to obtain linear programming routines can be used to do the design by computer.



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Gradient Razor Search Method for Optimization

J.W. Bandler and A.G. Lee-Chan. "Gradient Razor Search Method for Optimization." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 118-121.

A new and more efficient strategy based on the idea of the razor search method is presented. The adjoint network method of evaluating partial derivatives is incorporated. It is applied to the optimization of a seven section filter with frequency variable terminations.

[Click on title for a complete paper.](#)



Abstracts

Computer-Aided Characterization of Millimeter-Wave Semiconductor Devices

H.J. Kuno, T.T. Fong and D.L. English. "Computer-Aided Characterization of Millimeter-Wave Semiconductor Devices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 122-123.

A new, improved characterization technique for evaluating semiconductor devices at millimeter-wave frequencies is described. By this technique both passive and active parameters of the device (e.g., series resistance, junction capacitance, negative resistance), and also the circuit parasitic can be characterized accurately.



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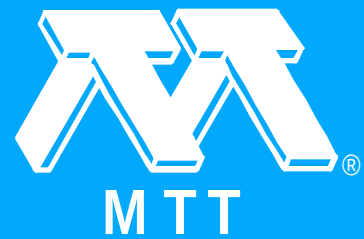


Abstracts

Working with Automatic Microwave Circuit Analysis Programs

W.J. Getsinger. "Working with Automatic Microwave Circuit Analysis Programs." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 124-125.

Techniques for utilizing available, automatic frequency analysis programs for microwave circuits are described. Commonsense generalizations of computer-oriented design experience are also presented. Finally, methods of enhancing program usefulness by circumventing apparent program limitations are illustrated.



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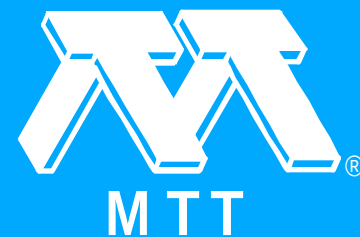


Abstracts

Computer-Aided Determination of Equivalent Circuits for Waveguide Discontinuities

C.C. Han and A.E. Smoll. "Computer-Aided Determination of Equivalent Circuits for Waveguide Discontinuities." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 126-129.

The use of a digital computer to convert a set of measured standing wave null positions versus sliding short positions to an equivalent circuit for a discontinuity in a uniform waveguide is discussed. This method when employed to interpret data indicates the presence of systematic or random errors and averages the accumulated information directly.



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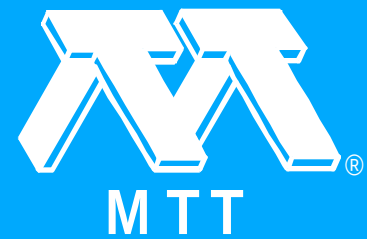


Abstracts

Computer-Aided Design of Parametric Amplifiers (1971 [MWSYM])

M. Maeda, A. Sumioka and Y. Kinoshita. "Computer-Aided Design of Parametric Amplifiers (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 130-131.

A computer-aided design approach is developed for the analysis and design of single-tuned parametric amplifiers. An 18 GHz single-tuned amplifier is designed and experimented for an illustration.



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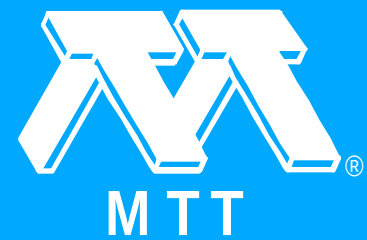
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Finite Element Techniques for the Solution of Poisson's Equation

A. Wexler and D.J. Richards. "Finite Element Techniques for the Solution of Poisson's Equation." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 132-133.

This paper describes a number of improvements to the finite-element method. The functional, whose extremum is furnished by the solution of Poisson's equation over the union of a number of piecewise homogeneous regions, is presented. The Rayleigh-Ritz method, using a two variable power series as a trial function, is employed to find an approximation to the solution. It is shown that Cauchy and Neumann boundary conditions are natural ones for the functional and that the interface condition of continuity of normal flux is satisfied naturally as well. The method of formulating the Dirichlet boundary condition, as a natural one, is described. The paper shows that a curved boundary need not be approximated by triangle sides but may be defined as accurately as desired.

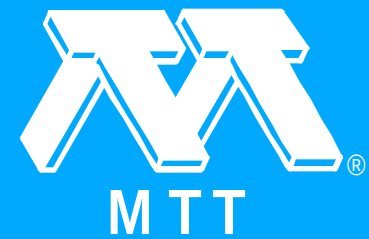
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Session IX -- Student Paper

"Session IX -- Student Paper." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 135-135.



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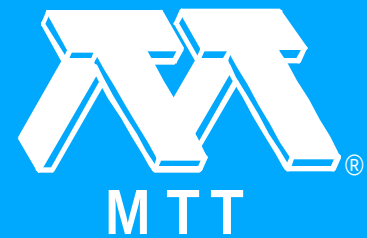


Abstracts

Generation of Confined Spectrum Pulses Using an Absorption PIN Diode Modulator (1971 [MWSYM])

T.A. Saponas. "Generation of Confined Spectrum Pulses Using an Absorption PIN Diode Modulator (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 136-138.

The PIN diode modulator provides a simple and accurate technique of generating pulses of confined spectrum. From measured amplitude and phase data on a commercially available modulator, the necessary bias input function to give a pseudogaussian pulse was computed, and the resultant spectrum was measured and compared to computed spectrum.



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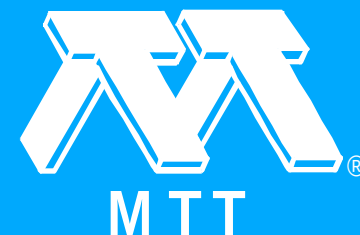
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Abstracts

Session X -- Microwave Applications for the 70's

"Session X -- Microwave Applications for the 70's." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 139-139.



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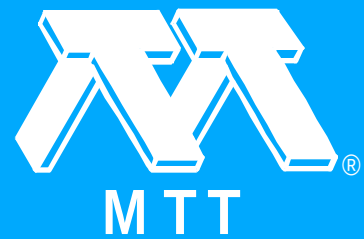


Abstracts

Channel Multiplexer for a Millimeter Waveguide Transmission System

T.A. Abele. "Channel Multiplexer for a Millimeter Waveguide Transmission System." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 140-141.

This paper describes development work done to date on a channel multiplexer network for a millimeter waveguide transmission system capable of carrying almost 250,000 telephone conversations. There is great interest in this means of transmission throughout the world and the multiplexer to be described is part of a system currently under exploratory development at Bell Telephone Laboratories.



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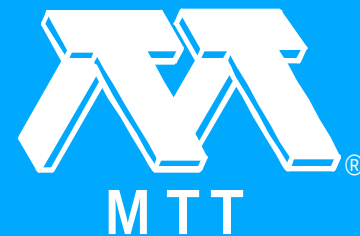


Abstracts

State of Art in Microwave Sensors for Measuring Nonelectrical Quantities

S.S. Stuchly and M.A.K. Hamid. "State of Art in Microwave Sensors for Measuring Nonelectrical Quantities." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 142-143.

Use of microwave sensors for measuring non-electrical quantities in laboratory, industrial and field environments is outlined along with salient specifications imposed by diversification of modern technology. The basic principles of operation and typical applications of common microwave sensors are presented and new concepts for possible future implementation are suggested.



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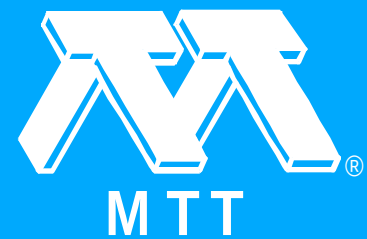


Abstracts

Status of the Technology and Applications of Free-Space Microwave Power Transmission

W.C. Brown. "Status of the Technology and Applications of Free-Space Microwave Power Transmission." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 144-145.

Applications: Space Power Station, Recently, Dr. Peter Glaser of A. D. Little, Inc., has proposed that we solve some of the pollution and natural-resource depletion problems associated with present methods of generating electrical energy by tapping otherwise unused solar energy. He would place in synchronous orbit a very large solar cell array and transmit the electrical energy thus captured to the earth by means of a microwave power transmission system. In view of the fact that his concept would indeed be near pollution-free, would not use any of the earth's fossil or nuclear fuel reserves, and could make practical use of our acquired space technology, it is receiving favorable attention.



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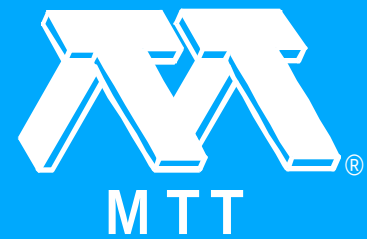


Abstracts

Microwave Ice Thickness Sensor

W. Koppl. "Microwave Ice Thickness Sensor." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 146-148.

This paper describes a method of measuring ice thickness with a microwave spectrometer operating in the 800 MHz - 4 GHz region of the electromagnetic spectrum.



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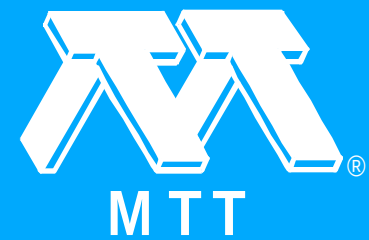
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Abstracts

Session XI -- Gunn Devices

"Session XI -- Gunn Devices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 149-149.



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Gunn Diode Impedance Measurements Using a Single-Tuned Oscillator

P.W. Dorman. "Gunn Diode Impedance Measurements Using a Single-Tuned Oscillator." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 150-151.

Impedance measurement of Gunn diodes indicate that these diodes have higher impedances than ordinary IMPATT diodes and that unusual circuit characteristics are required for self-starting maximum power, operation at off-transit-time frequencies.

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Abstracts

Experimental and Computer Simulation Analysis of a Gunn Diode (1971 [MWSYM])

Y. Ito, H. Komizo, T. Meguro, Y. Daido and I. Umebu. "Experimental and Computer Simulation Analysis of a Gunn Diode (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 152-153.

Bias voltage-and frequency-dependencies of dynamic admittance of a Gunn diode have been measured systematically in the 8 to 13GHz frequency range. We qualitatively verified the results by computer simulation.



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Abstracts

Gunn Effect Wide Band CW Waveguide Amplifier

A. Sene and F.J. Rosenbaum. "Gunn Effect Wide Band CW Waveguide Amplifier." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 154-155.

The operation, design and performance of a CW Gunn effect wideband amplifier in an X-band waveguide circuit is described. An equivalent circuit for the amplifier is used to characterize the active device and to predict broadband performance. The results are in good agreement with experiments.



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Abstracts

Multi-Parallel Operation of Gunn Diodes for High RF Power

Y. Kaneko, K. Kimura and J. Nakagawa. "Multi-Parallel Operation of Gunn Diodes for High RF Power." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 156-157.

Twelve diodes are operated to achieve a total output of 920 mW with 80% "paralleling efficiency" at 12.7 GHz. One oscillator unit consists of four diodes placed in a series-parallel configuration and can be cascaded.



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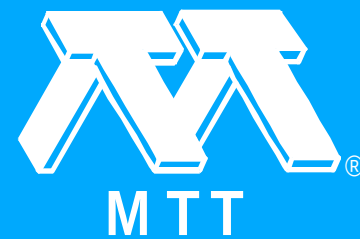


Abstracts

New Alarm Circuit Used for Injection Locking Oscillator of Microwave Communication Equipment

K. Sakamoto. "New Alarm Circuit Used for Injection Locking Oscillator of Microwave Communication Equipment." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 158-159.

Cavity-controlled microwave local oscillators are widely used since they are tunable over a wide frequency range with excellent output characteristics and generate little noise. However, the maximum frequency stability is limited to $\pm \times 10^{-5}$. To increase the frequency stability, a crystal-controlled oscillator is used to perform injection locking in the cavity-controlled oscillator. This paper describes a new injection locking method, explains the theory of injection locking alarm circuit and compares the experimental results with mathematical calculations. The injection locking method and alarm circuit based on this technique are very simple and easy to incorporate into high frequency-stability microwave local oscillator.



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Session XII -- Civil Radar Systems

"Session XII -- Civil Radar Systems." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 161-161.



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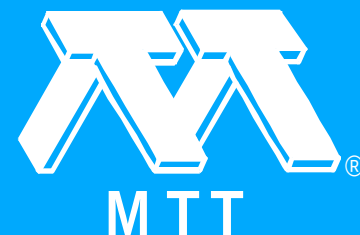


Abstracts

Microwave Applications to Transportation

L.W. Roberts. "Microwave Applications to Transportation." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 162-167.

In view of the fact that microwaves first impacted our technology during or slightly before World War II, it is natural that the greatest number of microwave applications have been directed to the solution of military problems. Very advanced techniques have been developed and form the basis of many of our modern weapon systems. Development costs have been astronomical but were made possible by a very large military budget. Now with a shrinking military budget, thoughts must be directed toward applying microwave technology to other areas. At least one of these areas is transportation, both public and private. Although it does not begin to have the kind of federal budget that the Department of Defense enjoyed for many years, it can sustain a modest amount of development effort.



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Abstracts

Application of Radar to Automobile Control and Sensing

W.P. Harokopus. "Application of Radar to Automobile Control and Sensing." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 168-169.

A description of two new experimental radar driver aids is presented. One adds longitudinal control to existing automobile speed controls to automatically operate both throttle and brakes in response to traffic flow. The second radar system acts as a rear vision aid.



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Automobile Radar

E.J. Baghdady. "Automobile Radar." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 170-171.

Miniradars utilizing the Doppler phenomenon have been developed for sale to the general public in the car aftermarket, as well as to car manufacturers, for providing safe-following headway control of car motion, and for detection of road hazards and collision threats both in front and in the back blind spots. Application to collision-anticipatory sensing for air-bag inflation and integration with anti-skid devices are also significant developments. In this paper, the essential requirements of the cited applications, the techniques that render radar economically feasible for the consumer market and the performance capabilities of the current car-installed equipment are reviewed briefly.

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A Doppler Radar Using a Gunn Diode Both as a Transmitter Oscillator and a Receiver Mixer

S. Nagano and Y. Akaiwa. "A Doppler Radar Using a Gunn Diode Both as a Transmitter Oscillator and a Receiver Mixer." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 172-173.

A simple and low cost doppler radar can be constructed by using a Gunn diode both as a transmitter oscillator and a receiver mixer. The radar has neither a mixer diode nor a circulator. This paper presents analytical and experimental results of the doppler radar. A burglar alarm using the radar has been developed.

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Abstracts

A New Weather Radar for General Aviation

G.C. Jung. "A New Weather Radar for General Aviation." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 174-176.

An analysis of the operational parameters of an airborne weather radar has resulted in the design of a far superior unit. A general outline of some of the most important factors is presented with an emphasis on the microwave area.



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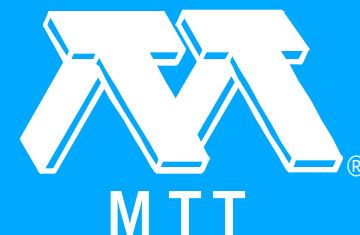
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Session XIII -- Solid State Microwave Devices

"Session XIII -- Solid State Microwave Devices." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 177-177.



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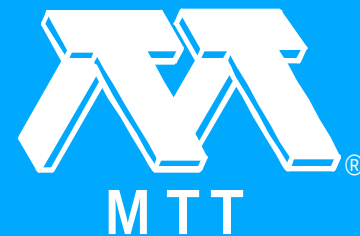


Abstracts

Broadband Diode Phase Shifters

R.V. Garver. "Broadband Diode Phase Shifters." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 178-179.

Design figures are presented for four types of diode phase shifters. Comparison is made of their bandwidths, and it is shown that most of them can work over an octave bandwidth. The fourth type of phase shifter is new using lumped element high-pass and low-pass circuits.



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Abstracts

Octave Band MIC Electronically Variable Attenuators Using PIN Diodes

H.C. Okean and R. Pflieger. "Octave Band MIC Electronically Variable Attenuators Using PIN Diodes." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 180-181.

A series of C- and X-band thin-film microstrip electronically variable attenuators have been developed, using PIN diode chips in an iterated structure, which exhibit half-to-full octave bandwidth capability. Using 10 PIN diodes, mounted singly and in pairs on a 1-inch square substrate, these attenuators exhibit less than 1.6 and 1.8 dB low attenuation insertion loss, about 34 and 27 dB maximum attenuation, and less than 1.6:1 and 1.4:1 VSWR over the 4 to 8 and 8 to 12 GHz frequency ranges, respectively.



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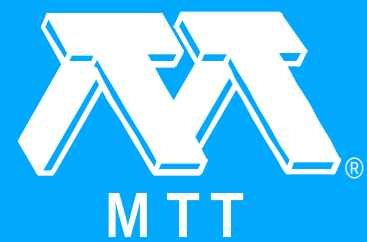
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Negative-Impedance Converters (NIC) for VHF Through Microwave Circuit Applications

A.F. Podell and E.G. Cristal. "Negative-Impedance Converters (NIC) for VHF Through Microwave Circuit Applications." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 182-183.

The negative impedance converter (NIC) is an active circuit element which has been increasingly useful in low frequency applications. It is a 2 port device which converts any load impedance at one port to an input impedance $-Z$ as seen at the other port. The NIC can be used to synthesize negative impedances and admittances which are then used to generate transfer functions or impedance functions which are not physically realizable without active circuits. We have developed two types of NIC circuits suitable for VHF and microwave applications. The first type of NIC is based upon the idealized circuit shown in Fig. 1. Particular care has been taken in the design and layout of this circuit to minimize stray reactance which might reduce the frequency response of this NIC realization. The transistors used in this circuit are NEC 2SC 989's which are relatively inexpensive and have an $f_{sub T}$ of 3 GHz. Figure 2 is a sketch of the layout of a practical realization of the RF portion of this NIC. Figure 3 demonstrates that the NIC can indeed neutralize a 22 pf capacitor up to 120 MHz. Figure 4 shows the effect of temperature variations on a lossless single-pole L-C filter which used an NIC to generate a $-R$ which cancelled the loss in the inductor. The loaded Q of the tuned circuit is 100. Without the NIC, the loss of the tuned circuit was 8 dB. The noise figure of the filter and NIC was 17 dB and the in-band third order intercept was -12 dBm.

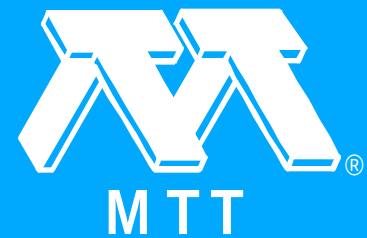


Abstracts

Gigahertz Rate Counter Logic and Clock Generation Using High $F/\text{sub } T$ Transistors

T. Doak, J. Ville, S. Zuckswert and C.L. Cuccia. "Gigahertz Rate Counter Logic and Clock Generation Using High $F/\text{sub } T$ Transistors." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 184-185.

Gigabit-rate communications will use high speed logic systems which will use gigahertz-rate hi-stable devices for various logic functions including waveform generation. The chief requirement of such devices is the generation of square-wave and steep-rise-front voltage, current, and power functions. This paper will review the long art of bi-stable devices and will compare the features of each including consideration of speed and developed voltage. The impact of new transistors with high $F/\text{sub } T$'s will be discussed, and experimental counter logic devices will be discussed which count at speeds at one gigahertz, and will include a discussion of experimental signal sources developing waveforms such as square waves, and pseudo random codes at gigahertz rates.



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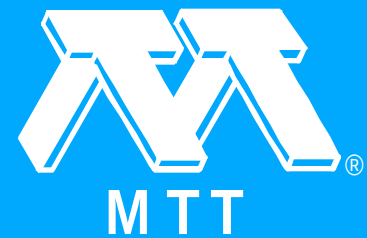


Abstracts

Microwave Integrated Tunnel Diode Amplifiers for Broadband, High Performance Receivers (1971 [MWSYM])

H.C. Okean and P.J. Meier. "Microwave Integrated Tunnel Diode Amplifiers for Broadband, High Performance Receivers (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 186-187.

A family of X-band thin-film microstrip tunnel diode amplifiers (TDA's) have been developed for use in broadband, high-performance receivers. These TDA's exhibit half-octave bandwidth capability, with about 9-dB gain per stage over 8.0 to 11.5 GHz, 5.0 to 6.0 dB noise figure (using Ge tunnel diodes), and -14 to -17 dB output level at 1-dB gain compression (using GaAs tunnel diodes). This represents a considerable advance in performance with respect to previously reported MIC - TDA's, shows a two-stage TDA, including an output isolator per stage.



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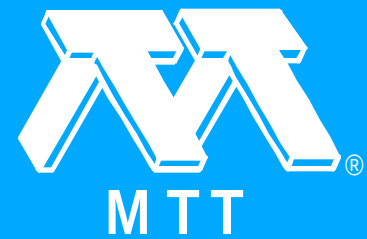
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A Mixer and Solid State L.O. for a 60 GHz Receiver

L.E. Dickens, J.M. Cotton, Jr. and B.D. Geller. "A Mixer and Solid State L.O. for a 60 GHz Receiver." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 188-191.

This paper describes the techniques evolved and the results obtained during the development of solid state RF component for use in the 50-70 GHz frequency range. The program is directed specifically toward the generation of a reliable, low noise, RF "front-end" for a 60 GHz radiometric receiver. The critical components of the "front-end" are the low noise (low conversion loss) mixer and the local oscillator. The mixer consists of GaAs Schottky barrier diodes of very high cut-off frequency; the local oscillator utilizes a silicon avalanche diode oscillator.

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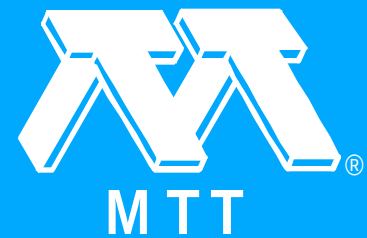


Abstracts

Variable-Permittivity Artificial Dielectrics

H.T. Buscher, R.M. McIntyre and S. Mikuteit. "Variable-Permittivity Artificial Dielectrics." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 192-194.

The use of liquid suspensions as a new class of microwave artificial dielectrics was explored. Liquid media were constructed with permittivities dependent on the strength of a low-frequency electric control field. Operating characteristics were measured for a 50 KW, 360° Ku-band waveguide phase shifter employing a practical liquid-suspension dielectric. Other applications are in electrically variable wideband lenses and in the analog control of phased arrays.



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Abstracts

Late News Papers (Session X) and (Session XI)

"Late News Papers (Session X) and (Session XI)." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 195-195.



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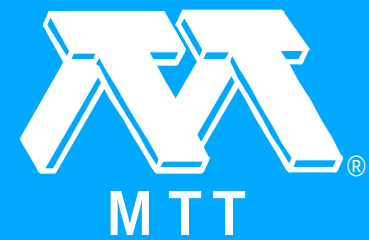
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Abstracts

1972 International GMIT Symposium (Announcement) (1971 [MWSYM])

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Microwave Prize Recipients and New Fellows (1971 [MWSYM])

"Microwave Prize Recipients and New Fellows (1971 [MWSYM])." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 197-197.



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Committees (1971 [MWSYM])

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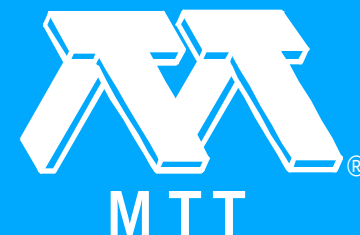
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Abstracts

Index, 1971 IEEE-GMTT International Microwave Symposium

"Index, 1971 IEEE-GMTT International Microwave Symposium." 1971 G-MTT International Microwave Symposium Digest of Technical Papers 71.1 (1971 [MWSYM]): 202-204.



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Back Cover (1971 [MWSYM])

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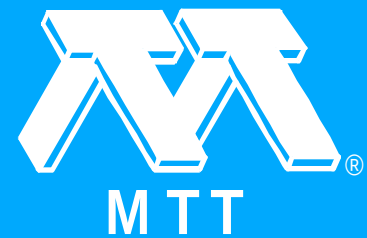


Abstracts

Foreword (1972 [MWSYM])

L.H. Hansen and R.M. Knox. "Foreword (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): iii-iii.

The Chicago Chapter, GMTT, takes pleasure in welcoming, for the first time, the IEEE - GMTT International Microwave Symposium to the Windy City. With these greetings from your steering committee comes the hope that your visit in Chicagoland will be both enjoyable and technically rewarding.



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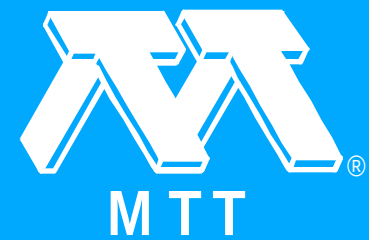
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Abstracts

Session 1 -- Low Noise Microwave Receiving System

"Session 1 -- Low Noise Microwave Receiving System." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 1-1.



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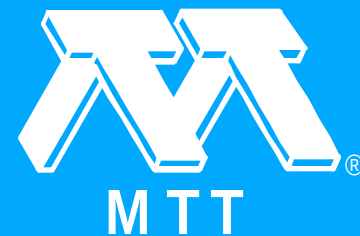


Abstracts

Front End Noise Sources in Commercial Microwave Radio Relay Systems

U.S. Berger. "Front End Noise Sources in Commercial Microwave Radio Relay Systems." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 2-4.

Noise in long haul terrestrial microwave systems originates in several portions of the radio repeater, one major source being the receiver front end. A review of the circuits examined for this application in Bell System microwave facilities is given.



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S-Band Radiometer Design for High Absolute Precision Measurement

A.W. Love and W.N. Hardy. "S-Band Radiometer Design for High Absolute Precision Measurement." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 5-7.

A radiometer for the remote measurement of absolute sea surface temperature is described. Two requirements are necessary for the attainment of the desired goal of 1 or 2 degrees (K) in absolute accuracy. Although the first is inappropriate for discussion here, it is clear that corrections must be developed to account for perturbations caused by surface effects (roughness, foaming, and salinity changes) and for atmospheric effects (absorption and scattering). The second requirement, namely the development of an instrument capable not only of high relative accuracy (i e., resolution) but also of high absolute precision, is the subject of this paper. The concept underlying the design of an instrument capable of an absolute precision of a few tenths degrees Kelvin in the measurement of brightness temperature at S-band is described. The role of the antenna is discussed and the importance of high ohmic and beam efficiencies is stressed. Finally, a description of the hardware itself is presented, along with the development of a unique cryogenically cooled termination used to calibrate the entire system, including antenna.

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Abstracts

Spaceborne Hybrid MIC PIN Diode Radiometer Switch

R.H. Pflieger. "Spaceborne Hybrid MIC PIN Diode Radiometer Switch." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 8-10.

Using hybrid MIC techniques a new SP5T precision PIN diode radiometer switch has been developed for use in highly accurate spaceborne radiometers. The successful use of hybrid MIC techniques in meeting the unusual and difficult requirements is discussed including the achieving of a precision noise balance and the incorporation of a hybrid MIC matching circuit for precision matching of the switch and receiver combination.



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Abstracts

Spaceflight-Qualified Tunable C-Band Parametric Amplifier System

R.K. Hendricks. "Spaceflight-Qualified Tunable C-Band Parametric Amplifier System." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 11-13.

An integrated spaceflight-qualified tunable C-band parametric amplifier system has been developed. The amplifier system is a single small package and is designed for minimum power drain. It consists of temperature compensated bias circuits, a waveguide pump network, waveguide mounted varactors, and a microstrip 5-port circulator in a 5- in³ aluminum housing weighing less than 0.5 lb. The measured performance of the system includes: 140 MHz minimum instantaneous 3-dB bandwidth, 17 dB minimum peak gain, >500 MHz tunable bandwidth, and 154 K maximum passband noise temperature.



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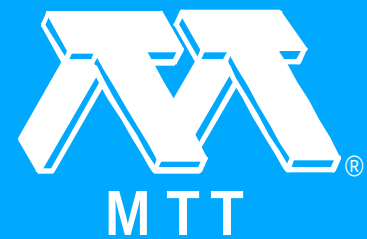


Abstracts

18 GHz Paramps with Both Liquid Helium and Room Temperature Operations and with Triple-Tuned Gain Characteristics

T. Okajima, M. Kudo, K. Shirahata and D. Taketomi. "18 GHz Paramps with Both Liquid Helium and Room Temperature Operations and with Triple-Tuned Gain Characteristics." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 14-16.

18 GHz low noise and wide band paramps designed considering skin effects of varactor diodes with both liquid helium and room temperature operations and with triple-tuned gain characteristics by a double-tuned signal circuit, for the experimental domestic satellite communication earth station, are described.



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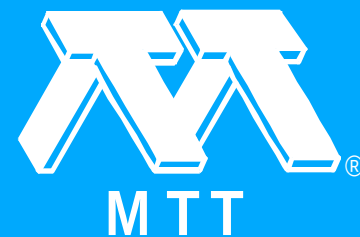


Abstracts

Low Noise Microwave Receiving Systems on a 64 m Antenna

M.S. Reid and D.A. Bathker. "Low Noise Microwave Receiving Systems on a 64 m Antenna." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 17-20.

The performance capability at S-, X- and K-band of the NASA/JPL 64 m Cassegrain antenna at Goldstone, California, is reviewed. The multiple feed system allows X-and K-band atmospheric research studies to be conducted simultaneously with mission directed S-band spacecraft tracking. A description of the antenna system and its multiple operation is followed by gain and efficiency comparisons at the three frequencies. The total operating system temperature, and its frequency dependence, is presented and discussed. Antenna gain and efficiency, and zenith system operating temperature are summarized, at S- and X-band respectively, by 62 dB, 63%, 16K; and 72 dB, 52%, 24K. Preliminary measurements for K-band are 76 dB, 39%, 29K.



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Session 2 -- Microwave Measurements

"Session 2 -- Microwave Measurements." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 21-21.



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Abstracts

NBS Millimeter Wave Power Standards

M.E. Harvey. "NBS Millimeter Wave Power Standards." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 22-23.

The NBS standards for millimeter wave power measurements are calorimeters which are used to determine the effective efficiency of transfer standards (bolometer units). A careful error analysis has been made and the effective efficiency of bolometer units may be determined with uncertainty limits of ± 0.28 percent.



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Abstracts

Automatic Rieke Diagram Drawing System

Y. Kosugi and Y. Naito. "Automatic Rieke Diagram Drawing System." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 24-26.

The development of a system which provides the power-constant loci on a Smith chart automatically is presented. The system consists of a couple of ferrite phase shifters, ended with PIN diodes, and a network analyzer.



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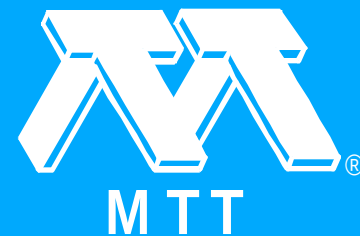


Abstracts

Scattering Parameter Measurement Techniques in Microstrip

J.L. Schallenberg and J.C. Beal. "Scattering Parameter Measurement Techniques in Microstrip." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 27-29.

Measurements are made on microstrip waveguides with coaxial-to-microstrip wave transitions, by means of a sliding obstacle method, and S-parameters of the transitions and the microstrip are derived for a range of frequencies from 1 to 11 GHz.



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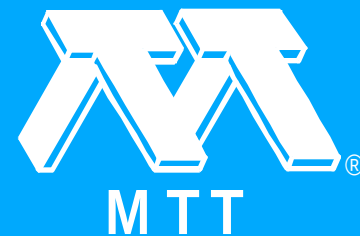


Abstracts

An RF Time Domain Reflectometer Not in Real Time

L.A. Robinson, W.B. Weir and L. Young. "An RF Time Domain Reflectometer Not in Real Time." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 30-32.

A nanosecond radar system was developed, in which each line of the pulse spectrum was radiated in turn, their reflections measured and stored in a computer, and finally added up to compute the echo.



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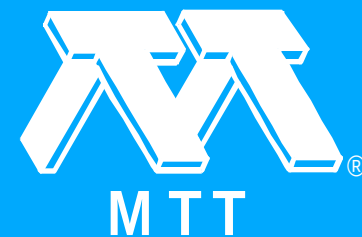


Abstracts

Microwave Measurements with Active Systems

R.C. Ajmera, D.B. Batchelor and H. Lashinsky. "Microwave Measurements with Active Systems." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 33-35.

A new system for microwave dielectric measurements is described. The system with sample comprises a microwave oscillator whose frequency and amplitude provide the desired information. Preliminary results pertaining to sensitivity, dynamic range and time resolution are presented.



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Abstracts

A Millimeter Wave Hot Load

A. Larsen, E.J. Wendt, J. deGruyl and J. Whelehan. "A Millimeter Wave Hot Load." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 36-38.

A new and simple millimeter wave hot load has been developed with an equivalent temperature of 888 ± 10.7 Kelvins (K) (± 1.3 percent) for the 50 to 75 GHz frequency band. The load is operated in an oven at a temperature of 1000 K.



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Abstracts

The Measurement of RF-Antenna Near Field Patterns Using Liquid Crystal Sensors

K. Truesdale. "The Measurement of RF-Antenna Near Field Patterns Using Liquid Crystal Sensors." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 39-42.

Present methods for measuring antenna near field RF patterns utilize a point to point probing technique. The results from this method are somewhat unsatisfactory due to the coupling between the antenna and the probes. Secondary effects such as reflections also tend to confuse the data. In addition, the point to point probing of an antenna near field is a time consuming process during which the RF power level must be held constant.



