

Microwave Digital Archive

IEEE Microwave Theory and Techniques Society

1978-1980

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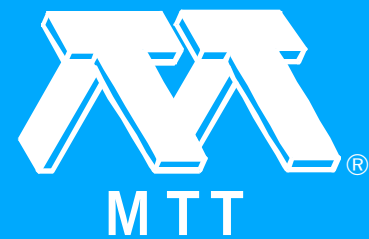
The Microwave Theory and Techniques Society of the IEEE has finished a complete archive of all reviewed and published material since 1953. Yearly updates of the published material will be compiled in the future. As digital media changes over the years, it will be necessary to update the format of the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

Remember that the quality of the old journals is not perfect, and that some photographs will not be as clear as Technicolor. Also, the optical character recognition is good, but not perfect, so some spelling errors will occur. None the less, you can copy and paste the material for your own uses and personal study.

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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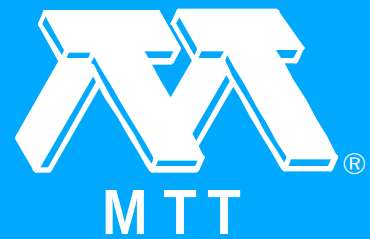
ACKNOWLEDGMENTS

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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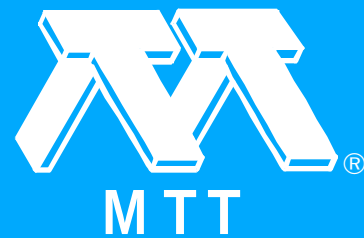
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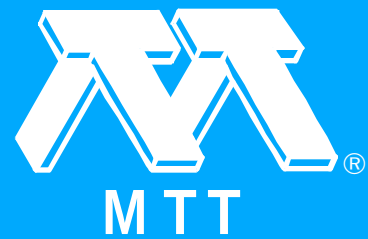
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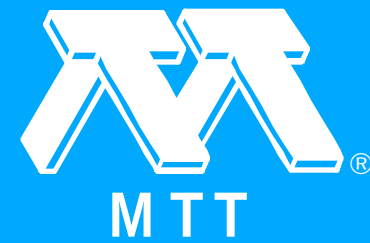
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INTRODUCTION

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.)



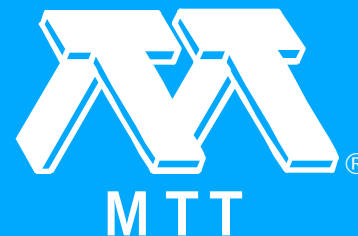
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In the dialog box shown for **General** Preferences, turn OFF the “Open Cross-Document Links in Same Window” option; this will keep the Guide file open when you view article files and allows you to return to the same page in the Guide when you close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

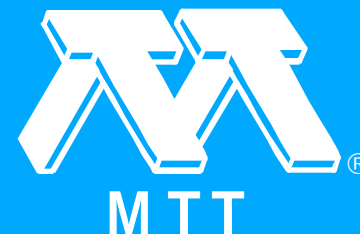


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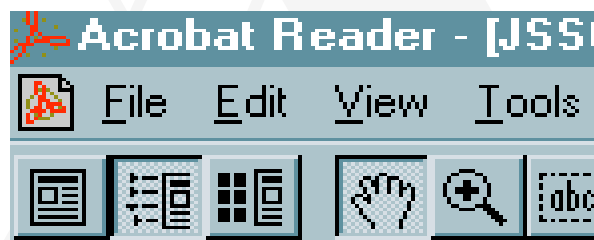
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USING BOOKMARKS

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

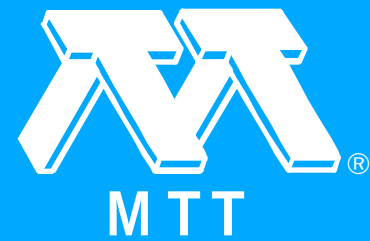
Articles may have text outside normal print-area defaults. We recommend selecting “Shrink to Fit” in the print menu (File > Print) to capture the complete image for your printout. This setting will become your new default.

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.

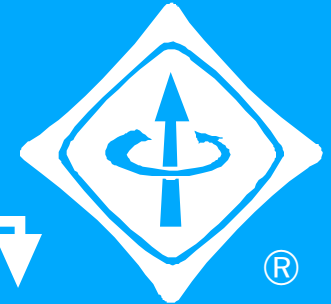
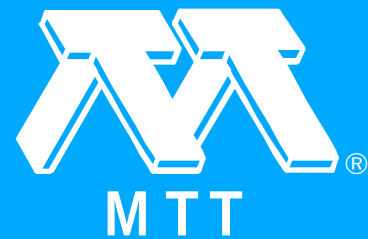
Next Page button

Click to advance to the next page in the section.

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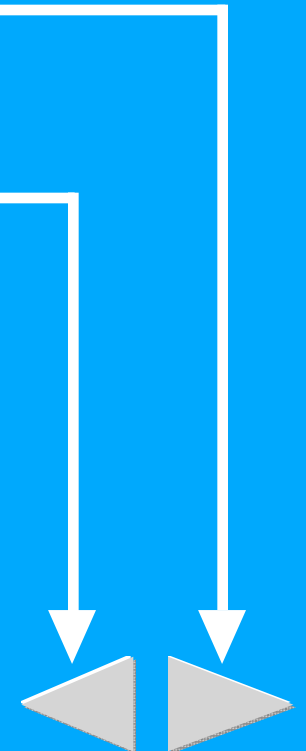
Click to go back to the previous page in the section. The first and last pages of a section show only one button.

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



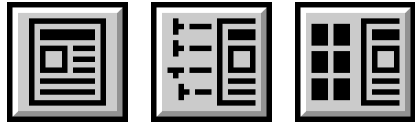
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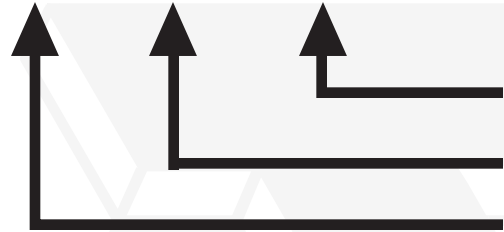


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ACROBAT TOOLBAR



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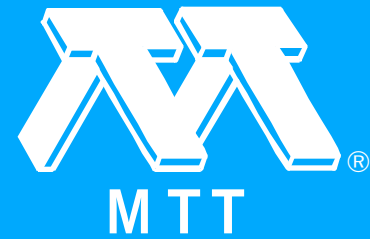
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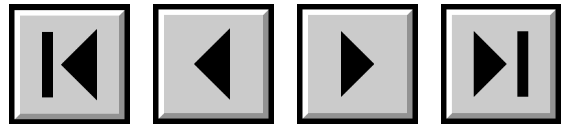
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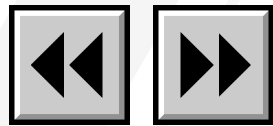
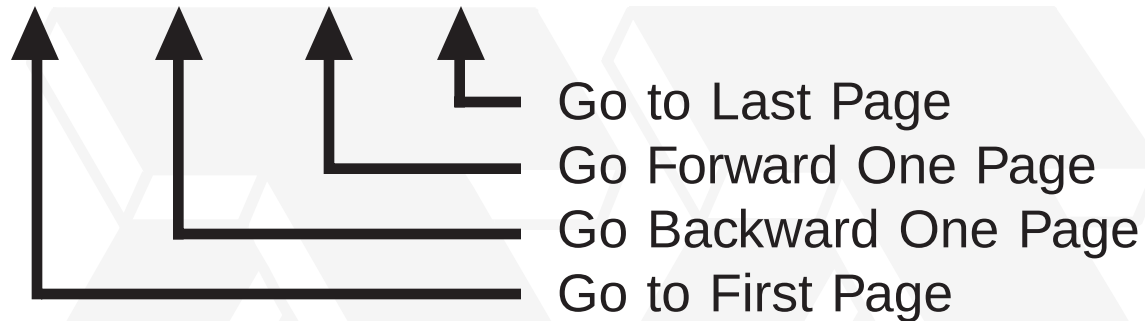


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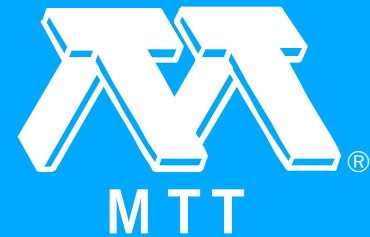
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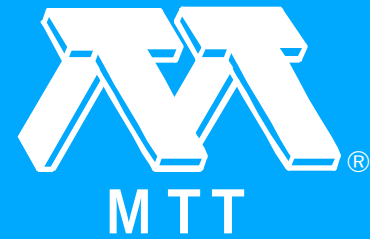
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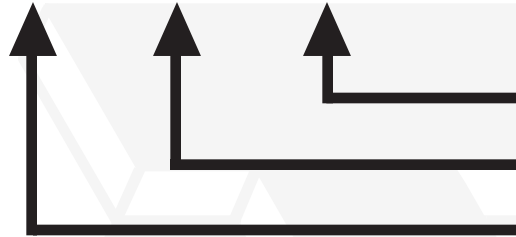
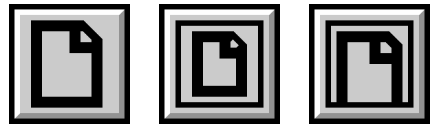
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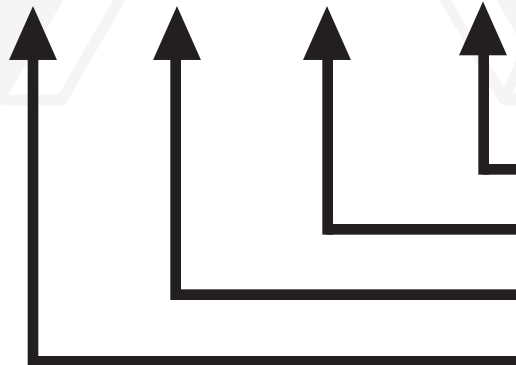
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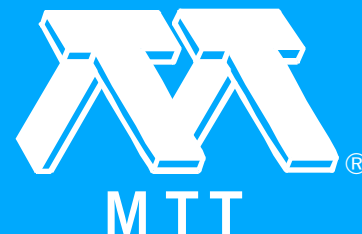
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SEARCHING

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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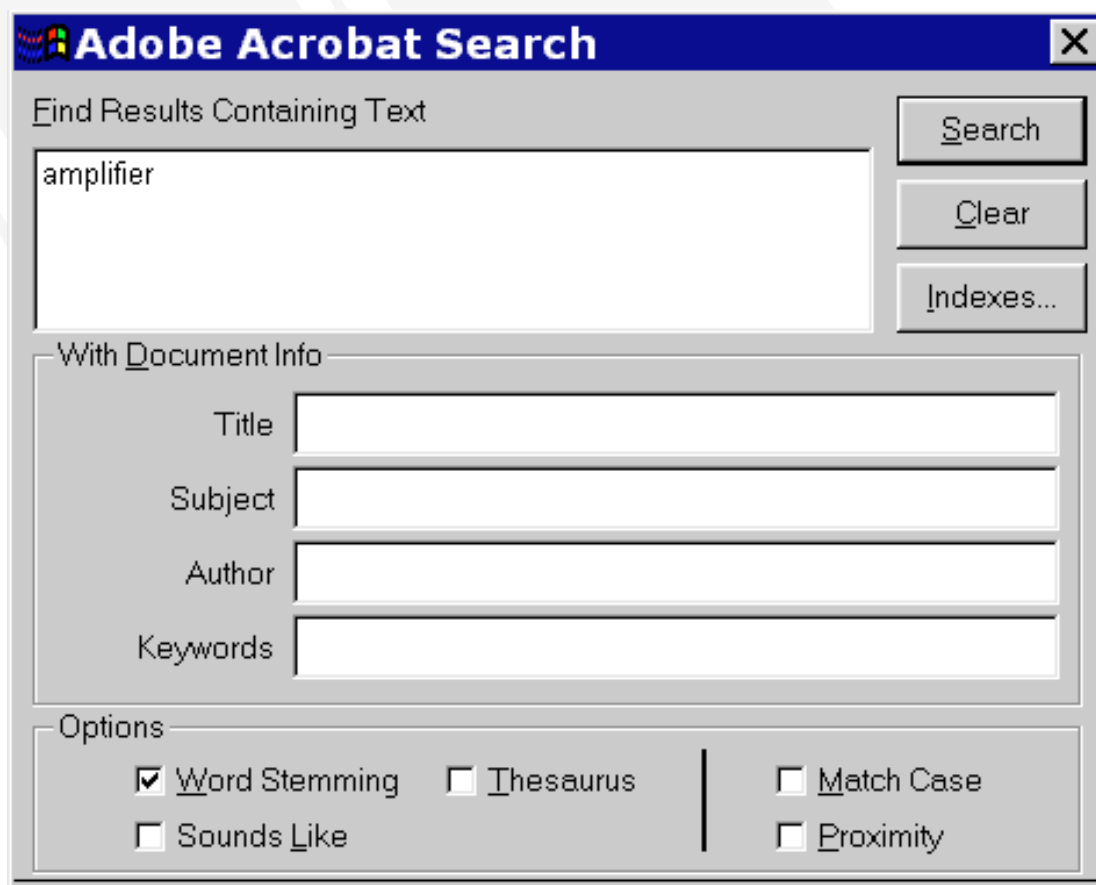
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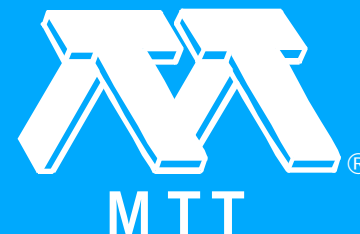
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If you are not finding files you think should show in the results list, Acrobat may not be attached to the correct index file. To check, press the “Indexes...” button for a list of available indexes. If this title is not listed, press the “Add...” 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 titled 'Find Results Containing Text' and contains a text input field with the word 'amplifier'. To the right of this field are three buttons: 'Search', 'Clear', and 'Indexes...'. Below this is a section titled 'With Document Info' containing four labeled text input fields: 'Title', 'Subject', 'Author', and 'Keywords'. At the bottom is an 'Options' section with four checkboxes: 'Word Stemming' (checked), 'Thesaurus' (unchecked), 'Match Case' (unchecked), and 'Sounds Like' (unchecked). 'Proximity' is also listed as an option but is not visible as a checkbox.

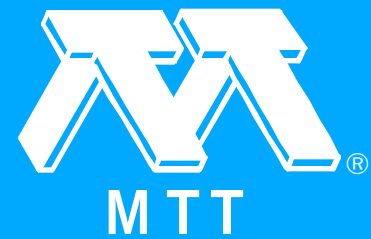


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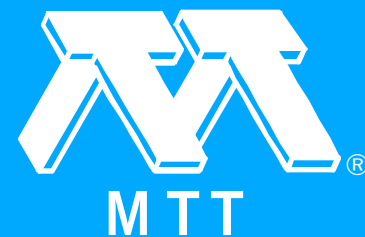
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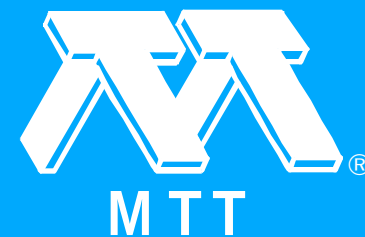
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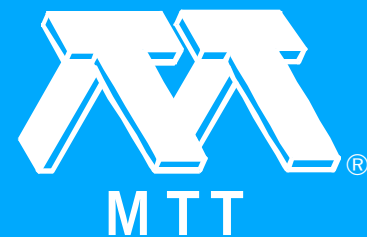
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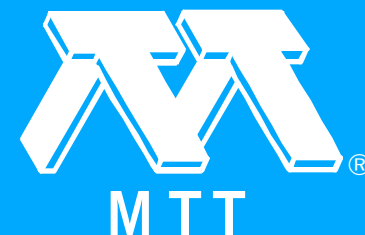
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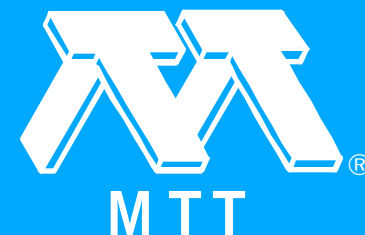
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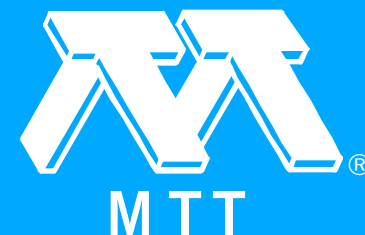
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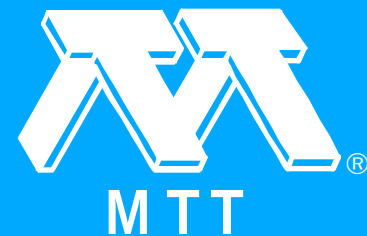
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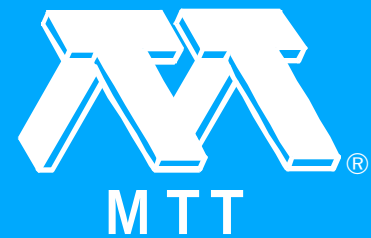
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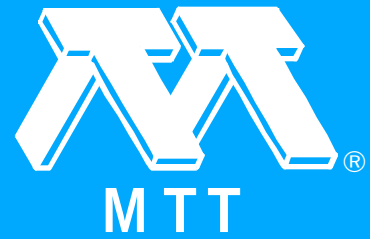
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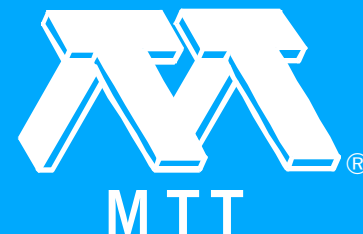
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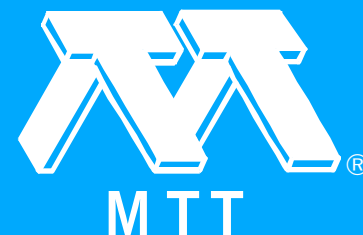
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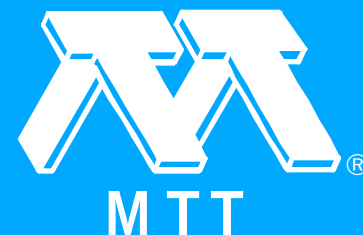
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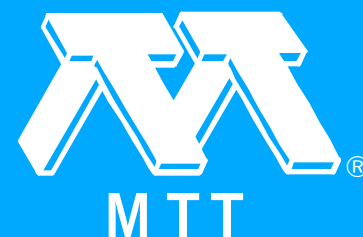
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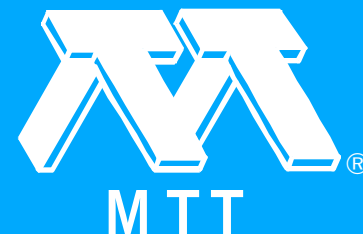
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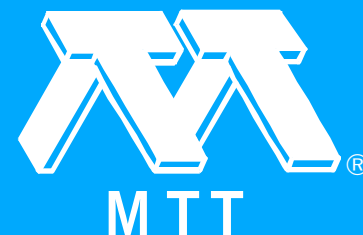
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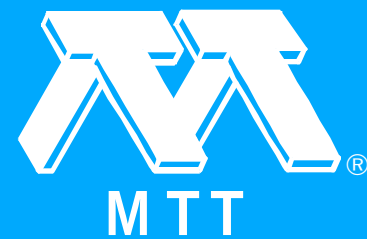
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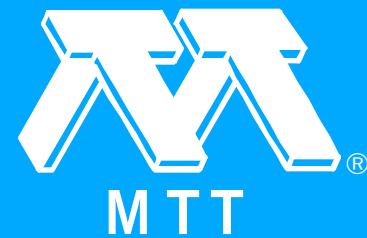
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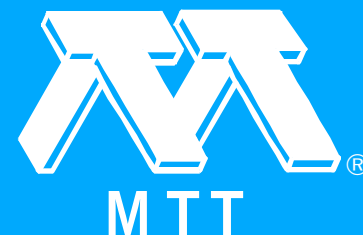
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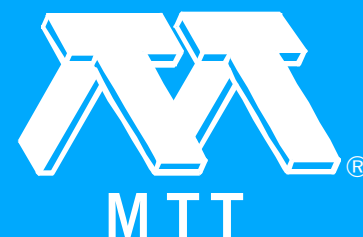
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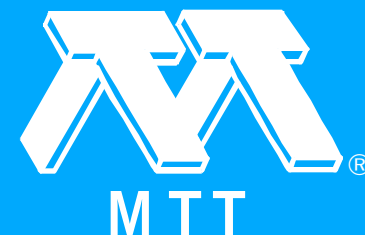
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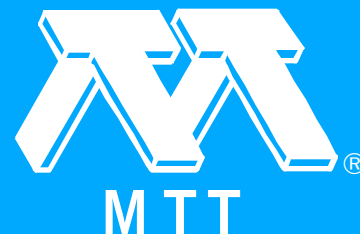


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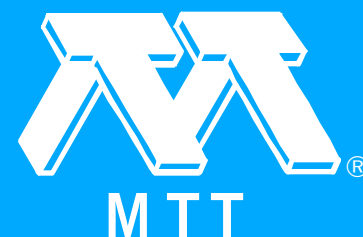
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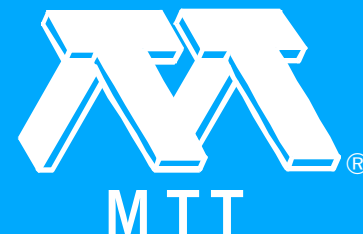
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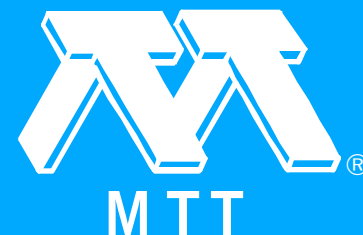
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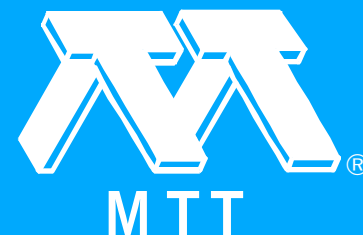
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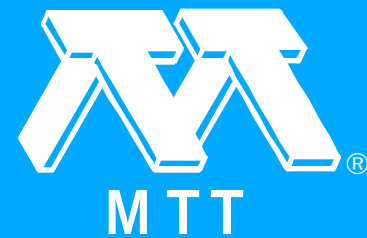
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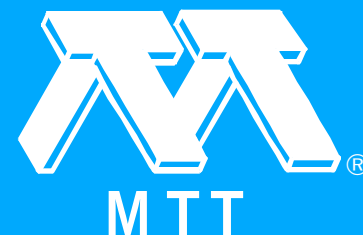
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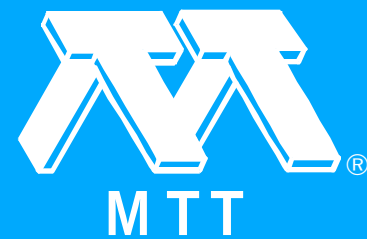
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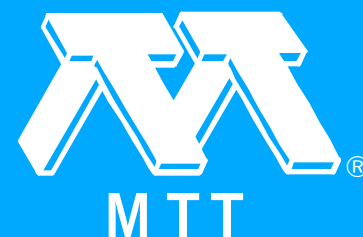
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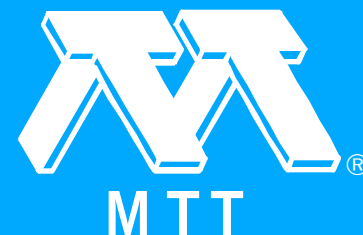
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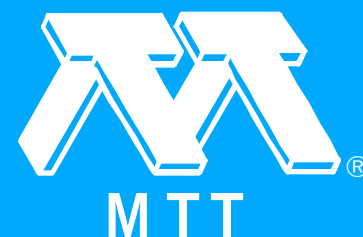
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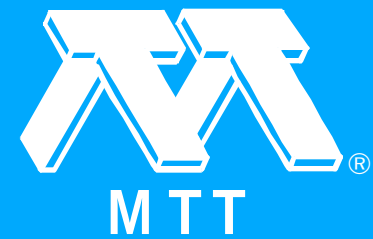
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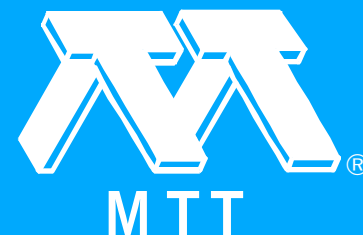
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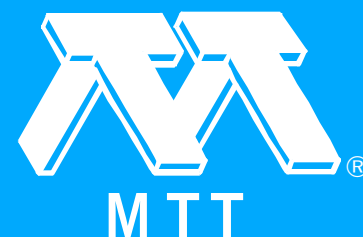
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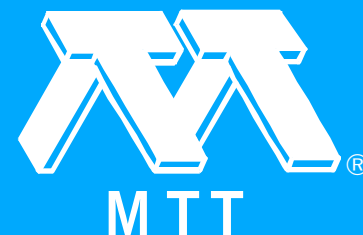
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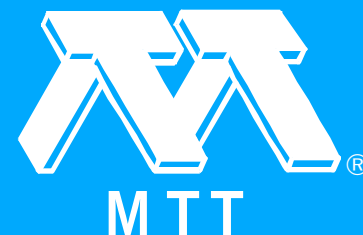


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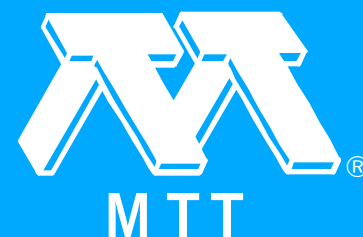
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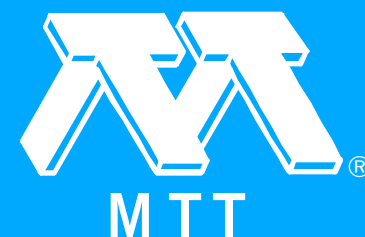
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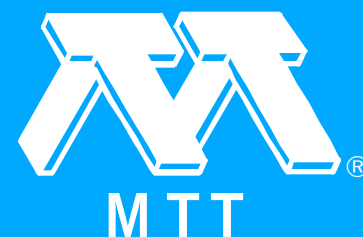
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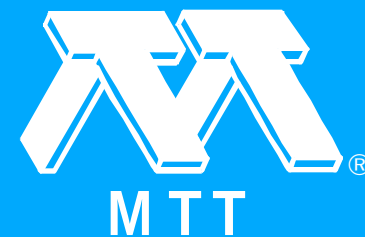
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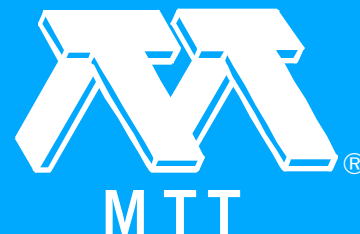


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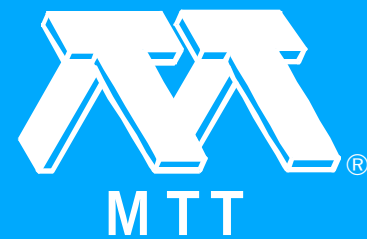
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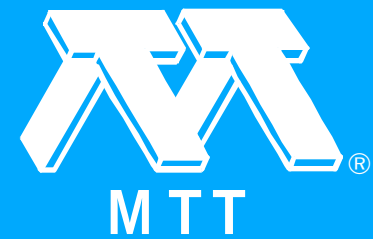
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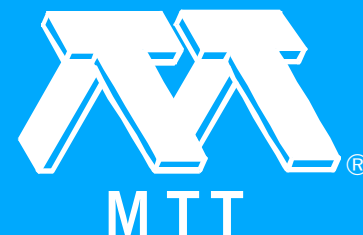


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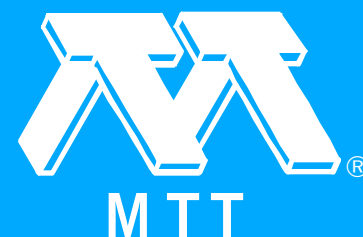
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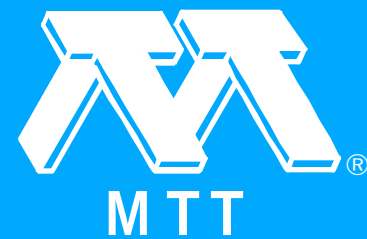
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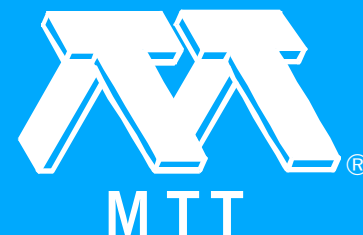


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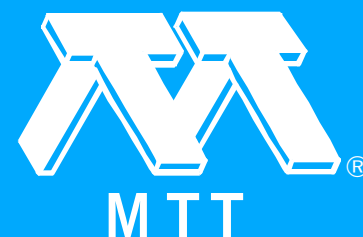
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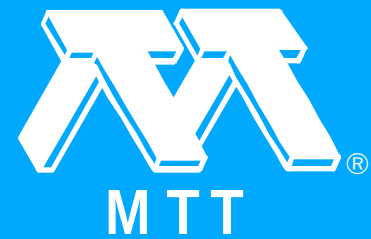
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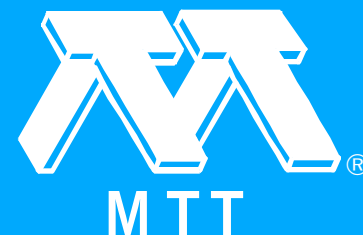
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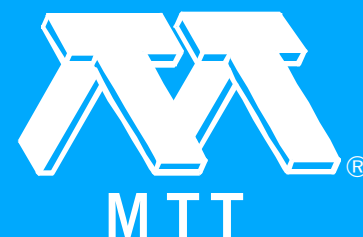
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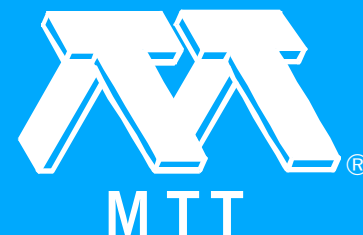


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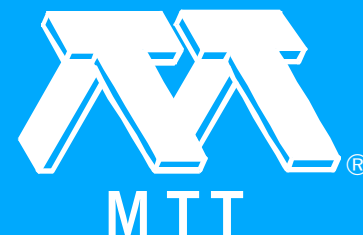
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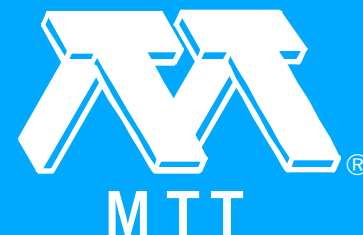
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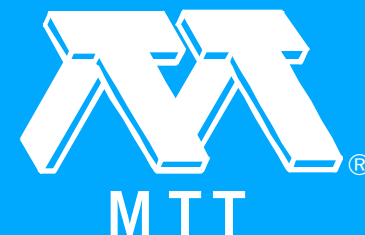
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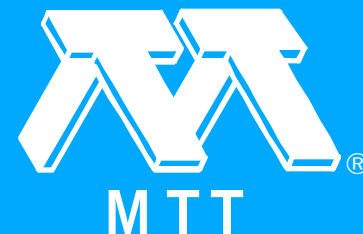
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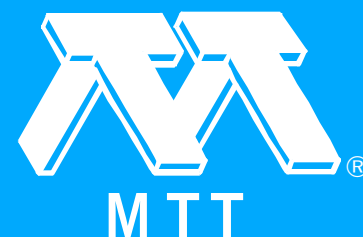
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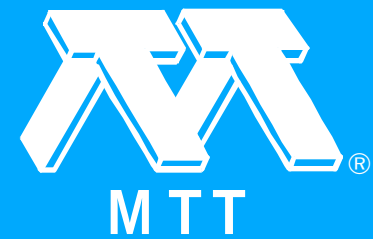
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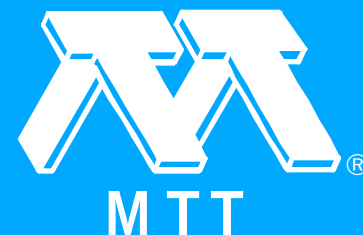
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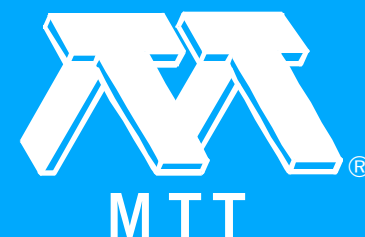
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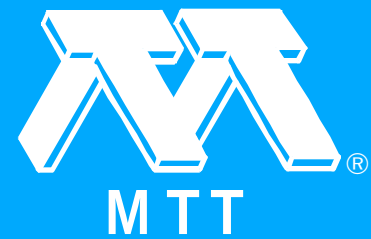
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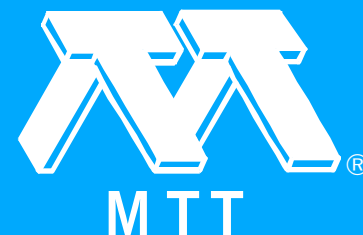
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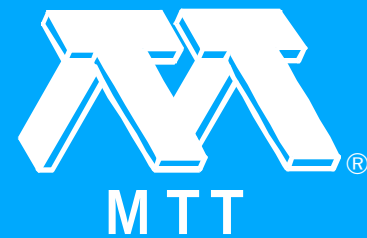
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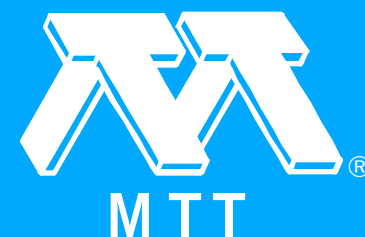
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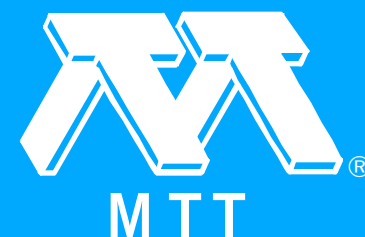
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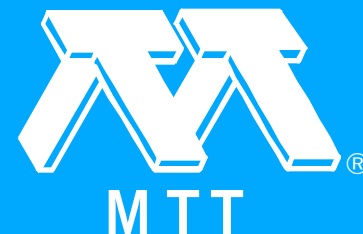
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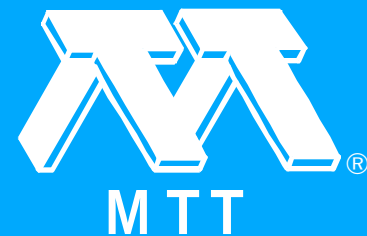
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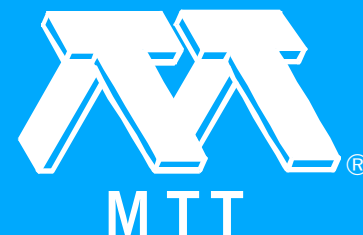
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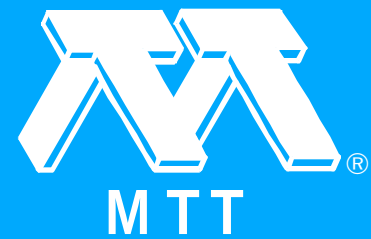
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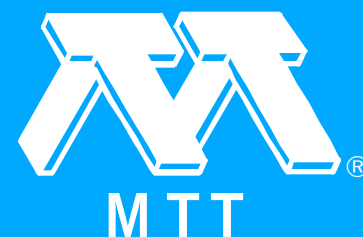
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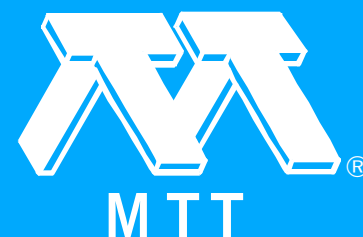
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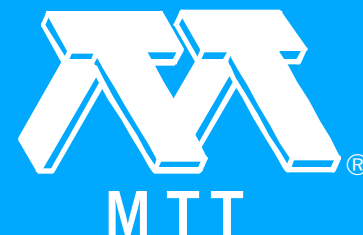
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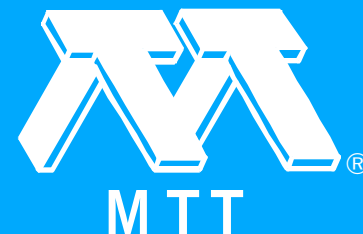


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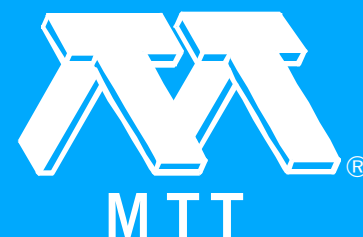
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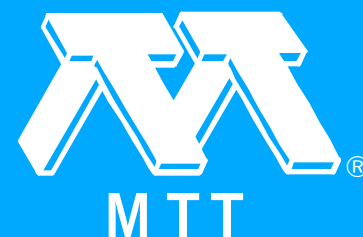
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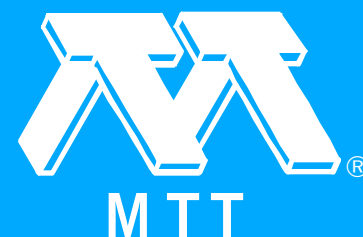
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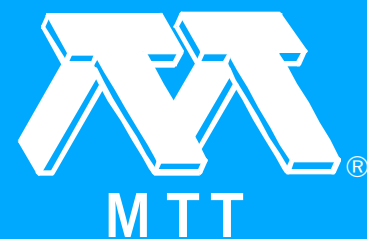
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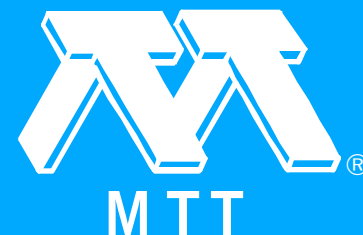
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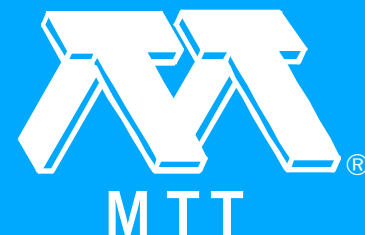
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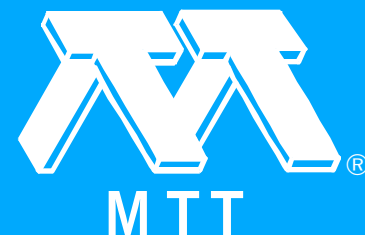
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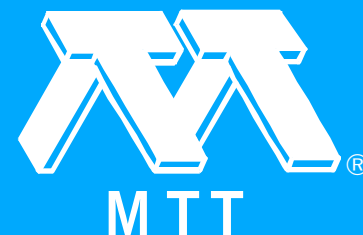
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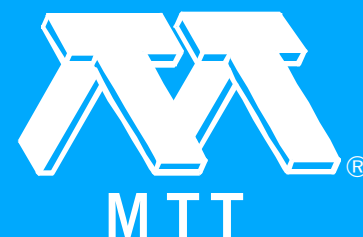
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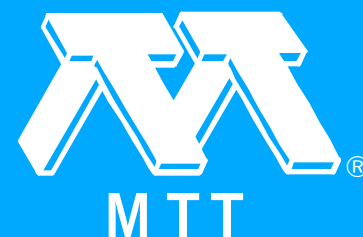
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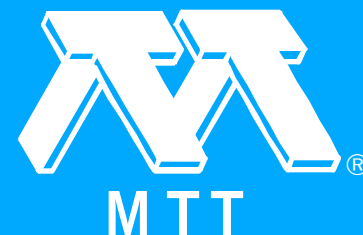
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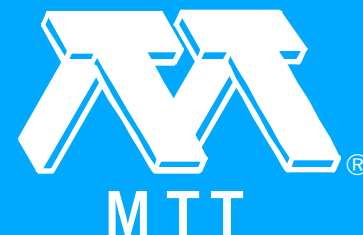
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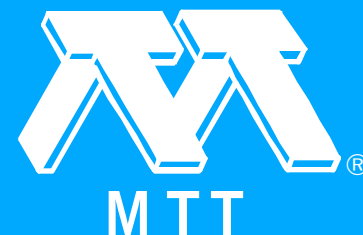
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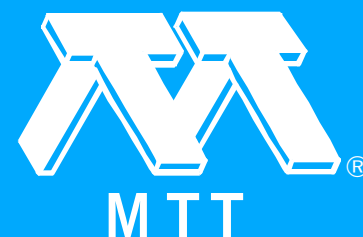
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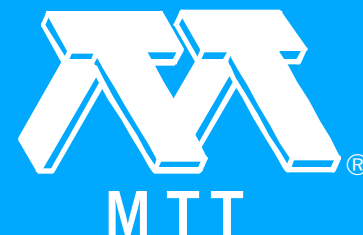
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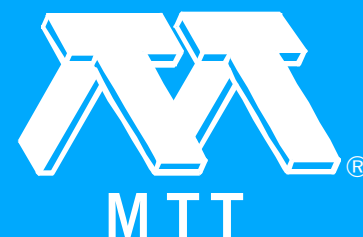
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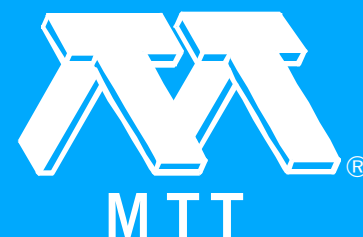
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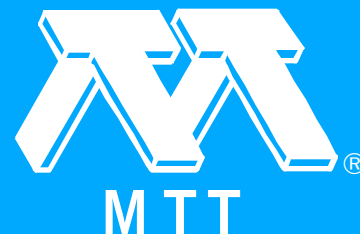