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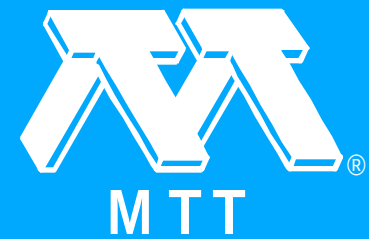
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Abstracts

Session 3 -- Solid-State Microwave Control Devices

"Session 3 -- Solid-State Microwave Control Devices." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 43-43.



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Abstracts

Diode Switching Topics

R.V. Garver. "Diode Switching Topics." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 44-46.

Diode switching topics are discussed. These include PIN junction theory, high power properties, and applicable filter theory.



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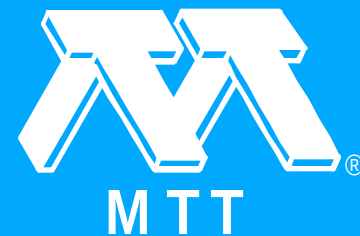


Abstracts

A High Power UHF Microstrip Diode Phase Shifter

R.L. Holden and R.W. Burns. "A High Power UHF Microstrip Diode Phase Shifter." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 47-48.

A four-bit high power UHF diode phase shifter is described. This device, using eight PIN diodes mounted in a low dielectric constant microstrip circuit, has operated at an 8 KW peak, 240 watt average power level with an average insertion loss of 0.75 dB.



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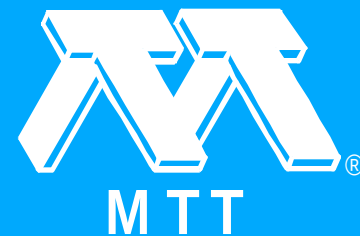


Abstracts

A Lumped Element Diode Phase Shifter

P.A. Rizzi. "A Lumped Element Diode Phase Shifter." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 49-51.

A digital phase shifter utilizing three PIN diodes in a tee configuration is described. The operation is explained in terms of low and high pass filter characteristics. Design expressions for phase change, insertion loss and VSWR as a function of element values are given. Frequency characteristics for 45, 90 and 180 degree units are shown in graphical form.



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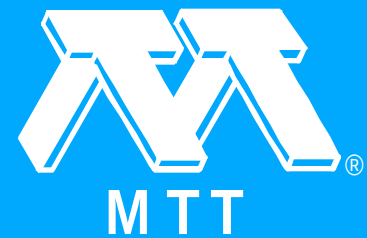


Abstracts

High Power Microstrip RF Switches

S.D. Choi and J.F. Boreham. "High Power Microstrip RF Switches." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 52-54.

A microstrip-type SPDT switch, using only two PIN diodes and eliminating usual dc blocking capacitors, has demonstrated an RF power handling capacity greater than 100 W CW at S-band. The insertion loss is less than 0.25 dB and the input-to-off port isolation is greater than 36 dB over a bandwidth larger than 30 MHz.



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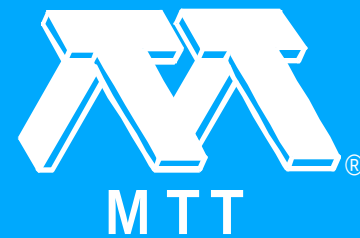


Abstracts

An X-Band Paramp with 0.85 dB Noise Figure (Uncooled) and 500 MHz Bandwidth

L.E. Dickens. "An X-Band Paramp with 0.85 dB Noise Figure (Uncooled) and 500 MHz Bandwidth." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 55-57.

This paper describes the results of a development program which had two primary objectives: (1) the development of planar, passivated varactor chip diodes with a zero bias frequency cutoff of greater than 600 GHz, and (2) the employment of these chips in an uncooled, X-band Paramp System having a noise temperature of 60° K. GaAs Schottky barrier varactors with a cutoff frequency of 800 GHz have been used in a balanced diode type of parametric amplifier operating with a signal frequency at 7.6 GHz. The parameters of the overall amplifier operating at room temperature are: Gain of 15 dB, Bandwidth of 500 MHz, and an excess noise temperature of 62°K (a noise figure of 0.85 dB).



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Abstracts

High Burnout Gallium Arsenide Schottky Barrier Diodes

T.H. Oxley, G.H. Swallow and A. Hansom. "High Burnout Gallium Arsenide Schottky Barrier Diodes." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 58-60.

This paper discusses the results of a programme to investigate the burnout phenomena of gallium arsenide Schottky barrier mixer diodes with regard to radar system t.r. cell leakage, and describes the performance of X-band high burnout diodes.



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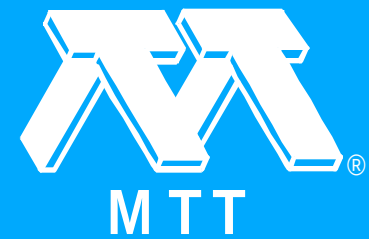
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Abstracts

Session 4 -- Waveguides- Techniques and Analysis

"Session 4 -- Waveguides- Techniques and Analysis." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 61-61.



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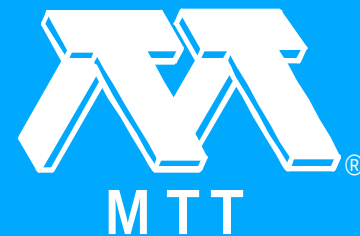


Abstracts

Remarks on Variational Bounds for Waveguide Scattering

C.J. Kleinman and K. Kalikstein. "Remarks on Variational Bounds for Waveguide Scattering." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 62-64.

Utilization of variational techniques has facilitated the solution of scattering problems. A variational principle which gives a bound on the scattering elements in waveguide problems is presented. The formalism is applicable to scalar and tensor type problems for single and multimode scattering. A variation-iteration method can be used to avoid the need for explicitly evaluating a Green's function that appears in the formalism. Also, an alternative variational bound principle is outlined.



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Abstracts

Tapered Waveguide Transitions Between Arbitrary Cross Sections and Sizes

G. Schindler and H.-G. Unger. "Tapered Waveguide Transitions Between Arbitrary Cross Sections and Sizes." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 65-67.

To analyze waveguide transitions between arbitrary cross sections and sizes the variational method of Galerkin is suitable for calculating local normal modes in intermediate cross sections. Near cutoff sections of spurious modes the solution of the generalized telegraphist's equations in form of Airy functions may be matched to the normal solution away from cutoff. By way of example spurious mode generation is analyzed for various square to round waveguide transitions.



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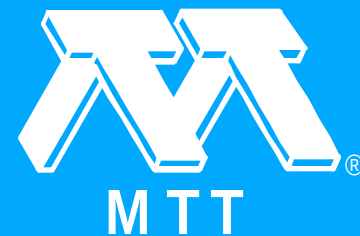


Abstracts

A New Method for Solving Discontinuity Problems in Microstrip Lines

T. Itoh, R. Mittra and R.D. Ward. "A New Method for Solving Discontinuity Problems in Microstrip Lines." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 68-70.

A new method has been developed for computing the fringe capacitance of the junctions in microstrip lines. It utilizes Galerkin's method in the methods. spectral domain and is numerically more efficient than many conventional methods.



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Dispersion Characteristics and Field Structure of an Axially Magnetized Ferrite Loaded Rectangular Waveguide

J.T. Bara and D.M. Bolle. "Dispersion Characteristics and Field Structure of an Axially Magnetized Ferrite Loaded Rectangular Waveguide." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 71-73.

A basic limitation in an earlier work on the axially magnetized, ferrite loaded rectangular guide has led to a detailed re-examination of this problem. Both a series solution and a perturbational technique are used to find dispersion curves and field patterns.

Click on title for a complete paper.

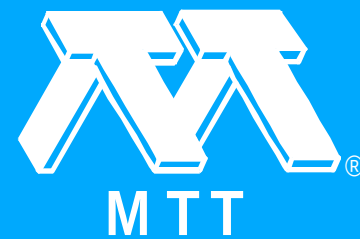


Abstracts

A Method for the Determination of All the Propagating Modes in a Loaded Waveguide Structure

A. Delfour, A. Priou and F.E. Gardiol. "A Method for the Determination of All the Propagating Modes in a Loaded Waveguide Structure." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 74-76.

A method has been investigated for the accurate determination of the total number of propagating modes, the electromagnetic field patterns and the power density distribution in a transversely magnetized, ferrite loaded rectangular waveguide. The established criterion is valid for any ferrite material thickness and gives more complete results than the first method developed by Gardiol et al.



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Abstracts

Analysis of a Tapered Circular Waveguide Using Spherical Modes

S.C. Moorthy. "Analysis of a Tapered Circular Waveguide Using Spherical Modes." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 77-79.

In this paper the coupled mode equations governing the propagation of TE^o_{0m} waves in a tapered circular waveguide are derived. The derivation is based on the assumption that an elementary section of the taper can be thought of as an elementary truncated cone. This approach is superior to the cylindrical mode representation in that it eliminates the singularity in the coupled mode equations for the modal amplitudes at "cut-off" and also leads to a faster converging expansion. An iterative method of solving these equations is also outlined.



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Abstracts

Scattering from a Large Hole of Any Shape in a Multimode Waveguide

J. Glaser. "Scattering from a Large Hole of Any Shape in a Multimode Waveguide." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 80-82.

An upper bound for the reflection coefficient of any mode incident on a hole of arbitrary shape in the infinitesimally thin wall of a perfectly conducting multimode waveguide is given. The theoretical value is verified experimentally.



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Abstracts

Session 5 -- Microwave Acoustics

"Session 5 -- Microwave Acoustics." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 83-83.



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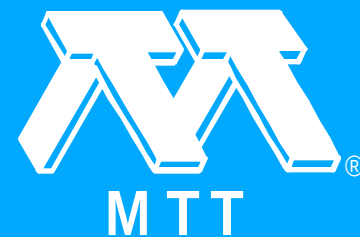


Abstracts

Acoustic Surface Wave Analog Filters

C.S. Hartmann. "Acoustic Surface Wave Analog Filters." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 84-86.

While the basic principles of surface wave device operation have been described previously, this paper describes the unification of this modeling information into a design synthesis procedure. Also, the excellent performance of the resulting devices is discussed. Emphasis is given to bandpass filters. The major advantages of acoustic surface wave filters are small size, low cost, reproducibility, wide dynamic range, high Q, great design flexibility, good temperature stability, and a center frequency range which extends from HF to L-band.



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Abstracts

Surface Wave Parametric Signal Processing

W.R. Shreve, G.S. Kino and M.V. Luukkala. "Surface Wave Parametric Signal Processing." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 87-88.

New types of surface acoustic wave devices which utilize parametric interactions between surface acoustic waves to perform signal processing functions will be described. These devices can give real time convolution of two modulated rf signals. Similar devices can also be employed to time invert a modulated rf signal, so two devices can be used in combination to obtain the correlation between two rf signals. As these are the basic signal processing functions required, the devices are also capable of performing fast Fourier transforms and pulse compression of chirped signals.



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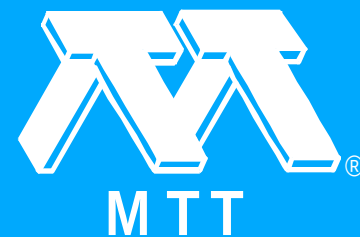
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Design Curves for Bi/sub 12/GeO/sub 20/ Spiral Acoustic Surface Wave Delay Lines

A.J. Slobodnik, Jr.. "Design Curves for Bi/sub 12/GeO/sub 20/ Spiral Acoustic Surface Wave Delay Lines." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 89-91.

Design curves accounting for all geometrical effects (axial offset, total distance, and time delay) are presented for Bi/sub 12/GeO/sub 20/ spiral acoustic surface wave delay lines. Crystalline anisotropy results in considerable deviation from a helical path.

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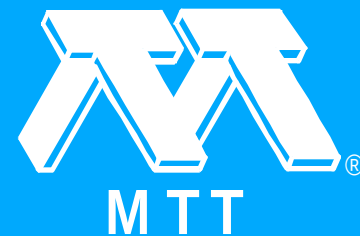


Abstracts

A Novel Continuously Variable Delay Line

A.F. Podell, R.E. Lee and A.J. Bahr. "A Novel Continuously Variable Delay Line." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 92-94.

A novel scheme for producing continuously variable time delay is proposed. The scheme makes use of two dispersive delay lines and spectral inversion to achieve dispersionless variable delay. Experimental results obtained at 1 to 2 GHz are presented.



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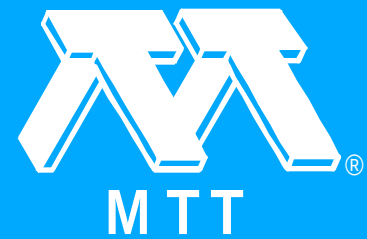
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Transducer-Coupled Surface Acoustic Wave Amplifiers

G. Chao, T.R. Larson and B.A. Auld. "Transducer-Coupled Surface Acoustic Wave Amplifiers." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 95-96.

A review is made of various transducer-coupled surface acoustic wave amplifiers which are by nature bilateral. A unilateral transducer-coupled parametric amplifier is described. Unilateral operation is achieved by the cancellation of excitation in the common idler circuit.

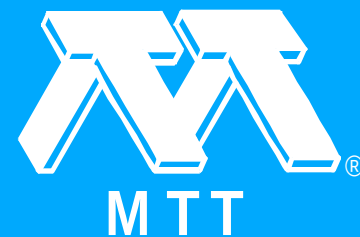


Abstracts

Propagation Characteristics of the Ridge Waveguide for Acoustic Surface Waves

R.C.M. Li, H.L. Bertoni, A.A. Oliner and S. Markman. "Propagation Characteristics of the Ridge Waveguide for Acoustic Surface Waves." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 97-99.

Using a microwave network approach, approximate but simple dispersion relations are obtained for the "flexural" and "pseudo-Rayleigh" modes of the ridge waveguide. The propagation characteristics calculated from the relation for the "flexural" mode compare very well with experimental data over a wide frequency range; no accurate measurements are presently available for the "pseudo-Rayleigh" mode.



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Reduction of Reflections in Surface Wave Devices with Quarter-Wave Taps

P.H. Carr. "Reduction of Reflections in Surface Wave Devices with Quarter-Wave Taps." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 100-102.

The reflections and back-voltages present in a multiply tapped delay line have been measured. Taps spaced by one-quarter wavelength were found to have lower reflections and back-voltages than the customary half-wavelength-spaced-taps.

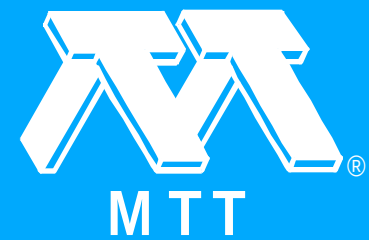
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Abstracts

Session 6 -- Computer-Aided Microwave Practices

"Session 6 -- Computer-Aided Microwave Practices." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 103-103.



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Abstracts

General-Purpose Microwave Circuit Analysis Incorporating Waveguide Discontinuity Models

M. Greenspan, K.I. Thomassen and P. Penfield, Jr.. "General-Purpose Microwave Circuit Analysis Incorporating Waveguide Discontinuity Models." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 104-106.

A project of incorporating waveguide discontinuity models into a general-purpose network-analysis program is described. The project is not yet completed. Examples are given which illustrate the need and usefulness of the project.



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Abstracts

Solution to Waveguide Problems by Successive Extrapolated Relaxation

E. Della Torre and W. Kinsner. "Solution to Waveguide Problems by Successive Extrapolated Relaxation." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 107-109.

A successive extrapolated relaxation (SER) technique has been developed to solve elliptic partial difference equations iteratively. SER is more efficient than optimized successive over-relaxation and permits useful solutions of waveguide modes using finite difference methods.



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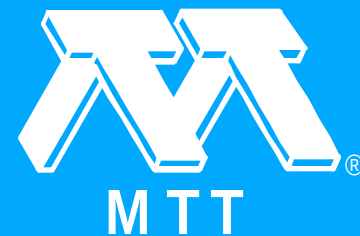


Abstracts

Large Signal Transistor Oscillator Design

J. Gonda. "Large Signal Transistor Oscillator Design." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 110-112.

A computer-aided general approach is described for oscillator design. The embedding network is built up, all the objectives: spurious free oscillation, output electronic tuning range and low FM noise.



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Abstracts

Differential Techniques and Infinite Regions

B.H. McDonald and A. Wexler. "Differential Techniques and Infinite Regions." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 113-115.

Local solutions of unbounded static and harmonic problems are obtained using a variational formulation of the partial differential equations, with the trial functions constrained by the integral equations for the exterior field.



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Abstracts

Computer-Aided Design of Broad-Band Active Matching Networks

F.R. Ore. "Computer-Aided Design of Broad-Band Active Matching Networks." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 116-118.

Described is a computer-aided technique of designing active matching networks using distributed constant circuit elements. The merits and limitations of various performance indices which have been used are discussed. Some sample designs are presented.



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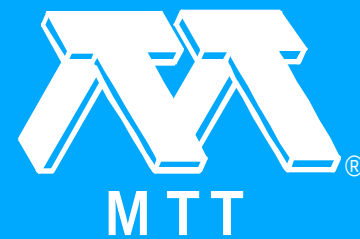


Abstracts

Waveguides of Arbitrary Cross Section by Solution of a Nonlinear Integral Eigenvalue Equation (1972 [MWSYM])

B.E. Spielman and R.F. Harrington. "Waveguides of Arbitrary Cross Section by Solution of a Nonlinear Integral Eigenvalue Equation (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 119-120.

An accurate solution to the problem of wave propagation in conducting waveguides of arbitrary cross section is developed. The solution is available in the form of two digital computer programs, which yield computed values of both cutoff wave numbers and field distributions. Sample calculations are presented for the ridge waveguide.



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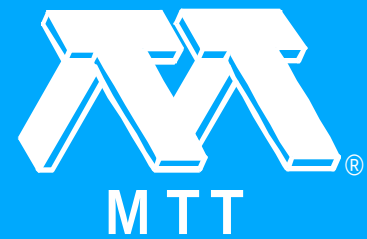


Abstracts

A New Approach to the Computer-Aided Design of Microwave Circuits

J.W. Bandler and C. Charalambous. "A New Approach to the Computer-Aided Design of Microwave Circuits." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 121-124.

An approach to computer-aided design of circuits believed to be new to microwave engineers is presented. Central to the process is the application of least pth approximation using extremely large values of p, typically 1000 to 1,000,000. A simple microwave design problem of a practical nature illustrate the procedure.



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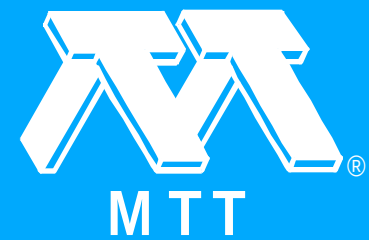
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Abstracts

Session 7 -- Commercial and Industrial Application of Microwaves

"Session 7 -- Commercial and Industrial Application of Microwaves." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 125-125.



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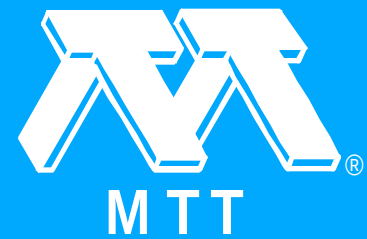


Abstracts

Submillimeter Waves - Bridging the Microwave/Optical Gap

M.A. Pollack. "Submillimeter Waves - Bridging the Microwave/Optical Gap." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 126-127.

This paper surveys the current state of submillimeter wave techniques. Recent work on sources, detectors and other components is described, and areas of major difficulty are indicated.



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Abstracts

A Guided Millimeter-Wave Transmission System Using High-Speed PSK Repeaters

K. Miyauchi, K. Izumi and S. Seki. "A Guided Millimeter-Wave Transmission System Using High-Speed PSK Repeaters." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 128-130.

This paper presents system features and some hardware performances of the "W-40G" guided millimeter-wave transmission system, which is under development at the Electrical Communication Laboratories, NTT, Japan.



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Abstracts

High Power Microwave Transistor Oscillator

J.A. Hall. "High Power Microwave Transistor Oscillator." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 131-132.

The design of a microwave transistor oscillator with the unique combination of low noise, high output power and extremely linear modulation capability vital to a new generation of simplified, high performance telecommunication transmitters is described.



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A Solidstate, 5 Watt, 6 GHz, Microwave Source For High Capacity FM Radio Relay

C.W.C. Anderson, H.U. Eichhorn and W.J. Cameron. "A Solidstate, 5 Watt, 6 GHz, Microwave Source For High Capacity FM Radio Relay." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 133-135.

The design and performance of a 5 Watt 6 GHz solid state source intended for use in a high capacity FM microwave-repeater is described. It utilizes a 2 GHz power amplifier and step recovery diode multiplier and generates 5 Watts with an overall efficiency of 8%. FM noise is less than 3.5 Hz RMS in a 1 KHz slot from 60 KHz to 10 MHz off carrier.

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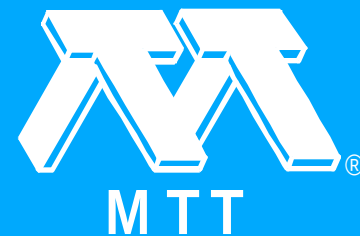


Abstracts

Transmission Lines for Continuous-Access Guided Communications in Mines and Tunnels

V. Rawat and J.C. Beal. "Transmission Lines for Continuous-Access Guided Communications in Mines and Tunnels." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 136-138.

A combined experimental and theoretical investigation of unorthodox transmission lines for continuous-access guided communications in mines and tunnels is described. A theoretical model for loose-braided coaxial cable with a contaminating layer of dirt is introduced and a novel experimental technique is discussed for measurements on such lines at VHF/UHF frequencies.



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Abstracts

Reflection of Surface Waves on a Dielectric Image Line with Application to "Guided RADAR"

S.F. Mahmoud and J.C. Beal. "Reflection of Surface Waves on a Dielectric Image Line with Application to "Guided RADAR"." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 139-141.

The dielectric image line is treated as an example of a line that can support a surface-wave mode, and reflections from metallic obstacles on the line are considered. This problem finds its application in an obstacle detection scheme for guided ground transportation where the metallic obstacle may represent a preceding vehicle. An integral equation for the currents on the obstacle is solved by the moment method and the surface-wave reflection coefficient is obtained.



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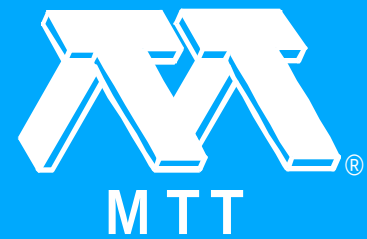


Abstracts

Microwave Design Optimization of the TSC Automobile Crash Sensor

F.R. Holmstrom, J.B. Hopkins, M.E. Hazel, A.T. Newfell and E.F. White. "Microwave Design Optimization of the TSC Automobile Crash Sensor." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 142-144.

This paper reports recent progress in optimizing microwave design of TSC's automobile crash sensor. This system is a bistatic cw radar employing homodyne detection and digital processing of the doppler signal, to detect impending crashes.



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Abstracts

Session 8 -- Passive Microwave Components

"Session 8 -- Passive Microwave Components." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 145-145.



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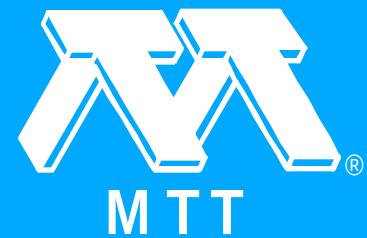


Abstracts

Loss Calculation in Parallel Coupled Lines

D. Kryger. "Loss Calculation in Parallel Coupled Lines." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 146-148.

A method to calculate dissipation loss in any number of parallel coupled lines is presented. The method is an extension of Wheeler's technique for a single transmission line. The results can be used to calculate performance of lossy transmission line network using parallel coupled lines.



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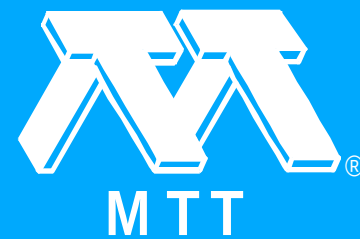


Abstracts

Meander-Line and Hybrid Meander-Line Transformers (1972 [MWSYM])

E.G. Cristal. "Meander-Line and Hybrid Meander-Line Transformers (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 149-151.

A new application of meander lines to impedance transformers is proposed and developed. Meander-line transformers are shown to have less bandwidth than stepped-impedance transformers for a given passband VSWR, but can have greatly preferred shape factors in stripline and MIC realizations. Hybrid meander-line transformers allow circuit designers greatly increased flexibility in choosing transformer shape factors, while allowing (basically) the same electrical performance as with either stepped-impedance or meander-line transformers. Experimental confirmations are presented.



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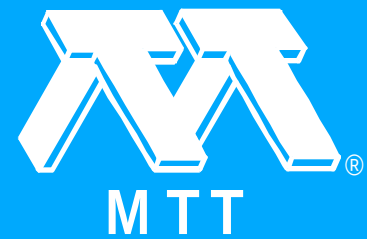


Abstracts

Microwave Filters with Arbitrary Prescribed Phase Characteristics

J.D. Rhodes. "Microwave Filters with Arbitrary Prescribed Phase Characteristics." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 152-153.

With the advent of practical non-minimum phase microwave networks, greater flexibility is now achievable in the design of frequency selective microwave filters. Design techniques are presented for the construction of generalized TEM mode interdigital filters and waveguide generalized direct coupled cavity filters which exhibit selective amplitude characteristics simultaneously approximating arbitrary prescribed phase characteristics.



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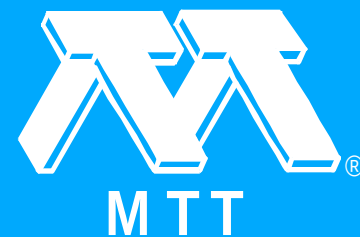


Abstracts

Understanding the Waveguide Diode Mount

R.L. Eisenhart. "Understanding the Waveguide Diode Mount." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 154-156.

A non-mathematical discussion of the characteristics of the standard waveguide diode mount is presented, based upon an equivalent circuit which allows isolation of the effects due to the variation of the physical configuration parameters such as waveguide dimensions and post size and location.



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Abstracts

A Multi-Channel Rotary Joint for Spacecraft Applications

E. Matthews and M.A. Ikemoto. "A Multi-Channel Rotary Joint for Spacecraft Applications." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 157-159.

A four-channel coaxial rotary joint has been designed for transferring S- and X-band signals between a spinning satellite and a despun antenna system. Measurements show insertion losses under 0.5 dB, VSWR's under 1.2, and inter-channel isolations exceeding 50 dB.



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Abstracts

Property of Four-Port Antireciprocal Circuit Utilizing YIG and Strip Line -- Filter and Circulator

M. Igarashi and Y. Naito. "Property of Four-Port Antireciprocal Circuit Utilizing YIG and Strip Line -- Filter and Circulator." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 160-162.

The experimental results of the four-port antireciprocal bandstop=pass filter and the theory of tunable resonance type circulator with the properties of the four-port filter are discussed. The filter operates for a 2-octave frequency range.



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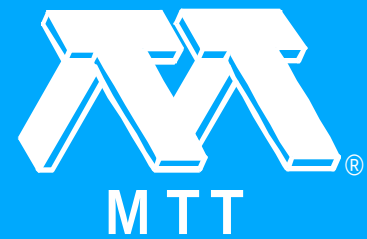


Abstracts

Unity Transmission Band Splitting and Recombination Filter Networks

R.J. Wenzel. "Unity Transmission Band Splitting and Recombination Filter Networks." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 163-165.

A class of filters is described that allows a given frequency band to be divided into two or more partial bands, and subsequently recombined in an identical filter network to yield a complete network with a unity transmission coefficient. Practical realization problems are discussed and experimental results are given. Possible circuit configurations for achieving filters with bandwidths of 20:1 and 100:1 are presented.



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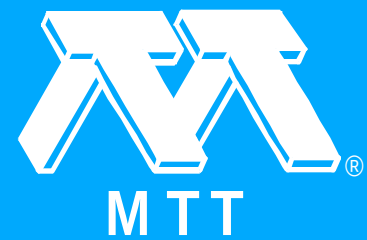


Abstracts

Design of a Channel Diplexer for Millimeter Wave Applications (1972 [MWSYM])

C.-L. Ren. "Design of a Channel Diplexer for Millimeter Wave Applications (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 166-168.

The design of millimeter wave filters is in principle no different from the design of conventional microwave filters. In practice, however, several factors impose limitations to the choice of the filter structure. As a result, new filter structures must be used requiring new techniques for their design. In this paper, a new channel diplexer structure is described and a technique for its design is given. The expected electrical performance and the design procedure were verified by measuring the performance of a scaled filter model centered at 3.95 GHz. The results of these measurements are given. Practical application of the filter at millimeter wave frequencies will require further effort in the areas of physical design and manufacturing techniques.



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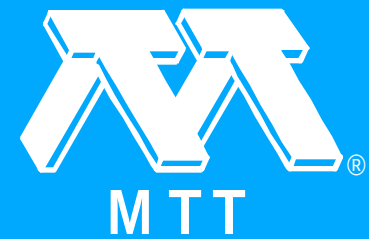
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Abstracts

Session 9 -- Solid-State Microwave Active Devices

"Session 9 -- Solid-State Microwave Active Devices." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 169-169.



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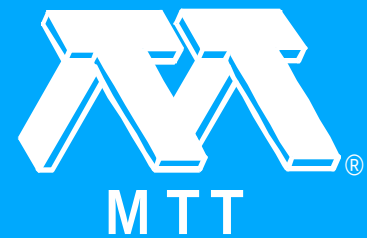


Abstracts

Microwave Transistors, Bipolar and Field Effect - Today and Tomorrow

S. Kakihana. "Microwave Transistors, Bipolar and Field Effect -Today and Tomorrow." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 170-172.

The state-of-the-art low noise and high power microwave transistors of both bipolar and field effect types are reviewed. The analyses are made to determine the future potentials of bipolar and field effect transistors in microwave applications. It appears that the bipolar transistor is approaching old age both as low noise and high power devices, but field effect transistors show increasing promise in both applications. The trend for monolithic integration of maturing bipolar devices is also discussed.



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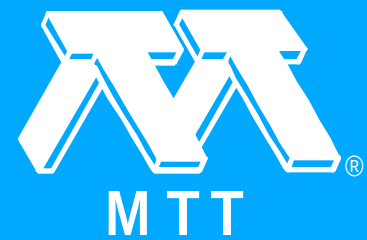
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Improved Injection Locking of Microwave FM-Oscillators

G. Endersz and V. Vucins. "Improved Injection Locking of Microwave FM-Oscillators." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 173-175.

A system for injection locking by angle-modulated signals is presented in which both the locked oscillator and the locking source is angle-modulated by the same signal. This method provides increased locking gain and improved stability against oscillator drift with preserved signal performance. Intermodulation measurements on a low-Q Gunn-oscillator, angle-modulated by a weakly coupled varactor (0.5 dB loss) demonstrated the expected effects.

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K-Band High Power Single-Tuned IMPATT Oscillator Stabilized by Hybrid-Coupled Cavities (1972 [MWSYM])

H. Komizo, T. Meguro, Y. Ito and M. Shinoda. "K-Band High Power Single-Tuned IMPATT Oscillator Stabilized by Hybrid-Coupled Cavities (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 176-178.

Highly stable 0.7W CW K-band IMPATT power source with frequency stability of about 4×10^{-5} / $^{\circ}\text{C}$ has been developed. This has been achieved by a combination of a single-tuned oscillator stabilized by hybrid-coupled cavities and one stage high power reflection type amplifier.

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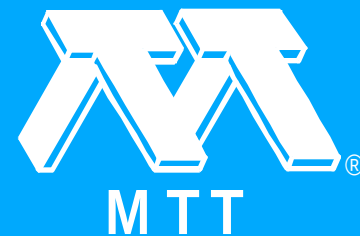


Abstracts

A C-Band All Ferrite Integrated Wideband High Power GaAs Avalanche Diode Amplifier

W.C. Tsai and C.W. Lee. "A C-Band All Ferrite Integrated Wideband High Power GaAs Avalanche Diode Amplifier." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 179-181.

A C-band 4-stage, 20 dB gain, 3-watt 25% bandwidth all ferrite substrate integrated GaAs avalanche diode amplifier is developed. The design procedure, as well as the amplifier performance including amplifier phase characteristics, is described. A power combining circuit which increases the output power capability by a factor of two is included in the output stage.



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Intermodulation Characteristics of X-Band IMPATT Amplifiers (1972 [MWSYM])

R.J. Trew, N.A. Masnari and G.I. Haddad. "Intermodulation Characteristics of X-Band IMPATT Amplifiers (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 182-184.

The intermodulation products produced when two equal amplitude signals are applied to the input of an X-band IMPATT diode amplifier have been measured. A Si p+nn+ IMPATT diode was operated in a double-slug-tuned reflection amplifier circuit that was tuned to provide 20 dB of small-signal gain at 9.340 GHz. The intermodulation tests consist of measurements of the magnitudes and frequencies of the amplifier output signals as a function of the input signal drive levels and frequency separations. The gain and single-frequency characteristics of the amplifier were also measured and are used along with the theoretical device and circuit admittance characteristics as a basis for explanation of the intermodulation results. A low-frequency dominance mechanism is found to exist in which the low-frequency signals are amplified more than the high-frequency signals. This mechanism becomes more significant as the amplifier drive level is increased.





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Widebandwidth IMPATT and Gunn Voltage Tuned Oscillators

K.M. Johnson. "Widebandwidth IMPATT and Gunn Voltage Tuned Oscillators." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 185-186.