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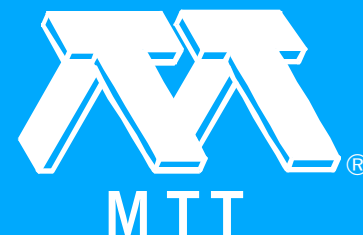
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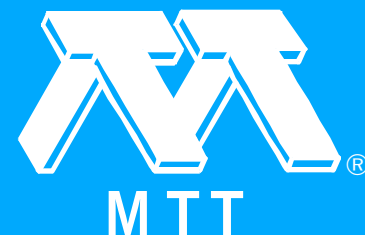
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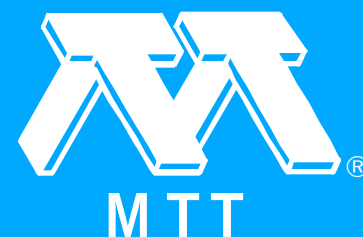
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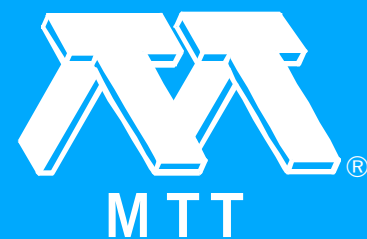
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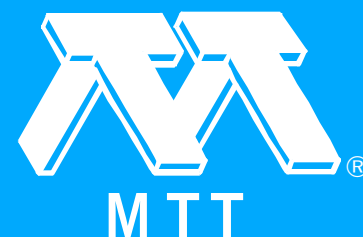
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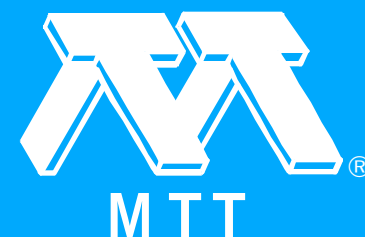
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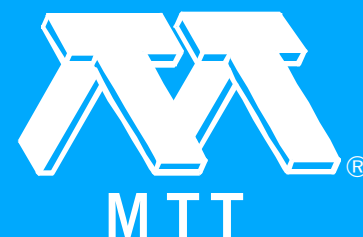
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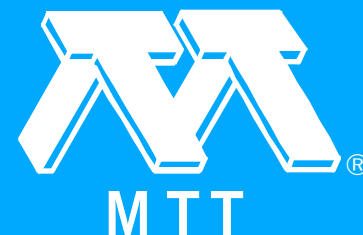
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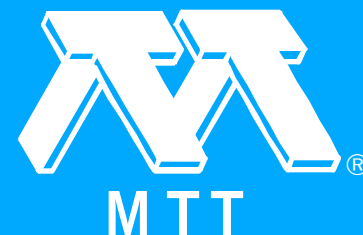
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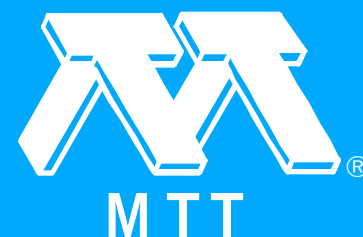
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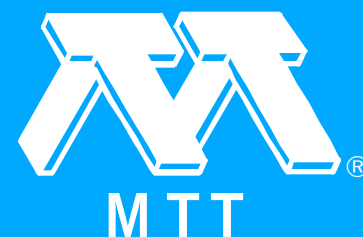
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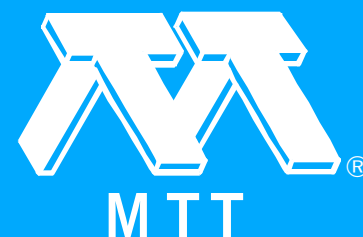
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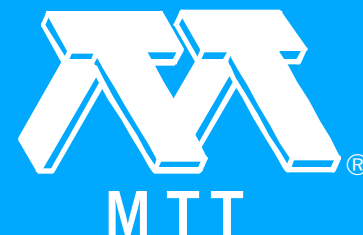
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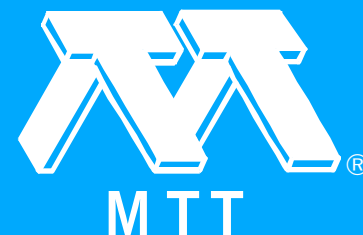
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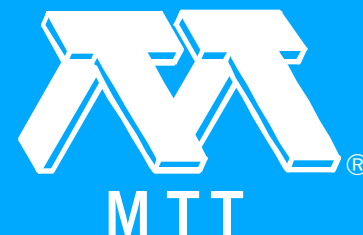
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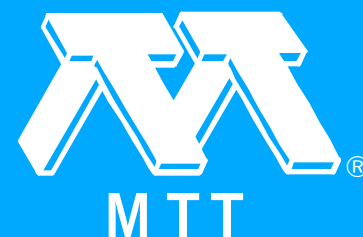
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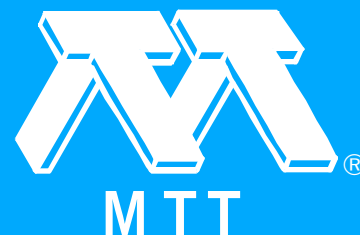
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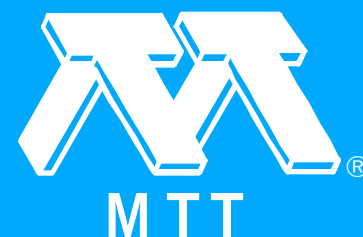
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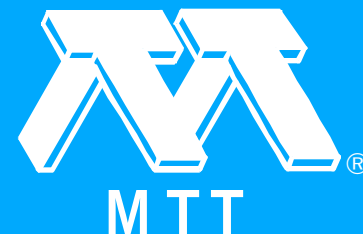
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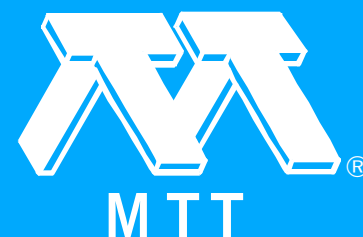
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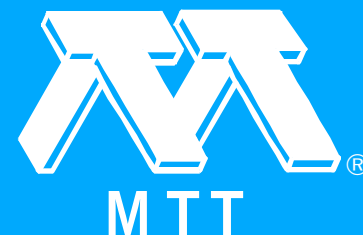
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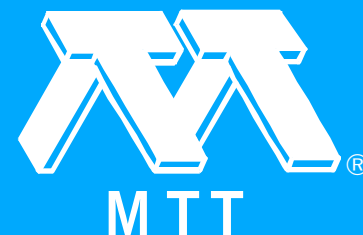
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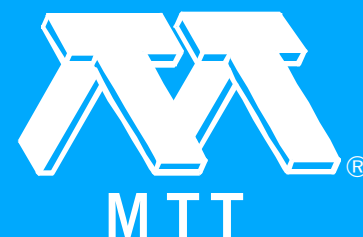
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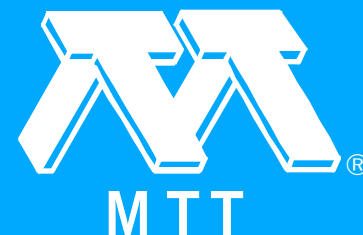
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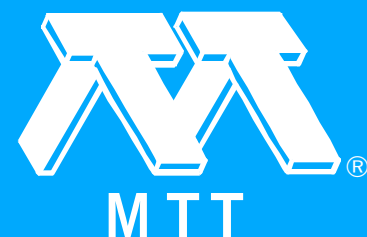
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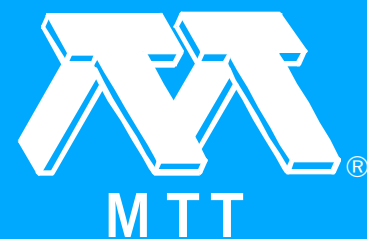
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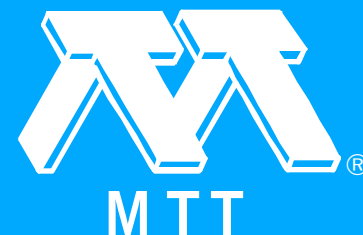
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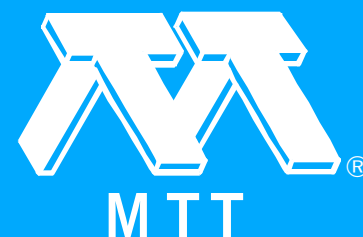
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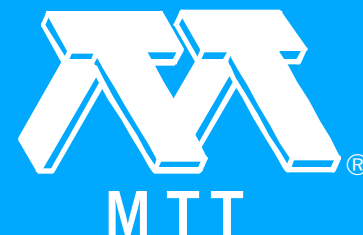
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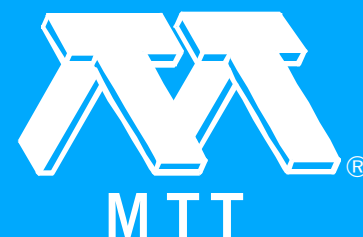
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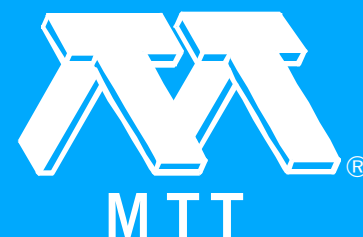
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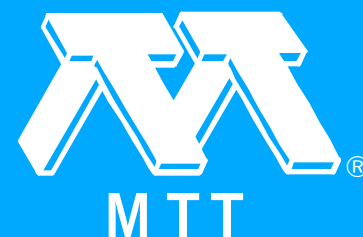
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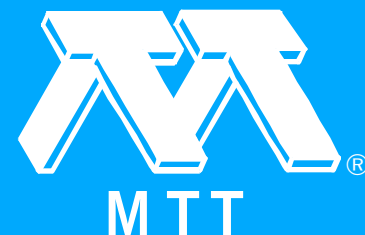
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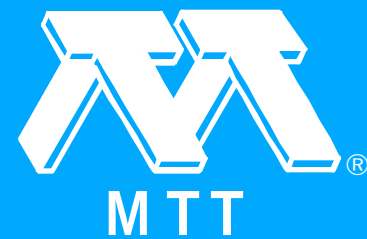
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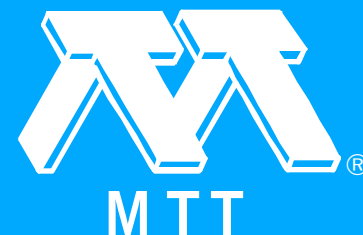
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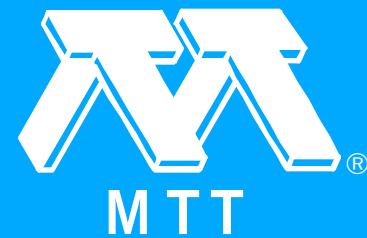
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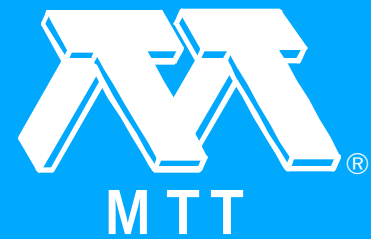
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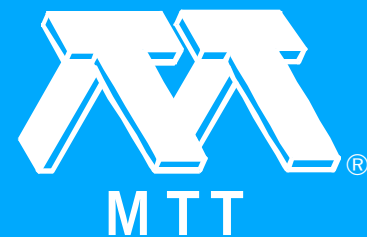
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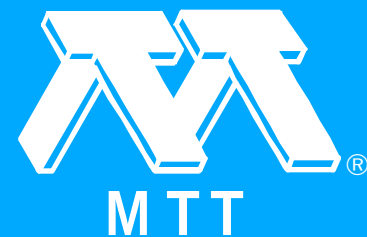
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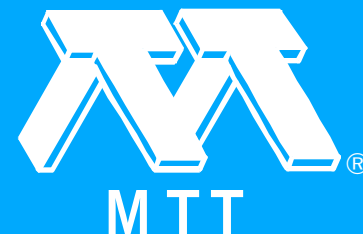
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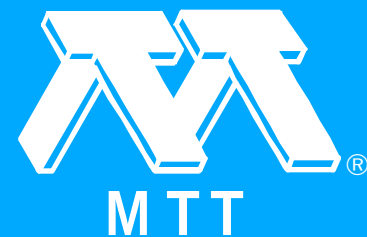
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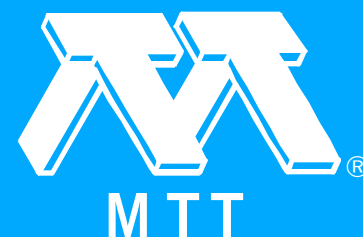
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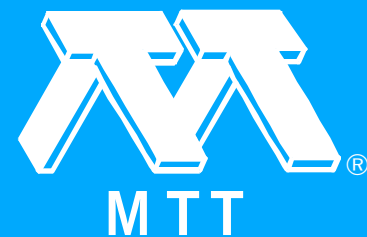
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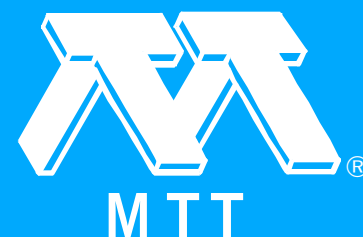
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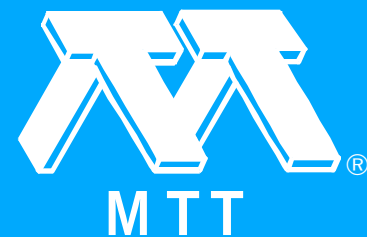
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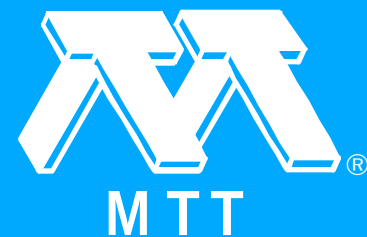
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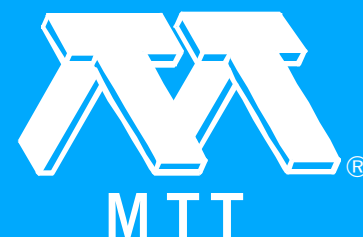
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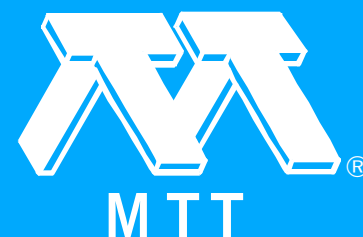
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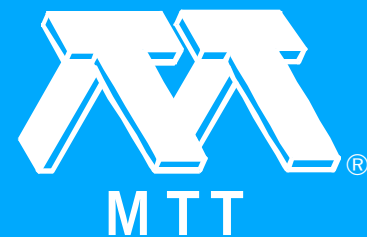
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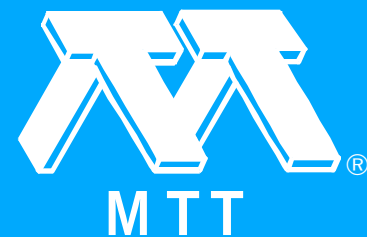
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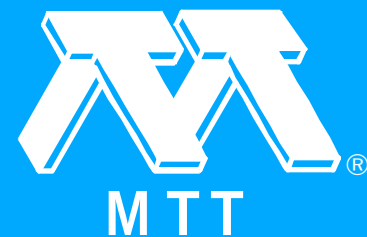
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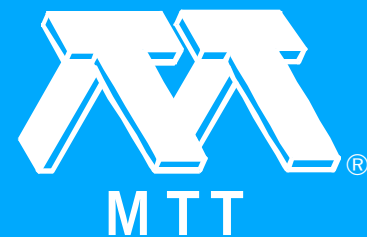
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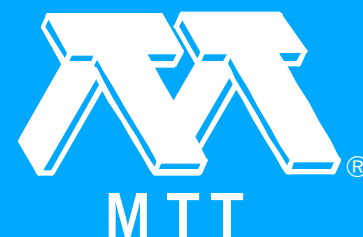
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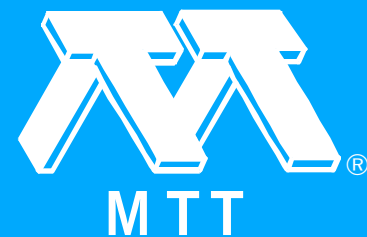
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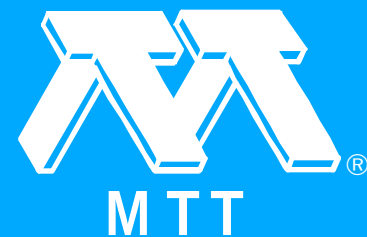
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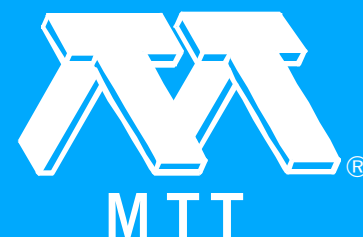
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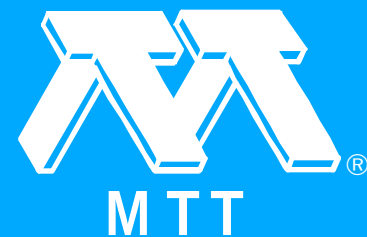
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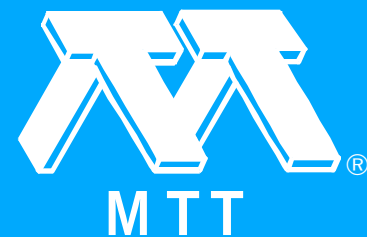
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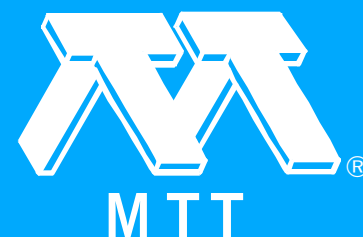
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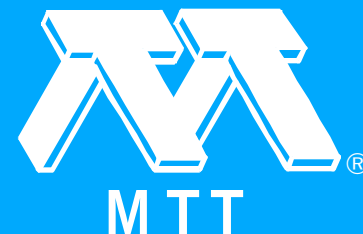
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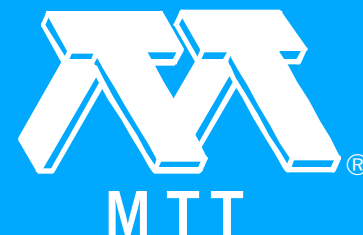
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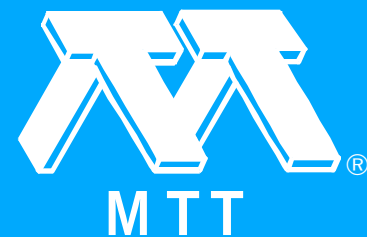
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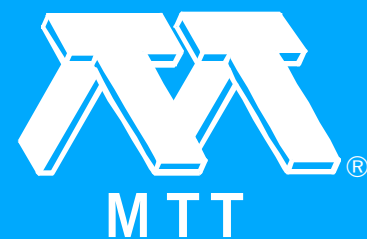
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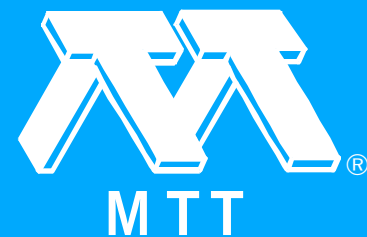
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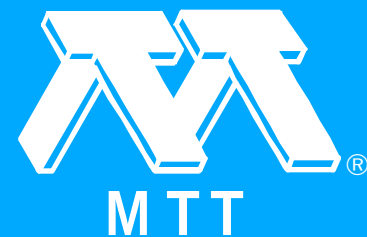
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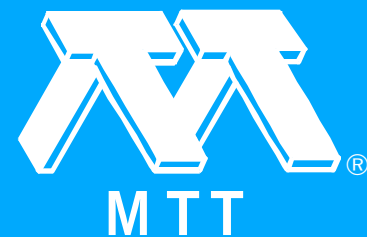
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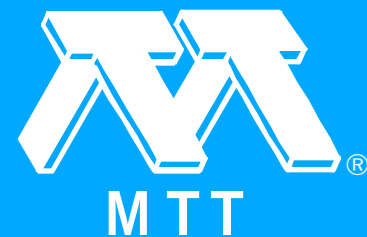
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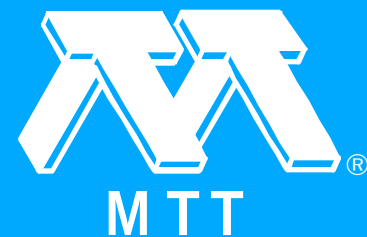
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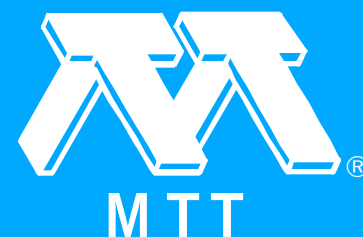
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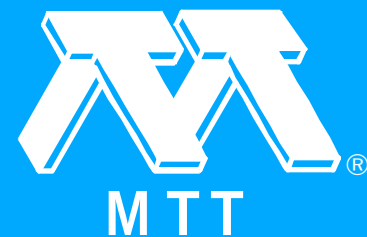
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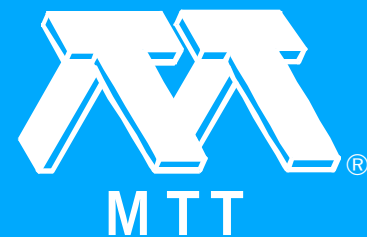
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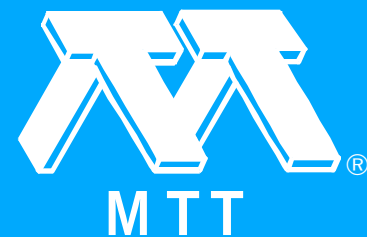
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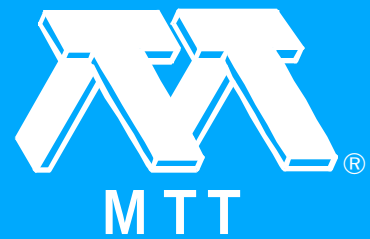
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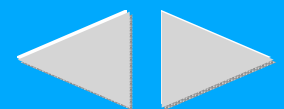
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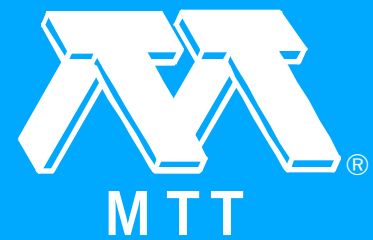
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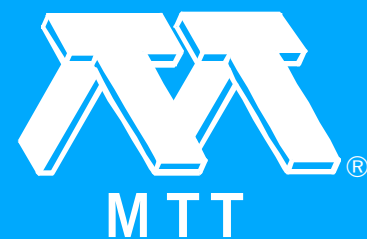
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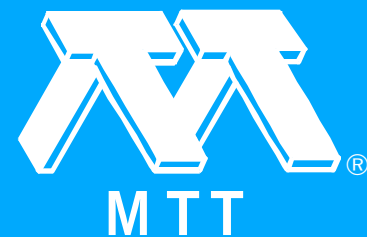
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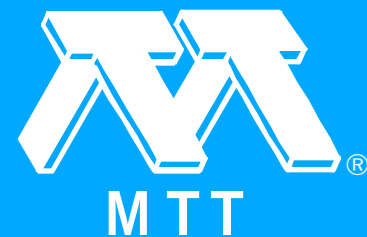
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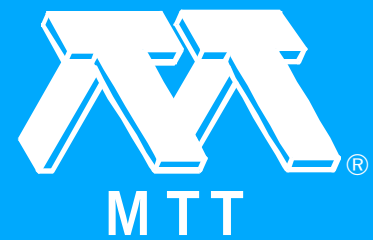
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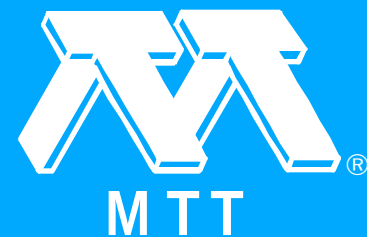
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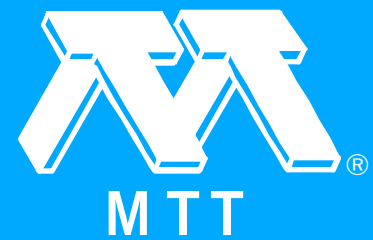
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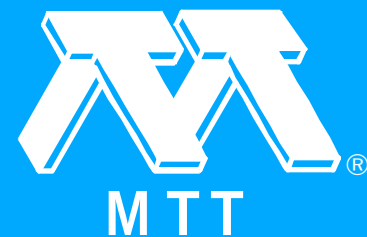
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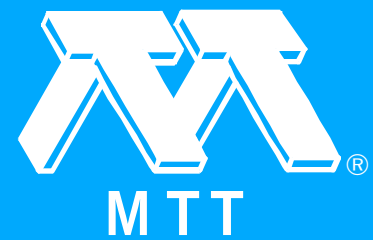
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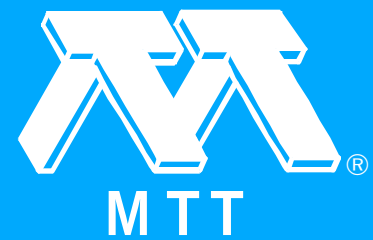
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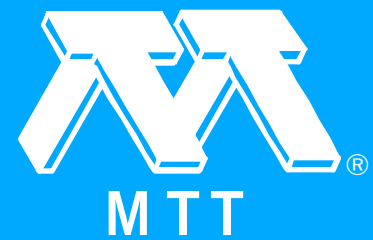
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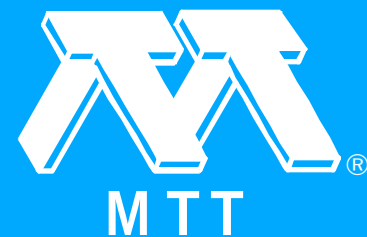
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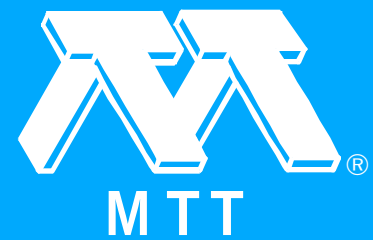
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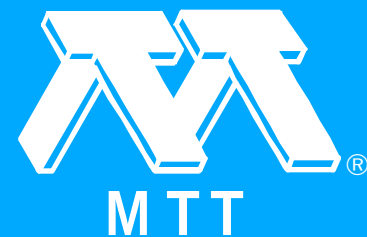
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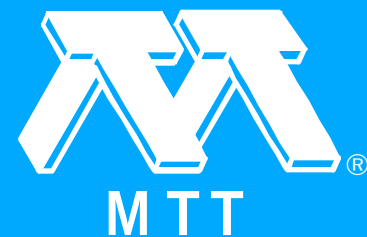
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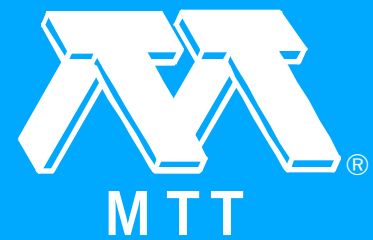
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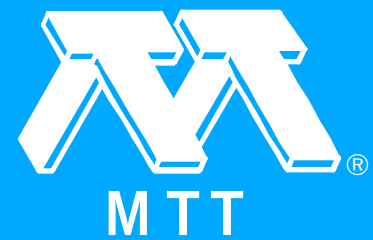
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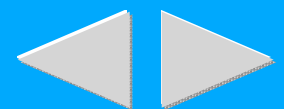
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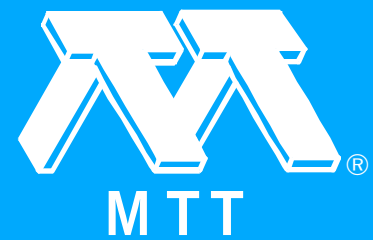
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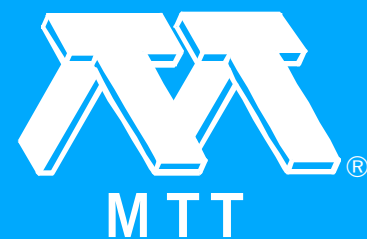
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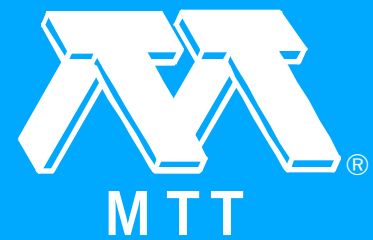
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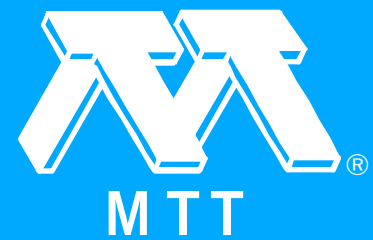
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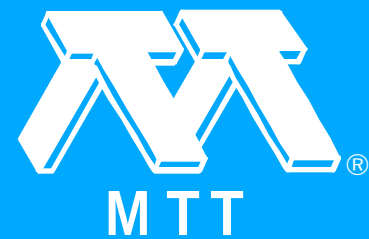
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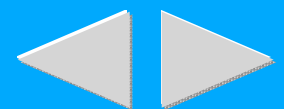
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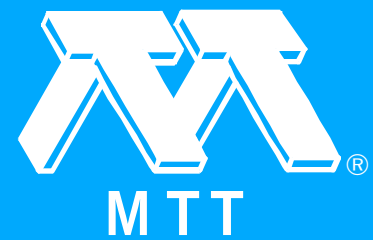
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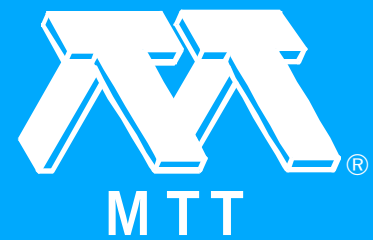
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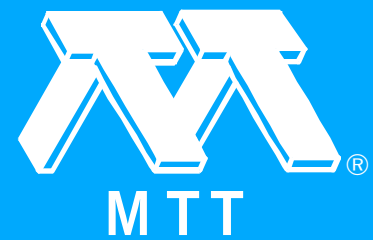
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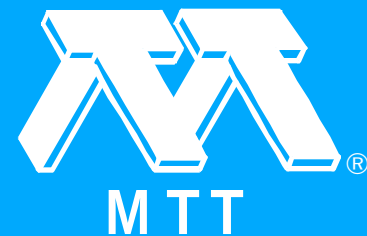
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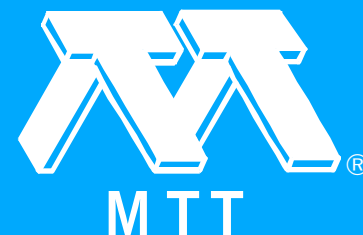
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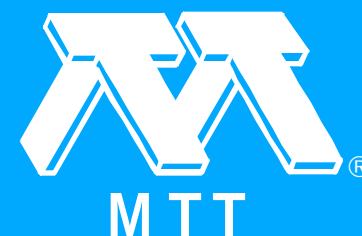
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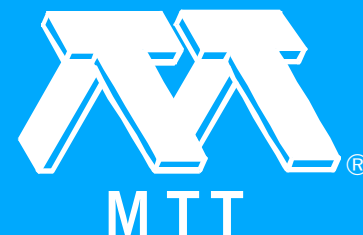
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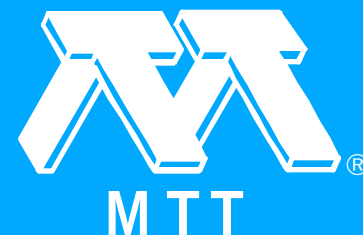
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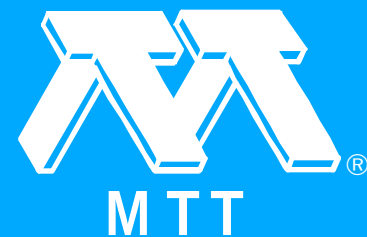
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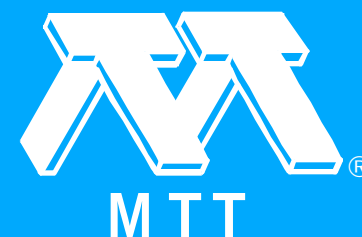
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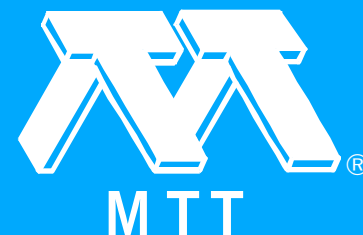
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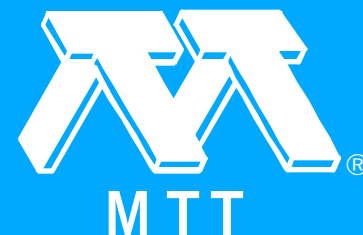
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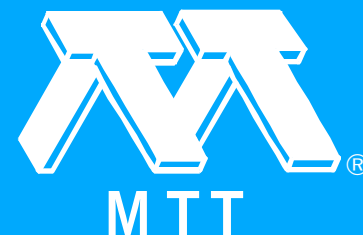
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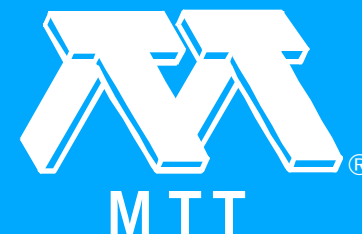
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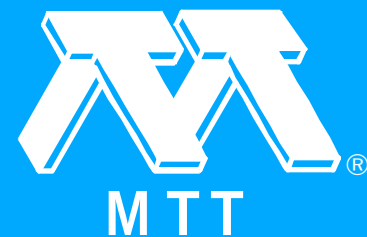
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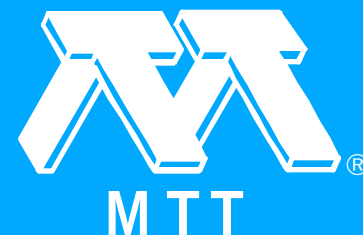
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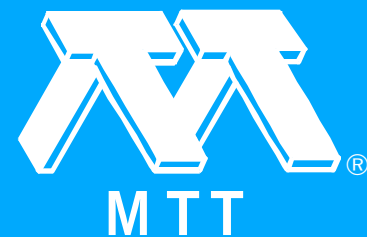
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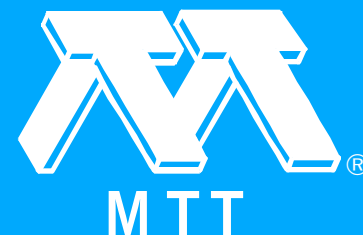
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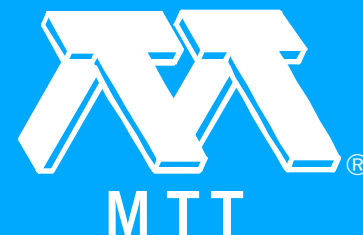
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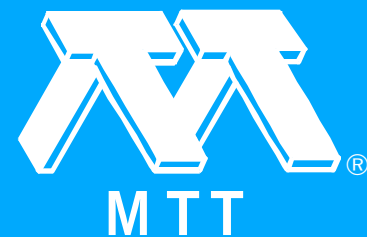
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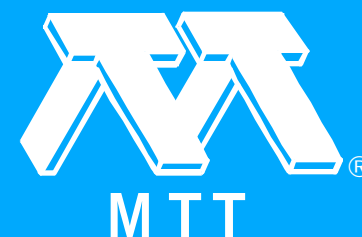


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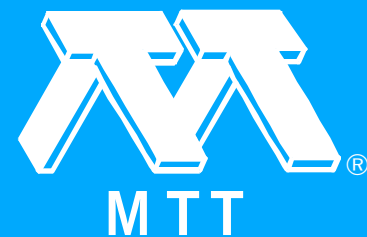
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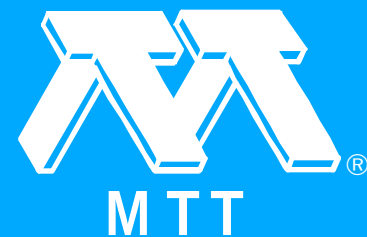
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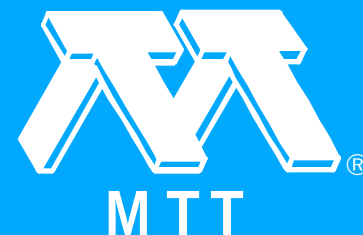
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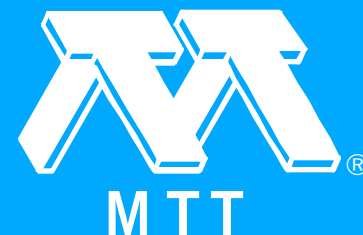
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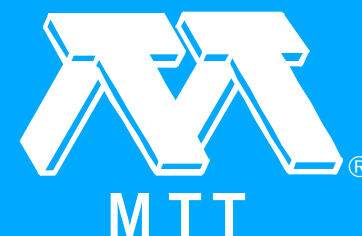
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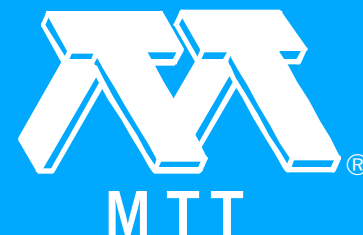
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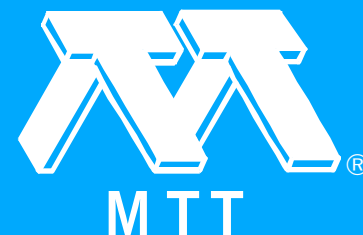
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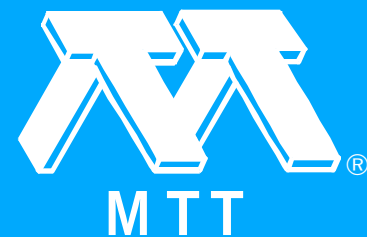
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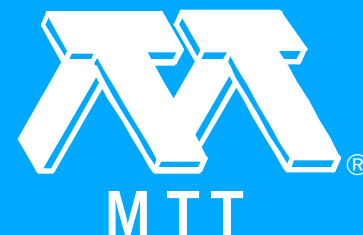
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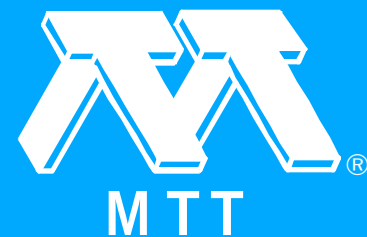
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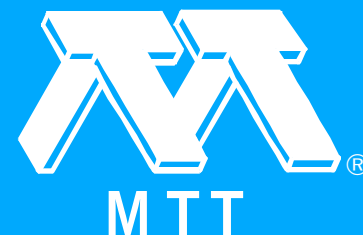
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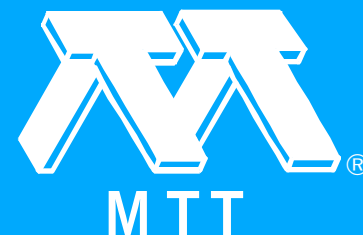
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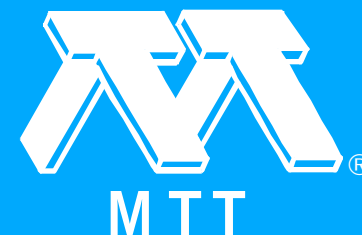
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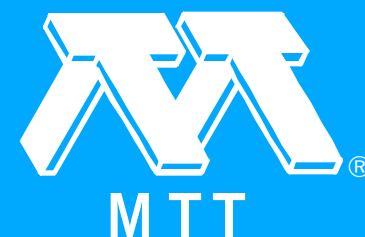
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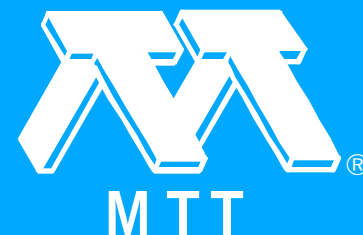
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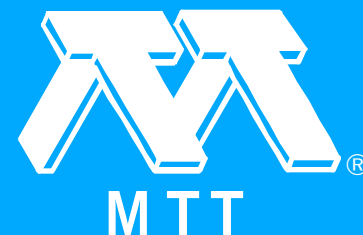


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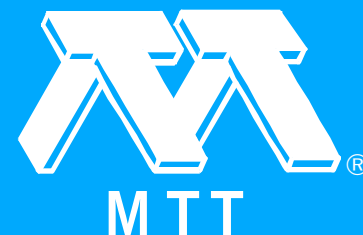
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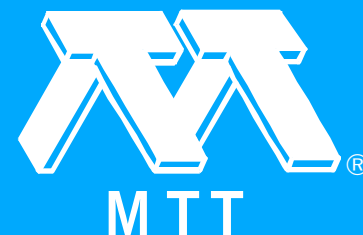
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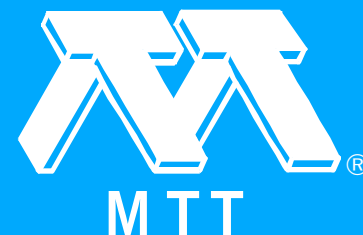
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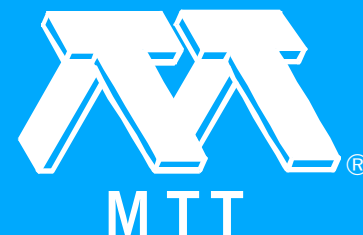


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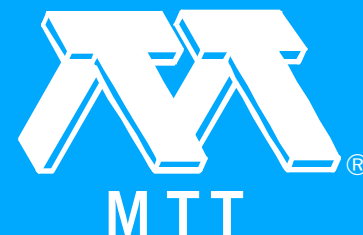
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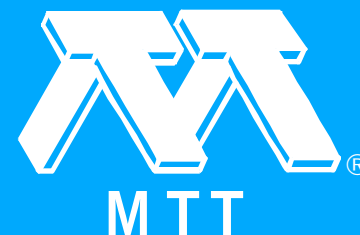
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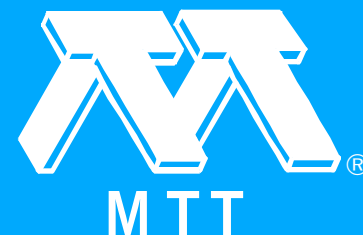
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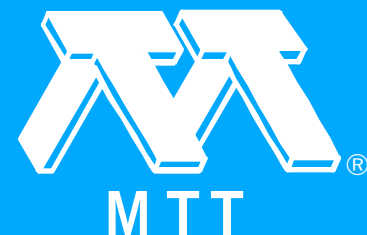
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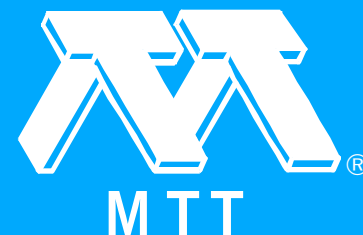
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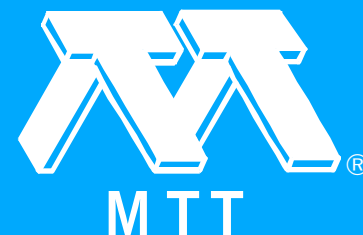
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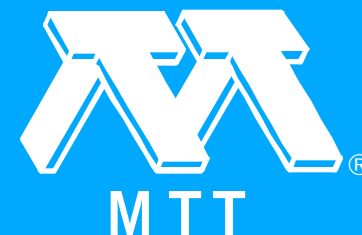
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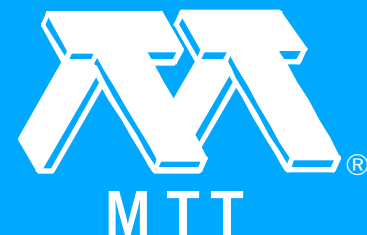
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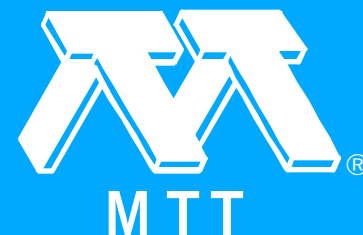
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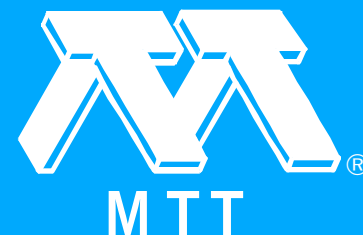
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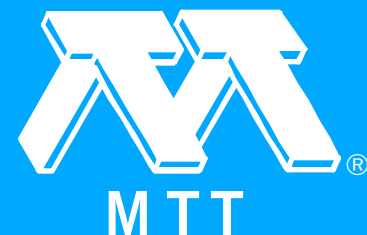
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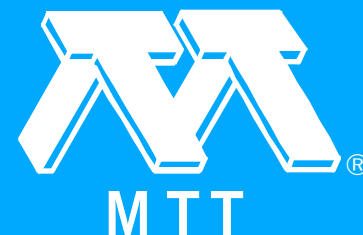
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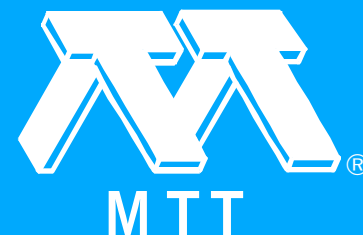
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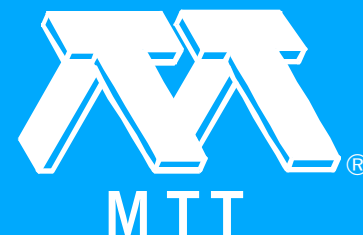
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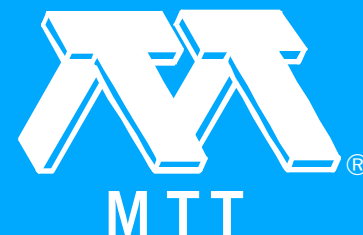
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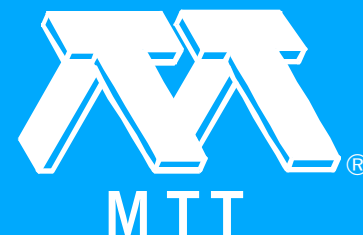
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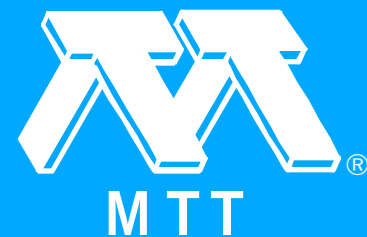
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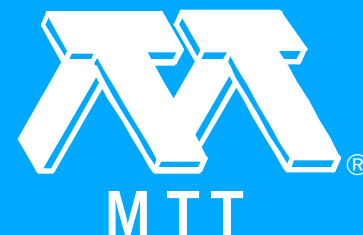
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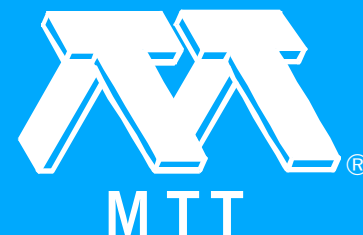
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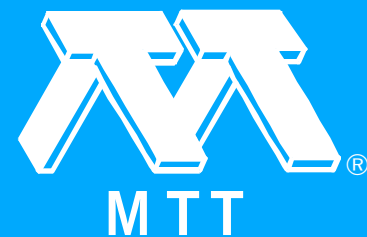
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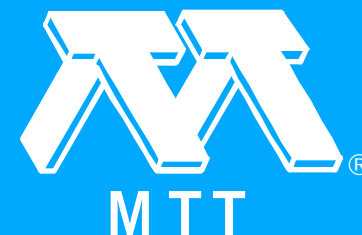
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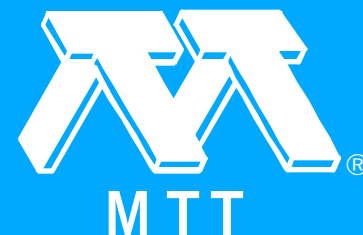
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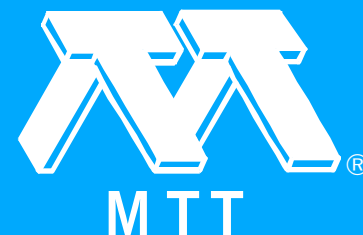
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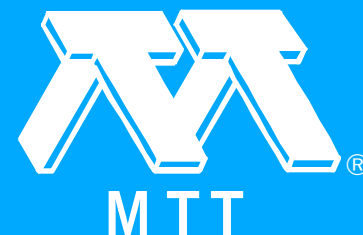
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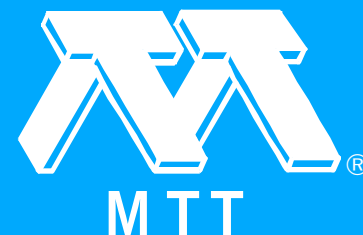
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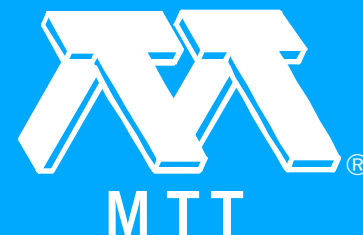
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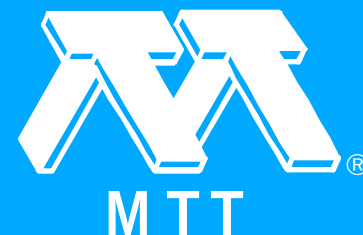
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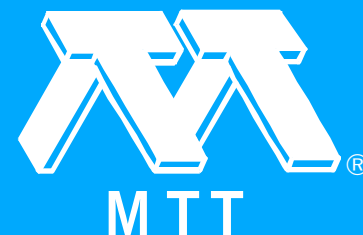
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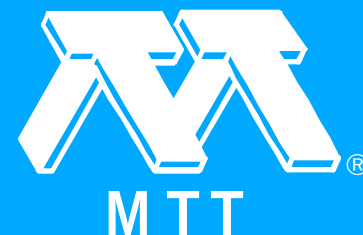
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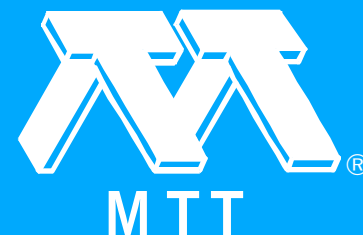
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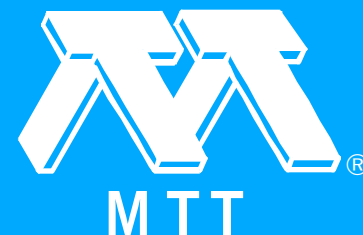
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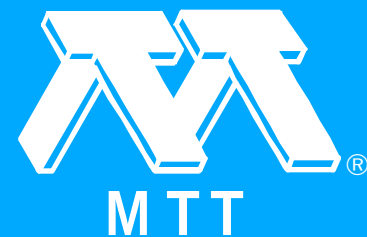
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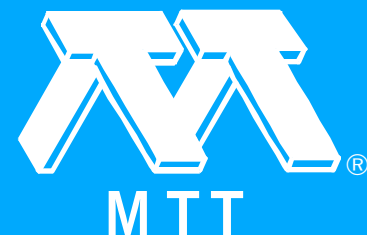
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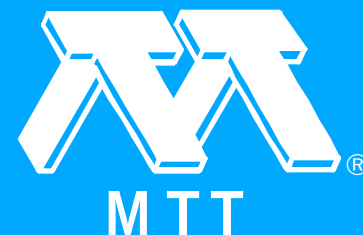
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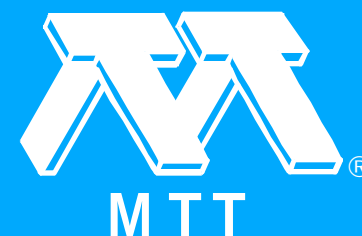
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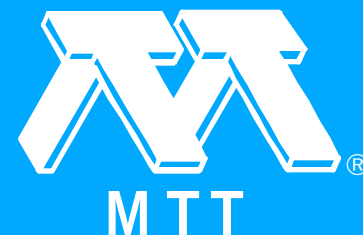
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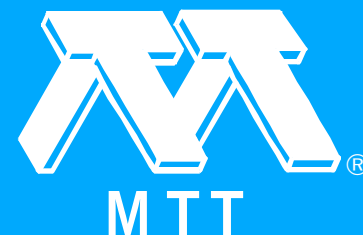
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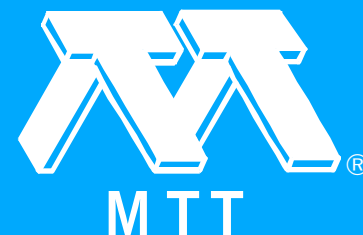
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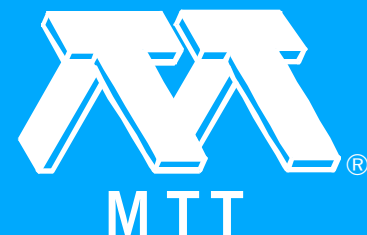
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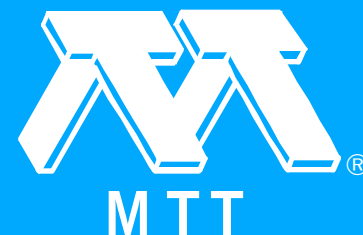
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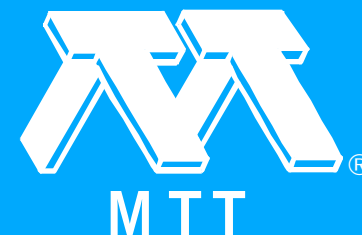
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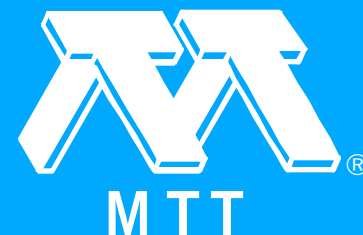
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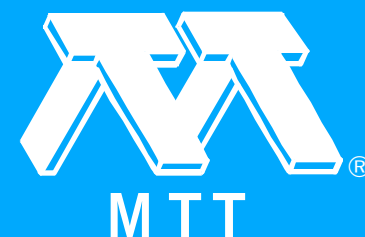


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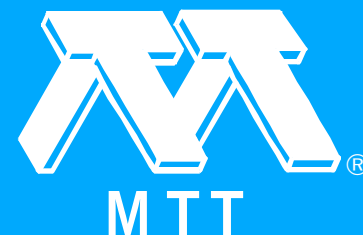
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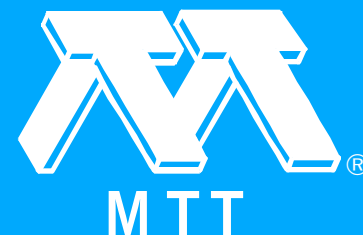
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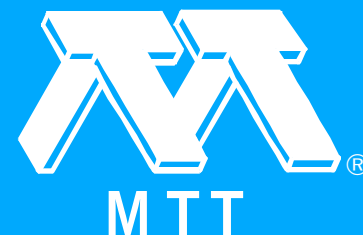
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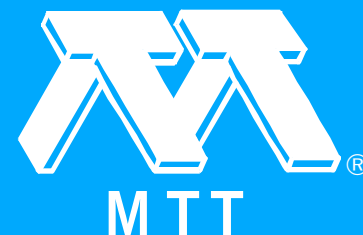
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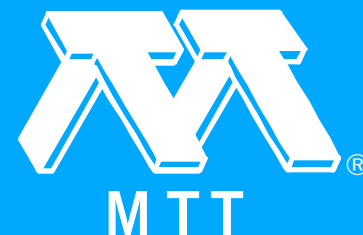
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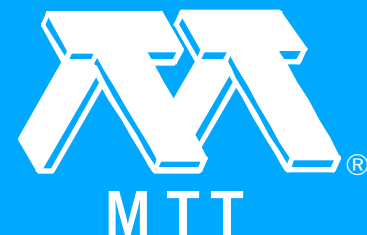
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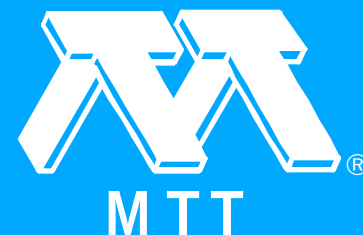
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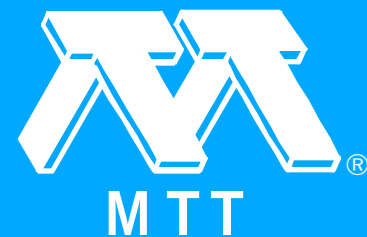
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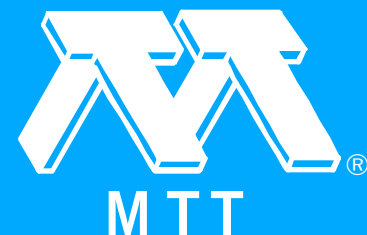
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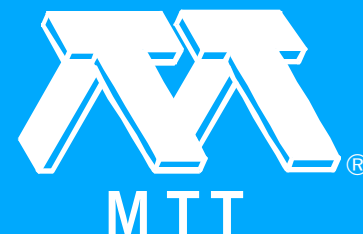
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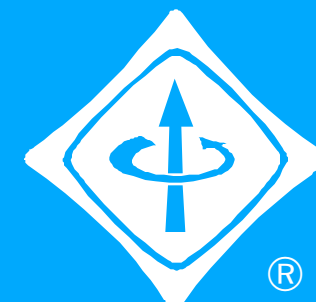
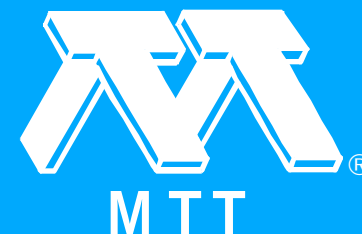
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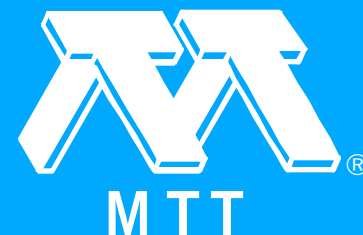
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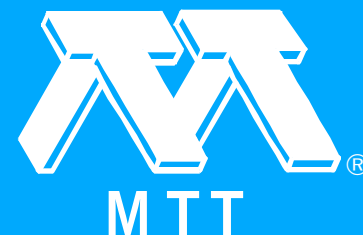
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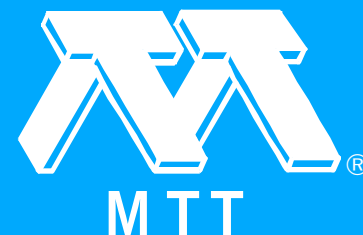
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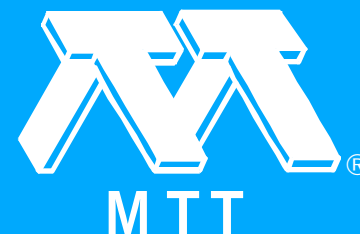
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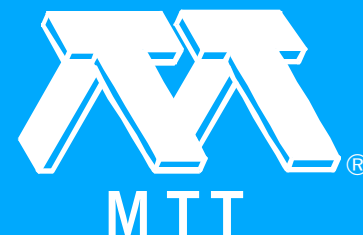
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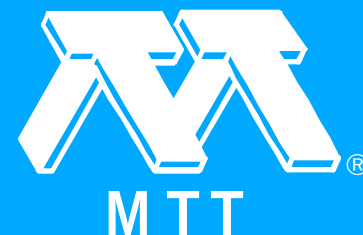
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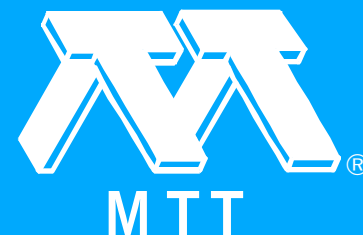
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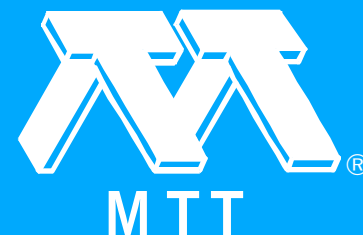
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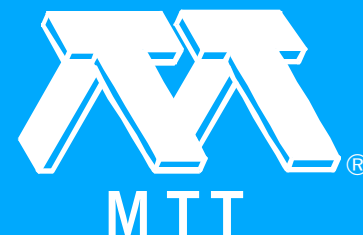
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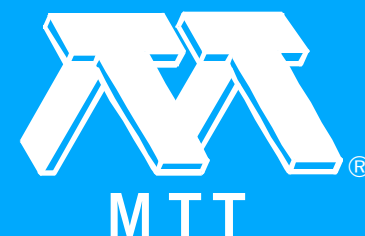
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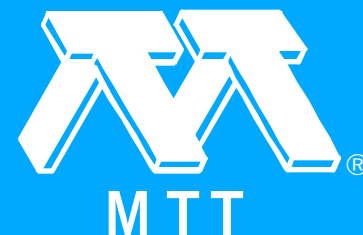
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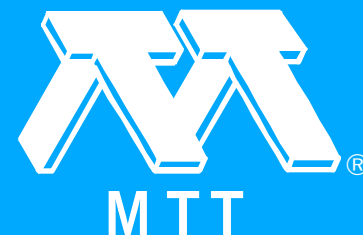
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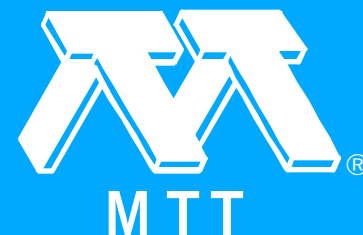
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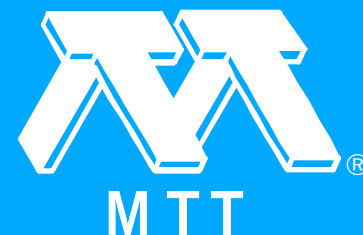


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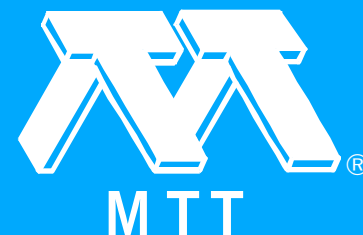
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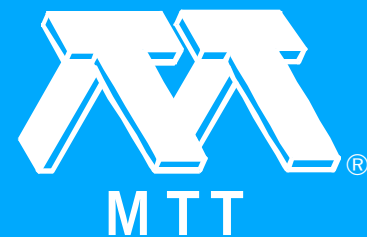
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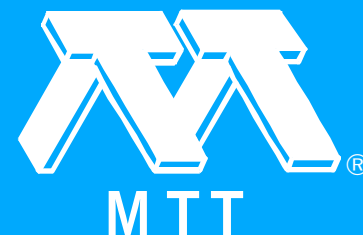
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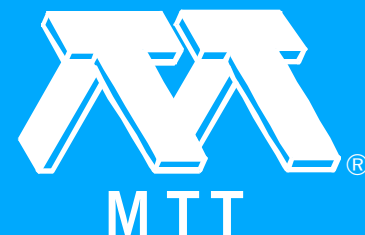
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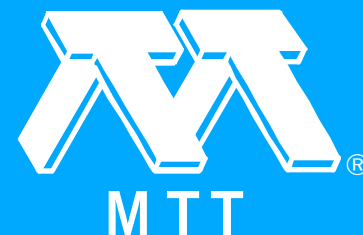
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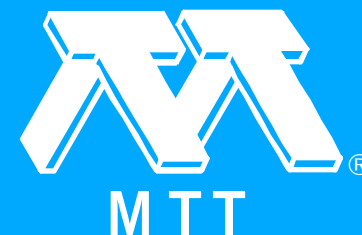
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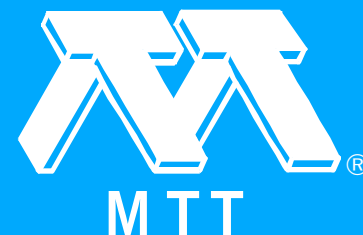
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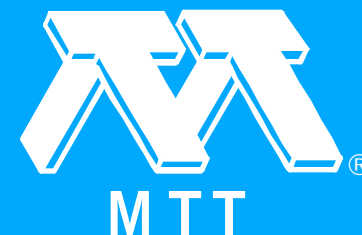
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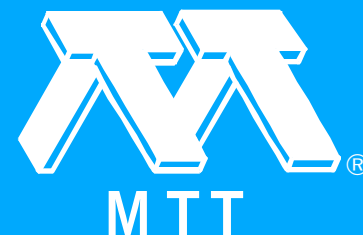
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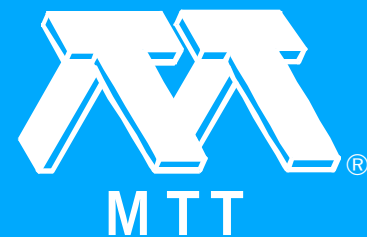
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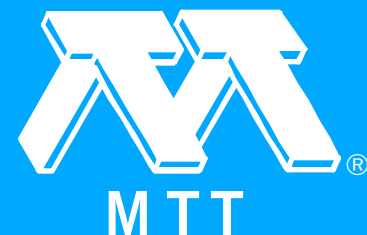
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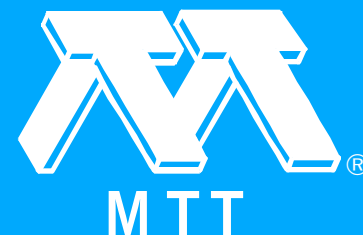
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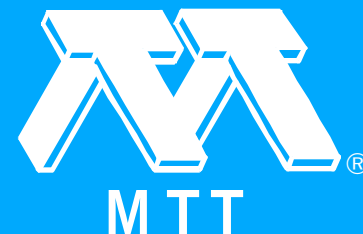
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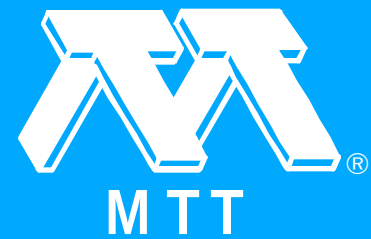
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D. Parker. "Editorial from the Previous Editor (Jan. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 1-1.

The December 1977 issue of IEEE Transactions on Microwave Theory and Techniques marks the end of my term as Editor. The January 1978 issue is the first issue published by the new Editor, Dr. J. L. Allen. Lamar is an excellent choice to serve as Editor; he has a great deal of experience in the microwave field, is conscientious, receptive to new ideas, and is a fine gentleman. The members of AdCom wish him well and are confident that he will not only maintain the high standards and quality of this Transactions, but will bring fresh ideas to increase its usefulness.



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J.L. Allen. "Comments from the Editor (Jan. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 2-2.

This Issue of the Transactions represents a milestone for me. Although I began my duties as Editor six months ago, this is the first issue for which I am responsible. I look forward to my tenure as Editor, appreciate the opportunity this position affords to contribute to the exchange of technical information among the microwave community. My view of "what the Editor does" has changed considerably in these past few months, and, it is with much deeper appreciation that I say to Don Parker, and all the Past Editors, "Congratulations, sincere thanks for a job well done."



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An MIC Doppler Module with Output Radiation Normal to the Substrate Plane

S. Nanbu. "An MIC Doppler Module with Output Radiation Normal to the Substrate Plane." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 3-5.

A flat Doppler module, only 18 mm thick, was fabricated. The module is based on a microwave integrated circuits (MIC) stabilized oscillator having a dipole antenna on a single substrate. It emits a microwave beam normal to the substrate plane whose radiation pattern is nearly symmetrical around the normal axis with a half-power-angle of about 60°.

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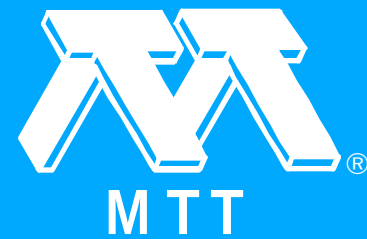


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Improving the Isolation of 3-dB Couplers in Microstrip-Slotline Technique

B. Schiek and J. Kohler. "Improving the Isolation of 3-dB Couplers in Microstrip-Slotline Technique." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 5-7.

The isolation of an experimental 3-dB strip-slot coupler has been improved by capacitive loading at the ends of the coupled region, accomplished by a lengthening of the slotline. In practice, the isolation has been improved by 5-10 dB, as compared to the uncompensated structure in C band.



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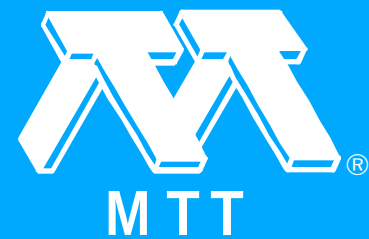
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The Design of Interdigitated Couplers for MIC Applications

V. Rizzoli and A. Lipparini. "The Design of Interdigitated Couplers for MIC Applications." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 7-15.

A straightforward design procedure for microstripline interdigitated directional couplers is outlined. Based on exact, closed-form equations for coupler analysis, a design chart is developed allowing the geometry of the cross section to be found, starting from a prescribed coupling and given bounds on directivity and VSWR. A further chart yields the length of the coupled section once the center-band frequency has been fixed. In this way, a complete picture of coupler performance is made available to the designer so that the necessary tradeoffs between coupling, directivity, and impedance match can be predicted and understood. The accuracy of the design procedure is also discussed in relation with the most important parasitic affecting coupler behavior, such as launching-discontinuity effects and bonding-wire reactances.

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The Effect of Tolerances on Microstripline and Slotline Performances

R. Garg. "The Effect of Tolerances on Microstripline and Slotline Performances." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 16-19.

The change in characteristics of a transmission line due to the tolerances of its parameters has been analyzed. The worst case behavior has been examined using the sensitivity approach. The analysis can be used to determine the tradeoff between performance and tolerances. Computations have been carried out for microstrip-line and slotline. The fabrication accuracies of linewidth and gapwidth for given tolerances in substrate parameters and specified accuracy in transmission-line characteristics have been evaluated. It has been observed that low-impedance microstriplines and high-impedance slotlines are less sensitive to tolerances in parameters.

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Abstracts

Cylindrical and Cylindrically Warped Strip and Microstriplines

Y.-C. Wang. "Cylindrical and Cylindrically Warped Strip and Microstriplines." 1978
Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 20-23.

The impedances of cylindrical and cylindrically warped strip and microstriplines are presented. Applications include rolled-up circuits using flexible dielectric material, transition adapter, balun, slotted line, and other special transmission lines. Effects of warpage on the impedances of planar strip and microstriplines are also presented.



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Direct Polar Display of Subnanosecond Millimeter-Wave Switching at 300 Mbit/s

F. Bosch and S.S. Cheng. "Direct Polar Display of Subnanosecond Millimeter-Wave Switching at 300 Mbit/s." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 24-27.

The switching behavior of an 80.99-GHz p-i-n diode modulator for the 40-110-GHz waveguide transmission system is studied. Detailed knowledge of the type of transient is required to establish rise-time and timing-error specifications compatible with the system performance objective. A test set displaying the transients at 300 Mbit/s in polar coordinates with a convenient time readout is described. The technique is suitable for the study of multiphase modulators in ultra-high-speed digital radio or satellite transmission systems.



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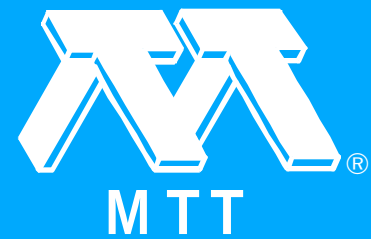


Abstracts

Up-Conversion in IMPATT Amplifiers

R.K. Gupta and C.G. Englefield. "Up-Conversion in IMPATT Amplifiers." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 28-30.

A simple technique has been presented to determine the up-conversion characteristics of IMPATT-diode amplifiers. The method uses the admittance characteristics of the device and the circuit of the amplifier. Theoretical results are given for a typical example and a comparison is made with experimental results obtained for actual amplifiers. Qualitative agreement is obtained.



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Cutoff Frequency of Submillimeter Schottky-Barrier Diodes

K.S. Champlin and G. Eisenstein. "Cutoff Frequency of Submillimeter Schottky-Barrier Diodes." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 31-34.

The traditional HF model of a bulk-type (nonepitaxial) Schottky-barrier diode is extended to include the influence of skin effect, carrier inertia, and displacement current. The parasitic cutoff frequency of the extended model is calculated for n-GaAs and n-Si and compared with that predicted by the traditional model. Below the plasma frequency, the two models are found to give similar results for n-Si. For n-GaAs, however, the extended model predicts a value of cutoff frequency only one-sixth that predicted by the traditional model. With both materials, operation near the plasma frequency is impractical since it would require unrealistically small contact dimensions. Above the plasma frequency, however, both materials display a broad frequency range where operation should again be feasible. For n-Si, the extended model predicts that operation above the plasma frequency can actually be achieved with larger contacts than is predicted on the basis of the traditional model.

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Abstracts

A Wave Approach to the Noise Properties of Linear Microwave Devices

R.P. Meys. "A Wave Approach to the Noise Properties of Linear Microwave Devices." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 34-37.

Noise temperature or noise factor are important parameters for many microwave devices. Their dependence on source characteristics is classically established using low-frequency concepts such as impedance, admittance, voltage, and current sources. This paper presents a derivation of the noise properties of linear two-ports in terms of noise waves, which leads to a convenient measurement method in distributed systems.



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Very High Sensitivity Heterodyne Detection of X-Band Radiation with Neon Indicator Lamps

Y. Makover, O.R. Manor and N.S. Kopeika. "Very High Sensitivity Heterodyne Detection of X-Band Radiation with Neon Indicator Lamps." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 38-43.

Very high sensitivity with simple inexpensive commercial neon glow lamps designed for indicator-lamp applications is observed at X band in synchronous detection. Typical minimum detectable signals with 10-nW-order local-oscillator powers are 10^{-17} W /spl dot/ Hz/sup -1/ or lower. This is equivalent to 10^{-22} W /spl dot/Hz/sup -1/ with 1-mW local-oscillator power. As such lamps can be used without damage in high microwave fields, they can be used in principle with appropriate local-oscillator power levels to reach ideal microwave noise equivalent power (NEP) limits. The low NEP and noise figure result from the high responsivities of such devices which are due to high internal signal gain. Experimental results correlate well with the enhanced-ionization collision-rate detection model.



Abstracts

Experimental Measurement of Microstrip Transistor Package Parasitic Reactance (Comments)

H. Beneking. "Experimental Measurement of Microstrip Transistor Package Parasitic Reactance (Comments)." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 43-43.

In the above paper, Akello et al. describe a method for experimental determination of the parasitic of microstrip-transistor packages, based on a resonance principle. A different method of measuring small reactances and susceptances, also permitting the determination of transistor-package elements based on time-domain techniques, is given by Piller in [1]. This method avoids the difficulties resulting from critical coaxial to microstrip transitions.



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Abstracts

On the Question of Computation of the Dyadic Green's Function at the Source Region in Waveguides and Cavities (Correction)

Y. Rahmat-Samii. "On the Question of Computation of the Dyadic Green's Function at the Source Region in Waveguides and Cavities (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 44-44.

In the above paper, the following typographical errors should be corrected.



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Abstracts

Transmission from a Rectangular Waveguide into Half Space through a Rectangular Aperture (Computer Program Descriptions)

J.R. Mautz and R.F. Harrington. "Transmission from a Rectangular Waveguide into Half Space through a Rectangular Aperture (Computer Program Descriptions)." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 44-45.

The program calculates the admittance seen by the waveguide, the tangential electric field in the aperture, and the radiation gain patterns for a rectangular waveguide feeding a rectangular aperture in a perfectly conducting plane of infinite extent.



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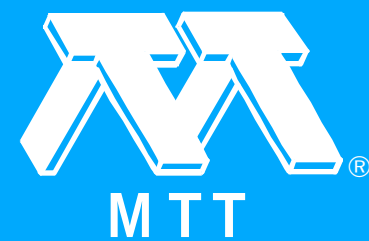
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Abstracts

Contributors (Jan. 1978 [T-MTT])

F. Bosch, K.S. Champlin, S.S. Cheng, G. Eisenstein, C.G. Englefield, R. Garg, R.K. Gupta, J. Kohler, N.S. Kopeika, A. Lipparini, Y. Makover, O.R. Manor, R.P. Meys, S. Nanbu, V. Rizzoli, B. Schiek and Y.-C. Wang. "Contributors (Jan. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 46-47.



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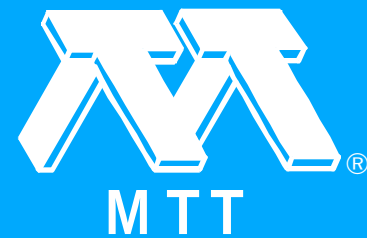
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Abstracts

Call for Papers - Special Issue on Solid State Microwave/Millimeter-Wave Power Generation, Amplification and Modulation (Jan. 1978 [T-MTT])

"Call for Papers - Special Issue on Solid State Microwave/Millimeter-Wave Power Generation, Amplification and Modulation (Jan. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): 48-48.



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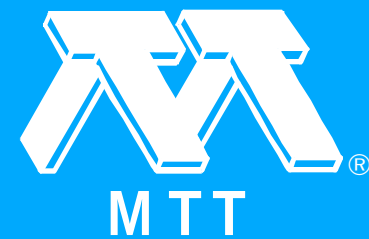
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Abstracts

Back Cover (Jan. 1978 [T-MTT])

"Back Cover (Jan. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.1 (Jan. 1978 [T-MTT]): b1-b2.



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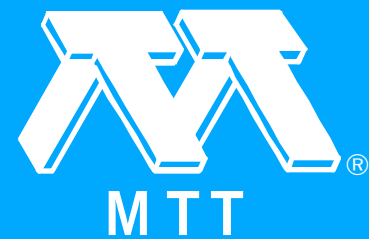
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Conversion Loss and Noise of Microwave and Millimeterwave Mixers: Part 1--Theory

D.N. Held and A.R. Kerr. "Conversion Loss and Noise of Microwave and Millimeterwave Mixers: Part 1--Theory." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 49-55.

An analysis is presented for the conversion loss and noise of microwave and millimeter-wave mixers. The analysis includes the effects of nonlinear capacitance, arbitrary embedding impedances, nonideality of microwave diodes, and shot, thermal, and scattering noise generated in the diode. Correlation of down-converted components of the time-varying shot noise is shown to explain the "anomalous" noise observed in millimeter-wave mixers. Part 1 of the paper presents the theoretical basis for predicting mixer performance, while Part 2 compares theoretical and experimental results for mixers operating at 87 and 115 GHz.

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Abstracts

Conversion Loss and Noise of Microwave and Millimeterwave Mixers: Part 2--Experiment

D.N. Held and A.R. Kerr. "Conversion Loss and Noise of Microwave and Millimeterwave Mixers: Part 2--Experiment." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 55-61.

The theory of noise and conversion loss in millimeter-wave mixers, developed in a companion paper, is applied to an 80-120-GHz mixer. Good agreement is obtained between theoretical and experimental results, and the source of the recently reported "anomalous noise" is explained. Experimental methods are described for measuring the embedding impedance and diode equivalent circuit, needed for the computer analysis.



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Abstracts

Microwave Mode Locking at X Band Using Solid-State Devices

L.A. Glasser and H.A. Haus. "Microwave Mode Locking at X Band Using Solid-State Devices." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 62-69.

A theory of mode locking in the microwave regime is presented. The use of solid-state microwave devices for this application is described. A system that has been built using an IMPATT diode as the gain element and a Schottky barrier diode in the role of a saturable absorber is analyzed. Passive, combined passive, and forced mode locking have been demonstrated experimentally. The system had a round-trip time of 25 or 50 ns. Pulse lengths between 4 and 15 ns were observed. Self-starting and stability requirements are investigated.



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Abstracts

A Directional Coupler with Very Flat Coupling

G.P. Riblet. "A Directional Coupler with Very Flat Coupling." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 70-74.

A reciprocal 4-port device is a directional coupler if any input port is matched and the device possesses either 180° rotational symmetry about two perpendicular axes, or 180° rotational symmetry about an axis combined with reflection symmetry in a plane either containing or perpendicular to the axis. In this paper an expression is derived for the equivalent admittance of such a device considered as a directional coupler. This expression is used to determine the equivalent admittance of the simplest symmetrical 2 branch coupler. Furthermore, it is shown that the coupling must be the same for all frequencies for which this junction is matched by identical 2-port matching networks connected at each port. These facts were used to build a 90° hybrid in stripline with maximum power division unbalance of 0.05 dB over the 3.7- to 4.2-GHz band.



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Abstracts

High-Speed Computation of Single and Coupled Microstrip Parameters Including Dispersion, High-Order Modes, Loss and Finite Strip Thickness

R.H. Jansen. "High-Speed Computation of Single and Coupled Microstrip Parameters Including Dispersion, High-Order Modes, Loss and Finite Strip Thickness." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 75-82.

Based on an optimized rigorous hybrid mode solution for covered/open zero thickness microstrip patterns the following frequency dependent single and coupled line data are evaluated with very short CP-times: The characteristic impedances of the even and odd quasi-TEM modes, the propagation/attenuation constants and associated strip current density components of these and the higher order modes, the loss of the dominant modes under consideration of nonuniform strip current, substrate surface roughness and dielectric loss tangent. Finite strip thickness is introduced by a correction of the strip width input values.



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Abstracts

A Simple Method for Determining the Green's Function for a Large Class of MIC Lines Having Multilayered Dielectric Structures

R. Crampagne, M. Ahmadpanah and J.-L. Guiraud. "A Simple Method for Determining the Green's Function for a Large Class of MIC Lines Having Multilayered Dielectric Structures." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 82-87.

To find the characteristic parameters of the wave propagation in microstrip structures, several Green's function methods have already been developed, corresponding to particular geometric configurations. In this paper, three of these methods are synthesized, showing that the final equations in the different cases are identical. Moreover, using the transverse transmission line theory, the Green's function is solved numerically for an N-layer dielectric structure.



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Abstracts

Calculation of Electromagnetic Energy Absorption in Prolate Spheroids by the Point Matching Method

R. Ruppin. "Calculation of Electromagnetic Energy Absorption in Prolate Spheroids by the Point Matching Method." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 87-90.

The point matching method is used to calculate electromagnetic power absorption in tissue prolate spheroids irradiated by a plane wave. The calculation extends from the low-frequency region and well into the resonance region, but is restricted to spheroids of small eccentricity. A strong dependence of the absorption on the orientation and the polarization of the incident beam is found to occur, in agreement with previous experimental measurements on animals and phantom models.



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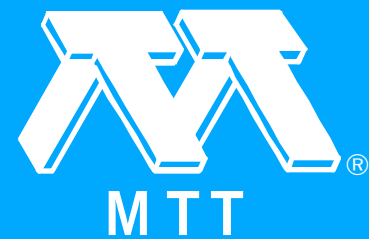


Self-Adjoint Variational Formulation of Problems Having Non-Self-Adjoint Operators

G. Jeng and A. Wexler. "Self-Adjoint Variational Formulation of Problems Having Non-Self-Adjoint Operators." 1978 *Transactions on Microwave Theory and Techniques* 26.2 (Feb. 1978 [T-MTT]): 91-94.

A systematic approach is given for deriving a variational formulation, previously stated by Stakgold, of non-self-adjoint operators from the standard quadratic functional for self-adjoint operators given by Mikhlin. If the same set of basis functions is used to approximate the solution of the operator equation and its adjoint equation, the resulting system of equations is identical to that derived from the Galerkin method. By using two differing sets of basis functions, one obtains a system of equations which corresponds to that derived from the moment method in general. As a particular and important example, the integral equation for the interface problem between differing media is considered. Compared to the method used by McDonald, Friedman, and Wexler, the present formulation involves no danger of finding a false solution, results in a simpler set of equations, requires fewer integrations, and is seen--in the case of integral equations--to correspond to the Galerkin method. It is also shown that for wave propagation through a lossy medium, which involves the solution of the non-self-adjoint complex Helmholtz equation, the resulting system of linear equations takes the same form as those for the real self-adjoint case but for the addition of complex arithmetic.





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Planar Triangular Resonators with Magnetic Walls

J. Helszajn and D.S. James. "Planar Triangular Resonators with Magnetic Walls." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 95-100.

This paper gives the field patterns in triangular planar resonators having no variation of the fields along the substrate thickness. The TM fields in such resonators with magnetic boundary conditions are obtained by duality from the TE modes with electric boundaries. The theoretical description includes the cutoff numbers of the first few modes. The radiation Q factor of fundamental microstrip resonators of this type was found experimentally to be higher than that associated with conventional disk resonators. The performance of a microstrip circulator using a triangular resonator is also described.

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Ray-Optical Calculation of Edge Diffraction in Unstable Resonators

C.E. Santana and L.B. Felsen. "Ray-Optical Calculation of Edge Diffraction in Unstable Resonators." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 101-108.

A previously developed ray-optical theory for calculation of modal reflection and coupling coefficients due to edge discontinuities in homogeneously or inhomogeneously filled parallel-plane waveguides is generalized to waveguides with nonplanar boundaries. Treated in particular are the reflections from the open ends of a bilaterally truncated waveguide whose convex walls are confocal hyperbolas. This open configuration serves as a model for unstable optical resonators with cylindrical mirrors. The ray optically determined modal reflection and coupling coefficients for mirrors with large Fresnel number are shown to reduce to those in a previously employed local parallel-plane approximation when the Fresnel numbers are moderate. The analysis quantifies proposed ray-optical models for explaining the influence of edge diffraction on the behavior of the resonant modes.

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Vectorial Wave Analysis of Inhomogeneous Optical Fibers Using Finite Element Method

K. Okamoto and T. Okoshi. "Vectorial Wave Analysis of Inhomogeneous Optical Fibers Using Finite Element Method." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 109-114.

A vectorial wave analysis of the propagation characteristics of radially inhomogeneous optical fibers is presented. The vectorial wave equation is first translated into a variational problem, and then it is solved by using the finite element method. The results are compared with those of the scalar wave analysis. The error caused by the scalar wave approximation is discussed for wide variety of refractive index profiles. It is shown that the error caused by the scalar wave approximation is about 0.1 percent for eigenvalues and 1 percent for delay time, when the relative index difference between core and cladding is 1 percent.

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Abstracts

Truncated Parabolic-Index Fiber with Minimum Mode Dispersion

M. Geshiro, M. Matsuhara and N. Kumagai. "Truncated Parabolic-Index Fiber with Minimum Mode Dispersion." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 115-119.

The use of a parabolic-index fiber as an optical transmission line has been receiving extensive attention because of its excellent mode dispersion characteristics. In the present paper, the modal dispersion in the optical fiber with truncated parabolic index distribution is analyzed theoretically in detail by using a variational method. Taking the influence of the cladding upon the propagating modes into consideration, it is found that there exists an optimum index distribution for which the modal dispersion is minimized. The standard deviation of the normalized group delay of propagating modes is used to estimate the modal dispersion behavior of the fiber.



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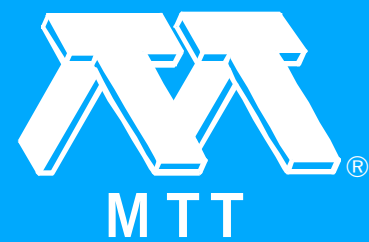


Analysis of the Microstrip and the Electrooptic Light Modulator

M. Kobayashi. "Analysis of the Microstrip and the Electrooptic Light Modulator." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 119-126.

Green's function for examples with an isotropic media is obtained using the image-coefficient method. The method is based on the boundary conditions and the reciprocity relation. Using this Green's function and solving directly the charge distribution on the strip, the line capacitances per unit length of a microstrip and of an electrooptic light modulator are obtained. High accuracy of this method is demonstrated by comparing the present results with the results obtained using the conformal mapping and with other data appeared in the literature. The charge distributions are also illustrated. Of particular interest is the effective filling fraction of the dielectric material, which depends mainly on the shape ratio and only slightly on the relative dielectric constant. The effective filling fractions are tabulated for the microstrip with a homogeneous dielectric substrate.





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Theory of an Efficient Electronic Phase Shifter Employing a Multilayer Dielectric-Waveguide Structure (Correction)

A.B. Buckman. "Theory of an Efficient Electronic Phase Shifter Employing a Multilayer Dielectric-Waveguide Structure (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 127-127.

A factor of $n_{\text{sub } g}$ should appear in the numerator of the right side of (11). This error affects the design of the structure in Fig. 3, as follows: To obtain values of $\Delta\phi/\Delta\theta$ of the order 50-80°/cm, it is necessary that $d_{\text{sub } g}/\lambda_{\text{sub } 0}$ be raised to 0.4375, and an additional layer of refractive index 3.4 and thickness $0.4375\lambda_{\text{sub } 0}$ be placed between the active layer and the superstrata. Other indices and thicknesses remain unchanged.

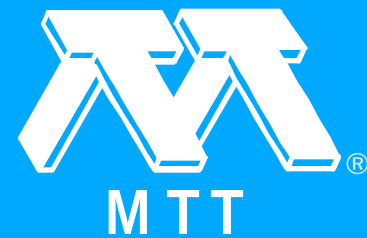
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Abstracts

Contributors (Feb. 1978 [T-MTT])

M. Ahmadpanah, R. Crampagne, L.B. Felsen, M. Geshiro, L.A. Glasser, J.-L. Guiraud, H.A. Haus, D.N. Held, J. Helszajn, D.S. James, R.H. Jansen, G. Jeng, A.R. Kerr, M. Kobayashi, N. Kumagai, M. Matsuhara, K. Okamoto, T. Okoshi, G.P. Riblet, R. Rupp, C.E. Santana and A. Wexler. "Contributors (Feb. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 127-130.



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Abstracts

Integration Method of Measuring Q of the Microwave Resonators (Technical Notes)

I. Kneppo. "Integration Method of Measuring Q of the Microwave Resonators (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 131-131.

A method of measurement of the loaded Q of microwave resonators is described based on the relation between the integral of the resonance curve and the Q of the cavity considered. The block diagram of the measuring set and some results of the verification experiments are also included.



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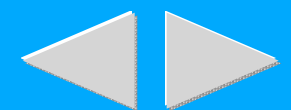
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Solid-State Devices for Low-Frequency Doppler Detectors (Technical Notes)

Y. Iijima, J.R. East and G.I. Haddad. "Solid-State Devices for Low-Frequency Doppler Detectors (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 132-133.

This paper describes doppler detector measurements for X-band IMPATT, Gunn and BARITT devices with doppler frequencies between 1 Hz and 1 kHz. Over this range of frequencies the BARITT is found to be superior as a self-oscillating doppler detector.

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Abstracts

Use of Attenuation and Phase Delay Characteristics of SAW to Measure Air-Gap Height (Technical Notes)

J.D. Crowley, J.F. Weller and T.G. Giallorenzi. "Use of Attenuation and Phase Delay Characteristics of SAW to Measure Air-Gap Height (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 134-135.

The attenuation and phase delay characteristics of a SAW which has been perturbed by a metallic plane above the surface of a piezoelectric delay line have been theoretically computed and experimentally measured. These measurements provide a diagnostic tool for determining the height of an air gap and for determining the minimum achievable air gap for a particular supporting structure.



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Abstracts

Highly Stable, Low Noise Millimeter-Wave IMPATT Oscillator (Technical Notes) (Feb. 1978 [T-MTT])

H. Okamoto, M. Ikeda, S. Kodaira and K. Miyazawa. "Highly Stable, Low Noise Millimeter-Wave IMPATT Oscillator (Technical Notes) (Feb. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): 136-136.

A highly stable and low noise IMPATT oscillator at 75 GHz is realized by using the parametric injection locking technique along with an AFC circuit in which a crystal oscillator is used as a reference. Noise level of this oscillator is lower by 25 dB as compared with that of the free-running IMPATT oscillator and the frequency stability is as good as $10^{-8}/^{\circ}\text{C}$.



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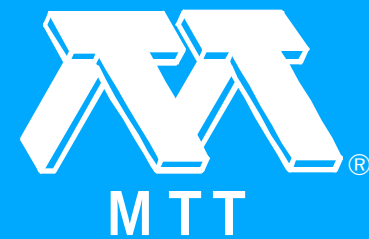
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"Back Cover (Feb. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.2 (Feb. 1978 [T-MTT]): b1-b2.



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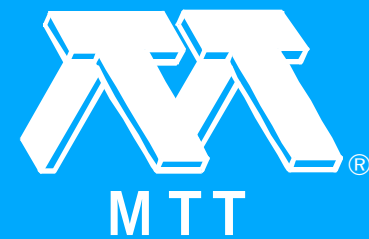
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"Front Cover (Mar. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): f1-f2.



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Abstracts

High-Frequency Waveform Generation Using Optoelectronic Switching in Silicon

J.M. Proud, Jr. and S.L. Norman. "High-Frequency Waveform Generation Using Optoelectronic Switching in Silicon." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 137-140.

Conversion of dc energy to RF pulses may be accomplished by fast optoelectronic switching in semiconductors. A particular device is described and demonstrated involving the simultaneous activation of an array of silicon switches by a laser pulse. The resultant traveling wave is a short RF pulse burst whose waveshape is determined by the static voltage profile established in the device. The possibility exists for generating megawatt-level pulses at frequencies extending into the higher microwave bands.



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Effects of Electromagnetic Fields on Isolated Nerve and Muscle Preparations

C.-K. Chou and A.W. Guy. "Effects of Electromagnetic Fields on Isolated Nerve and Muscle Preparations." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 141-147.

An S-band waveguide exposure system was designed to study the electromagnetic fields on the isolated tissues. The temperature of the exposed tissue was maintained at a constant temperature by circulating temperature controlled Ringer's solution through the waveguide. Isolated frog sciatic nerves, cat saphenous nerves, rabbit vagus nerves and superior cervical ganglia, as well as rat diaphragm muscles were placed in the waveguide either parallel or perpendicular to the electric field of the TE/sub 10/ mode. Compound action potentials of nerves or contractile tensions of muscles were recorded before, during and after the 2450-MHz microwave irradiation. Results showed no significant change in characteristics of nerves or muscles exposed to CW specific absorption rate (SAR) of 0.3-1500 W/kg and pulsed peak SAR of 0.3-220 kW/kg. The effects observed during high-power radiation were reproducible by changing the solution temperature. No direct field stimulation of nerves or muscles was observed during microwave irradiation.



Abstracts

On the Matching of Transmission Cavity Stabilized Microwave Oscillators

K. Schunemann and R. Nochel. "On the Matching of Transmission Cavity Stabilized Microwave Oscillators." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 147-155.

A matching condition is derived for a transmission cavity stabilized microwave oscillator, which takes account for the power loss in the diode mounting structure. In addition, the power dissipated in the damping resistor--which is commonly used in order to eliminate mode jumping problems--is minimized, thus leading to a useful improvement in both output power and loaded Q-factor of the compound oscillator structure. The effectiveness of the design procedure is finally demonstrated by applying it to a Gunn oscillator realization: at 15 GHz a loaded Q-factor of 6500 could be achieved at the sacrifice of only 2.4-dB overall power loss.



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A Highly Stabilized Low-Noise GaAs FET Integrated Oscillator with a Dielectric Resonator in the C Band

H. Abe, Y. Takayama, A. Higashisaka and H. Takamizawa. "A Highly Stabilized Low-Noise GaAs FET Integrated Oscillator with a Dielectric Resonator in the C Band." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 156-162.

A GaAs FET integrated oscillator stabilized with a BaO--TiO/sub 2/ system ceramic dielectric resonator provides a high-frequency-stabilized low-noise compact microwave power source. The newly developed ceramic has an expansion coefficient and dielectric constant temperature coefficient that offset each other and result in a small resonant frequency temperature coefficient. A stabilized oscillator output of 100 mW with a 17-percent efficiency and a frequency temperature coefficient as low as 2.3 ppm/°C are obtained at 6 GHz. FM noise level is reduced more the 30 dB by the stabilization. The dynamic properties of the oscillator and resonator are precisely measured to determine equivalent circuit representations. A large-signal design theory based on these equivalent circuit representations is presented to realize the optimal coupling condition between the oscillator and stabilizing resonator. The stabilized oscillator performance is sufficient for application to microwave communications systems.



Abstracts

Dynamic Considerations of Injection Locked Pulsed Oscillators with Very Fast Switching Characteristics

D. Pavlidis, H.L. Hartnagel and K. Tomizawa. "Dynamic Considerations of Injection Locked Pulsed Oscillators with Very Fast Switching Characteristics." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 162-169.

A theory is reported which describes, in a more accurate manner than previously, the voltage and phase transients of injection locked pulsed oscillators with very fast growth times by incorporating second-order effects which become important under certain conditions. The locking transients are determined either in the time domain or on a phase plane in which the variables are the oscillation amplitude and the phase ϕ . The optimum conditions for fast switching are demonstrated with the aid of experimentally obtained data for Gunn oscillators, which give some experimental verification of the theory presented here.



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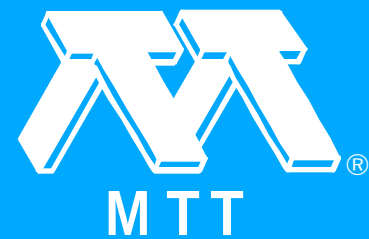
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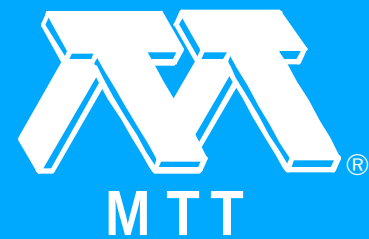
Measurements of Dispersion Characteristics and Field Distributions in Rectangular-Dielectric Waveguide and its Modifications

K. Ogusu. "Measurements of Dispersion Characteristics and Field Distributions in Rectangular-Dielectric Waveguide and its Modifications." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 169-171.

The author has previously numerically analyzed transmission characteristics of several dielectric waveguides by applying generalized telegraphist's equations. The technique may be applicable to a wide class of dielectric waveguides with arbitrary dielectric profile and cross section. In this paper, the dispersion characteristics and the field distributions in rectangular-dielectric waveguides and in single material fibers have been measured at X-band frequencies to verify the validity of the analysis. Good agreement between measured and calculated results shows that the analysis is useful to study the transmission characteristics of dielectric waveguides.

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A Useful Equivalence for a Coaxial-Waveguide Junction

R.L. Eisenhart, P.T. Greiling, L.K. Roberts and R.S. Robertson. "A Useful Equivalence for a Coaxial-Waveguide Junction." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 172-174.

The junction formed by a coaxial line entering the broad wall of a rectangular waveguide is commonly used, but has not been accurately analyzed due to the electromagnetic-field complexity. An excellent correlation has been established between this complex structure and a similar one which has already been thoroughly characterized. This close correlation permits use of the equivalent circuit of the previously characterized structure as a representation for the coax-waveguide junction as well. This usage is made possible by study of the relationship which exists between the two configurations, thus allowing accurate circuit analysis of components utilizing the coax-waveguide junction.

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Abstracts

Experimental Study of Symmetric Microstrip Bends and Their Compensation

R.J.P. Douville and D.S. James. "Experimental Study of Symmetric Microstrip Bends and Their Compensation." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 175-182.

An experimental study of microstrip bends is described. For right-angle corners, equivalent circuit parameters covering a wide range of frequencies, linewidths, and permittivities are presented and compared with the limited theoretical values available. The influence of mitring or rounding of the corner was investigated, and useful empirical expressions are given for the optimum miter.



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Abstracts

Some Considerations About the Frequency Dependence of the Characteristic Impedance of Uniform Microstrips

B. Bianco, L. Panini, M. Parodi and S. Ridella. "Some Considerations About the Frequency Dependence of the Characteristic Impedance of Uniform Microstrips." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 182-185.

Various possible definitions of characteristic impedance are derived from two different microstrip models obtaining similar results. It is shown that slightly different definitions yield strongly different behavior versus frequency.



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Abstracts

Exact and Approximate Synthesis of TEM-Mode Transmission-Type Directional Filters

J.L.B. Walker. "Exact and Approximate Synthesis of TEM-Mode Transmission-Type Directional Filters." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 186-192.

An exact equivalent circuit is derived for TEM-mode transmission-type directional filters. An approximate synthesis technique is described which provides excellent results and which requires only the use of a hand-held electronic calculator to compute the element values. An exact synthesis technique is also described.



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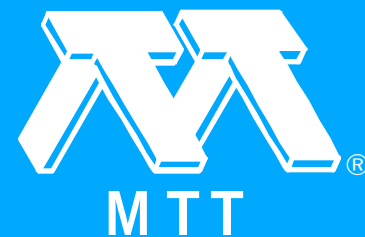


Abstracts

A New MIC Doppler Module

S. Nanbu. "A New MIC Doppler Module." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 192-196.

A new microwave integrated circuit (MIC) Doppler module comprising a germanium avalanche oscillator diode and a Schottky-barrier detector diode has been fabricated and analyzed. The module is essentially a high-stability MIC oscillator, which is connected to an X-band waveguide by means of a stripline probe. In addition to high minimum detectable signal level -- 100 dBm, a prominent feature that has been revealed is that the Doppler signal level is practically independent of oscillator output power under a specific condition. It is also shown that a simple adaptor attached to the module can provide a direction-sensitive device in a compact form.



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The Frequency Behavior of Stripline Circulator Junctions

S. Ayter and Y. Ayasli. "The Frequency Behavior of Stripline Circulator Junctions." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 197-202.

The frequency dependence of the circulation equations for Y-junction stripline and microstrip circulators is investigated, and a new set of design curves is generated for the frequency-independent forms of the circulation condition's roots for both below- and above-resonance cases. Using this new set of curves, the wide-band design predicted by Wu and Rosenbaum and Bosma's narrow-band design are analyzed and compared. Quantitative arguments for the effect of the junction parameters on the bandwidth are given. To support the arguments, the theoretical junction performance of the 7-15 GHz "continuous tracking" circulator reported by Wu and Rosenbaum is calculated and compared with the theoretical performance of a 24 GHz circulator junction designed using the same method. Experimental results also are presented for the 24 GHz design. An analysis for the effect of the ferrite thickness on impedance matching is also included.

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Frequency-Domain Shuttle-Pulse Measurement of Losses and Mode Conversion

P. Bernardi, F. Bertolani and V. Rizzoli. "Frequency-Domain Shuttle-Pulse Measurement of Losses and Mode Conversion." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 203-209.

A new method for measuring losses and mode conversion at microwave frequencies is presented. The method consists of producing the impulse response of single- or double-cavity resonant circuits in the frequency domain. To obtain this response, the input reflection coefficient of the circuit to be measured is first changed into a function of time by a swept-frequency technique, and then Fourier-transformed by means of a spectrum analyzer system. High generality of application and repeatability as well as measurement simplicity and definition are the main features of the new method. The examples of application presented include measurement of microstrip-line attenuation constants up to X-band and characterization of mode conversion coefficients in overmoded circular waveguide at millimeter-wave frequencies.





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Coupling of Waveguides through Large Apertures

V.M. Pandharipande and B.N. Das. "Coupling of Waveguides through Large Apertures." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 209-212.

A closed form expression for the equivalent network of a narrow transverse slot in the common broadwall between two waveguides is derived in terms of self-reaction and discontinuity in modal voltage. The coupling is expressed in terms of equivalent circuit parameter. A comparison between theoretical results with those obtained from the results of Levinson and Fredberg (for slot length $> 0.4a$, where a is the broad dimension of the waveguide), the results obtained from the formula of Sangster and the experimental results are presented.

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Surface Wave Propagation through a Small Gap Between Oppositely Magnetized Ferrite Substrates

N.C. Srivastava. "Surface Wave Propagation through a Small Gap Between Oppositely Magnetized Ferrite Substrates." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 213-215.

This paper presents an investigation of electromagnetic wave propagation in a thin dielectric slab sandwiched between oppositely magnetized ferrite substrates. It is found that this configuration supports forward surface wave modes with a lower cutoff frequency $\omega_{L'} = \gamma H_0$, which is smaller than the lower cutoff frequency $(\omega_L = \gamma[H_0/(H_0 + 4\pi M_0)]^{1/2})$, for the surface waves in previously examined structures. Backward surface waves propagate in a broad band in the high frequency region. When the saturation magnetizations of the substrates are the same, the group delay time varies linearly with the wave frequency as well as the biasing field throughout the range of allowed modes, except near the cutoffs.

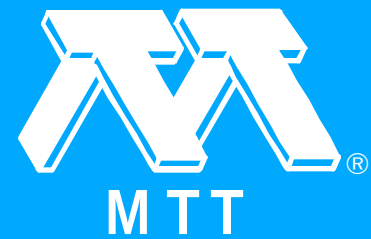


Abstracts

Modal Theory of Spatially Periodic Media (Correction)

R.S. Chu and J.A. Kong. "Modal Theory of Spatially Periodic Media (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 216-216.

In the above paper, Figs. 5 and 6 are incorrect and should be replaced by the following two figures.



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Abstracts

High-Speed Computation of Single and Coupled Microstrip Parameters Including Dispersion, Higher Order Modes, Loss and Finite Strip Thickness (Correction)

R.H. Jansen. "High-Speed Computation of Single and Coupled Microstrip Parameters Including Dispersion, Higher Order Modes, Loss and Finite Strip Thickness (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 216-216.

In the above paper, the manuscript received and revised dates were printed incorrectly. The dates should have read manuscript received October 15, 1956: revised January 13, 1977.



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Abstracts

Calculation of the S-Parameters of an Unsymmetric Microstrip T-Junction (Computer Program Descriptions)

W. Menzel. "Calculation of the S-Parameters of an Unsymmetric Microstrip T-Junction (Computer Program Descriptions)." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 217-217.

The program TSTRIP calculates the frequency dependent S-parameters of an unsymmetric microstrip T-junction.



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Contributors (Mar. 1978 [T-MTT])

H. Abe, Y. Ayasli, S. Ayter, P. Bernardi, F. Bertolani, B. Bianco, C.-K. Chou, B.N. Das, R.J.P. Douville, R.L. Eisenhart, P.T. Greiling, A.W. Guy, H.L. Hartnagel, A. Higashisaka, D.S. James, R. Knochel, S. Nanbu, S.L. Norman, K. Ogusu, V.M. Pandharipande, L. Panini, M. Parodi, D. Pavlidis, J.M. Proud, Jr., S. Ridella, V. Rizzoli, L.K. Roberts, R.S. Robertson, K. Schunemann, N.C. Srivastava, H. Takamizawa, Y. Takayama, K. Tomizawa and J.L.B. Walker.
"Contributors (Mar. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 218-222.



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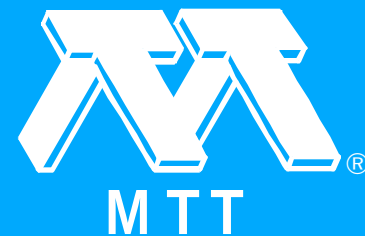


Abstracts

Fast Measurement of Cavity Coupling Coefficients (Technical Notes)

G. Magerl. "Fast Measurement of Cavity Coupling Coefficients (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): 223-224.

A swept frequency technique is described which allows to quickly obtain accurate values for the coupling coefficients of transmission-type cavities. An illustrative example is presented, and conditions for the validity of the new method are established.



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Back Cover (Mar. 1978 [T-MTT])

"Back Cover (Mar. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.3 (Mar. 1978 [T-MTT]): b1-b2.



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Front Cover (Apr. 1978 [T-MTT])

"Front Cover (Apr. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): f1-f2.



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Meander-Folded Coupled Lines

S. Rehnmark. "Meander-Folded Coupled Lines." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 225-230.

The quarter wave meander-folded coupler is a compact device useful for frequencies up to a few gigahertz. The folding is shown to shorten the electric length of the coupler and a theory is presented for the calculation of this shortening effect. The theory shows that the even-mode circuit is shortened to a higher extent than the odd-mode circuit which in stripline causes a degradation of performance. A conformal mapping technique is presented for determining the characteristic impedances of some stripline structures necessary for the theory. The theory is verified by experimental meander-folded stripline couplers. It is also experimentally shown that the meander-folded microstrip coupler can be designed to equalize the even- and the odd-mode lengths.



Abstracts

Parallel Line Microstrip Filters in an Inhomogeneous Medium

D. Pompei, O. Benevello and E. Rivier. "Parallel Line Microstrip Filters in an Inhomogeneous Medium." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 231-238.

Parallel coupled microstrip lines in an inhomogeneous medium are studied. The quasi-static capacitance is shown to be linear with regard to the dielectric constant ϵ_r simplifying the formalism used for analyzing microstrip filters. The electromagnetic advantages of the homogeneous medium carry over to the inhomogeneous medium. This result is obtained by equalizing all the velocities of the propagation modes.



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Abstracts

The Characteristic Impedance of Rectangular Transmission Lines with Thin Center Conductor and Air Dielectric

C.M. Weil. "The Characteristic Impedance of Rectangular Transmission Lines with Thin Center Conductor and Air Dielectric." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 238-242.

The characteristic impedance of large-scale rectangular strip transmission line facilities used for such purposes as EMI susceptibility testing, biological exposures, etc., is discussed. These lines are characterized by a thin center conductor and an air dielectric. Impedance data obtained by earlier workers, using different analytical and numerical techniques, are reviewed and compared. Exact data are available for the problem involving a center conductor of zero thickness while for the center conductor of finite thickness data are available which are accurate to less than 1.25 percent.



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Electromagnetic Wave Propagation in a Rectangular Waveguide with Sinusoidally Varying Width

A.K. Mallick and G.S. Sanyal. "Electromagnetic Wave Propagation in a Rectangular Waveguide with Sinusoidally Varying Width." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 243-249.

Wave propagation along a rectangular waveguide with slowly varying width has been investigated with the help of field theory and approximate circuit theory. In the field theory approach, two different methods of analysis have been attempted. Many properties of the modulated periodic structure, e.g., the frequency dependence of the propagation constant group and phase velocities and the electric field axial variation for the fundamental space harmonic and its filter-like property have been investigated. The magnetic field lines on the H-plane for a typical case exhibit an expected configuration. Experimental results show close agreement with analysis. It is concluded that this structure supports the fast fundamental space harmonic.

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Abstracts

Bound on Scattering Elements for Irregularly Shaped Waveguides

K. Kalikstein. "Bound on Scattering Elements for Irregularly Shaped Waveguides." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 250-252.

A lower bound is obtained on the phase shifts that characterize the scattering of electromagnetic waves by obstacles in an irregularly shaped waveguide for which the form function is imprecisely known. A numerical example illustrates the method.



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Propagation of Magnetostatic Waves Along Curved Ferrite Surfaces

N. Srivastava. "Propagation of Magnetostatic Waves Along Curved Ferrite Surfaces." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 252-256.

Electromagnetic equations have been appropriately transformed and solved in order to investigate the propagation of magnetostatic waves in curved geometries. The results have been utilized to study magnetostatic propagation along the surface of a cylindrically curved slab of ferrite in the azimuthal direction. In the case of an unbacked- or a metal-backed slab, it is found that the effect of curvature is to slightly reduce the phase as well as the group velocity by a constant factor throughout the frequency range of allowed modes. However, under favorable conditions, the presence of a dielectric layer between ferrite and metal leads to a strong enhancement in the propagation constant. It is also found that an axially magnetized homogeneous ferrite cylinder cannot support magnetostatic surface waves propagating along its curved surface in the azimuthal direction.

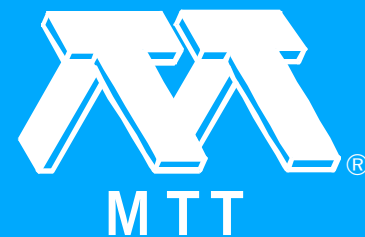


Abstracts

On the Resonant Frequency of a Reentrant Cylindrical Cavity

M. Jaworski. "On the Resonant Frequency of a Reentrant Cylindrical Cavity." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 256-260.

A new efficient method determining the resonant frequency of a reentrant cylindrical cavity is suggested. The method is based on solving the Helmholtz equation within two cavity regions and matching the solutions across the boundary surface. Contrary to similar formulations published previously, the continuity conditions on the boundary are imposed in a rigorous way. As a result the solution is obtained in a form of successive approximations converging to the exact resonant frequency when a number of iterations tend toward infinity. Numerical examples are given for a few reentrant cavities of typical dimensions. Comparison is also made with experimental data as well as other theoretical results.



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Abstracts

Analysis of Wave Propagation in Inhomogeneous Dielectric Slab Waveguides

H. Ikuno. "Analysis of Wave Propagation in Inhomogeneous Dielectric Slab Waveguides." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 261-266.

The propagation characteristics of the guided modes in an inhomogeneous dielectric slab waveguide are analyzed by the regularized WKB method. The corrected propagation constants of the guided modes in a near parabolic index medium are derived in analytic form. The effects of the refractive index profile and the homogeneous cladding on the guided modes can be expressed in terms of the mode indices and evaluated numerically.



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Abstracts

The Electromagnetic Fields and the Phase Constants of Dielectric Image Lines (Apr. 1978 [T-MTT])

K. Solbach and I. Wolff. "The Electromagnetic Fields and the Phase Constants of Dielectric Image Lines (Apr. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 266-274.

A method is described for the exact calculation of the field distributions and the phase constants of single and coupled dielectric image lines of rectangular cross section. Field distributions and phase constants calculated by this method are presented as well as experimental results from lines fabricated of paraffin wax. The physical properties of the electromagnetic fields and the mode designation are discussed. The theory is compared to approximate calculation methods known from the literature.



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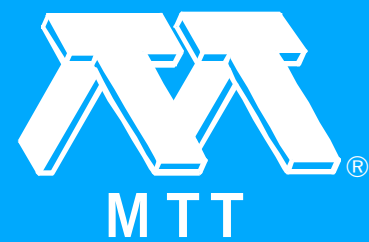
An Eigenadmittance Condition Applicable to Symmetrical Four-Port Circulators and Hybrids

G.P. Riblet. "An Eigenadmittance Condition Applicable to Symmetrical Four-Port Circulators and Hybrids." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 275-279.

Recently, an expression for the equivalent admittance of symmetrical three-port circulators has been derived on the basis of symmetry considerations. In this paper, the same technique is extended to the symmetrical four-port circulator. It is shown that a simple relationship must be satisfied by the eigenadmittances jY_{01} , $jY_{-1/2}$, $jY_{1/2}$, and $jY_{2/4}$ if perfect circulation is to be obtainable by matching alone. This relationship also applies to reciprocal four-port devices with 2-fold symmetry about two perpendicular axes which are required to be 90° hybrids upon matching, provided that the eigenadmittances $jY_{1/2}$, $jY_{2/4}$, $jY_{3/4}$, and $jY_{4/0}$ are used. An interesting application of this relation to the construction of a compact stripline hybrid is given.

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Field Theory Treatment of H-Plane Waveguide Junction with Triangular Ferrite Post

A.-M. Khilla and I. Wolff. "Field Theory Treatment of H-Plane Waveguide Junction with Triangular Ferrite Post." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 279-287.

This paper presents an exact field theory treatment for the H-plane waveguide junction with three-sided ferrite prism. The treatment is general, being independent of the geometrical symmetry of the junction, the number of ports, and the location of the ferrite post inside the junction. The solution of the wave equations in the ferrite post and in the surrounding region is written in the form of an infinite summation of cylindrical modes. The fields at the ferrite-air interface are matched using the point-matching technique. This results in two amplitudes for the cylindrical modes describing the fields in the air region in the form of a matrix. The fields at the arbitrary boundary between the air region and the waveguides are also matched using the point-matching technique. This results in a finite system of nonhomogeneous equations in the field amplitudes. The three-port waveguide junction circulator with central triangular ferrite post is analyzed using this technique. Two specific arrangements are considered. In the first arrangement, the points of the triangles are in the centers of the waveguides, and in the second, the sides of the triangles are in the centers of the waveguides. The method used in this paper can also be applied to study the effect of the ferrite-post geometry on the circulator performance in order to seek the best possible circulator structure. Excellent agreement has been found between published experimental measurements and the numerical results obtained by this technique in the case of a waveguide junction circulator with cylindrical ferrite post.

Click on title for a complete paper.



Abstracts

A Numerical Technique for SAW Diffraction Simulation

D. Penunuri. "A Numerical Technique for SAW Diffraction Simulation." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 288-294.

An efficient numerical technique is presented for simulating the effect of diffraction on the performance of surface acoustic wave (SAW) devices. A computer code based on this technique accurately predicts the performance of several "practical" bandpass filters fabricated on ST-cut quartz. Since the algorithm is fast, an iterative design procedure which minimizes the frequency sidelobes in the presence of diffraction is now practical.



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Abstracts

Static Capacitance Calculations for a Surface Acoustic Wave Interdigital Transducer in Multilayered Media

A. Venema, J.J.M. Dekkers and R.F. Humphries. "Static Capacitance Calculations for a Surface Acoustic Wave Interdigital Transducer in Multilayered Media." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 294-297.

The static capacitance of an interdigital structure in multi-layered media has been calculated. Numerical results are given for a surface acoustic wave interdigital transducer on an oxidized silicon substrate with a piezoelectric overlay. The capacitance is derived in terms of the layer thicknesses for zero and infinite substrate resistivity.



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New Leaky Surface Waves in Anisotropic Metal-Diffused Optical Waveguides

K. Yamanouchi, T. Kamiya and K. Shibayama. "New Leaky Surface Waves in Anisotropic Metal-Diffused Optical Waveguides." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 298-305.

Propagation of guided waves in anisotropic metal-diffused optical waveguide is investigated. Two-dimensional guide-mode dispersion curves are computed and classified for a metal-diffused waveguide with arbitrary optic-axis orientation in various diffusion depth. It is found that a new leaky surface wave exists in the region where the refractive index is above the cutoff value, not below it. Typical values of decay constant are about 5 dB/cm for the wave propagating along X axis on 128° rotated Y-cut LiNbO/sub 3/, and 35 dB/cm for the wave propagating along the direction making an angle of 70° to X axis on Y-cut plane LiNbO/sub 3/. We were able to observe the leaky surface waves experimentally.

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Analysis of Intermodulation Noise in Frequency Converters by Volterra Series

R.B. Swerdlow. "Analysis of Intermodulation Noise in Frequency Converters by Volterra Series." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 305-313.

Frequency converters produce intermodulation noise in the desired signal band which may be a serious problem for communications systems using amplitude modulation. In this paper, we introduce the Volterra series with time-varying kernels to treat intermodulation in frequency converters with one two-terminal nonlinearity. The method gives exact results up to the order calculated (third order here) for any nonlinearity expressible as a power series, will treat frequency dependence in the nonlinearity as well as the terminations, and leads to a convenient algorithm for computer calculation. The mathematics provides a physical picture of intermodulation of a specific order as being produced by the modulation of lower order products through the nonlinearity. In fact, the solution for a given order of intermodulation currents or charges is the solution of a set of linear equations where the driving functions are intermodulation currents of lower order. A program has been written for the specific but important case of an abrupt junction varactor upconverter. Results for an upconverter that may be used for single-sideband operation in the common carrier microwave band show that the largest contribution to intermodulation comes from currents which are at the sum and difference frequencies of the input (IF) signal corresponding to currents above the input port in frequency and currents in the bias circuitry. This paper documents previously unpublished work (1972) done as part of the exploratory study of single-sideband modulation on long-haul microwave radio transmission.





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Full-Band Low-Loss Continuous Tracking Circulation in K Band (Comments)

Y. Ayasli. "Full-Band Low-Loss Continuous Tracking Circulation in K Band (Comments)." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 314-314.

In a recent paper, Konig et al. report the design of a wide-band Y-junction stripline circulator for the 18-26.5-GHz frequency band. In this paper, among the design constraints and assumptions, it is stated, "Adjust the ground plane spacing such that the first transformer step physically subtends an angle at the edge of the ferrite resonator equal to the coupling angle ψ ."

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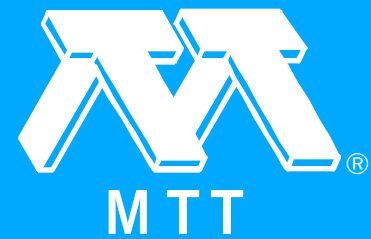


Abstracts

On the Smith Chart (Letters)

F.W. Schott. "On the Smith Chart (Letters)." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 314-314.

The Smith Chart is the complex plane of the reflection coefficient. The unique contribution of P. H. Smith was the superposed grid for identifying impedance or admittance values; however, students, when being introduced to the Chart, can often be caught up in the superposed grid. Mastery of the use of the Chart requires a clear understanding of its underlying essence.



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Measurement of Microwave Loss Tangent by Means of Microwave Resonator Bridge (Comments)

K. Watanabe. "Measurement of Microwave Loss Tangent by Means of Microwave Resonator Bridge (Comments)." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 314-315.

In the above paper, Kneppo and Weis claim that the microwave resonator bridge (MRB) is a new and highly sensitive method for measuring dielectric losses of materials. Contrary to their belief, the principles of measurement are not new but have already been reported in [1] and [2]. Especially, the system arrangement described in [2] is the same as that of MRB, except that the former uses a shutter in tandem with a matched termination as a reference load of the bridge, while the latter uses a reference resonator. Thus the point in question is whether or not this replacement of the reference load improves the sensitivity of the bridge.

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



Abstracts

Input Impedance of Coaxial Line to Circular Waveguide Feed (Correction)

N.D. Deshpande and B.N. Das. "Input Impedance of Coaxial Line to Circular Waveguide Feed (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 315-315.

In the above paper the expression (8) in Section IV should read as



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Abstracts

Optimization of the Matching Network for a Hybrid Coupler Phase Shifter (Correction)

J.P. Starski. "Optimization of the Matching Network for a Hybrid Coupler Phase Shifter (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 315-315.

In the above paper, the manuscript received date was printed incorrectly. The date should have read, Manuscript received August 16, 1976.



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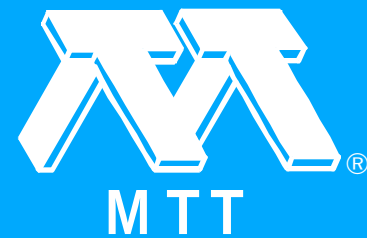
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Abstracts

Contributors (Apr. 1978 [T-MTT])

O. Benevello, J.J.M. Dekkers, R.F. Humphries, H. Ikuno, M. Jaworski, K. Kalikstein, T. Kamiya, A.-M. Khill, A.K. Mallick, D. Penunuri, D. Pompei, S. Rehnmark, G.P. Riblet, E. Rivier, G.S. Sanyal, K. Shibayama, K. Solbach, N.C. Srivastava, R.B. Swerdlow, A. Venema, C.M. Weil, I. Wolff and K. Yamanouchi. "Contributors (Apr. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 316-318.



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Abstracts

Analysis of Waveguide Post Configurations: Part 3--Influence of General Waveguide Terminations (Technical Notes)

J.S. Joshi and J.A.F. Cornick. "Analysis of Waveguide Post Configurations: Part 3--Influence of General Waveguide Terminations (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): 319-320.

Analysis of general post configurations in an infinitely long rectangular waveguide was presented earlier. This technical note considers the extension of that work to the case when the two waveguide ports are generally terminated.



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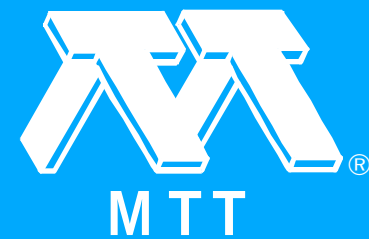
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Abstracts

Back Cover (Apr. 1978 [T-MTT])

"Back Cover (Apr. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.4 (Apr. 1978 [T-MTT]): b1-b1.



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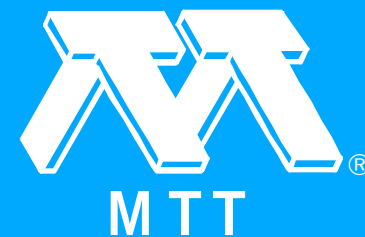
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Abstracts

Front Cover (May 1978 [T-MTT])

"Front Cover (May 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): f1-f2.



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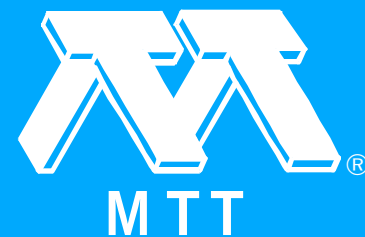


Abstracts

Foreword (May 1978 [T-MTT])

K. Tomiyasu. "Foreword (May 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 321-321.

During the 1975 IEE International Microwave Symposium in Palo Alto, CA, a Strong Interest was Voiced Suggesting a Technical Session Featuring High-Power Microwaves. One Year Later at the 1976 IEEE International Symposium in Cherry Hill, NJ, a High Power Microwave Techniques Session was Scheduled and There was a Large Attendance. Some of the Papers Stressed Application of High Power to Radar and Power Transmission. Other Papers Dealt with Components and Techniques.



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Abstracts

A Wideband Linear FM Ramp Generator for the Long-Range Imaging Radar

D.R. Bromaghim and J.P. Perry. "A Wideband Linear FM Ramp Generator for the Long-Range Imaging Radar." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 322-325.

This paper describes the linear FM ramp generator that provides the wideband transmitted signal and correlation receiver reference for the long-term imaging radar (LRIR) developed and operated by the M.I.T. Lincoln Laboratory. The signal generated has a bandwidth of 1000 MHz and a duration of 250 μ s. Because of its large time-bandwidth product, the signal is generated actively by sweeping a voltage-controlled oscillator. Special attention is given to the means for achieving linearity, reproducibility, and coherence of the generated ramps.



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Abstracts

High Power X-Band Monopulse Tracking Feed for the Lincoln Laboratory Long-Range Imaging Radar

K.R. Goudey and A.F. Sciambi, Jr.. "High Power X-Band Monopulse Tracking Feed for the Lincoln Laboratory Long-Range Imaging Radar." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 326-332.

This paper covers the design, development, and test of a 10-GHz 10-percent bandwidth high-efficiency feed system to be used in a 120-ft Cassegrainian antenna for the M.I.T. Lincoln Laboratory Long Rang Imaging Radar. The feed is a multimode monopulse tracking feed employing a multifare horn and is capable of transmitting a power level of 800 kW at 50-percent duty. The feed will operate in both right- and left-hand circular polarization simultaneously or in both vertical and horizontal polarization simultaneously depending on the input network.



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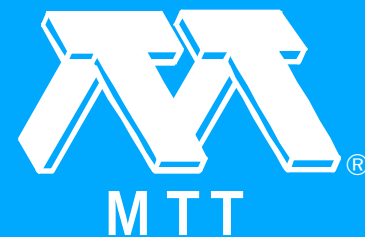


Abstracts

A Mode Transducing Antenna

R.D. Wengenroth. "A Mode Transducing Antenna." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 332-334.

At power levels above those readily handled by standard waveguide, and for long waveguide runs, the TE/sub 01/ mode in circular guide is a preferred transmission line approach. At the antenna, this mode is generally unsuited to radiation since it forms a conical, instead of a pencil beam. Phase and polarization shifting techniques at a reflecting surface cause the illumination to be transduced to form a pencil beam. The techniques have been demonstrated in a 33-GHz model.



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Abstracts

The Beamed Power Microwave Transmitting Antenna

R.M. Dickinson. "The Beamed Power Microwave Transmitting Antenna." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 335-340.

The potential applications, resulting hazards, safety considerations, and alternate options for high-power microwave beam transmission functions are discussed. Existing and projected beamed power control techniques are presented, and the differences between existing and proposed high-power conventional antennas and phased arrays are described.



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Abstracts

A Reactive Fourth-Harmonic Filter Operating at 400-kW CW

H.J. Mohr. "A Reactive Fourth-Harmonic Filter Operating at 400-kW CW." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 341-345.

A reactive fourth-harmonic filter operating at a fundamental power level of 400-kW CW is described. The filter, used in the NASA Deep Space Instrumentation Facilities, operates in an S-band (WR-430) waveguide run and it effectively attenuates the fourth harmonic of the fundamental transmit frequency near 2.1 GHz by a minimum of 40 dB. The design approach including power handling capability considerations is presented. Also included are some details of mechanical construction, tuning procedures, and results achieved.



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X-Band High-Power Multipactor Receiver Protector

T.P. Carlisle. "X-Band High-Power Multipactor Receiver Protector." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 345-347.

High vacuum devices incorporating the secondary electron resonance phenomenon have been used for several years in receiver protection circuits for high-power high-pulse repetition frequency (PRF) radars. These are known as multipactor devices. Recent technological developments have increased the peak-power handling capability and bandwidth of airborne-qualified devices to 50 kW and 12.5 percent respectively. Life tests on multipactor devices have demonstrated 2500 h of failure free operation.



Abstracts

A High-Power Switching Network for a Dual-Mode Antenna

V.J. Albanese and D. Kerbs. "A High-Power Switching Network for a Dual-Mode Antenna." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 348-354.

A novel hybrid switching network is described in which high levels of RF power (2-3 kW) are controlled and switched over an octave bandwidth in low L band by the use of a relatively low-power level switch matrix used in conjunction with a pair of 8.34-dB (nominal) directional couplers and a phasing network. An alternate design to compactly achieve the same results is also described. The device is for use with a switchable (dual-mode) airborne transmitting antenna. Theoretically predicted performance parameters are graphically presented along with correlated measured data.



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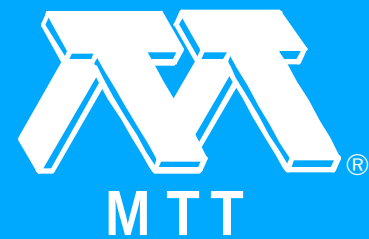
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Characteristics of High-Power Breakdown at 28 GHz

M. Nakamura, T. Saito and M. Kuramoto. "Characteristics of High-Power Breakdown at 28 GHz." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 354-356.

Characteristics of arcs resulting from high-power breakdown in a waveguide at 28 GHz were determined as a function of CW power level. The radio frequency power reflected from and absorbed in arcs as well as the arc velocity were measured. In addition, the spectrum of the arc light and the track on the surface in a waveguide caused by an arc were evaluated. Comparing the velocity of an arc at 28 GHz with that at about 10 GHz, it was found that the velocity of the arc is proportional to the square of the electric field strength but depends very little on radio frequency.

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



Thermal Stress-Induced Breakdown in an S-Band Isolator

D.C. Buck and M.L. King. "Thermal Stress-Induced Breakdown in an S-Band Isolator." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 357-360.

In increasing the average power capability of a high peak power S-band isolator, severe RF breakdown was repeatedly encountered, which always led to extensive destruction of the ferrite material. Through careful study of the microwave and thermal test data, it was ascertained that breakdown was preceded by thermally induced stress and fracture in the ferrite, which was a consequence of a thermally induced adhesive failure. It is shown that the adhesive parameters of importance include the tensile strength and the thermal elongation of the adhesive layer. Also, restrictions on the range of dielectric loss tangents of the ferrite consistent with the proposed breakdown mechanism are given.

Abstracts

A 50-kW CW Ferrite Circulator in S Band

C. Fournet-Fayas, A.C. Priou and G.E. Forterre. "A 50-kW CW Ferrite Circulator in S Band." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 360-363.

A 50-kW CW differential phase-shift circulator at 2450 MHz has been developed. Its insertion loss and isolation are 0.18 dB and 20 dB, respectively, over a bandwidth of 25 MHz at 2450 MHz. It is useful for protecting the microwave source of a high-power system from reflected power. The design and experimental results of the circulator are presented.



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Design of a High-Power CW Y-Junction Waveguide Circulator

F. Okada and K. Ohwi. "Design of a High-Power CW Y-Junction Waveguide Circulator." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 364-369.

A junction circulator appears inferior in average power-handling capability, although it is compact and light-weight and has good performance. A new type of 100-kW CW waveguide Y-junction circulator is realized by dividing the junction of the circulator into four equal unit junctions in a so-called "multilayer structure," which is water-cooled easily. This circulator has an insertion loss of 0.18 dB and an isolation of 20 dB, and it is compact and economical to build. The design of 30- and 100-kW CW waveguide Y-junction circulators is presented in this paper, which discusses determination of ferrite dimensions and air gap, considers heat generation in the ferrite, and the influence of dc magnetic-field distribution on its performance. The ferrite dimensions and air gap are determined very easily by using this design method, and these have been confirmed by experiment. It was found that a uniform distribution of internal dc magnetic field, obtained by considering the demagnetizing dc magnetic field, gives optimum performance. This is a significant design factor for high-power circulators which require minimum insertion loss.