This paper describes circuit techniques for obtaining wide frequency tuning capability from IMPATT and Gunn devices using varactor tuning. Using the coaxial circuit described here, an IMPATT VTO with a half octave tuning bandwidth (35%) was developed and a Gunn oscillator with a 52% bandwidth was achieved. Similar results have been reported previously by Large for a Gunn device circuit. The circuit described here applies equally well to IMPATT devices.

[Click on title for a complete paper.](#)



Abstracts

A 22 Percent C.W. Efficiency Solid State Microwave Oscillator

B. Kramer, A. Farayre, L. Hollan, E. Constant and G. Salmer. "A 22 Percent C.W. Efficiency Solid State Microwave Oscillator." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 187-190.

Operation of GaAs Schottky-barrier IMPATT diodes is reported. We describe the technology, the electrical characterization and the microwave coaxial measurements. Efficiencies of 22% at 6.5 GHz and 18.5% at 12 GHz were obtained. Computer calculations indicate that the efficiency of these devices may be considerably higher.



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Abstracts

Session 10 -- Gigabit Data-Rate Applications

"Session 10 -- Gigabit Data-Rate Applications." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 191-191.



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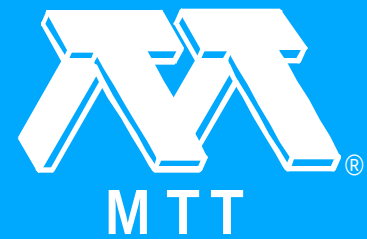


Abstracts

One Gigabit/Second Signal Processing and Data Handling

J.S. Gray. "One Gigabit/Second Signal Processing and Data Handling." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 192-194.

An overview of hardware developments allowing digital communication and data handling at a 1-Gb/s rate is presented. The signal processing hardware includes a 1-Gb/s QPSK modem, 500-Mb/s bit synchronizer - signal conditioners, and a test system. The data handling equipment includes developments for multiplexing, demultiplexing, recording, and analog-to-digital conversion. The signal plus noise performance of the modem and the bit synchronizer - signal conditioner is discussed.



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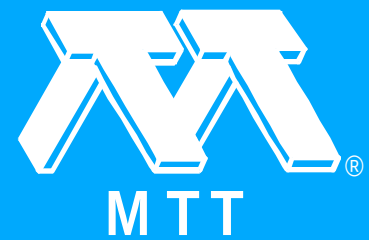
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Millimeter-Wave Solid-State Exciter-Modulator-Amplifier Module for Gigabit Data-Rate

H.J. Kuno, D.L. English and P.S. Pusateri. "Millimeter-Wave Solid-State Exciter-Modulator-Amplifier Module for Gigabit Data-Rate." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 195-197.

A module consisting of an IMPATT diode oscillator, a PIN diode bi-phase modulator, and an IMPATT diode power amplifier operated at a gigabit data-rate in-V-band frequency range is described.

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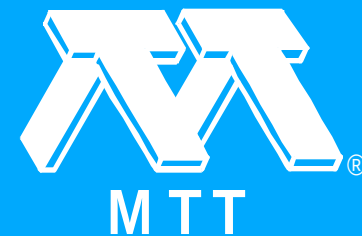


Abstracts

A 2 GHz Pulse Counter

H.G. Jungmeister and P. Drugh. "A 2 GHz Pulse Counter." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 198-200.

A counter able to process pulses of random distribution with repetition rates up to 2 GHz employs tunnel diodes in the input circuit and in the fastest flipflops. The outer circuits contain ECL and TTL ICs. Function and theory are discussed.

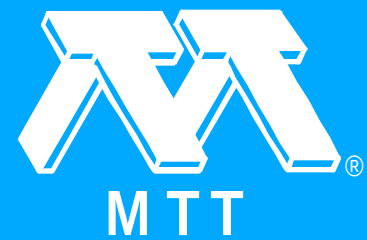


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An L-Band, High Baud-Rate DCPSK Detector/AFC Discriminator in Microstrip

H.F. Lenzing. "An L-Band, High Baud-Rate DCPSK Detector/AFC Discriminator in Microstrip." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 201-203.

A DCPSK detector/AFC discriminator circuit designed for a proposed millimeter-wave waveguide transmission system is described. The circuit operates at the system IF, 1.404 GHz. The baud rate is 280.8 Megabits/s. The circuit is built in microstrip on alumina substrates.

Click on title for a complete paper.



Abstracts

A New Phase Coherent Parametric Mixer for PCM-PSK Communications

M. Hata, N. Kondo, T. Ohta and Y. Masuda. "A New Phase Coherent Parametric Mixer for PCM-PSK Communications." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 204-206.

A new phase coherent parametric mixer pumped by quadruple frequency of input signal is developed with the objects of obtaining a carrier recovery circuit for synchronous detection and a new phase regenerator with excellent characteristics, especially for high-speed four-phase communications.



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Generating PBR Sequences for System Testing at 500megabits/Sec. and Higher Using IC Flip-Flops.

J.A. Coekin and J.R. Wicking. "Generating PBR Sequences for System Testing at 500megabits/Sec. and Higher Using IC Flip-Flops.." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 207-210.

Generating pseudo-random bit sequences at very high bit-rates is limited by the maximum switching speed of shift registers and modulo-2 adders. A system is proposed in which registers composed of integrated circuits, operating near their maximum bit-rate may be combined in parallel to produce sequences at much higher rates.



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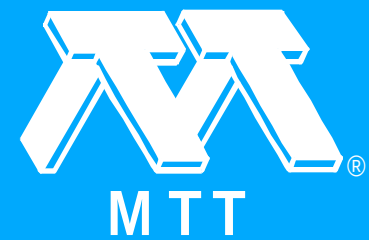
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Abstracts

Session 11 -- Microwave Integrated Circuits

"Session 11 -- Microwave Integrated Circuits." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 211-211.



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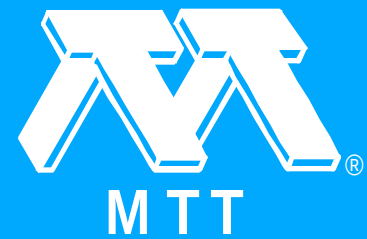


Abstracts

Microguide - A New Microwave Integrated Circuit Transmission Line

E.G. Cristal, A.F. Podell and D. Parker. "Microguide - A New Microwave Integrated Circuit Transmission Line." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 212-214.

A new transmission line for microwave integrated circuit applications at frequencies above X band is described. Although physically similar to microstrip, its principal mode of propagation is a quasi-TE/sub 10/ waveguide type mode. Preliminary measurements indicate low loss and reduced coupling between adjacent lines.



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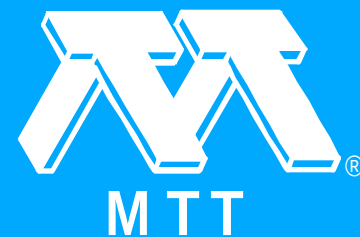


Abstracts

Recent Developments in Broadband Directional Couplers on Microstrip

F.C. de Ronde. "Recent Developments in Broadband Directional Couplers on Microstrip." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 215-217.

Introduction of lumped elements in the microstrip itself proved to be a rather simple way to overcome the difficulties encountered by achieving tight coupling (3 dB) and high directivity (>20 dB) for proximity couplers on plain microstrip. Three couplers were made as proof; two 3 dB proximity couplers: a distributed-lumped and an octave-flat lumped one, and a 8.34 dB decade-wide asymmetric coupler of the DuHamel & Armstrong type. It is evident that application of the new technique is not restricted to couplers.



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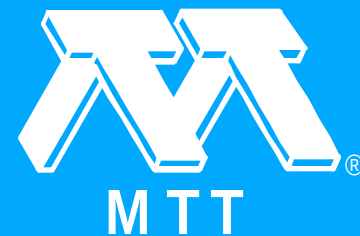


Abstracts

Ceramic Waveguide Microwave Integrated Circuits

W. From. "Ceramic Waveguide Microwave Integrated Circuits." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 218-220.

The transmission line to be described uses a plated ceramic as the waveguide or coaxial medium and represents a practical circuit integration technique for frequencies from C-band through at least K/sub A/-band. Preliminary investigations indicate that fabrication techniques are commensurate with high level integration and low cost.



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Abstracts

Two New Integrated-Circuit Media with Special Advantages at Millimeter Wavelengths

P.J. Meier. "Two New Integrated-Circuit Media with Special Advantages at Millimeter Wavelengths." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 221-223.

This paper describes two new integrated-circuit media called integrated fin-line and oversized microstrip. Their advantages over conventional microstrip at millimeter wavelengths include: reduced radiation, single-mode operation, less stringent tolerances, compatibility with hybrid devices, and ease of transition to standard waveguide.



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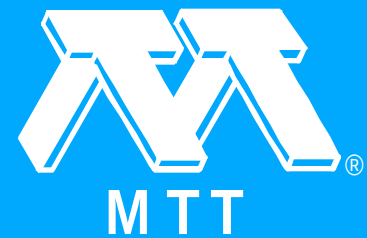


Abstracts

Hybrid Microwave Integrated Circuits for Millimeter Wavelengths

T.H. Oxley, K.J. Ming, G.H. Swallow, B.J. Climer and M.J. Sisson. "Hybrid Microwave Integrated Circuits for Millimeter Wavelengths." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 224-226.

This paper discusses some initial results which demonstrate the feasibility of hybrid M.I.C. designed for frequencies in the range 26 to 90 GHz. Practical single ended and balanced mixer circuits are described.



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An All Solid-State MIC Transmit - Receive Module

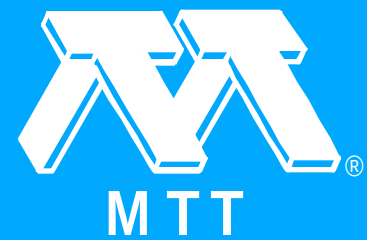
F. Sullivan and R. Perry. "An All Solid-State MIC Transmit - Receive Module." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 227-229.

This paper discusses the results obtained in the design and development of two breadboard solid-state MIC transmit-receive modules; the second unit being an improved version of the first unit. Attention will be focused on both results that were obtained, and the associated problems involved in the integration of several distinct components into a single module. The associated problem discussion will deal with two areas: 1) The difference in RF boundary conditions of a single component and of multiple components integrated into a single subsystem. 2) Fabrication difficulties as they related to integrating several components. The module under consideration was designed by Raytheon Company, Missile Systems Division, in 1969-1970. The effort was sponsored by the Air Force at Wright Patterson Air Force Base. The overall objective is to ultimately use such a module in airborne phased array communication systems.

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Design Considerations of a 3.1 - 3.5 GHz GaAs FET Feedback Amplifier

L. Besser. "Design Considerations of a 3.1 - 3.5 GHz GaAs FET Feedback Amplifier." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 230-232.

Recent GaAs FET devices have exhibited promising capabilities for microwave amplification. Circuit designers, however, found two problems with the FET applications, namely, the characteristically high input/output impedances are difficult to match into a 50 Ohm system and the potential instabilities that exists at frequencies below 4 GHz. This paper describes development work done on feedback circuits in designing an unconditionally stable FET amplifier in the 3.1 - 3.5 GHz frequency range by using conventional microstrip techniques, and also investigates the effect of feedback components on noise and output capabilities.

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Abstracts

Single and Dual Gate GaAs FET Integrated Amplifiers in C Band

S. Arnold. "Single and Dual Gate GaAs FET Integrated Amplifiers in C Band." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 233-234.

This paper outlines some aspects of the device characterisation, circuit design and realisation of hybrid integrated amplifiers in C Band. The performance of designs at 5 GHz employing single and dual-gate GaAs FETs are presented.



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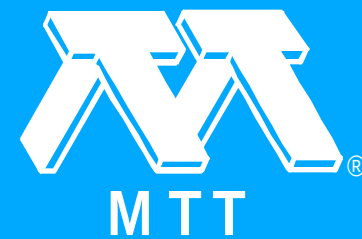
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Abstracts

Session 12 -- Ferrite Devices

"Session 12 -- Ferrite Devices." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 235-235.



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Abstracts

Ferrite Transmission Devices Using the Edge-Guided Mode of Propagation

M.E. Hines. "Ferrite Transmission Devices Using the Edge-Guided Mode of Propagation." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 236-237.

An edge-guided mode of propagation is found in wide microstrip and stripline transmission devices using ferrite dielectric slabs magnetized perpendicular to the ground plane. The theory of propagation is reviewed, and applications of the principles are described for devices such as isolators, multiport circulators, and phase shifters.



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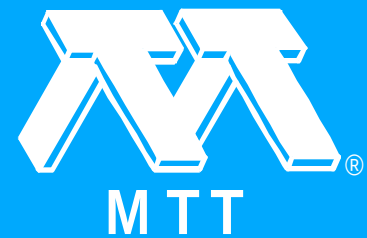


Abstracts

Experiments on the Optimization of a Novel M.I.C. Symmetrical Three-Port Circulator

P. de Santis and F. Pucci. "Experiments on the Optimization of a Novel M.I.C. Symmetrical Three-Port Circulator." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 238-240.

The results are reported of feasibility and optimization studies on a novel type of M.I.C. symmetrical, three-port, X-band circulator based on "edge guided waves" propagation.



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Elevated Substrate Ferrite Film Circulator

R.R. Jones, R.A. Moore, A.I. Braginski and T.R. Oeffinger. "Elevated Substrate Ferrite Film Circulator." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 241-242.

An elevated substrate ferrite film circulator has been designed. The ferrite film and the rf conductor are deposited completely above the substrate. The ferrite disc has its thermal expansion coefficient adjusted to match the sapphire substrate. Circulator insertion loss and isolation are 0.6 dB and 20 dB over a 5% bandwidth ($f_{\text{sub o}} = 12.3 \text{ GHz}$), respectively.

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Abstracts

A Lumped-Element Circulator on Ceramic Substrates

S. Okamura and T. Nagai. "A Lumped-Element Circulator on Ceramic Substrates." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 243-245.

By mounting a lumped-element ferrite-junction on the ceramic substrate, a small-sized circulator compatible with microwave integrated circuits is obtained. An L-band model with compensating microstrip circuits for broadbanding is also constructed on the one inch square alumina substrate.



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Abstracts

Switching Characteristics of Latching Ferrite Devices

J.E. Pippin. "Switching Characteristics of Latching Ferrite Devices." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 246-247.

Switching characteristics of latching ferrite devices are discussed and it is shown that the switching time may be defined in several ways, depending on the application of the device. The interdependence of the switching time specification with several other pertinent variables, such as driver cost, switching energy, and bandwidth, is discussed.



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A Precision Analog Duplexing Phase Shifter

C.R. Boyd and G. Klein. "A Precision Analog Duplexing Phase Shifter." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 248-250.

Ferrite phase shifters have long been employed in high power, analog control applications. However, the control characteristics of most of these structures have left much to be desired. The suppressed-rotation (Reggia-Spencer) type unit is a typical example; although it is simple to build, this geometry suffers from excessive temperature drift and frequency dispersion. Also, the phase shift vs. coil current characteristic depends intimately on the magnetization curve of the particular piece of ferrite used, and large hysteresis effects are generally experienced, further complicating the problem of accurate control. Finally, the mechanical configuration of a rod suspended in a waveguide makes removal of large amounts of dissipated rf energy difficult at best.

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Abstracts

Analysis of a Circular Waveguide Cavity Loaded with Thick Ferrite Disks

J.M. Hellums and L.E. Davis. "Analysis of a Circular Waveguide Cavity Loaded with Thick Ferrite Disks." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 251-254.

Solutions with $e^{-j\theta} + j\theta$ azimuthal dependence are investigated, with the aid of the computer, for a circular waveguide cavity containing thick, axially magnetized ferrite disks. Such an investigation and investigations of related configurations may have an application in the theory of the E-plane circulator.



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Committees (1972 [MWSYM])

"Committees (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 255-258.



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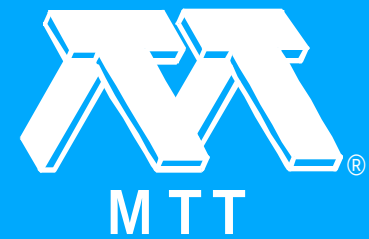
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Abstracts

1972 Microwave Prize Recipient and New Fellows Listing

"1972 Microwave Prize Recipient and New Fellows Listing." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 259-260.



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Membership Application (1972 [MWSYM])

"Membership Application (1972 [MWSYM])." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 261-261.



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Abstracts

Index, 1972 IEEE-GMTT International Microwave Symposium

"Index, 1972 IEEE-GMTT International Microwave Symposium." 1972 G-MTT International Microwave Symposium Digest of Technical Papers 72.1 (1972 [MWSYM]): 262-266.



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Front Cover (1973 [MWSYM])

"Front Cover (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): f1-f2.



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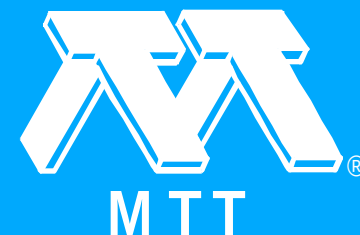
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Abstracts

1973 IEEE G-MTT International Microwave Symposium, Digest of Technical Papers

"1973 IEEE G-MTT International Microwave Symposium, Digest of Technical Papers." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): i-ii.



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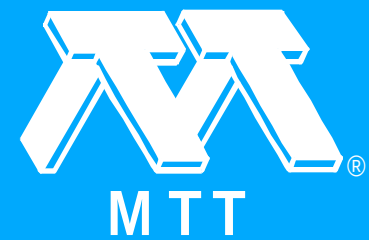
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Abstracts

Committees (1973 [MWSYM])

"Committees (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 1-5.



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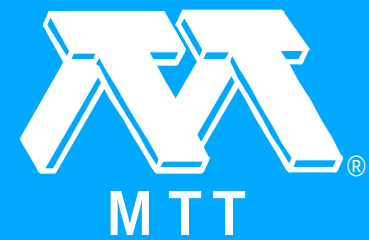
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Abstracts

Microwave Prize Recipients and New Fellows (1973 [MWSYM])

"Microwave Prize Recipients and New Fellows (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 6-7.



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Program (1973 [MWSYM])

"Program (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 8-14.



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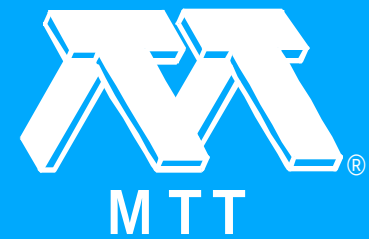
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Abstracts

Session I -- Millimeter and Submillimeter Wavelength Techniques

"Session I -- Millimeter and Submillimeter Wavelength Techniques." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 15-15.



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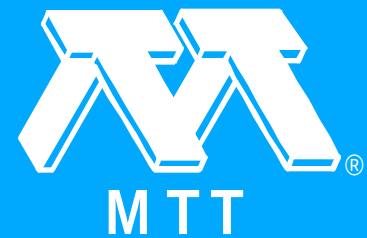


Abstracts

Millimeter-Wave Integrated Circuits (1973 [MWSYM])

M.V. Schneider. "Millimeter-Wave Integrated Circuits (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 16-18.

Recent advances in microstrip circuit technology and solid-state device technology have resulted in hybrid integrated circuits which look attractive for use in millimeter-wave communication systems. This paper describes the design and performance of frequency converters, solid-state sources, circulators and injection-locked amplifiers at millimeter wavelengths.



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Circular TE/sub 0n/ Mode Filters for a Guided Millimeter-Wave Transmission (1973 [MWSYM])

K. Hashimoto, S. Shimada and M. Koyama. "Circular TE/sub 0n/ Mode Filters for a Guided Millimeter-Wave Transmission (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 19-21.

This paper describes theoretical and experimental results of TE/sub 02/ and TE/sub 03/ mode filters for circular waveguides with large diameter. The experimental results show that the TE/sub 01/ insertion loss is less than 0.8 dB for the former and less than 0.4 dB for the latter over the 40 to 80-GHz frequency range. The attenuation loss of the undesired modes is more than 6 dB over the same frequency range for both filters.

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Modal and Coupling Characteristics of Inhomogeneous Dielectric Slab Waveguides

E.F. Kuester, D.C. Chang and S.W. Maley. "Modal and Coupling Characteristics of Inhomogeneous Dielectric Slab Waveguides." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 22-24.

A numerical scheme based on invariant imbedding methods is applied to the problem of calculating the propagation constants for the surface-wave modes of an inhomogeneous lossless dielectric slab. The method results in a first-order Riccati equation for the transverse wave impedance (or admittance), which is numerically integrated across the slab to yield the transverse resonance condition for each specific mode. The method is generalized to treat lossy structures, as well as coupling between slabs.

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Radiation Losses in Curved Dielectric Image Waveguides of Rectangular Cross Section

R.M. Knox, P.P. Toullos and J.Q. Howell. "Radiation Losses in Curved Dielectric Image Waveguides of Rectangular Cross Section." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 25-27.

An approximate analytical model has been developed for predicting the radiation attenuation in curved rectangular dielectric image waveguide. The radiation is shown to depend on radius of curvature, dielectric constant, and cross-sectional dimensions. Correlation of experimental measurements with theory was good.

[Click on title for a complete paper.](#)



Abstracts

Semiconductor Dielectric Waveguides for Millimeter Wave Functional Circuits

H. Jacobs and M.M. Chrepta. "Semiconductor Dielectric Waveguides for Millimeter Wave Functional Circuits." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 28-29.

High resistivity silicon has been used as a medium for low loss propagation of millimeter waves. In addition, associated components and devices can be constructed directly in semiconductor dielectric waveguides. The concept is analogous to that employed in integrated optics, except that here the medium is a semiconductor and the active elements are obtained with semiconductor devices.



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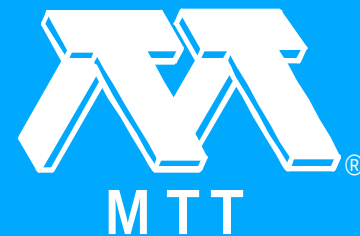


Abstracts

The Tungsten - P Type Silicon Point Contact Diode

A.J. Kerecman. "The Tungsten - P Type Silicon Point Contact Diode." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 30-34.

Video detection at 90 GHz, 890 GHz, 28.3 THz, and 474 THz is examined with respect to whisker advancement. Reproducible behavior of I-V curves is obtained and correlated with the RF data. A significant thermal effect is shown to compete with conventional barrier rectification. Micrographic analysis coupled with microhardness measurements clearly demonstrates that the tungsten whisker exerts sufficient pressure to deform the silicon surface of the diodes.



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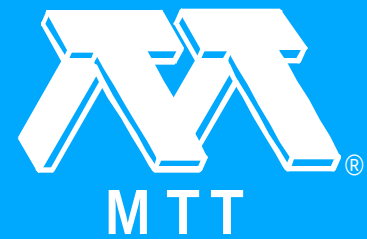


Abstracts

Reflection Beam Isolator for Submillimeter Wavelengths

M. Kanda and W.G. May. "Reflection Beam Isolator for Submillimeter Wavelengths." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 35-36.

Magnetoplasma reflection beam isolators for submillimeter wave use are discussed. The basic configuration used is that of the Kerr transverse magneto-optical effect. Theoretical and experimental data at 337 μm using InSb as a plasma medium are given.



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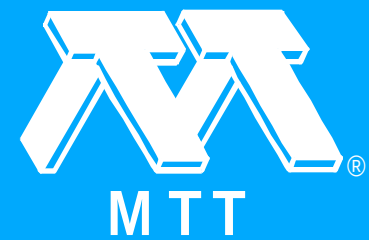
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Abstracts

Session II -- Computer-Aided Microwave Practices

"Session II -- Computer-Aided Microwave Practices." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 37-37.



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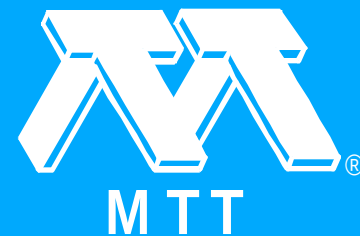


Abstracts

A Microwave Network Optimization Program

J.W. Bandler, V.K. Jha, C.M. Kudsia and J.R. Popovic. "A Microwave Network Optimization Program." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 38-40.

The paper describes a fully-documented, comprehensive, user-oriented computer program package that will analyze and optimize certain electrical networks such as microwave filters and allpass networks. The package is written in FORTRAN IV.



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Abstracts

Microwave Circuit Analysis by Sparse Matrix Techniques (1973 [MWSYM])

F. Bonfatti, V.A. Monaco and P. Tiberio. "Microwave Circuit Analysis by Sparse Matrix Techniques (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 41-43.

Linear microwave circuit analysis by sparse matrix techniques is discussed. Optimum equation ordering and pivoting are proposed to reduce execution time, storage requirement and to improve accuracy. Details on the implemented program and a numerical example are given.



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Abstracts

New Algorithms for Network Optimization (1973 [MWSYM])

C. Charalambous and J.W. Bandler. "New Algorithms for Network Optimization (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 44-46.

Two new algorithms suitable for optimization of networks are presented. Least pth approximation is used in such a way that any finite value of $p > 1$ can be used to produce minimax results very efficiently.



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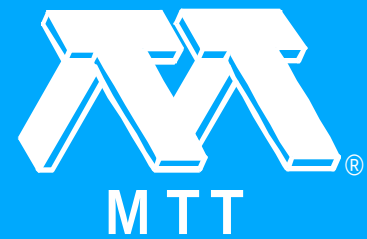


Abstracts

Numerical Techniques for TRAPATT Circuit Analysis and Design

R.D. Regier and K.L. Kotzebue. "Numerical Techniques for TRAPATT Circuit Analysis and Design." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 47-49.

Four numerical techniques used in conjunction with a simple diode model are described for the analysis of TRAPATT circuits. Some of these techniques require minimal computer time and hence appear promising for design purposes.



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Abstracts

Computer Simulation and Optimization of a Planar Phased Array of Circular Waveguide Elements

J. Dudgeon and E.J. Finnell, III. "Computer Simulation and Optimization of a Planar Phased Array of Circular Waveguide Elements." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 50-52.

Computer-aided optimization using a Ritz-Galerkin boundary value solution to a planar phased array of circular waveguide elements are presented. Wide angle impedance matching (WAIM) is sought, and mutual coupling and polarization effects are noted.



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Abstracts

Computer-Aided Design of a Waveguide Multiplexer

A.E. Atia. "Computer-Aided Design of a Waveguide Multiplexer." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 53-55.

A procedure based on an analysis algorithm and interactive program is described for the design of waveguide multiplexers. Simple rules, which enable the designer to quickly find a near-optimum design in a small number of iteration steps, are given. An example of a 6-channel communications multiplexer, which utilizes narrow-bandpass elliptic function waveguide filters, is also included.



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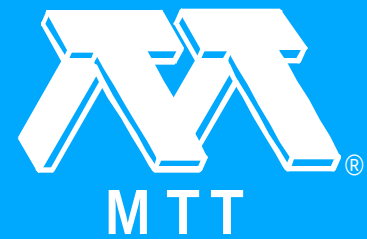


Abstracts

Acceleration of Convergence of the Finite-Element Method

E. Della Torre and W. Kinsner. "Acceleration of Convergence of the Finite-Element Method." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 56-58.

An extrapolation technique has been found effective in reducing the computation time in solving field problems by the method of finite differences. This technique has been applied to the finite-element method with a corresponding reduction in computation time.



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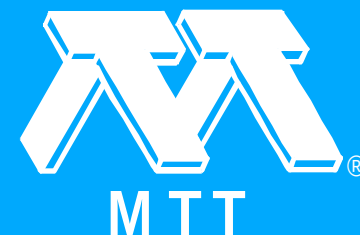
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Abstracts

Session III -- Millimeter Wavelength Components

"Session III -- Millimeter Wavelength Components." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 59-59.



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Abstracts

Power Amplification at 55-65 GHz with 18 GHz Gain-Bandwidth Product

J.E. Raue. "Power Amplification at 55-65 GHz with 18 GHz Gain-Bandwidth Product." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 60-62.

A high efficiency silicon avalanche diode power amplifier with 100-200 mW output power is described. Typical single stage gain of 20-22 dB with bandwidths exceeding 1 GHz has been achieved in production quantities. Best performance showed an 18 GHz voltage gain-bandwidth product.



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Abstracts

A Distributed PIN Diode Phaser for Millimeter Wavelengths

B.J. Levin and G.G. Weidner. "A Distributed PIN Diode Phaser for Millimeter Wavelengths." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 63-65.

A technique particularly applicable at millimeter wavelengths is described for electronically varying the phase shift per unit length in rectangular waveguide using a distributed PIN diode. Design, construction, and experimental evaluation at 140 GHz are described.



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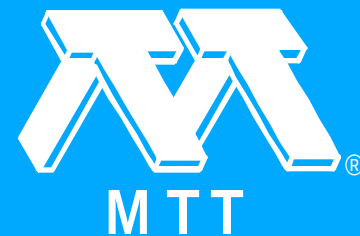


Abstracts

Low Conversion Loss Millimeter Wave Mixers

L.E. Dickens. "Low Conversion Loss Millimeter Wave Mixers." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 66-68.

To be reported in this paper are new results obtained for mixers in the frequency range up to 95 GHz. Both frequency diplexer types of mixers and those which utilize a standard directional coupler for LO injection will be discussed. The mixers use a replaceable wafer type diode holder. The replaceable wafer contains a unique Westinghouse developed double diode structure which results in very low RF losses. The diode is a GaAs Schottky barrier with zero bias frequency cut-off of over 800 GHz. Theoretically predicted values of conversion loss under 5.0 dB are attained over the frequency range.



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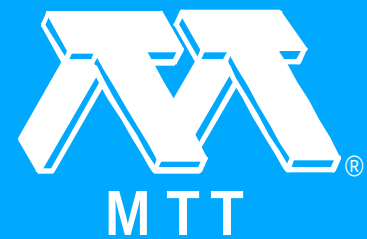


Abstracts

Solid States Devices at 50 GHZ

M. Akaike, N. Kanmuri, H. Kato, T. Miyakawa, N. Tokoyo, H. Yatsuka and H. Hayashi. "Solid States Devices at 50 GHZ." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 69-71.

This paper reports the features and some performances of a transmitting frequency converter, a receiving frequency converter and a local oscillator at 50 GHz. The output power of the transmitting converter is 12 dBm and the front end noise figure of the receiving converter is below 10.3 dB. The power and the frequency stability of the local oscillator are 20 dBm and within $\pm 7 \times 10^{-5}$ (0~60°C), respectively.



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20°K-Cooled Parametric Amplifier for 46 GHz with Less Than 60°K Noise Temperature

J. Edrich. "20°K-Cooled Parametric Amplifier for 46 GHz with Less Than 60°K Noise Temperature." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 72-74.

The first 20°K-cooled degenerate parametric amplifier for 46 GHz is described. New 20°K-cooled circulators and Schottky barrier junctions are used. Its noise of less than 60°K means almost an order of magnitude improvement over previous uncooled amplifiers.



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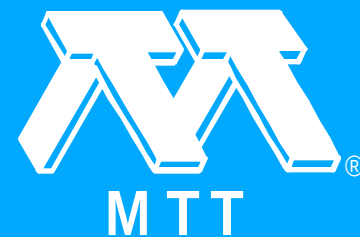


Abstracts

A Nondegenerate Millimeter Wave Parametric Amplifier with a Solid-State Pump Source

J. Whelehan, E. Kraemer, H. Paczkowski, F. Bourne, J. Taub, E.J. Wendt and A. Larsen. "A Nondegenerate Millimeter Wave Parametric Amplifier with a Solid-State Pump Source." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 75-77.

A state-of-the-art nondegenerate millimeter wave parametric amplifier that utilized a reliable solid-state pump source at 105 GHz has been successfully developed and tested in the 55 to 65 GHz frequency band. A gain of 14 dB with a 1 -dB bandwidth of 670 MHz has been obtained. The measured single-sideband noise factor of the paramp averaged 5.9 dB across the operating passband.



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Abstracts

Low Noise, 94 GHz Parametric Amplifier Development

H.C. Okean, J.R. Asmus and L.J. Steffek. "Low Noise, 94 GHz Parametric Amplifier Development." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 78-79.

This paper describes the development of a 94 GHz non-degenerate parametric amplifier, the first of its kind. Included in this discussion is a description of the evolution of the state-of-the-art high-quality varactor, circulator and millimeter-wave circuit technology necessary for low noise 94 GHz paramp realization. Finally, a description of the physical embodiment of the overall 94 GHz paramp is presented along with relevant measured performance data.



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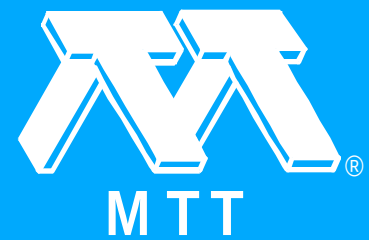
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Low Loss, 3mm Junction Circulator

H.C. Okean and L.J. Steffek. "Low Loss, 3mm Junction Circulator." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 80-82.

This paper describes the design and performance of a 3mm H-plane waveguide junction circulator which exhibited, with appropriate partial height ferrite and transformer dimensions, 0.5 to 1 dB insertion loss, 23 to 30 dB maximum isolation and 3 to 5 GHz 20 dB isolation bandwidth over the 80-100 GHz frequency range. Application of the resonant mode theory of H-plane waveguide circulator operation indicated that said circulator resonated in the axial "compact turnstile" mode, with strong correlation between theoretical and measured center frequencies.

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Abstracts

Session IV -- Passive Solid-State Devices

"Session IV -- Passive Solid-State Devices." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 83-83.



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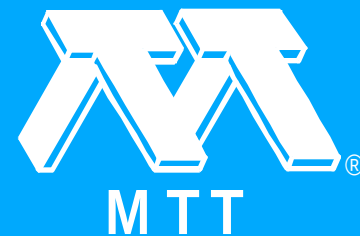


Abstracts

Octave Coverage Lumped Element Circulator Development

J. Wolczok and I. Rubinstein. "Octave Coverage Lumped Element Circulator Development." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 84-85.

A compact broadband 220 to 400 MHz lumped element RF circulator has been developed using novel band-switchable, single-tuned matching networks at each port. Isolations of greater than 15 dB and mid-band insertion losses of 1dB were obtained.



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On Stripline Four-Port Circulator

W.H. Ku and Y.S. Wu. "On Stripline Four-Port Circulator." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 86-88.

A rigorous and exact theory of four-port stripline circulator based on Green's function method is presented in this paper. Three circulation conditions were derived and numerical results are presented which can be used for practical four-port circulator design. Since the solution derived is exact, metal pin tuning is not necessary to fabricate the four-port circulator described in this paper.



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Abstracts

High Power S-Band Junction Circulator

R.A. Stern. "High Power S-Band Junction Circulator." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 89-91.

The design of a high-power air-cooled microwave Y junction circulator which is capable of operation at peak and average power levels of 800 kW and 800 W, respectively, is described. The unit is an H-plane waveguide circulator which is externally air cooled. The circulator design employs a full height substituted YIG rod together with boron nitride matching transformers.



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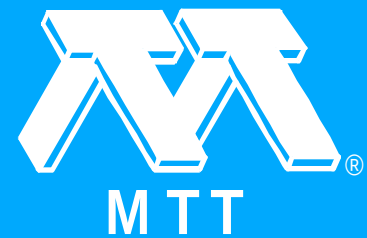


Abstracts

Wideband Operation of Microstrip Circulators

Y.S. Wu and F.J. Rosenbaum. "Wideband Operation of Microstrip Circulators." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 92-94.

Octave bandwidths are found to be readily obtainable in 3-port Y-junction microstrip circulators. Theoretical and experimental results are presented which show that wide coupling lines and a smaller than usual disk radius can be used to obtain wideband operation.



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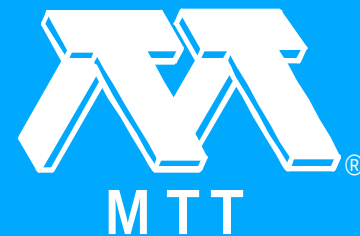


Abstracts

Review of Ferrite Phase Shifter Technology

L.R. Whicker. "Review of Ferrite Phase Shifter Technology." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 95-97.

Ferrite phase shifter technology is reviewed. Particular emphasis is placed on discussion of nonreciprocal, toroidal waveguide phasers and dual mode reciprocal phasers for use in phased array antennas.



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Abstracts

A Low Cost Lithium Ferrite Phase Shifter

D.A. Charlton. "A Low Cost Lithium Ferrite Phase Shifter." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 98-100.

Low cost construction techniques for twin slab ferrite phase shifters are presented along with an experimental comparison of garnet and lithium ferrite materials. A 3-bit phase shifter with lithium ferrite material which is approximately half the price of garnet material had a measured loss of 0.4 dB and a peak power handling of 4.5 kW.



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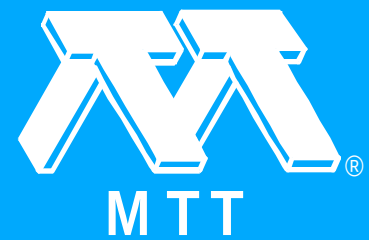
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The Twin-Ferrite-Toroid Circular Waveguide Phaser

F.J. Bernues and D.M. Bolle. "The Twin-Ferrite-Toroid Circular Waveguide Phaser." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 101-103.

The TE/sub 01/ mode in the circular waveguide loaded by two concentric ferrite toroids, magnetized circumferentially in opposite directions, is investigated. A method is proposed to switch the remanent magnetization of both toroids simultaneously by means of a single biasing wire. The dps (differential phase shift) shows substantial increase over that of the twin-ferrite slab phaser.

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Abstracts

Ultra Broadband Phase Shifters

G.D. Lynes. "Ultra Broadband Phase Shifters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 104-106.

A method is shown wherein the resonance effects on three types of PIN diode phase shifters may be completely eliminated, thereby increasing the bandwidth and reducing phase shift limitations. By employing this method, multi-octave phase shifters have been constructed.



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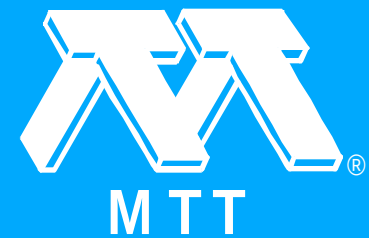


Abstracts

Driverless Phase Shifters

R.W. Burns, R.L. Holden and R. Tang. "Driverless Phase Shifters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 107-110.

Characteristics of two novel microwave semiconductor switching devices which do not require forward current for switching are described. These devices effectively eliminate the need for drivers in phased array antennas; hence, greatly reducing the cost of phased array radars.



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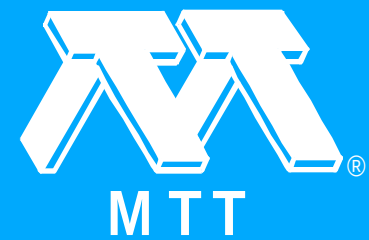
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Abstracts

Panel Session -- Nonlinearities in Microwave Devices and Systems

"Panel Session -- Nonlinearities in Microwave Devices and Systems." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 111-111.



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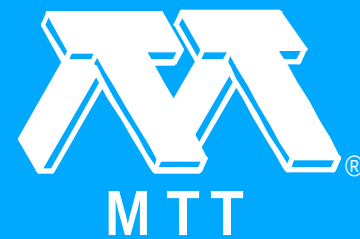


Abstracts

The Relationship Between Non-Linearity Measurements and Performance in CATV Systems

K.A. Simons. "The Relationship Between Non-Linearity Measurements and Performance in CATV Systems." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 112-112.

The signals carried by a CATV system generally consist of a great many (20 or more) amplitude-modulated picture carriers, each accompanied by its frequency-modulated sound carrier. In a large system, these signals pass through as many as 50 amplifiers in tandem. To avoid appreciable degradation of the received picture, distortion products must be kept 50 to 60 dB below the picture signal for the entire system, which implies distortion levels 90 to 100 dB down in the individual amplifiers.



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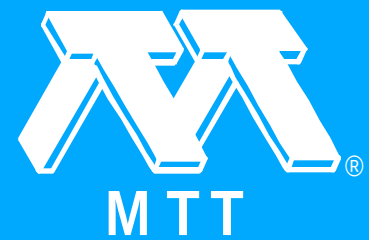
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Two-Tone Nonlinearity Testing - The Intercept Point $P_{i/}$

F.F. Fulton, Jr.. "Two-Tone Nonlinearity Testing - The Intercept Point $P_{i/}$." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 112-112.

When a nonlinearity is modeled as memoryless with a three-term power series, a convenient way of expressing the characteristics is by the use of intercept points. An intercept point is the output power level at which the fundamental tone and the distortion tone have equal amplitudes. For many practical system problems, specification of an intercept point permits very quick calculation of distortion tone levels; in particular, given two equal amplitude fundamental tones at similar frequencies, the adjacent third order distortion product is down from a fundamental by twice the number of decibels that the fundamental is down from the third order intercept point. Even more simply, the second order distortion is down from a fundamental by an amount equal to the number of decibels that the fundamental is down from the appropriate intercept point.

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Abstracts

Three-Tone Nonlinearity Testing - The Intermodulation Coefficient, M

R.C. Heidt. "Three-Tone Nonlinearity Testing - The Intermodulation Coefficient, M." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 113-113.

In many cases single tone and two-tone testing of nonlinear devices yield sufficient information for the systems designer. Additional diagnostics can be obtained from three-tone testing.



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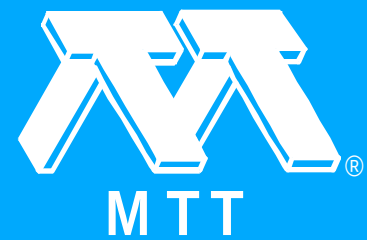


Abstracts

Noise Loading of FM Systems the Noise-Power-Ratio (NPR) and Customer Requirements

J.C. Gillespie. "Noise Loading of FM Systems the Noise-Power-Ratio (NPR) and Customer Requirements." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 113-113.

Amplitude and phase non-linearities in multichannel FM transmission systems must be closely controlled to avoid excessive intermodulation noise in the derived message channels. Though parameters may be measured individually, their combined effect on distortion performances most directly measured by applying a standard test signal to the FM system which closely simulates the working multi-channel baseband signal. For high capacity systems, this baseband signal is closely approximated by a band of Gaussian (white) noise, band-limited at the same frequencies as the working baseband.



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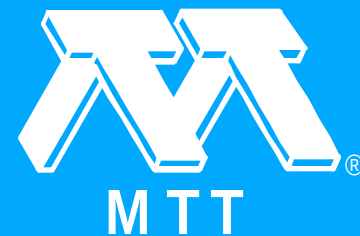


Abstracts

Relationships Between Nonlinearity Parameters

G.L. Heiter. "Relationships Between Nonlinearity Parameters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 114-114.

The nonlinearity parameters discussed by this panel can be interrelated analytically. On logarithmic scales straight line relationships result. Good agreement is found between predicted and observed quantities for power levels below the region where the gain deviates severely from its low level value.



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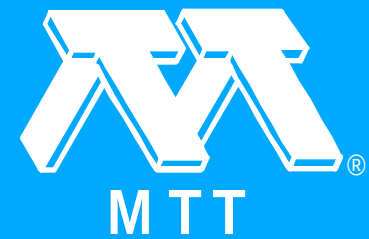
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Abstracts

Session V -- Microwave Delay Lines and Acoustic Devices

"Session V -- Microwave Delay Lines and Acoustic Devices." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 115-115.



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Abstracts

Systems Applications of Acoustic Surface Wave (Abstract)

T.W. Bristol. "Systems Applications of Acoustic Surface Wave (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 116-116.

The unique characteristics of surface wave devices provide cost-effective new solutions to system problems which extend ultimate system performance capabilities. This paper summarizes the current and projected performance of surface wave delay lines, tapped delayed lines, dispersive filters, and band-pass filters with emphasis on how it relates to improved capabilities of military radar and spread spectrum communications systems. Examples include applications in radar pulse compression and multiple target indicators, and low probability of intercept and multiple access communication systems.



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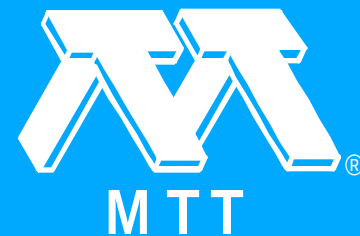


Abstracts

A Synthesis Procedure for Unapodized Nondispersive Surface Wave Filters

W.R. Smith. "A Synthesis Procedure for Unapodized Nondispersive Surface Wave Filters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 117-119.

A synthesis procedure is presented for nondispersive surface acoustic wave filters having unapodized transducers. The simplest filter design utilizes flat-passband transducers whose uniform acoustic beam is useful in acoustic correlators and reflective array pulse compressors (RAC). Another device is a spectral weighting (e.g. Hamming) filter which may be a separate unit or an integral part of a RAC.



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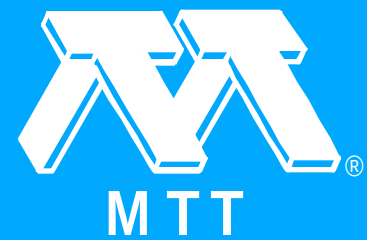
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The Microwave Realization of a Simple Surface Wave Filter Function

R.D. Weglein and E.D. Wolf. "The Microwave Realization of a Simple Surface Wave Filter Function." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 120-122.

Surface wave acoustic device technology continues to generate new ideas, analyses and potential applications at an impressive rate. Concomitant introduction of some specific low-frequency prototypes into systems design and subsequently hardware is witness to the growing acceptance of this technology by the systems community. The demand for specific filter functions at steadily increasing frequencies is a natural consequence of this trend. Therefore, second order as well as high frequency effects must be understood in detail, if the desired filter properties are to be realized. In this paper the authors discuss the design and fabrication of a microwave delay line with a precisely specified bandpass characteristic and center frequency. The filter design required a parabolic form factor (to within ± 0.3 dB) and essentially ripple free (< 0.1 dB) in-band response between 3 dB points. The filter was fabricated using three-period tuned interdigital transducers produced by electron beam microfabrication. The emphasis of this paper will be on interaction of the various effects, such as electrical load and acoustic mass loading, frequency dependent propagation loss and matching element parasitics which, particularly at microwave frequencies, render the achievement of the desired pass band properties more difficult. In addition, the accuracy and stability requirements of the electron beam microfabrication of micron-sized electrode geometry will be discussed. The sources and control of spurious response ripples which degrade the otherwise smooth transfer function are also discussed.

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Large Pulse Compression Ratio Obtained with Nonlinear Interaction of Bulk Acoustic Waves in LiNbO₃

J.M. White, D.K. Winslow and H.J. Shaw. "Large Pulse Compression Ratio Obtained with Nonlinear Interaction of Bulk Acoustic Waves in LiNbO₃." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 123-125.

We report here on increased bandwidth in bulk wave parametric convolvers, and demonstrate a new approach to cancellation of the inherent signal distortion in time inverters. A 6 ns compressed pulse has been generated in the convolver by autoconvolution of a 7 μ s V-FM chirp signal (center frequency of 1.2 GHz), using the nonlinear interaction of longitudinal waves in LiNbO₃. Time inversion of microwave signals has been demonstrated with uniform output for signal lengths up to 5 μ s, by compensating for the signal distortion resulting from delay line attenuation.

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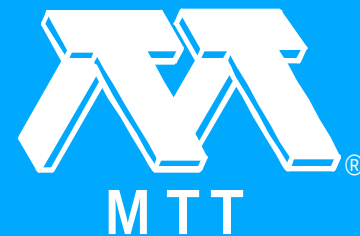


Abstracts

Development of an L-Band Pulse Compressor Using Surface Waves

D.T. Bell, Jr. and D.W. Mellon. "Development of an L-Band Pulse Compressor Using Surface Waves." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 126-128.

Projection printing can be used for definition of interdigital electrode patterns with the third harmonic at 1.3 GHz. Tradeoffs in finger geometry, bulk mode suppression, and control of impedance are considered and experimental results are presented.



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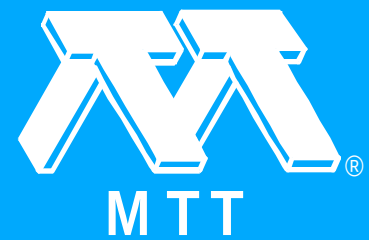
Device Performance Using Magnetic Waves at X Band

W.L. Bongianni. "Device Performance Using Magnetic Waves at X Band." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 129-131.

The development of samarium cobalt magnets, high quality epitaxial yttrium iron garnet (YIG) films, and a better understanding of surface magnetic waves have resulted in a new class of signal processing devices at X band.

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Control of Surface Acoustic Waves with Distributed Varactors

G. Chao. "Control of Surface Acoustic Waves with Distributed Varactors." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 132-133.

A distributed Schottky barrier varactor junction is described, capable of varying the electrical boundary conditions seen by a surface wave propagating on a piezoelectric medium. Control of the acoustic wave is evidenced by almost 180° of phase shift in 1.75 mm of interaction length at 54 MHz.

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Abstracts

Electronically Controllable Time Delay

J. Burnsweig, W.T. Gosser and S.H. Arneson. "Electronically Controllable Time Delay." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 134-136.

An electronically controllable, time delay implementation is described for composite TV video signals using quartz substrate, surface acoustic-wave delay lines with CHIRP coded interdigital transducers. Potential applications to radar, data links, and CATV systems are indicated.



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Abstracts

Session VI -- Microwave Measurements

"Session VI -- Microwave Measurements." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 137-137.



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Abstracts

A New Method for Measuring Dielectric Properties of Material Media Using a Microstrip Cavity

T. Itoh and R. Mittra. "A New Method for Measuring Dielectric Properties of Material Media Using a Microstrip Cavity." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 138-139.

A new method for non-destructive testing has been developed for measuring the dielectric constant and the dissipation factor of a slab-type material using a microstrip line cavity. The method has several advantages and yields accurate results with a simple procedure.



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Metrological Applications of a Property of Stationarity in Rectangular Cavities Containing a Dielectric Slab

C.E. Eugene. "Metrological Applications of a Property of Stationarity in Rectangular Cavities Containing a Dielectric Slab." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 140-142.

A property of stationarity for the resonant frequency of a rectangular cavity in function of the thickness of a dielectric slab inserted in it, leads to a new and accurate measuring method of the permittivity of the sample.



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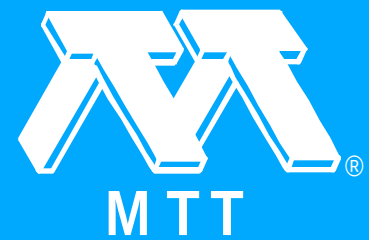
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Measurement of Transmission Cavity Quality Factors

F.M. Palka and J.R. Ashley. "Measurement of Transmission Cavity Quality Factors." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 143-145.

The high internal Q and the presence of two coupling ports greatly complicate the accurate determination of the Q and coupling factors for the transmission cavities used in the stabilization of microwave oscillators. Most signal sources used in microwave measurements do not have sufficient carrier stability to allow VSWR measurements on resonators with Q 's greater than 10,000 and a dynamic or sweeping method is required. This paper uses a method based on readily available sweep oscillators. A system for proper termination of the "unused" port is described. The most significant advantage of the method is the small amount of time required to take and process the data.

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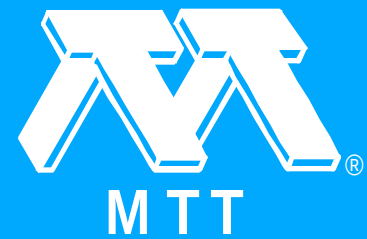


Abstracts

A New Computer-Controlled Klinger Cavity Mode Conversion Test Set

B.S. Seip and L.W. Hinderks. "A New Computer-Controlled Klinger Cavity Mode Conversion Test Set." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 146-148.

In the mm waveguide system, components are needed to transform the TE/sub 10//spl square/ mode into the TE°/sub 01/ mode. A new computer controlled Klinger Cavity Test Set has been developed for measuring the modal purity of mm waveguide components.



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Abstracts

A Reference Noise Standard for Millimeter Waves

W.C. Daywitt. "A Reference Noise Standard for Millimeter Waves." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 149-150.

The WR15 Thermal Noise Source that is used as the National Reference Standard of noise power in the frequency range from 56 GHz to 64 GHz is described in the following summary. The source forms a basis for both the noise power comparison services and noise figure service offered by the National Bureau of Standards in this frequency range.



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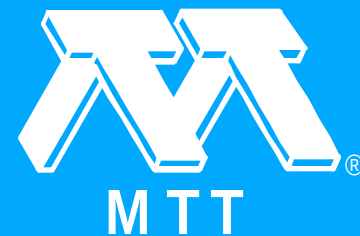


Abstracts

A High Precision Swept RF Reflectometer System in Coaxial Line (Abstract)

P. Lacy and W. Oldfield. "A High Precision Swept RF Reflectometer System in Coaxial Line (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 151-151.

A system is presented which provides a decade improvement in voltage reflection coefficient measurement accuracy over the range of 0 to 50 dB return loss. The technique separates the unknown from the error signals. Two methods using a combination of old and new techniques are presented Error Averaging and Magnified Swept Sensor. The basic ingredients are precision airline and directional bridge. A mathematical review of the old and the new reflectometer methods will be included.



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Abstracts

Swept Long Line Detector Network Analyzer

R. Garver and F. Weinert. "Swept Long Line Detector Network Analyzer." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 152-154.

A network analyzer is described which provides the measurement of both magnitude and phase of S_{11} and S_{21} . The RF components of the system are resistors, video detectors, and long lines, giving wide bandwidth.



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Abstracts

Large-Signal S-Parameter Characterization of UHF Power Transistors

R.J. Chaffin and W.H. Leighton. "Large-Signal S-Parameter Characterization of UHF Power Transistors." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 155-158.

The problems involved in the measurement and application of large-signal S-parameters for UHF power transistors are discussed. Experimental results obtained using a specially designed high-power S-parameter test set are reported.



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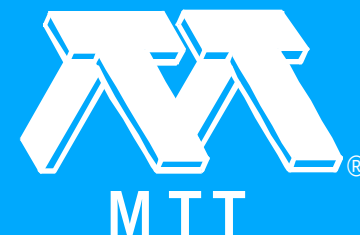
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Abstracts

Session VII -- Active Solid-State Devices (A)

"Session VII -- Active Solid-State Devices (A)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 159-159.



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Abstracts

A Push-Pull IMPATT Diode Amplifier

W.C. Tsai and C.W. Lee. "A Push-Pull IMPATT Diode Amplifier." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 160-162.

A new circuit approach which connects two IMPATT diode chips in push-pull configuration is presented. The impedance level of the push-pull diode is doubled. The theoretical device maximum output power capability is increased by a factor of four.



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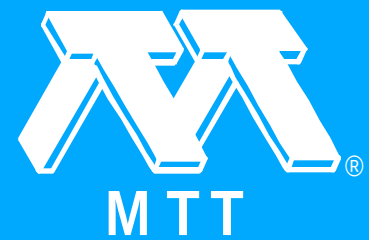
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A High-Power, C-Band Multiple IMPATT Diode Amplifier

R.E. Lee, D. Parker and U. Gysel. "A High-Power, C-Band Multiple IMPATT Diode Amplifier." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 163-165.

The design and performance of a high-power, reflection type microwave amplifier is described. The amplifier utilizes four individually matched silicon IMPATT diodes and a hybrid-circuit power-combiner scheme to achieve a CW output of 8 watts at 5.23 GHz with 6-dB gain and a power added efficiency of over 5 percent. FM and AM noise performance of the IMPATT amplifier is compared to that of a medium power klystron. The design of the hybrid-circuit power combiner is outlined and test results obtained on the four-way combiner are presented.

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Abstracts

Characteristics of IMPATT Diode Reflection Amplifiers (1973 [MWSYM])

R.W. Laton and G.I. Haddad. "Characteristics of IMPATT Diode Reflection Amplifiers (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 166-168.

The nonlinear characteristics of stable IMPATT diode reflection amplifiers including the dependence of gain, bandwidth and saturation properties upon device material, doping profile and operating conditions are given.



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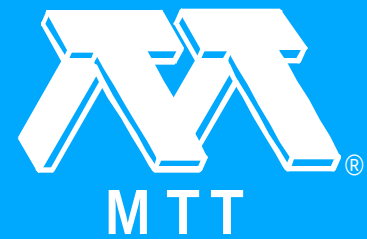


Abstracts

A Ku-Band IMPATT Amplifier with Improved Intermodulation Products

H. Komizu, Y. Daido, H. Ashida, Y. Ito and M. Honma. "A Ku-Band IMPATT Amplifier with Improved Intermodulation Products." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 169-171.

More than 40 dB 3rd order intermodulation product has been achieved in a 13 GHz band 2-stage IMPATT amplifier with 21 dBm output level and 11 dB gain, using diode bias current compensation and phase predistortion techniques. Theoretical calculations also verified the experimental data.



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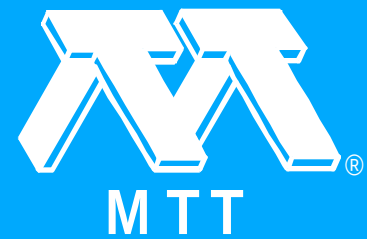


Abstracts

Impedance Characteristics of TRAPATT Oscillator Circuits

J.D. Welch and P.T. Greiling. "Impedance Characteristics of TRAPATT Oscillator Circuits." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 172-174.

An accurate, closed-form analysis has been developed for calculating the harmonic matching impedance required for a time-delay-triggered TRAPATT oscillator. Quantitative agreement was obtained with experimental impedance measurements on an S-Band oscillator.



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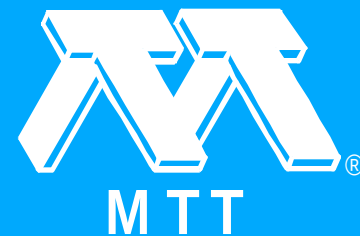


Abstracts

F-Band TRAPATT Diode Fundamental Mode Amplifier Circuits

V.A. Mikenas. "F-Band TRAPATT Diode Fundamental Mode Amplifier Circuits." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 175-177.

This paper describes some new circuit approaches and corresponding performance breakthroughs for F-Band TRAPATT diode circuits. Power outputs of up to 200 watts have been measured for fundamental mode operation at F-Band using alumina substrate circuits.



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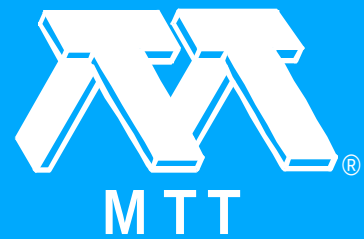


Abstracts

The Design of Lumped-Element TRAPATT Circuits

K.L. Kotzebue and R.D. Regier. "The Design of Lumped-Element TRAPATT Circuits." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 178-180.

Using a simple diode model, computer simulations have been made which show that simple, all-lumped-element, high-efficiency TRAPATT circuits are feasible. Such circuits should possess greater bandwidth than conventional distributed TRAPATT circuits.



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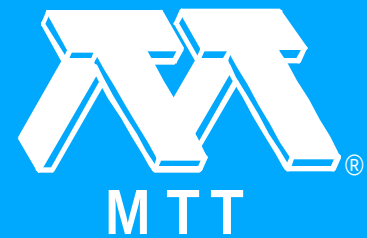


Abstracts

Transmission Cavity and Injection Stabilization of an X-Band Transferred Electron Oscillator

J.R. Ashley and F.M. Palka. "Transmission Cavity and Injection Stabilization of an X-Band Transferred Electron Oscillator." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 181-182.

The theory and operation of a novel new oscillator is presented. The F.M. Noise at X-band is less than .3 Hz rms in a 100 Hz bandwidth while the carrier stability is that of a high quality Quartz oscillator. The oscillator consists of a Transferred Electron Oscillator (Gunn Diode) in a moderate Q cavity transmission stabilized with a TE/sub 011/ resonator at X-band. A low level signal is injected between the oscillator cavity and the stabilizing cavity to synchronize the X-band oscillation with a harmonic of a 100 MHz Quartz oscillator. The locking power is sufficient to hold synchronization for tens of minutes without significantly degrading the F.M. noise of the system. The oscillator system has made possible several break-throughs in frequency and time measurements.



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Abstracts

Session VIII -- Civil Microwave Systems

"Session VIII -- Civil Microwave Systems." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 183-183.



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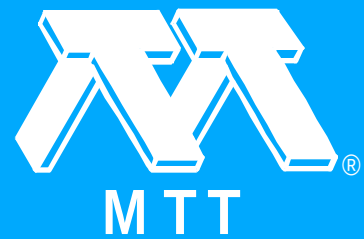


Abstracts

The Environmental Impact of Microwave Systems in the 70's

D.M. Jansky. "The Environmental Impact of Microwave Systems in the 70's." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 184-185.

This paper will commence with a description of the present use and dependence upon microwave systems within the United States, particularly from the point of view of the Federal Government. Secondly, a description will be given of the kinds of advances projected in microwave technology during the 70's and the kind of new systems these advances will bring into use. The paper will then discuss the two major aspects of environmental impact that both present and proposed systems will make. These include the impact of new systems on existing systems and secondly, the impact of a microwave system on the biological environment. Finally, this paper will discuss the implications of environmental impacts insofar as adequacy of boundary conditions in each area.



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Abstracts

The Satellite Solar Power Station

P.E. Glaser. "The Satellite Solar Power Station." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 186-188.

The feasibility of power production on Earth by means of a satellite solar power station is discussed. The status of technology to achieve solar energy conversion, microwave generation, transmission and rectification and transportation to synchronous orbit is reviewed, and costs for the system and components are presented.



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Abstracts

Adapting Microwave Techniques to Help Solve Future Energy Problems (1973 [MWSYM])

W.C. Brown. "Adapting Microwave Techniques to Help Solve Future Energy Problems (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 189-191.

The relationship between microwave techniques and the growing concern for future sources of energy is reviewed. The relationship is specifically explored in the use of a microwave beam to efficiently transport power from an array of solar photovoltaic cells in space to the Earth's surface. Recent advances in power conversion technology and experimental results on overall efficiency of free-space power transmission are reviewed.



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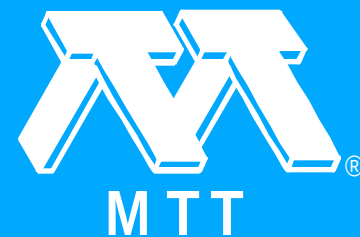


Abstracts

Comparison of Microwave, Millimeter Wave and Optical Techniques for Communications (Abstract)

F. Arams. "Comparison of Microwave, Millimeter Wave and Optical Techniques for Communications (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 192-192.

The properties at millimeter and optical/infrared wavelengths of four key communications system elements will be surveyed. The key elements are: sensitivity of the receiving system, antenna properties, available transmitter power and atmospheric transmission. Fundamental equations, available data, and parameters on realizable systems will be presented and discussed.



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Abstracts

Millimeter Wave Space Communications with the ATS-F Satellite

L.J. Ippolito. "Millimeter Wave Space Communications with the ATS-F Satellite." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 193-194.

The first space communications system operating at millimeter wavelengths is planned for the sixth NASA Applications Technology Satellite (ATS-F), scheduled for launch in April of 1974. The ATS-F experiment is designed to provide engineering data on wideband space-to-earth transmissions at 20 GHz and 30 GHz as a function of meteorological conditions and modulation techniques. This paper describes the system design for both the spacecraft and ground station portions of the experiment and emphasizes the unique design characteristics of these relatively new and unexplored frequency bands.



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Abstracts

Three-Axis Attitude Sensing on ATS-F/G Spacecraft (Abstract)

A. Kampinsky. "Three-Axis Attitude Sensing on ATS-F/G Spacecraft (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 195-195.

This paper describes the evolution of an R. F. microwave attitude, three axis, sensor specifically designed for the stringent angular accuracies and five-year longevity requirements of advanced Communications capabilities. The achieved instrument, is based upon the interferometric principle, however, with high angular accuracy (3 sigma 3×10^{-4} radians), stability, and with an inherent capability of uprating by one or more orders of accuracy for Earth Resources and Meteorological applications.



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Abstracts

2.6 GHz Satellite TV Broadcast Receiver

J.A. Hall, R.D. Pering and D.J. Mellor. "2.6 GHz Satellite TV Broadcast Receiver." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 196-197.

The microwave satellite receiver described in this paper combines state-of-art performance and excellent reliability at low cost by extensive use of microwave integrated circuit technology.



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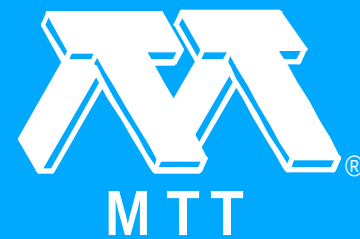
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Avalanche Diode Source with Integrated AFC Circuit and Frequency Converter for Digital Communication Systems

S.F. Paik, R.E. Blight, C.J.R. Pallemerts, W.W. Rollins and G.G. Russo. "Avalanche Diode Source with Integrated AFC Circuit and Frequency Converter for Digital Communication Systems." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 198-200.

An integrated 11 GHz source is developed for a digital communication system with emphases on suppression of interference by spurious signals. Performance characteristics of the integrated source/converter module are measured in a Q-PSK modulated system carrying up to 40 M-bits of data.



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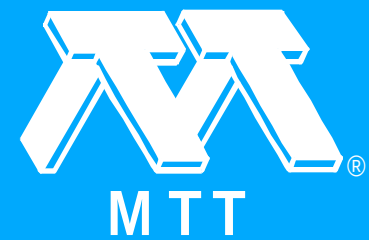
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Abstracts

Session IX -- Microwave Filters and Related Components

"Session IX -- Microwave Filters and Related Components." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 201-201.



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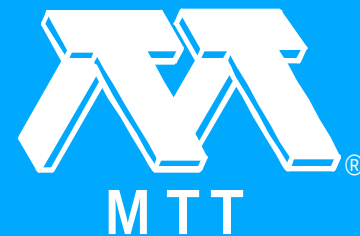


Abstracts

Temperature Stable Microwave Dielectric Resonators Utilizing Ferroelectrics

J.K. Plourde. "Temperature Stable Microwave Dielectric Resonators Utilizing Ferroelectrics." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 202-204.

Temperature stable dielectric resonators suitable for high quality microwave filter applications have been obtained with composite structures utilizing either $\text{LiTaO}_3/\text{TiO}_2$ or $\text{LiNbO}_3/\text{TiO}_2$. These resonators yield $\epsilon \sim 50$ and $Q \sim 5000$ at 4 GHz.



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Abstracts

Improved Hairpin-Line Filters

U.H. Gysel. "Improved Hairpin-Line Filters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 205-207.

A new theory is presented for hairpin-line and hybrid hairpin-line/half-wave parallel-coupled-line filters that leads to a better physical understanding of the filter response. Improved performance is obtained. In particular, the bandwidth can be controlled closely. Results are compared with previous designs.