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Generation of Microwave Power with a Spark-Gap Cavity

V.M. Ristic and T.P. Sorensen. "Generation of Microwave Power with a Spark-Gap Cavity." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 369-374.

A theory of a $\lambda/4$ transmission line resonator containing a spark gap is developed and parameters such as output spectrum, bandwidth, Q factor, and efficiency are derived. Equivalent circuits incorporating different spark-gap parameters are presented and used for numerical simulation of cavity output. Several fixed and variable frequency cavities are constructed and tested. Typical peak power outputs are 7.2 kW into 50- Ω line at a frequency of 2.1 GHz, and 27 kW into 50- Ω line at a frequency of 1.5 GHz. For proper operation of this device the spark resistance must fall to a value less than the characteristic impedance of the line in a time less than T where $f_{\text{req}} = 1/2T$ is the required frequency.

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Abstracts

Behavior of the Magnetostatic Wave in a Periodically Corrugated YIG Slab (Correction)

M. Tsutsumi, Y. Sakaguchi and N. Kumagai. "Behavior of the Magnetostatic Wave in a Periodically Corrugated YIG Slab (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 374-374.

In the above short paper, in (21) the minus sign was inadvertently left out. Equation (21) should read as follows:



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Abstracts

Mie Series Solution for a Sphere (Computer Program Descriptions)

J.R. Mautz. "Mie Series Solution for a Sphere (Computer Program Descriptions)." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 375-375.

To compute the Mie series solution for plane-wave scattering by a conducting sphere, by a homogeneous loss-free material sphere.



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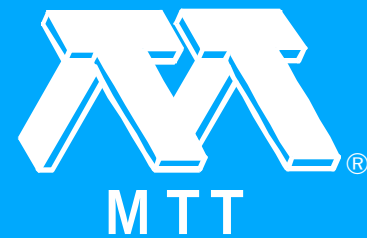
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Abstracts

Contributors (May 1978 [T-MTT])

V.J. Albanese, D.R. Bromaghim, D.C. Buck, T.P. Carlisle, R.M. Dickinson, G.E. Forterre, C. Fournet-Fayas, K.R. Goudey, D. Kerbs, M.L. King, M. Kuramoto, H.J. Mohr, M. Nakamura, K. Ohwi, F. Okada, J.P. Perry, A.C. Priou, V.M. Ristic, T. Saito, A.F. Sciambi, Jr., T.P. Sorensen, K. Tomiyasu and R.D. Wengenroth. "Contributors (May 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 376-378.



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An Analysis of Microwave De-Embedding Errors (Technical Notes)

L.A. Glasser. "An Analysis of Microwave De-Embedding Errors (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.5 (May 1978 [T-MTT] (Special Issue on High-Power Microwaves)): 379-380.

Bounds on de-embedding errors are derived. Both measurement errors and "known" load errors are considered. Of particular interest is the determination of error bounds for unknown loads situated in regions of the Smith chart that are remote from the location of the known de-embedding loads. An example is presented. This analysis is of particular interest for de-embedding microwave diodes.

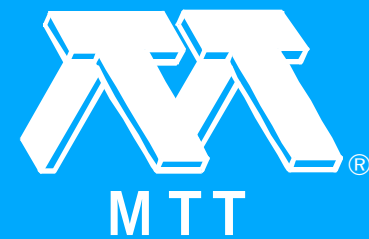
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"Front Cover (Jun. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): f1-f2.



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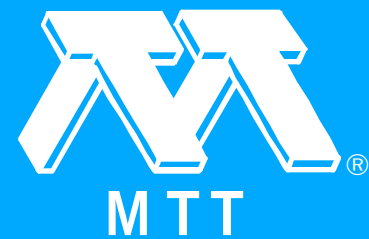


Microwave Oven Mode Tuning by Slab Dielectric Loads

T.G. Mihran. "Microwave Oven Mode Tuning by Slab Dielectric Loads." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 381-387.

Cold-test measurements have been made of mode tuning in a microwave oven cavity containing a slab water load of variable height. Two distinct types of mode behavior are observed: 1) a mode which is tuned generally upward in frequency, proceeding in sawtooth stew and 2) a mode whose resonant frequency is nearly constant, except for slight downward perturbations at regular intervals. Two theoretical treatments are presented to understand and verify the observed mode behavior. A plane wave analysis is found to illustrate most of the qualitative aspects of mode tuning, such as its staircase behavior and the phenomenon of mode linking by loss. A more accurate, quantitative description of mode behavior is obtained by generalizing dispersion relationships which have been developed in the past for the analysis of rectangular waveguides with dielectric slabs. Agreement between theory and measurement is good in general except for light loads in case 2 above.





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Characteristics of Single and Coupled Microstrips on Anisotropic Substrates

N.G. Alexopoulos and C.M. Krowne. "Characteristics of Single and Coupled Microstrips on Anisotropic Substrates." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 387-393.

In this paper, the effect of an anisotropic substrate on the characteristics of covered microstrip is presented for single and coupled lines. The Green's function is obtained in integral and series form for an arbitrary anisotropic substrate. Computer programs based on the method of moments approach are employed and results are presented in graphical form for impedance Z , coupling constant K , and phase velocity $v_{\text{sub } p}$ as functions of $n_{\text{sub } x} / n_{\text{sub } y}$ (the ratio of the substrate indices of refraction). Z , K , and $v_{\text{sub } p}$ are studied for various w/H , S/H , and B/H ratios where w is the line width ($w_{\text{sub } 1}$ and $w_{\text{sub } 2}$ for coupled lines), S is the separation between coupled lines, B is the separation between ground planes, and H is the substrate thickness.

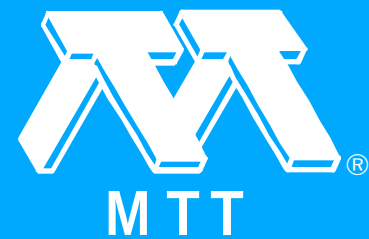
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Design Charts for Inhomogeneous Coupled Microstrip Lines

A.E. Ros. "Design Charts for Inhomogeneous Coupled Microstrip Lines." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 394-400.

Owing to the bear variation of the odd- and even-mode capacitances in terms of the dielectric constant ϵ_r , of the substrate, it has been possible to obtain formulas giving all the electrical characteristics of the lines for given values of the ratios, width w and separation s of the lines upon height h of the dielectric substrate. Conversely, by means of charts, it is possible to obtain the geometrical dimensions of the lines, whatever the value of ϵ_r , for the imposed matching impedance and coupling coefficient. The use of these charts is very easy, and the results are the closest to experimental data published to date.



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Calculation of Microstrip Bends and Y-Junctions with Arbitrary Angle

R. Mehran. "Calculation of Microstrip Bends and Y-Junctions with Arbitrary Angle." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 400-405.

A method is described for calculating the frequency-dependent scattering parameters of microstrip bends and Y-junctions with arbitrary angles. Use is made of a waveguide model and an orthogonal series expansion for the fields around the discontinuity of the bend, so that the excitation and propagation of higher order modes can be considered. The transmission properties of the Y-junctions are derived from those of the bends by a symmetry consideration. Numerical results are given for two different substrates and are compared with experimental data. Neglecting radiation effects, they are in good agreement.

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Bandwidth Optimization by Dielectric Loading

S. Halevy, S. Raz and H. Cory. "Bandwidth Optimization by Dielectric Loading." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 406-412.

The known theory of dielectrically loaded rectangular waveguides is combined with appropriate optimization procedures to yield optimal bandwidth design. The minimal acceptable power handling capacity and/or the maximal allowed losses are used as constraints. Alternatively, power handling capacity or losses may be considered as the desired optimization targets. The numerical determination of the relevant cutoff frequencies is carried out by the efficient mode-matching technique as well as the more generally applicable moment solution. Alternative search algorithms are used and compared. Results of the optimization process are given a simple physical interpretation.

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Ridged Waveguides with Inhomogeneous Dielectric-Slab Loading

G. Magerl. "Ridged Waveguides with Inhomogeneous Dielectric-Slab Loading." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 413-416.

The dispersion equation of the ridged waveguide with inhomogeneous dielectric-slab loading is derived. Numerical results for the cutoff frequencies of the three lowest order TE/sub m0/ modes are given which substantiate the feasibility of the modal expansion and field-matching technique employed. For a Teflon-slab loaded ridged waveguide, a 40-percent decrease of dominant-mode cutoff frequency, simultaneously providing 20-percent enhanced TE/sub 20/-mode separation compared to an empty ridged waveguide, is demonstrated.

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Abstracts

Two-Signal Method of Measuring the Large-Signal S-Parameters of Transistors (Jun. 1978 [T-MTT])

S.R. Mazumder and P.D. van der Puije. "Two-Signal Method of Measuring the Large-Signal S-Parameters of Transistors (Jun. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 417-420.

In this paper, large-signal S-parameters are reviewed, and transistors of Class-C are employed. Problems are encountered in obtaining large-signal parameters S_{12} and S_{21} . A novel method is concisely developed based on theory presented herein. The acquired S-parameters are applied to amplifier design accordingly. The predicted and measured output power are compared, and suitable conclusions are duly recorded.



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Abstracts

Cavity Stabilization and Electronic Tuning of a Millimeter-Wave IMPATT Diode Oscillator by Parametric Interaction

H. Okamoto and M. Ikeda. "Cavity Stabilization and Electronic Tuning of a Millimeter-Wave IMPATT Diode Oscillator by Parametric Interaction." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 420-424.

A new technique is proposed by which both noise reduction and electronic tuning of a millimeter-wave solid-state oscillator can be realized by injecting an arbitrary low-frequency (several hundred megahertz or beyond) signal to the oscillator element which is provided with an additional high-Q cavity. This method has much wider tuning bandwidth than that of the conventional subharmonic injection locking technique. Presented are both experimental results and some theoretical interpretations by using an IMPATT diode oscillator.



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A Broad-Band Second-Harmonic Mixer Covering 76-106 GHz

R. Kawasaki and M. Akaike. "A Broad-Band Second-Harmonic Mixer Covering 76-106 GHz." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 425-427.

A broad-band second-harmonic millimeter-wave mixer has been constructed. The circuit consists of a single unencapsulated Schottky-barrier diode and embedding network which includes a wave absorber in the IF output terminal. The conversion loss of the mixer is 14.6 ± 0.9 dB over a frequency range of 76-106 GHz. The mixer is pumped by a local oscillator that is tuned over the range of 37.15-52.15 GHz. The IF is kept constant at 1.7 GHz. The new mixer looks attractive for use in broad-band millimeter-wave measuring equipment, such as spectrum analyzers.

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A Low-Loss Diffraction Grating Frequency Multiplexer

P.S. Henry and J.T. Ruscio. "A Low-Loss Diffraction Grating Frequency Multiplexer." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 428-433.

A quasi-optical frequency multiplexer based on a blazed diffraction grating is studied. Experimental data, supported by semi-quantitative theoretical considerations, show that the multiplexer is an efficient channel-dropping filter well suited to use in the millimeter wave region. A feature of the grating multiplexer which sets it apart from conventional designs is its ability to drop several channels using a single frequency-selective element, namely, a diffraction grating. This economy of hardware results in a simple, compact structure. The channels of the experimental multiplexer have typical bandwidths of ~540 MHz with loss of ~1 dB. The width of the impulse response at half amplitude is ~1.5 ns. Return loss within a channel is typically 15-20 dB. Comparisons with other millimeter wave multiplexer designs are discussed.

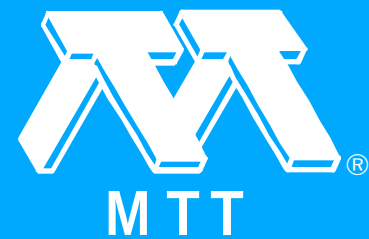


Measurements of Earth-Space Attenuation at 230 GHz

G.T. Wrixon and R.W. McMillan. "Measurements of Earth-Space Attenuation at 230 GHz." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 434-439.

Measurements of attenuation at 230 GHz through the total atmosphere due to the presence of oxygen and water vapor molecules, clouds, and rain are presented and discussed. The measurements were carried out using a specially designed superhetrodyne receiver mounted on a sun tracker. Simultaneons measurements were also carried out at 13 GHz. For a measuring site close to sea level at Holmdel, NJ, the "clear-sky" zenith attenuation was found to be given by $A \text{ (dB)} = 0.35 \rho$, where ρ was the measured ground water vapor density in g/m^3 . When the ground temperature was below about 7°C , most cloud and overcast gave < 0.5 -dB attenuation whereas with a ground temperature greater than 13°C , cloud attenuation was 8-10 times greater. Calculations of zenith attenuation in the 230-GHz atmospheric window were also made using the Gross analytic line shape, Schulze-Tolbert empirical line shape, and an empirically modified Gross line shape. These calculations were based on determinations of water vapor density and temperature made at the measurement site, and on radiosonde measurements made at a distance of 80 km away. Measured and calculated results are graphically compared. It is concluded that either the modified Gross line shape or the Schulze-Tolbert line shape gives conservative estimates of zenith attenuation at 230 GHz for clear days, while the Gross line shape gives fair agreement with measured results.





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Radio Communication in Tunnels

J. Chiba, T. Inaba, Y. Kuwamoto, O. Banno and R. Sato. "Radio Communication in Tunnels." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 439-443.

The attenuation constant of radio waves in tunnels was obtained experimentally and theoretically. According to this study, the tunnel is a transmission channel of high-pass type. It is found that the higher the frequency, the smaller the attenuation constant. The experimental values of attenuation constants are similar to the theoretical values of the the TE/sub 01/ and EH/sub 11/ and modes when the tunnel is regarded as a circular waveguide with the same cross-sectional area as the tunnel. Radio communication using the tunnel was proven to be fully possible in spite of the standing wave effects due to the interference of the propagation modes.

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Complex Radiation Impedance of Microstrip-Excited Magnetostatic-Interface Waves

A.K. Ganguly, D.C. Webb and C. Banks. "Complex Radiation Impedance of Microstrip-Excited Magnetostatic-Interface Waves." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 444-447.

A technique is described for computing the radiation reactance of microstrip-excited MSSW's from a Hilbert transform of a previously derived expression of the radiation resistance. The series combination of the radiation reactance, radiation resistance, and an inductive reactance corresponding to a shorted section of microstrip line forms an equivalent circuit characterizing the excitation process. Supporting impedance measurements are presented and limitations of the model are discussed.

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Harmonic Analysis of SAW Transducers

C.M. Panasik and B.J. Hunsinger. "Harmonic Analysis of SAW Transducers." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 447-450.

The excitation function of an interdigital transducer (IDT) is determined by measuring the discrete impulse response, taking into account the first seven harmonics of the frequency domain. Using a time segregation method, all non-SAW time-domain components are suppressed. A single transducer is isolated by a method of autodeconvolution that utilizes a theoretically derived phase function. The resulting excitation function provides experimental insight into the operation of IDT electrodes and compares well with the theoretical response of Smith and Pedler. The basic analysis technique can be used for other configurations, once the frequency-domain phase response of one transducer is known.

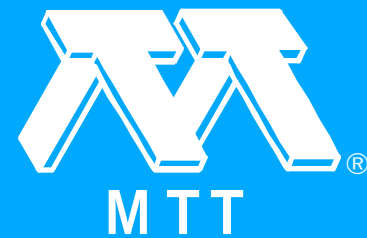
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Contributors (Jun. 1978 [T-MTT])

M. Akaike, N.G. Alexopoulos, C. Banks, O. Banno, J. Chiba, H. Cory, A.K. Ganguly, S. Halevy, P.S. Henry, B.J. Hunsinger, M. Ikeda, R. Kawasaki, C.M. Krowne, Y. Kuwamoto, G. Magerl, S.R. Mazumder, R.W. McMillan, R. Mehran, T.G. Mihran, H. Okamoto, C.M. Panasik, S. Raz, A.E. Ros, J.T. Ruscio, R. Sato, P.D. van der Puije, D.C. Webb and G.T. Wrixon.
"Contributors (Jun. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 451-454.



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Abstracts

A Simple Analysis of Thick Microstrip on Anisotropic Substrates (Technical Notes)

N.G. Alexopoulos and N.K. Uzunoglu. "A Simple Analysis of Thick Microstrip on Anisotropic Substrates (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.6 (Jun. 1978 [T-MTT]): 455-456.

A simple variational numerical method is developed to yield efficient solutions to the problem of finite thickness microstrip lines on anisotropic and inhomogeneous substrates. The method relies on Galerkin's procedure with the expansion and testing functions being a set of exponential functions of the conductor perimeter variable.



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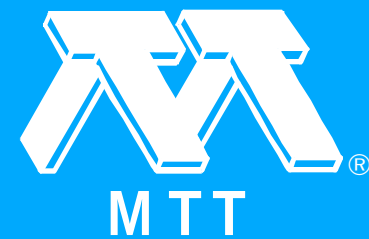
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Abstracts

Analysis of a Three-Dimensional Arbitrarily Shaped Dielectric or Biological Body Inside a Rectangular Waveguide (Jul. 1978 [T-MTT])

J.J.H. Wang. "Analysis of a Three-Dimensional Arbitrarily Shaped Dielectric or Biological Body Inside a Rectangular Waveguide (Jul. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 457-462.

This paper presents a method for the analysis of three-dimensional arbitrarily shaped dielectric obstacles inside a rectangular waveguide. The numerical computation involves a dyadic Green's function containing a double infinite series, which is evaluated by a partial summation technique.



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Method of Analysis and Filtering Properties of Microwave Planar Networks

G. D' Inzeo, F. Giannini, C.M. Sodi and R. Sorrentino. "Method of Analysis and Filtering Properties of Microwave Planar Networks." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 462-471.

A method of analysis of planar microwave structures, based on a field expansion in term of resonant modes, is presented. A first advantage of the method consists in the possibility of taking into account fringe effects by introducing, for each resonant mode, an equivalent model of the structure. Moreover, the electromagnetic interpretation of the filtering properties of two-port networks, particularly of the transmission zeros, whose nature has been the subject of several discussions, is easily obtained. The existence of two types of transmission zeros, modal and interaction zeros is pointed out. The first ones are due to the structure's resonances, while the second ones are due to the interaction between resonant modes. Several experiments performed on circular and rectangular microstrips in the frequency range 2-18 GHz have shown a good agreement with the theory.

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Abstracts

Analysis of Planar Disk Networks

R.R. Bonetti and P. Tissi. "Analysis of Planar Disk Networks." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 471-477.

The impedance matrix of a disk n-port is determined with fringing fields at the disk edge included in the analysis. The theory is valid for both stripline and microstrip geometries and is also applicable to magnetic substrates. A simple quasi-static approximation to the disk capacitance is obtained. Applicability to numerical design is exemplified with the search for transmission zeros in a reciprocal 2 port. Experimental results are presented for the 1-port and 2-port disks.



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Toroidal Resonators for Electromagnetic Waves--

I

F. Cap and R. Deutsch. "Toroidal Resonators for Electromagnetic Waves--I." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 478-486.

The solution of Maxwell's equations for toroidal systems has been reduced to the solution of the scalar Helmholtz equation. The eigenfunctions and the corresponding electromagnetic fields have been calculated analytically. The dispersion relation was formulated. Three different types of eigenmodes were obtained for each frequency. The structure of the electromagnetic field of the $m=0,1,2$, and 3 modes is analyzed.

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Techniques and Formulations for Mode Coupling of Multimode Optical Fibers

K. Tatekura, K. Itoh and T. Matsumoto. "Techniques and Formulations for Mode Coupling of Multimode Optical Fibers." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 487-493.

Mode coupling, caused by random variations of core index or random irregularities of the fiber wall, influences the transmission characteristics of multimode optical fibers in a complicated way. The effects of mode coupling in multimode optical fibers have been reported using coupled power equations or power flow equations, and the good agreement between theoretical and experimental results provides further evidence that the power flow equation is a useful description of the power distribution in a multimode optical fiber. From these situations, it would be useful to develop general means to analyze power flow equations. In this paper, a means applicable to any coupling mechanism for treating the effects of mode coupling is given together with formal solutions.

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Transmission Modes in a Braided Coaxial Cable and Coupling to a Tunnel Environment

D.B. Seidel and J.R. Wait. "Transmission Modes in a Braided Coaxial Cable and Coupling to a Tunnel Environment." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 494-499.

Radio frequency transmission in a semicircular tunnel containing a braided coaxial cable is considered. The general formulation accounts for both the ohmic losses in the tunnel wall and a thin lossy film layer on the outer surface of the dielectric jacket of the cable. Using a quasi-static approximation, it is found that the propagation constants of the low-frequency transmission line modes are obtained through the solution of a cubic equation. However, for the special case when the conductivity thickness product of the lossy film layer vanishes, this cubic equation reduces to a quadratic. The spatially dispersive form of the braid transfer impedance is also accounted for. It is shown that the quasistatic theory is well justified for frequencies as high as 100 MHz for typical tunnel geometries. Finally, special characteristic impedances are derived for the various modes of the equivalent multiconductor transmission line.

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Electromagnetic Transmission through a Filled Slit in a Conducting Plane of Finite Thickness, TE Case

D.T. Auckland and R.F. Harrington. "Electromagnetic Transmission through a Filled Slit in a Conducting Plane of Finite Thickness, TE Case." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 499-505.

A solution is developed for computing the transmission characteristics of a slit in a conducting screen of finite thickness placed between two different media. The slit may be filled with lossy material while the two regions on either side of the screen are assumed lossless. A magnetic line source excitation is used (TE case) which is parallel to the axis of the slit. The equivalence principle is invoked to replace the two slit faces by equivalent magnetic current sheets on perfect electric conductors. Two coupled integral equations containing the magnetic currents as unknowns are then obtained and solved for by the method of moments. Pulses are used for the expansion and testing functions. Quantities computed are equivalent magnetic currents, the transmission coefficient, the gain pattern, and the normalized far field pattern.

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Abstracts

Upper Bound Calculations on Capacitance of Microstrip Line Using Variational Method and Spectral Domain Approach

K. Araki and Y. Naito. "Upper Bound Calculations on Capacitance of Microstrip Line Using Variational Method and Spectral Domain Approach." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 506-509.

In this paper, the authors have employed an analytical approach based on the Fourier transformation and variational techniques in terms of the surface potential of the dielectric sheet to find the upper bounds of the microstrip line capacitance. It is hoped that our work will complement that of Yamashita et al., who calculated the lower bounds dealing with the charge density on the surface of the conductor strip, in estimating the margins of error in calculation.



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Green's Function Technique for Solving Anisotropic Electrostatic Field Problems

M. Kobayashi. "Green's Function Technique for Solving Anisotropic Electrostatic Field Problems." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 510-512.

The validity of the reciprocity relation satisfied by the Green's function is discussed for a multidielectric region with inhomogeneous anisotropic media. A theoretical proof on the use of the Green's function technique for solving boundary-value problems is discussed for general cases.



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K. Araki, D.T. Auckland, R.R. Bonetti, F. Cap, R. Deutsch, G. D'Inzeo, F. Giannini, R.F. Harrington, I. Kiyohiko, M. Kobayashi, T. Matsumoto, Y. Naito, D.B. Seidel, C.M. Sodi, R. Sorrentino, K. Tatekura, P. Tissi, J.R. Wait and J.J.H. Wang. "Contributors (Jul. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.7 (Jul. 1978 [T-MTT]): 513-515.



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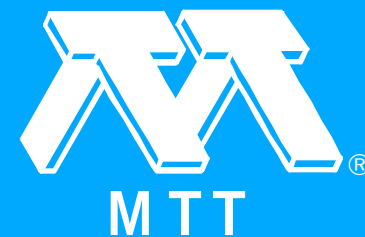
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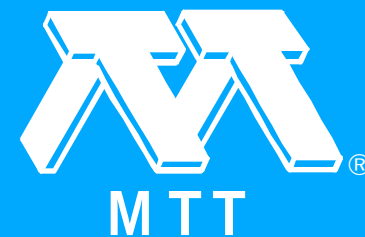
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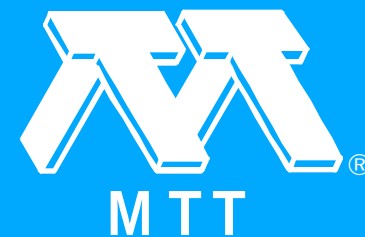
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A.W. Guy. "Foreword (Aug. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 517-518.



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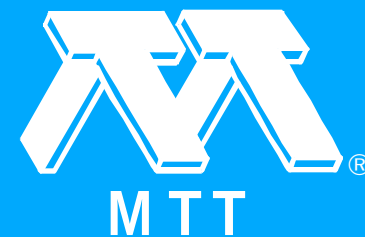
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In Remembrance of Curtis C. Johnson

D.R. Justesen. "In Remembrance of Curtis C. Johnson." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 519-519.



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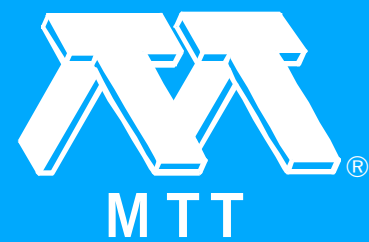
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Inhibition of Tumor Growth in Mice by Microwave Hyperthermia, Polyribonucleosinic-Polyribocytidylic, and Mouse Interferon

S. Szmigielski, M. Bielec, M. Janiak, M. Kobus, M. Luczak and E. De Clercq. "Inhibition of Tumor Growth in Mice by Microwave Hyperthermia, Polyribonucleosinic-Polyribocytidylic, and Mouse Interferon." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 520-522.

Mice bearing sarcoma 180 tumors were irradiated by 3000-MHz microwave at a power density of 40 mW/cm² for 2 h daily during 14 consecutive days. The irradiation resulted in an increase of rectal temperature of 3-4°C. Hyperthermal treatment was started on the second day after tumor-cell transplantation. Some of the animals also received daily injections of polyribonucleosinic acid-polyribocytidylic acid (poly I-poly C), 2 mg/g, or of mouse interferon (100 IU/g), or of both. Survival of the animals, mass of the tumors, incorporation of tritiated thymidine, uridine and glycine into the tumor tissue, and intracellular levels of cyclic AMP were determined. Microwave hyperthermia resulted in a prolongation of the survival of tumor-bearing mice, a regression of tumors in 12 out of 24 mice, and a decreased incorporation of thymidine and glycine. The inhibitory effect of microwave hyperthermia was enhanced by simultaneous treatment with poly I-poly C and mouse interferon. Combination of microwave hyperthermia and poly I-poly C and interferon treatment resulted in a regression of sarcoma 180 tumors in 16 out of 24 animals. No tumor regression was observed in the control group.



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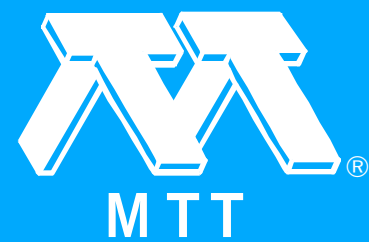
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Biological Effect of 27.12-MHz Short-Wave Diathermic Heating in Experimental Tumors

J. Overgaard. "Biological Effect of 27.12-MHz Short-Wave Diathermic Heating in Experimental Tumors." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 523-529.

Twelve isologous experimental mouse tumors of different origin, degree of differentiation, and histology have been treated with short-wave diathermy (27.12 MHz) in the temperature range 41-43°C. All heated tumors react clinically in a similar way with shrinkage and hardened consistency of the palpable tumor. Local control was normally obtained after a certain minimum threshold heat dose, but the curability varied in different tumors from 9 to 25 percent. By lower heat doses usually no control was obtained, but a slight variation in heat sensitivity exists. Higher heat doses did normally not improve the curative results but deviations under special conditions were observed. A mutual variability of temperature and heating time without alteration in biological effect was observed. Histologic examination of heated tumors showed local destruction of the tumor core in all cases. However, in some of the tumors unaffected tumor cells were observed in the periphery of the treatment field and resulted in regrowth of tumor. Therefore, the quantitative curative results were varying for the different tumors after identical hyperthermic treatments. This may be explained by a technical insufficiency of the local diathermy. Such treatment will, at tumors characterized by a high peripheral blood flow and intense infiltrative growth, often be insufficient due to a heterogeneous heating of these peripheral cells. A correlation between the degree of peripheral infiltrative growth and cure rate was found. No other relationship was established between the curative effect of hyperthermia and tumor characteristic parameters.





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Interaction Between 2450-MHz Microwaves and Ionizing Radiation in Tribolium Confusum

P.-K. Lai, C.A. Cain and H.S. Ducoff. "Interaction Between 2450-MHz Microwaves and Ionizing Radiation in Tribolium Confusum." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 530-534.

The combined effect of single or fractionated ^{137}Cs gamma radiation and 2 h of 2450-MHz microwave radiation at two different power levels, resulting in specific absorption rates of 680 or 760 W/kg in distilled H_2O , was investigated in the flour beetle, *Tribolium confusum*. The potentiating effect of microwave treatment after single gamma irradiations was observed only if applied within 60 min; in contrast, the potentiating effect of microwave treatment given before gamma-irradiation lasted at least 8 h. Microwave treatment also altered the kinetics of split-dose recovery. At the higher power level, split-dose recovery was abolished for at least 36 h; at the lower power level, split-dose repair of ionizing radiation damage was delayed for 8-10 h, and then, with longer interfraction intervals, survival increased. All of the foregoing observations essentially mimic those previously reported for appropriate hyperthermic treatment by means of immersion in hot water. These findings are in keeping with the hypothesis that heating, whether by microwaves or by water immersion, affects the repair capabilities of the beetle, either by damaging some of the enzymes that repair radiation-damaged DNA or by altering the cytostructural integrity of the DNA-chromatin membrane complex, rendering the DNA lesions less amenable to repair.

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The Effects of Microwave Radiation, Hyperthermia, and L-Ascorbic Acid on Ehrlich Ascites Carcinoma Cell Metabolism

G.E. Piontek, C.A. Cain and J.A. Milner. "The Effects of Microwave Radiation, Hyperthermia, and L-Ascorbic Acid on Ehrlich Ascites Carcinoma Cell Metabolism." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 535-540.

The effects of microwave radiation, hyperthermia, and L-ascorbic acid on metabolism of (U-¹⁴C) glucose, (2-¹⁴C) glucose, and (1,5-¹⁴C) citrate in Ehrlich ascites tumor cells (EATC) were studied. Microwave irradiated and water bath incubated cells were maintained at the same temperature for comparison. Data were obtained at 37.5°C and 42.5°C in the presence or absence of L-ascorbic acid. Ascorbic acid increased the rate of metabolism of both glucose and citrate. No significant differences in glucose and citrate metabolism were found between irradiated and nonirradiated cells at the same temperature and ascorbic acid concentration. A comparison of glucose metabolism in a normal tissue preparation and EATC was made. Vitamin C did not increase metabolism in the normal cell preparation.



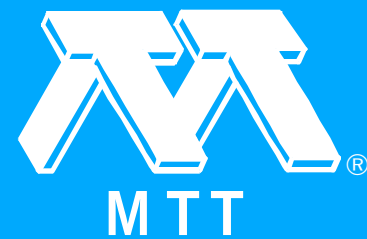
Abstracts

A System for Developing Microwave-Induced Hyperthermia in Small Animals (Aug. 1978 [T-MTT])

R.J. Baker, V. Smith, T.L. Phillips, L.J. Kane and L.H. Kobe. "A System for Developing Microwave-Induced Hyperthermia in Small Animals (Aug. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 541-545.

A system has been developed at the University of California, San Francisco, for producing microwave-induced hyperthermia in small laboratory animals by irradiating an entire transverse section of defined height, for the purpose of assessing the effects of heat alone and heat plus ionizing radiation on normal tissue and tumors. A thermometry system consisting of a thermistor array, a low-voltage scanner, and a single channel recorder is described.

Thermographic studies on sacrificed animals and thermistor studies in a phantom reveal a pattern of deep heating in a well-defined region, corroborated by thermistor measurements in vivo. Long-term animal survival at elevated temperatures (/spl equiv/45°C) throughout a large volume is not readily obtained. Seven out of 17 animals heated to 44.8°C throughout the entire abdominal region survived seven days post-heating, and histologic findings on this group of animals are briefly described. Various aspects of the biological techniques and the endpoints for current and planned experiments are discussed.



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Techniques for Uniform and Replicable Microwave Hyperthermia of a Model Mouse Carcinoma

J.E. Robinson, A.Y. Cheung, G.M. Samaras and D. McCulloch. "Techniques for Uniform and Replicable Microwave Hyperthermia of a Model Mouse Carcinoma." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 546-549.

Two techniques for localized 2450-MHz hyperthermia of experimental mouse cancers are described. In the far-field approach superficial tumors are encapsulated in 5-cm mold-formed spheres of semi-solid phantom material, then placed in an anechoic chamber on an equipower surface. In the applicator approach, tissues are immersed in a temperature-controlled tissue-equivalent liquid bolus, and are irradiated by time-multiplexed parallel-opposed beams. Both techniques feature microwave bolusing for improved coupling and tumor heating uniformity.



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Development of a 915-MHz Direct-Contact Applicator for Therapeutic Heating of Tissues

A.W. Guy, J.F. Lehmann, J.B. Stonebridge and C.C. Sorensen. "Development of a 915-MHz Direct-Contact Applicator for Therapeutic Heating of Tissues." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 550-556.

The design of a 915-MHz diathermy dielectric-loaded applicator with a TE/sub 10/-mode aperture field distribution is described. The lightweight porous dielectric used for loading the applicator allows for the transmission of refrigerated air through the cavity to provide surface cooling so therapeutic temperature can be produced in deep tissues without excessive heating of surface tissues. The design is based on theoretical calculations previously developed by the authors which predict optimal size of the aperture and field distribution that would provide the best heating patterns in deep layers of tissue. Experimental evaluations of the heating of tissues of models and human beings are discussed.



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Evaluation of a Therapeutic Direct-Contact 915-MHz Microwave Applicator for Effective Deep-Tissue Heating in Humans

J.F. Lehmann, A.W. Guy, J.B. Stonebridge and B.J. deLateur. "Evaluation of a Therapeutic Direct-Contact 915-MHz Microwave Applicator for Effective Deep-Tissue Heating in Humans." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 556-563.

A 13-cm square direct-contact microwave applicator which operates at 915 MHz was evaluated in tissue models and human volunteers to determine its therapeutic effectiveness. It was found that the applicator with radome- and forced-air cooling selectively elevates temperatures in muscles (1-2 cm) to 43-45°C. At this higher range of temperature, certain physiologic responses such as an increase in blood flow are produced. The applicator may also be used to heat malignant tumors of muscle.

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The Performance of a New Direct Contact Applicator for Microwave Diathermy

G. Kantor, D.M. Witters, Jr. and J.W. Greiser. "The Performance of a New Direct Contact Applicator for Microwave Diathermy." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 563-568.

A direct contact applicator, specifically designed for microwave diathermy at the Industrial, Scientific Medical (ISM) frequency of 2.45 GHz was evaluated by studying near-field patterns in free space, thermographic heating patterns in phantoms of simulated fat and muscle tissue, and associated leakage radiation. The main features are a circular waveguide with a short conical flare horn output section surrounded by an annular choke and two sets of dual posts to generate far-field circular polarization. The significant near field components of the therapeutic beam are in a transverse plane, parallel to the aperture. Heating patterns on the exposed surface of muscle phantoms and inside fat-muscle phantoms are spatially similar and relatively uniform. The leakage level is 0.8 mW/cm² per 100 W of forward power for direct contact and 4 mW/cm² per 100 W of forward power for a 1-cm air gap between aperture and planar phantoms. The uncertainty of these leakage measurements is ± 2 dB. This investigation demonstrates the technical feasibility of a safe and effective direct contact microwave diathermy applicator operating at 2.45 GHz. The applicator is a viable candidate for hyperthermia applications.

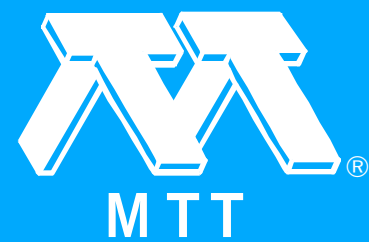


Selective Heating of Cutaneous Human Tumors at 27.12 MHz

P.P. Antich, N. Tokita, J.H. Kim and E.W. Hahn. "Selective Heating of Cutaneous Human Tumors at 27.12 MHz." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 569-572.

Data obtained on superficial lesions in different sites and for different patients show that it is possible to correlate average values of the temperature and of the absorbed power density. For healthy tissues, the correlation appears to be defined to within 1°C. For tumor tissues, on the other hand minimum values of the temperature appear to be predictable. This result indicates that hyperthermic dosimetry is feasible. Furthermore, a differential temperature phenomenon is observed, in which a localized absorbed power distribution induces higher temperatures in tumors than in the surrounding healthy tissues. This observation, if confirmed with larger statistics and for tumors at a depth, appears to indicate that tumor-killing temperatures can be induced with the heating method employed while simultaneously sparing the surrounding healthy tissues.





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Thermographic Tumor Detection Enhancement Using Microwave Heating

J.E. Thompson, T.L. Simpson and J.B. Caulfield. "Thermographic Tumor Detection Enhancement Using Microwave Heating." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 573-580.

Infrared thermography offers a viable alternative to X-ray mammography for early breast cancer detection if the inherent low sensitivity of the technique can be improved. This paper presents results which indicate that the sensitivity of thermography is increased by irradiating the examined area with microwaves. This arises because of selective absorption characteristics of the particular tumor tissue investigated; specifically, it has been observed that in situ irradiation of transplantable guinea pig hepatoma, using 2450-GHz microwave radiation, results in a tumor temperature rise of 5.5°C and a rise of 2.5°C in the surrounding healthy tissue. This spatial gradient of 3°C compares with the relevant unheated spatial gradient of approximately 0.5°C. The microwave-induced increased temperature differential between tumor and healthy tissue is easily observed using a thermovision camera. Data regarding the temporal evolution of spatial temperature distributions associated with tumor tissue before, during, and after microwave irradiation are presented. Additional data are included regarding the heating and cooling rates of microwave-irradiated tumors. The data show conclusively that the specific tumor investigated selectively absorbs microwave energy in situ and exhibits this selective absorption as a thermographically observable increase in local skin surface temperature. The data further show that tumor heating and cooling rates are faster than for healthy tissue.

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Abstracts

Preliminary Observations with an Electromagnetic Method for the Noninvasive Analysis of Cell Suspension Physiology and Induced Pathophysiology

L.E. Larsen, J.H. Jacobi and A.K. Krey. "Preliminary Observations with an Electromagnetic Method for the Noninvasive Analysis of Cell Suspension Physiology and Induced Pathophysiology." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 581-595.

A technique for the electromagnetic analysis of physiological and patho-physiological states in cell suspensions is presented. The technique is based upon high speed automatic network analysis in the HF band for measurement of complex permittivity. The results demonstrate that changes in HF-band permittivity dispersion may be related to physiological and drug-induced patho-physiological states of the cell membrane. Mechanical disruption of the cell membrane by sonication obliterates the HF-band dispersion of permittivity that is present in undisrupted cells. The effect of species, suspending medium, and temperature were systematically analyzed in erythrocyte suspension in order to aid comparison between published studies of red cell preparations.



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Microwave-Induced Hyperthermia Dose Definition

E.R. Atkinson. "Microwave-Induced Hyperthermia Dose Definition." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 595-598.

In vitro thermal data on cytotoxicity are consistent with the simple picture of chemical reaction kinetics as governed by an activation energy. These kinetics are used to calculate, for any arbitrary heating profile used in clinical hyperthermia, the corresponding percentage of cells killed by such treatment in in vitro tissue cultures. The quantity calculated, which incorporates biological response to thermodynamic parameters, is suggested as a measure of hyperthermal dosage. Alternative dosage measures are discussed. Doses, defined by thermal cytokinetics, are derived for current clinical practice in whole-body and local hyperthermia. Both types of treatment, although superficially very different, are shown to employ comparable dose magnitudes, and these magnitudes are found to be in quantitative accord with the thermal cytotoxic basis for dosage measurement.

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Response of Insulated Electric Field Probes in Finite Heterogeneous Biological Bodies

S.H. Mousavinezhad, K.-M. Chen and D.P. Nyquist. "Response of Insulated Electric Field Probes in Finite Heterogeneous Biological Bodies." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 599-607.

An ideal probe for measuring the electric field inside a finite heterogeneous biological body should possess a constant calibration factor; probe effective length and equivalent impedance must therefore be independent of its location in the body. A practical probe with minimal variation of these parameters can be implemented by insulating the metallic probe with a thick low-loss dielectric coating of low permittivity. An idealized spherical probe, insulated by a dielectric layer and immersed in a finite lossy-dielectric body (representative of more general probes) is studied. Analytical expressions for the effective diameter and equivalent impedance of the probe are obtained. Numerical results indicate that the variation of these parameters with probe location is minimized by coating the probe with a relatively thick low-permittivity dielectric layer. Experimental impedance and electric field measurements confirm this conclusion. Limitation of using this probe in biological media with low dielectric constants is discussed.





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Heat Potential Distribution in an Inhomogeneous Spherical Model of a Cranial Structure Exposed to Microwaves Due to Loop or Dipole Antennas

A. Hizal and Y.K. Baykal. "Heat Potential Distribution in an Inhomogeneous Spherical Model of a Cranial Structure Exposed to Microwaves Due to Loop or Dipole Antennas." 1978 *Transactions on Microwave Theory and Techniques* 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 607-612.

An inhomogeneous spherical model of a 3.3-cm radius cranial structure is assumed to be placed symmetrically in the near field of a small loop antenna or an electrical dipole antenna at 3 GHz. The transitions between the layers are taken to be sharp but sinusoidal. Calculations of the heat potential are performed using a spherical wave expansion technique in which linear differential equations are solved for the unknown multipole coefficients. The results are also compared with the plane-wave excitations. It is seen that a more uniform distribution of the heat potential occurs for the dipole antenna excitation which is also similar to the E-plane distribution in the case of plane-wave excitation. For the loop excitation, a significant hot spot occurs near the center of the structure.

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Abstracts

Coherent Electric Vibrations in Biological Systems and the Cancer Problem

H. Frohlich. "Coherent Electric Vibrations in Biological Systems and the Cancer Problem." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 613-618.

The existence of coherent electric vibrations in the 5×10^{10} - 3×10^{12} Hz region has now been established experimentally for biologically active microorganisms. It is shown that such vibrations might play a decisive role in the control of growth of tissues and, hence, in the cancer problem.



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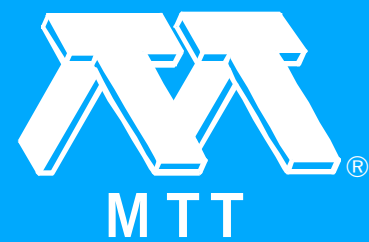
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Microwave Transmission through Normal and Tumor Cells

W.D. Hershberger. "Microwave Transmission through Normal and Tumor Cells." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 618-619.

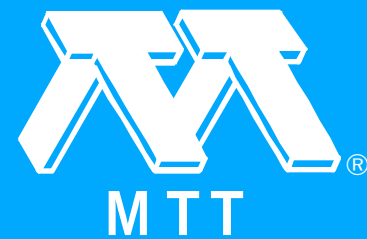
The role of standing waves in the microwave measuring systems used in the study of normal and tumor cells is discussed. A pronounced cyclic variation in measured power as a function of frequency through biological materials has been reported in curves published for two frequency ranges 66-76 GHz and 76-86 GHz. The materials studied included a variety of normal and tumor cells and compounds such as guanine and guanylic acid. A condition for cyclic and multiple resonances in a waveguide system is satisfied when at least two impedance discontinuities giving rise to reflections are present. When we have only two discontinuities, the distance between them may be calculated from the operating frequency and the separation between frequencies for maximum power transmission through a branch of the measuring system. In the resulting standing-wave pattern, the effect of introducing the organic or biological sample with losses over a wide frequency range into the measuring system is to reduce the magnitude of the maxima in the standing-wave pattern and to increase the magnitude of the minima. To distinguish between losses due to the sample and the frequency selectivity of the microwave measuring system, one sound procedure is to adjust the system for unity standing-wave ratio (SWR). After this is done, if one still observes a frequency-dependent absorption which arises on introducing the sample or by use of a comparison method employing two samples, the results will no longer be ambiguous. The ambiguity in results reported in the literature will be resolved when effective methods are used to control the frequency selectivity of the equipment.



Abstracts

Contributors (Aug. 1978 [T-MTT])

P.P. Antich, E.R. Atkinson, R.J. Baker, Y.K. Baykal, M. Bielec, C.A. Cain, J.B. Caulfield, K.-M. Chen, A.Y. Cheung, E. De Clercq, B.J. deLateur, H.S. Ducoff, H. Frohlich, J.W. Greiser, A.W. Guy, E.W. Hahn, W.D. Hershberger, A. Hizal, J.H. Jacobi, M. Janiak, L.J. Kane, G. Kantor, J.H. Kim, L.H. Kobe, M. Kobus, A.K. Krey, P.-K. Lai, L.E. Larsen, J.F. Lehmann, M. Luczak, D. McCulloch, J.A. Milner, S.H. Mousavinezhad, D.P. Nyquist, J. Overgaard, T.L. Phillips, G.E. Piontek, J.E. Robinson, G.M. Samaras, T.L. Simpson, V. Smith, C.C. Sorensen, J.B. Stonebridge, S. Szmigielski, J.E. Thompson, N. Tokita and D.M. Witters, Jr.. "Contributors (Aug. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 620-626.



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Highly Stable, Low Noise Millimeter-Wave IMPATT Oscillator (Technical Notes) (Aug. 1978 [T-MTT])

H. Okamoto, M. Ikeda, S. Kodaira and K. Miyazawa. "Highly Stable, Low Noise Millimeter-Wave IMPATT Oscillator (Technical Notes) (Aug. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): 627-628.

A highly stable and low noise IMPATT oscillator at 75 GHz is realized by using the parametric injection locking technique along with an AFC circuit in which a crystal oscillator is used as a reference. Noise level of this oscillator is lower by 25 dB compared with that of the free-running IMPATT oscillator, and the frequency stability is as good as $10^{-8}/^{\circ}\text{C}$.



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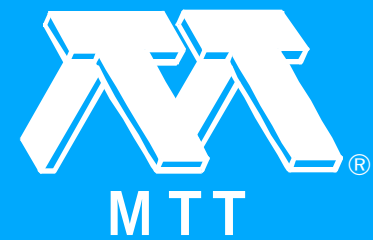
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"Back Cover (Aug. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.8 (Aug. 1978 [T-MTT] (Special Issue on Microwaves in Medicine, with Accent on the Application of Electromagnetics to Cancer Treatment)): b1-b2.



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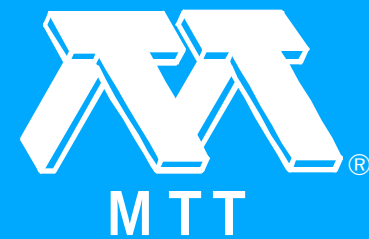
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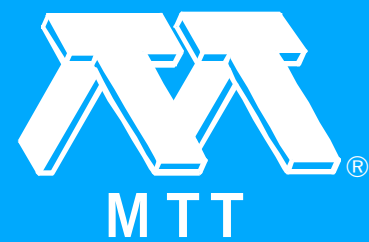
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Cryogenically Cooled C-Band p-i-n Diode Integrated Switch Matrix for Radio Astronomy Applications

G.H. Behrens, Jr.. "Cryogenically Cooled C-Band p-i-n Diode Integrated Switch Matrix for Radio Astronomy Applications." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 629-635.

A low-loss cryogenically coded (20 K) eight port C-band p-i-n diode switch has been developed for radio astronomy applications. The switching functions are achieved through the use of eight p-i-n diodes in a stripline package. Maximum measured loss and VSWR over the 4.4-5.1-GHz band are 0.75 dB and 1.5:1, respectively. The average measured noise temperature is 9.8 K. The switch provides operational versatility for a dual-channel dual-band (C- and L-bands) radiometer by simultaneously performing as a Dicke switch a feed/load selector switch and a band selector switch. The switch performs these functions at a noise temperature unobtainable with commercially available switches.

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Subharmonically Pumped Schottky Diode Single Sideband Modulator

J. Chramiec. "Subharmonically Pumped Schottky Diode Single Sideband Modulator." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 635-638.

A subharmonically pumped single sideband Schottky diode modulator is described. Its advantages are a large carrier suppression and lowered pumping frequency. The experimental 2-GHz MIC modulator pumped with an 8-mW signal exhibits a conversion loss of 6.2-7.3 dB over a 15-percent frequency band. For a 120-mu W input modulating signal, the unwanted components in the output spectrum are at least 18 dB and mostly over 20 dB below the desired sideband.

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Computer-Aided Determination of Microwave Two-Port Noise Parameters

C. Giuseppe and M. Sannino. "Computer-Aided Determination of Microwave Two-Port Noise Parameters." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 639-642.

The least-squares fit of measured noise figures as a function of source admittance is an accurate and rapid method also convenient from the experimental point of view, to determine linear two-port noise parameters. However, to avoid the erroneous results often obtained by experimenters, this paper presents some criteria to be followed in choosing the proper source admittances. In order to apply the method to microwave two-ports, a relationship relating noise parameters in a linearized form is introduced. The analytical developments are in terms of effective input noise temperature of the two-port. Experimental results for a microwave transistor are also reported as a function of experimental redundancy.

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An Interdigitated 3-dB Coupler with Three Strips

V. Tulaja, B. Schiek and J. Kohler. "An Interdigitated 3-dB Coupler with Three Strips." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 643-645.

An interdigitated microstrip coupler on alumina substrate with three strips and two bond wires is described that provides an alternative to the four-strip Lange coupler. The useful coupling range is between 3 and 6 dB. Experimental results for a 3-dB coupler in the frequency range 4.5-9 GHz are presented together with theoretical results for 3-5-dB coupling.

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MIC Overlay Coupler Design Using Spectral Domain Techniques

D.D. Paolino. "MIC Overlay Coupler Design Using Spectral Domain Techniques." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 646-649.

A quasi-TEM analysis of dielectric overlay microstrip is described for an overlay extending several conductor linewidths beyond the coupled lines. This method permits the analysis of numerous variations of overlay coupler geometries. The relevant spectral domain Green's function is given and used to generate a set of design curves when the overlay is identical in thickness and dielectric constant to the main substrate. A trial 8.34-dB coupler was built. Significant improvement in isolation was noted with the overlay when compared to the equivalently designed uncompensated coupler. The measured values of isolation agree very well with predicted values.

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Some Results on the End Effects of Microstriplines

C. Gupta, B. Easter and A. Gopinath. "Some Results on the End Effects of Microstriplines." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 649-652.

A new resonant technique for accurate and reliable measurement of end and gap effects in microstripline has been developed. An investigation of the frequency dependence of end and gap effects in microstrip was performed. There is no apparent frequency variation for the end effects for $w/h = 0.5, 1.0$, and 2.0 lines on alumina substrate ($\epsilon_r \approx 9.8$), between 7.0 and 18.0 GHz. A small dependence on resonator mode number of these effects has been observed.



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Operation of High Peak Power Differential Phase Shift Circulators at Direct Magnetic Fields Between Subsidiary and Main Resonances

J. Helszajn and P.N. Walker. "Operation of High Peak Power Differential Phase Shift Circulators at Direct Magnetic Fields Between Subsidiary and Main Resonances." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 653-658.

Instability in high peak power ferrite devices is usually avoided by either widening the spinwave linewidth to move the onset of the subsidiary resonance above the specification of the device, or by using a value of magnetic field below that at which the peak in the subsidiary resonance occurs. A third way to prevent this instability altogether is by adjusting the direct field and material magnetization to prohibit the frequency relation between the microwave signal and the spinwaves. This approach leads to an exceptionally low loss device at both small and large signal levels. The paper describes the experimental development of an 8.5-9.6-GHz 1-MW differential phase shift circulator biased in this way with an insertion loss of less than 0.20 dB.



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Design Considerations of Broadband Dual-Mode Optical Fibers

J.-I. Sakai, K. Kitayama, M. Ikeda, Y. Kato and K. Tatsuya. "Design Considerations of Broadband Dual-Mode Optical Fibers." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 658-665.

We propose and present design data for a new type of graded index fiber which has a profile and radius such that only two mode groups (LP/sub 01/ and LP/sub 11/) propagate and both propagate with virtually identical group velocities. This dual-mode fiber has a core diameter approximately twice that of a conventional step index single-mode fiber. For example, a core diameter of 16.3 μm is attainable with relative index difference $\Delta = 0.3$ percent at 1.25- μm wavelength. Fabrication tolerances securing a group delay difference below 100 ps/km are given by a power-law profile parameter $\alpha = 4.85 \pm 0.25$ and a normalized frequency $u = 4.45 \pm 0.11$. The allowable u -value deviation range to keep the group delay difference within 100 ps/km is about five times as large as that of a step-index fiber, in which group delays of two mode groups are matched. Comparison with a multimode graded-index fiber, with respect to group delay characteristics and bending loss of the dual-mode fiber, are also discussed.





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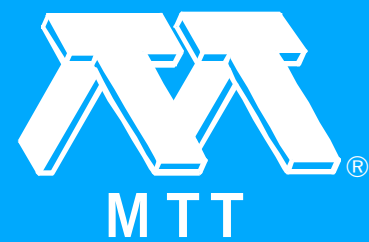
A Compact Light-Weight Gaussian-Beam Launcher for Microwave Exposure Studies

P.S. Neelakantaswamy, K.K. Gupta and D.K. Banerjee. "A Compact Light-Weight Gaussian-Beam Launcher for Microwave Exposure Studies." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 665-666.

A new type of compact light-weight Gaussian-beam launcher for producing a focused-microwave exposure field in biological experiments is described. This launcher is identical to the structure described by the authors elsewhere, except that a simple circular waveguide aperture, instead of a corrugated pipe is used to illuminate a dielectric sphere lens with the result that a considerable weight and size reduction of the launcher is achieved. The proposed structure consists of a simple cylindrical waveguide excited with a balanced mixture of complementary modes and the diffracted field due to this waveguide aperture is made to illuminate a dielectric sphere (lens). It is shown that a near-circular Gaussian beam is then produced in the image space of the sphere with a high focusing factor. Design details, theoretical calculation, and experimental results concerning a practical launcher are presented. Suitability of this compact structure for diathermy applications at a frequency of 2450 MHz is mentioned.

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Attenuation Characteristics of Circular Dielectric Waveguide at Millimeter Wavelengths

D. Jablonski. "Attenuation Characteristics of Circular Dielectric Waveguide at Millimeter Wavelengths." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 667-671.

Experiments were done to determine the practicality of using circular dielectric waveguide for a low-loss transmission line at millimeter wavelengths. The lowest order mode on a circular dielectric guide will propagate regardless of how small the guide diameter is. Thus it is possible to make the attenuation factor of a circular dielectric guide arbitrarily small by reducing its diameter. Loss measurements for several different diameters of polystyrene and Teflon rods were made at 72.70 GHz. The measurements were made by directly probing long sections of dielectric guide and plotting the average power as a function of length on an X-Y plotter. Dielectric constants were measured from the standing wave patterns of polystyrene Teflon, and fused quartz rods at 71.0 GHz. Teflon rods exhibited attenuation factors from 0.8 dB/m to 2.2 dB/m depending on the diameter. This is an improvement over silver waveguide at this frequency. Polystyrene rods were found to have attenuation factors ranging from 3.9 dB/m to 12.5 dB/m, again depending on the diameter of the rod. The measured dielectric constants are consistent with previously published data. The various attenuation factors are related to the intrinsic loss tangent of the dielectric using the theory of the HE/sub 11/ mode. Values of tan delta derived from measurements of different rods are consistent indicating that the experimental results are valid. The problem of radiation from dielectric rods is discussed. The experimental results are not conclusive but it appears likely that radiation loss is negligible.



Abstracts

Analysis of an End Launcher for a Circular Cylindrical Waveguide

M.D. Deshpande and B.N. Das. "Analysis of an End Launcher for a Circular Cylindrical Waveguide." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 672-675.

The analysis of an end launcher type of transition exciting dominant TE/sub 11/ mode circular waveguide from a coaxial line is presented. The expressions for real and imaginary parts of impedance seen by the coaxial line are derived for the general case of offset launcher using self reaction of the assumed current over the loop. The dimensions of combined electric and magnetic loops having low input VSWR are determined. There is satisfactory agreement between theoretical and experimental results.



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Abstracts

Nondestructive Microwave Evaluation of Ceramics

A.J. Bahr. "Nondestructive Microwave Evaluation of Ceramics." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 676-683.

The ability of microwave energy to penetrate some kinds of ceramic materials at frequencies of 100 GHz and above suggests that microwave techniques may be useful for the nondestructive evaluation (NDE) of such materials. This paper presents experimental results that demonstrate the basic feasibility of using these techniques to detect and locate various types of inclusions (including voids) in silicon nitride $\text{Si}/\text{sub } 3/\text{N}/\text{sub } 4/$. Inclusions as small as 0.005 in in diameter have been detected.



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Abstracts

Systematic Derivation of Variational Expressions for Electromagnetic and/or Acoustic Waves

K. Morishita and N. Kumagai. "Systematic Derivation of Variational Expressions for Electromagnetic and/or Acoustic Waves." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 684-689.

A systematic procedure generalized to derive the variational expressions for electromagnetic and/or acoustic field problems is proposed. It is shown that the variational expressions useful to treat the systems involving electromagnetic waves or acoustic waves or both can be formulated systematically all from the simple and basic principle of least action point of view.



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Transmission from a Rectangular Waveguide into Half Space through a Rectangular Aperture (Comments)

F.E. Gardiol. "Transmission from a Rectangular Waveguide into Half Space through a Rectangular Aperture (Comments)." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 690-690.