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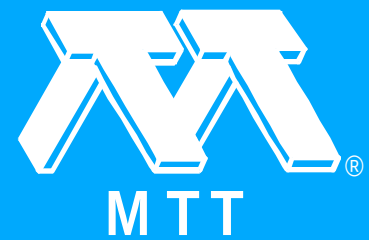
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The Waveguide Sandwich Harmonic Rejection Filter

J.D. Rhodes. "The Waveguide Sandwich Harmonic Rejection Filter." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 208-209.

A novel technique is presented for a harmonic rejection filter which attenuates only prescribed harmonic bands. This waveguide 'sandwich' filter is constructed from several plates which are dowelled together and results in a very compact and inexpensive device.

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Abstracts

Non-Minimum Phase, Optimum Amplitude, Bandpass Waveguide Filters

A.E. Atia and A.E. Williams. "Non-Minimum Phase, Optimum Amplitude, Bandpass Waveguide Filters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 210-212.

This paper describes the synthesis of narrow-bandpass waveguide filters having flat group delay and optimum amplitude characteristics. The design utilizes orthogonal-mode square waveguide cavities which lead to compact and lightweight filters.



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Abstracts

A Low-Loss, Wideband Transmitter Multiplexer

J.I. Smith and R.E. Fisher. "A Low-Loss, Wideband Transmitter Multiplexer." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 213-214.

A network capable of multiplexing two 850 MHz transmitter channel groups is described. This combining network has a theoretical ratio of channel group bandwidth to minimum group separation of 150 to 1 for a 1 dB maximum loss.



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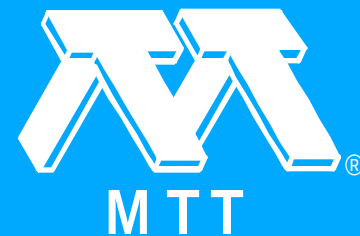


Abstracts

Frequency Multiplexing with Active Networks

N.M. Swamy and V.P. Kodali. "Frequency Multiplexing with Active Networks." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 215-217.

The realisation of UHF and microwave frequency active multiplexers and measured characteristics for diplexers and triplexers, with both contiguous and non-contiguous channels, are described.



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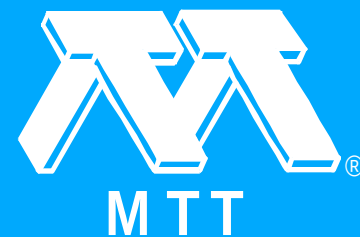
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Basic Considerations on TEM-Mode Hybrid Power Dividers

N. Nagai and A. Matsumoto. "Basic Considerations on TEM-Mode Hybrid Power Dividers." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 218-220.

This paper presents a three-way hybrid power divider which splits one signal into three output signals with arbitrary amplitude ratios at all frequencies, and achieves a perfect isolation among all output ports at one frequency.

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Abstracts

New Non-Uniform Waveguide Taper Design Yielding Low VSWR and High Rejection

H.J. Gould, A.E. Smoll and C.C. Han. "New Non-Uniform Waveguide Taper Design Yielding Low VSWR and High Rejection." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 221-223.

A new and improved theoretical method is described for the design of continuous exponential waveguide tapers which may be utilized in designing high pass filters or transitions between different sized waveguides. Comparisons are made between the new approach and commonly published designs. Experimental results from a filter, with a 1% separation between the passband and the stop band, designed by the new method are presented.



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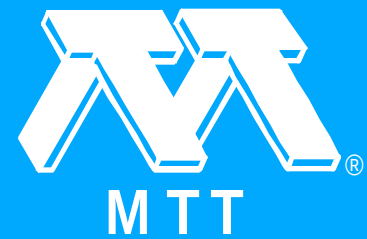
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Abstracts

Panel Session -- Microwave Noise Measurements and System Effects

"Panel Session -- Microwave Noise Measurements and System Effects." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 225-225.



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Abstracts

An Overview of the Role of Microwave Noise in Systems

S. Okwit. "An Overview of the Role of Microwave Noise in Systems." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 226-226.

A brief description of the effect of noise on microwave systems will be presented. A summary of figures of merit for systems such as radar, communications, radiometry, etc., and how the different sources of noise enter into the development of these figures of merit will be given. This talk will be aimed at presenting an overview of the role of the different noise generating mechanisms and their characterization, on microwave systems.



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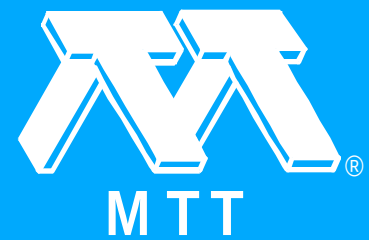
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Measurement of Noise Performance Factors

M.G. Arthur. "Measurement of Noise Performance Factors." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 226-226.

During the past three decades since the introduction of the concept of noise factor, many techniques have been used to measure the noise performance of amplifiers and other electronic transducers. Recently, a project at the National Bureau of Standards provided the opportunity to review many of these techniques and to make a critical comparison of their merits. The results of this review and comparison will be available soon as a "metrology guide" for noise performance factors. They are briefly described during this Panel Discussion.

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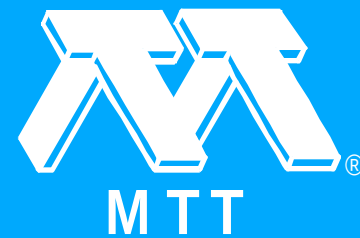


Abstracts

Pseudo-Random Noise Loading for System Evaluation

R.B. Swerdlow. "Pseudo-Random Noise Loading for System Evaluation." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 227-227.

The design of high capacity, long haul carrier transmission systems for telecommunication service demands strict control of noise due to intermodulation distortion. The intermodulation noise at any point in such a system depends on both the magnitude of the distortion and the manner in which it accumulates.



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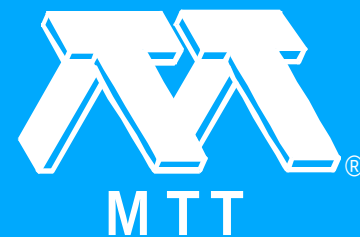


Abstracts

Noise Comparisons in Low and Medium Power Devices

J.R. Ashley. "Noise Comparisons in Low and Medium Power Devices." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 227-227.

Measured FM and AM noise data will be presented for the following microwave signal sources: Reflex klystron, two-resonator low noise klystron, IMPATT diode oscillators, transferred electron (Gunn diode) oscillators, TRAPATT mode avalanche oscillators, and VHF crystal-multiplier chain sources. The pros and cons of using an oscillator figure of merit to compare active devices will be discussed.



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Low Noise Receivers and Their Calibration

C.T. Stelzried. "Low Noise Receivers and Their Calibration." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 228-228.

Low noise microwave receiving systems are particularly important for deep space communications systems, radio astronomy and some sensitive laboratory measurement systems such as transmission spectroscopy. Dramatic improvements in microwave receivers have reduced noise figures from the range of 10 dB to tenths of dB's in the last 15 to 20 years. Although cooled parametric amplifiers provide a very practical performance compromise for ultra low noise, wide bandwidth and low cost, the maser has the lowest noise temperature of any practical microwave amplifier.



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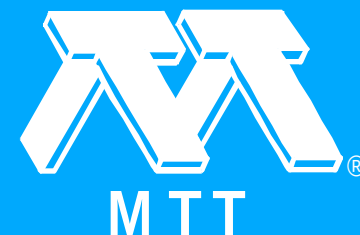
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Abstracts

Session X -- Active Solid-State Devices (B)

"Session X -- Active Solid-State Devices (B)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 229-229.



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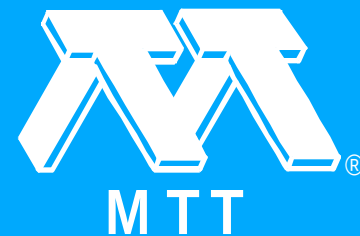


Abstracts

Performance and Limitations of FETs as Microwave Power Amplifiers

L. Napoli and R. DeBrecht. "Performance and Limitations of FETs as Microwave Power Amplifiers." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 230-232.

The GaAs FET has excellent potential as a microwave power amplifier and has demonstrated an $f_{\text{sub}} t^2$ (PX) product exceeding that of silicon bipolar devices. The design, fabrication, and performance limitations of GaAs power FETs is discussed. Experimental results for a multigate 4 GHz device and a single gate 7 GHz device are presented.



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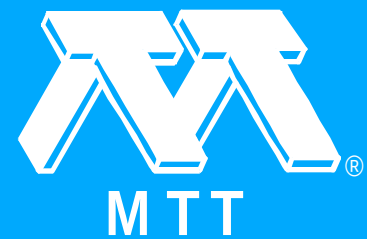


Abstracts

Two-Dimensional Distributed Theory for a Microwave Schottky Barrier Field Effect Transistor

G.D. Alley, H.E. Talley and G.L. Wright. "Two-Dimensional Distributed Theory for a Microwave Schottky Barrier Field Effect Transistor." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 233-235.

A small signal equivalent circuit for a SBFET derived from the basic transport equations is extended to include the effects of finite propagation velocities along the contact metallizations. Resonances are shown to occur in the device y parameters due to distributed effects along these contacts.



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Abstracts

A 4 GHz High Power Transistor - Design and Reliability

P. Wang, J. Chen, P. Froess and S. Kakihana. "A 4 GHz High Power Transistor - Design and Reliability." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 236-238.

An experimental high power, high gain 4 GHz transistor is described. The design aspects of high breakdown voltage, ballasting resistors, metallization system and thermal design are reviewed. It is shown how these consideration have been optimized for device reliability and long MTF.



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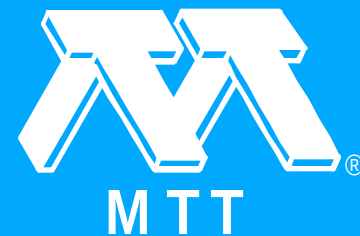


Abstracts

Power Transistor Amplifier Design Using Large-Signal S Parameters

J.G. Webb and R.J. Chaffin. "Power Transistor Amplifier Design Using Large-Signal S Parameters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 239-241.

Large-signal S-parameters are used in the design of UHF power transistor amplifiers, yielding analytical means for calculating stability criteria and circuit impedances for the desired gain and output power. A 3.5 watt, 500 MHz amplifier designed using these methods is described.



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Simple LSA Circuits

J.M. Rodgers. "Simple LSA Circuits." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 242-243.

LSA circuits built entirely from simple coaxial transmission line elements perform well at 4-16 GHz. The lumped-inductive, variable-loaded cavities are fully and precisely characterized. Optimized power, efficiency, frequency variation with bias conditions agree well with relaxation oscillator models, allowing engineered circuits to be designed for any operating regime.



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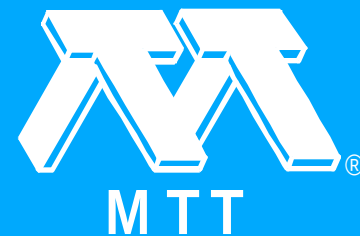


Abstracts

A 0.75- to 6-GHz Varactor Up-Converter Broadbanded at All Three Ports

R.L. Sicotte. "A 0.75- to 6-GHz Varactor Up-Converter Broadbanded at All Three Ports." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 244-246.

Bandwidths of 500 MHz have been achieved at the signal, pump, and upper sideband ports for output levels of 80 mW by using a heavily overdriven varactor in a low-inductance mount and matching into a contiguous band diplexer.



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Abstracts

Frequency Modulation of Cavity Stabilized Solid State Diode Oscillators

W.R. Day. "Frequency Modulation of Cavity Stabilized Solid State Diode Oscillators." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 247-249.

A coupled cavity technique for frequency modulation of cavity stabilized solid state diode sources is described. This technique provides FM deviations suitable for communications system applications while still retaining low FM noise.



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Abstracts

GaAs "Traveling-Wave" Transistor

R.H. Dean, R.E. DeBrecht, A.B. Dreeben, J.J. Hughes, R.J. Matarese and L.S. Napoli. "GaAs "Traveling-Wave" Transistor." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 250-252.

Present packaged GaAs "traveling-wave" transistors produce instantaneous 5-20 GHz CW net gain with 17 dB X-band noise figure. The devices employ self-aligned input electrodes. A versatile new broad-band microwave package has been developed.



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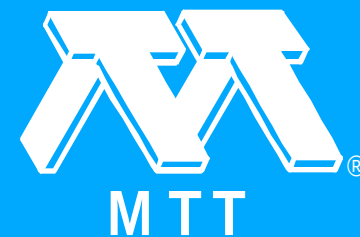
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Abstracts

Session XI -- Microwave Techniques in Biological Research

"Session XI -- Microwave Techniques in Biological Research." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 253-253.



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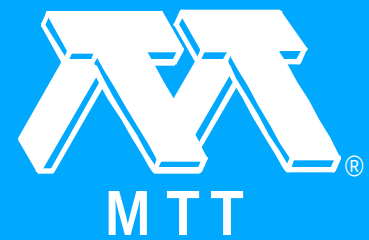
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Geoelectric Discontinuity Detector

H. Trazaska. "Geoelectric Discontinuity Detector." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 254-254.

It is sometimes necessary to quickly localize a mine bed within an accuracy of a few cm. in depth. Such high accuracy measurements are made by chemical or physio-chemical methods. These methods have the disadvantage of requiring a few hours of time due to the necessity of measuring the metallic content of the ore in the laboratory rather than in situ. Sometimes high accuracy in the measurement can be sacrificed in the interest of obtaining results more quickly.

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Abstracts

Environmentally Controlled Waveguide Irradiation Facility

H.S. Ho, E.I. Ginns and C.L. Christman. "Environmentally Controlled Waveguide Irradiation Facility." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 255-256.

An environmentally-controlled waveguide irradiation facility has been built for the exposure of small animals to 2450 MHz, CW microwave energy. Integral dose rate is determined without significantly perturbing the microwave field interacting with the irradiated animal.



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Abstracts

Power Deposition in a Spherical Model of Man Exposed to 1-20 MHz EM Fields (1973 [MWSYM])

J.C. Lin, C.C. Johnson and A.W. Guy. "Power Deposition in a Spherical Model of Man Exposed to 1-20 MHz EM Fields (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 257-259.

EN power deposition in a spherical model of man exposed to HF fields may be derived from a simple approximate equation where the absorbed power due to electric field coupling can be calculated separately from that due to magnetic coupling. The latter is an order of magnitude greater for a plane wave.



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Abstracts

Application of Nonthermal Effects in High Dielectric Materials to Microwave Dosimetry

R.J. Vetter, D.R. Elle, D.J. Fehringer and P.L. Ziemer. "Application of Nonthermal Effects in High Dielectric Materials to Microwave Dosimetry." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 260-261.

Thermoluminescent properties of high dielectric materials were examined before and after exposure to 2450 MHz microwave radiation. Fading of low temperature peaks was significantly greater in phosphors exposed to microwaves than in oven heated controls.



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Abstracts

An RF Decoupled Electrode for Measurement of Brain Temperature During Microwave Exposure

L.E. Larsen, R.A. Moore and J. Acevedo. "An RF Decoupled Electrode for Measurement of Brain Temperature During Microwave Exposure." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 262-264.

The thermistor probe mount involving the use of microcircuitry, current limiting, series resistance and thermal isolation makes possible temperature measurements in the presence of continuous RF radiation to a resolution of 0.1° C.



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Abstracts

Theoretical and Experimental Studies of Microwave Induced Cataracts in Rabbits

P. Kramar, A.F. Emery, A.W. Guy and J.C. Lin. "Theoretical and Experimental Studies of Microwave Induced Cataracts in Rabbits." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 265-267.

Power deposition patterns, temperature distribution patterns, and cataractogenesis thresholds have been established in the eyes of rabbits exposed to localized near zone 2450 MHz radiation. There was good agreement between results obtained through theoretical and experimental approaches.



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Bird Feathers as Dielectric Receptors of RF Fields

J.B. del Blanco, C. Romero-Sierra and J.A. Tanner. "Bird Feathers as Dielectric Receptors of RF Fields." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 268-270.

The characteristics of bird feathers as dielectric aerials have been investigated in the X-band region of the microwave spectrum. Preliminary findings show that feathers may act as microwave sensors. Hence, man can influence the behaviour of birds by means of a microwave beam.

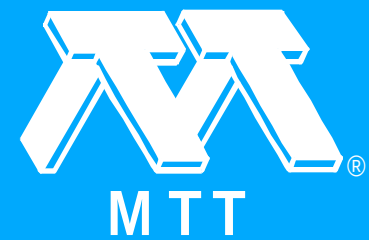
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Abstracts

Session XII -- Waveguide Analytical Techniques

"Session XII -- Waveguide Analytical Techniques." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 271-271.



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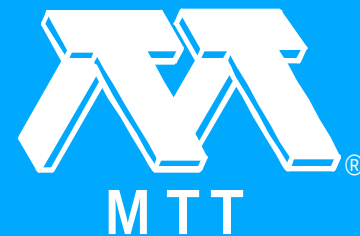


Abstracts

Minimum Phase Behavior of Random Media

H.E. Rowe and D.T. Young. "Minimum Phase Behavior of Random Media." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 272-274.

We give two different sufficient conditions for the transfer function of two-mode random media to be minimum phase and illustrate these results with a few examples.



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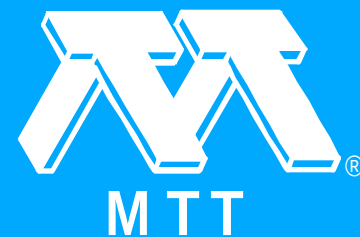


Abstracts

Comparison Between Rectangular and Annular Waveguide Modal Analyses for Waveguide Bends

E. Bahar and G. Govindarajan. "Comparison Between Rectangular and Annular Waveguide Modal Analyses for Waveguide Bends." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 275-277.

Coupling in waveguide bends of nonuniform curvature is determined by employing modal expansions for rectangular and annular waveguides. For large curvature waveguide bends an iterative method is suitable only for the annular modal analysis.



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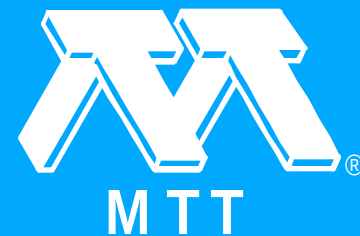


Abstracts

Further Extension of the Modified Residue Calculus Technique

J.P. Montgomery and D.C. Chang. "Further Extension of the Modified Residue Calculus Technique." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 278-280.

This paper extends the modified residue calculus technique to problems which previously have only been solved by the generalized scattering matrix technique in whole or part. In particular, the trifurcated waveguide solution is given.



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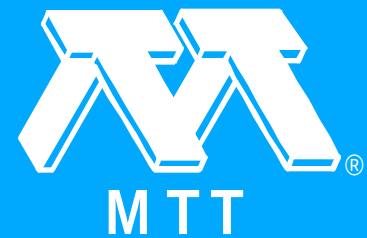


Abstracts

Mutual Coupling Between Parallel Plate Waveguides (1973 [MWSYM])

Y.S. El-Moazzen and L. Shafai. "Mutual Coupling Between Parallel Plate Waveguides (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 281-283.

Coupling between parallel plate waveguides is investigated using the Wiener-Hopf technique. For a TE/sub 0, 1/ excitation of one guide, exact solutions for the radiate, reflected and transmitted fields are found and are expressed by three terms. One term is due to the exciting waveguide alone and the other two are due to interaction between two waveguides. The expressions for the exact solutions are further reduced to derive approximate solutions, which could be obtained using the ray theory of diffraction with a modified diffraction coefficient.



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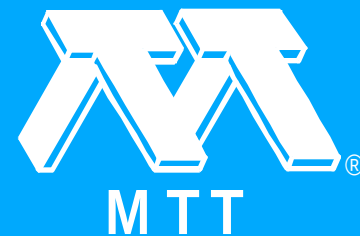


Abstracts

A Coupled Integral Equation Solution for Microstrip Transmission Lines

C.E. Smith. "A Coupled Integral Equation Solution for Microstrip Transmission Lines." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 284-286.

A theoretical analysis of microstrip transmission lines is presented which is based on a derivation of a set of coupled integral equations in terms of a free-space Green's function in the related inhomogeneous region.



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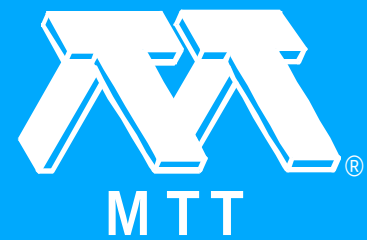


Abstracts

A Numerical Method for the Solution of Junction of Cylindrical Waveguides

H. Oraizi and J. Perini. "A Numerical Method for the Solution of Junction of Cylindrical Waveguides." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 287-289.

A numerical method for the junction of two cylindrical waveguides is developed by constructing a positive definite function from the boundary conditions and minimizing it with respect to the modal amplitudes. The junction of two rectangular waveguides is treated with mode and current probe excitations. Many types of diaphragms and junctions that are not available in the literature are treated. Of special interest is the case of a current element across the gap in a thin metallic post.



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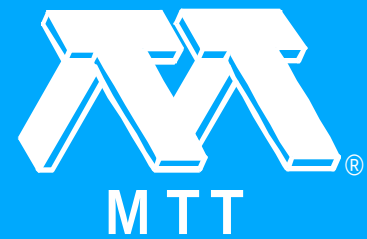


Abstracts

Analysis of Probe-Fed Cavities of Arbitrary Shape

N. Wang and G.A. Thiele. "Analysis of Probe-Fed Cavities of Arbitrary Shape." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 290-292.

A method for calculating the probe impedance and fields in a cavity of arbitrary shape, either with or without slots in the walls, is given. Using the classical probe-fed rectangular cavity as a test case, experimentally confirmed theoretical curves for the probe impedance and interior fields are given.



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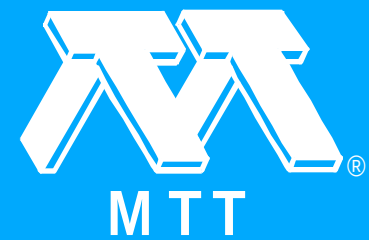
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Abstracts

Session XIII -- Integrated Optics

"Session XIII -- Integrated Optics." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 293-293.



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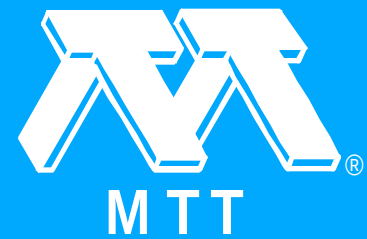


Abstracts

Introduction to Guided-Optical-Wave Theory and Techniques (Abstract)

H. Kogelnik. "Introduction to Guided-Optical-Wave Theory and Techniques (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 294-294.

This talk will try to give an introduction to and an overview of the principles and techniques basic to optical guided-wave devices and the ideas of integrated optics. An effort will be made to emphasize the parallels to microwave theory and techniques. The principal characteristics of dielectric waveguides will be discussed along with fabrication requirements and techniques. Current work on couplers and modulators will be described as an illustration of the potential of optical miniature circuits and devices.



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Abstracts

Integrated Optical Devices (Abstract)

E.G.H. Lean. "Integrated Optical Devices (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 294-294.

The current state of the art in integrated optical devices based on optical guided waves in thin films will be reviewed. The sources, the couplers, the passive elements and the modulators, which are basic components for integrated optics will be discussed.



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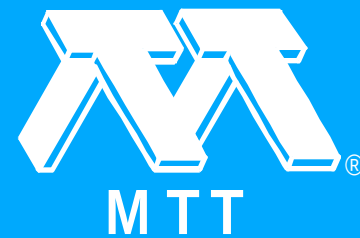


Abstracts

Military Applications of Integrated Optics and Fiber Optics (Abstract)

R.A. Andrews. "Military Applications of Integrated Optics and Fiber Optics (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 294-294.

A general discussion of military applications of integrated optics and fiber optics will be presented. Specific applications to be discussed are (1) a multiterminal multiplexed data highway for aircraft and shipboard use, (2) optical fibers as tethers, (3) a 10.6μ heterodyne detector, and (4) integrated optical phased arrays.



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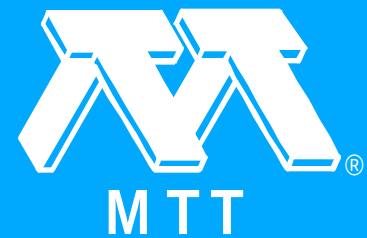


Abstracts

Integrated Optics for 10 Micron Wavelengths (Abstract)

D.B. Anderson. "Integrated Optics for 10 Micron Wavelengths (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 294-294.

Efforts to develop the integrated optics art at North American Rockwell for the far infrared region will be summarized. The material properties and processing techniques apposite to passive waveguide and active devices in the 10 micron region will be indicated noting the similarities and differences to the comparable microwave art. Parametric frequency conversion and second harmonic experiments using waveguide phase matching techniques are delineated. Coupling techniques for beam/waveguide via end-fire approach are included.



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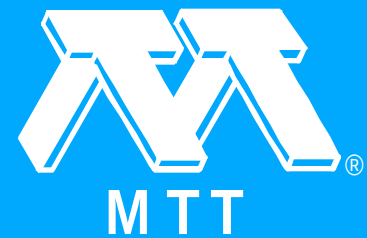


Abstracts

Periodic Structures and Their Application in Integrated Optics (Abstract)

W.S.C. Chang. "Periodic Structures and Their Application in Integrated Optics (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 294-294.

Analysis and applications of periodic structures to optical waveguides as input-output couplers, mode converters, modulators, etc., will be given. Similarities between these optical devices to guided waves and periodic structures at microwaves will be discussed. Experimental data collected for these devices at 10.6 μm wavelength will be presented.



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Abstracts

Materials Study for Millimeter Subcarrier Optical Modulators

A.E. Popa. "Materials Study for Millimeter Subcarrier Optical Modulators." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 295-296.

Experimental millimeter wavelength loss tangent data are presented for 14 electro-optic materials. CdTe operating at $1.06\text{ }\mu\text{m}$ is selected for continued refinement as the most promising material for use in an electro-optic modulator driven at millimeter wavelengths.



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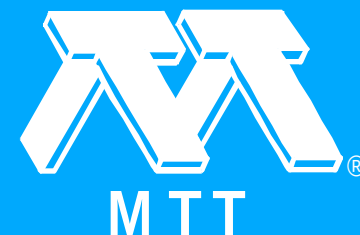
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Abstracts

Session XIV -- MIC Systems Components

"Session XIV -- MIC Systems Components." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 297-297.



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Abstracts

A Compact S-Band Diode Phase Shifter

R.W. Burns and R.L. Holden. "A Compact S-Band Diode Phase Shifter." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 298-300.

The design and performance of a five-bit S-Band diode phase shifter is described. This thick-film microstrip device uses series coupled diodes for the small bits and constant phase-frequency switched line bits for the three large bits.



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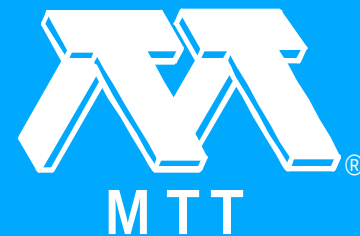


Abstracts

A New MIC Double-Balanced Mixer with RF and IF Band Overlap

R. Pflieger. "A New MIC Double-Balanced Mixer with RF and IF Band Overlap." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 301-303.

A new type of MIC double-balanced mixer has been developed using a combination of slot-line, microstrip, and wire near a ground-plane transmission line. A number of these mixers have been built with octave RF bandwidths in the 2 to 18 GHz region with RF and IF band overlap.



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Broadband Integrated Up and Down Converters

D.W. Maki, J.E. Degenford and M. Cohn. "Broadband Integrated Up and Down Converters." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 304-305.

In a 1.6 cubic inch volume, each of these units combines an up converter, down converter, LO power divider and numerous filters. Utilizing both upper and lower frequency passbands, these two units provide nearly continuous coverage of the 5.9 to 16.5 GHz range with combined down conversion and up conversion loss of 14 to 18 dB.

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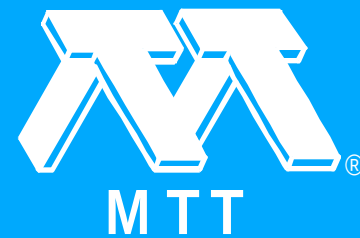


Abstracts

A Hybrid Integrated L-Band ALC Amplifier

W. Kruppa and R.F. Lee. "A Hybrid Integrated L-Band ALC Amplifier." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 306-307.

An ALC amplifier consisting of an rf amplifier, a detector, a variolosses, and an operational amplifier is described. The complete amplifier is realized on an alumina substrate using tantalum RC thin-film technology with appliqued beam-lead devices.



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Abstracts

A MIC Phased Locked Loop Avalanche Oscillator in X Band (Abstract)

J.A. Salmon. "A MIC Phased Locked Loop Avalanche Oscillator in X Band (Abstract)." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 308-308.

This paper describes the design and performances of a MIC Phase Locked Loop X band Avalanche Oscillator. The Output power (500 mW/CW) the input reference level (1 mW) the locking time (80 nanoseconds) and the simplicity of digital phase control makes it very attractive as a primary element of an active phased array.



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Abstracts

Coplanar Balun Circuits for GaAs FET High-Power Push-Pull Amplifiers

R.E. DeBrecht. "Coplanar Balun Circuits for GaAs FET High-Power Push-Pull Amplifiers." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 309-312.

Three-strip coplanar balun circuits have been designed and fabricated for the push-pull operation of high-power amplifiers using GaAs Schottky-barrier FETs. Theoretical and measured properties of the balun and amplifier results are presented.



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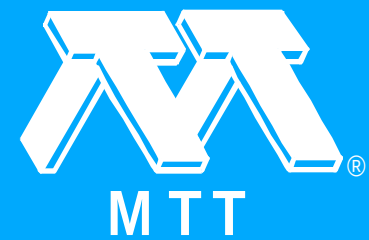
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Abstracts

Session XV -- Biological Effects of Microwave Radiation

"Session XV -- Biological Effects of Microwave Radiation." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 313-313.



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Abstracts

Possible Mechanisms for the Bimolecular Absorption of Microwave Radiation with Functional Implications

J.R. Rabinowitz. "Possible Mechanisms for the Bimolecular Absorption of Microwave Radiation with Functional Implications." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 314-315.

Theoretical analysis of the possible modes of molecular interaction with microwave radiation suggests that the absorption of a microwave photon may interfere with stereospecific bimolecular processes.



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Abstracts

Microwave Effects on Central Nervous System Attributed to Thermal Factors

E.M. Taylor, A.W. Guy, B. Ashleman and J.C. Lin. "Microwave Effects on Central Nervous System Attributed to Thermal Factors." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 316-317.

Microwave-produced changes in CNS-evoked potentials appear limited to thermal effects, as evidenced by 1) similar changes being elicited by equivalent non-radiation heating, and 2) reduction or even reversal of radiation effects with concurrent brain cooling.



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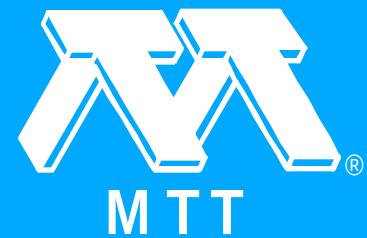


Abstracts

Effect of 2450 MHz Microwave Fields on Peripheral Nerves

C.K. Chou and A.W. Guy. "Effect of 2450 MHz Microwave Fields on Peripheral Nerves." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 318-320.

There was no significant change in characteristics of nerves exposed to cw and pulsed 2450 MHz fields in a waveguide filled with temperature-controlled Ringer's solution. Absorbed power densities varied from 0.003 to 1.7 W/cc for cw and 0.3 to 30 W/cc peak for pulsed fields.



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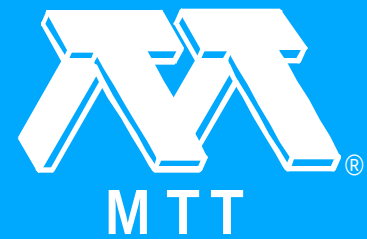


Abstracts

Microwave Interaction with the Auditory Systems of Humans and Cats

A.W. Guy, E.M. Taylor, B. Ashleman and J.C. Lin. "Microwave Interaction with the Auditory Systems of Humans and Cats." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 321-323.

Recordings from elements of the auditory system of cats in response to pulsed microwaves, as well as determinations of thresholds of audibility of humans to the pulses indicate that an auditory sensation may be elicited by pulse energies $>20 \mu\text{J}/\text{cm}^2$, regardless of average or peak power.



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Abstracts

The Effect of Chronic Low-Level Microwave Radiation on the Testicles of Mice

S.J. Haidt and A.H. McTighe. "The Effect of Chronic Low-Level Microwave Radiation on the Testicles of Mice." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 324-325.

Testicular damage has occurred in mice which were exposed to 2.45 GHz CW whole-body radiation at an average exposure of 6.5 mW/cm² for a total of 230 hours over a two-month period. No post-irradiation increase in rectal temperature was noted.



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Abstracts

Microwave Irradiation Sacrifice: Application in Neurochemical Research

D.E. Schmidt, M.J. Schmidt, G.A. Robison and L.K. Wilson. "Microwave Irradiation Sacrifice: Application in Neurochemical Research." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 326-328.

Temperatures, inactivation rates of adenylyl cyclase, phosphodiesterase and cholinesterase, and levels of acetylcholine and cyclic AMP were measured in rat brain following microwave sacrifice. Results indicate that such sacrifice results in rapid and simultaneous inactivation of enzyme systems throughout the brain. Levels of acetylcholine and cyclic AMP in brain compare favorably to those obtained following other means of sacrifice.