The authors of the above computer program description failed to acknowledge several publications dedicated to the same subject. An open-ended waveguide terminated by a flat infinite metal flange and radiating into an open half space of homogeneous, isotropic, and possibly lossy medium was considered in [1]. The electromagnetic field distribution, the equivalent admittance of the aperture, and the reflection coefficient were presented. In another publication [2], the same approach was applied to radiation through a partial rectangular aperture; it was then also extended to radiation into a slab. The study of a rectangular cavity made from a section of open-ended rectangular waveguide was also treated and further developed in a third publication [3]. Computer programs have been available for all these problems on a complimentary basis and were widely distributed.

Click on title for a complete paper.



Aperture Coupling Between Microstrip and Resonant Cavities (Comments)

M. Kumar and M.G. Sharma. "Aperture Coupling Between Microstrip and Resonant Cavities (Comments)." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 690-691.

In the above paper, the authors have considered the case of coupling between two identical microstrips in Section II-B. The equivalent model of parallel plate waveguide with magnetic side walls (Fig. 3) has been used for the determination of normalized reactance of a small aperture. The notations and relations of [1] have been used directly for analyzing this equivalent model. It may be noted, however, that the case considered in [1] is of transmission through a transverse plane while the case considered by the authors of the above paper is transmission through broad wall of the guide Fig. 2(b). Therefore, the end result obtained in Section II-B is not convincing.

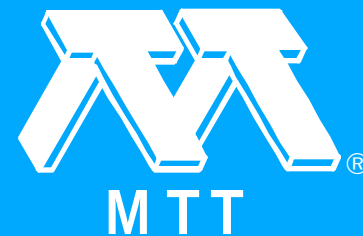


Abstracts

A Directional Coupler with Very Flat Coupling (Correction)

G.P. Riblet. "A Directional Coupler with Very Flat Coupling (Correction)." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 691-691.

In the above paper, (17) of Section VI should read:



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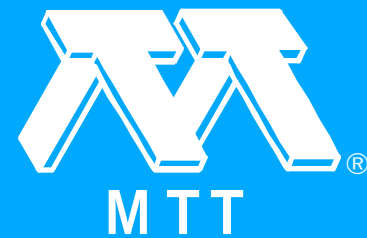
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Contributors (Sep. 1978 [T-MTT])

A.J. Bahr, D.K. Banerjee, G.H. Behrens, Jr., G. Caruso, J. Chramiec, B.N. Das, M.D. Deshpande, B. Easter, A. Gopinath, C. Gupta, K.K. Gupta, J. Helszajn, M. Ikeda, D. Jablonski, K. Yasuyuki, T. Kimura, K. Kitayama, J. Kohler, N. Kumagai, K. Morishita, P.S. Neelakantaswamy, D.D. Paolino, J.-I. Sakai, M. Sannino, B. Schiek, V. Tulaja and P.N. Walker. "Contributors (Sep. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 692-695.



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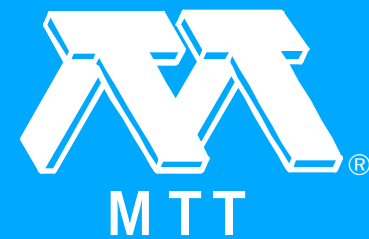
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Overseas Abstracts (Sep. 1978 [T-MTT])

"Overseas Abstracts (Sep. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 695-702.



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Abstracts

Some Experiments on Design Principle of Broadband Electrooptic Modulators (Technical Notes)

E. Yamashita and K. Atsuki. "Some Experiments on Design Principle of Broadband Electrooptic Modulators (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): 703-704.

An experimental modulator was fabricated to test a design principle of broadband traveling-wave electrooptic light modulators proposed in a previous paper. The measured value of modulation bandwidth, 10 GHz, appears to confirm the design principle.



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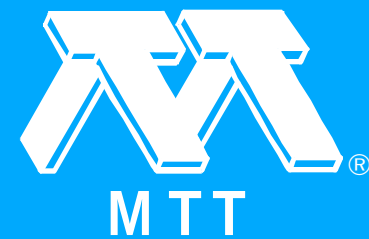
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Abstracts

Back Cover (Sep. 1978 [T-MTT])

"Back Cover (Sep. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.9 (Sep. 1978 [T-MTT]): b1-b2.



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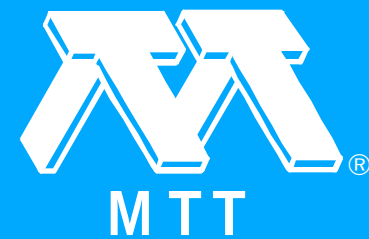
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Front Cover (Oct. 1978 [T-MTT])

"Front Cover (Oct. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): f1-f2.



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Foreword (Oct. 1978 [T-MTT])

R.H. Knerr. "Foreword (Oct. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 705-705.

The IEEE-S-MTT Technical Committee on Microwave and Millimeter-Wave Integrated Circuits (MTT-6), in its continuing effort to review its field of responsibility, considers it timely to sponsor this issue.



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Subharmonically Pumped Millimeter-Wave Mixers

E.R. Carlson, M.V. Schneider and T.F. McMaster. "Subharmonically Pumped Millimeter-Wave Mixers." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 706-715.

The two-diode subharmonically pumped stripline mixer has a pair of diodes shunt mounted with opposite polarities in a stripline circuit between the signal and local oscillator inputs. The circuit has low noise and conversion loss and substantial AM local oscillator noise cancellation. The local oscillator frequency is about half the signal frequency. A novel diode chip, the notch-front diode, which has ohmic contacts on the chip faces adjacent the face containing the diode junctions, was developed for these circuits. The notch-front diode permits the low parasitic reactance of the waveguide diode mount to be achieved in stripline circuits. The best performance for a two-diode subharmonically pumped mixer with notch-front diodes was a 400 K mixer noise temperature, obtained at 98 GHz which is comparable to the best fundamental mixers in this frequency range. The performance over a 47-110-GHz frequency range for this circuit with commercial beam-lead diodes is also presented.

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Planar Circuit Mounted in Waveguide Used as a Downconverter

Y. Konishi. "Planar Circuit Mounted in Waveguide Used as a Downconverter." 1978 *Transactions on Microwave Theory and Techniques* 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 716-719.

This paper describes the equivalent network constants of several patterns of the planar circuit mounted in a waveguide which was proposed by this author. As an example of the application of the circuit, a planar circuit is designed for a 12-GHz band downconverter by using the equivalent network constants.

Click on title for a complete paper.



Abstracts

12-GHz-Band FM Receiver for Satellite Broadcasting

Y. Konishi. "12-GHz-Band FM Receiver for Satellite Broadcasting." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 720-725.

This paper describes the low-noise low-cost receiver for satellite broadcasting with new technology developed by us. The paper also describes the image recovery theory, the design principle of our downconverter, a frequency-stabilized local oscillator with bipolar transistors, the required limiting factor of a filter, the removing circuit of an energy dispersal signal, and a parabolic antenna for circularly polarized waves together with the performance of our device. The experimental results obtained through the Communication Technology Satellite (CTS) are also shown.



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Millimeter Integrated Circuits Suspended in the E-Plane of Rectangular Waveguide

P.J. Meier. "Millimeter Integrated Circuits Suspended in the E-Plane of Rectangular Waveguide." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 726-733.

Progress concerning a class of planar millimeter circuits is reported. The circuits are photoetched into one or more conductor layers and are suspended with or without dielectric layers, in the E-plane of one or more rectangular waveguides. The class includes the integrated fin line, the planar structure introduced by Konishi and a four-port printed-probe circuit. Such circuits feature standard waveguide flanges, printed-circuit economy, low insertion loss, wide single-mode bandwidth, and compatibility with low-parasitic hybrid devices. Furthermore, the equivalent dielectric constant can be close to unity, which is advantageous at millimeter wavelengths. The design and performance are reported of new E-plane millimeter components including a wide-band high-isolation low-loss SPST switch, a balanced mixer, an endfire antenna, and a four-port coupler applicable to planar channel-dropping networks. The versatility, performance, and construction features of the E-plane approach are relevant to advanced, highly integrated, millimeter systems.

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Hybrid Integrated Frequency Multipliers at 300 and 450 GHz

T. Takada and M. Hirayama. "Hybrid Integrated Frequency Multipliers at 300 and 450 GHz." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 733-737.

300- and 450-GHz band doublers and triplers using thin-film integrated circuits have been developed. The multipliers are built with a GaAs honeycomb-type Schottky barrier diode designed to have a high cutoff frequency and transitions from microstrip to rectangular waveguides. A 450-GHz band tripler delivered an output power of -11.2 dBm with a corresponding conversion loss of 19.4 dB. The output power of the 300-GHz band doubler was -3.6 dBm, and its minimum conversion loss was 10.7dB. The hybrid integrated frequency multipliers are useful as solid-state sources in the short-millimeter-wave and submillimeter-wave regions.

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Rigorous Analysis of the Step Discontinuity in a Planar Dielectric Waveguide

T.E. Rozzi. "Rigorous Analysis of the Step Discontinuity in a Planar Dielectric Waveguide." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 738-746.

Planar dielectric waveguides play an important role in electrooptics and in the submillimeter regions. In many laser configurations and integrated optical components, grooves are etched in the planar surface or overlays are deposited on it. The step is an idealization of such discontinuity. In this paper, the problem of an arbitrary large step under multimode excitation is solved by means of a rigorous variational approach. A rapidly converging expression for the scattering matrix of the step is derived, which is analogous to the one previously derived for transverse discontinuities in closed waveguides. Two choices as to the basis functions are compared: one is constituted by optimally scaled Laguerre functions and the other by the surface waves of both slabs complemented by Laguerre functions. Both the electric field and the magnetic field formulations of the problem have been investigated for the TE case. Numerical results are presented for the scattering matrix of the step under monomode and multimode excitation as well as for its radiation pattern. The accuracy and limitations of existing small step approximations are discussed. The technique is applicable to other transverse discontinuities in open structures.





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Low-Loss Rectangular Dielectric Image Line for Millimeter-Wave Integrated Circuits

S. Shindo and T. Itanami. "Low-Loss Rectangular Dielectric Image Line for Millimeter-Wave Integrated Circuits." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 747-751.

This paper describes some fundamental properties of a low-loss $E_{11}/\sup x/$ mode rectangular dielectric image line where the electric field is parallel to the metal image plane. This image line is characterized by its low transmission loss, compared with the conventional dominant $E_{11}/\sup y/$ mode rectangular dielectric image line. The transmission loss of this new image line is nearly less than half that of the $E_{11}/\sup y/$ mode rectangular dielectric image line. As an application example, a bandpass filter is developed using this $E_{11}/\sup x/$ mode rectangular dielectric image line and the measurement results of its frequency responses in the 50-GHz range are presented. Although the $E_{11}/\sup x/$ mode is a higher order mode in the rectangular dielectric image line, reasonable bandpass filter characteristics have been realized.

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Abstracts

Millimeter-Wave Image-Guide Integrated Passive Devices

J.A. Paul and Y.-W. Chang. "Millimeter-Wave Image-Guide Integrated Passive Devices." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 751-754.

Millimeter-wave boron-nitride image-guide integrated passive devices such as couplers, detectors, and balanced mixers have been developed with performances comparable to their metal waveguide circuit counterparts.



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Abstracts

Electric Probe Measurements on Dielectric Image Lines in the Frequency Range of 26-90 GHz

K. Solbach. "Electric Probe Measurements on Dielectric Image Lines in the Frequency Range of 26-90 GHz." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 755-758.

Electric-field probes, using miniature semirigid coaxial cable in connection with standard metal waveguide detectors, are described and shown to be well-suited for direct standing wave measurements on dielectric image lines. Experiments in the frequency range of 26-90 GHz for the determination of phase and attenuation constants of image lines as well as experiments for the determination of very small reflections from matched dielectric image-line terminations and the scattering coefficients of dielectric image-line discontinuities are described.



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Channel Dropping Filter for Millimeter-Wave Integrated Circuits

T. Itanami and S. Shindo. "Channel Dropping Filter for Millimeter-Wave Integrated Circuits." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 759-764.

The dielectric waveguide structure finds various applications in integrated circuits for the millimeter-optical-frequency range. Many passive and active devices, using dielectric waveguide, have been developed. From the viewpoint of low-loss property, the dielectric rectangular waveguide seems to be more suitable for integrated circuits. This paper describes the design method and experimental results for channel dropping filter using dielectric rectangular waveguide. Some experimental investigations of the dielectric rectangular waveguide properties are also presented. The channel dropping loss of the filter is 1.5 dB at a channel center frequency of 52 GHz with a 180-MHz 3-dB bandwidth. Experimental results agree fairly well with the theoretical calculations.

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Silicon Waveguide Frequency Scanning Linear Array Antenna

K.L. Klohn, R.E. Horn, H. Jacobs and E. Freibergs. "Silicon Waveguide Frequency Scanning Linear Array Antenna." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 764-773.

The design and experimental findings of a novel approach a relatively simple low-cost frequency-scanning milliter-wave antenna are described. The antenna consists of a silicon dielectric rectangular rod with periodic metallic stripe perturbations on one side. The feasibility of electronically scanning through a range of angles by varying the frequency fed into the silicon rod is shown. Calculations were made to determine the allowable physical size of the silicon rod in order to maintain a single fundamental mode of operation and the effect which size variations and perturbation spacing have on the angle of radiation and the range of angular scan for a given frequency shift. Efforts covered the frequency range 55-100 GHz with specific points of interest at 60, 70, and 94 GHz. The results of the experiments conducted are compared with the theoretical calculations.

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Abstracts

A 12-W GaAs Read-Diode Amplifier at X Band

H.Q. Tserng, D.J. Coleman, Jr., F.H. Doerbeck, D.W. Shaw and W.R. Wisseman. "A 12-W GaAs Read-Diode Amplifier at X Band." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 774-778.

Multiple-mesa GaAs Read diodes have been incorporated in a single-stage microstrip amplifier module at X band. Stable CW amplification with an output power of 12 W at 4-dB gain and 23.5-percent power-added efficiency has been demonstrated. Design considerations for the amplifier circuits along with the microwave performance results are presented.



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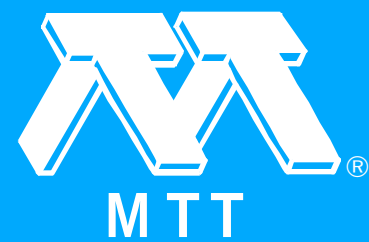
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Radiation Considerations in the Design of Linear Microwave Transistor Amplifiers for Space Applications

M.H. Gibson and I. Thomson. "Radiation Considerations in the Design of Linear Microwave Transistor Amplifiers for Space Applications." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 779-779.

It has been shown recently that a number of different types of microwave transistors used in linear microwave amplifiers designed for space applications are radiation sensitive. Since the transistor h_{FE} is the most radiation sensitive parameter, microwave performance of amplifiers intended for long space missions may degrade prematurely due to changes in transistor bias conditions. A description of the various factors affecting the overall radiation sensitivity of linear microwave amplifiers is given and is followed by experimental results of ground radiation testing on a L-band and a S-band preamplifier. Calculations based on the expected radiation dose levels in space show that neglecting the effects of radiation in amplifier design could lead to mission lives in the order of weeks instead of years. As a result of the experience gained with component and amplifier characterization, an approach to radiation hardening of microwave integrated-circuit transistor amplifiers is presented.





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Sensitivity Analysis of Coupled Microstrip Directional Couplers

S.D. Shamasundara and K.C. Gupta. "Sensitivity Analysis of Coupled Microstrip Directional Couplers." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 788-794.

Sensitivities of the parameters (coupling, bandwidth and impedance) of a coupled-line directional coupler with respect to even- and odd-mode impedances have been evaluated. These are used to determine the accuracy required from the closed-form expressions for even- and odd-mode impedances of microstriplines. Closed-form expressions satisfactory for a coupling coefficient greater than 0.3 are proposed and used for evaluating the effect of dimensional tolerances on the performance of microstrip directional couplers. This effect is significant when compared with effects of unequal phase velocities and dispersion.

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Abstracts

Multiconductor Couplers

Y. Tajima and S. Kamihashi. "Multiconductor Couplers." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 795-801.

Analysis of electromagnetic fields of interdigitated couplers and derivation of propagation parameters such as the line impedances and wavelengths for even and odd modes resulted in designs of couplers with an arbitrary number of strips. Calculations were carried out on two-, three-, four-, and six-strip couplers and showed that results for two- and four-strip couplers were consistent with available published data. The three-strip coupler, which was designed and fabricated, achieved 3-dB coupling with a simpler configuration than Lange's interdigitated coupler and with characteristics consistent with calculated data. Coupling as tight as 1.5 dB was achieved by a six-strip coupler which was designed with a part of the ground plane of the microstrip substrate removed. This coupler can be used as the middle part of a three-section coupler for which test data shows a wide range of balanced coupling, from 2.5 to 12 GHz, with a coupling unbalance of less than ± 0.6 dB. It was concluded from the calculation that couplers with more than six strips would not be very practical.



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Interdigitated Microstrip Coupler Design

A. Presser. "Interdigitated Microstrip Coupler Design." 1978 *Transactions on Microwave Theory and Techniques* 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 801-805.

A design procedure for four-line interdigitated couplers is presented which provides excellent agreement between performance and actual coupler dimensions. The inclusion of a correction term for the finite metal thickness of the microstriplines is significant. Using existing odd-and-even mode impedance data of only two coupled lines in the array actual coupling coefficients in the 2.5-6.5-dB range are predictable to within ± 0.05 dB. Graphs are shown which relate fabrication tolerances of dielectric constant and physical fine dimensions to deviations in coupling and characteristic coupler impedance. The design was verified on 3-, 5-, and 6-dB couplers in the 1-5-GHz frequency range.

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



Abstracts

Simplified Design of Lange Coupler

D. Kajfez, Z. Paunovic and S. Pavlin. "Simplified Design of Lange Coupler." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 806-808.

An approximate procedure is described for the computation of characteristic impedances and relative dielectric constants of the odd and even modes on the interdigitated microstrip coupler consisting of N conductors. The procedure requires the knowledge of 1) parameters of the two-conductor coupled microstrip and 2) parameters of the single microstrip.



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Abstracts

A Simple Method for Computing the Resonant Frequencies of Microstrip Ring Resonators

S.G. Pintzos and R. Pregla. "A Simple Method for Computing the Resonant Frequencies of Microstrip Ring Resonators." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 809-813.

A simple and efficient method for the computation of the resonant frequencies of microstrip ring resonators is presented. By means of the "reaction concept" a stationary formula for the resonant frequency of these resonators is derived. In this context a suitable approximation for the current distribution on the strip pertaining to the dominant mode has been made. The numerical results are in excellent agreement with experimental data corroborating the accuracy of the presented method.



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Optimization of the Thick-and Thin-Film Technologies for Microwave Circuits on Alumina and Fused Silica Substrates

J.-P. Ramy, M.-T. Cotte, J.P. Bolloch, R. Schnitzler, J.-J. Guena and C. Thebault.

"Optimization of the Thick-and Thin-Film Technologies for Microwave Circuits on Alumina and Fused Silica Substrates." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 814-820.

Two technologies can be used in the fabrication of microwave integrated circuits (MIC's), thick film and thin film. This paper describes and compares these technologies. Two types of substrates commonly used in MIC's are tested, alumina (AL/sub 2/O/sub 3/) for the X band, and, because of its better optical flatness and its Lower dielectric constant, fused silica (SiO/sub 2/) for the KU band. The parameters examined are, for thick-film circuits, the nature of metallizations, the method of circuit definition, and the influence of the ground plane, and for thin-film circuits, the influence of the adhesive layer and the thickness of the deposited gold. The parameters selected for the microwave comparison are the microwave Quality factor (Q) of the conductors, the adhesion of the conductor, and the ability to be wire bonded. The results show that, when their technology is optimized, thick films can be as good as thin films in the X band on alumina substrates. On silica subtrates, thin films are better and will be preferred in the KU band (by extension of the C-band measurements).





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A Generalized Spectral Domain Analysis for Coupled Suspended Microstriplines with Tuning Septums

T. Itoh and A.S. Hebert. "A Generalized Spectral Domain Analysis for Coupled Suspended Microstriplines with Tuning Septums." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 820-826.

An efficient computation method is developed for solving the microstrip-type structures in which a number of conducting strips are located on several interfaces of dielectric layers. The method is applied to the coupled suspended microstripline with tuning septums on the underside of the suspending dielectric layer. The numerical solutions obtained by the new method are compared with available data. The method is believed useful in the design of tightly coupled structures such as the 3-dB hybrid as well as of transitions between different transmission lines for microwave and millimeter-wave integrated circuit application.

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



Abstracts

Microstrip Discontinuity Inductances

B.M. Neale and A. Gopinath. "Microstrip Discontinuity Inductances." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 827-831.

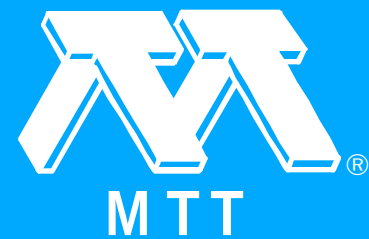
A method of calculation for microstrip discontinuity inductance parameters is described which overcomes various problems encountered in previous methods. A computer program has been written to implement this method, and typical calculated data is presented showing good agreement with experimental measurements.



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Capacitance Parameters of Discontinuities in Microstriplines

A. Gopinath and C. Gupta. "Capacitance Parameters of Discontinuities in Microstriplines." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 831-836.

Capacitance components of microstrip equivalent circuit discontinuities of gaps and the T junctions have been calculated using the quasi-static formulation. Comparison of the calculated results with experimental measurements where available show good agreement. The range of data extends that data previously published, and new results on parallel gaps also are included.

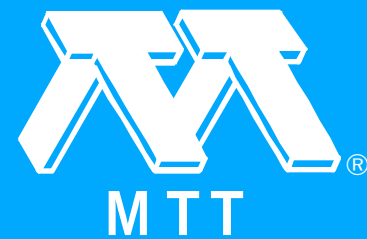
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J.P. Bolloch, E.R. Carlson, Y.-W. Chang, D.J. Coleman, Jr., M.-T. Cotte, F.H. Doerbeck, E. Freibergs, M.H. Gibson, A. Gopinath, J.-J. Guena, C. Gupta, K.C. Gupta, A.S. Hebert, M. Hirayama, R.E. Horn, T. Itanami, T. Itoh, H. Jacobs, D. Kajfez, S. Kamihashi, K.L. Klohn, Y. Konishi, R.H. Knerr, T.F. McMaster, P.J. Meier, B.M. Neale, J.A. Paul, Z. Paunovic, S. Pavlin, S.G. Pintzos, R. Pregla, A. Presser, J.-P. Ramy, T.E. Rozzi, M.V. Schneider, R. Schnitzler, S.D. Shamasundara, D.W. Shaw, S. Shindo, K. Solbach, Y. Tajima, T. Takada, C. Thebault, I. Thomson, H.Q. Tserng and W.R. Wisseman. "Contributors (Oct. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 836-842.



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Avalanche Noise from Schottky Barrier Diodes in the Frequency Range 75 - 115 GHz (Technical Notes)

N.J. Keen, R.W. Haas and P. Zimmermann. "Avalanche Noise from Schottky Barrier Diodes in the Frequency Range 75 - 115 GHz (Technical Notes)." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): 843-844.

Excess noise has been generated in the 75-115 GHz band, by reverse biasing GaAs Schottky barrier diodes into avalanche breakdown. Diodes with lower epi-layer doping yield lower excess noise, but provide stable avalanche noise, and are less liable to generate excess mixer noise. A sharp reverse bias characteristic appears to be a precondition for a stable avalanche noise output.

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Abstracts

Back Cover (Oct. 1978 [T-MTT])

"Back Cover (Oct. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.10 (Oct. 1978 [T-MTT] (Special Issue on Microwave and Millimeter-Wave Integrated Circuits)): b1-b2.



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"Front Cover (Nov. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): f1-f2.



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Multiply Reflected Gaussian Beams in a Circular Cross Section

S.-Y. Shin and L.B. Felsen. "Multiply Reflected Gaussian Beams in a Circular Cross Section." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 845-851.

A well-collimated beam reflected repeatedly within a circular cross section undergoes periodic focusing and defocusing. This behavior is of interest for tracking of beams around a type of acoustic surface wave disk delay line, and it also relates to beam monitoring after oblique injection into the endface of a multimode optical fiber. The problem is analyzed by considering first the field excited by an isotropic line source inside a dielectric cylinder, and then converting this to Gaussian beam excitation by assigning a complex value to the source coordinate location. Because the wavelength is small compared to the cylinder radius, ray-optical methods are employed to construct the solution, with inclusion of such novel ingredients as the lateral ray shift on a curved boundary. Results are obtained for the amplitude and phase of the ray and beam field and for such beam parameters as the location of the focus the minimum beam width and the rate of beam divergence between successive reflections.

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Effect of Lossy Cladding on Modal Dispersion Characteristics of Parabolic-Index Fiber

Y. Masaki, M. Matsuhara and N. Kumagai. "Effect of Lossy Cladding on Modal Dispersion Characteristics of Parabolic-Index Fiber." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 852-855.

The influence of the cladding on the modal dispersion characteristics of a multimode fiber has been studied for the special case of a lossless fiber. In this paper, we consider a multimode fiber with a lossy cladding and explain the influence of the cladding loss on the modal dispersion characteristics of the fiber. We adopt a standard deviation of group delay of guided modes to estimate the modal dispersion behavior of the fiber. We conclude that a lossy cladding improves the modal dispersion characteristics in the case of the parabolic-index fiber.

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



Abstracts

Wave Propagation in a Nonparabolic Graded-Index Medium

R. Pratesi and L. Ronchi. "Wave Propagation in a Nonparabolic Graded-Index Medium." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 856-858.

Wave propagation in a slab of graded-index medium whose refractive index is a polynomial expression of the transverse coordinate is treated by a simple generalization of the theory commonly adopted for the square-law media.



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Abstracts

The Screening Potential Theory of Excess Conduction Loss at Millimeter and Submillimeter Wavelengths

Y.-C. Wang. "The Screening Potential Theory of Excess Conduction Loss at Millimeter and Submillimeter Wavelengths." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 858-861.

On using the screening potential theory, the room-temperature excess conduction loss in copper waveguide is explained and calculated. The low-frequency and long-wavelength conductivity with spatial dispersion has been shown to give 30-percent more conduction loss in copper at submillimeter-wave frequency. Good agreement between experimental and theoretical results is obtained.



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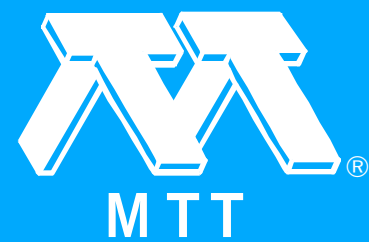
The Traveling-Wave IMPATT Mode

M. Franz and J.B. Beyer. "The Traveling-Wave IMPATT Mode." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 861-865.

The small-signal analysis of a distributed IMPATT diode indicates the existence of a traveling-wave mode. The severe power-frequency limitation as well as the associated low impedance level of the discrete diode appear avoidable. No external resonant circuitry is needed. It is shown that the TEM parallel-plate waveguide mode of the junction is modified by the injection of electrons at the p⁺-n junction (or Schottky contact). The transverse electric field takes on a traveling-wave nature in the transverse direction tracking the injected electrons, and a small longitudinal electric field will also be present. In previous papers on IMPATT traveling-wave structures, the IMPATT effect was lumped into an effective complex permittivity in a composite layer model or into an effective shunt admittance in a transmission line model. The current work attempts to incorporate the IMPATT mechanism into the wave model and considers the actual carrier field interaction. The small-signal analysis yields an analytic field solution and a characteristic equation for the complex propagation constant. Solutions are found and documented for various frequencies and bias current densities. For the particular structure considered, at 12 GHz with a bias current density of 1000 A/cm² a gain of 72 dB/cm was found.

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Transmission-Line Properties of a Strip Line Between Parallel Planes

H.A. Wheeler. "Transmission-Line Properties of a Strip Line Between Parallel Planes." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 866-876.

The subject is a strip line sandwiched in dielectric between parallel planes (commonly termed "stripline"). In the manner of the author's earlier papers relating to a different type (1964, 1965, 1977), all the significant properties are formulated in explicit form for practical applications. This may mean synthesis and/or analysis. Each formula is a close approximation for all shape ratios, obtained by a gradual transition between theoretical forms for the extremes of narrow and wide strips. The effect of thickness is formulated to a second-order approximation. Then the result is subjected to numerical differentiation for simple evaluation of the magnetic-loss power factor from the skin depth. The familiar derivation for a thin strip (in terms of elliptic integrals K'/K) is obtained by a simple algorithm of binary stepping with no reliance on tables. This is susceptible of any degree of approximation in closed form and is reversible for synthesis or analysis. It is used to verify a simple empirical formula which is more convenient for differentiation. In the transition region between the extremes of narrow and wide strips, the effect of thickness is computed by conformal mapping and numerical integration (in place of elliptic integrals). From this reference, a simple empirical formula is verified. Graphs are given for practical purposes, showing the wave resistance and magnetic loss for a wide range of shape and dielectric. For numerical reading, the formulas are suited for programming on a small digital calculator.

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Characteristic Impedance of a Rectangular Coaxial Line with Offset Inner Conductor

J.C. Tippet and D.C. Chang. "Characteristic Impedance of a Rectangular Coaxial Line with Offset Inner Conductor." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 876-883.

The singular-integral-equation technique is used to derive the capacitance and, hence, characteristic impedance of a rectangular coaxial line with a zero-thickness inner conductor. The position of the inner conductor is arbitrary, but its orientation is assumed to be parallel to the top and bottom walls of the outer conductor. Simple yet very accurate formulas for the capacitance and characteristic impedance are found in terms of complete elliptic integrals.

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Abstracts

The Compensation of Step Discontinuities in TEM-Mode Transmission Lines

J.A.G. Malherbe and A.F. Steyn. "The Compensation of Step Discontinuities in TEM-Mode Transmission Lines." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 883-885.

A method for the compensation of the effects due to discontinuities that arise when transmission lines of different characteristic impedance are joined is presented. The proposed method is not based calculating the equivalent circuit of the discontinuity but makes use of simple taper on the wider line at an impedance step to remove the effects of the discontinuity.



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Abstracts

The Open-Ring Line: A Low-Loss Surface Waveguide

C. Fray and A. Papiernik. "The Open-Ring Line: A Low-Loss Surface Waveguide." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 886-892.

This paper presents the theoretical analysis of the electromagnetic properties of the open-ring line by means of the Hankel transform. Fields components, stored energy, power flow, dispersion relation, and energy distribution are calculated. Measurements have corroborated our theoretical results. These results help in the design of low-loss line operating in the fundamental dipolar hybrid mode. The measured attenuation on a prototype line consisting of equally spaced aluminum rings held by a metal rod is less than 5 dB/km below 1.8 GHz. Among the possible applications are railway traffic control and railway obstacle detection.



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Spurious Radiation from a Microstrip Y Junction

L. Lewin. "Spurious Radiation from a Microstrip Y Junction." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 893-894.

The radiation from a microstrip Y junction is calculated as a function of angle. It is shown that the radiated power increases monotonically with the Y angle, decreases inversely as the dielectric constant of the substrate for large permittivities, and increases as the square of the substrate thickness for thin substrates.

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Air-Gap Effect in Rectangular Waveguide Containing a Lossy H-Plane Dielectric Slab

J.B. Ness and M.W. Gunn. "Air-Gap Effect in Rectangular Waveguide Containing a Lossy H-Plane Dielectric Slab." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 894-897.

The propagation coefficient for a partially filled rectangular waveguide containing a lossy H-plane slab against the broad wall can be significantly altered if an air gap exists between the slab and the wall of the waveguide. The solutions of the dispersion equation show that the attenuation and phase coefficients may be increased as well as decreased by the presence of an air gap. For a fully filled waveguide the effect of an air gap is maximized if the gap is equally distributed at the top and bottom of the sample.

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Cutoff Conditions in Three-Layer Cylindrical Dielectric Waveguides

A. Safaai-Jazi and G.L. Yip. "Cutoff Conditions in Three-Layer Cylindrical Dielectric Waveguides." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 898-903.

Exact cutoff expressions for hybrid and circularly symmetric modes in three-layer cylindrical dielectric waveguides are derived. It analytically established that whenever the refractive index of the enter medium (n_{sup2}) is higher than either the refractive index of the core (n_{sub1}) or of the inner cladding (n_{sub2}), i.e., $n_{\text{sub1}} > n_{\text{sub3}} > n_{\text{sub2}}$ or $n_{\text{sub2}} > n_{\text{sub3}} > n_{\text{sub1}}$, the dominant HE_{sub11} mode can have a nonzero cutoff frequency. Inequalities relating the permittivities to the ratio of the cladding radius to the core radius, as conditions for the nonzero cutoff of the HE_{sub11} mode, are determined. The cutoff conditions presented in this paper are also applicable to similar structures used io millimeter-wave communications.

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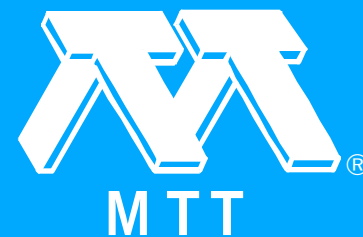


Abstracts

Improvement of Convergence in Moment-Method Solutions by the Use of Interpolants

M.J. Hagmann, O.P. Gandhi and C.H. Durney. "Improvement of Convergence in Moment-Method Solutions by the Use of Interpolants." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 904-908.

Two interpolants are described that may be used to correct the results of a moment-method solution using pulse functions as a basis and delta functions for testing. The interpolants allow for some of the variation of the fields within each cell and thereby increase accuracy and improve convergence. The interpolants are usable for a general scatterer and typically require about 1 percent of the cost of the initial numerical solution.



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Aperture Excitation of a Wire in a Rectangular Cavity

D.B. Seidel. "Aperture Excitation of a Wire in a Rectangular Cavity." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 908-914.

The problem of determining the currents excited on a wire enclosed within a rectangular cavity is considered. The wire and cavity interior are excited by electromagnetic sources exterior to the cavity which couple to the cavity interior through a small aperture in the cavity wall. It is assumed that the wire is thin, straight, and oriented perpendicular to one of the cavity walls. An integral equation is formulated for the problem in the frequency domain using equivalent dipole moments to approximate the effects of the aperture. This integral equation is then solved numerically by the method of moments. The dyadic Green's function for this problem are difficult to compute numerically; consequently, extensive numerical analysis is necessary to render the solution tractable. Sample numerical results are presented for representative configurations of cavity, wire, and aperture.

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Abstracts

Propagation Modes, Equivalent Circuits, and Characteristic Terminations for Multiconductor Transmission Lines with Inhomogeneous Dielectrics (Comments)

Y.Y. Sun. "Propagation Modes, Equivalent Circuits, and Characteristic Terminations for Multiconductor Transmission Lines with Inhomogeneous Dielectrics (Comments)." 1978 *Transactions on Microwave Theory and Techniques* 26.11 (Nov. 1978 [T-MTT]): 915-918.

This letter intends to recognize the correct expression of the characteristic admittance matrix of multiconductor transmission lines.



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Ridged Waveguides with Inhomogeneous Dielectric Slab Loading (Comments)

C.W. Young, Jr. and G. Magerl. "Ridged Waveguides with Inhomogeneous Dielectric Slab Loading (Comments)." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 919-919.

In the above paper/sup1/, Magerl derives dispersion equations for TE/sub m0/ modes of ridged waveguide with inhomogeneous dielectric-slab loading. The existence of TE modes was evidently assumed a priori (a seemingly natural assumption); unfortunately, true TE modes do not exist in this waveguide (with a singular exception to be noted).

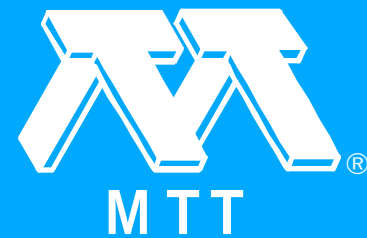
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Contributors (Nov. 1978 [T-MTT])

J.B. Beyer, D.C. Chang, C.H. Durney, L.B. Felsen, M. Franz, C. Fray, O.P. Gandhi, M.W. Gunn, M.J. Hagmann, N. Kumagai, L. Lewin, J.A.G. Malherbe, Y. Masaki, M. Matsuhara, J.B. Ness, A. Papiernik, R. Pratesi, L. Ronchi, A. Safaai-Jazi, D.B. Seidel, S.-Y. Shin, A.F. Steyn, J.C. Tippet, Y.-C. Wang, H.A. Wheeler and G.L. Yip. "Contributors (Nov. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 920-923.



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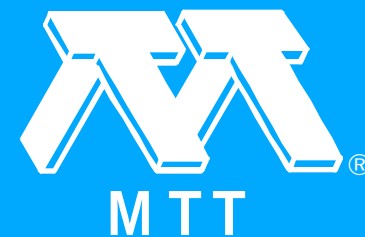
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IEEE Journals on Microfilm (Advertisement) (Nov. 1978 [T-MTT])

"IEEE Journals on Microfilm (Advertisement) (Nov. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.11 (Nov. 1978 [T-MTT]): 924-924.



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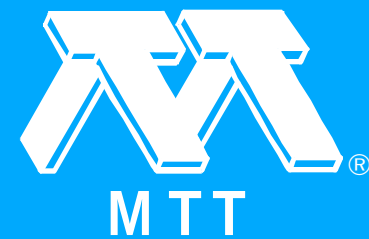
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Front Cover (Dec. 1978 [T-MTT])

"Front Cover (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): f1-f2.



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Abstracts

Editor's Overview (Dec. 1978 [T-MTT])

W. Steenaart. "Editor's Overview (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 926-926.

With the 1978 International Microwave Symposium now behind us, it is good to review some of the highlights and to sample the technical content by publishing several of the papers presented in expanded form.



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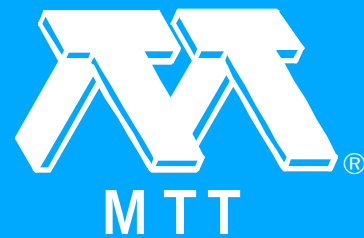


Abstracts

The 1978 International Microwave Symposium (Dec. 1978 [T-MTT])

W. Steenaart and R. Vankoughnett. "The 1978 International Microwave Symposium (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 927-931.

The 1978 MTT International Microwave Symposium was organized by the Ottawa chapter of MTT with very significant assistance of members of the Montreal chapter. It was held at the Chateau Laurier Hotel, Ottawa, Canada, the first venture outside the United States of America.



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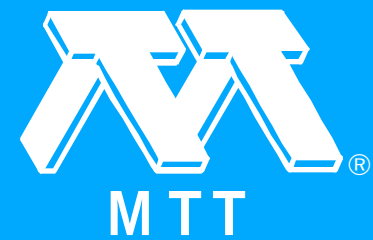
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Abstracts

1977 MTT Awards (Dec. 1978 [T-MTT])

"1977 MTT Awards (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 932-934.



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Cryogenic Millimeter-Wave Receiver Using Molecular Beam Epitaxy Diodes (Dec. 1978 [T-MTT])

R.A. Linke, M.V. Schneider and A.Y. Cho. "Cryogenic Millimeter-Wave Receiver Using Molecular Beam Epitaxy Diodes (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 935-938.

A millimeter-wave cryogenic receiver has been built for the 60-90-GHz frequency band using GaAs mixer diodes prepared by molecular beam epitaxy (MBE). The diodes are mounted in a reduced-height image rejecting waveguide mixer which is followed by a cooled parametric amplifier at 4.5-5.0 GHz. At a temperature of 18 K the receiver has a total single-sideband (SSB) system temperature of 312 K at a frequency of 81 GHz. This is the lowest system temperature ever reported for a resistive mixer receiver. The low-noise operation of the mixer is seen to be a result of 1) the short-circuiting of the noise entering the image port and 2) an MBE mixer diode with a noise temperature which is consistent with the theoretical shot noise from the junction and the thermal noise from the series resistance.



Abstracts

Noise and Transfer Properties of Harmonically Synchronized Oscillators (Dec. 1978 [T-MTT])

R. Knochel and K. Schunemann. "Noise and Transfer Properties of Harmonically Synchronized Oscillators (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 939-944.

A theoretical model of a harmonically synchronized oscillator is developed. Using this model output power, stability conditions, noise, and transfer properties of a harmonic frequency divider are calculated and discussed.



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1.6-Gb/s 16-Level Superposed APSK Modem with Baseband Signal-Processing Coherent Demodulator (Dec. 1978 [T-MTT])

M. Washio, T. Shimamura, N. Komiyama and Y. Takimoto. "1.6-Gb/s 16-Level Superposed APSK Modem with Baseband Signal-Processing Coherent Demodulator (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 945-951.

A 1.6-Gb/s 16-level superposed APSK modem using a newly developed baseband signal-processing coherent demodulator is described. In the modulator, the superposing modulation method is adopted in which two QPSK carriers having different levels are superposed so that the combined signal forms a 16-level APSK carrier. Sixteen signal points are arranged in lattice form on the signal space. In the demodulator, a newly developed carrier recovery loop is adopted in which quantizing error signals are detected in the process of data regeneration; they are used for generating the phase error signal to control a VCO. The principles of operation and theoretical analysis of this carrier recovery loop is described, through which it is shown that the recovered carrier has inherently low-pattern jitter power. Furthermore, it features a very simple circuit configuration. The circuit configurations of an experimental modem and some important test results are described in detail. It is shown that the modem has improved performance characteristics in such a high-speed region as 1.6 Gb/s while its circuit configuration is much simplified.



Abstracts

Calibrating the Six-Port Reflectometer by Means of Sliding Terminations

G.F. Engen. "Calibrating the Six-Port Reflectometer by Means of Sliding Terminations." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 951-957.

The six-port technique promises to have a major impact on the next generation of automatic network analyzers because complex heterodyne methods may be replaced by simple amplitude detectors. This projection, however, is predicated upon the existence or development of calibration techniques which permit one to conveniently and accurately obtain the parameters which characterize the six-port. This paper describes a number of substantial refinements to a previously described procedure which is based upon the use of sliding terminations.



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Computer-Aided Filter Alignment and Diagnosis (Dec. 1978 [T-MTT])

H.L. Thal, Jr.. "Computer-Aided Filter Alignment and Diagnosis (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 958-963.

The cavity resonant frequencies and coupling values of a wide range of bandpass filters, band-reject filters, and equalizers have been determined in situ by computer-adjusting analytic models to fit the scattering parameters measured on an automatic network analyzer. A higher order mode elliptic filter, a dual-mode quasi-elliptic filter, and a dual-mode band-reject filter are presented as examples. The general relationships between mechanical dimensions and circuit parameters are discussed. The circuit adjustment procedure is outlined, and equations for the sensitivity coefficients of several element types are tabulated.

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Abstracts

New Results in Network Simulation, Sensitivity, and Tolerance Analysis for Cascaded Structures (Dec. 1978 [T-MTT])

J.W. Bandler, M.R.M. Rizk and H.L. Abdel-Malek. "New Results in Network Simulation, Sensitivity, and Tolerance Analysis for Cascaded Structures (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 963-972.

An attractive, exact, and efficient approach to network analysis for cascaded structures is presented. It is useful for sensitivity and tolerance analyses, in particular, for a multiple of simultaneous large changes in design parameter values. It also facilitates the exploitation of symmetry to reduce computational effort for the analysis. Responses at different loads in branched networks, which may be connected in series or in parallel with the main cascade, can be obtained analytically in terms of the variable elements. Sensitivity and large-change effects with respect to these variables can be easily evaluated. The approach is not confined to 2-port elements but can be generalized to 2p-port cascaded elements.



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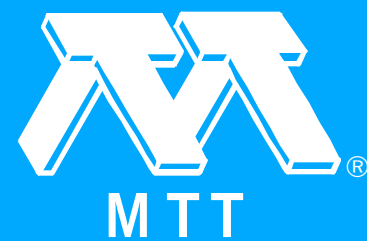


Abstracts

Exact Calculation of the Uncertainty on the Input Reflection Coefficient of Arbitrary Two Ports Due to Mismatches and Arbitrary Reference Planes (Dec. 1978 [T-MTT])

H. Tromp. "Exact Calculation of the Uncertainty on the Input Reflection Coefficient of Arbitrary Two Ports Due to Mismatches and Arbitrary Reference Planes (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 973-978.

A specific problem of worst case analysis of microwave networks is dealt with. Exact formulas are derived for the upper and lower limits of the amplitude of the input reflection coefficient of an arbitrary two port, in the presence of mismatched source and load and/or arbitrary reference planes. The derivation is based on certain properties of the bilinear transformation.



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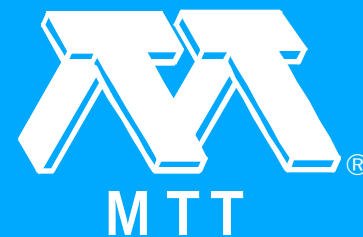


Abstracts

An Approximate Dynamic Spatial Green's Function for Microstriplines

Y.L. Chow and I.N. El-Behery. "An Approximate Dynamic Spatial Green's Function for Microstriplines." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 978-983.

A dynamic model of both charge and current images is constructed to give rise to a frequency-dependent dyadic Green's function in the space domain for microstriplines. While the spatial Green's function is approximate, its image model is very simple, and the propagation constants calculated from it agree well with published results.



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Abstracts

Generalized Spectral Domain Method for Multiconductor Printed Lines and its Application to Turnable Suspended Microstrips (Dec. 1978 [T-MTT])

T. Itoh. "Generalized Spectral Domain Method for Multiconductor Printed Lines and its Application to Turnable Suspended Microstrips (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 983-987.

An efficient method is developed for obtaining propagation characteristics of microstripline type structures in which a number of conductors are located on various interfaces. Specific computations have been carried out for suspended microstripline structures with tuning conductive septums. A number of data useful for design are included.



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Simulation Study of Electronically Scannable Antennas and Tunable Filters Integrated in a Quasi-Planar Dielectric Waveguide (Dec. 1978 [T-MTT])

T. Itoh and A.S. Hebert. "Simulation Study of Electronically Scannable Antennas and Tunable Filters Integrated in a Quasi-Planar Dielectric Waveguide (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 987-991.

Preliminary studies on electronically scannable leaky-wave antennas integrated in a dielectric waveguide are reported. Electronic scan is simulated by a small mechanical motion from which the relation between the scan angle and the necessary change in the dielectric constant can be derived. The work is also applicable to electronically tunable bandstop filters.



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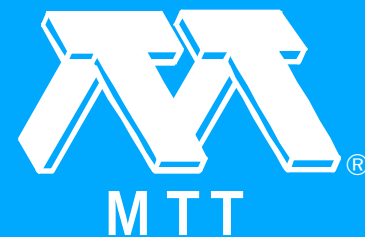


Abstracts

Measurements of Excitation Condition and Quantitative Mode Analysis in Optical Fibers

H. Shigesawa, T. Matsuo and K. Takiyama. "Measurements of Excitation Condition and Quantitative Mode Analysis in Optical Fibers." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 992-997.

The purpose of this paper is to describe an accurate method for determining the modal-power distribution along optical fibers and also to present a technique for measuring the launching conditions produced by an input laser beam. Experimental results demonstrate both the accuracy and the effectiveness of those methods for investigating the transmission characteristics of optical waveguides. Various factors having an important influence upon the accuracy are discussed, and appropriate methods for minimizing the systematic errors also are presented.



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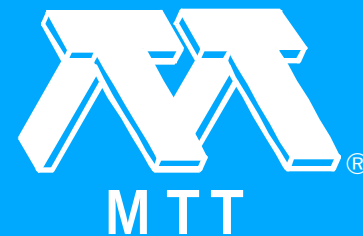


Abstracts

Groove- and H-Waveguide Design and Characteristics at Short Millimetric Wavelengths

D.J. Harris, K.-W. Lee and J.M. Reeves. "Groove- and H-Waveguide Design and Characteristics at Short Millimetric Wavelengths." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 998-1001.

The design of the H guide and groove guide for use in the short millimetric range with relatively low-loss, low-dispersion, and single-mode operation is considered. Measurements at 40 and 100 GHz show encouraging characteristics. It is considered feasible to construct components to form complete systems in these guides.



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Abstracts

A Simple Method for Analyzing Fin-Line Structures (Dec. 1978 [T-MTT])

A.M.K. Saad and K. Schunemann. "A Simple Method for Analyzing Fin-Line Structures (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1002-1007.

A first-order design theory for fin-line circuits is developed by establishing a correspondence between a fin line and a set of rectangular waveguides. The usefulness of the method is demonstrated by applying it to the analysis of a transition from a fin line to a below-cutoff waveguide. Finally, theoretical and experimental results are given for a bandpass filter, which show a fairly good agreement.



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Abstracts

An X-Band Balanced Fin-Line Mixer (Dec. 1978 [T-MTT])

G. Begemann. "An X-Band Balanced Fin-Line Mixer (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1007-1011.

The fin-line technique has been used in a balanced 9-11-GHz mixer with a 70-MHz intermediate frequency. The mixer without an IF amplifier has an available conversion loss of less than 5 dB with a 3.8-dB minimum and a SSB noise figure of less than 6.9 dB with a 5.3-dB minimum. The mixer is tunable by variable shorts. It is possible to scale the device to millimeter-wave frequencies.



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Nonreciprocal Remanence Ferrite Phase Shifters Using the Grooved Waveguide

A. Mizobuchi and H. Kurebayashi. "Nonreciprocal Remanence Ferrite Phase Shifters Using the Grooved Waveguide." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1012-1016.

For the purpose of improving the performance characteristics of the nonreciprocal remanence ferrite phase shifter, a new configuration with a grooved waveguide is proposed and analyzed. Some results calculated as functions of dielectric and ferrite thickness, waveguide dimensions, and frequency are shown and compared as being in good agreement with experiments at the X band. The figure of merit (differential phase shift per insertion loss) and the handling power of the proposed phase shifter are discussed in comparison with those of the conventional waveguide geometry.

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Abstracts

A Technique for Predicting Large-Signal Performance of a GaAs MESFET (Dec. 1978 [T-MTT])

H.A. Willing, C. Rauscher and P. de Santis. "A Technique for Predicting Large-Signal Performance of a GaAs MESFET (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1017-1023.

A method is described for accurately predicting the nonlinear microwave performance of GaAs MESFET devices. The method utilizes time-domain analysis and is based upon the experimentally characterized bias dependence of device-circuit model elements. Precise predictions are made of fundamental and harmonic power levels up to 6 dB of gain compression.



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Surface-Oriented Transferred-Electron Devices (Dec. 1978 [T-MTT])

M.S. Shur and L.F. Eastman. "Surface-Oriented Transferred-Electron Devices (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1023-1028.

The application of MESFET technology to the manufacturing of surface-oriented transferred-electron devices (TED's) with parameters close to GaAs MESFET's is discussed. The limitations related to the contact resistance, fringing capacitance, domain formation time, impact ionization, and heat sinking are analyzed for GaAs and InP devices. Our estimates show that the surface-oriented devices can be used as microwave LSA generators at higher frequencies than the conventional LSA diodes. In a domain mode, the surface-oriented TED's can yield low values of the power-delay product comparable to those of GaAs MESFET's at higher speeds. The analysis of impact ionization within a high-field domain leads to a conclusion that even InP logic devices with practical lengths of the active layer can be manufactured with doping densities up to $10^{17}/\text{cm}^3$. The estimate of the temperature rise indicates that a CW operation is possible for practical device parameters. Because the parameters of surface-oriented TED's are similar to those of GaAs MESFET's they may be manufactured using the rapidly developing GaAs integrated-circuit technology and used in combination with GaAs MESFET's.

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GaAs TUNNETT Diodes

J.-I. Nishizawa, K. Motoya and Y. Okuno. "GaAs TUNNETT Diodes." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1029-1035.

The tunnel-injection-transit-time (TUNNETT) diode is operated at a high frequency and has a low-noise level compared to the IMPATT diode. The tunnel injection in a thin carrier generating region of the TUNNETT depends strongly on the electric-field intensity over 1000 kV/cm where the ionization of carriers can be neglected, leading to a higher efficiency performance than that of the IMPATT. GaAs TUNNETT diodes with p+-n and p+-n-n+ structures have been fabricated by a new LPE method (the temperature-difference method under controlled vapor pressure). The fundamental oscillation at frequencies from about 100 up to 248 GHz has been obtained from the pulse-driven p+-n-n+ diodes. This paper describes the details of the oscillation characteristics of GaAs TUNNETT diodes.



YIG Resonator Circuit with Isolator Property and its Application to a Gunn Diode Oscillator (Dec. 1978 [T-MTT])

F. Okada, K. Ohwi and Y. Yokochi. "YIG Resonator Circuit with Isolator Property and its Application to a Gunn Diode Oscillator (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1035-1039.

This paper presents the analysis and experiment of a newly developed YIG resonator circuit with isolator property, which is constructed with a YIG sphere, three coupling loops, and a 3-dB stripline directional coupler. This YIG circuit can be used advantageously as the toning element of a magnetically tunable oscillator. The circuit has an advantage in preventing frequency pulling and the variation of output power level of the oscillator due to a change in load condition because of the resonator circuit having isolator property at the same time. The design procedure and experiment of a magnetically tunable Gunn diode oscillator with the YIG circuit is also shown. It has been confirmed that the YIG circuit when applied to a tunable oscillator is quite useful.



Reflection of Magnetostatic Forward Volume Waves by a Shallow-Grooved Grating on a YIG Film

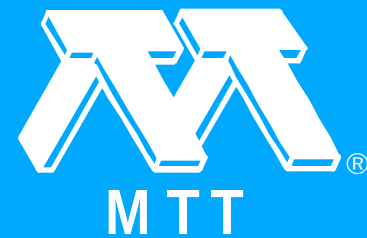
J.P. Parekh and H.-S. Tuan. "Reflection of Magnetostatic Forward Volume Waves by a Shallow-Grooved Grating on a YIG Film." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1039-1044.

The magnetostatic forward volume wave (MSFVW) reflection characteristics of a uniform grating of shallow grooves etched on the planar surface of an epitaxial YIG film are treated using an approach which integrates field theory with the coupled-mode approach. The MSFVW reflectivity per groove is found to be comparable to the reflectivity of magnetostatic surface waves (MSSW's) and thus is found to be significantly large considering that the volume waves are reflected by surface-localized and shallow grooves.

Abstracts

Contributors (Dec. 1978 [T-MTT])

H.L. Abdel-Malek, J.W. Bandler, G. Begemann, A.Y. Cho, Y.L. Chow, P. de Santis, L.F. Eastman, I.N. El-Behery, G.F. Engen, D.J. Harris, A.S. Hebert, T. Itoh, R. Knochel, N. Komiyama, H. Kurebayashi, K.-W. Lee, R.A. Linke, T. Matsuo, A. Mizobuchi, K. Motoya, J.-I. Nishizawa, K. Ohwi, F. Okada, Y. Okuno, J.P. Parekh, C. Rauscher, J.M. Reeves, M.R.M. Rizk, A.M.K. Saad, M.V. Schneider, K. Schunemann, H. Shigesawa, T. Shimamura, M.S. Shur, W. Steenaart, Y. Takimoto, K. Takiyama, H.L. Thal, Jr., H. Tromp, H.-S. Tuan, M. Washio, H.A. Willing and Y. Yokochi. "Contributors (Dec. 1978 [T-MTT])." 1978 Transactions on Microwave Theory and Techniques 26.12 (Dec. 1978 [T-MTT] (1978 Symposium Issue)): 1045-1051.



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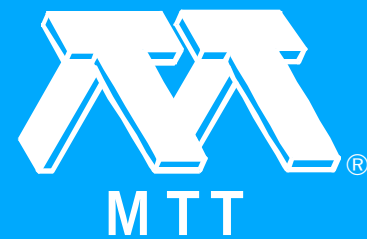
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Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-26, 1978

*"Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-26, 1978."
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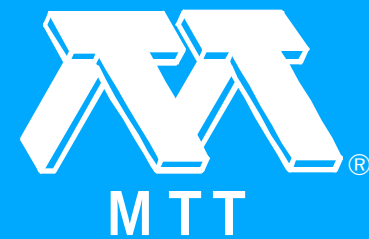
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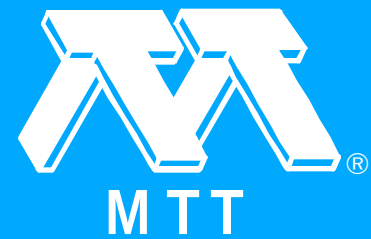


Abstracts

Microwave Amplifier Design with Potentially Unstable FET's

K.L. Kotzebue. "Microwave Amplifier Design with Potentially Unstable FET's." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 1-3.

The concept of maximally efficient gain, as applied to the design of microwave transistor amplifiers with potentially unstable devices, is illustrated by an example, utilizing the parameters of a typical small-signal microwave FET.



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Broad-Band Internal Matching of Microwave Power GaAs MESFET's

K. Honjo, Y. Takayama and A. Higashisaka. "Broad-Band Internal Matching of Microwave Power GaAs MESFET's." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 3-8.

Broad-band internal matching techniques for high-power GaAs MESFET's at C band have been developed adopting novel circuit configurations and large-signal characterizations in the circuit design. The lumped-element two-section input matching network is formed on a single ceramic plate with a high dielectric constant. The semidistributed single-section output circuit is formed in microstrip pattern on an alumina plate. The internally matched GaAs FET with 11200- μ m total gate width developed has a 2.5-W power output at 1-dB gain compression and a 4.4-W saturated power output with 5.5-dB linear gain from 4.2 to 7.2 GHz without external matching. The FET internally matched from 4.5 to 6.5 GHz exhibited 5-W saturated power output with 6-dB linear gain.



Abstracts

Design Theory for Broad-Band YIG-Tuned FET Oscillators

R.J. Trew. "Design Theory for Broad-Band YIG-Tuned FET Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 8-14.

Design techniques that have been successfully used on the development of X-band GaAs FET YIG-tuned oscillators are presented. The design procedure results in the maximization of the oscillator bandwidth. Small-signal device characterization is utilized and accurately predicts the oscillator bandwidths. Spurious oscillation conditions are discussed, and design techniques are prescribed for eliminating spurious oscillations in both the active circuit and resonator. The operation of an experimental oscillator verifies the design procedure.



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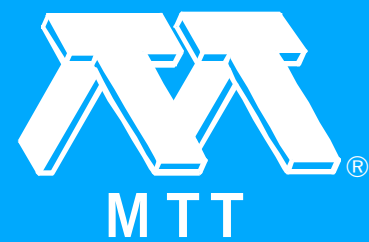
A Fast Low-Loss Microstrip p-i-n Phase Shifter

B. Glance. "A Fast Low-Loss Microstrip p-i-n Phase Shifter." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 14-16.

A 4-bit p-i-n phase shifter with low RF attenuation, fast switching time, and low switching power requirements is described. The circuit, made in microstripline, consists of four cells giving phase shifts of 180, 90, 45, and 22.5°, respectively. Each cell consists of a 3-dB coupler loaded by two p-i-n diodes. The transmission loss is 1.6 dB $\pm$ 0.2 dB over the operating bandwidth of 11.7-12.2 GHz for a biasing current of only 5 mA/cell. Switching time between phase states is 1 ns.

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Analysis and Design of an X-Band Actively Compensated IMPATT Diode Amplifier

A.S. Bains and C.S. Aitchison. "Analysis and Design of an X-Band Actively Compensated IMPATT Diode Amplifier." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 17-23.

This paper shows how broad-banding of an IMPATT diode amplifier can be achieved using a circuit technique known as active reactance compensation. Theoretical analysis and experimental results both show that the gain-bandwidth products of an uncompensated IMPATT amplifier improves from $G/\sqrt{1/2/B} = k$ to $G/\sqrt{1/4/B} = 2k$ (where k is a constant) for the same amplifier actively compensated. The measured 3-dB bandwidth of 230 MHz for a 9.0-GHz amplifier having a gain of 10 dB is improved to 700 MHz at the same gain.

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Circuit Behavior and Impedance Characteristics of Broad-Band TRAPATT-Mode Amplifiers

J.P. Quine. "Circuit Behavior and Impedance Characteristics of Broad-Band TRAPATT-Mode Amplifiers." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 23-31.

The characteristics of TRAPATT-mode high-efficiency oscillators and broadband amplifiers are reviewed. It is concluded that a broad-band amplifier like a high-efficiency oscillator should have capacitive circuit impedances and is distinguished from a high-efficiency oscillator principally by the number of important harmonics employed. A smaller number of harmonics for the amplifier can lead to broader bandwidth but lower efficiency. The relative merits of experimental amplifier circuits are discussed. It is shown that coaxial-line circuits employing diode packages with large lead inductances are characterized by harmonic impedances which can have large values over broad frequency bands. However, it is also shown that the device waveforms in this case are excessively degraded and relatively low-efficiency results. On the other hand, microstrip circuits with a low-impedance diode mount can provide broadband low impedances at both fundamental and third harmonic and have exhibited better performance.

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Abstracts

Experimental Attenuation of Rectangular Waveguides at Millimeter Wavelengths (Jan. 1979 [T-MTT])

F.J. Tischer. "Experimental Attenuation of Rectangular Waveguides at Millimeter Wavelengths (Jan. 1979 [T-MTT]." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 31-37.

The experimental values of attenuation of commercially available rectangular waveguides were determined at frequencies between 25 and 200 GHz with emphasis on high accuracy. They were compared with the theoretical values computed from the dc conductivities, taking into consideration temperature effects, work hardening, size effects, surface roughness, and a room-temperature anomaly of the skin effect. A new way to express the excess attenuation due to these effects was formulated. Excess ratios of attenuation of coin-silver waveguides were found to be well below the values used in engineering in the past. They can satisfactorily be explained by surface roughness. The normalized excess attenuations of copper guides are higher than those of guides made of silver but lower than cited in the literature.



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Online Measurements of the Fast Changing Dielectric Constant in Oil Shale Due to High-Power Microwave Heating

C.-L.J. Hu. "Online Measurements of the Fast Changing Dielectric Constant in Oil Shale Due to High-Power Microwave Heating." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 38-43.

The change of the complex dielectric constant ϵ of oil shale under intensive microwave heating is an abrupt phenomenon which is quite different from that due to conventional heating. Based on the principle of competitive chemical kinetics, a theory is proposed here for explaining this rapid change of the dielectric constant. A mathematical analysis of a coaxial waveguide loaded with oil-shale blocks which has a fast changing ϵ with respect to time is carried out in detail, from which an online measuring technique is derived for measuring this fast changing ϵ with respect to time and temperature. Preliminary experimental results show that the proposed theory is suitable for explaining this fast changing phenomenon. The online measuring technique reported here is very similar to the three-probe or five-port measuring methods reported in the literature, except that it is more general compared to some of these methods. Its designing approach is also different because it is derived from a modified phasor analysis with the physical picture easily visualized.

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Abstracts

Microstrip Tapped-Line Filter Design

J.S. Wong. "Microstrip Tapped-Line Filter Design." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 44-50.

The subject of this article is a step-by-step design procedure for microstrip tapped-line filters, accompanied by appropriate design curves. In addition to microstrip tapped-line interdigital filters, a new hairpin-line filter using tapping is introduced. The equation to equation the singly loaded Q for hairpin resonators produced by tapping is derived. Experimental data is presented for filters over 20-percent bandwidth.



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Abstracts

The Measurement of the Radiation Losses in Dielectric Image Line Bends and the Calculation of a Minimum Acceptable Curvature Radius

K. Solbach. "The Measurement of the Radiation Losses in Dielectric Image Line Bends and the Calculation of a Minimum Acceptable Curvature Radius." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 51-53.

Measurements of the insertion loss due to radiation curved dielectric image lines of rectangular cross section are described for the frequency range from 26 to 90 GHz. A minimum acceptable curvature radius as a function of the frequency is calculated employing the field distributions of straight dielectric image lines and is compared with measurements.



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Abstracts

The Calculation and the Measurement of the Coupling Properties of Dielectric Image Lines of Rectangular Cross Section

K. Solbach. "The Calculation and the Measurement of the Coupling Properties of Dielectric Image Lines of Rectangular Cross Section." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 54-58.

In this paper the coupling properties of uniformly coupled dielectric image lines of rectangular cross section are calculated employing an exact method for the determination of the phase constants of the even and the odd mode. The theoretical results are verified experimentally. The results are also applied to the calculation of the coupling characteristics of practical dielectric image line directional couplers.



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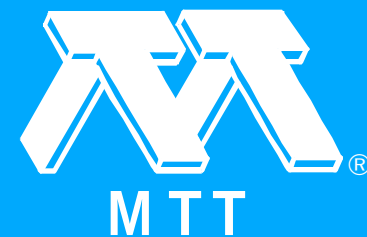


Abstracts

On an Ultrabroad-Band Hybrid Tee

U. Barabas. "On an Ultrabroad-Band Hybrid Tee." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 58-64.

A hybrid tee is investigated which consists of two broad-band line transformers and a lumped branching point. The branching point forms a bridge circuit, the resistances of which are determined by six lines and their load resistors. The bandwidth is wider than three decades, extending from 2.4 MHz to 5 GHz, and is determined by the transformers. In a special version, the upper cutoff frequency can be shifted to about 12 GHz. The isolation between opposite lines is greater than 40 dB.



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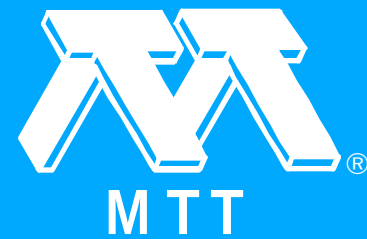
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Slot-Coupled Tee Junction in Rectangular-Guide E Plane

V.M. Pandharipande and B.N. Das. "Slot-Coupled Tee Junction in Rectangular-Guide E Plane." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 65-69.

An expression for the equivalent circuit of a waveguide tee junction coupled through a narrow transverse slot of variable length is determined from self-reaction and discontinuity in modal voltage. Impedance loading on primary guide and coupling are determined from the equivalent network parameter. A comparison between theoretical and experimental results is presented.



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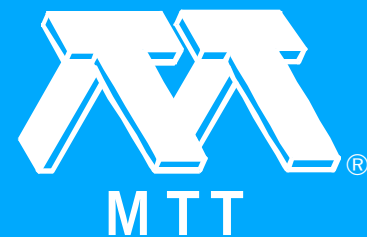
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Water-Immersed Microwave Antennas and Their Application to Microwave Interrogation of Biological Targets

J.H. Jacobi, L.E. Larsen and C.T. Hast. "Water-Immersed Microwave Antennas and Their Application to Microwave Interrogation of Biological Targets." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 70-78.

This paper describes a method of significantly improving the resolution of systems used for interrogating the spatial variation of permittivity of biosystems at S band. The basic principle employed is to contract the wavelength of the interrogating radiation and to reduce the physical aperture of the interrogating probes by immersing the transmitting antenna, receiving antenna, and the target into a material with a high dielectric constant, namely water. The antenna design is described, and line scans employing transmitted and reflected energy are presented.



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A Microwave System for the Controlled Production of Local Tumor Hyperthermia in Animals

R.L. Magin. "A Microwave System for the Controlled Production of Local Tumor Hyperthermia in Animals." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 78-83.

A microwave system was designed and constructed which provides controlled, localized hyperthermia in the tumors of four experimental animals. The components of the system are a 2.45-GHz microwave source, a four-way power-dividing network and reflected power monitor, a temperature-controlled microwave power regulator, and small direct-contact microwave applicators. Adjustment of the temperature control results in elevated temperatures in the centers of tumors which can be maintained to within $\pm 0.1^{\circ}\text{C}$ without production of significant whole body hyperthermia. The temperatures at the edges of the locally heated tumors were found to vary within $\pm 1.0^{\circ}\text{C}$ of the center temperature. The system is currently being used to evaluate the therapeutic potential of sustained localized hyperthermia in small tumors implanted subcutaneously in mice.



Abstracts

The Measurement of Noise in Microwave Transmitters (Comments) (Jan. 1979 [T-MTT])

R. Knochel, K. Schunemann and B. Schiek. "The Measurement of Noise in Microwave Transmitters (Comments) (Jan. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 84-85.

In the recent paper, "The Measurement of Noise in Microwave Transmitters," J. R. Ashley et al. give a review of several methods for the measurement of AM and FM noise, respectively. The section, which deals with FM noise measurements at frequencies below 5 GHz, may be the source of erroneous conclusions, as will be pointed out in this comment.



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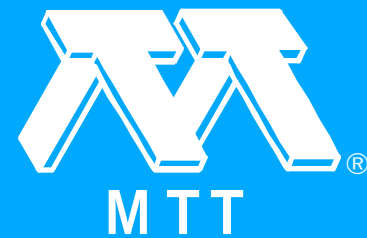
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Contributors (Jan. 1979 [T-MTT])

C.S. Aitchison, A.S. Bains, U. Barabas, B.N. Das, B. Glance, C.T. Hast, A. Higashisaka, K. Honjo, C.-L.J. Hu, J.H. Jacobi, K.L. Kotzebue, L.E. Larsen, R.L. Magin, V.M. Pandharipande, J.P. Quine, K. Solbach, Y. Takayama, F.J. Tischer, R.J. Trew and J.S. Wong. "Contributors (Jan. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 86-88.



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Abstracts

A New Microwave Variable Power Divider (Jan .1979 [T-MTT])

L. Nystrom. "A New Microwave Variable Power Divider (Jan .1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): 89-90.

A new variable power divider (VPO) has been developed without any phase shifter and only two diodes are needed and in a balanced circuit four diodes. The two varactor diodes are equally biased. The differential phase shift between the output is zero independent of the power dividing ratio. Measurements on an experimental VPD at L-band frequencies are presented.



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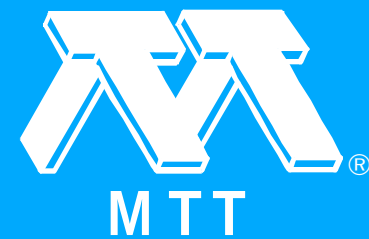
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"Back Cover (Jan. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.1 (Jan. 1979 [T-MTT]): b1-b2.



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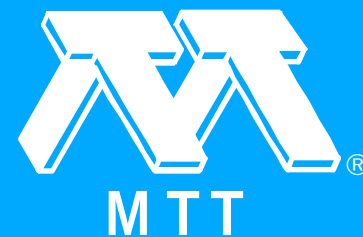


Abstracts

A New Method of Broad-Band Equalization Applied to Microwave Amplifiers

H.J. Carlin and J.J. Komiak. "A New Method of Broad-Band Equalization Applied to Microwave Amplifiers." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 93-99.

A new approach to broad-band matching which bypasses analytic gain-bandwidth theory and directly utilizes measured real frequency impedance data is applied to gain equalization and low-noise design of GaAs Schottky-barrier FET amplifiers. Neither the equalizer topology nor the analytic form of the system transfer function are initially assumed. These result from the design process. Examples include an octave-band FET amplifier design and a low-noise FET amplifier design. The equalizers are realized with lumped elements or transmission-line sections. A single basic least squares program implements the design procedure.



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Abstracts

A Generalized Multiplexer Theory

J.D. Rhodes and R. Levy. "A Generalized Multiplexer Theory." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 99-111.

A general direct analytical design process is presented for multiplexers having any number of channels with arbitrary channel complexity, bandwidths, and interchannel spacings. The theory assumes initially that independent doubly terminated designs are available for the individual filters, and formulas for modifications to parameters associated with the first two resonators are developed to match the multiplexer. These formulas are approximate, and the limitations of the theory are indicated with several computed examples. The theory is applied to the design of a five-channel interdigital multiplexer. A first-stage immittance compensation scheme is described which improves the design for limiting cases, but the theory of complete immittance compensation which handles even contiguous channel operation is reserved for a companion paper.



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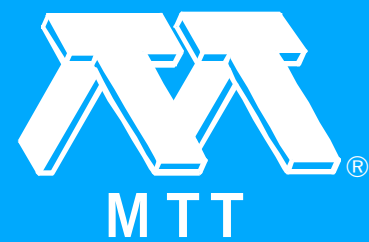
Design of General Manifold Multiplexers

J.D. Rhodes and R. Levy. "Design of General Manifold Multiplexers." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 111-123.

The direct analytical design process for arbitrary multiplexers given in a previous paper is extended to the case of bandpass channel filters connected to a uniform-impedance manifold (e.g., a length of waveguide or transmission line). The previous approximations are greatly improved by adding immittance compensation in a way which not only preserves the canonic form of the network but also assists in the physical construction by spacing the filters along a manifold. The phase shifters between channels are themselves sufficient to compensate the filter interactions to such an extent that contiguous channeling cases are designable. The results are presented mainly in closed form requiring minimal computer optimization. Analysis of multiplexers with frequency-dependent manifolds indicate that there are restrictions on the total bandwidth, but a ten-channel multiplexer is probably feasible, suitable for input and output multiplexers required in typical communications systems. Practical results on a simple manifold triplexer are presented.

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Tables for Nonminimum-Phase Even-Degree Low-Pass Prototype Networks for the Design of Microwave Linear-Phase Filters

J.H. Cloete. "Tables for Nonminimum-Phase Even-Degree Low-Pass Prototype Networks for the Design of Microwave Linear-Phase Filters." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 123-128.

The element values of a selection of even-degree nonminimum phase low-pass prototype networks with equiripple passband amplitude and constant group delay in the least squares sense over a large percentage of the passband are tabulated. All the prototypes have passband insertion loss ripple $R=0.01$ dB and cutoff frequency $\omega_c = 1.0$ rad/s at the 0.01-dB point. Five tables contain the element values of networks up to degree $N=20$. The tables are classified according to the number of transmission zeros at infinite frequency NZ_{∞} and the passband frequency to which the group delay is constant in the least squares sense ω_d . The following combinations of NZ_{∞} and ω_d are tabulated: $NZ_{\infty} = 2$ and $\omega_d=0.9$; $NZ_{\infty} = 4$ and $\omega_d=0.8$; $NZ_{\infty} = 6$ and $\omega_d=0.7$; $NZ_{\infty} = 8$ and $\omega_d=0.6$; and $NZ_{\infty} = 10$ and $\omega_d=0.5$. The maximum phase and delay errors for each network are tabulated. Plots of the passband group delay and stopband insertion loss versus frequency, for each network, accompany the tables to facilitate selection of a prototype. The prototypes are suitable for the design of narrow-band generalized interdigital, generalized direct-coupled cavity waveguide, and generalized combline linear-phase filters. A simple algorithm for the analysis of the prototypes is given.





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Band-Limited Deconvolution of Locating Reflectometer Results

P.I. Somlo. "Band-Limited Deconvolution of Locating Reflectometer Results." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 128-135.

The locating reflectometer is a frequency-swept microwave instrument which, by analog Fourier transformation, converts the reflection coefficient, a function of frequency $\Gamma(s)$, into the spatial distribution of the reflection coefficient $\Gamma(x)$. It will be shown that by the method of deconvolution an increase in axial resolution may result. By making use of the fact that the real and imaginary parts of the "locating plot" $\Gamma(x)$ are a Hilbert transform pair, a signal-to-noise ratio improvement is achieved by averaging the results of complex deconvolution using only the real and then only the imaginary parts of the locating plots. A number of experimental results are given, illustrating the increase in axial resolution when the method of band-limited deconvolution is applied to some typical waveguide components and obstacles.

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Shot-Noise in Resistive-Diode Mixers and the Attenuator Noise Model

A.R. Kerr. "Shot-Noise in Resistive-Diode Mixers and the Attenuator Noise Model." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 135-140.

The representation of a pumped exponential diode, operating as a mixer, by an equivalent lossy network, is reexamined. It is shown that the model is correct provided the network has ports for all sideband frequencies at which (real) power flow can occur between the diode and its embedding. The temperature of the equivalent network is $\eta/2$ times the physical temperature of the diode. The model is valid only if the series resistance and nonlinear capacitance of the diode are negligible. Expressions are derived for the input and output noise temperature and the noise-temperature ratio of ideal mixers. Some common beliefs concerning noise-figure and noise-temperature ratio are shown to be incorrect.

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Analysis of Varactor Frequency Multipliers: Nonlinear Behavior and Hysteresis Phenomena

E. Bava, G.P. Bava, A. Godone and G. Rietto. "Analysis of Varactor Frequency Multipliers: Nonlinear Behavior and Hysteresis Phenomena." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 141-147.

A nonlinear analysis of varactor frequency multipliers has been performed and numerically implemented to obtain the quantities that must be specified to define the quality of a multiplier used to generate high spectral purity signals for metrological purposes. The theoretical model has proved adequate to predict the existence of complicated hysteresis phenomena, confirmed by experimental investigation. The practical cases examined refer to abrupt-junction doublers and triplers operating in self-bias conditions. The circuit parameters have been determined for maximum efficiency at a given generator available power. Then, some effects of input power, frequency, and tuning variations have been investigated, and calculated curves including hysteresis cycles are shown. Beside the optimization of the multiplier operation, the equations given are sufficiently general to yield the information requested on multipliers of this kind, where the power handling capabilities of the varactor are not fully exploited but the high spectral purity of the input signals must be preserved. As an example, one of the most important features of the frequency multiplier, i.e., the AM-PM conversion, was determined in a practical case for varying input power levels.





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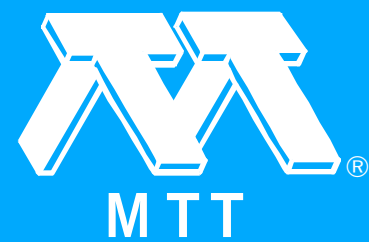
A Calculation of the Conformal Mapping Parameters Used in Evaluating the Approximate Fringing Capacitances

H.J. Riblet. "A Calculation of the Conformal Mapping Parameters Used in Evaluating the Approximate Fringing Capacitances." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 148-150.

The "approximate" fringing capacitances C'_{f0} and C'_{fe} are found by mapping the upper half plane into the interior of an infinite polygon bounded by an infinite rectangular bar and so infinite channel. The thickness of the bar t its spacing from the channel at one end $s/2$, and the width of the channel b are given in terms of two independent parameters k and a . It is shown how these relationships may be inverted and how k and a may be expressed directly in terms t/b and s/b . First, $q' = \exp(-\pi K/K')$ is expressed as an odd power series in $\exp(-\pi s/b)$ whose coefficients are irrational functions of t/b . k is given by a well known formula in terms of q' from the theory of elliptic functions and an expression for a in terms of q' and s/b is derived. Numerical values of the coefficients of the first six terms in the expansion of q' in terms of $\exp(-\pi s/b)$ for $t/b = 0.1, 0.2, 0.3, 0.4, 0.5$ are given. For this range of t/b , useable accuracy is shown for s/b as small as 0.1.

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Highly Efficient Calculation of Shielded Microstrip Structures in the Presence of Undercutting

V. Rizzoli. "Highly Efficient Calculation of Shielded Microstrip Structures in the Presence of Undercutting." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 150-157.

Shielded microstrip transmission lines of a trapezoidal cross section such as resulting from the undercutting effect are analyzed by a highly efficient numerical technique, essentially consisting in a new formulation of the integral-equation approach. First, the method of electric images is used to change the conventional Fourier-series expansion of the Green's function into a fast-converging expression allowing the time required for computation to be reduced by more than two orders of magnitude. Then, the discretization of the Fredholm integral equation for the charge density on the strip surface is carried out by the Jacobi-Gauss integration formula, ensuring optimum accuracy for a given order of the solving matrix. In this way a very powerful tool for microstrip analysis and design is obtained, combining generality of application and excellent numerical performance.

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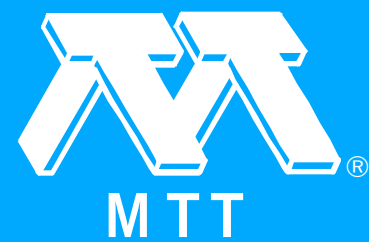
The E-Plane Step-Diaphragm Junction Discontinuity

T. Ruehle and L. Lewin. "The E-Plane Step-Diaphragm Junction Discontinuity." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 158-160.

A two-to-one E-plane step in rectangular guide is combined with a capacitive diaphragm at the junction. Singular integral equation techniques are applied, and the effect of the diaphragm in distorting the junction field is determined. The junction susceptance is shown to be augmented by a term corresponding directly to the diaphragm susceptance, with, rather surprisingly, zero net coupling effect between the step and the diaphragm.

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The Susceptance of an Annular Metallic Strip in a Circular Waveguide with Incident TE/sub 01/ Mode

T. Sugiura and H. Suga. "The Susceptance of an Annular Metallic Strip in a Circular Waveguide with Incident TE/sub 01/ Mode." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 160-167.

The principal aims of this paper are twofold: 1) to solve the problem of the scattering of a thin, perfectly conducting annular strip suspended in a multimodal circular waveguide in which any number of TE/sub 0n/ modes can propagate, and with the aid of this result, 2) to give the susceptance of the thin annular strip in monomodal circular guide with an incident TE/sub 01/ mode. These are treated with a variational approach. Applying the appropriate Green's functions to the continuity equations for the transverse electric field yields a variational expansion for the scattering matrix elements. This is treated with a Rayleigh-Ritz procedure and matrix methods. Curves of normalized susceptance as a function of the free-space wavelength and the size of the annular metallic strip are shown. These results are in good agreement with experimental data. Tables of the scattering coefficients for a typical wavelength versus strip size are also included.

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Short End Effect of Ridge Guide with Planar Circuit Mounted in a Waveguide

Y. Konishi and H. Matsumura. "Short End Effect of Ridge Guide with Planar Circuit Mounted in a Waveguide." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 168-170.

The end effect of the short end ridge guide with planar circuit mounted in a waveguide is theoretically obtained by a variational method. The results were also confirmed by measured values. The resonant frequency of a ridge guide resonator was also obtained by using the above mentioned end effect.

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Abstracts

Propagation through Hollow Cylindrical Anisotropic Dielectric Guides

B.B. Chaudhuri and D.K. Paul. "Propagation through Hollow Cylindrical Anisotropic Dielectric Guides." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 170-172.

Hybrid mode in a circular hollow anisotropic dielectric guide is reported here. The use of such guide in fabricating gas laser is compared with its isotropic counterpart. It has been shown that proper choice of anisotropic material can increase the net gain of gas lasers.



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Abstracts

Toroidal Resonator with a Conducting Separating Wall

R. Deutsch. "Toroidal Resonator with a Conducting Separating Wall." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 172-178.

The exact solution of Maxwell's equations for electromagnetic waves in toroidal resonators with a separating wall was obtained. The components of the intensities of the electric and magnetic fields, the charge densities on the toroidal surface and on the separating wall, the magnetic field lines, and the dispersion relation were determined. Both the empty torus and the coaxial torus were studied. A general method to determine in an easy way the magnetic field lines from the structure of the Hertz vector is given.



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Characteristics and Optimum Operating Parameters of a Gyrotron Traveling Wave Amplifier

K.R. Chu, A.T. Drobot, V.L. Granatstein and J.L. Seftor. "Characteristics and Optimum Operating Parameters of a Gyrotron Traveling Wave Amplifier." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 178-187.

Characteristics and optimum operating parameters are determined for a new type of high-power high-efficiency generator of millimeter waves known as a gyrotron traveling wave amplifier. In the example considered, wave amplification results from the interaction of a TE/sub 01/ waveguide mode with the fundamental cyclotron harmonic of an electron beam. The parameter optimization involves the determination of the point of maximum device efficiency as a function of beam density, beam energy, beam positioning, and external magnetic field for the output power required. An analytical linear theory and a numerical simulation code form the basis of theoretical calculations. As a result of the extensive survey in parameter space, the peak efficiency in the beam frame has been found to exceed 70 percent. This result has been applied to the specific design of a 35-GHz amplifier with output power ~340 kW, a power gain of 2 dB/cm, and a laboratory frame efficiency of 51 percent.

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Circulators Using Planar Triangular Resonators

J. Helszajn, D.S. James and W.T. Nisbet. "Circulators Using Planar Triangular Resonators." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 188-193.

This paper gives the theoretical description of 3-port circulators using planar triangular resonators. The standing-wave solution for this circulator is obtained by taking a linear combination of two $TM_{1,0,-1}$ standing waves with one of them rotated through 120° . The loaded Q factor for this junction is derived by forming the ratio of the energy stored in the circuit to that dissipated in the termination. The bandwidth of circulators using apex-coupled triangular resonators is three times that of circulators using conventional disk resonators. In the case of circulators using side-coupled triangular resonators, the bandwidth is one-third of that of the conventional arrangement.

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



Abstracts

Time Domain Analysis of SAW Reflectors

R.D. Fildes and B.J. Hunsinger. "Time Domain Analysis of SAW Reflectors." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 194-198.

A time domain analysis of high-reflectivity SAW reflector arrays is shown to yield values of stripe reflectivity, center frequency, and effective reflections plane penetration. An examination of the approach shows that the results are insensitive to device losses, RF coupling, and transducer response. Experimental results confirm the validity of the technique.



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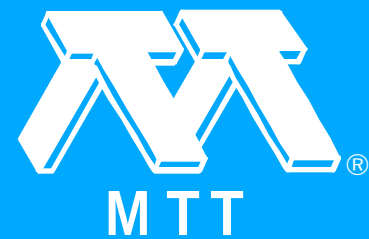
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Magnetic Wave Interactions in a Periodically Corrugated YIG Film

S.R. Seshadri. "Magnetic Wave Interactions in a Periodically Corrugated YIG Film." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 199-204.

The magnetic wave interactions in a YIG film having periodically corrugated surfaces are investigated for the ease of magnetization parallel to the propagation direction. By a singular boundary perturbation procedure, the coupled-mode equations governing the nature of the interactions are deduced and analyzed to obtain the characteristics of the interactions. Representative numerical results are presented to reveal the characteristics of the resulting wave filter.

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



Abstracts

The Effects of Nonlinear Membrane Capacity on the Interaction of Microwave and Radio Frequencies with Biological Materials

G.C. Berkowitz and F.S. Barnes. "The Effects of Nonlinear Membrane Capacity on the Interaction of Microwave and Radio Frequencies with Biological Materials." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 204-207.

A model for the capacitance of biological membranes as a function of voltage is used to predict signal mixing and difference frequency generation in membranes. Production of low-frequency signals by the biomembrane from modulated RF is predicted, and implications for macroscopic modification of membrane function are discussed.



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Abstracts

A Note on the Double Fresnel Integral (Letters)

L. Lewin. "A Note on the Double Fresnel Integral (Letters)." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 208-208.

In a recent paper Penunuri introduces the following functions:



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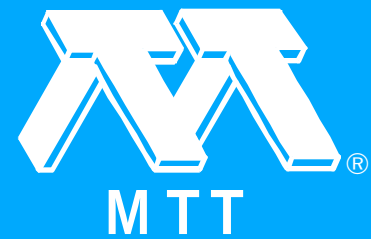


Abstracts

Sensitivity Analysis of Coupled Microstrip Directional Couplers (Correction)

S.D. Shamasundara and K.C. Gupta. "Sensitivity Analysis of Coupled Microstrip Directional Couplers (Correction)." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 208-208.

With reference to the above paper, the following corrections may be noted.



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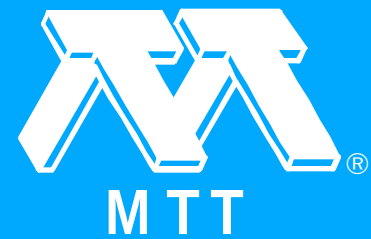


Abstracts

Coupling of Waveguides through Large Apertures (Correction)

V.M. Pandharipande and B.N. Das. "Coupling of Waveguides through Large Apertures (Correction)." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 208-208.

In the above paper, expression (13) on page 211 should read as follows:



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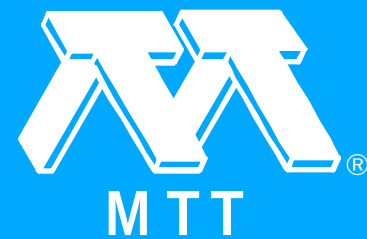
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Contributors (Feb. 1979 [T-MTT])

F.S. Barnes, E. Bava, G.P. Bava, G.C. Berkowitz, H.J. Carlin, B.B. Chaudhuri, K.R. Chu, J.H. Cloete, R. Deutsch, A.T. Drobot, R.D. Fildes, A. Godone, V.L. Granatstein, J. Helszajn, B.J. Hunsinger, D.S. James, A.R. Kerr, J.J. Komiak, Y. Konishi, R. Levy, L. Lewin, H. Matsumura, W.T. Nisbet, D.K. Paul, J.D. Rhodes, H.J. Riblet, G. Rietto, V. Rizzoli, T. Ruehle, J.L. Seftor, S.R. Seshadri, P.I. Somlo, H. Suga and T. Sugiura. "Contributors (Feb. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 209-213.



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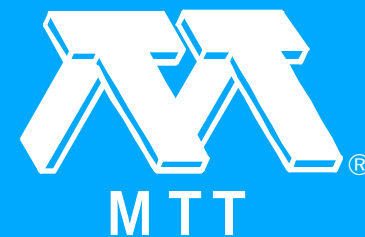
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Abstracts

IEEE Journals on Microfilm (Advertisement) (Feb. 1979 [T-MTT])

"IEEE Journals on Microfilm (Advertisement) (Feb. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 214-214.



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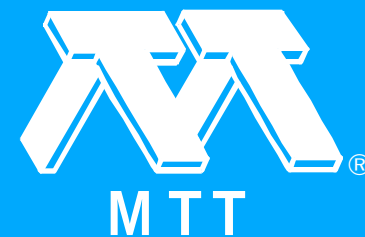
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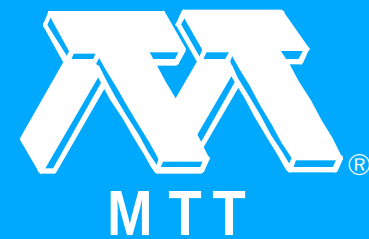
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Abstracts

Membership Application (Feb. 1979 [T-MTT])

"Membership Application (Feb. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): 216-216.



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"Back Cover (Feb. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.2 (Feb. 1979 [T-MTT]): b1-b2.



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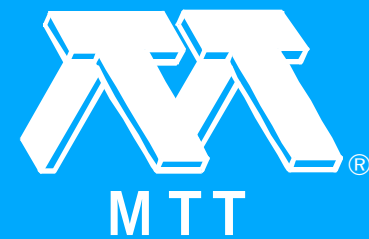
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Front Cover (Mar. 1979 [T-MTT])

"Front Cover (Mar. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): f1-f2.



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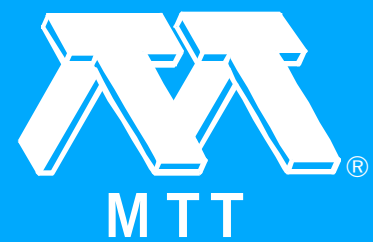
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Large Signal GaAs MESFET Oscillator Design

K.M. Johnson. "Large Signal GaAs MESFET Oscillator Design." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 217-227.

Techniques for large signal GaAs MESFET oscillator design are described which do not require repeated large signal measurement. In the first technique, small signal S-parameter measurements are used with a computer program to compute the packaged and mounted device equivalent circuit. Large signal measurements are made to determine a mathematical relationship between only those parameters which vary under large signal conditions. These relationships are included in the computer program. Then, once the equivalent circuit has been computed from the small signal S-parameter measurements, those parameters varying under large signals are incrementally altered until large signal S parameters are obtained which correspond to maximum oscillator output power. These values are used to calculate embedding element values for six oscillator topologies. A coaxial cavity FET oscillator was built and tested using the large signal design theory, and it substantially verified the design technique. The second design technique is based on the fact that S_{21} varied more than other S parameters under large signals. By making design calculations based on S_{21} reduced to the point corresponding to maximum oscillator power, it was possible to get usable design information for an FET oscillator.

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IF Conversion Gain of Glow Discharge Lamps X-Band Mixers for High LO Power Levels

N.S. Kopeika, Y. Makover and S. Schonbach. "IF Conversion Gain of Glow Discharge Lamps X-Band Mixers for High LO Power Levels." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 227-232.

Inexpensive glow discharge indicator lamps mounted in a waveguide mount are investigated as mixers at relatively high X-band local oscillator (LO) power levels. The IF conversion efficiency was found to drop off for LO power levels greater than about 30-40 mW, although no damage occurs to the lamps at higher power levels. Because of the small lamp size relative to waveguide cross section, sensitivity is much less than in the free space configuration. For many reasons the use of such devices as mixers should be much more promising at millimeter-wave frequencies than at microwave frequencies.

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Cylindrical Dielectric Resonators and Their Applications in TEM Line Microwave Circuits

M.W. Pospieszalski. "Cylindrical Dielectric Resonators and Their Applications in TEM Line Microwave Circuits." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 233-238.

A cylindrical sample of low-loss high ϵ_r placed between two parallel conducting plates perpendicular to the sample axis forms a microwave resonator. A simple approximate method for predicting the resonant frequencies of the TE modes of this structure is developed. The method becomes exact for the fitting case of this structure which is known as a dielectric post resonator. In all cases, the accuracy of the method is shown to be better than 3.5 percent. The TE_{01 δ} mode chart presented allows the determination of the resonant frequency and the tuning range of any cylindrical dielectric resonator for which $\epsilon_r \geq 10$. The properties of the dielectric resonator as a TEM line element are demonstrated experimentally.

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



Abstracts

Computer-Aided Design of Microstrip Filters Considering Dispersion, Loss, and Discontinuity Effects

R. Mehran. "Computer-Aided Design of Microstrip Filters Considering Dispersion, Loss, and Discontinuity Effects." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 239-245.

A computer-aided design procedure of microstrip filters involving junctions and discontinuities is investigated. The analysis of microstrip filters is described in detail considering dispersion, loss, and the frequency dependent properties of the microstrip discontinuities. It is found that the described analysis procedure leads to an accurate fast numerical computation of the microstrip filter properties. The theoretical results for some filter structures are compared with measurements, and theory and experiment are found to correspond closely.



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The Low-Noise 115-GHz Receiver on the Columbia-GISS 4-ft Radio Telescope

H.-I. Cong, A.R. Kerr and R.J. Mattauch. "The Low-Noise 115-GHz Receiver on the Columbia-GISS 4-ft Radio Telescope." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 245-248.

The superheterodyne millimeter-wave radiometer on the Columbia-GISS 4-ft telescope is described. This receiver uses a room-temperature Schottky diode mixer, with a resonant-ring filter as LO diplexer. The diplexer has low signal loss, efficient LO power coupling, and suppresses most of the LO noise at both sidebands. The receiver IF section has a parametric amplifier as its first stage with sufficient gain to overcome the second-stage amplifier noise. A broad-banded quarter-wave impedance transformer minimizes the mismatch between mixer and paramp. At 115 GHz, the SSB receiver noise temperature is 860 K, which is believed to be the lowest figure so far reported for a room-temperature receiver at this frequency.

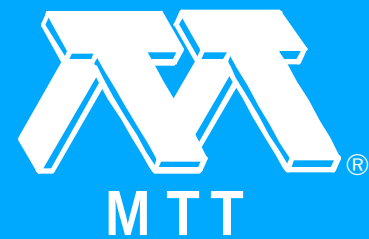
[Click on title for a complete paper.](#)



A Reflected-Wave Ruby Maser with K-Band Tuning Range and Large Instantaneous Bandwidth

C.R. Moore and R.C. Clauss. "A Reflected-Wave Ruby Maser with K-Band Tuning Range and Large Instantaneous Bandwidth." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 249-256.

A novel maser concept is outlined and a unique design described which permits wide bandwidth and waveguide tuning range by employing four stages cascaded via cryogenically cooled circulators. Theoretical considerations for gain, bandwidth, gain ripple, and noise temperature are included. Operated on a chased-cycle helium refrigerator with a superconducting persistence-mode magnet, the four-stage amplifier is tunable from 18.3 to 26.6 GHz with 30 dB of net gain and achieves 240 MHz of 3-dB bandwidth near the center of this band. The measured noise temperature is 13 ± 2 K referred to the room-temperature input flange. Applications are foreseen utilizing cooled parametric downconverters and upconverters with this amplifier at IF to extend the low-noise performance up to millimeter frequencies and down to L-band for radio astronomy and planetary spacecraft communication.



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Electrical Characterization of Transferred Electron Devices by a Novel Galvanomagnetic Technique

J. McBretney and M.J. Howes. "Electrical Characterization of Transferred Electron Devices by a Novel Galvanomagnetic Technique." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 256-265.

A novel technique is described that utilizes a galvanomagnetic phenomenon for the characterization of transferred electron devices. It is shown that this technique offers important advantages over present techniques based on the use of dummy packages and thus represents a useful analytical tool for the optimum design of transferred electron amplifier and oscillator circuits.

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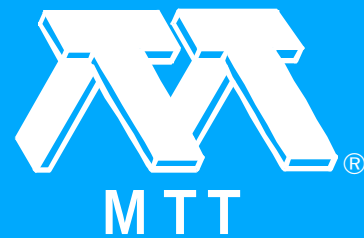


Abstracts

Tapered Block Coupling and Mode Conversion in Integrated Optics

G.A. Teh, V.C.Y. So and G.I. Stegeman. "Tapered Block Coupling and Mode Conversion in Integrated Optics." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 265-266.

High-efficiency power transfer between two planar waveguides on separate substrates has been achieved via the tapered velocity mechanism. This method is simple and easily repeatable. The same setup can also be used as a mode converter as well as a mode filter.



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Abstracts

Comparison of Microwave Irradiation at 986 versus 2450 MHz for In Vivo Inactivation of Brain Enzymes in Rats

J.L. Meyerhoff, O.P. Gandhi, J.H. Jacobi and R.H. Lenox. "Comparison of Microwave Irradiation at 986 versus 2450 MHz for In Vivo Inactivation of Brain Enzymes in Rats." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 267-270.

The pattern of enzyme inactivation in the brains of rats sacrificed by exposure to high-intensity microwave irradiation at 2450 MHz in a closed-waveguide structure is markedly altered by rotation of the rat. At 986 MHz, the pattern is relatively insensitive to rotation. These data suggest that use of lower frequencies may reduce regional variability of enzyme inactivation and lessen the requirement for immobilization during sacrifice.



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Abstracts

The Electric-Field Probe Near a Material Interface with Application to the Probing of Fields in Biological Bodies

G.S. Smith. "The Electric-Field Probe Near a Material Interface with Application to the Probing of Fields in Biological Bodies." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 270-278.

A theoretical model is formulated to determine the effect of an interface between different media on the response of an electric-field probe. The model used provides a "worst case" estimate of the interaction between the probe and the interface. The effect of the interface on the response of the probe is examined as a function of the size of the probe, the insulation on the probe, the load admittance at the terminals of the probe, the dissipation in the surrounding medium and the spacing between the probe and the interface. The use of electricity small bare and insulated probes to measure the field in the interior of biological bodies is discussed as an example. Measured results are shown to be in general agreement with the theory.



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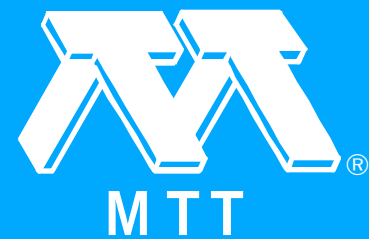
Electromagnetic Fields and Power Deposition in Body-of-Revolution Models of Man

T.-K. Wu. "Electromagnetic Fields and Power Deposition in Body-of-Revolution Models of Man." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 279-283.

Internal electromagnetic (EM) fields and power absorption in a homogeneous lossy dielectric body of revolution are evaluated using the surface integral equation method. The method yields moment method solutions for the induced current densities on the body surface. The interior fields to the body are then evaluated via the reciprocity theorem and the measurement matrix concept. The bulk body power deposition is obtained by the integration of the surface Poynting vector. The method applies for a wide range of dielectric parameters (with ϵ/ϵ_0 from 1.1 to 10^2 and σ from 0 to 10^3 mhos/m) in the resonance region. Numerical results for EM fields and power deposition in a body-of-revolution model of a human torso with height of 1.78 m are evaluated for frequencies of 30, 80, and 300 MHz. It is found that the strongest power deposition in the torso model occurs for fields polarized along the longest dimension and for frequencies near the first resonance (i.e., 80 MHz) of the torso body. Hot spots are also observed in the neck region of the torso body.

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Input Impedance of Coaxial Line to Circular Waveguide Feed (Comments)

P.K. Bondyopadhyay, B.N. Das and M.D. Deshpande. "Input Impedance of Coaxial Line to Circular Waveguide Feed (Comments)." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 284-285.

The author read with interest the above paper in conjunction with the correction to it. While attempting to apply Harrington's well-known development for a coax/rectangular waveguide transition to the coax/circular waveguide transition case, the authors arrived at results and conclusions which are highly erroneous and misleading. As explained below, (4b) and the expression for $X_{1/}$ in (6), the reactance part of the input impedance, are both incorrect. Even if the expression for $X_{1/}$ in (6) is corrected, the reactance series is clearly divergent.

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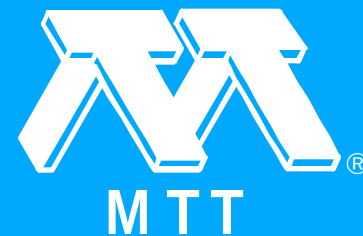


Abstracts

Note on a Correction to Aperture Admittance in Waveguide Handbook (Letters)

A.Q. Howard, Jr. and K.A. Nabulsi. "Note on a Correction to Aperture Admittance in Waveguide Handbook (Letters)." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 285-285.

An apparent error in the Waveguide Handbook for the aperture admittance of a parallel plate waveguide terminated in a flange plane has been discovered.



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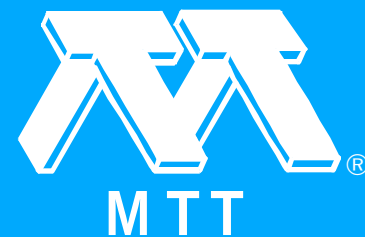
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Contributors (Mar. 1979 [T-MTT])

R.C. Clauss, H.-I. Cong, O.P. Gandhi, M.J. Howes, J.H. Jacobi, K.M. Johnson, A.R. Kerr, N.S. Kopeika, R.H. Lenox, Y. Makover, R.J. Mattauch, J. McBretney, R. Mehran, J.L. Meyerhoff, C.R. Moore, M.W. Pospieszalski, S. Schonbach, G.S. Smith, V.C.Y. So, G.I. Stegeman, G.A. Teh and T.-K. Wu. "Contributors (Mar. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 286-288.



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Call for Papers - Special Issue on Gigabit Logic for Microwave Systems (Mar. 1979 [T-MTT])

"Call for Papers - Special Issue on Gigabit Logic for Microwave Systems (Mar. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 289-289.



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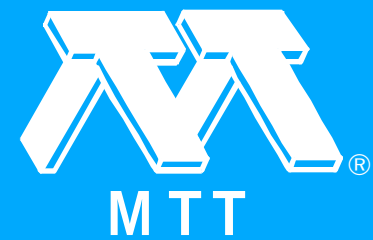
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IEEE Journals on Microfilm (Advertisement) (Mar. 1979 [T-MTT])

"IEEE Journals on Microfilm (Advertisement) (Mar. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 290-290.



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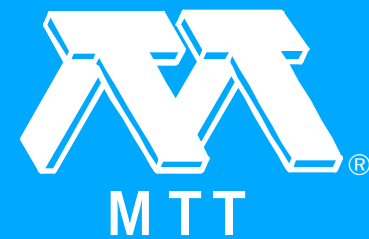
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Membership Application (Mar. 1979 [T-MTT])

"Membership Application (Mar. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.3 (Mar. 1979 [T-MTT]): 291-291.



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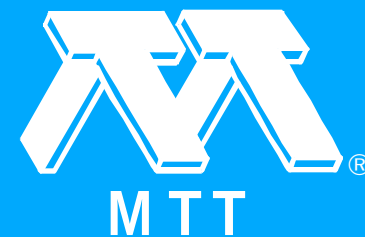
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Microstrip Characteristic Impedance

W.J. Getsinger. "Microstrip Characteristic Impedance." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 293-293.

A recent paper by Bianco et al. gives five definitions of microstrip characteristic impedance which do not have the same frequency dependence. This paper shows that the most widely used definition can be based on wave-impedance and is a unique unambiguous characteristic impedance for microstrip, consistent with characteristic impedance definitions of other waveguiding structures.

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Abstracts

The Characteristic Impedance of a Family of Rectangular Coaxial Structures with Off-Centered Strip Inner Conductors

H.J. Riblet. "The Characteristic Impedance of a Family of Rectangular Coaxial Structures with Off-Centered Strip Inner Conductors." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 294-298.

A two-parameter family of hyperelliptic integrals is exhibited which maps the upper half-phase into the interior of a rectangle pierced by a reentrant line. Since these integrals can be expressed as the sum of elliptic integrals of the first kind, the odd- and even-mode characteristic impedances of a two-parameter family of coaxial structures whose inner conductors are strips, displaced perpendicularly to their width from the center of the outer rectangular conductor, can be expressed in terms of these well-known functions. Numerical values are given for a range of values of W/B and $B_{sub 1}/B$. Here W is the width of the strip, B is the height of the outer rectangular conductor, and $B_{sub 1}$ is the distance from the strip to the farthest parallel wall of the outer conductor.



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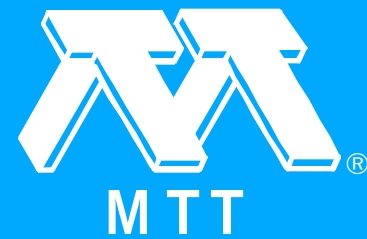


Abstracts

Analysis of Asymmetric Stripline by Conformal Mapping

J.S. Rao and B.N. Das. "Analysis of Asymmetric Stripline by Conformal Mapping." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 299-303.

This paper presents analysis of asymmetric stripline using a conformal mapping technique. The expression obtained for the characteristic impedance shows its functional dependence on the dimensions of the stripline. Equations for equipotential and flux lines and an expression for field distribution in the stripline are derived. Plots of impedance variation with strip width and strip displacement are presented.



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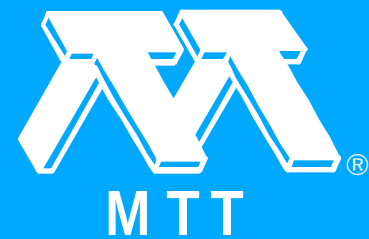
Field and Network Analysis of Interacting Step Discontinuities in Planar Dielectric Waveguides

T.E. Rozzi and G.H. in't Veld. "Field and Network Analysis of Interacting Step Discontinuities in Planar Dielectric Waveguides." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 303-309.

Planar dielectric waveguides play an important role in electrooptics and at millimeter frequencies. In many laser configurations and integrated optical components, grooves are etched in the planar surface or overlays are deposited on it. The step is an idealization of such a discontinuity. Step discontinuities are seldom isolated. Mostly a cascade is employed. The aim of this paper is to derive, from a rigorous field analysis an accurate finite network description for such cascades, either finite or infinite, periodic or aperiodic, which takes account also of the continuous spectrum. Numerical examples are given.

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Analysis of Discontinuities in Dielectric Waveguides by Means of the Least Squares Boundary Residual Method

K. Morishita, S.-I. Inagaki and N. Kumagai. "Analysis of Discontinuities in Dielectric Waveguides by Means of the Least Squares Boundary Residual Method." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 310-315.

A novel approach to analyze the discontinuities in open-type transmission lines is proposed. The method used is the least squares boundary residual technique which has been applied previously to treat the boundary-value problems in closed-type transmission lines. As an example of application of our approach the reflected, transmitted, and radiated waves caused by the transverse displacement at the junction of two dielectric slab waveguides are calculated.

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Computer-Aided Design of H-Plane Waveguide Junctions with Full-Height Ferrites of Arbitrary Shape

N. Okamoto. "Computer-Aided Design of H-Plane Waveguide Junctions with Full-Height Ferrites of Arbitrary Shape." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 315-321.

A method for solving the problem of H-plane waveguide junctions with a full-height ferrite post of arbitrary shape is proposed. The junctions are allowed to have arbitrary cross section and arbitrary number of ports. The method is based on the integral equations derived from the reciprocity theorems in both the ferrite region and the air region ranging from the reference planes of connecting waveguides to the inside of the junction. For comparison with the previously published experimental and theoretical results, Y junctions with a circular ferrite post are first treated. Excellent agreement has been found between the experimental data and the numerical results obtained by the present method. The performance of a Y-junction circulator with a triangular ferrite post having rounded angles is next investigated. Both the ferrite geometry and the internal dc magnetic field are examined in detail. For this geometry the calculated 20-dB bandwidth has been found to become greater as the cross section of the ferrite approaches a regular triangle from a circle.

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Multiple-Frequency Operation of Y-Junction Circulators Using Single-Mode Approximation

E.R.B. Hansson and K.G. Filipsson. "Multiple-Frequency Operation of Y-Junction Circulators Using Single-Mode Approximation." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 322-328.

The conditions for a Y-junction circulator to operate within more than one frequency band are studied. By taking into account only the dominant resonance mode at each circulation frequency, explicit expressions are obtained which define the properties of the circulator. The results are presented in diagrams and tables which enable rapid evaluation of obtainable performance for some of the most important mode combinations. The validity of the results are experimentally verified.

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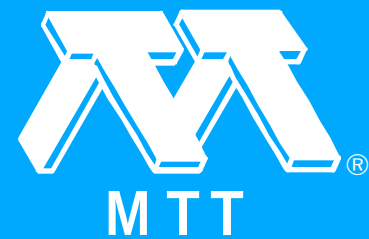
The Magnetic-Dipole Resonances of Ring Resonators of very High Permittivity

M. Verplanken and J. Van Bladel. "The Magnetic-Dipole Resonances of Ring Resonators of very High Permittivity." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 328-333.

The lowest magnetic-dipole mode with symmetry of revolution is investigated in a coaxial ring resonator of height L , inner radius b , and outer radius a . Theoretical data are given about the Q of the mode, the eigen magnetic dipole at resonance, and the structure of the fields (electric and magnetic) inside and outside the resonator. The variables are the dielectric constant $\epsilon_r = N^2$ and the dimensionless ratios b/a and $L/2a$. The data are valid in the limit of very high ϵ_r . Experiments show them to be already useful at $\epsilon_r = 35$.

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Electromagnetic Properties of Shielded Ring Lines and Attenuation of the Fundamental Dipolar Mode

C. Fray and A. Papiernik. "Electromagnetic Properties of Shielded Ring Lines and Attenuation of the Fundamental Dipolar Mode." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 334-340.

This paper presents a theoretical analysis of the electromagnetic properties of the shielded ring line and provides expressions for field components, stored energy, and power flow. The dispersion relation obtained by equating electric and magnetic stored energies is discussed. The shielded ring line is shown to have a fundamental dipolar hybrid mode. The attenuation of this mode is evaluated. Measurements have corroborated the theoretical values.

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Abstracts

A General Reciprocity Theorem

P.R. Mclsaac. "A General Reciprocity Theorem." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 340-342.

A general reciprocity theorem based on the Onsager relations is developed which applies to all casual and linear media, including those whose ac susceptibilities depend on an applied dc magnetic field and on the dc drift velocity of charge carriers. Applications are made to the scattering matrix for microwave junctions and to the mode orthogonality relations for uniform and periodic waveguides.



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Complex Reciprocity Theorem for Multiregions, with Piezoelectric Media and Surface Impedance

M. Kobayashi and T. Sugita. "Complex Reciprocity Theorem for Multiregions, with Piezoelectric Media and Surface Impedance." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 343-345.

It is shown that the complex reciprocity theorem holds for regions bounded by inhomogeneous anisotropic impedance surfaces and composed of lossless inhomogeneous and piezoelectric media. Also, the complex reciprocity theorem is obtained in the quasi-electrostatic form.



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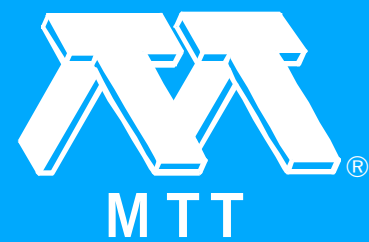
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Application of Generalized Characteristic Vectors to Problems of Propagation in Clad Inhomogeneous Dielectric Waveguides

E. Bahar and B.S. Agrawal. "Application of Generalized Characteristic Vectors to Problems of Propagation in Clad Inhomogeneous Dielectric Waveguides." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 345-352.

A transformation matrix that uses generalized characteristic vectors is used to convert Maxwell's equations into a set of loosely coupled equations for the wave amplitudes. This transformation is suitable for permittivity profiles with turning points. In earlier full-wave solutions to these equations, several special functions that account for the local features of the permittivity profile, especially near the turning points, were used to obtain appropriate expansions of the fields. The transverse field components, the propagation coefficients, as well as the phase and group velocities, are computed for both horizontally polarized (TE) and vertically polarized (TM) modes of the dielectric waveguides using the full-wave approach. These solutions are compared with analytic solutions for waveguides with special permittivity profiles. They are also compared with recently published results based on a perturbational approach.

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Modal Analysis of Homogeneous Optical Fibers with Deformed Boundaries

E. Yamashita, K. Atsuki, O. Hashimoto and K. Kamijo. "Modal Analysis of Homogeneous Optical Fibers with Deformed Boundaries." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 352-356.

The modal characteristics of homogeneous optical fibers with several types of deformed boundaries are analyzed by a numerical method on the point-matching principle. The propagation constants of various modes are given. The separation of degeneracy in the dominant is discussed. The results of microwave-model experiments show good agreement with those of calculation.



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The Network Representation and the Unloaded Q for a Quasi-Optical Bandpass Filter

M.H. Chen. "The Network Representation and the Unloaded Q for a Quasi-Optical Bandpass Filter." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 357-360.

A simplified equivalent network for a quasi-optical bandpass filter consisting of several wire-grid polarizers has been developed based upon the concept of local coordinates. Various modes of loss are evaluated, and the equivalent unloaded Q is computed.



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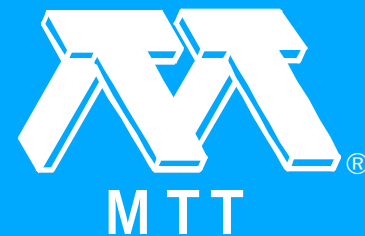
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Contributors (Apr. 1979 [T-MTT])

B.S. Agrawal, K. Atsuki, E. Bahar, M.H. Chen, B.N. Das, K.G. Filipsson, C. Fray, W.J. Getsinger, E.R.B. Hansson, O. Hashimoto, S.-I. Inagaki, G.H. in't Veld, K. Kamijo, M. Kobayashi, N. Kumagai, P.R. Mclsaac, K. Morishita, N. Okamoto, A. Papiernik, J.S. Rao, H.J. Riblet, T.E. Rozzi, T. Sugita, J. Van Bladel, M. Verplanken and E. Yamashita. "Contributors (Apr. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.4 (Apr. 1979 [T-MTT]): 361-364.



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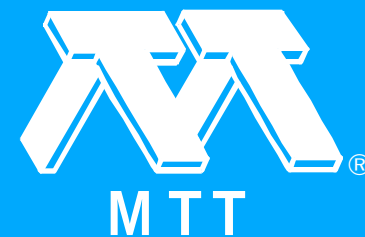
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Front Cover (May 1979 [T-MTT])

"Front Cover (May 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): f1-f2.



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Foreword (May 1979 [T-MTT])

B. Berson and H.J. Kuno. "Foreword (May 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 365-366.

Solid-state devices have been key to the development of today's microwave systems. radars, communications systems, and EW systems currently in use offer advantages in performance, size, reliability, and cost that would certainly not be possible without these devices. Equally certain is the fact that the future course of microwave and millimeter-wave systems will be determined by solid-state devices currently under development.



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GaAs Power MESFET's: Design, Fabrication, and Performance

J.V. DiLorenzo and W.R. Wisseman. "GaAs Power MESFET's: Design, Fabrication, and Performance." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 367-378.