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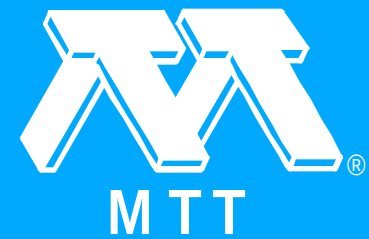
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Abstracts

Workshop Session -- Biological Effects of Microwave Radiation

"Workshop Session -- Biological Effects of Microwave Radiation." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 329-329.



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Abstracts

Comparative Aspects of Radiofrequency and Microwave Biomedical Research

S.M. Michaelson and H.P. Schwan. "Comparative Aspects of Radiofrequency and Microwave Biomedical Research." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 330-332.

Physical "scaling" and comparative biomedical aspects of size, metabolism, and thermal tolerance are discussed as criteria for selecting experimental animals to assess biologic effects and potential hazards to man from exposure to microwaves.



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Abstracts

Further Experiments Seeking Evidence of Nonthermal Biological Effects of Microwave Radiation

L.M. Liu, G.W. Skewes, G.A. Lindauer and F.J. Rosenbaum. "Further Experiments Seeking Evidence of Nonthermal Biological Effects of Microwave Radiation." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 333-334.

Carpenter and Livstone's experiments on beetle pupae were repeated and extended. Increased incidence of abnormal development occurred due to exposure to microwave energy, both c.w. and pulse. Measurements are reported which specify the microwave environment encountered by the insect.



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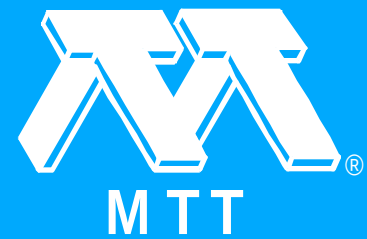
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Bradycardia in Isolated Hearts Induced by Microwave Irradiation

J.L. Lords, C.H. Durney, A. Borg and C. Tinney. "Bradycardia in Isolated Hearts Induced by Microwave Irradiation." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 335-336.

Continuous 960 MHz irradiation (estimated 5 mW absorbed) of isolated poikilothermic hearts in Ringer's solution causes bradycardia, in contrast to the tachycardia usually produced by generalized heating. The effect appears to occur only over a narrow power range.

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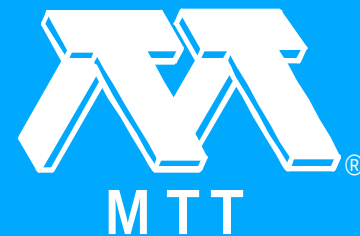


Abstracts

Continuous Exposure of Chicks to Electromagnetic Fields

A.J. Giarola and W.F. Krueger. "Continuous Exposure of Chicks to Electromagnetic Fields." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 337-338.

Homogeneity trials indicate that growth depressions previously reported on chicks exposed to a UHF field are from controlled environmental conditions. Measurements of power density support previous hypotheses that the observed biological responses from exposure to the UHF field resulted from "non thermal" effects.



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Membership Application (1973 [MWSYM])

"Membership Application (1973 [MWSYM])." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 339-339.



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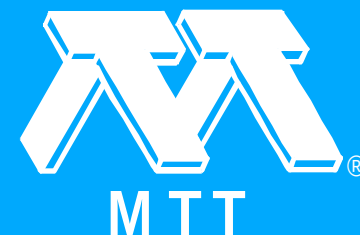
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Abstracts

Index, 1973 IEEE-GMTT International Microwave Symposium

"Index, 1973 IEEE-GMTT International Microwave Symposium." 1973 G-MTT International Microwave Symposium Digest of Technical Papers 73.1 (1973 [MWSYM]): 340-343.



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Front Cover (1974 [MWSYM])

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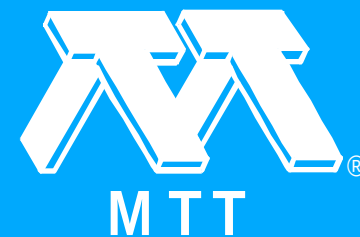
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Abstracts

1974 IEEE S-MTT International Microwave Symposium, Digest of Technical Papers

"1974 IEEE S-MTT International Microwave Symposium, Digest of Technical Papers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): i-ii.



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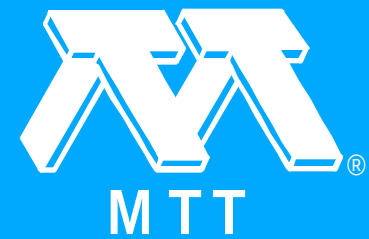
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Abstracts

Special Session -- Technology Forecasting and Assessment

"Special Session -- Technology Forecasting and Assessment." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 1-2.



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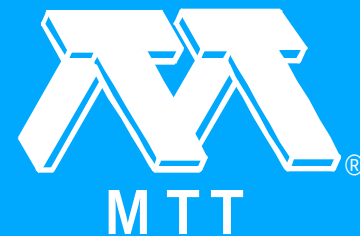
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Special Session -- TRAPATT and LSA -- Optimum Impedance and Starting Conditions

"Special Session -- TRAPATT and LSA -- Optimum Impedance and Starting Conditions." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 3-4.



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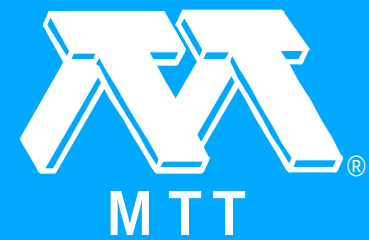
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Abstracts

Session 1 -- Phased Arrays I (Joint AP-S and S-MTT)

"Session 1 -- Phased Arrays I (Joint AP-S and S-MTT)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 5-5.



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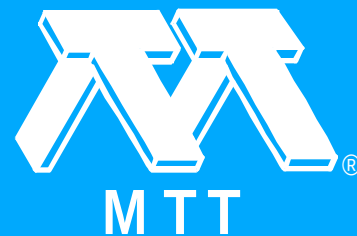


Abstracts

The Phased Array Success Story: Six Years of AN/FPS-85 Operation

J.E. Reed. "The Phased Array Success Story: Six Years of AN/FPS-85 Operation." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 6-8.

The success of a large phased array which has been in operational inventory for nearly six years is unique. The author suggests reasons for its relatively low cost development and maintenance. System concepts which have contributed most to the unprecedented "blue-suit" operation and maintenance are reviewed.



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Abstracts

Selection of Phased Array Configuration

D.T. Thomas. "Selection of Phased Array Configuration." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 9-11.

A major decision in the design of phased array antennas is the selection of array configuration. Once the coverage sector, net antenna gain, effective radiated power (ERP) and other system requirements are established, the effects of (1) subdividing the coverage sector, i.e., using multiple antennas and (2) choosing linear versus sector arc arrays can be determined.



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Abstracts

Hemispherically Scanned Arrays

A.T. Villeneuve, M.C. Behnke and W.H. Kummer. "Hemispherically Scanned Arrays." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 12-16.

Inertialess scanning techniques have been implemented in many different ways over the last decade, but the development of designs for airborne phase-scanned antennas has lagged behind that of ground systems largely because of the limitations of size, weight, volume, and cost.



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Abstracts

A Conical Beam Ship Array Antenna with Infinitely Variable Control of the Elevation Angle

H. Forster, H.H. Mattes and A. Schrott. "A Conical Beam Ship Array Antenna with Infinitely Variable Control of the Elevation Angle." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 17-20.

Studies on a ship terminal for a maritime satellite system have shown that a shipboard antenna with a 6-8 dB gain would have an optimum in costs. Therefore the DFVLR - Institut für Flugfunk und Mikrowellen decided to design an experimental shipboard antenna system meeting these datas. The first model of the antenna system was tested by the ESRO-Balloon-Simulation-Experiment during Sept./Oct. 1973 in the English Channel.



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Abstracts

An Experimental Evaluation of Adaptive Radar (Abstract)

F.M. Staudaher. "An Experimental Evaluation of Adaptive Radar (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 21-21.

An experimental system to test the potential performance of a two-pulse, four-element adaptive array has been constructed, using two four-element arrays to represent the receiver function and 8 signal sources distributed in azimuth to represent clutter. Results are reported on tests which are in progress to evaluate the limitations of mutual coupling, receiver match, A/D conversion, and simulated platform motion.



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Abstracts

Conformal Phased Array Antenna Design (Abstract)

J.H. Staehlin. "Conformal Phased Array Antenna Design (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 22-22.

An extremely low profile modular conformal phased array antenna design will be presented. Components that make up the antenna will be described to show the unique features such as the plug-in balun, the MHP phase shifter assembly, and the stripline RF manifold tracks incorporated to create a lightweight, reliable, maintainable panel. The eight element test array fabricated using the final array design features along with range test results will be given.



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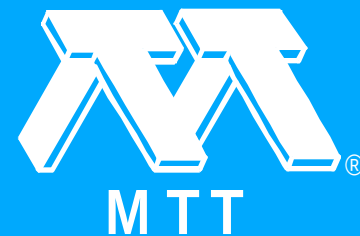


Abstracts

An X- Band Reflect-Array with Integrated PIN Diodes (Abstract)

J.A. Salmon, R. Pierrot and Y. Commault. "An X- Band Reflect-Array with Integrated PIN Diodes (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 23-23.

In classical reflect-arrays, radiating elements and phase-shifters are quite distinct. The transitions between these two parts and the shielding problems generally lead to complicated structures. In the array presented the phase shifter elements (PIN diodes) are integrated on the radiating surface. Scanning is then realized by changing the position of the reflection plane in open propagation.



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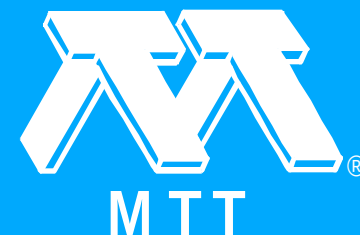
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Abstracts

Session 2 -- Analysis and Application of Microwaves in Biology and Medicine

*"Session 2 -- Analysis and Application of Microwaves in Biology and Medicine." 1974 S-MTT
International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 25-25.*



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Abstracts

A Survey of the Potential for Beneficial Applications of Microwaves in Medicine and Biology

J.M. Osepchuk. "A Survey of the Potential for Beneficial Applications of Microwaves in Medicine and Biology." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 26-26.



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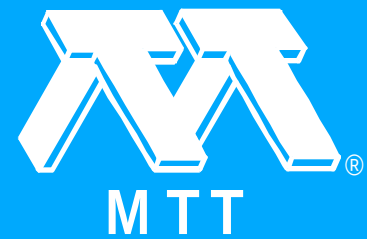


Abstracts

Insect-Control Possibilities Using Microwaves and Lower Frequency RF Energy

S.O. Nelson. "Insect-Control Possibilities Using Microwaves and Lower Frequency RF Energy." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 27-29.

Principles applicable to controlling stored-product insects with radiofrequency (RF) energy and general findings of research on this topic are reviewed. Data are presented on the frequency dependence of the dielectric constant and dielectric loss factor of insects and grain, and use of such information is discussed in relation to RF treatment for insect control. Some aspects of practical application are also considered.



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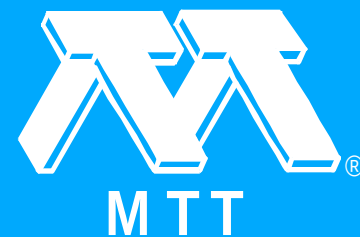


Abstracts

Nerve Stimulation by Implanted Microwave Diode

C.C. Johnson, J.L. Lords and M.A. Coombs. "Nerve Stimulation by Implanted Microwave Diode." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 30-31.

Damage to nerves in the body can cause loss of voluntary muscle function, such as the arms and legs, and loss of involuntary muscle function such as heart contraction, control of urination, etc. In many cases, if appropriate nerves could be stimulated by external means, these functions could be restored. This paper describes experimental work to develop an extremely small implanted device which, when located close to a viable impaired nerve, can restore its function. The device is activated by RF electromagnetic waves passing through the skin which do not damage the intervening tissue.



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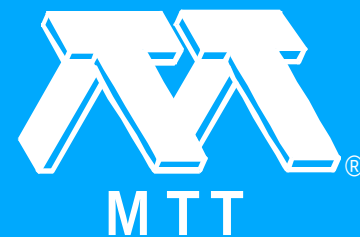


Abstracts

Liquid Crystal Fiberoptic Temperature Probe for the Measurement of Electromagnetic Power Absorption in Tissue

C.C. Johnson, C.H. Durney and J.L. Lords. "Liquid Crystal Fiberoptic Temperature Probe for the Measurement of Electromagnetic Power Absorption in Tissue." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 32-34.

A temperature probe has been constructed which uses liquid crystals as a temperature-sensitive sensor and fiberoptic to transmit light to and from the sensor. Since the probe is completely nonmetallic, it is ideal for making temperature measurements in tissue subjected to electromagnetic radiation. The probe can measure temperature differences to within 0.1°C accuracy.



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Abstracts

Electromagnetic Fields Induced Inside of Biological Bodies

D.E. Livesay and K.-M. Chen. "Electromagnetic Fields Induced Inside of Biological Bodies." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 35-37.

A theoretical study has been conducted to determine the electromagnetic field induced inside of biological bodies of irregular shapes. A tensor integral equation was derived and solved numerically for various biological models.



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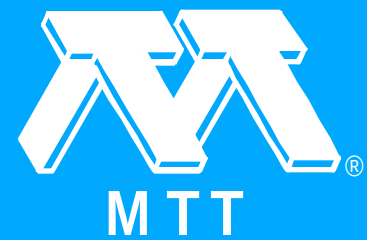
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Multi-Frequency Electromagnetic Thawing of Frozen Kidneys

C.P. Burns and E.C. Burdette. "Multi-Frequency Electromagnetic Thawing of Frozen Kidneys." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 38-40.

The development of electromagnetic radiation techniques for thawing frozen organs is necessary in establishing frozen organ banks for surgical transplantation. Rapid and uniform thawing is a very difficult problem which is dependent upon kidney size, frequency of radiation, and power level. Failure to accomplish these thawing conditions results in excessive tissue damage. Experiments with canine and rabbit kidneys at two different frequencies are described.

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Abstracts

Some Theory and Preliminary Experiments on Microwave Radiometry of Biological Systems

J.B. del Blanco, C. Romero-Sierra and J.A. Tanner. "Some Theory and Preliminary Experiments on Microwave Radiometry of Biological Systems." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 41-44.

The theory of microwave radiometry of biological systems is outlined. To check theoretical predictions, an X-band microwave radiometer of the correlation type has been built. More recently, a new series of experiments have been conducted with a self-nulling Dicke radiometer operating at 9.2 GHz. Preliminary experiments performed on humans and some lower animals and plant vegetation show, in principle, the correctness of the theory.



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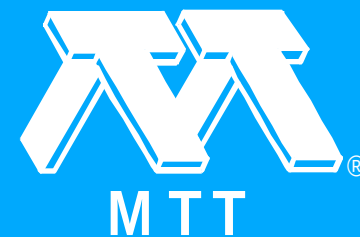
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Abstracts

Session 3 -- Phased Arrays II (Joint AP-S and S-MTT)

"Session 3 -- Phased Arrays II (Joint AP-S and S-MTT)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 45-45.



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Abstracts

Requirements for Optically Processing Information from a Phased Array

J.E. Rhodes, Jr.. "Requirements for Optically Processing Information from a Phased Array." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 46-49.

A receiving array antenna has RF information in the response of its elements that may simultaneously cover many targets in the "radio scene" in front of it. To realize this potential requires an enormous amount of data processing. This data processing could be accomplished efficiently with an "optical data processor," provided a reasonable optical replica of the RF field in the antenna aperture could be realized.



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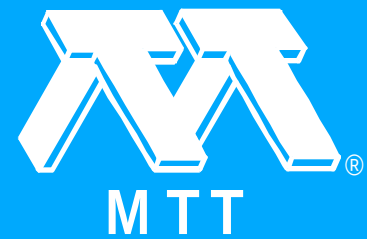


Abstracts

Commercial Micro Computer Chips for Integrated Phased Array Control

F.J. Langley. "Commercial Micro Computer Chips for Integrated Phased Array Control." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 50-53.

Low cost commercial microcomputers, (currently used in many diverse applications, e.g. point-of-sale terminals, desk top computers, check processors, etc.), despite their relatively low computational speed, provide the opportunity for computing beam steering and shaping phase shifts for large phased-array antennas at high beam switching rates through the use of federated multi-computer techniques.



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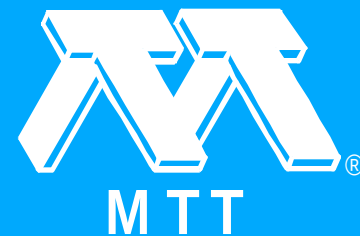


Abstracts

Solid State Phased Array Radar

A.Y. Harper. "Solid State Phased Array Radar." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 54-56.

The system advantages and limitations imposed by the solid state phased array radar are reviewed. The implications of these factors on the radar subsystems are discussed and the characteristics of the U.S. Army test bed solid state radar are presented.



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Abstracts

The AN/TPS-59 Antenna Row-Board Design

R.R. Kinsey. "The AN/TPS-59 Antenna Row-Board Design." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 57-60.

The development model of the AN/TPS-59, an advanced tactical air-defense radar, employs a planar array composed of a vertical stack of linear row-arrays. Azimuth scanning is by mechanical rotation of the antenna while phase controlled solid-state row-transmitters and row-receivers provide electronic scanning in elevation.



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Abstracts

TPS-59 Array Electronics (Abstract)

R.C. Litty. "TPS-59 Array Electronics (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 61-61.

The requirements for a transmitter-receiver that is distributed spatially on an array are reviewed and the design of the RF and the power supply packages are described. Details of the major RF components are discussed as well as overall parameters such as cost trade-offs and array signal and power distribution problems.



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Abstracts

R.F. Power Modules for L-Band Solid State Transmitters

D.J. Hoft and L.R. Lavallee. "R.F. Power Modules for L-Band Solid State Transmitters." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 62-64.

The advantages of Solid-State Transmitters and typical configurations will be briefly described. Several S.S. L-band modules developed over the past two years are delineated. The technical design approach of high power S.S. amplifiers will be discussed with emphasis on design for low junction temperature (long life) and production yield. A technique utilizing Smith Chart contour curves is presented.



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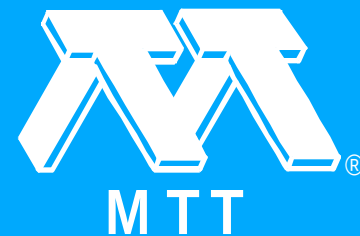


Abstracts

Operation of Solid State Transceivers in an L-Band Array

R. Sudbury, K. Fischer, F. Palmer and G. Jones. "Operation of Solid State Transceivers in an L-Band Array." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 65-67.

Solid state transceivers have been utilized in an L-Band array. The experience associated with the acquisition of over 300,000 total transceiver operating hours obtained with 97 transceivers will be described.



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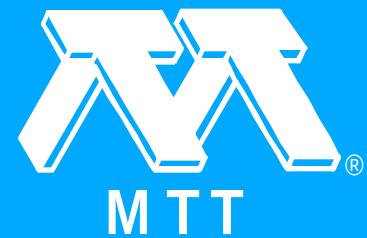


Abstracts

Solid State S-Band Transmit/Receive Module (Abstract)

G. Hanley, R. Viola and P. Koegler. "Solid State S-Band Transmit/Receive Module (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 68-68.

This paper presents the results of a development program for a 40 watt, S-Band transmit/receive module. The module contains, transistor amplifiers, diode phase shifters, and crossed dipoles for operation with all senses of linear and circular polarizations. One hundred modules were fabricated for an experimental 10 x 10 subarray.



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Abstracts

An X-Band Transceiver Module for MAIR (Abstract)

R.J. Bauer, R.J. Taylor and J.P. Muhlbaier. "An X-Band Transceiver Module for MAIR (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 69-69.

An X-band transceiver phased array module is described for MAIR (Modular Airborne Intercept radar). The transmit chain produces an output power of 4 watts -- while the receive section exhibits a noise figure of 7 dB. In addition, recent developments in improving the module's efficiency, bandwidth and size reduction will be presented. A typical radar configuration is presented using this module.



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Abstracts

Session 4 -- Microwave Theory

"Session 4 -- Microwave Theory." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 71-71.



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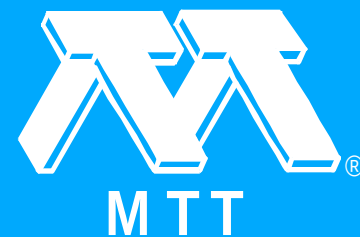


Abstracts

Design of Multimode Waveguide Transition Sections Based on Radial and Rectangular Modal Analyses

E. Bahar and G. Govindarajan. "Design of Multimode Waveguide Transition Sections Based on Radial and Rectangular Modal Analyses." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 72-74.

Multimode waveguide transition sections are designed based on a quasi-optical approach and rectangular and radial modal analyses. The radial modal analysis is most suitable for large flare angle transitions possessing spurious mode cut-off cross-sections.



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Abstracts

Symmetry-Induced Modal Characteristics of Uniform Waveguides

P.R. Mclsaac. "Symmetry-Induced Modal Characteristics of Uniform Waveguides." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 75-77.

The application of symmetry analysis to uniform waveguides is discussed. Symmetry analysis provides exact information concerning mode classification, mode degeneracy, modal field symmetries, and the minimum waveguide sectors which completely determine the modes in each mode class.



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Upper and Lower Variational Bounds in EM Scattering

K. Kalikstein, C.J. Kleinman, L. Rosenberg and L. Spruch. "Upper and Lower Variational Bounds in EM Scattering." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 78-80.

A formulation of the variational bound method is presented which together with some previous work can provide both upper and lower bounds on the phase shifts or equivalent network elements of obstacles located in single and multimode waveguides. As an illustration numerical results are obtained for a rectangular parallel epiped obstacle. The upper and lower bounds on the phase shifts are quite close to one another.

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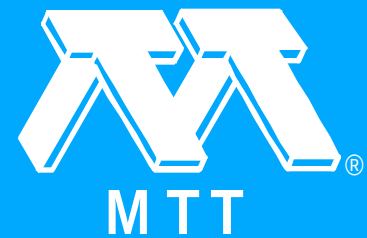


Abstracts

Proximity Effects of Transmission Line Discontinuities

T.W. Parker and T.C. Cisco. "Proximity Effects of Transmission Line Discontinuities." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 81-83.

The proximity effects of multiple step transmission line discontinuities have been computed by a computer assisted integral equation technique and good agreement with experimental data and exact asymptotic solutions is obtained. New results for typical matching structures and filter geometries are presented.



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Abstracts

Iterative Solution of the Waveguide-Horn Junction

M.F. Iskander and M.A.K. Hamid. "Iterative Solution of the Waveguide-Horn Junction." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 84-86.

A solution for the fields at a waveguide-horn junction is derived using the iterative technique of overlapping regions. By dividing the junction into semi-infinite rectangular and sectoral regions and using the Green's functions for the sub-regions, the problem is reduced to the solution of a system of integral equations of the Fredholm type. The solution is relatively simple and the method is shown to be efficient and reliable in comparison with other techniques particularly for the reflection coefficient in the feed waveguide.



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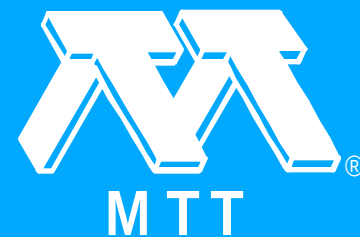


Abstracts

Some New Results on Coupled or Meander Microstrip Lines by Application of a Matrix Theory

R. Daumas, D. Pompei, E. Rivier and A. Ros. "Some New Results on Coupled or Meander Microstrip Lines by Application of a Matrix Theory." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 87-89.

Knowing the elements of capacitance matrices for coupled microstrip lines, we are able to obtain the characteristics of coupled or meander lines by application of a matrix theory. The elements of the capacitances matrices previously computed from geometrical dimensions of the lines can now be obtained directly by analytical formulas in a large domain of values of ω , s , h and ϵ_r .



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Abstracts

A Full-Wave Analysis of Microstrip Resonators

T. Itoh. "A Full-Wave Analysis of Microstrip Resonators." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 90-92.

An accurate and efficient method was developed for computing the resonant frequencies of microstrip resonators. The numerical data were compared with other theoretical and experimental results. The agreement of the numerical results with experimental data was extremely good.



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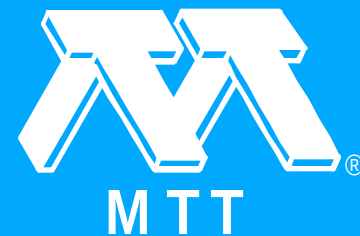


Abstracts

N-Way Branch Line Directional Couplers

C.L. Chao. "N-Way Branch Line Directional Couplers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 93-96.

This paper presents an N-way branch line coupler which is capable of splitting an input signal into N-way equal or unequal amplitude output signals. It consists of N parallel and $2(N-1)$ shunt quarter wavelength transmission lines and gives a reasonable isolation among output ports at the design center frequency.



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Abstracts

Session 5 -- Biological Effects of Microwaves

"Session 5 -- Biological Effects of Microwaves." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 97-97.



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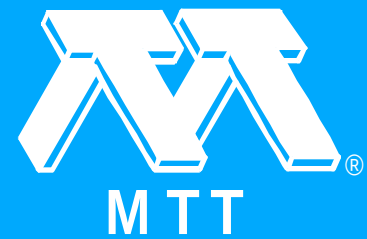
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Abstracts

Experimental Models for the Evaluation of Microwave Biological Effects

P. Czerski. "Experimental Models for the Evaluation of Microwave Biological Effects." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 98-98.



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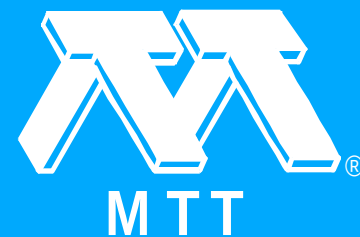


Abstracts

An International Program for Microwave Exposure Protection

S.M. Michaelson and M.J. Suess. "An International Program for Microwave Exposure Protection." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 99-101.

In the developed countries there has been a remarkable increase in the number of processes and devices that utilize or emit microwaves during the last 25 years. Such devices are used in all sectors of our society for military, industrial, telecommunications, and consumer applications. Because of the world-wide implications of the rapidly developing technology and associated health safety considerations, development and implementation of a program for international cooperation in the use and protective measures related to microwave/radiofrequency exposure is required. Activity in this respect has been initiated by the Regional Office for Europe of the World Health Organization (WHO/EURO) which has developed a long term program concerned with the health effects of nonionizing radiations. To implement this program, several steps have been taken with participation by scientists and administrators from several countries. These activities have engendered plans and proposals for facilitating exchange and evaluation of information on the biologic and health effects of microwave radiation and in focusing attention on those areas in which additional information and new approaches are needed.



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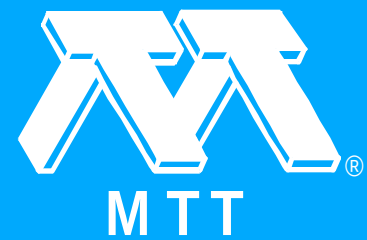
Abstracts

Thermogenetic and Cardiodynamic Regulation in Dogs Cranially Exposed to 2450 MHz (CW) Microwaves

S.-T. Lu, R. Bogardus, J. Cohen, J. Jones, E. Kinnen, S. Michaelson and R. Magin.

"Thermogenetic and Cardiodynamic Regulation in Dogs Cranially Exposed to 2450 MHz (CW) Microwaves." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 102-103.

The cranial area of dogs was exposed dorsally to 2450 MHz (CW) microwaves at different power densities, while various temperatures (rectal, skin, jugular and tympanic), blood flows (pulmonary, renal and systemic circulation) and pressures (interventricular and systemic arterial) were simultaneously monitored. The preliminary results obtained provide a basis for comparison of the response of various organs to localized and whole-body exposure to microwaves.



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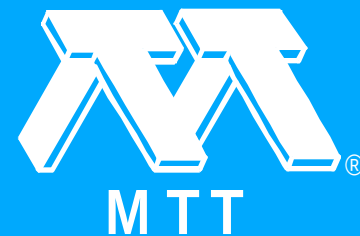


Abstracts

Microwave Effect on Rabbit Superior Cervical Ganglion (1974 [MWSYM])

J.C. Lin, K. Courtney, A.W. Guy and C.K. Chou. "Microwave Effect on Rabbit Superior Cervical Ganglion (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 104-105.

Rabbit superior cervical ganglia were exposed to continuous wave 2450 MHz fields within a temperature controlled waveguide environment. Absorbed power densities between 2 and 1000 W/kg failed to significantly influence conduction latencies of responses recorded from postganglionic fibers due to stimulation of either B (myelinated) or C (unmyelinated) fibers in the preganglionic trunk.



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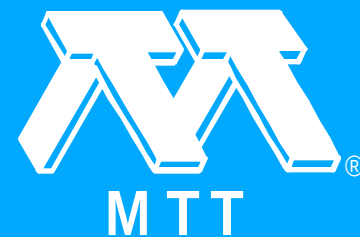


Abstracts

Behavioral Changes of Rats Exposed to Microwave Radiation

L.R. Caldwell, J.C. Lin and A.W. Guy. "Behavioral Changes of Rats Exposed to Microwave Radiation." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 106-108.

Fixed ratio performance changes of rats exposed to near zone 918 MHz radiation have been observed to occur at incident power levels of 40 mW/cm² corresponding to peak absorbed power densities of 32-36 W/kg. No change in behavior was indicated for incident and peak absorbed power densities of up to 20 mW/cm² and 18 W/kg, respectively.



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Absorption Characteristics of Multi-Layered Sphere Models Exposed to UHF/Microwave Radiation

C.M. Weil. "Absorption Characteristics of Multi-Layered Sphere Models Exposed to UHF/Microwave Radiation." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 109-111.

Plane wave absorption characteristics of spherical models composed of six layers of dissipative dielectric media, representing various biological tissues found in human and animal heads, are examined in the frequency range of 0.1 to 10 GHz. The internal distribution of energy deposition inside the sphere is discussed with emphasis on strong localized heating (hot spot) effects.

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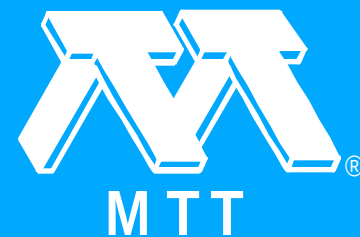


Abstracts

A Microwave Dosimetry System for Measuring Sampled Integral Dose Rate (1974 [MWSYM])

C.L. Christman, H.S. Ho and S. Yarrow. "A Microwave Dosimetry System for Measuring Sampled Integral Dose Rate (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 112-114.

An interface has been developed to allow the measurement of sampled integral dose rate, defined as the change in integral dose during a particular time interval divided by that interval, absorbed by test animals as they are exposed in a waveguide to 2450 MHz CW microwave energy.



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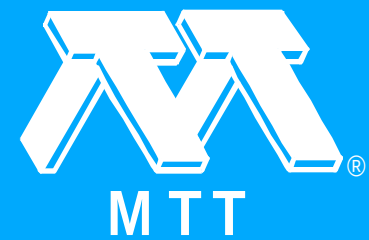
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Abstracts

Session 6 -- Millimeter Astronomy and Related Topics

"Session 6 -- Millimeter Astronomy and Related Topics." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 115-115.



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Abstracts

Application of Millimeter Wave Receivers to Astronomy (Abstract)

T.G. Phillips and K.B. Jefferts. "Application of Millimeter Wave Receivers to Astronomy (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 116-116.

Millimeter wave receivers are discussed from the point of view of applications of line astronomy. A heterodyne bolometer system is described which has a noise temperature of 300°K at 230 GHz. It is expected that these receivers will extend the range of radio line astronomy to about 500 GHz.



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Abstracts

Molecular Millimeter Wave Astronomy (Abstract)

L.E. Snyder. "Molecular Millimeter Wave Astronomy (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 117-117.

A current review of recent observation of interstellar molecules in the millimeter wavelength region will be presented.



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Abstracts

A Millimeter Wave Radiometer for Cosmic Background Radiation Measurements

R.J. Pedersen and F.L. Vernon, Jr.. "A Millimeter Wave Radiometer for Cosmic Background Radiation Measurements." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 118-119.

A ground-based radiometer for measuring the cosmic background radiation at a wavelength of 2.1mm is described. The instrument, including black body radiators for calibration, is self-contained and operable in the automatic mode. Output data is punched on paper tape for later computer analysis.



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Development and Testing of a Receiver at 230 GHz

M.V. Schneider and G.T. Wrixon. "Development and Testing of a Receiver at 230 GHz." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 120-122.

A superhetrodyne receiver operating at 230 GHz has been developed and tested. The hybrid mixer consists of a Schottky barrier diode in a rectangular waveguide and a stripline circuit whose performance was optimized using low frequency scaling techniques. Ultra-low capacitance, low-noise Schottky barrier diodes were developed for use in the mixer. The local oscillator signal is provided by a frequency doubler pumped by a 115 GHz klystron. The output of the doubler is coupled into the mixer using a cavity. The IF amplifier is a 1.4 GHz parametric amplifier with a noise figure of 0.8 dB. The total double sideband noise figure of the receiver is 13.4 dB corresponding to a noise temperature of 6000 K.

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Abstracts

Millimeter Wave Interferometry

W.J. Welch. "Millimeter Wave Interferometry." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 123-123.



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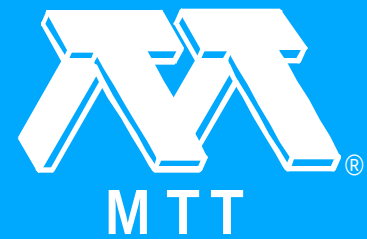


Abstracts

Millimeter Wave Solar Observations

J.P. Castelli, D.A. Guidice and P.M. Kalaghan. "Millimeter Wave Solar Observations." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 124-126.

Several categories of millimeter wave observations in the range between approximately 20 and 3 mm are considered. First, the general area of current observations conducted with small antennas of low resolving power and simple radiometric receivers is reviewed. The type of solar information derived and its application are discussed. The second area considered is that of current high-resolution solar investigations from antennas with beam widths as small as 1 minute of arc. Finally, future ultra-high resolution work (<10 arc seconds) by interferometer techniques and the need for such work are discussed.



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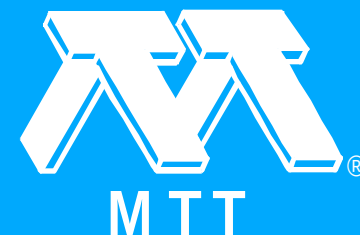
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Abstracts

Special Session -- Electromagnetic Education (Joint AP-S/S-MTT/URSI)

"Special Session -- Electromagnetic Education (Joint AP-S/S-MTT/URSI)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 127-128.



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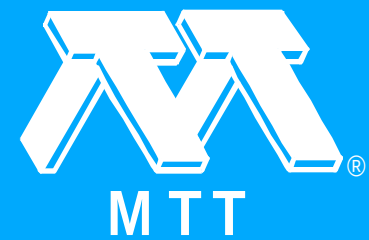
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Abstracts

Session 7 -- Microwave Technology for Phased Arrays

"Session 7 -- Microwave Technology for Phased Arrays." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 129-129.



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Fidelity of Pulsed Microwave Transistor Amplifiers

D. Staiman and J. Liston. "Fidelity of Pulsed Microwave Transistor Amplifiers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 130-131.

High-power microwave transistor amplifiers characteristically display amplitude and phase droop in the amplification of long RF pulses. The effects of these signal distortions on linear FM modulated waveforms are examined, with specific attention addressed to time sidelobes and main lobe width of a filtered, matched Hamming-weighted pulse.

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Abstracts

Design Considerations of Active Element Array Transceivers

J.N. Jansen, R.F. Wade, D. Renkowitz and H. Balshem. "Design Considerations of Active Element Array Transceivers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 132-134.

Mechanical and electrical design considerations, including performance trade-offs of microwave integrated circuit solid state active element array transceiver modules operating in the L-Band region will be presented.



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Abstracts

A Computer Aided Design of L-Band Transistor Power Amplifiers

G.T. O'Reilly, R.E. Neidert and L.K. Wilson. "A Computer Aided Design of L-Band Transistor Power Amplifiers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 135-137.

A computer aided design procedure is formulated for L-band transistor power amplifiers. The procedure incorporates a precision measurement technique for transistor impedances, a model for large step discontinuities in microstrip and an optimization routine for the direct realization of broadband matching circuits.



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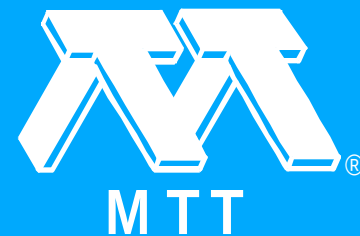


Abstracts

RF Reliability Testing of L-Band Power Transistors (Abstract)

W. Weisenberger, B.C. Dodson, Jr. and A. Christou. "RF Reliability Testing of L-Band Power Transistors (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 138-138.

Accelerated life tests using pulsed rf power conditions have been incorporated in order to evaluate the reliability of L-band power transistors for use in phased array radar programs. The basic philosophies, test procedures, and diagnostic techniques used will be explained and an explanation of how to use the data will be given.



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Abstracts

Investigations of RF Induced Burnout in Microwave Mixer Diodes: A Continuing Study

G.E. Morris, G.A. Hall, C.F. Cook and V.J. Higgins. "Investigations of RF Induced Burnout in Microwave Mixer Diodes: A Continuing Study." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 139-141.

Investigations of RF induced burnout in silicon point contact and Schottky barrier mixer diodes at X-band frequencies are presented. SEM observation of diode chip condition was made through a "window" in the package prior to burnout. Comparisons of photographs before and after burnout were used to determine subtle changes in chip topography.



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S-Band, 3-Bit, 1 kW Peak, 0.8 dB Average Loss, Diode Phase Shifter and Driver Under \$100

J.F. White. "S-Band, 3-Bit, 1 kW Peak, 0.8 dB Average Loss, Diode Phase Shifter and Driver Under \$100." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 142-144.

There is a need for an S-band high power electronic phase shifter with low insertion loss and low cost for ground and ship-based phased array radars. Both diodes and ferrites are candidates for this application. Typically, the ferrite phase shifter is known to have low insertion loss; however, the recent use of wafer glassed PIN diodes removes the necessity for an expensive ceramic diode package and, furthermore, improves performance by eliminating diode package parasitic reactance. With these diodes, a complete 3-bit phase shifter having only 0.8 dB of average insertion loss has been made. This device has a rated power of 1 kW peak (the burnout level is 4 kW peak) using 120 microsecond-long pulses and 0.05 duty cycle. This paper describes the construction and testing of the phase shifter and a cost estimate for large quantities.

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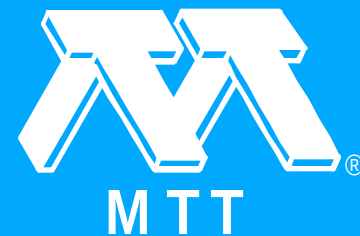


Abstracts

High Power Microwave Window Design

H.L. Bassett, J.M. Schuchardt, G.T. Colwell and B.L. Smith. "High Power Microwave Window Design." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 145-148.

The design of a heat-pipe cooled microwave waveguide window will be presented in this paper. The window is capable of handling megawatts of RF power in S-band (2.6 - 4.0 GHz) waveguide. The thickness and spacing of the windows, the window material characteristics, the thermal analysis of the heat pipe and the power handling capability will be addressed. The use of this technique in cooling other microwave components is discussed



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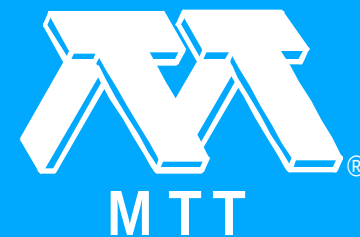
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Abstracts

Session 8 -- Recent Advancements in Gallium Arsenide Devices

"Session 8 -- Recent Advancements in Gallium Arsenide Devices." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 149-149.



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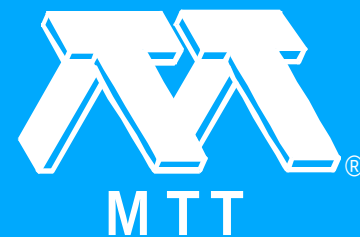


Abstracts

Recent Advancements in Gallium Arsenide Devices (Panel)

G.L. McCoy. "Recent Advancements in Gallium Arsenide Devices (Panel)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 150-150.

This panel will discuss recent work done on three devices which are presently in the forefront of microwave technology. These devices are the GaAs IMPATT diodes for X and Ka-band, Gunn diodes for X and Ka-band, and Field Effect Transistors for C and X-band. Discussion by the panel will include a short presentation by each panel member highlighting recent advancements in his area. Presentations will include discussion of the basic devices and applications of devices. The panel will conclude with a summary of projected performance for the IMPATT, Gunn and FET devices.



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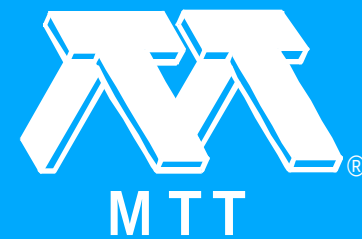
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Abstracts

Session 9 -- Millimeter Waves

"Session 9 -- Millimeter Waves." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 151-151.



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Abstracts



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Millimeter Radar at Georgia Tech (Abstract)

F.B. Dyer and E.K. Reedy. "Millimeter Radar at Georgia Tech (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 152-152.

This paper outlines the history of millimeter radar research at Georgia Tech during the past twenty years. During this period, numerous important developments have been achieved by investigators at Georgia Tech in the understanding and application of millimeter waves. Milestones in this work include 35 GHz propagation and scattering investigations dating from the early fifties (results of which are still widely referenced); early application of 70 GHz, submillimeter radiometric and spectroscopic investigations beyond 300 GHz; development of unique, low-loss scanning antennas; and fabrication and testing of complete scanning radar systems at 70 GHz. Recent research includes investigations of scattering phenomena at all of the millimeter radar bands and the development of extremely high performance antennas at 70 and 95 GHz,

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Abstracts

Highlights and Review of the NELC Millimeter Conference (Abstract)

L.R. Whicker. "Highlights and Review of the NELC Millimeter Conference (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 153-153.

The Naval Electronics Laboratory Center (NELC, San Diego) has recently sponsored a three-day Conference on Millimeter Wave Techniques, 26-28 March 1974. The purpose of the Conference has been to coordinate and exchange the latest information on the states-of-the-art of millimeter wave techniques (20-100 GHz), to identify present and future areas of military applications and establish direct interaction among appropriate agencies and personnel.



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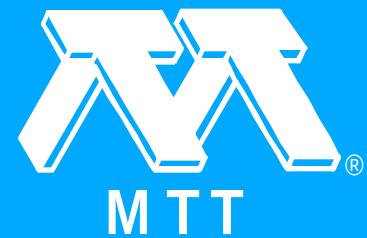


Abstracts

Highlights and Review of the Submillimeter Wave Symposium (Abstract)

J.J. Gallagher. "Highlights and Review of the Submillimeter Wave Symposium (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 154-154.

The program of the International Conference on Submillimeter Waves and Their Applications, held on June 5, 6, 7, 1974 in Atlanta, will be reviewed. The conference reflects the many advances which have been made in recent years as a result of the availability of improved submillimeter wave sources. Topics covered during the conference include sources (lasers, optically pumped lasers, and tunable sources), detectors, Fourier transform spectroscopy, and submillimeter applications to solid state investigations, plasma interactions, and cosmic and atmospheric physics.



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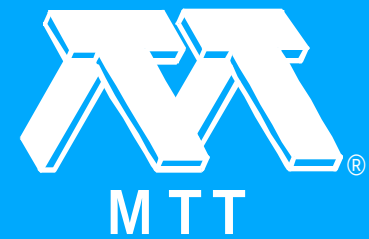
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Abstracts

Session 10 -- Planar Microwave Active and Passive Components

"Session 10 -- Planar Microwave Active and Passive Components." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 155-155.



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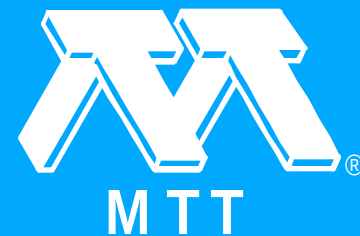


Abstracts

Fundamental Even- and Odd-Mode Waves for Nonsymmetrical Coupled Lines in Non-Homogeneous Media

R.A. Speciale. "Fundamental Even- and Odd-Mode Waves for Nonsymmetrical Coupled Lines in Non-Homogeneous Media." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 156-158.

Propagation experiments show the even-mode to have equal voltage-magnitudes and the odd-mode equal current-magnitudes. A new even-mode/odd-mode analysis is thus given for nonsymmetrical coupled-lines in non-homogeneous media, leading to the most general formulation of the 4 x 4 Y-matrix.



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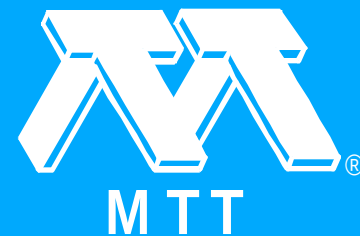


Abstracts

Inhomogeneous Coupled-Line Filters

J.L. Allen. "Inhomogeneous Coupled-Line Filters." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 159-161.

Experimental and Theoretical results are presented demonstrating some novel properties of inhomogeneous coupled-line structures having large even-odd mode velocity ratios, e.g., a single inhomogeneous coupled-line filter section with an equiripple, 3-peak stopband response.



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Folded-Line and Hybrid Folded-Line Bandstop Filters

P.A. Dupuis and E.G. Cristal. "Folded-Line and Hybrid Folded-Line Bandstop Filters." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 162-164.

The feasibility of a new, compact bandstop filter geometry is demonstrated theoretically and experimentally. The filter geometry is particularly suited for stripline and MIC fabrications in that grounding is not required for any part of the filter. Hybrid folded-line geometries allow the filter designer substantial flexibility in choosing a suitable shape factor without significantly effecting the filter's electrical characteristics. The filter geometry is suitable for narrow bandwidth (provided capacitive coupled stubs are used) to wide bandwidth applications.

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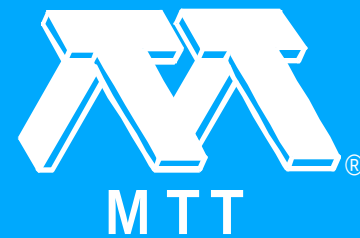


Abstracts

Dispersion and Field Analysis of a Microstrip Meander Line Slow-Wave Structure (1974 [MWSYM])

J.A. Weiss. "Dispersion and Field Analysis of a Microstrip Meander Line Slow-Wave Structure (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 165-166.

A structure which is important as an example of a spatially periodic medium for microwave propagation is analyzed theoretically, with rigorous consideration of its partial dielectric composition, translation and reflection symmetry properties, and field configuration relating to its use for electron-wave interaction.



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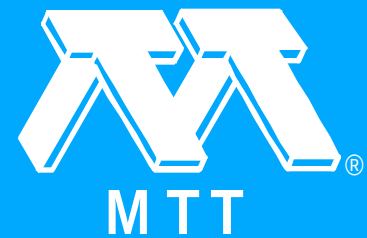


Abstracts

The Design of Planar Circuit Mounted in Waveguide and the Application to Low Noise 12GHz Converter

Y. Konishi, K. Uenakada and N. Hoshino. "The Design of Planar Circuit Mounted in Waveguide and the Application to Low Noise 12GHz Converter." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 168-170.

The proposed planar circuits in a waveguide and their design theory are presented together with the confirmation by experimental results. The application of this circuit to 12GHz down-converter is also shown.



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Abstracts

Harmonic Mixing with an Anti-Parallel Diode Pair (1974 [MWSYM])

M. Cohn, J.E. Degenford and B.A. Newman. "Harmonic Mixing with an Anti-Parallel Diode Pair (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 171-172.

The analysis and experimental evaluation of a new harmonic mixer configuration capable of yielding lower conversion loss and circumventing the local oscillator noise sideband problem is presented.



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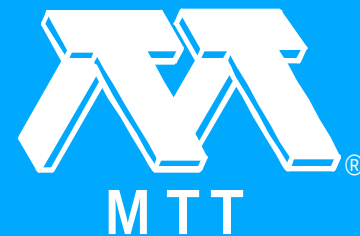


Abstracts

High Power PIN Diode Switch Matrix

H.R. Malone, M.L. Matson and P.D. Kennedy. "High Power PIN Diode Switch Matrix." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 173-175.

A single pole, fifty six throw PIN diode switch matrix has been designed for a G-Band cylindrical steerable beam antenna for the AN/USW-3(V) Integrated Target Control System. Bandwidth of the matrix is 20 percent, and CW power handling capability is greater than one-half kilowatt.



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Fast-Acting Varactors for Sub-Nanosecond Power Limiting in Receiver Protectors

T.M. Nelson and H. Goldie. "Fast-Acting Varactors for Sub-Nanosecond Power Limiting in Receiver Protectors." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 176-178.

Fast-acting pn junctions were developed to self-limit in less than 1 nsec at relatively high peak levels at X-band frequencies. The cascading of junctions in order of decreasing base region thickness behind high average power plasma limiters resulted in a passive receiver protector capable of limiting 1 nsec risetime multi-kilowatt RF pulses to 1 watt spike levels. It is also shown that 1 watt spikes of less than 10 nsec duration do not degrade the noise figure of balanced mixers employing small-junction (5 to 10 μ diameters) Schottky barrier diodes.

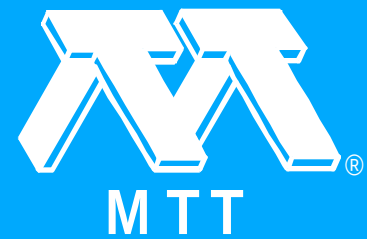
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Abstracts

Session 11 -- Applications of Acoustic Devices in Microwave Systems

"Session 11 -- Applications of Acoustic Devices in Microwave Systems." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 179-179.



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Abstracts

Radar Applications of Acoustic Surface Wave Devices

J.D. Carlson. "Radar Applications of Acoustic Surface Wave Devices." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 180-181.

The concept of radar system cost reduction through the application of advanced technology is discussed. Emphasis is placed on the complex signal processing requirements of the Ballistic Missile Defense phased array radar and applications of surface wave devices which can simplify the system.



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Abstracts

Applications of Surface Acoustic Wave Devices to Spread Spectrum Communications (Abstract)

C.E. Wheatley, III. "Applications of Surface Acoustic Wave Devices to Spread Spectrum Communications (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 182-182.

The use of spread spectrum signaling structures, achieved either through instantaneous spreading techniques (e.g., pseudo-noise modulation) or piecewise spreading techniques (e.g., frequency hopping) is being proposed for an ever increasing number of electronic systems. These systems cover a wide field of applications, including analog and digital communications, position identification.



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Abstracts

The Economic Future of Surface Acoustic Wave Devices

M.G. Holland. "The Economic Future of Surface Acoustic Wave Devices." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 183-184.

Surface Acoustic Wave (SAW) devices are now being manufactured for use in a number of electronic systems, both military and commercial. The advantages of these devices include size, reproducibility, and new function capability. Reliability has not yet really been established nor has cost proven to be low. These devices are established, but the present and predicted market has been exaggerated. The eventual size of the SAW market will be due to a mix of one-of-a-kind high technology devices, moderate volume devices for the military market, and medium volume commercial devices. We conclude that the SAW device supplier will have to be versatile enough to provide a variety of devices including delay lines, matched filters, and bandpass filters at various production levels with very little high volume business.



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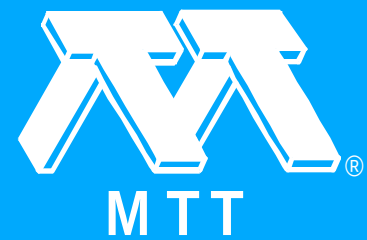


Abstracts

Analog Signal Processing Using Surface Wave and Charge Transfer Devices (Abstract)

L.T. Claiborne and D.D. Buss. "Analog Signal Processing Using Surface Wave and Charge Transfer Devices (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 185-185.

Two viable component technologies currently exist for implementing analog signal processing at VHF and UHF, namely, surface wave devices (SWD's) and charge transfer devices (CTD's). A review of each technology will be given along with relevant advantages, disadvantages, and ranges of important operating parameter for each. Under SWD's, primary emphasis will be given to the practical surface wave filters as well as to monolithic programmable matched filters using MOSFET detectors for surface wave taps on a silicon substrate, and the selectable bandpass filter in which programmable techniques are employed to obtain variable bandwidth and variable center frequency surface wave bandpass filters. The discussion of CTD's will include both charge coupled devices and bucket brigade devices (BED's). Application will be discussed for variable frequency bandpass filters, programmable matched filters, and variable tap weight transversal filters for adaptive filtering such as telephone channel equalization. A comparison of the present and projected advantages and also limitations of these two technologies will be discussed.



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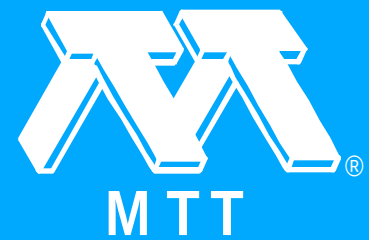
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Industrial Applications of Acoustic Wave Phenomena (Abstract)

G.A. Alers. "Industrial Applications of Acoustic Wave Phenomena (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 186-186.

Although high frequency sound waves find applications throughout industrial processing and control, the applications which utilize microwave technology the most are those found in ultrasonic nondestructive testing. In the past, antenna theory and transmission line concepts have been used to describe ultrasonic transducer and their coupling to the parts to be tested. More recently, the more complex problems of mode conversion and dispersion by the medium in which the sound waves travel have received attention. The interaction of both shear and compressional waves with various possible defects is now being attacked rigorously with both experimental and theoretical tools. This paper will review recent advances in sound wave propagation in highly anisotropic media such as composites; the scattering of sound in solid media; the use of the normal modes of vibration of plates and bars for rapid inspection; computer aided acoustic holography; nonlinear effects for detecting internal stress; and dispersion of surface waves to analyze surface layers.

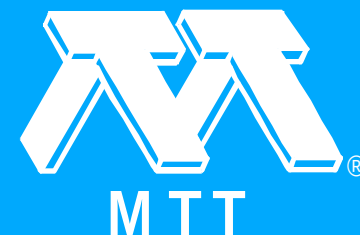
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Abstracts

Session 12 -- Millimeter Integrated Circuits and Components

"Session 12 -- Millimeter Integrated Circuits and Components." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 187-187.



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Millimeter-Wave Microstrip Oscillators

B.S. Glance and M.V. Schneider. "Millimeter-Wave Microstrip Oscillators." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 188-190.

Hybrid integrated millimeter-wave sources at 30, 60 and 100 GHz have been built using a novel oscillator configuration. The new structure features a planar microstrip circuit in a conducting channel with an IMPATT diode which is inserted into the side wall of the channel. RF efficiencies of 5% at an output power of a quarter watt CW have been measured both at 30 and 60 GHz. The output power at 100 GHz is 25 mW with an efficiency of 2%. The oscillators can be readily tuned over a 10% bandwidth.

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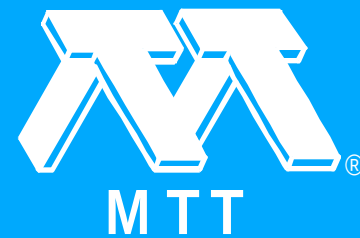


Abstracts

Planar Dielectric Strip Waveguide for Millimeter-Wave Integrated Circuits

T.T. Fong and S.W. Lee. "Planar Dielectric Strip Waveguide for Millimeter-Wave Integrated Circuits." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 191-194.

A modal analysis based on the transverse resonance concept is presented for a planar dielectric strip waveguide which exhibits good guiding properties and is particularly applicable to millimeter-wave integrated circuits. Numerical results are given for the dispersion characteristics and modal field distributions for high resistivity silicon substrate.



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Abstracts

Integrated Fin-Line Millimeter Components (1974 [MWSYM])

P.J. Meier. "Integrated Fin-Line Millimeter Components (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 195-197.

A PIN attenuator and band-pass filter have been developed to demonstrate the advantages of integrated fin-line over microstrip at millimeter wavelengths. These advantages include lower loss, less stringent tolerances, and better compatibility with hybrid devices.



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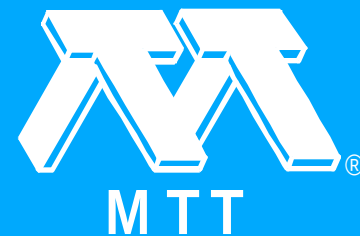


Abstracts

Millimeter Wave Integrated Circuits

M.M. Chrepta and H. Jacobs. "Millimeter Wave Integrated Circuits." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 198-198.

New applications for millimeter waves have been developed and will be described. These include: high data rate communications, secure communications, low altitude radar, obstacle avoidance, imaging and fog penetration, radiometry and radiometric imaging.



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Abstracts

Quasi-Optical Diplexers

A.A.M. Saleh. "Quasi-Optical Diplexers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 199-199.

Quasi-optical diplexers have low-loss and high power-handling capability at millimeter and submillimeter wavelengths. This paper reviews several types of quasi-optical diplexers. Theoretical as well as experimental results will be discussed.



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Abstracts

An Expansion Joint for a Millimeter Waveguide Transmission System

J.W. Carlin and R.J. Colardeau. "An Expansion Joint for a Millimeter Waveguide Transmission System." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 200-202.

An expansion joint for a circular (TE/sub 01/) waveguide millimeter wave transmission system was fabricated for a 51 mm. diameter guide. The spurious mode level was measured from 50-70 GHz and found to be at least -40dB lower than the incident TE/sub 01/ level. The measured results compared favorably with an analytic prediction of a -50dB or lower spurious mode level from 40-110 GHz.



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Abstracts

H/sub 01/ for Circular Waveguide Low-Pass Filter for Millimeter Wave Transmission System

C.-L. Ren and H.-C. Wang. "H/sub 01/ for Circular Waveguide Low-Pass Filter for Millimeter Wave Transmission System." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 203-205.

A broadband low-pass filter in a multimode circular waveguide has been designed for the millimeter-wave waveguide transmission system. It provides high stopband insertion loss and good passband return loss with very low intrinsic as well as mode conversion loss. The physical realization of the filter is simple and economical.



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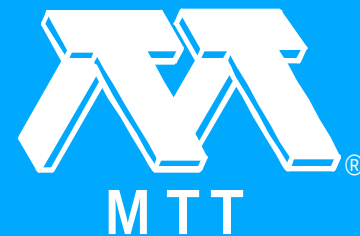


Abstracts

Four Gigabits Per Second Millimeter-Wave Exciter-Modulator-Amplifier Module

Y. Chang, D.L. English and H.J. Kuno. "Four Gigabits Per Second Millimeter-Wave Exciter-Modulator-Amplifier Module." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 206-208.

This paper describes a solid-state oscillator-quadri-phase modulator-amplifier module operating at four gigabits per second data-rate in V-band frequency range.



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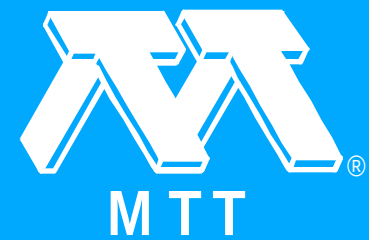
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Abstracts

Session 13 -- Parametric Amplifiers and Upconverters

"Session 13 -- Parametric Amplifiers and Upconverters." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 209-209.



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Abstracts

Low-Cost X-Band MIC Parametric Amplifier

D.A. Fleri, J.J. Taub, J.J. Whelehan and J.M. Wolczok. "Low-Cost X-Band MIC Parametric Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 210-212.

An X-band MIC parametric amplifier using planar printed circuit techniques which result in low-cost and high reliability has been developed. Design of a microstrip four-port circulator and parametric amplifier stage on a low-loss YIG substrate, a 31-GHz microstrip pump source on teflon-fiber glass, and a pump source at the same frequency in integrated fin-line are described.



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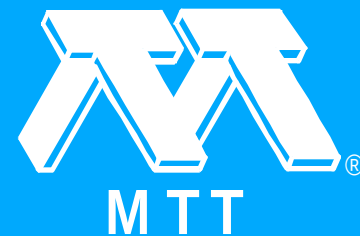


Abstracts

An Integrated X-Band Parametric Amplifier

L.E. Dickens and R.S. Littlepage. "An Integrated X-Band Parametric Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 213-214.

To be reported in this paper are the results of a program for the design and development of an all solid state integrated circuit microwave parametric amplifier. This is a room temperature device with a design stressing low cost and high reliability.



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A Cooled MIC Parametric Upconverter

G.V. Kopcsay, R.A. Lange, E.W. Sard and J.J. Taub. "A Cooled MIC Parametric Upconverter." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 215-217.

A parametric upconverter, suitable for cryogenic cooling in a low-noise receiver system, has been developed using microstrip circuit techniques. The prototype upconverter provides 2.4 to 3.0 dB of gain for input signals from 1.35 to 1.73 GHz with an output in the 4.6 to 4.98 GHz band. Less than 26 mW of pump power at 3.25 GHz is required for its operation. The cooled noise temperature of the upconverter is less than 7 K.

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Abstracts

Octave Input, S-TO K/sub a/-Band Large-Signal Upper-Sideband Varactor Upconverter

H.C. Okean and L.J. Steffek. "Octave Input, S-TO K/sub a/-Band Large-Signal Upper-Sideband Varactor Upconverter." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 218-220.

The S-to K/sub a/-band varactor upconverter described herein provides significantly greater power output/bandwidth capability than obtainable from a single-sideband resistive modulator, leading to significant potential simplification in high-modulation-rate millimeter wave transmitters. This upconverter uses high quality varactors and a unique design to provide octave (2-4 GHz) instantaneous input bandwidth, and a flat (6-9 mW), 2 GHz-wide K/sub a/-band output power-frequency response with minimum K/sub a/-band pump power expenditure.



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Abstracts

A Low Noise, Room Temperature 12 GHz Parametric Amplifier (Abstract)

S.D. Lacey, B.T. Hughes and J.C. Vokes. "A Low Noise, Room Temperature 12 GHz Parametric Amplifier (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 221-221.

A low noise, room temperature, wideband parametric amplifier is described which could be used for example in 12 GHz satellite ground station receivers. The amplifier has a gain of 26 dB, a $\frac{1}{2}$ dB bandwidth of 660 MHz and noise temperature between 156 and 171°K.



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Abstracts

K/sub u/-Band Spacecraft Parametric Amplifier

E. Kraemer, J. Leeper and J. Whelehan. "K/sub u/-Band Spacecraft Parametric Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 222-224.

A spacecraft 15-GHz parametric amplifier having a 500-MHz 1-dB bandwidth at 18-dB gain and 140 K noise temperature has been demonstrated. The 14-ounce unit incorporates the amplifier mount, 5-port circulators, varactor doubler, Gunn oscillator, and pump source. The maximum dc input of 11 watts includes stabilization over -5 to +50°C in a thermal-vacuum environment.



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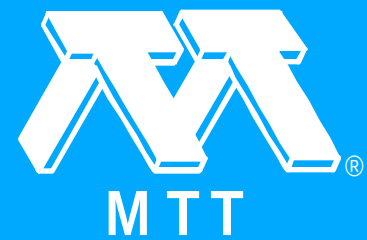
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Miniaturized Nondegenerate K/sub a/-Band Paramp for Earth to Satellite Communications

M.A. Balfour, A. Larsen, S. Nussbaum and J. Whelehan. "Miniaturized Nondegenerate K/sub a/-Band Paramp for Earth to Satellite Communications." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 225-227.

State-of-the-art millimeter wave paramp designs have been reduced to practice resulting in a miniaturized low-noise, all solid-state, K/sub a/-band amplifier designed to meet stringent electrical and mechanical specifications. An amplifier gain of 18 dB and a noise figure of 3.8 dB were achieved. This amplifier has application to future generation communications systems, and because of its small size and weight, to upgrading existing systems.

[Click on title for a complete paper.](#)



Abstracts

An IMPATT Pump for a Low Noise Parametric Amplifier

T. Smith, B. Smilowitz, G. Irvin and R. Kaminsky. "An IMPATT Pump for a Low Noise Parametric Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 228-230.

Noise measurements have been made on an IMPATT pumped S-band parametric amplifier. For the properly adjusted pump, no significant increase in noise temperature was observed for interfering signal levels up to -40 dBm, 20 MHz from the noise measurement frequency.



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Abstracts

Low Noise Down-Converter and High Efficiency Up-Converter for 60 ~ 86 GHz Transmitter-Receiver

N. Kanmuri, M. Akaike, H. Kato, S. Kitazume, H. Kobayashi and H. Ishihara. "Low Noise Down-Converter and High Efficiency Up-Converter for 60 ~ 86 GHz Transmitter-Receiver." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 231-234.

Composition and characteristics of both low noise down-converter and high efficiency up-converter for transmitter-receiver in the frequency range of 60 ~ 86 GHz are described in this report.



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Abstracts

Session 14 -- Microwave Acoustic Devices

"Session 14 -- Microwave Acoustic Devices." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 235-235.



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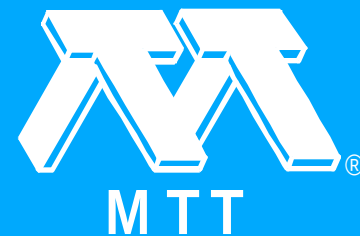


Abstracts

One Hundred Channel Selectable Surface Wave Bandpass Filter

R.M. Hays, R.C. Rosenfeld and C.S. Hartmann. "One Hundred Channel Selectable Surface Wave Bandpass Filter." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 236-236.

Surface wave multichannel bandpass filters such as the selectable filters, filter trees, or filter banks provide a large number of bandpass filter channels with relatively few transducers. Among major systems applications are frequency-hopped receivers, spread-spectrum equipment, and multichannel multiplex systems. Synthesis of more than 100 bandpass responses of varying center frequency and varying bandwidth with nominally 20 transducers is detailed.



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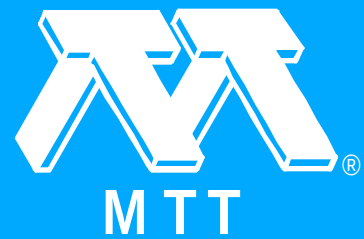


Abstracts

Electronically Variable Chirp Signal Correlation with the Diode-Correlator

T.M. Reeder. "Electronically Variable Chirp Signal Correlation with the Diode-Correlator." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 237-239.

The application of the Diode-Correlator to electronically variable chirp signal correlation is described. Theory and experiments for this nonlinear tapped delay line device are presented which show that input chirp signal bandwidth may be arbitrarily variable up to a maximum specified by the tap sampling frequency.