This paper reviews the state of the art of power GaAs MESFET's. Items that will be covered are the operating principles of the device from a material and geometric point of view, the design, fabrication sequences, and material structures used by various laboratories, the factors identified as important to power by workers in the field the performance of the device in terms of frequency effects, power per unit gate-width effects, scaling from small to large gate-width devices, and voltage effects. In addition, the circuit applications of GaAs FET's will be briefly discussed.

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Abstracts

A Unified Approach to the Design of Wide-Band Microwave Solid-State Oscillators

G.R. Basawapatna and R.B. Stancliff. "A Unified Approach to the Design of Wide-Band Microwave Solid-State Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 379-385.

Present design techniques for broad-band tunable MESFET and bipolar transistor oscillators are indirect and tedious. We present new technique based on negative resistance concepts and a new theorem herein stated and proven. This technique is developed through two design examples a 5.9-12.4-GHz MESFET oscillator and a 2-8.4-GHz bipolar transistor oscillator.



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Transmission-Type Injection Locking of GaAs Schottky-Barrier FET Oscillators

Y. Tajima and K. Mishima. "Transmission-Type Injection Locking of GaAs Schottky-Barrier FET Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 386-391.

Transmission-type injection-locked oscillators equipped with both signal-input and power-output ports are studied. A comparison with traditional reflection-type injection-locked oscillators, in which a signal is injected into the output port of the oscillator, is presented theoretically. It is shown that the locking range of transmission types always differs from the reflection type by a factor of G_{s}/G_{p} where G_{s} represents the maximum stable gain of the two-port oscillator and G_{p} represents the square root of the output power ratio of the two ports. Experiments on common-source injection-locked oscillators using GaAs FET chips are described and show that, with transmission types, a 1.8 times wider locking range can be obtained than with reflection types. Furthermore, investigation of FM noise for both types of injection revealed lower off-carrier FM noise for transmission types than reflection types, even though the locking gain of the transmission types was kept the same as that of reflection types. Thus overall features of transmission-type injection locking were found to be advantageous for FM signal amplification even though there is a minimal power loss at the signal input port.





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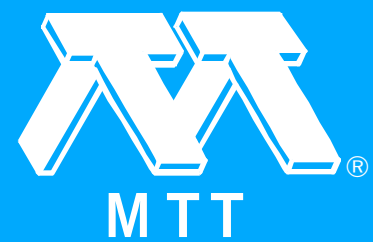
Common-Drain Flip-Chip GaAs FET Oscillators

R.L. Camisa and F.N. Sechi. "Common-Drain Flip-Chip GaAs FET Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 391-394.

GaAs FET oscillators with flip-chip mounted devices in a novel common-drain configuration are described. It is shown how common-drain oscillators can achieve low thermal resistance while at the same time minimizing parasitics. It is also shown that broad-band negative resistances can be generated without external feedback elements. This paper also reports experimental results where output powers of 390 mW with 22-percent efficiency at 8.5 GHz and 230 mW with 26-percent efficiency at 11.7 GHz have been demonstrated.

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11-GHz GaAs Power MESFET Load-Pull Measurements Utilizing a New Method of Determining Tuner Y Parameters

H. Abe and Y. Aono. "11-GHz GaAs Power MESFET Load-Pull Measurements Utilizing a New Method of Determining Tuner Y Parameters." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 394-399.

A load-pull technique utilizing a new method of determining tuner Y parameters is proposed for huge-signal characterization of microwave power transistors. Large-signal input-output transfer characteristics of an active circuit containing a GaAs FET and an input matching circuit are measured by inserting a microstrip tuner between the active circuit output drain terminal and the 50- Ω load. The microstrip-tuner Y parameters are determined by comparing the dc bias-dependent small-signal S parameter S_{22} of the active circuit and that of the circuit which contains the active circuit and microstrip tuner. The reflection coefficient presented to the active circuit output drain terminal is derived from tuner Y parameters. Optimal load impedances for output power, obtained with this new load-pull technique, are used to design X-band GaAs FET power amplifiers. An 11-GHz power amplifier with a 3000- μm gate-width FET chip delivers 1-W microwave power output with 4-dB gain in the 500-MHz band.





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Third-Order Intermodulation Distortion and Gain Compression in GaAs FET's

R.S. Tucker. "Third-Order Intermodulation Distortion and Gain Compression in GaAs FET's." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 400-408.

A simple unilateral nonlinear circuit model of a GaAs FET is used in the analysis of the third-order intermodulation distortion and gain compression characteristics of a single-stage amplifier. Expressions are obtained for these characteristics, relating them to the input power level and to the device load admittance. The expressions are illustrated with contours on the load admittance plane of constant intermodulation distortion ratio, intercept point gain compression, AM-to-PM conversion, and output power, and as output power versus input power plots for fixed terminations. Agreement with experimentally measured distortion characteristics is good.

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23-GHz Band GaAs MESFET Reflection-Type Amplifier

H. Tohyama and H. Mizuno. "23-GHz Band GaAs MESFET Reflection-Type Amplifier." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 408-415.

A new method is presented for applying a packaged GaAs MESFET to an amplifier in the frequency region above 20 GHz, using package resonance as a positive feedback element and operating GaAs MESFET as a negative resistance two-terminal device in a reflection-type amplifier. Experimentally, a 6-dB noise figure in the 23-GHz band and a 8-dB noise figure in the 27-GHz band have been achieved.

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Performance of a Dual-Gate GaAs MESFET as a Frequency Multiplier at Ku-Band

P.T. Chen, C.-T. Li and P.H. Wang. "Performance of a Dual-Gate GaAs MESFET as a Frequency Multiplier at Ku-Band." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)).

The fabrication and characteristics of a dual-gate GaAs MESFET are briefly described. The feasibility of using a dual-gate GaAs MESFET as a novel frequency multiplier over Ku-band with good conversion gain is demonstrated. The multiplier achieved 8-dB conversion gain with frequency doubling at 12.6 GHz and 2.5-dB gain with frequency tripling at 12 GHz. In addition, it possessed a built-in control of conversion gain over a 36-dB dynamic range.

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Abstracts

Silicon Bipolar Microwave Power Transistors

R. Allison. "Silicon Bipolar Microwave Power Transistors." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 415-422.

This paper presents a review of the present states of commercially available silicon bipolar transistors and projects what power at frequency performance will be available in the next few years. It discusses the need for implementing certain fabrication/processing developments necessary to meet the projected power at frequency performance levels.



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Bipolar Microwave Linear Power Transistor Design

J.T.C. Chen and C.P. Snapp. "Bipolar Microwave Linear Power Transistor Design." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 423-430.

Design considerations for n-p-n bipolar microwave linear power transistors are discussed. Optimization procedures are presented for determining emitter width for a specific operation frequency, emitter ballasting resistance, and active area geometry based on calculated temperature distributions. A transistor chip designed for 4-GHz operations using these procedures achieved a linear power output of 27.5 dBm at a 1-dB compressed gain of 7 dB with a power added efficiency of 23 percent. Junction temperature rise was limited to 90°C.

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Improvement of a Class-C Transistor Power Amplifier by Second-Harmonic Tuning

S.R. Mazumder, A. Azizi and F.E. Gardiol. "Improvement of a Class-C Transistor Power Amplifier by Second-Harmonic Tuning." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 430-433.

Considerations for the effects of second-harmonic reactive terminations on the performances of a UHF class-C transistor power amplifier are presented. An experimental amplifier circuit design using coupled-TEM-bar transmission lines is described. This circuit can vary the fundamental and the second-harmonic impedance terminations of the amplifier independently. With this amplifier circuit, significant improvement in the performance characteristics of a class-C power amplifier were achieved by presenting proper values of second-harmonic reactive terminations, both at the input and the output of the transistor.

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Progress with CW IMPATT Diode Circuits at Microwave Frequencies

J.W. Gewartowski. "Progress with CW IMPATT Diode Circuits at Microwave Frequencies." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 434-442.

Progress with CW operation of IMPATT diodes at frequencies up to 20 GHz is reviewed, with emphasis on their circuit applications. Noise properties, stability criteria, and reliability are discussed. Comparisons are made between flat-profile and modified-Read-profile diodes. Examples of oscillator and amplifier circuits are presented.



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High-Frequency Limitations of IMPATT, MITATT, and TUNNETT Mode Devices

M.E. Elta and G.I. Haddad. "High-Frequency Limitations of IMPATT, MITATT, and TUNNETT Mode Devices." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 442-449.

High-frequency limitations of IMPATT and other mode devices are explored by concentrating on the details of the large-signal injected current pulse formation. Simple waveform models are given for injected current pulses of large widths, and various scaling relations are also included. The large-signal injected current pulse is calculated by use of a modified Read equation where attention is given to the effect of the intrinsic response time and the tunneling current. The poor high-frequency performance of GaAs devices is explained by postulating that the intrinsic response time is larger than expected. Tunneling current is shown to increase the high-frequency performance of GaAs diodes. Device efficiencies are calculated for specific diode structures by using a computer simulation which includes mixed avalanche-tunnel breakdown. The results for GaAs and Si devices are given, and the results are discussed and compared.





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High Peak Pulse Power Silicon Double-Drift IMPATT Diodes

G. Pfund and R. Curby. "High Peak Pulse Power Silicon Double-Drift IMPATT Diodes." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 450-451.

The performance of high peak pulse power silicon double-drift IMPATT devices operated at medium pulse repetition frequency are discussed. Several devices were characterized and achieved more than 45-W peak pulse power with 10-percent duty cycle at 9.7 GHz. Conversion efficiencies in the order of 9.7-11.2 percent were observed. These results compare with previously reported 19-W peak power, 10-percent duty-cycle, and 9.5-percent efficiency.

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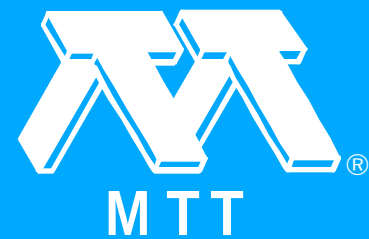
Nonlinear Noise Theory for Synchronized Oscillators

K.F. Schunemann and K. Behm. "Nonlinear Noise Theory for Synchronized Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 452-458.

A nonlinear theory of noise in synchronized oscillators is outlined, thus extending Kurokawa's work from small to arbitrary injection levels. The description is of phenomenological nature: it uses the describing function method of control theory for calculating the carrier waves, and the circuit theory of periodically driven nonlinear systems for an analysis of the noise sidebands. Simple expressions are derived for the various output noise and noise conversion factors in the case when the nonlinear characteristic of the active device can be described by a third-order (van-der-Pol) polynomial.

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Microwave Characterization of Silicon BARITT Diodes Under Large-Signal Conditions

G.K. Montress and M.S. Gupta. "Microwave Characterization of Silicon BARITT Diodes Under Large-Signal Conditions." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 458-462.

Experimental measurements of the small- and large-signal admittance of a silicon BARITT diode are reported. The structural characteristics of the devices are also reported, so that the results provide a basis for evaluating the large-signal analyses of BARITT diodes. A lumped-element frequency-independent equivalent circuit is proposed to represent the terminal characteristics of the device over a broad-frequency range, and is verified by comparison with the measured admittances. Simple approximations are given to describe the dependence of the device admittance on the three operating point parameters: dc bias current, signal frequency, and RF signal level.

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Abstracts

Design and Performance of I-Band (8-10-GHz) TRAPATT Diodes and Amplifiers

C.H. Oxley, A.M. Howard and J.J. Purcell. "Design and Performance of I-Band (8-10-GHz) TRAPATT Diodes and Amplifiers." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 463-471.

The design and fabrication of I-band silicon TRAPATT diodes are described, and the results of both oscillator and amplifier measurements are presented. The paper includes details of the design and characterization of a cascaded three-stage TRAPATT amplifier.



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Microwave Power Combining Techniques

K.J. Russell. "Microwave Power Combining Techniques." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 472-478.

A review of various techniques for coherently combining microwave power from two or more sources is presented. Emphasis is placed on techniques which combine solid-state power sources. Basic operating characteristics and limitations for the different combiner types are discussed. The performances obtained with the most successful techniques are described. Future trends in combining RF power from solid-state sources are identified.

Click on title for a complete paper.



Abstracts

Techniques for Increasing the Bandwidth of a TM/sub 010/-Mode Power Combiner

R. Aston. "Techniques for Increasing the Bandwidth of a TM/sub 010/-Mode Power Combiner." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 479-482.

A computer analysis of the TM/sub 010/-mode power combiner for N diodes is described which identifies circuit parameters that increase the bandwidth of the power combiner. These parameters reduce the external Q and provide unique techniques for increasing the bandwidth of injection-locked power combiners. Comparisons with external Q measurements give experimental verification of the analysis.



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Millimeter-Wave CW IMPATT Diodes and Oscillators

T.A. Midford and R.L. Bernick. "Millimeter-Wave CW IMPATT Diodes and Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 483-492.

This paper summarizes the current state of the art of silicon CW millimeter-wave IMPATT diodes and oscillators in the frequency range from 30 to 250 GHz. Design procedures, fabrication, and packaging technology are reviewed, and the current performance of diode oscillators is reported. A brief account of present device reliability is also presented. The contrast between maturing device technology below 100 GHz and largely laboratory-based technology at higher frequencies is discussed. Finally, a prognosis of future developments is offered.

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Abstracts

Millimeter-Wave Pulsed IMPATT Sources

T.T. Fong and H.J. Kuno. "Millimeter-Wave Pulsed IMPATT Sources." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 492-499.

High-power millimeter-wave pulsed MPATT sources have found a variety of applications as solid-state transmitters in radar applications. These applications have been greatly enhanced by the rapidly advancing millimeter-wave technology of which the high-power pulsed IMPATT source is a key element. In this paper the unique IMPATT properties which affect the oscillator spectral purity and coherency are reviewed. Some key considerations for the device design and system applications of the pulsed oscillators are discussed along with the state of the art, recent progress, and future trend.



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High Effective Subharmonic Injection Locking of a Millimeter-Wave IMPATT Oscillator

R. Hayashi and Y. Asano. "High Effective Subharmonic Injection Locking of a Millimeter-Wave IMPATT Oscillator." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 500-504.

Abstract-Effective stabilization of an IMPATT oscillator in the millimeter-wave region can be achieved through subharmonic injection locking to a weak parasitic oscillating signal. In subharmonic injection-locking experiments more than 19 dB of locking gain at 10-MHz locking range was obtained at a subharmonic ratio 1:2 of the main oscillating frequency. At the subharmonics 1:4 and 1:6, the locking gain was more than 12 and 13 dB at 10 MHz, respectively. Using the parasitic oscillating signal, higher than 32-dB gain and 10-MHz locking range at a subharmonic ratio 1:2 of the parasitic oscillating frequency was obtained. This locking gain was 13 dB higher than that for the main oscillating signal. At the subharmonic ratio 1:4, the gain was more than 15 dB higher. As measured with the spectrum analyzer, the oscillating signal which was locked by the subharmonic injection signal almost coincided with the injection signal. These data show that the subharmonic injection locking has high gain as compared with that using the main oscillating signal.

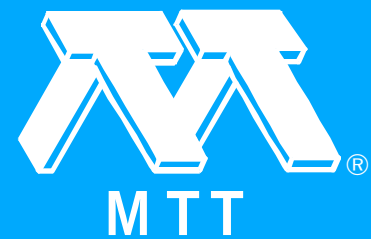


Abstracts

Millimeter-Wave Pretuned Modules

G. Cachier, J. Espagnol and J. Stevance. "Millimeter-Wave Pretuned Modules." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 505-510.

This paper presents pretuned modules for millimeter-wave devices. A general description of the device, some new developments of the technology, and the different techniques used for its characterization are covered. It is shown how the bias-to-waveguide coupling is made, and how these techniques lead to an oscillator which radiates directly into free space.



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Abstracts

A Dual-Diode 73-GHz Gunn Oscillator

A.K. Talwar. "A Dual-Diode 73-GHz Gunn Oscillator." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 510-512.

It is shown that two resonant cap structures can be mounted in a common waveguide to combine power from two Gunn diodes. Approximately 80-mW power was obtained at 73 GHz.



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Abstracts

A Tunable High-Power V-Band Gunn Oscillator

C. Sun, E. Benko and J.W. Tully. "A Tunable High-Power V-Band Gunn Oscillator." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 512-514.

A method of combining two Gunn devices has been developed in the 50-60-GHz band. A power output of 23.75 dBm with a mechanical tuning range of 6 GHz has been achieved. A varactor-tuned Gunn source with an electronic tuning bandwidth of 200 MHz has also been demonstrated in the V band.



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Distributed Bragg Reflector Gunn Oscillators for Dielectric Millimeter-Wave Integrated Circuits

T. Itoh and F.-J. Hsu. "Distributed Bragg Reflector Gunn Oscillators for Dielectric Millimeter-Wave Integrated Circuits." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 514-518.

A new Gunn oscillator is proposed for microwave and millimeter-wave integrated circuits. The device consists of a Gunn diode placed in a dielectric waveguide in which grating structures are created. The gratings provide frequency-selective feedback to the diode enabling a stable oscillation. After the design principle is presented, observed oscillation characteristics of prototype oscillators are reported. Some problems as well as future directions for improvement are discussed. Potential applications as multiple-element high-power oscillators are also proposed.

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Frequency Triplers and Quadruplers with GaAs Schottky-Barrier Diodes at 450 and 600 GHz

T. Takada and M. Ohmori. "Frequency Triplers and Quadruplers with GaAs Schottky-Barrier Diodes at 450 and 600 GHz." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 519-523.

Submillimeter-wave solid-state sources have been developed with a frequency tripler and a frequency quadrupler driven by an 150-GHz band IMPATT oscillator. The tripler and quadrupler delivered an output power of -9.3 dBm at 447 GHz with a conversion loss of 20 dB, and -28 dBm at 589 GHz with a conversion loss of 39 dB, respectively. The frequency multiplication was performed by use of GaAs-Ni-Au schottky-barrier diodes with junction diameter of 1-3 μm and hybrid integrated circuit techniques.

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Microwave Semiconductor Control Devices

R.V. Garver. "Microwave Semiconductor Control Devices." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 523-529.

Three topics on microwave semiconductor control devices are discussed: field effect transistors (FET's), switching speed and power, and millimeter-wave devices. This paper reviews present switching, limiting and phase modulating with FET's and proposes a new structure for switching with them. Present efforts to resolve the gap between theory and practice for present speed and power limitations are summarized and some definitions that are needed for specifying switching speed are suggested. Also, the state of the art of millimeter-wave switching and phase modulating is presented with the conclusions that waveguide reflection devices perform excellently up to 100 GHz, fin-line devices perform even better to 40 GHz and may be useful up to 100 GHz, and long distributed p-i-n junction devices in a dielectric waveguide are able to phase shift moderate power levels at frequencies above 100 GHz, but at relatively slow switching speeds.

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A Wide-Band Mechanically Stable Quasi-Optical Detector for 100-300 GHz

R. Kawasaki and K. Yamamoto. "A Wide-Band Mechanically Stable Quasi-Optical Detector for 100-300 GHz." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 530-533.

A wide-band mechanically stable quasi-optical detector for 100-300-GHz waves propagating in free space has been constructed. The circuit consists of a whisker diode and an oversized waveguide tuning section. The whisker diode using a honeycomb p-Si Schottky-barrier diode chip is placed on the aperture of the oversized waveguide open to the free space. For an incident power of 1 W/m², output voltage of 10-0.1 mV is obtained over the 100-300-GHz range. The present detector looks attractive for practical use in wide-band instrumentation.

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Abstracts

An Avalanching Optoelectronic Microwave Switch

R.A. Kiehl. "An Avalanching Optoelectronic Microwave Switch." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 533-539.

A new optoelectronic microwave switching device is described. The device is composed of a Semiconductor junction diode that is incorporated into a transmission line and illuminated with optical pulses from a semiconductor laser. Switching of microwave signals is achieved by changes in the RF impedance of the diode's high-field region resulting from an optically induced switching between low and high-level avalanche states. Experimental results demonstrating the switching characteristics and speed of this device are presented along with a basic theory of operation. The ultimate capabilities of this device and its advantages over conventional p-i-n diode switches and other optoelectronic switching devices are also discussed.



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Abstracts

Electrically Controllable Liquid Artificial Dielectric Media

H.T. Buscher. "Electrically Controllable Liquid Artificial Dielectric Media." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 540-545.

New work is reported on electric field controlled liquid dielectrics demonstrating their application in control devices at 35 and 95 GHz. Liquid artificial dielectric design approaches and performance prediction are also discussed, with emphasis on electronic beam steering of millimeter-wave antennas. References are included listing much of the prior work done in this area.



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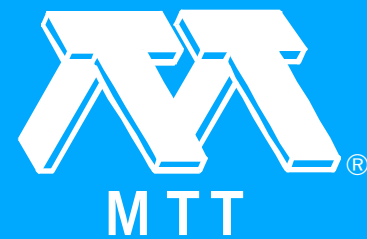
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H. Abe, R. Allison, Y. Asano, Y. Aono, R. Aston, A. Azizi, G.R. Basawapatna, K. Behm, E. Benko, R.L. Bernick, H.T. Buscher, G. Cachier, R.L. Camisa, J.T.C. Chen, P.T. Chen, R. Curby, J.V. DiLorenzo, M.E. Elta, J. Espaignol, T.T. Fong, F.E. Gardiol, R.V. Garver, J.W. Gewartowski, M.S. Gupta, G.I. Haddad, R. Hayashi, A.M. Howard, F.-J. Hsu, T. Itoh, R. Kawasaki, R.A. Kiehl, H.J. Kuno, C.-T. Li, S.R. Mazumder, T.A. Midford, K. Mishima, H. Mizuno, G.K. Montress, M. Ohmori, C.H. Oxley, G. Pfund, J.J. Purcell, K.J. Russell, K.F. Schunemann, F.N. Sechi, C.P. Snapp, R.B. Stancliff, J. Stevance, C. Sun, Y. Tajima, T. Takada, A.K. Talwar, H. Tohyama, R.S. Tucker, J.W. Tully, P.H. Wang, W.R. Wisseman and K. Yamamoto. "Contributors (May 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 546-554.



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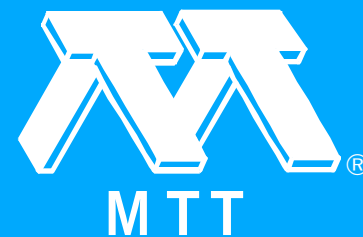
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IEEE Journals on Microfilm (Advertisement) (May 1979 [T-MTT])

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Membership Application (May 1979 [T-MTT])

"Membership Application (May 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 556-556.



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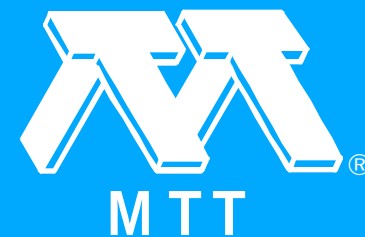
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Back Cover (May 1979 [T-MTT])

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"Front Cover (Jun. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): f1-f2.



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An Approximation for the Characteristic Impedance of Shielded-Slab Line

H.J. Riblet. "An Approximation for the Characteristic Impedance of Shielded-Slab Line." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 557-559.

It is shown how the parametric expressions for t/b and w/b of shielded-slab line, given by means of elliptic integrals in terms of two independent real parameters a and k , can be inverted. First $q' = \exp(-\pi K/K')$ is expressed as an odd power series in $\exp(-\pi w/(b-t))$ whose coefficients are irrational functions of t/b . Here, w is the width of the slab, t is its thickness, and b is the spacing between the infinite parallel plates. Then k is expressed in terms of q' by a well-known formula, and an expression is derived which gives a in terms of q' and $w/(b-t)$. When the series expressions for a and k are substituted in the formulas which yield the total capacitance $C_{\text{sub } 0}$, of the shielded-slab line, it is found that the fringing capacitance $C_{\text{sub } f0} = C_{\text{sub } 0}/4 - w/(b-t)$, is given by an even power series in $\exp(-\pi w/(b-t))$, at least to the eighth power. These coefficients, which are irrational functions of t/b , are given explicitly. Finally, comparisons are made with exact values of $Z_{\text{sub } 0}$.

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The E-Plane Taper Junction in Rectangular Waveguide

L. Lewin. "The E-Plane Taper Junction in Rectangular Waveguide." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 560-563.

This paper compares formulas for reflection in rectangular waveguide from an E-plane junction with radial guide. There is a major discrepancy between results for the junction parameters from earlier results of the author and those in the Waveguide Handbook. The two sets of results are discussed; the Handbook result is apparently in error, but the formulas do not seem capable of reconciliation. Limitations and slight improvements on the author's earlier result are given, together with supporting measurements taken at X band.

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Abstracts

Capacitance of the Abrupt Transition from Coaxial-to-Circular Waveguide

M. Razaz and J.B. Davies. "Capacitance of the Abrupt Transition from Coaxial-to-Circular Waveguide." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 564-569.

A least-squares boundary residual method is applied to calculate the discontinuity capacitance of an abrupt transition from coaxial-to-circular waveguide. Accurate values of the capacitance are presented here and compared with published results. Our results are believed to be accurate to about ± 0.1 fF and hence suitable for standards work.



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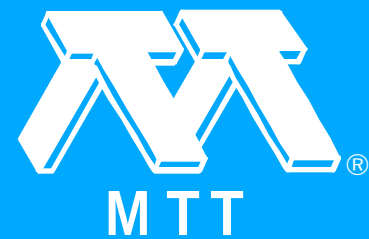
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Cutoff Wavenumbers of Goubau Lines

J.G. Fikioris and J.A. Roumeliotis. "Cutoff Wavenumbers of Goubau Lines." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 570-573.

The cutoff wavenumbers k_{nm} of the surface wavemodes in a Goubau line are determined by a procedure that leads directly to the eigenvalue equation in the limit of zero values for the wavenumber of the infinite exterior medium. The same result has been obtained by a much longer procedure based on an extension of previous methods used in correction with simple dielectric waveguides. Numerical results and related curves for all types of modes are also included.

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Abstracts

A Study of Waveguides for Far Infrared Interferometers Measuring Electron Density of Tokamak Plasmas

J.P. Crenn. "A Study of Waveguides for Far Infrared Interferometers Measuring Electron Density of Tokamak Plasmas." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 573-577.

In the 0.1-1-mm wavelength range, waveguide propagation offers some advantages over optical propagation in multichannel infrared interferometers measuring electron density of Tokamak plasmas. In this paper, the necessary conditions for use of waveguides for this purpose are defined. Possible waveguides are theoretically and experimentally studied, taking into account their shape, size, material, and length. It is shown that it is possible to find waveguides well suited for these interferometers. These results can also be applied to other far infrared interferometers and devices.



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Abstracts

An Exact Three-Dimensional Field Theory for a Class of Cyclic H-Plane Waveguide Junction

R.J. Copplestone. "An Exact Three-Dimensional Field Theory for a Class of Cyclic H-Plane Waveguide Junction." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 577-584.

The device analyzed consists of g waveguides meeting in a cavity with a central metal disk. A conducting boundary such as this occurs in practical waveguide-junction circulators and the technique developed here may find application in circulator field theory. A special case of the geometry considered here is the "tuning screw" which arises when $g = 2$. The method of analysis is by representing the fields by mode summation, in the usual way, and then matching to the metal surfaces and across various imaginary internal boundaries. The device is assumed lossless. The agreement between experimental and theoretical results is very good, thus indicating the method is valid and has been formulated correctly.



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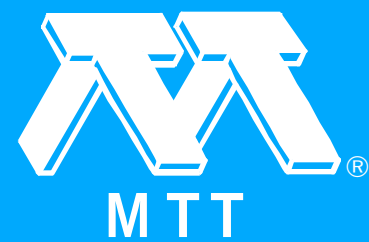


On the Modeling of the Edge-Guided Mode Stripline Isolators

S.H. Talisa and D.M. Bolle. "On the Modeling of the Edge-Guided Mode Stripline Isolators." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 584-591.

A model for the inhomogeneously ferrite-loaded microstrip and stripline is considered. The structure consists of a loaded ferrite slab between two infinite, perfectly conducting planes with the bias magnetization perpendicular to the ground planes. The ferrite is taken to be lossy and is loaded on one side by a semi-infinite lossy material and on the other by a dielectric slab. The modal spectrum of this configuration as well as the influence on the omega-alpha and omega-beta diagrams of the various parameters involved are studied. Special attention has been paid to the capabilities of this configuration to model a nonreciprocal isolator. A hypothetical isolator is designed, and its characteristics are compared with experimental results obtained by Hines, Dydyk and Courtois. Substantial agreement is observed.





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The Point-Matching Solution for Magnetically Tunable Cylindrical Cavities and Ferrite Planar Resonators

A.-M. Khilla and I. Wolff. "The Point-Matching Solution for Magnetically Tunable Cylindrical Cavities and Ferrite Planar Resonators." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 592-598.

This paper presents an exact field theory treatment for a cylindrical cavity containing a full-height triangular ferrite post as well as for ferrite planar resonators of arbitrary shape. The knowledge of the resonant frequencies of the cavity is essential for the construction of circulators with a triangular ferrite post; those of the planar circuits are needed for the design of microwave integrated circuits. The treatment is general and depends neither on the location of the ferrite post inside the cavity nor on the geometry of the planar resonator. The solution of the wave equations in the ferrite material and in a possible surrounding air region is written as an infinite summation of cylindrical modes. In the case of the cavity, the individual modes are exactly matched along the internal cylindrical metallic boundary of the cavity. The fields at the ferrite-air interface in both cases are matched using the point-matching technique, which leads to a finite system of homogeneous, simultaneous equations for which the determinantal equation must be zero. An example of a cavity with a triangular ferrite post is studied and calculated, and measured results are compared. Furthermore, examples of application of the theory on triangular and quadratic planar resonators are described and compared with published experimental measurements.

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Theory of Infrared and Optical Frequency Amplification in Metal-Barrier-Metal Diodes

D.M. Drury and T.K. Ishii. "Theory of Infrared and Optical Frequency Amplification in Metal-Barrier-Metal Diodes." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 598-603.

The near-infrared and optical frequency power gain of a metal-barrier-metal (MBM) point contact diode exhibiting a negative differential resistance region in its current-voltage characteristic is derived as a function of frequency. The diode is treated as a traveling-wave amplifier. The starting point for the analysis is the known electric and magnetic field distribution of the surface waves that propagate in the oxide barrier layer between the diode whisker and substrate, assuming no tunneling current is present. Then the differential tunneling conductance is introduced, and the electric and magnetic field distribution is used to find the propagation constant of the equivalent transmission line formed by the diode structure. It is shown that if the differential tunneling conductance is negative, gain can result. It is shown theoretically that the diode amplifier can provide approximately a 6-dB gain from the CO/sub 2/ laser frequency to the He-Ne laser frequency.

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Closed-Form Analysis of the Abrupt Junction Varactor Doubler

E.W. Sard. "Closed-Form Analysis of the Abrupt Junction Varactor Doubler." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 604-611.

Circuit equations of the abrupt junction varactor doubler have been consolidated into one implicit equation in one unknown. For tuned input and output circuits, this equation reduces to a cubic equation that is solved explicitly as a function of available input power and circuit loading. Optimum loading conditions for maximum power output are functions of only a single composite parameter. For general terminating impedances at input and output frequencies, the consolidated equation is readily solved numerically using the tuned results as a starting point. As examples, doubler frequency responses, with single- and double-tuned load circuits, have been calculated. Surprisingly, double tuning is of limited value in enhancing the instantaneous bandwidth. In addition, for single-tuned load circuits, the frequency response as a function of bias voltage has been calculated, showing the potentiality of greater than 20-percent frequency tunability.



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An Improved Computational Method for Noise Parameter Measurement

M. Mitama and H. Katoh. "An Improved Computational Method for Noise Parameter Measurement." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 612-615.

Conventional methods for noise parameter measurement for linear noisy two-ports have been improved by introducing a computational method for evaluating measured admittance errors. Derivation and comparison with a conventional method are given. Noise parameters of a packaged 0.5- μ m gate-length GaAs MESFET (NE38806) were successfully measured using the proposed technique.

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



Abstracts

A Mechanism for High-Frequency Electromagnetical Field-Induced Biological Damage?

B.O. Nilsson and L.E. Pettersson. "A Mechanism for High-Frequency Electromagnetical Field-Induced Biological Damage?." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 616-618.

It is shown that local electrical fields up to about 100 times larger than average fields can be induced around microscopic wedge-shaped boundaries between regions with different dielectric constants likely to be present in the human body. It is pointed out that this phenomenon might explain biological effects at low radiation power levels especially in the case of low duty-cycle pulsed radiation.



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Abstracts

Microwave Apexcardiography

J.C. Lin, J. Kiernicki, M. Kiernicki and P.B. Wollschlaeger. "Microwave Apexcardiography." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 618-620.

A microwave technique for recording apexcardiograms is reported. The technique is based on detecting changes in the reflected microwaves caused by movement of the chest wall in response to left-ventricle activity. Results show that microwave technique is useful for delineating the fine structures in the precordial movement.



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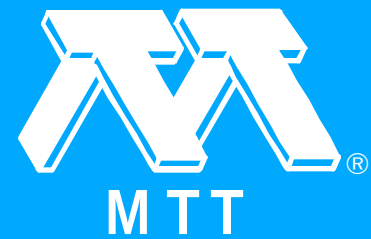


Abstracts

Analysis of an End Launcher for a Circular Cylindrical Waveguide (Comments)

P.K. Bondyopadhyay, B.N. Das and M.D. Deshpande. "Analysis of an End Launcher for a Circular Cylindrical Waveguide (Comments)." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 621-621.

I have read with interest the above paper, the contents of which are erroneous and misleading.



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Abstracts

Comments on 'In Impedance of Coaxial Line to Circular Waveguide Feed' (Correction)

P.K. Bondyopadhyay. "Comments on 'In Impedance of Coaxial Line to Circular Waveguide Feed' (Correction)." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 621-621.

In the above correspondence the expression of the Hankel asymptotic approximation for Bessel functions on page 284, should read without the subscripts "np" in the argument x of the Bessel functions as:



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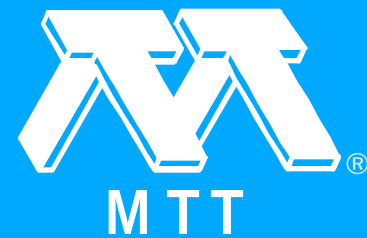
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Abstracts

Contributors (Jun. 1979 [T-MTT])

D.M. Bolle, R.J. Copplestone, J.P. Crenn, J.B. Davies, D.M. Drury, J.G. Fikioris, T.K. Ishii, H. Katoh, A.-M. Khilla, J. Kiernicki, M. Kiernicki, L. Lewin, J.C. Lin, M. Mitama, B.O. Nilsson, L. Pettersson, M. Razaz, H.J. Riblet, J.A. Roumeliotis, E.W. Sard, S.H. Talisa, I. Wolff and P.B. Wollschlaeger. "Contributors (Jun. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 622-625.



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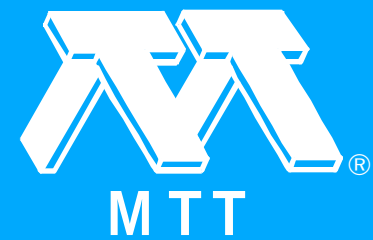
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Abstracts

IEEE Standard Dictionary (Advertisement) (Jun. 1979 [T-MTT])

"IEEE Standard Dictionary (Advertisement) (Jun. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 626-626.



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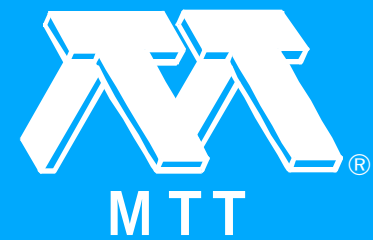
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Abstracts

Membership Application (Jun. 1979 [T-MTT])

"Membership Application (Jun. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 627-627.



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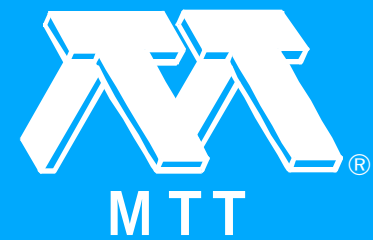
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Abstracts

IEEE Journals on Microfilm (Advertisement) (Jun. 1979 [T-MTT])

"IEEE Journals on Microfilm (Advertisement) (Jun. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 628-628.



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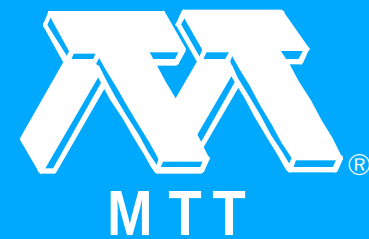
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Abstracts

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"Back Cover (Jun. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): b1-b2.



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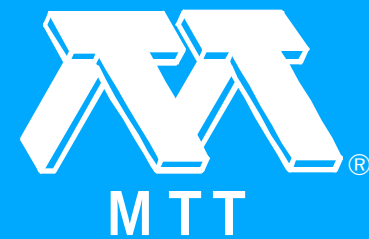
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Abstracts

Front Cover (Jul. 1979 [T-MTT])

"Front Cover (Jul. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): f1-f2.



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Abstracts

GaAs FET Applications for Injection-Locked Oscillators and Self-Oscillating Mixers (Jul. 1979 [T-MTT])

Y. Tajima. "GaAs FET Applications for Injection-Locked Oscillators and Self-Oscillating Mixers (Jul. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 629-632.

Injection-locked oscillators (ILO's) using GaAs FET's are described experimentally and theoretically, showing that a wider locking range can be obtained with transmission-type ILO's than with reflection-type, assuming $Q_{\text{sub ext}}$, to the load to be the same in each case. Frequency-stabilized FET oscillators are discussed in terms of the advantages gained by terminating the gate port by a 50- Ω load. Functioning as a self-oscillating mixer, the circuit showed a 9.5-dB (DSB) noise figure.



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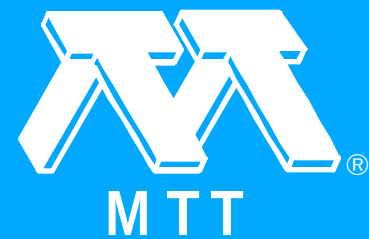
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A Highly Stabilized MIC Gunn Oscillator Using a Dielectric Resonator

T. Makino and A. Hashima. "A Highly Stabilized MIC Gunn Oscillator Using a Dielectric Resonator." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 633-638.

An X-band frequency-stabilized MIC Gunn oscillator of a very simple structure using a dielectric resonator is developed. It is studied how the oscillating characteristics can be controlled by circuit parameters, with special attention to the factors affecting the frequency stability with temperature. By optimizing these factors and by selecting the proper temperature coefficient of a newly developed dielectric resonator, the high frequency stability of less than ± 100 MHz over the temperature range from -20 to 60°C (2×10^{-7} / $^{\circ}\text{C}$) was obtained.



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An Accurate Solution of the Cylindrical Dielectric Resonator Problem

M. Jaworski and M.W. Pospieszalski. "An Accurate Solution of the Cylindrical Dielectric Resonator Problem." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 639-643.

A cylindrical sample of low-loss high-epsilon/_r, dielectric placed between two parallel conducting plates perpendicular to the sample axis forms a microwave resonator. A new method of determining the field distribution and resonant frequency of this resonator is presented. By this method the solution is obtained in a form of successive approximations converging to the exact solution. The analysis is outlined in detail for the TE/_{01δ}/ mode and compared with previously published approximate calculations and experimental data.

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



Design of Microwave GaAs MESFET's for Broad-Band Low-Noise Amplifiers

H. Fukui. "Design of Microwave GaAs MESFET's for Broad-Band Low-Noise Amplifiers." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 643-650.

As a basis for designing GaAs MESFET's for broad-band low-noise amplifiers, the fundamental relationships between basic device parameters, and two-port noise parameters are investigated in a semiempirical manner. A set of four noise parameters are shown as simple functions of equivalent circuit elements of a GaAs MESFET. Each element is then expressed in a simple analytical form with the geometrical and material parameters of this device. Thus practical expressions for the four noise parameters are developed in terms of the geometrical and material parameters. Among the four noise parameters, the minimum noise figure $F_{\min}$, and equivalent noise resistance R_n , are considered crucial for broad-band low-noise amplifiers. A low R_n corresponds to less sensitivity to input mismatch, and can be obtained with a short heavily doped thin active channel. Such a high channel doping-to-thickness (N/a) ratio has a potential of producing high power gain, but is contradictory to obtaining a low $F_{\min}$. Therefore, a compromise in choosing N and a is necessary for best overall amplifier performance. Four numerical examples are given to show optimization processes.



Continuous Varactor-Diode Phase Shifter with Optimized Frequency Response

B. Ulriksson. "Continuous Varactor-Diode Phase Shifter with Optimized Frequency Response." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 650-654.

A method is introduced for designing continuous varactor-diode phase shifters with optimum frequency response. The circuit used gives very small frequency variations of the phase shift if the maximum phase shift of the device is less than about 200° . Measurement results on a 180° L-band phase shifter are presented. This unit gives less than 5° variation of any given phase shift less than 180° , when the frequency is changed from 1.5 to 1.7 GHz.



Abstracts

Barium Tetratitanate MIC Technology

Y.S. Lee, W.J. Getsinger and L.R. Sparrow. "Barium Tetratitanate MIC Technology." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 655-660.

Experimental results on BaTi/sub 4/O/sub 9/ microwave integrated circuit (MIC) characteristics, including microstrip dispersion and loss, have shown excellent agreement with the theoretical predictions. Precision measurements of temperature stability were conducted at 14 GHz. The high dielectric constant ($\epsilon_r = 37$) and its negative temperature coefficient can be used in specialized MIC's for application to advanced microwave subsystems.



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Abstracts

Simple Microwave Technique for Independent Measurement of Sample Size and Dielectric Constant with Results for a Gunn Oscillator System

M.R. Lakshminarayana, L.D. Partain and W.A. Cook. "Simple Microwave Technique for Independent Measurement of Sample Size and Dielectric Constant with Results for a Gunn Oscillator System." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 661-665.

Standard perturbation theory analysis has been used to develop a new microwave technique for simultaneously and independently measuring the size and dielectric constant of dielectric samples. Gunn flange oscillators have been used to show that simple and low cost systems give measurement accuracies better than 5 percent when applied to nylon, Teflon, and quartz samples. The techniques should be particularly useful with samples of irregular cross section.



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Conversion Losses in Schottky-Barrier Diode Mixers in the Submillimeter Region

W.M. Kelly and G.T. Wrixon. "Conversion Losses in Schottky-Barrier Diode Mixers in the Submillimeter Region." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 665-672.

Conversion losses, both intrinsic and parasitic, are calculated for Schottky diode mixers in the submillimeter region, and optimum mixer performance is shown to depend strongly upon operating frequency and upon diode diameter. The implications for high-frequency diode fabrication are discussed, and a comparison is made of the expected performance of GaAs, Si, and InSb Schottky diodes at frequencies up to 5 THz.

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A Microwave Compatible MIC Temperature Electrode for Use in Biological Dielectrics

L.E. Larsen, R.A. Moore, J.H. Jacobi, F.A. Halgas and P.V. Brown. "A Microwave Compatible MIC Temperature Electrode for Use in Biological Dielectrics." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 673-679.

A microwave compatible four-terminal electrode design based on hybrid microwave integrated circuit (MIC) construction is presented. The concept of electrothermal matching is employed to prevent artifact in either of two directions: heat sourcing and heat sinking. The electrode system includes a temperature-encoding electronic package. The electrode is designed for use in the brain at a specific insertion depth. It has been tested by thermographic methods for electromagnetic properties at 2450 MHz and a power density of ~ 250 mW/cm². The system has been thermometrically evaluated for calibration stability and freedom from hysteresis. Stability and artifact has been shown to be within $\pm 15^\circ\text{C}$ independent of temperature cycling and/or thermal history.

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The Modal Spectrum of a Lossy Ferromagnetic Slab

F. Bardati and P. Lampariello. "The Modal Spectrum of a Lossy Ferromagnetic Slab." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 679-688.

The propagation of electromagnetic waves on a lossy ferrimagnetic slab is considered. Direction of propagation, dc external magnetic field and surface normals are assumed at right angles. Modal curves, assuming the width of the slab and the frequency as parameters, are presented. In general, the modes corresponding to propagating as well as attenuating waves are confined to the vicinity of the slab in a frequency range greater than is the case for no magnetic losses. Magnetostatic and half-space approximations are discussed.

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Broad-Band Coupling of High-Q Resonant Loads (Jul. 1979 [T-MTT])

S.R. Borgaonkar and S.N. Rao. "Broad-Band Coupling of High-Q Resonant Loads (Jul. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 688-690.

Considering the method of broad-band coupling a series resonant RLC load to a resistive source using a uniform quarter-wave transmission-line inverter, it is shown that the 3-dB bandwidth of the network insertion loss reckoned with respect to a 0-dB loss attains a maximum for a particular value of the center frequency insertion loss in the range 0-3 dB. The center frequency loss and the corresponding value of the maximum 3-dB bandwidth are calculated for various loads and the results graphically presented.

Abstracts

An Appraisal of Methods for Computation of the Dispersion Characteristics of Open Microstrip

E.F. Kuester and D.C. Chang. "An Appraisal of Methods for Computation of the Dispersion Characteristics of Open Microstrip." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 691-694.

A number of methods in the literature for computing the dispersion characteristics of open microstrip are compared in the case when substrate thickness is comparable to strip width. Significant discrepancies between the various results are found, and several suggestions are made to explain them.



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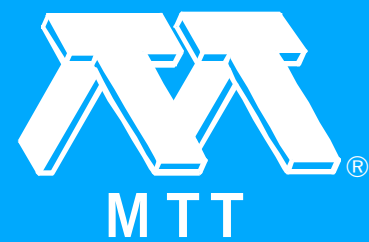
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Accurate Solution of Microstrip and Coplanar Structures for Dispersion and for Dielectric and Conductor Losses

D. Mirshekar-Syahkal and J.B. Davies. "Accurate Solution of Microstrip and Coplanar Structures for Dispersion and for Dielectric and Conductor Losses." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 694-699.

For the analysis of coplanar- and microstrip-type structures, a higher order solution of the spectral-domain approach is introduced. Legendre polynomials are used as the basis functions for fields having singularities near the edges, leading to fast convergence to the exact solution. A perturbation technique is combined with the spectral-domain method to evaluate conductor and dielectric losses in microstrip, inverted microstrip, and coupled microstrip in the metallic enclosure. Computations of characteristic impedance and losses incurred in several structures are also presented. Central processing unit (CPU) time on an IBM 360/65 for the zeroth-order approximation ranges from 1 to about 5 s for the whole computation, and increases if higher order of solution is requested for better accuracy. The calculation of attenuation due to conductor losses is found to be particularly sensitive to order of approximation, so that the generally used "zeroth-order" solution is inadequate. A user-oriented program package has been written, including options on order of mode, order of solution (i.e., of approximation), impedance, attenuation, and number of substrates. Although written for single or coupled microstrip, the program can be adapted for arbitrary arrangements of thin coplanar conductors. The program is described separately.

Click on title for a complete paper.



Characteristics of Coupled Microstriplines

R. Garg and I.J. Bahl. "Characteristics of Coupled Microstriplines." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 700-705.

Semiempirical design equations for the even- and odd-mode characteristics of coupled microstriplines are presented. The characteristics include capacitance, effective dielectric constant, impedance, and losses. The coupled line capacitances are obtained by suitably dividing the total capacitance into parallel plate and fringing capacitances. These capacitances are then used to determine other characteristics. The accuracy of characteristic impedances obtained from these capacitances is better than 3 percent. The sensitivity of the characteristics of coupled microstriplines to the tolerance in parameters is described. It is observed that the effect of tolerances on the coupling constant of a directional coupler increases with the increase in the value of coupling constant. The effects of dispersion and the finite thickness of metal strips have been included. It is noticed that the dispersion is more pronounced for even mode, whereas finite strip thickness affects odd mode to larger extent.



Abstracts

Slot Coupling Between Uniform Rectangular Waveguides (Letters)

A.J. Sangster. "Slot Coupling Between Uniform Rectangular Waveguides (Letters)." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 705-707.

The results of a recent paper, which analyzes the slot-coupled waveguide problem using a 'reaction' method, are shown to be at variance with those of more established theories, for the particular case of a centrally located transverse slot in the common broad wall separating a pair of rectangular waveguides.



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Abstracts

Coupling of Waveguides through Large Aperture (Comments)

V.M. Pandharipande and B.N. Das. "Coupling of Waveguides through Large Aperture (Comments)." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 707-708.

The authors thank Dr. Sangster for his useful comments on their paper. At the time of preparation of the paper it was not known to the authors that there was an unfortunate printing error in reproduction of eq. (34) of [2].



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Abstracts

Mode Classification of a Triangular Ferrite Post for Y-Circulator Operation (Correction)

Y. Akaiwa. "Mode Classification of a Triangular Ferrite Post for Y-Circulator Operation (Correction)." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 709-709.

In the above paper, the following corrections should be made.



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Operation Modes of a Waveguide Y Circulator (Correction)

Y. Akaiwa. "Operation Modes of a Waveguide Y Circulator (Correction)." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 709-709.

In the above paper, the following corrections should be made:



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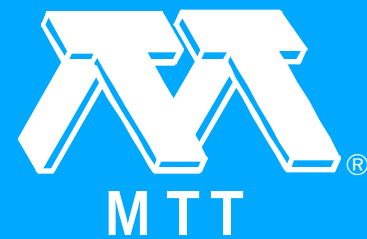
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Abstracts

Contributors (Jul. 1979 [T-MTT])

I.J. Bahl, F. Bardati, S.R. Borgaonkar, P.V. Brown, D.C. Chang, W.A. Cook, J.B. Davies, H. Fukui, R. Garg, W.J. Getsinger, A. Hashima, J.H. Jacobi, M. Jaworski, W.M. Kelly, E.F. Kuester, M.R. Lakshminarayana, P. Lampariello, L.E. Larsen, Y.S. Lee, T. Makino, D. Mirshekar-Syahkal, R.A. Moore, L.D. Partain, M.W. Pospieszalski, S.N. Rao, L.R. Sparrow, Y. Tajima, B. Ulriksson and G.T. Wrixon. "Contributors (Jul. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.7 (Jul. 1979 [T-MTT]): 710-714.



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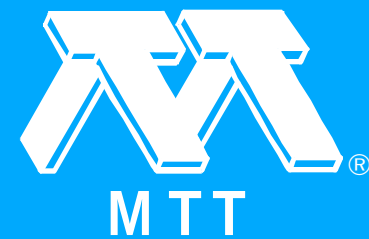
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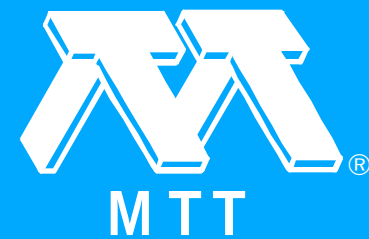
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"Front Cover (Aug. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): f1-f2.



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Abstracts

Transmission-Line Properties of a Round Wire in a Polygon Shield

H.A. Wheeler. "Transmission-Line Properties of a Round Wire in a Polygon Shield." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 717-721.

A family of transmission lines is based on a round wire in a cylindrical shield of polygon cross-section. There is presented a simple formula which gives a smooth transition between the extremes of a small wire and a wire near contact. The same formula is adapted for different shapes by entry of different constants depending on the number of shield planes and the degree of symmetry. The formula is reversible for synthesis or analysis by explicit expression of either shape ratio or wave resistance in terms of the other. For comparison in the transition region, there is computed for each shape a close approximation by the method of images.



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Abstracts

Radiation from Microstrip Discontinuities

M.D. Abouzahra and L. Lewin. "Radiation from Microstrip Discontinuities." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 722-723.

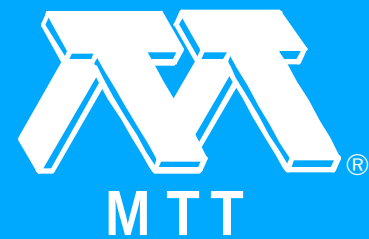
Radically different methods of calculation by Lewin and by van der Pauw are compared. It is shown that the difference in the two sets of results is due not to the difference in method, but to assumptions on the value of dielectric constant to be used when calculating the substrate polarization. Curves show that differences of up to 30 percent can arise from this source, but the differences are much smaller for the larger values of dielectric constant.



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The Reflection Definition of the Characteristic Impedance of Microstrips

F. Arndt and G.U. Paul. "The Reflection Definition of the Characteristic Impedance of Microstrips." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 724-731.

The frequency-dependent characteristic impedance shielded microstrips is computed by the scattering matrix of the step of rectangular transmission line to the shielded microstrip including higher order hybrid modes. This method avoids the ambiguities of the hitherto known definitions based on TEM quantities. For the dispersion characteristics a resonant model is used which reduces the number of the characteristic equations required. Numerical results are given including strips of finite thickness placed unsymmetrically in the shielded microstrip.

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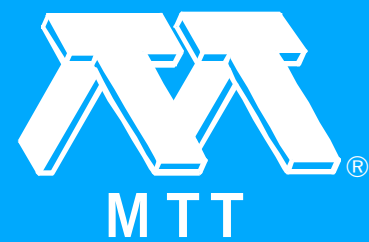


Analysis of an End Launcher for an X-Band Rectangular Waveguide

M.D. Deshpande, B.N. Das and G.S. Sanyal. "Analysis of an End Launcher for an X-Band Rectangular Waveguide." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 731-735.

The analysis of an end-launcher type, coaxial-to-rectangular waveguide transition, exciting dominant TE/sub 01/ mode in X-band rectangular waveguide is presented. Expressions for the real and imaginary parts of the input impedance seen by the coaxial line are derived for the general case of an offset launcher using self-reaction of an assumed current over the loop. The dimensions of the combined electric and magnetic loops having low input VSWR in the coaxial line are determined. There is satisfactory agreement between theoretical and experimental results.





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Low-Frequency Behavior of the Propagation Constant Along a Thin Wire in an Arbitrarily Shaped Mine Tunnel

E.F. Kuester and D.B. Seidel. "Low-Frequency Behavior of the Propagation Constant Along a Thin Wire in an Arbitrarily Shaped Mine Tunnel." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 736-741.

Seidel and Wait have investigated the complex propagation constant (phase and attenuation coefficients) of the fundamental mode of propagation for radio waves along a thin wire or cable, located in an elliptical mine tunnel, and found that the attenuation rate for low frequency is insensitive to the shape of the ellipse if the cable-wall distance and cross-sectional area are kept constant. We consider here tunnels of more general cross section, and obtain a characteristic equation for the propagation constant valid for sufficiently low frequency, by means of a variational formulation of an integral equation. The characteristic equation involves only the electrical parameter of the tunnel walls, the radius of the wire, and the capacitance per unit length that the wire would have if the tunnel walls were perfectly conducting. Agreement with exact calculations for several geometries is found to be excellent below about 100 kHz, and acceptable even up to 1 MHz or more, for typical tunnel parameters. Since the wire capacitance can be shown to depend most importantly on its distance from the wall and on the area of the tunnel, the conclusion of Seidel and Wait can be made more precise and extended to tunnels of arbitrary cross section.

Click on title for a complete paper.



Abstracts

Synthesis of Even-Order Equally Terminated Transmission-Line Bandstop Filters

R. Nedunuri. "Synthesis of Even-Order Equally Terminated Transmission-Line Bandstop Filters." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 742-744.

An exact synthesis procedure for the design of even-order equally terminated transmission-line bandstop filters is described. The method is optimum in the sense that it does not introduce redundant unit elements into the network. The final network is obtained in the form of a cascade of unit elements and shunt open-circuited stubs.



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Abstracts

Interdigital Microstrip Circuit Parameters Using Empirical Formulas and Simplified Model (Aug. 1979 [T-MTT])

A.B. Dalby. "Interdigital Microstrip Circuit Parameters Using Empirical Formulas and Simplified Model (Aug. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 744-752.

Empirical formulas are given for single- and multiple-coupled microstrips, directly giving propagation mode admittances and phase velocities to be used in simplified expressions for the admittance parameters for the 2N-port network in the form of N-coupled strips, thus forming the basis for both analysis and synthesis of interdigital microstrip circuits. Calculated and measured results are presented for two interdigital band-pass filters synthesized as Chebyshev filters.



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Transfer Functions of Amplitude and Phase Fluctuations and Additive Noise in Varactor Doublers

E. Bava, G.P. Bava, A. Godone and G. Rietto. "Transfer Functions of Amplitude and Phase Fluctuations and Additive Noise in Varactor Doublers." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 753-757.

In order to evaluate the spectral purity degradation produced by varactor doublers, the transfer properties of amplitude and phase fluctuations have been determined with reference to a theoretical analysis developed in a previous work. Quasi-stationary conditions have been assumed and the input and output tuning circuits have been approximated with a linear relation between frequency and reactance. The effect of the bias circuit has been taken into account both for fixed-bias and self-bias conditions. Then the additive-noise contribution of the doubler circuit elements have been obtained. Numerical examples and curves are given for all the evaluated quantities.

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An Empirical Formula for Broad-Band SAR Calculations of Prolate Spheroidal Models of Humans and Animals

C.H. Durney, M.F. Iskander, H. Massoudi and C.C. Johnson. "An Empirical Formula for Broad-Band SAR Calculations of Prolate Spheroidal Models of Humans and Animals." 1979 *Transactions on Microwave Theory and Techniques* 27.8 (Aug. 1979 [T-MTT]): 758-763.

An empirical relation for calculating approximate values of the average specific absorption rate (SAR) over a broad-frequency range for any prolate spheroidal model is derived for E-polarized incident plane waves. This formula provides a simple and inexpensive method for calculating the SAR for human and animal models, which otherwise requires complicated and expensive methods of calculation. The formula satisfies the f^2 SAR behavior at lower frequencies, the resonance characteristic at intermediate frequencies, the $1/f$ behavior past resonance, and the dependence on the dielectric constant at the geometrical optics limits. An expression for the resonance frequency f_0 in terms of the dimensions of the model is also derived. The unknown expansion coefficients were determined by curve-fitting all the data available in the second edition of the Radiofrequency Radiation Dosimetry Handbook. Numerical results obtained from the empirical relations are generally in good agreement with those calculated by other methods. Limitations of the formula and suggestions for its improvement are also discussed.