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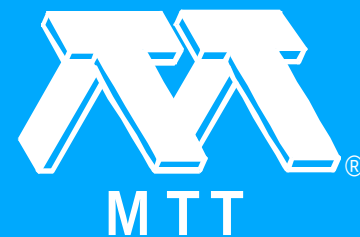


Abstracts

Acoustic Surface Wave Burst Correlator

H.M. Gerard, T.W. Bristol, E.H. Ross, W.R. Smith and P.B. Snow. "Acoustic Surface Wave Burst Correlator." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 240-242.

A doppler resolution filter is described which utilizes two acoustic-surface-wave tapped delay lines to perform an important radar signal processing function. The (-1 dB) bandwidth is 50 MHz and the delay increment for each tap is 5.0 μ sec, for a total of 16 taps. A novel LiNbO₃/sub 3/ temperature stabilization technique is reported for controlling the 80 μ sec delay line stability to $\pm 2 \times 10^{-7}$ over an ambient 10°F range.



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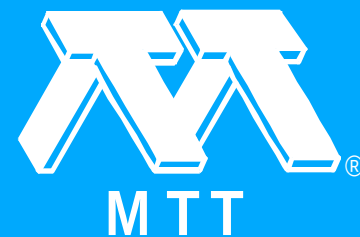


Abstracts

Development of a Pulse Compression DMS System Using Surface Acoustic Wave Devices (Abstract)

D.W. Mellon and W.D. Daniels. "Development of a Pulse Compression DMS System Using Surface Acoustic Wave Devices (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 243-243.

The development of a chirp pulse pair DME system using surface wave devices (SWD) for pulse expansion and compression and as delay lines for time domain decoding is discussed. Pulse compression allows improvements in receiver sensitivity and frequency band channelization while SWD's provide size, weight, and performance improvements.



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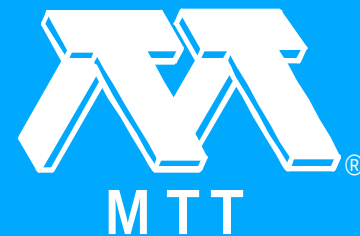


Abstracts

Radar Pulse Expansion/Compression Filters Utilizing Surface Acoustic Waves

E.H. Gregory and J. Burnsweig. "Radar Pulse Expansion/Compression Filters Utilizing Surface Acoustic Waves." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 244-246.

Surface acoustic wave pulse expansion/compression filters have been developed at Hughes which have applications to modern radar systems. A review will be presented of two pertinent applications and the advantages of these devices will be emphasized.



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Synthesis of Periodic Apodized SAW Filters in the Presence of Diffraction

A.J. Slobodnik, Jr. and T.L. Szabo. "Synthesis of Periodic Apodized SAW Filters in the Presence of Diffraction." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 247-249.

Straightforward analytic synthesis techniques are derived for correcting for diffraction in periodic acoustic surface wave filters having one apodized transducer. Quantitative experimental verification of the procedure is provided for a LiTaO₃ filter operating at 340 MHz.

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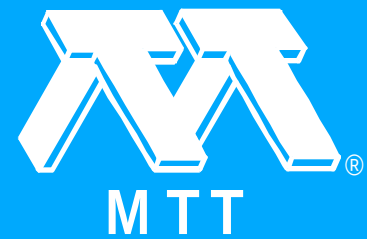


Abstracts

Multi-Piezo Film Microwave Acoustic Transducers

R. Kaul, T.M. Reeder and J.T. Flynn. "Multi-Piezo Film Microwave Acoustic Transducers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 250-252.

High performance bulk-wave transducers employing alternating half-wavelength thick piezoelectric and acoustically matched metal films have been fabricated to operate in Ku-band. Longitudinal-mode transducers employing zinc oxide and copper films fabricated on sapphire substrates yielded an untuned conversion loss of 25 dB from 8 to above 14 GHz.



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Magnetostatic Surface Wave Delay Lines

J.C. Sethares and M.R. Stiglitz. "Magnetostatic Surface Wave Delay Lines." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 253-256.

Measurements have been made of insertion and propagation loss of MSSW delay lines at microwave frequencies. Loss data are compared with recent theory and the frequency independent MSSW damping parameter λ is calculated to be 0.88×10^4 Hz.

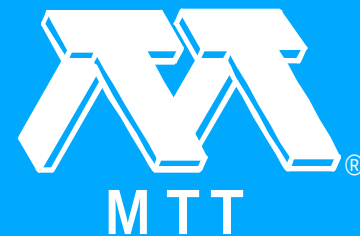
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Abstracts

Session 15 -- Microwave Automated Measurement and Computer Optimization Techniques

*"Session 15 -- Microwave Automated Measurement and Computer Optimization Techniques."
1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974
[MWSYM]): 257-257.*



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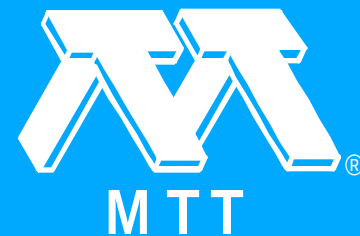


Abstracts

Testing Microwave Transmission Lines

A.R. Howland. "Testing Microwave Transmission Lines." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 258-260.

Direct RF measurement techniques are discussed in terms of their application to testing of long microwave transmission lines such as those used in heavily loaded microwave relay systems or high power radar systems. The return loss profile, a measure of transmission line quality, is introduced. Test results presented include data obtained by means of measurement techniques which permit inservice determination of the transmission line operating characteristics.



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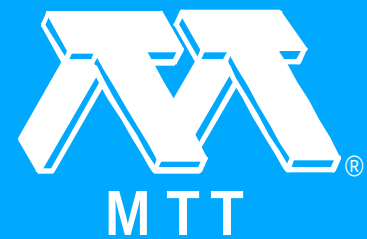


Abstracts

An Alternative Calibration Technique for Automated Network Analyzers with Application to Adapter Evaluation

G.F. Engen. "An Alternative Calibration Technique for Automated Network Analyzers with Application to Adapter Evaluation." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 261-262.

Although conceptually straightforward, the application of existing automated network analyzers to the problem of adapter evaluation is inhibited by the limited accuracy of the detection process, the requirement for several impedance standards at each frequency, and software problems. This paper describes a simple hardware modification, which for adapter evaluation yields an order of magnitude improvement in accuracy. A alternative calibration procedure is outlined which exploits this improved accuracy potential, and which requires only one impedance standard.



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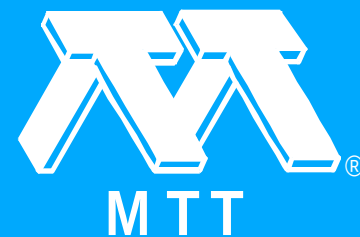


Abstracts

An Application of the Power Equation Concept and Automation Techniques to Precision Bolometer Unit Calibration (1974 [MWSYM])

E.L. Komarek. "An Application of the Power Equation Concept and Automation Techniques to Precision Bolometer Unit Calibration (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 263-265.

The power equation concept has been implemented into a multioctave precision bolometer unit calibration system employing automation techniques in conjunction with an automatic network analyzer system. The system was qualified as a calibration transfer system operating in the 2-12.4 GHz frequency range at 1 to 10 mW with a single measurement standard deviation of 0.2% to 1% from 2-10 GHz.



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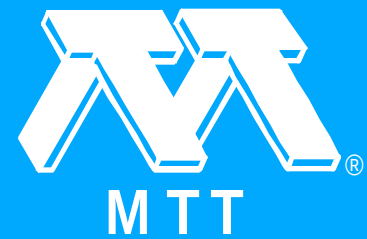


Abstracts

Time Domain Oscillographic Microwave Network Analysis Using Frequency-Domain Data

H.E. Stinehelfer. "Time Domain Oscillographic Microwave Network Analysis Using Frequency-Domain Data." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 266-267.

Measurements taken in the frequency domain are translated into the time domain and plotted. Selected time slots are then reconstructed in the frequency domain revealing the VSWR of single connectors or circuit parameters without connector mismatch contribution.



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Abstracts

An Automated General Purpose Test System for Solid State L.O.'s (Abstract)

J.R. Humphrey. "An Automated General Purpose Test System for Solid State L.O.'s (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 268-268.

Automation has provided a cost-effective solution to test problems associated with solid-state local oscillators. Computer controlled measurement and analysis for L.O.'s, L-Band through Ku-Band, is provided by a single system. Improved testing provides positive feedback to design efforts and enhances device tuning capability.



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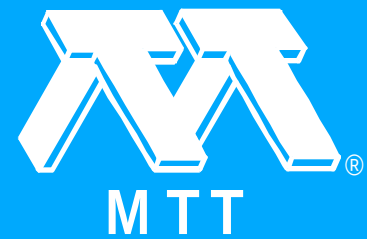


Abstracts

Automatic Load Contour Mapping for Microwave Power Transistors (1974 [MWSYM])

J. Cusack, S. Perlow and B. Perlman. "Automatic Load Contour Mapping for Microwave Power Transistors (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 269-271.

A technique for large signal characterization of microwave power transistors is described. A computer controlled apparatus is used to map contours of constant output power and efficiency, on a Smith Chart, for dynamic matching of both input and output circuits.



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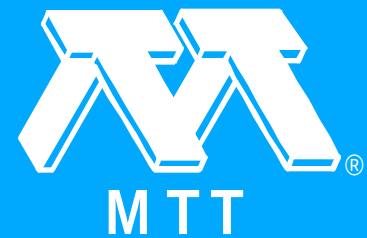


Abstracts

Generalized Design of Band-Pass and Other Filters by Computer Optimization

S.B. Cohn. "Generalized Design of Band-Pass and Other Filters by Computer Optimization." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 272-274.

A straightforward method yields accurate equal-ripple response for band-pass, low-pass, etc., filters. The circuit can contain unequal line lengths, lumped elements, and discontinuity-effect representations. Examples include a 3.0-resonator band-pass design.



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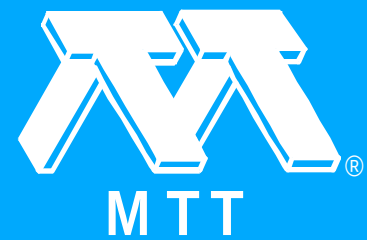


Abstracts

Computer-Aided Tolerance Optimization Applied to Microwave Circuits

J.W. Bandler, P.C. Liu and J.H.K. Chen. "Computer-Aided Tolerance Optimization Applied to Microwave Circuits." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 275-277.

A very important practical problem in microwave circuit design is the problem of optimal design subject to component tolerances. An approach which treats the component tolerance assignment as an integral part of computer-aided design is, to the authors' knowledge, new to microwave engineers. Using recent nonlinear programming techniques and Dakin's branch and bound technique in conjunction with Fletcher's unconstrained minimization program, a variety of continuous and discrete tolerance problems may be solved. It is planned to make the full program available.



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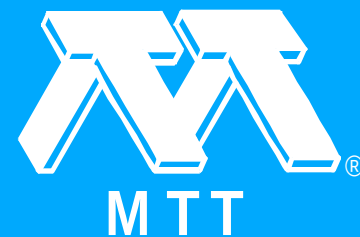


Abstracts

New Microwave Frequency Synthesizers that Exhibit Broader Bandwidths and Increased Spectral Purity (1974 [MWSYM])

P.G. Tipon. "New Microwave Frequency Synthesizers that Exhibit Broader Bandwidths and Increased Spectral Purity (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 278-280.

A new Microwave Frequency Synthesizer has been developed that provides a spectrally pure microwave signal source for measurement of sophisticated components and sub-systems. Patent has been applied for on this unique synthesis at microwave technique.



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Abstracts

Session 16 -- Ferrite Control Components

"Session 16 -- Ferrite Control Components." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 281-281.



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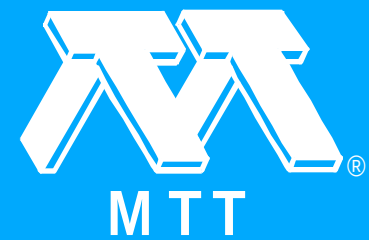
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Abstracts

Manufacturing Methods Studies of Ferrite Phasers

M. Mohr. "Manufacturing Methods Studies of Ferrite Phasers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 282-282.



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Abstracts

The Ferrite-Loaded Waveguide Discontinuity Problem (1974 [MWSYM])

F.J. Bernues and D.M. Bolle. "The Ferrite-Loaded Waveguide Discontinuity Problem (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 283-285.

A method to obtain the scattering matrix of a waveguide inhomogeneously loaded with ferrite is presented. Numerical results are obtained for the dielectric-loaded twin-slab phase shifter in rectangular waveguide.



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A New Edge Mode Isolator in the VHF Range (Abstract)

L. Courtois, B. Chiron and G. Forterre. "A New Edge Mode Isolator in the VHF Range (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 286-286.

Hines has shown opportunity of using "dynamic surface modes" to realize non reciprocal devices in microwave range. At low frequencies the lowfield losses of the ferrite limit the working of these devices. The authors show that the "magnetostatic surface mode" allows the realization of non reciprocal devices working at frequencies lower than that of ferrite resonance. An isolator in the range 200 to 425 Mc/s is presented.

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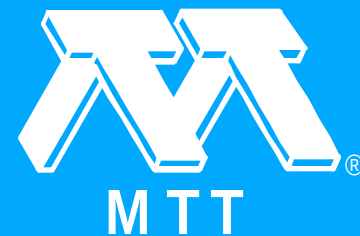


Abstracts

A Narrow-Band Millimeter-Wave Y-Junction Circulator with Wide-Band Tuning Capability

B. Owen. "A Narrow-Band Millimeter-Wave Y-Junction Circulator with Wide-Band Tuning Capability." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 287-289.

This paper describes the mode of operation and the synthesis technique for a series of narrow-band tuneable circulators suitable for use in millimeter-wave system channel applications. Typical design and performance data are presented for circulators operating from 50 to 110 GHz.



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Bandwidth Enlargement of a Millimeter Wave Y-Circulator with Half Wavelength Line Resonators

Y. Akaiwa. "Bandwidth Enlargement of a Millimeter Wave Y-Circulator with Half Wavelength Line Resonators." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 290-292.

Half wavelength line resonators are employed to enlarge the bandwidth of a 50 GHz Y-circulator. The resonator has a very simple structure that a rectangular metal block is placed in a waveguide. The bandwidth is enlarged from 3.5 GHz to 5.5 GHz.

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Abstracts

A 1.7GHz Lumped-Element Circulator Stable Over a Wide Range of Temperature

I. Ikushima and M. Maeda. "A 1.7GHz Lumped-Element Circulator Stable Over a Wide Range of Temperature." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 293-295.

This paper describes a broadband thin-film lumped-element circulator stabilized over a wide range of temperatures using a newly-developed ferrite material with a low temperature coefficient. The experimental circulator exhibits a bandwidth of about 420MHz over a wide temperature range of from -10°C to 60°C, in which VSWR and loss are less than 1.2 and 1.0dB, respectively.



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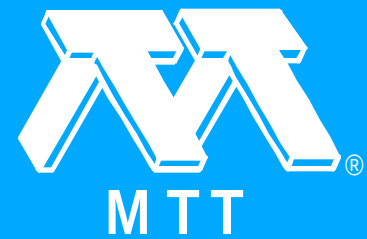
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Theory of 4-Port Nonreciprocal Circuit -- Filter and Circulator

M. Igarashi and Y. Naito. "Theory of 4-Port Nonreciprocal Circuit -- Filter and Circulator." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 296-298.

The general formula for 4-port nonreciprocal circuit is given. The effects of structures and physical properties of resonator on the characteristics of the circuit are investigated. The limitations of available frequency range are clarified.

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Abstracts

Session 17 -- Active Solid State Devices I

"Session 17 -- Active Solid State Devices I." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 299-299.



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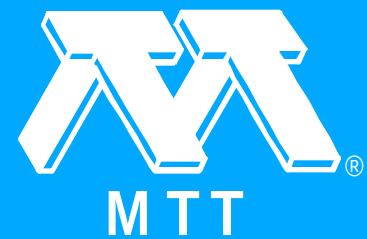


Abstracts

Measurement of the Large Signal Characteristics of Microwave Solid State Devices Using an Injection Locking Technique

J.C.T. Young and I.M. Stephenson. "Measurement of the Large Signal Characteristics of Microwave Solid State Devices Using an Injection Locking Technique." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 300-302.

The device under test is operated as an injection-locked oscillator. The dynamic conductance and susceptance of the device are obtained from the phase and amplitude response of the system.



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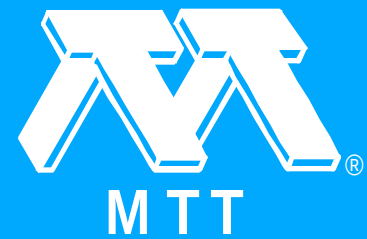


Abstracts

Determination of Semiconductor Junction Device Package Networks (1974 [MWSYM])

P.T. Greiling and R.W. Laton. "Determination of Semiconductor Junction Device Package Networks (1974 [MWSYM])." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 303-305.

A general method for the determination of a linear, lumped-element equivalent circuit of any semiconductor device package in any microwave circuit mount is presented. Results are given for IMPATT and TRAPATT devices in coaxial and microstrip circuits, together with experimental validation of the results.



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Performance of Avalanche Diode Oscillators with Large Leakage Current

R.J. Gutmann and J.M. Borrego. "Performance of Avalanche Diode Oscillators with Large Leakage Current." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 306-308.

Experimental results of the RF performance of 500 milliwatt CW, X-band IMPATT diode oscillators and 30 watt pulsed, S-band TRAPATT diode oscillators with large leakage current are presented. The leakage current was varied from 10 microamps to 10 milliamps by varying the dose rate of high energy electrons from a linear accelerator. Correlation obtained with device models indicate that the principal effects of leakage current on avalanche diode oscillator characteristics have been properly identified.

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Abstracts

High Efficiency Read Diode Amplifier

W.C. Tsai, C.K. Kim and R.E. Gray. "High Efficiency Read Diode Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 309-311.

Impedance characteristics of Read-profile IMPATT diodes are evaluated and amplifiers operating in the stable reflective mode have been designed based on the measured diode impedance. Power output of up to 4.5 Watts was obtained in a one stage single diode amplifier with a gain of 4.5 dB and an efficiency of 22 percent.



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Abstracts

Pulsed and CW Double-Drift Silicon IMPATTs

G. Pfund, C. Snapp and A. Podell. "Pulsed and CW Double-Drift Silicon IMPATTs." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 312-314.

The properties of double-drift Si IMPATTs designed for both pulsed and CW operation at frequencies between 8 and 18 GHz are discussed. Peak pulse powers greater than 18 watts at 10 GHz and 13.5 watts at 16.5 GHz were obtained for 800 nsec pulses at a 25% duty cycle with the junction temperature rise limited to 200°C. For a similar temperature rise a CW power of 3.4 watts at 11.5 GHz was achieved. Conversion efficiencies were between 10.5 and 13.7%.



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Performance and Reliability of K/sub a/-Band GaAs IMPATT Diodes

R.A. Murphy, W.T. Lindley, D.F. Peterson and P. Staecker. "Performance and Reliability of K/sub a/-Band GaAs IMPATT Diodes." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 315-317.

K/sub a/-band GaAs p-n junction IMPATT diodes have been fabricated which have delivered 450 mW of added power with 9.6% efficiency at a junction temperature of 275°C. Results of life tests predict operating life in excess of five years at this temperature.

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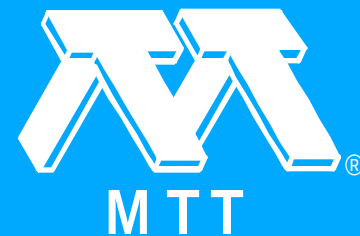


Abstracts

A Four Stage, 30 dB Gain, 100 mW Gunn Effect Amplifier in Ka-Band

J.G. de Koning, R.E. Goldwasser, R.J. Hamilton, Jr. and F.E. Rosztoczy. "A Four Stage, 30 dB Gain, 100 mW Gunn Effect Amplifier in Ka-Band." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 318-319.

Design and performance of a four-stage, 30 dB gain Gunn effect amplifier are described. The frequency response at different input power levels is given, as well as gain variation versus temperature. Saturated output power is 250 mW.



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Tunable Millimeter-Wave Packaged IMPATT Diode Oscillators

K.P. Weller, D.L. English and H.J. Kuno. "Tunable Millimeter-Wave Packaged IMPATT Diode Oscillators." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 320-322.

Broadband mechanically tunable V-band (50-75 GHz) and W-band (75-110 GHz) IMPATT oscillators have been developed using packaged silicon p+n junction diodes. A tuning bandwidth of 20% with minimum output of over 50 mW is obtained in V-band and 6% bandwidth with minimum output over 25 mW is obtained in W-band. Higher power but more limited tuning bandwidth results from using other diode structures.

[Click on title for a complete paper.](#)



Abstracts

A Low Noise 80 GHz Silicon IMPATT Oscillator Highly Stabilized with a Transmission Cavity

S. Nagano, S. Ohnaka, K. Sekido and K. Ayaki. "A Low Noise 80 GHz Silicon IMPATT Oscillator Highly Stabilized with a Transmission Cavity." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 323-326.

Design consideration and experimental performance of a new transmission-cavity-controlled silicon IMPATT diode oscillator for millimeter wavelength are described. The oscillator has the frequency stability of 1×10^{-4} over temperature variation $0^\circ - 50^\circ\text{C}$ and remarkably improved noise characteristics, and is free from troublesome moding problems. Discussion is made on the circuit design that satisfies frequency stabilization, noise reduction, mode stabilization and increase of circuit efficiency.



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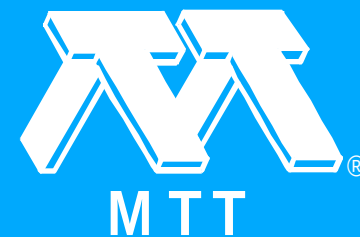
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Abstracts

Session 18 -- The Real World of MIC Packaging (Panel)

"Session 18 -- The Real World of MIC Packaging (Panel)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 327-328.



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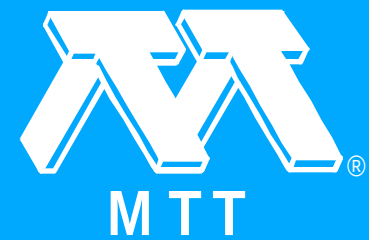
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Abstracts

The Real World of MIC Packaging

F.J. Rosenbaum. "The Real World of MIC Packaging." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 328-328.



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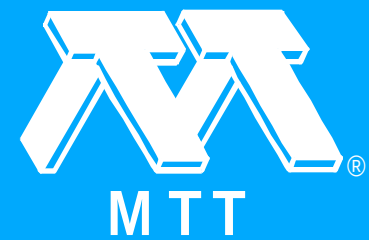
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Abstracts

Session 19 -- Microwaves in Communication and Industrial Systems

"Session 19 -- Microwaves in Communication and Industrial Systems." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 329-329.



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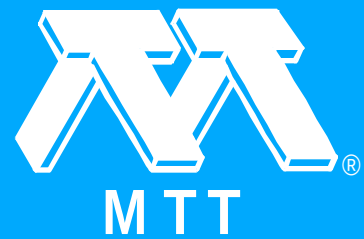
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Abstracts

Trends in Transponders in Commercial Communication Satellites

D.P. Sullivan. "Trends in Transponders in Commercial Communication Satellites." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 330-330.



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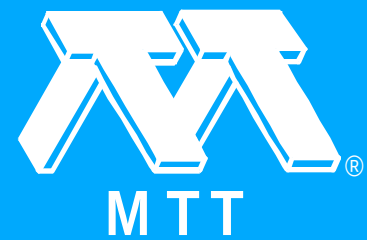


Abstracts

Modern Microwave Technology in High-Speed QPSK Communication Systems (Abstract)

C.L. Cuccia. "Modern Microwave Technology in High-Speed QPSK Communication Systems (Abstract)." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 331-331.

This paper presents a technical survey and status report of the microwave subsystems presently in use in the RF portion of modern high-speed phase-shift-keying communication systems, operating at data rates up to one gigabit per second. The principal subsystems reviewed will include four-phase phase-shift modulators of both the direct-frequency type plus up-converter; the four-phase demodulators; and the microwave circuits used to derive both carrier frequency (clock) and reference phase information from a received QPSK modulated carrier. The circuits and subsystems reviewed will be discussed at the level of the technology of the associated microwave components including details of the switching diodes, high FT transistors, video amplifiers, VCO's and special frequency multipliers involved.



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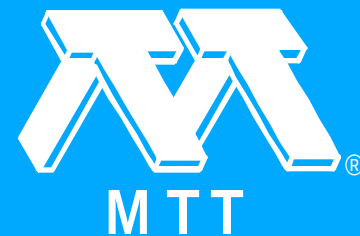


Abstracts

Recent Progress in Power Reception Efficiency in a Free-Space Microwave Power Transmission System

W.C. Brown and C.K. Kim. "Recent Progress in Power Reception Efficiency in a Free-Space Microwave Power Transmission System." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 332-333.

Recent improvements in rectifier devices in the form of specially designed GaAs Schottky-barrier diodes have been combined with rectifier circuit technology to produce receiving elements complete with low pass filtering at the microwave input and filtering at the output that operate in the 82-86 percent efficiency region. The combining of these elements in a rectenna array should produce an overall collection and rectification efficiency of over 80 percent.



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Abstracts

More than 4 Percent Efficiency Solid-State Transmitter for 4 GHz Radio Relay

Y. Kitahara, T. Kyuzaki and R. Tamura. "More than 4 Percent Efficiency Solid-State Transmitter for 4 GHz Radio Relay." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 334-336.

This paper describes a 4 GHz transmitter developed by using a low-level varactor up converter and a high-gain transistor injection locked amplifier. This transmitter, permitting to obtain an RF output of 220 mW at an efficiency of more than 4% for a DC input of 5 W, is usable as a transmitter or exciter for radio relay of a maximum of 1380 channels.



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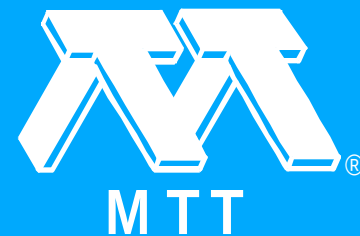


Abstracts

3.7 to 4.2 GHz Portable Microwave Repeater

W.W. Raukko. "3.7 to 4.2 GHz Portable Microwave Repeater." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 337-339.

This paper describes the use of microwave integrated circuit technology in the design of a frequency agile, portable microwave repeater of light weight, compact construction without sacrifice of performance.



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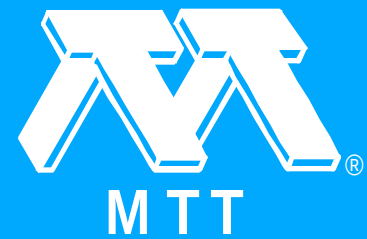


Abstracts

Solid-State Linear FM/CW Radar Systems - Their Promise and Their Problems

P. Denniss and S.E. Gibbs. "Solid-State Linear FM/CW Radar Systems - Their Promise and Their Problems." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 340-342.

The problems associated with linear FM/CW solid state radars are examined in detail, particularly sweep non-linearities. Design information is given which predicts the range sidelobe levels of such radars and methods of reducing these to acceptable levels are discussed.



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Bidirectional Microwave Repeater for Obstacle Detection Radar in Guided Ground Transportation

H.H. Tan and M.S. Gupta. "Bidirectional Microwave Repeater for Obstacle Detection Radar in Guided Ground Transportation." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 343-346.

A solid-state microwave bidirectional repeater designed for use in a guided radar system is described. The radar is meant for detecting obstacles lying along the tracks in guided ground transportation systems. An echo-cancellation scheme is proposed for reducing the effect of reflections from impedance mismatches at repeater ports.

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Abstracts

Session 20 -- Active Solid State Devices II

"Session 20 -- Active Solid State Devices II." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 347-347.



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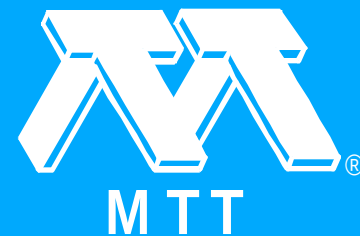


Abstracts

Bandpass Microwave Electron-Bombarded Semiconductor Amplifiers

P.S. Carter, Jr., J.A. Long and L.A. Roberts. "Bandpass Microwave Electron-Bombarded Semiconductor Amplifiers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 348-350.

This paper introduces a new type of microwave amplifier which employs as its active element electron-bombarded semiconductor diodes. This amplifier is capable of achieving both high peak and high average powers. Useful characteristics include its broad bandwidth (several GHz are possible), high efficiency (in the 50 to 60 percent range), and very low harmonic distortion. These characteristics make this amplifier extremely attractive for use in a variety of communications, radar, and laboratory test applications.



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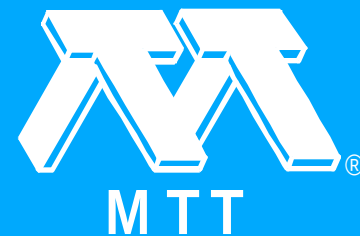


Abstracts

Application of Dual-Gate GaAs FET to Microwave Variable-Gain Amplifier

M. Maeda and Y. Minai. "Application of Dual-Gate GaAs FET to Microwave Variable-Gain Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 351-353.

The dual-gate GaAs FET has a gain control characteristic at frequencies ten times higher than that of the Si MOS tetrode. This paper demonstrates the feasibility of the dual-gate GaAs FET for a microwave variable-gain amplifier.



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High-Efficiency Broadband Power Transistors for S-Band Applications

J.E. Chapman, Jr.. "High-Efficiency Broadband Power Transistors for S-Band Applications." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 354-356.

A 50-ohm microwave power transistor has been developed for high-efficiency broadband applications at lower S-Band frequencies. The device is capable of providing 10 watts of output power with 9 dB gain and greater than 0.50 collector efficiency in a 50-ohm system.



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Abstracts

New Results on the Design of Broadband Microwave Bipolar and FET Amplifiers

W.H. Ku, W.C. Petersen and A.F. Podell. "New Results on the Design of Broadband Microwave Bipolar and FET Amplifiers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 357-359.

New results on the design of broadband microwave transistor amplifiers are presented. These results include analytical design and computer-aided optimization techniques for microwave bipolar and FET amplifiers with prescribed transistor gain roll-off characteristics and practical realizations of broadband input and output matching networks. Several designs of octave-band microwave bipolar and GaAs FET amplifiers are presented to illustrate the general design techniques.



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Abstracts

Circuit Optimization of S-Band TRAPATT Oscillators

R.J. Trew, N.A. Masnari and G.I. Haddad. "Circuit Optimization of S-Band TRAPATT Oscillators." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 360-361.

Improved performance of S-band TRAPATT oscillators has been obtained by circuit optimization techniques. Experimental conversion efficiencies approaching the theoretical predictions have been obtained for n+pp+ oscillators. Significant improvement has also been obtained in the operation of p+nn+ diodes.



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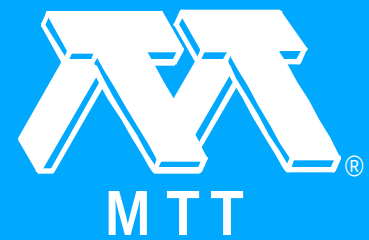
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High Pulse Energy F-Band TRAPATT Diode Amplifiers

J.H. Bowen, M.E. Breese, V.A. Mikenas, A. Schwarzmann, M. Weiss, S.G. Liu and H. Sobol. "High Pulse Energy F-Band TRAPATT Diode Amplifiers." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 362-364.

Design considerations in building high-power wide-pulse-width TRAPATT diode amplifiers are outlined. Diode characteristics, package parasitics, and circuit impedance levels are discussed. Analytical and experimental investigations of the transient thermal behavior of TRAPATT diodes are presented. Performance characteristics of several MIC alumina substrate amplifiers are described.

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Abstracts

Complementary X-Band TRAPATT Diodes

T.T. Fong and R.S. Ying. "Complementary X-Band TRAPATT Diodes." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 365-366.

X-band n+p TRAPATT diodes have been fabricated and have shown better performance than their p+n complement. The low threshold power densities required to achieve the high efficiency oscillation have greatly enhanced their high duty and CW operation. The fabrication techniques for these high frequency devices and their performance in both pulsed and CW modes will be discussed.



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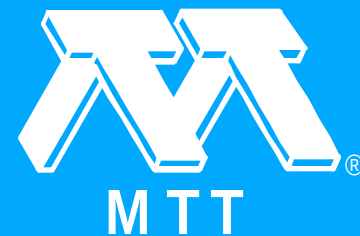


Abstracts

X-Band TRAPATT Amplifier

N.W. Cox, C.T. Rucker and K.E. Gsteiger. "X-Band TRAPATT Amplifier." 1974 S-MTT International Microwave Symposium Digest of Technical Papers 74.1 (1974 [MWSYM]): 367-370.

The design and performance of broad-band TRAPATT amplifiers in X-band are described along with a discussion of critical circuit parameters. Bandwidths of 10% and peak powers up to 38 watts have been achieved using coaxial circuits with single and multichip diodes.



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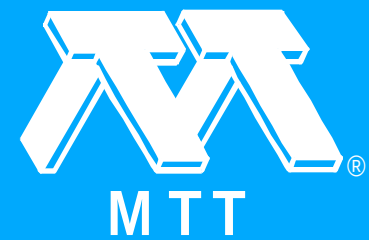
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Microwave Prize Recipients and New Fellows (1974 [MWSYM])

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