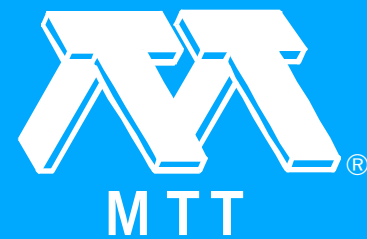
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Contributors (Aug. 1979 [T-MTT])

M.D. Abouzahra, F. Arndt, E. Bava, G.P. Bava, B.N. Das, M.D. Deshpande, C.H. Durney, A. Godone, M.F. Eskamder, C.C. Johnson, E.F. Kuester, L. Lewin, H. Massoudi, R. Nedunuri, G.U. Paul, G. Rietto, G.S. Sanyal, D.B. Seidel, H.A. Wheeler and A.B. Dalby. "Contributors (Aug. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 764-766.



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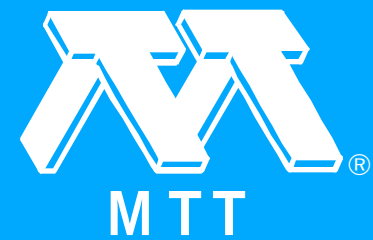
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Membership Application (Aug. 1979 [T-MTT])

"Membership Application (Aug. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.8 (Aug. 1979 [T-MTT]): 767-767.



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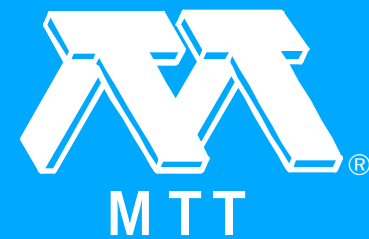
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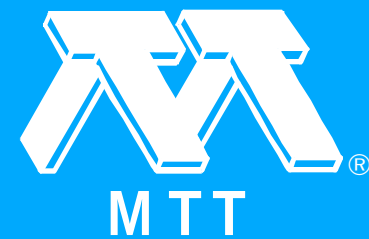
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New View on an Anisotropic Medium and Its Application to Transformation from Anisotropic to Isotropic Problems

M. Kobayashi and R. Terakado. "New View on an Anisotropic Medium and Its Application to Transformation from Anisotropic to Isotropic Problems." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 769-775.

The metric factor is defined as $m(\epsilon_x, \epsilon_y, \theta_x) = \sqrt{\cos^2 \theta_x / \epsilon_x + \sin^2 \theta_x / \epsilon_y}$ in the radial direction, with the angle θ_x from the x axis being one of the principal axes in an anisotropic dielectric medium filling the two-dimensional space. The normalized metric factor is defined as $n(\epsilon_x, \epsilon_y, \theta_x, \beta) \equiv m(\epsilon_x, \epsilon_y, \theta_x) / m(\epsilon_x, \epsilon_y, \beta)$ in the form normalized by the metric factor in the direction with the angle β from the x axis. The effective path length d'_{P1P2} between the points P1 and P2 is defined as $d'_{P1P2} = n(\epsilon_x, \epsilon_y, \theta_x, \beta) d_{P1P2}$ where d_{P1P2} is the actual path length of the straight line P1P2 with the angle θ_x from the x axis. We propose the minimum principle of the effective path length for electric flux in the region with multilayered anisotropic media. It is applied to solving the electrostatic problem with two anisotropic media whose principal axes are different. We show by using the normalized metric factor that the anisotropic problem can be transformed into the isotropic problem.



Abstracts

Accurately Approximate Formula of Effective Filling Fraction for Microstrip Line with Isotropic Substrate and its Application to the Case with Anisotropic Substrate

M. Kobayashi and R. Terakado. "Accurately Approximate Formula of Effective Filling Fraction for Microstrip Line with Isotropic Substrate and its Application to the Case with Anisotropic Substrate." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 776-778.

The accurately approximate formula of effective filling fraction $q_{\text{sub } w/}$ is obtained for the microstrip line with zero-thickness strip and isotropic substrate. The line capacitance per unit length $C_{\text{epsilon/sub } 0/}$ for the case with anisotropic substrate can easily be obtained by using the approximate formula of $q_{\text{sub } w/}$ and $C_{\text{sub } 0/\text{epsilon/sub } 0/}$ tabulated for the wide range of shape ratio w/h . The parameters Z , v , and λ for such a line can be calculated by using $C_{\text{epsilon/sub } 0/}$ and $C_{\text{sub } 0/\text{epsilon/sub } 0/}$.



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Abstracts

Determination of Microwave Two-Port Noise Parameters through Computer-Aided Frequency-Conversion Techniques

G. Caruso and M. Sannino. "Determination of Microwave Two-Port Noise Parameters through Computer-Aided Frequency-Conversion Techniques." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 779-783.

A method to determine noise parameters of microwave linear two-ports (transistors) is presented which is based on a two-channel noise temperature measuring system and an analytical data processing procedure. As compared with the one-channel measurements and the graphical processing techniques, the method offers advantages from both accuracy and experiment viewpoints. Experimental verification related to noise parameters determination for a microwave transistor as function of frequency in S band are reported.



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Broad-Band GaAs FET Amplifier Design Using Negative-Image Device Models

M.W. Medley, Jr. and J.L. Allen. "Broad-Band GaAs FET Amplifier Design Using Negative-Image Device Models." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 784-788.

A new technique is presented for determining equivalent source and load device models applicable to GaAs FET or other devices for which measured data is available. The new technique provides a more accurate starting point for matching network synthesis, better prediction of achievable circuit performance, and does not require the unilateral device assumption. Simple computer optimization and elements with negative reactance slope parameters are utilized. A description of the method and examples of its application to GaAs FET amplifier design are presented.

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Abstracts

Optimization of Interdigital Capacitors

J.L. Hobdell. "Optimization of Interdigital Capacitors." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 788-791.

The variation of Q and capacitance slope for series- and shunt-connected interdigital capacitors is shown. A theory suitable for interactive design of capacitors is given.



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Abstracts

Measurement of Dielectric Parameters at Microwave Frequencies by Cavity-Perturbation Technique

A. Parkash, J.K. Vaid and A. Mansingh. "Measurement of Dielectric Parameters at Microwave Frequencies by Cavity-Perturbation Technique." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 791-795.

Relations for evaluating dielectric parameters from changes in resonance frequency and Q of a cylindrical TM/sub 010/-mode cavity have been derived for thin samples of length less than the height of the cavity. Although derived under some simplifying assumptions, they reduce to the standard form when the length of the specimen equals the height of the cavity, and yield consistent results when applied to different lengths of the same material.



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The Effect of Flange Loss on the Reflection Coefficient of Reduced-Height Waveguide Reflection Standards

P.I. Somlo. "The Effect of Flange Loss on the Reflection Coefficient of Reduced-Height Waveguide Reflection Standards." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 795-797.

It is shown that when reflection-coefficient standards are constructed from reduced-height waveguide having the plane of the change in height coincident with that of the flange, the flange loss will reduce the calculated reflection coefficient, and for small reflection-coefficient standards ($|\rho_s| < 0.1$) and practical flange losses, the effect is more significant than step capacitance which is usually taken into account.



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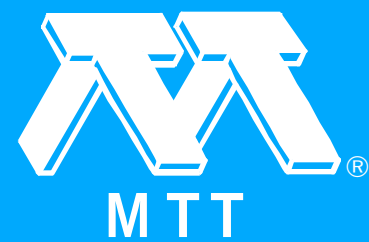
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Dielectric Hemisphere-Loaded Scalar Horn as a Gaussian-Beam Launcher for Microwave Exposure Studies

P.S. Neelakantaswamy and F.C. Hong. "Dielectric Hemisphere-Loaded Scalar Horn as a Gaussian-Beam Launcher for Microwave Exposure Studies." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 797-799.

A new type of Gaussian-beam launcher for producing a focused-microwave exposure field in biological experiments for selective partial-body irradiation is studied. The proposed launcher consists of a scalar horn (corrugated cylindrical open-ended waveguide) excited with a balanced hybrid (HE/sub 11/) mode and the aperture of the horn is loaded with a dielectric hemisphere. This launcher is similar to the structure described by one of the authors elsewhere, except that a dielectric hemisphere instead of a full sphere is used, with the result that the spherical aberration is considerably reduced, as well as that the weight and the size are, to a certain extent, reduced. It is shown that the present structure also produces in the image space of hemispherical lens, a near-circular Gaussian beam with a high-focusing factor. Design details, theoretical calculations, and experimental results concerning a practical X-band launcher are presented.

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Equivalent Circuit of a Narrow-Wall Waveguide Slot Coupler

V.M. Pandharipande and B.N. Das. "Equivalent Circuit of a Narrow-Wall Waveguide Slot Coupler." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 800-804.

An expression for the equivalent network of a long axial slot in the common narrow wall between two rectangular waveguides is determined from self-reaction and discontinuity in modal current. The analysis is extended to the case of H-plane Tee junction coupled through a longitudinal slot in the narrow wall of primary guide. Variation of coupling, input VSWR, and impedance loading on the primary guide are determined from the equivalent network parameter. A comparison between theoretical and experimental results is presented.

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Abstracts

Numerical Calculation of Electromagnetic Energy Deposition for a Realistic Model of Man

M.J. Hagmann, O.P. Gandhi and C.H. Durney. "Numerical Calculation of Electromagnetic Energy Deposition for a Realistic Model of Man." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 804-809.

Numerical calculations of absorbed energy deposition have been made for a block model of man that is defined with careful attention given to the biometric and anatomical features of a human being. Calculated post-resonant absorption and distribution of energy deposition through the body have better agreement with experimental results than previous calculations made using less realistic models.



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Abstracts

Head Resonance: Numerical Solutions and Experimental Results

M.J. Hagmann, O.P. Gandhi, J.A. D'Andrea and I. Chatterjee. "Head Resonance: Numerical Solutions and Experimental Results." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 809-813.

We have used numerical solutions and experiments with phantom models of man, and experiments with the Long Evans rat to show the existence of head resonance. Greatest absorption in the head region of man occurs at a frequency of about 375 MHz. Absorption is stronger for wave propagation from head to toe than it is when the electric field is parallel to the long axis. The highest absorption cross section for the human head is projected to be approximately 3.5 times its physical cross section.



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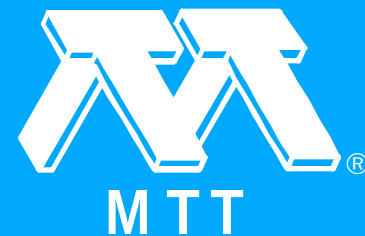
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J.L. Allen, G. Caruso, I. Chatterjee, J.A. D'Andrea, B.N. Das, C.H. Durney, O.P. Gandhi, M.J. Hagmann, J.L. Hobdell, F.C. Hong, M. Kobayashi, A. Mansingh, M.W. Medley, Jr., P.S. Neelakantaswamy, V.M. Pandharipande, M. Sannino, P.I. Somlo, R. Terakado, J.K. Vaid and A. Parkash. "Contributors (Sep. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.9 (Sep. 1979 [T-MTT]): 814-816.



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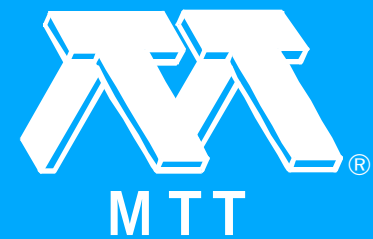
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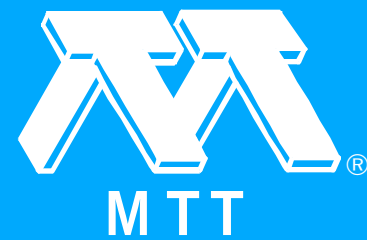
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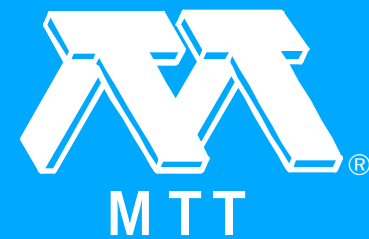
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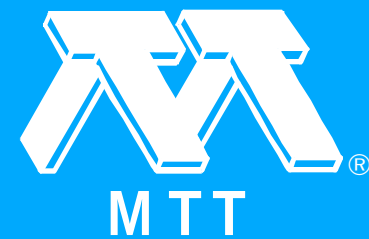
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Electromagnetic Absorption in Multilayered Cylindrical Models of Man

H. Massoudi, C.H. Durney, P.W. Barber and M.F. Iskander. "Electromagnetic Absorption in Multilayered Cylindrical Models of Man." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 825-830.

The absorption characteristics of multilayered cylindrical models of man irradiated by a normally incident electromagnetic plane wave are investigated. Numerical calculations for a specific skin-fat-muscle cylindrical model of man predict a layering resonance at 1.2 GHz with an average specific absorption rate (SAR) about double that calculated for the corresponding homogeneous model. The layering resonance frequency is found to be the same for incident waves polarized parallel and perpendicular to the cylinder axis. The effects of layers on whole-body absorption by man are determined by averaging the effects obtained for many combinations of skin and fat thicknesses. Absorption effects due to clothing are also investigated.

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Computer-Aided Large-Signal Measurement of IMPATT-Diode Electronic Admittance

B.A. Syrett. "Computer-Aided Large-Signal Measurement of IMPATT-Diode Electronic Admittance." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 830-834.

A technique for the measurement of the large-signal electronic admittance of IMPATT diodes as a function of frequency and RF voltage level using the network analyzer is described. The method de-embeds the admittance of the active region of the device from the mounting and measurement circuitry without physical disturbance of the diode. The small series resistance of the diode at breakdown is included in the embedding network together with the mount and diode package parameters. The determination of transformation networks between the measurement port and the active chip through a simple calibration procedure, a knowledge of the diode admittance below breakdown, and computer-aided optimization constitute the de-embedding procedure. Experimental electronic admittance curves are given for a low-power (100-mW) silicon IMPATT diode in the frequency range 5.7-6.5 GHz and with RF voltage levels applied across the active chip in the range 0-24 V, with an estimated error of less than 20 percent (typically 5 percent) in admittance values.

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Abstracts

Simulation of Nonlinear Microwave FET Performance Using a Quasi-Static Model

C. Rauscher and H.A. Willing. "Simulation of Nonlinear Microwave FET Performance Using a Quasi-Static Model." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 834-840.

A technique is described for accurately predicting nonlinear performance of microwave GaAs field-effect transistors in arbitrary circuit embedding. The approach is based on a quasi-static device model which is derived from measured bias and frequency dependence of the small-signal device S parameters. Excellent agreement is demonstrated between experimental and predicted "load-pull" characteristics at X band.



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Application of Inverted Strip Dielectric Waveguides for Measurement of the Dielectric Constant of Low-Loss Materials at Millimeter-Wave Frequencies

T. Itoh and F.-J. Hsu. "Application of Inverted Strip Dielectric Waveguides for Measurement of the Dielectric Constant of Low-Loss Materials at Millimeter-Wave Frequencies." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 841-844.

An entirely new method for measuring dielectric properties of slab-type materials is developed by using a novel dielectric waveguide structure originally designed for millimeter-wave integrated circuits. The method entails the measurement of the stopband of the grating structure created in the dielectric waveguide. Several examples of measurement results are reported.



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Low Cost X-Band MIC BARITT Doppler Sensor

S.P. Kwok and K.P. Weller. "Low Cost X-Band MIC BARITT Doppler Sensor." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 844-847.

An MIC X-band BARITT self-mixing oscillator has been developed. A minimum detectable signal below carrier of - 139 dB/Hz at 100 kHz away from carrier was achieved at 1-mW signal carrier. A low cost, compact and sensitive hybrid MIC Doppler sensor module was constructed, incorporating the BARITT MIC circuit and a microstrip antenna.

On the Use of a Microstrip Three-Line System as a Six-Port Reflectometer

R.J. Collier and N.A. El-Deeb. "On the Use of a Microstrip Three-Line System as a Six-Port Reflectometer." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 847-853.

The scattering parameters for a coupled symmetrical three-line system in an inhomogeneous dielectric medium (e.g., microstrip) are derived directly in terms of a set of three orthogonal modes. The obtained results show that the condition for isolation of nonadjacent ports (e.g., ports 1 and 3 in Fig. 1) does not result from putting the corresponding per unit length immittance parameters equal to zero (i.e., $z_{13}/y_{13} = 0$). The use of such a three-line system as a six-port reflectometer is analyzed in terms of the derived scattering parameters. The reflectometer discussed in this paper allows an unknown impedance to be measured using a standard impedance.



Abstracts

Transmission Lines Loaded at Regular Intervals

S.D. Malaviya and V.P. Singh. "Transmission Lines Loaded at Regular Intervals." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 854-859.

By a mathematical analysis, the switching time of an incident wave is predicted for a terminated net in which equal, lumped capacitive loads are repeated a finite number of times at regular intervals. The analysis is valid even for the case of only a few loads, for which the distributed load approximation is poor. An APL program has been developed to compute the delay; its use is demonstrated by an example. The results are extended to include complex loads.



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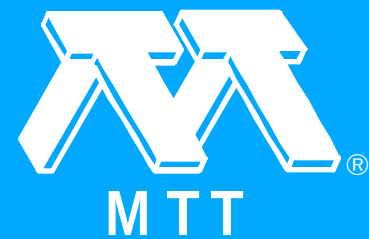
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Guided Waves on a Planar Helix

S. Aditya and R.K. Arora. "Guided Waves on a Planar Helix." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 860-863.

Considered here is a planar structure comprising a pair of parallel arrays of periodically spaced conducting strips which conduct in different directions in the two arrays. The guiding properties of this planar structure are found to be similar, in one case, to those of circular tape helices. While in general, different dielectric media are assumed in the sandwiched and outer regions, the special cases studied are 1) the case in which air constitutes both the media, 2) the normal-helix case in which the inner medium is a solid dielectric and the outer medium is air, and 3) the "inverted-helix" case with the two media interchanged.

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



Nonreciprocal Dispersion Characteristics of a Planar Helix on Magnetized Ferrite Slabs

S. Aditya and R.K. Arora. "Nonreciprocal Dispersion Characteristics of a Planar Helix on Magnetized Ferrite Slabs." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 864-868.

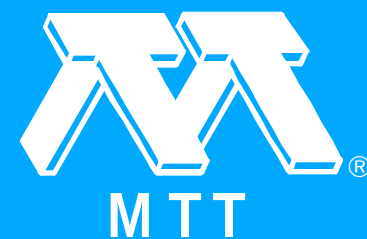
A structure comprising a pair unidirectionally conducting (UC) screens a pair of parallel magnetized ferrite slabs is considered. The screens are conducting in different direction, thus constituting a planar helix. The nonreciprocal dispersion characteristics of the structure are studied. The slow-wave properties of the structure coupled with the fact that the guided waves on it are, in general, elliptically polarized results in relatively large differential phase shifts per unit length. Possible use of the structure as a phase shifter in planar configuration is indicated.



Abstracts

Contributors (Oct. 1979 [T-MTT])

S. Aditya, R.K. Arora, P.W. Barber, R.J. Collier, C.H. Durney, N.A. El-Deeb, F.-J. Hsu, M.F. Iskander, T. Itoh, S.P. Kwok, S.D. Malaviya, H. Massoudi, C. Rauscher, V.P. Singh, B.A. Syrett, K.P. Weller and H.A. Willing. "Contributors (Oct. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 869-871.



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Membership Application (Oct. 1979 [T-MTT])

"Membership Application (Oct. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.10 (Oct. 1979 [T-MTT]): 872-872.



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Submillimeter Guided-Wave Experiments with Polyethylene Slab Waveguides

M. Tsuji, K. Kawai, H. Shigesawa and K. Takiyama. "Submillimeter Guided-Wave Experiments with Polyethylene Slab Waveguides." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 873-878.

The attenuation constants of a symmetric polyethylene slab waveguide are measured in the submillimeter-wave region at $\lambda/337 \mu\text{m}$. In our experiments the fine metal grating is used as a coupler, instead of a usual prism coupler. Our coupler which is different from the conventional grating coupler fixed on a slab is easily movable along a slab without a fluctuation in the coupling efficiency, and the loss measurement is successfully performed for several kinds of slab thicknesses by using such couplers. As a result, the attenuation constant of about 1.3 dB/m is measured, in good reliability, for a slab of 10 μm in thickness. Finally, to make clear the accuracy of our loss measurements, the transverse broadening of the field along the propagating direction of a slab is measured experimentally, and it is concluded that there is little influence of the transverse broadening on the measured attenuation constants.



Abstracts

The Edge-Guided Mode Nonreciprocal Phase Shifter (Nov. 1979 [T-MTT])

D.M. Bolle and S.H. Talisa. "The Edge-Guided Mode Nonreciprocal Phase Shifter (Nov. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 878-882.

Results of a theoretical study are presented for a four-region model of a nonreciprocal dielectric-ferrite loaded stripline phase shifter employing the edge-guided dynamic mode. The behavior of our model in terms of the differential phase shift, the insertion loss, and the effective bandwidth is explored as a function of the various parameters involved.



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Field Solution for Radial Waveguides with Annular Discontinuities

B. Azarbar and L. Shafai. "Field Solution for Radial Waveguides with Annular Discontinuities." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 883-890.

A method is established which gives the internal field of a radial waveguide in the presence of annular-type slots on the conducting walls or metallic scatterers inside the guide. The exciting field can have a general form, and the dielectric constant of the region could be lossy or lossless. To obtain a solution, the induced currents (magnetic current in case of slot-type discontinuity) over the scattering bodies are expanded into a finite series of suitable basis functions with unknown coefficients. The total number of these functions is directly related to the electrical dimensions of the scatterers. The complex coefficients are then obtained by employing the appropriate Green's functions and an application of the boundary conditions over the scattering bodies. The method is then applied to the problem of coupling between two radials waveguides by annular slots on the common boundary. It is shown that in general, higher order modes have significant effect on the solution, and for a precise evaluation of the field their contribution must also be included.

Click on title for a complete paper.



Abstracts

Time-Domain Analysis of Lumped-Distributed Networks

J.L. Allen. "Time-Domain Analysis of Lumped-Distributed Networks." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 890-896.

A new method for time-domain analysis of networks containing transmission lines and lumped linear/nonlinear elements is presented. A key feature of the method is a procedure for generating a system matrix in a manner that involves only sums of subnetwork (or element) terms (no products or quotients). Numerical integration algorithms are used to reduce the problem to a solution of sparse algebraic equations.



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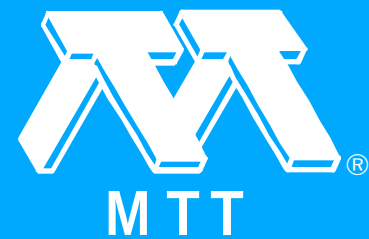
Surface Charge and Field Distribution in a Finite SAW Transducer

V.M. Ristic and A.M. Hussein. "Surface Charge and Field Distribution in a Finite SAW Transducer." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 897-901.

Using the moment-method technique, closed-form expressions for the surface charge, potential and electric fields of a finite transducer over a low coupling substrate are derived. The influence of the end effects on the total capacitance of the transducer are studied and the field patterns of three different electrode sequences are computed. It is shown that for Y-Z lithium niobate, the surface-charge density is proportional to the normal component of the electric field under the transducer. The moment-method technique was also used to study the total input admittance of finite transducers on Y-Z lithium niobate as a function of the number of finger pairs. Numerical results indicate that the increase in capacitance and conductance with the number of finger pairs, when the number of finger pairs exceeds three, is approximately constant.

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Magnetostatic Surface-Wave Transducers

J.C. Sethares. "Magnetostatic Surface-Wave Transducers." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 902-909.

Magnetostatic surface-wave (MSSW) transducer theory is extended and generalized. A Fourier transform relation is established between MSSW field amplitudes and transducer spatial current distribution. Expressions are developed for the radiation resistance of periodic meander and grating transducers, spatial harmonic amplitudes, and radiation resistance for uniform and nonuniform current distribution models. An expression is given for the radiation resistance of apodized transducers. The results enable one to predict transducer frequency response for a specified weighting of transducer element width, length and spacing.

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



Electromagnetic Power Deposition in a Dielectric Cylinder in the Presence of a Reflecting Surface

R. Ruppin. "Electromagnetic Power Deposition in a Dielectric Cylinder in the Presence of a Reflecting Surface." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 910-914.

A method for calculating electromagnetic power absorption in a dielectric cylinder in the presence of a reflecting plane, due to irradiation by a normally incident plane wave, is presented. The method, which combines imaging with point matching, is applied to the calculation of the absorbed power density in tissue cylinders of arm and thigh size.



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A Possible Mechanism for the Influence of Electromagnetic Radiation on Neuroelectric Potentials

R.J. MacGregor. "A Possible Mechanism for the Influence of Electromagnetic Radiation on Neuroelectric Potentials." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 914-921.

This paper explores the idea that the electrical component of applied microwave and radiowave radiation might induce transmembrane potentials in nerve cells and, thereby, disturb nervous function and behavior. The paper estimates the transmembrane currents and potentials induced in nerve cells by applied electrical fields and currents. Estimates are made for steady and for oscillating stimulation. The primary conclusion is that intracranial electrical fields associated with low-intensity irradiation in the frequency range of 10^6 - 10^{10} Hz may induce transmembrane potentials of tenths of millivolts (or more) and that, therefore, such externally applied fields may disturb normal nervous function through this mechanism. The paper also presents a discussion which indicates that the induced transmembrane potential should exhibit a maximum at about 10^8 Hz. Although some researchers suggest that the direct mechanism explored here may not represent the main influence of microwaves and radiowaves on biological tissue, this model together with a recent model by Barnes and Hu suggest that the results so produced may indeed be significant.

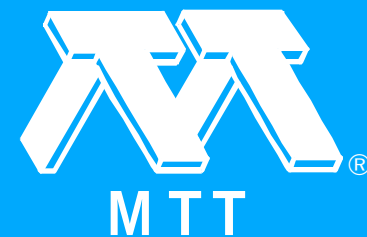
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Contributors (Nov. 1979 [T-MTT])

J.L. Allen, B. Azarbar, D.M. Bolle, A.M. Hussein, K. Kawai, R.J. MacGregor, V.M. Ristic, R. Ruppin, J.C. Sethares, L. Shafai, H. Shigesawa, K. Takiyama, S.H. Talisa and M. Tsuji.
"Contributors (Nov. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.11 (Nov. 1979 [T-MTT]): 922-923.



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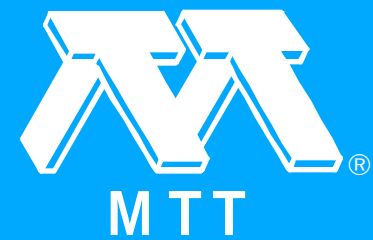
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IEEE Journals on Microfilm (Advertisement) (Nov. 1979 [T-MTT])

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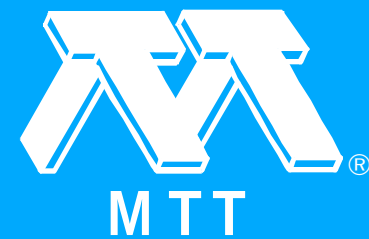
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Editor's Overview (Dec. 1979 [T-MTT])

J.C. Wiltse. "Editor's Overview (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 927-927.

This Issue includes a review of the highlights of the 1979 International Microwave Symposium and a sampling of the 172 technical papers presented at the meeting. Also included are a summary article on the winners of the 1979 MTT awards, and acknowledgments to many of the individuals who devoted their efforts to making the Symposium a success.



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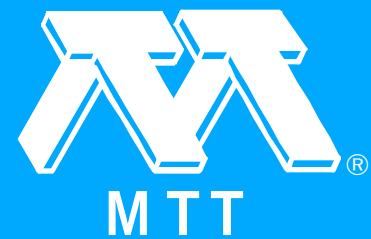


Abstracts

The 1979 MTT-S International Microwave Symposium (Dec. 1979 [T-MTT])

R.E. Henning. "The 1979 MTT-S International Microwave Symposium (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 928-935.

The "World of Microwaves" came to Orlando, FL from April 30-May 4 when the Orlando and Florida West Coast chapters hosted the 1979 MTT International Microwave Symposium at the Sheraton Twin Towers.



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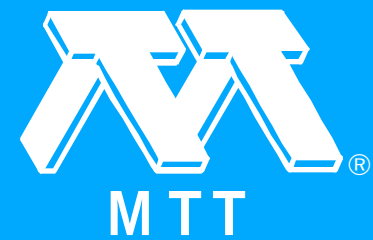
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1978 MTT Awards (Dec. 1979 [T-MTT])

"1978 MTT Awards (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 936-937.



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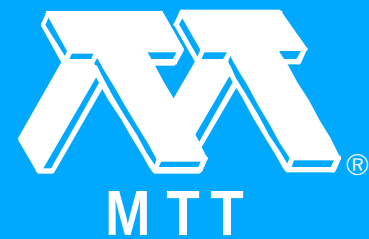
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Noise and Loss in Balanced and Subharmonically Pumped Mixers: Part I--Theory

A.R. Kerr. "Noise and Loss in Balanced and Subharmonically Pumped Mixers: Part I--Theory." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 938-943.

In this paper, the theory of noise and frequency conversion is developed for two-diode balanced and subharmonically pumped mixers. Expressions for the conversion loss, noise temperature, and input and output impedances are derived in a form suitable for numerical analysis. Schottky diodes are assumed, having nonlinear capacitance, series resistance (which may be frequency dependent due to skin effect), and shot and thermal noise. In Part II, the theory is applied to several practical examples, and computed results are given which show the very different effects of the loop inductance (between the diodes) in balanced and subharmonically pumped mixers. It is also shown that the ideal two-diode mixer using exponential diodes has a multiport noise-equivalent network (attenuator) similar to that of the ideal single-diode mixer.

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Abstracts

Noise and Loss in Balanced and Subharmonically Pumped Mixers: Part II-- Application

A.R. Kerr. "Noise and Loss in Balanced and Subharmonically Pumped Mixers: Part II-- Application." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 944-950.

The theory presented in Part I is applied here to some simple two-diode subharmonically pumped and balanced mixers. It is shown that the magnitude of the loop inductance (seen by currents circulating through the two diodes) affects the subharmonically pumped mixer much more strongly than the balanced mixer. The theory is also applied to the ideal two-diode mixer (balanced or subharmonically pumped) using exponential diodes with no series resistance and no nonlinear capacitance. It is shown that, like its single-diode counterpart, this mixer has a noise-equivalent lossy network whose physical temperature is $\eta T/2$, where η is the ideality factor of the exponential diodes. It follows that the ideal subharmonically pumped resistive mixer is not intrinsically less noisy than the ideal resistive fundamental mixer. This is not necessarily the case if parametric effects, due to nonlinear diode capacitance, are present.



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Multichip IMPATT Power Combining, a Summary with New Analytical and Experimental Results (Dec. 1979 [T-MTT])

C.T. Rucker, J.W. Amoss, G.N. Hill and N.W. Cox. "Multichip IMPATT Power Combining, a Summary with New Analytical and Experimental Results (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 951-957.

X band IMPATT diode chips have been efficiently combined in parallel, in series on diamond heat sinks, and in series-parallel on diamond heat sinks. This paper summarizes experimental and analytical work performed over a four-year period and places some of the results in perspective with respect to practical applications. Several device types have shown to be compatible with series geometries. Analysis has shown that some device types, when connected in series, form a combination which is neither open-circuit nor short-circuit stable, an intrinsically unstable condition. It has been shown further that capacitors of practical size can be placed in parallel with each chip of such an assembly to prevent the occurrence of the unstable condition. Thus unique problems reported earlier with some types of IMPATT's are understood and can be prevented. These experimental and analytical results appear to eliminate any hypothetical barrier to the routine series power combining of at least several types of IMPATT device chips.



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Power Combining in an Array of Microwave Power Rectifiers (Dec. 1979 [T-MTT])

R.J. Gutmann and J.M. Borrego. "Power Combining in an Array of Microwave Power Rectifiers (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 958-968.

Microwave power rectifiers have been developed previously with greater than 85-percent RF-to-dc conversion efficiency. To obtain useful power levels for proposed free-space microwave power transmission applications, numerous rectifier outputs are interconnected in series and/or parallel to share a common dc load. This work analyzes the resultant efficiency degradation when identical rectifiers operate at different RF power levels as caused by the power beam taper. Both a closed-form analytical circuit model and a detailed computer-simulation model are used to obtain the output dc load line of the rectifier. The efficiency degradation is nearly identical with series and parallel combining, and the closed-form analytical model provides results which are similar to the detailed computer-simulation model.

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Abstracts

An Ultra-Low Noise Microwave Synthesizer (Dec. 1979 [T-MTT])

G.D. Alley and H.-C. Wang. "An Ultra-Low Noise Microwave Synthesizer (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 969-974.

A silicon bipolar transistor together with a barium titanate dielectric resonator were used to design a low noise microwave synthesizer. The oscillator was phase locked to a low-frequency (LF) reference with microwave frequency selection provided by a high-speed digital programmable divider within the phase-locked loop. The resulting FM noise $\Delta f_{\text{sub rms}}$ was 0.0003 Hz in a 1-Hz band greater than 1000 Hz from the 1-GHz carrier.



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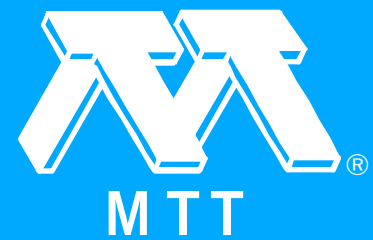
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Multilayer Hybrid in Circular Waveguide (Dec. 1979 [T-MTT])

E.T. Harkless and D.N. Zuckerman. "Multilayer Hybrid in Circular Waveguide (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 975-982.

A dielectric sheet across a waveguide will partially transmit and partially reflect propagating waves. Such a sheet placed at 45° across the right angle intersection of two waveguides can create a hybrid junction. The use of several dielectric layers reduces mode conversion and also broad-bands the performance. It is shown here how to choose the thickness and permittivity of the layers to yield nearly constant power division over the 40- to 110-GHz range and at the same time minimize conversion of energy to other modes. Ray-optics analysis is used in this design procedure. Experimental results are presented which confirm the analysis. The use of such multilayer hybrid junctions to produce filters covering the 40 to 110-GHz range is examined.

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Cylindrical TE/sub 011//TM/sub 111/ Mode Control by Cavity Shaping (Dec. 1979 [T-MTT])

H.L. Thal, Jr.. "Cylindrical TE/sub 011//TM/sub 111/ Mode Control by Cavity Shaping (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 982-986.

An appropriate modification of the shape of a cylindrical filter cavity has been used to separate the degenerate TM/sub 111/ (doublet) modes while at the same time providing a slight increase in the already high unloaded Q of the desired TE/sub 011/ mode. Experimental results of mode frequencies and unloaded Q's are tabulated for a family of shaped cavities. Two low-loss filters utilizing these cavities are discussed. The general correspondence between modes of spherical, cylindrical and rectangular cavities and waveguides is described in order to place the performance of intermediate shapes in perspective.

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Abstracts

Thru-Reflect-Line: An Improved Technique for Calibrating the Dual Six-Port Automatic Network Analyzer

G.F. Engen and C.A. Hoer. "Thru-Reflect-Line: An Improved Technique for Calibrating the Dual Six-Port Automatic Network Analyzer." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 987-993.

In an earlier paper, the use of a "thru-short-delay" (TSD) technique for calibrating the dual six-port automatic network analyzer was described. Another scheme required only a length of precision transmission line and a "calibration circuit." The better features of these two somewhat different approaches have now been combined and the requirement for either a known short, or a "calibration circuit" eliminated. This paper will develop the theory for this new procedure.



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Performance of a Dual Six-Port Automatic Network Analyzer (Dec. 1979 [T-MTT])

C.A. Hoer. "Performance of a Dual Six-Port Automatic Network Analyzer (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 993-998.

Initial results of the performance of an experimental dual six-port automatic network analyzer operating in the 2-18-GHz range with thermistor-type power detectors are given. The imprecision in measuring reflection coefficients of one-port devices, or the scattering parameters of two-port devices is 4×10^{-5} , excluding connector repeatability. At 3 GHz, the imprecision in measuring attenuation varies from 0.0003 dB at low values of attenuation to 0.15 dB at 60 dB. The systematic error in measuring attenuation appears to be less than the imprecision. The systematic error in measuring reflection coefficient appears to be less than 0.0004. Additional systematic errors caused by changes in the calibration constants over a 20-week period were observed to be less than 0.003 dB in attenuation and less than 0.002 in reflection coefficient.

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Abstracts

Technology Considerations for the Use of Multiple Beam Antenna Systems in Communication Satellites (Dec. 1979 [T-MTT])

E.W. Matthews, C.L. Cuccia and M.D. Rubin. "Technology Considerations for the Use of Multiple Beam Antenna Systems in Communication Satellites (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 998-1004.

The general usage of multibeam antennas in satellite communication system is reviewed, and design constraints for a six-beam reconfigurable satellite antenna system are considered. These show that losses in the variable beam-forming network (BFN) limit performance achievable with a conventional common-power-amplifier/receiver system. An alternative design for an active BFN is presented, and relative performance predicted at 4/6, 11/14, and 20/30 GHz.



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Abstracts

Shallow Bulk Acoustic Wave Progress and Prospects

A. Ballato and T.J. Lukaszek. "Shallow Bulk Acoustic Wave Progress and Prospects." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1004-1012.

Shallow bulk acoustic wave propagation in piezoelectric crystals is reviewed from the standpoint of work reported to date. It is compared to bulk and surface acoustic waves as to properties and device potential. Singly and doubly rotated cuts are considered, as are piezoelectric transduction energy trapping, equivalent networks, as well as areas of future work such as new materials other than quartz, and nonlinear effects.



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Practical Aspects of Surface-Acoustic-Wave Oscillators (Dec. 1979 [T-MTT])

S.K. Salmon. "Practical Aspects of Surface-Acoustic-Wave Oscillators (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1012-1018.

A surface-acoustic-wave (SAW) delay line integrated with a thin film amplifier can form the basis of a small high-stability microwave oscillator. Practical aspects of delay lines and the noise properties, stabilization frequency setting, and modulation of oscillators are presented.



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Distributed Bragg Reflection Dielectric Waveguide Oscillators

B.-S. Song and T. Itoh. "Distributed Bragg Reflection Dielectric Waveguide Oscillators." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1019-1022.

Dielectric waveguide Gunn oscillators are presented in which the cavity consists of grating structures exhibiting either the surface-wave stopband or the leaky-wave stopband. Oscillation conditions and design criteria of the grating structures are studied. When a grating exhibiting the leaky-wave stopband is used in the oscillator, the extraction of the output power in the direction perpendicular to the dielectric waveguide axis is possible. This is because such a grating becomes a broadside-firing leaky-wave antenna with high input VSWR.

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Abstracts

Computer-Simulated Design of an Active Microwave All-Pass Network (Dec. 1979 [T-MTT])

S.E. Sussman-Fort. "Computer-Simulated Design of an Active Microwave All-Pass Network (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1023-1025.

A new microwave active all-pass network is proposed. In a computer simulation it is shown that the network, even with markedly nonideal transistors, can provide a true all-pass response over 8-12 GHz.



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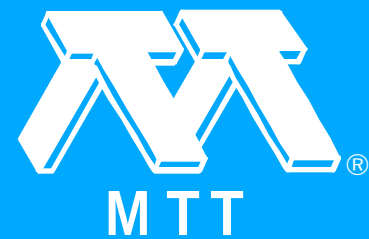
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Microwave Nanosecond Pulse Burnout Properties of GaAs MESFET's (Dec. 1979 [T-MTT])

J.J. Whalen, M.C. Calcaterra and M.L. Thorn. "Microwave Nanosecond Pulse Burnout Properties of GaAs MESFET's (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1026-1031.

Microwave nanosecond pulse burnout data have been measured at 9.3 GHz for three commercially available 1- μ m gate MESFET's. Values for the incident pulse power required to cause burnout are concentrated in the ranges 4-10 W for 10-ns pulses, 12-25 W for 3-ns pulses, and 15-30 W for 1.5-ns pulses. The corresponding values for the absorbed microwave pulse energy required to cause burnout are concentrated in the ranges 0.3 to 0.6 ergs for 10-ns pulses, 0.2-0.4 ergs for 3-ns pulses, and 0.2-0.35 ergs for 1.5-ns pulses. Two dominant failure modes in overstressed MESFET's have been observed. One is a gate-to-source low-resistance path (5-25 Ω) which frequently is correlated with metal migration (mainly gold) from the source metallization to the gate metallization. This failure mode was dominant when MESFET's failed at lower power levels as at 10 ns. The other dominant failure mode is a reduction in I_{DSS} or a drain-to-source short which is correlated with massive damage in the channel region between the source and gate metallizations. This failure mode was dominant when MESFET's failed at high power levels as at 1.5 ns.



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GaAs SAMP Device for Ku-Band Switching (Dec. 1979 [T-MTT])

P.L. Fleming, T. Smith, H.E. Carlson and W.A. Cox. "GaAs SAMP Device for Ku-Band Switching (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1032-1035.

Switchable attenuating medium propagation (SAMP) devices are coplanar transmission lines on an epitaxial semiconductor (GaAs) substrate. These transmission lines can be switched rapidly between states of high and low attenuation by controlling the width of a depletion layer under the center conductor. SAMP devices can easily be characterized by the use of transmission line theory. They are well suited for use in monolithic microwave integrated circuits (MMIC's). Experimental performance data and theoretical background will be presented.

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



Abstracts

An Approximate Dispersion Formula of Microstrip Lines for Computer-Aided Design of Microwave Integrated Circuits (Dec. 1979 [T-MTT])

E. Yamashita, K. Atsuki and T. Ueda. "An Approximate Dispersion Formula of Microstrip Lines for Computer-Aided Design of Microwave Integrated Circuits (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1036-1038.

A simple approximate formula for the computer-aided design of the dispersion property of microstrip lines is reported in this paper which well fits the calculated curves based on a rigorous analysis.



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Abstracts

3-GHz 15-W Silicon Bipolar Transistors (Dec. 1979 [T-MTT])

I. Uchizaki, S. Hori, Y. Oda and N. Tomita. "3-GHz 15-W Silicon Bipolar Transistors (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1038-1042.

Silicon bipolar transistors delivering 15-W CW output power with 4.8-dB gain and 38-percent collector efficiency have been developed at 3 GHz. The transistors have been fabricated by boron ion implantation for base region and arsenic diffusion from doped polysilicon for emitter region. Chemical dry-etching techniques for fine patterning and internal-matching techniques have been applied.



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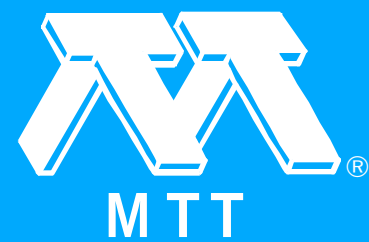
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Simulation and Design of Microwave Class-C Amplifiers through Harmonic Analysis (Dec. 1979 [T-MTT])

F. Filicori, V.A. Monaco and C. Naldi. "Simulation and Design of Microwave Class-C Amplifiers through Harmonic Analysis (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1043-1051.

A method for analyzing microwave class-C amplifiers is proposed which satisfies the requirements of a wide application field, and, at the same time, operates with a fast running time and without convergence problems. It is based on the partitioning of the circuit into linear and nonlinear subnetworks for which, respectively, frequency-domain and time-domain equations are written. Then, taking into account that the time-domain and frequency-domain representations are related by the Fourier series, the circuit behavior is described by means of a system of nonlinear equations whose unknowns are the harmonic components of the incident waves at all the connections. To overcome the numerical problems arising in the search for the solution of this system when strong nonlinearities are involved, a special step-by-step procedure is adopted. The problem is transformed into the search for the solution of a sequence of well-conditioned systems of equations corresponding to a sequence of well-chosen circuits obtained from the original one through progressive changes of the input signal starting from 0 up to the nominal value. The program which implements the method is also described and the results of the analysis relative to a class-C amplifier are compared with measured values.

Click on title for a complete paper.



High-Frequency Si-MOSFET's

C. Tsironis and U. Niggebrugge. "High-Frequency Si-MOSFET's." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1052-1058.

Silicon (Si-) MOSFET's with 0.8- μ m channel, made by conventional technology and optimized for microwave applications, have noise figures of 3.7 dB at 4 GHz and maximum frequencies of oscillation of 10 to 12 GHz. The noise and radio-frequency (RF) small signal performance are only slightly affected by double ion implantation of the channel region, used to shift the threshold voltage from -2 V to +0.2 V. Excess noise is generated in the implanted MOSFET's for lower V_{DS}/V_{GS} values than in unimplanted ones. The variation of the noise parameters with drain current is lower in implanted devices. The RF equivalent circuit analysis indicates negligible parasitic lead resistances, but high feedback capacitance. A comparison with GaAs MESFET's of the buried channel type showed the Si-MOSFET's to have lower third-order harmonic distortion when driven by a 1-GHz signal source.



Abstracts

A 4-W 56-dB Gain Microstrip Amplifier at 15 GHz Utilizing GaAs FET's and IMPATT Diodes (Dec. 1979 [T-MTT])

V. Sokolov, M.R. Namordi and F.H. Doerbeck. "A 4-W 56-dB Gain Microstrip Amplifier at 15 GHz Utilizing GaAs FET's and IMPATT Diodes (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1058-1065.

Performance results and design considerations are presented for an all solid-state Ku-band power amplifier which is feasible for use in PM communication systems for airborne or spacecraft transmitter applications. Design emphasis is placed on high power, and high efficiency operation as well as on compact amplifier construction. A six-stage GaAs FET preamplifier and a driver and balanced power amplifier utilizing GaAs IMPATT diodes operating in the injection locked oscillator mode are discussed. For high power and efficiency Schottky-Read IMPATT's with low-high-low doping profiles are employed. For improved reliability the IMPATT's incorporate a TiW barrier metallization to retard degradation of the IMPATT's. Results of accelerated life testing of the IMPATT devices are also presented.



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A 12-GHz 1-W GaAs MESFET Amplifier (Dec. 1979 [T-MTT])

M. Nakatani, Y. Kadowaki and T. Ishii. "A 12-GHz 1-W GaAs MESFET Amplifier (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1066-1070.

A practical method using small signal S_{22} is presented for the design of GaAs MESFET power amplifier. A five-stage MIC amplifier, which delivers 1-W power output with 27-dB linear gain in the 12-GHz band, was constructed based on this method. Further improvement in the power performance of the amplifier was investigated using newly developed flip-chip MESFET's resulting in 4-W and 2-W power outputs for a unit and a five-stage amplifier, respectively.

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Abstracts

Highly Reliable GaAs MESFET's with a Statistic Mean NF/sub min/ of 0.89 dB and a Standard Deviation of 0.07 dB at 4 GHz (Dec. 1979 [T-MTT])

T. Suzuki, A. Nara, M. Nakatani and T. Ishii. "Highly Reliable GaAs MESFET's with a Statistic Mean NF/sub min/ of 0.89 dB and a Standard Deviation of 0.07 dB at 4 GHz (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1070-1074.

High-performance and high-reliability low-noise GaAs MESFET's are studied from a practical point of view. By optimizing the structure and the configuration of GaAs FET's and by developing techniques to form a reproducible thick submicrometer gate, GaAs FET's having improved characteristics have been made. A mean minimum noise figure NF/sub min/ of 0.89 dB, a standard deviation of 0.07 dB at 4-GHz CW and a pulse input power capability of more than 0.4 and 2 W, respectively, and a failure rate, supported by field data of less than 200 FIT have become practical.



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A Microstrip Low-Noise X-Band Voltage-Controlled Oscillator (Dec. 1979 [T-MTT])

E.C. Niehenke and R.D. Hess. "A Microstrip Low-Noise X-Band Voltage-Controlled Oscillator (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1075-1079.

Design and performance of an X-band microstrip bipolar varactor-tuned oscillator integrated with an FET amplifier is presented. Wide temperature operation (-55 to 71°C), constant high power (0.5 W), low post-tuning drift (0.75 MHz) for 8-percent tuning range, and exceptionally low SSB phase noise (-125 dBc/Hz with GaAs hyperabrupt or -132 dBc/Hz with silicon abrupt tuning diode at 1-MHz modulation frequency) is reported. Extremely linear frequency-voltage characteristic is achieved with the GaAs hyperabrupt tuning diode for this oscillator without the need for complex linearizing circuitry. Circuit synthesis techniques and noise estimation criteria are presented which correlate with the experimental results.

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Abstracts

The Surface Contour Radar, a Unique Remote Sensing Instrument (Dec. 1979 [T-MTT])

J.E. Kenney, E.A. Uliana and E.J. Walsh. "The Surface Contour Radar, a Unique Remote Sensing Instrument (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1080-1092.

A 36-GHz computer-controlled airborne radar has been developed by NRL and NASA WFC which generates a false-color coded elevation map of the sea surface below the aircraft in real-time and can routinely produce ocean directional wave spectra with off-line data processing.



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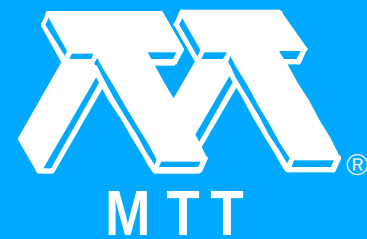
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Contributors (Dec. 1979 [T-MTT])

G.D. Alley, J.W. Amoss, K. Atsuki, A. Ballato, J.M. Borrego, M.C. Calcaterra, H.E. Carlson, N.W. Cox, W.A. Cox, C.L. Cuccia, F.H. Doerbeck, G.F. Engen, F. Fillicori, P.L. Fleming, R.J. Gutmann, E.T. Harkless, R.D. Hess, G.N. Hill, C.A. Hoer, S. Hori, T. Ishii, T. Itoh, K. Yoshinobu, J.E. Kenney, A.R. Kerr, T.J. Lukaszek, E.W. Matthews, V.A. Monaco, M. Nakatani, C. Naldi, M.R. Namordi, A. Nara, E.C. Niehenke, U. Niggebrugge, Y. Oda, M.D. Rubin, C.T. Rucker, S.K. Salmon, T. Smith, V. Sokolov, B.-S. Song, S.E. Sussman-Fort, T. Suzuki, H.L. Thal, Jr., M.L. Thorn, N. Tomita, C. Tsironis, I. Uchizaki, T. Ueda, E.A. Uliana, E.J. Walsh, H.-C. Wang, J.J. Whalen, E. Yamashita and D.N. Zuckerman. "Contributors (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): 1093-1098.



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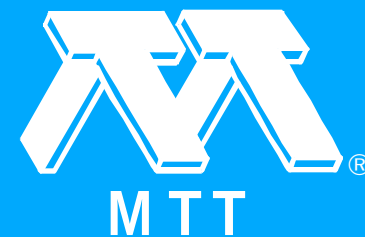
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Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-27, 1979

*"Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-27, 1979."
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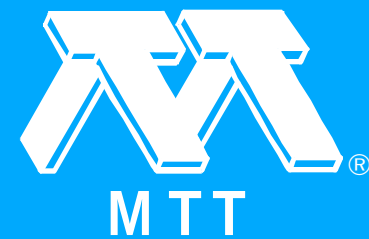
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Abstracts

Back Cover (Dec. 1979 [T-MTT])

"Back Cover (Dec. 1979 [T-MTT])." 1979 Transactions on Microwave Theory and Techniques 27.12 (Dec. 1979 [T-MTT] (1979 Symposium Issue)): b1-b2.



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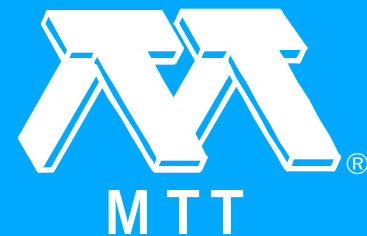


Abstracts

Planning Microwave Device R&D for Defense

L. Young and L.R. Weisberg. "Planning Microwave Device R&D for Defense." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 17-19.

The paper reviews the DOD planning process and presents the historical evolution of content and funding of the DOD electronic devices program since the late 1950's, with emphasis on microwave devices.



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Abstracts

Communication for a Mobile Society: Implications of Developments at 900 MHz (Abstract)

R. Bowers. "Communication for a Mobile Society: Implications of Developments at 900 MHz (Abstract)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 20-20.

Technical advances and regulatory decisions will make possible substantially increased capacity for vehicular and fully portable communication units. The speaker will review the principal conclusions of a recently completed assessment of the implications of these developments, emphasizing economic, regulatory, organizational and social issues. (See R. Bowers, et al, Communications for a Mobile Society, Sage Publications, Beverly Hills, California; April 1978.)



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Abstracts

New Integrated mm-Wave Components Using Fin-Lines

H. Hofmann, H. Meinel and B. Adelseck. "New Integrated mm-Wave Components Using Fin-Lines." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 21-23.

New integrated fin-line components are presented: reflecting and matched PIN-attenuators, power-divider, PIN double-throw switch, and different oscillator configurations. All exhibit excellent performance and great flexibility in design and application.



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Abstracts

An X-Band Balanced Finline Mixer (1978 [MWSYM])

G. Begemann. "An X-Band Balanced Finline Mixer (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 24-26.

Finline technique has been used in a balanced 9-11 GHz mixer with a 70 MHz intermediate frequency. The conversion loss is less than 5 dB with 3.8 dB minimum. The mixer is tunable by variable shorts. It is possible to scale the mixer to mm-wave frequencies.



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Abstracts

Advances in E-Plane Printed Millimeter-Wave Circuits

L.D. Cohen and P.J. Meier. "Advances in E-Plane Printed Millimeter-Wave Circuits." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 27-29.

Recent work is reported on printed millimeter-wave circuits mounted in the E-plane of rectangular waveguide. The circuits include wideband four-port coupling elements and one-port GaAs and InP Gunn oscillators providing 20 to 60 mW in the range of 55 to 70 GHz, with mechanical tunability up to 8 GHz.



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Simulation Study of Electronically Scannable Antennas and Tunable Filters Integrated in a Quasi-Planar Dielectric Waveguide (1978 [MWSYM])

T. Itoh and A.S. Hebert. "Simulation Study of Electronically Scannable Antennas and Tunable Filters Integrated in a Quasi-Planar Dielectric Waveguide (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 30-32.

Preliminary studies on electronically scannable leaky-wave antennas integrated in a dielectric waveguide are reported. Electronic scan is simulated by a small mechanical motion from which the relation between the scan angle and the necessary change in dielectric constant can be derived. The work is also applicable to electronically tunable band-stop filters.



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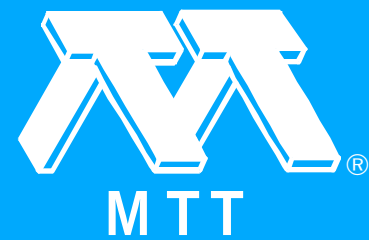


Abstracts

An Alignment Technique for Multiple Ball YIG Bandpass Filters Operating Over Multi-Octave Frequency Bands

M. Cohen. "An Alignment Technique for Multiple Ball YIG Bandpass Filters Operating Over Multi-Octave Frequency Bands." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 33-36.

To date, the alignment of a multi-sphere YIG bandpass filter for multi-octave frequency bands has been designated as a "Black Art" performed by a rare breed of highly skilled and patient individuals. The intent of this paper is to bring YIG filter alignment out of the realm of "tweaking and hunting", thereby significantly reducing the cost per unit. A logical step by step alignment procedure applicable to any YIG or Ga YIG multi-sphere bandpass filter is presented. The validity of the technique has been verified by many successfully aligned complex filters.



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14-GHz MIC 16-ns Delay Filter for Differentially Coherent QPSK Regenerative Repeater

Y.S. Lee. "14-GHz MIC 16-ns Delay Filter for Differentially Coherent QPSK Regenerative Repeater." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 37-40.

A parallel-coupled microstrip fused silica filter at 14 GHz was developed as a 16-ns delay element for application to direct detection with a differentially coherent quaternary PSK (DQPSK) demodulator/regenerator module of an onboard regenerative repeater for future satellite-switched time-domain multiple-access (SS-TDMA) satellite communications systems. Design considerations, experimental results of the 14-GHz bandpass delay element, and a technique for precision measurement of the fused silica filter delay phase temperature coefficient are presented. In addition, the expected DQPSK demodulator performance is evaluated by simulation analysis using a comprehensive transmission channel modeling program.

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Improvement of Performances of Microstrip Structures by Equalization of Phase Velocities

A.E. Ros and D. Pompei. "Improvement of Performances of Microstrip Structures by Equalization of Phase Velocities." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 41-43.

It is well known that, in the TEM approximation, the electrical characteristics of microstrips couplers are easily obtained, if we assume the equality between the odd, even modes phase velocities. In the other hand the directivity of such couplers is considerably decreased when the gap between these velocities increased. So, it can be very useful to equalize them. This result can be achieve by using a dielectric overlay or an upper ground plaine symetrical of the lower one with regard to the conductors. This last result can be generalized to a n-parallel microstrip device. Advantages, disadvantages of these two technics are discussed, experimental results are given.

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A Matched Coaxial-Radial Transmission Line Junction

R.C. Allison, R.L. Eisenhart and P.T. Greiling. "A Matched Coaxial-Radial Transmission Line Junction." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 44-46.

A broadband transition between coaxial and radial transmission lines was designed by means of an equivalent circuit developed for the junction. The design accuracy was substantiated by excellent correlation between measured and theoretical performance.

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A Comparison of Four Overmoded Canonical Narrow Bandpass Filters at 12 GHz

E.L. Griffin and F.A. Young. "A Comparison of Four Overmoded Canonical Narrow Bandpass Filters at 12 GHz." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 47-49.

The relative merits of four waveguide modes, square TE/sub 103/ and TE/sub 105/ and cylindrical TE/sub 113/ and TE/sub 011/, in constructing small, lightweight, low loss, narrow bandpass canonical filters for use at 12 GHz and above are presented in this paper. The TE/sub 113/ mode is the choice of the present study.

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Abstracts

Integrated Gigabit Logic -- State of the Art Assessment and Performance Projections

L.J. Micheel and G.G. Rabanus. "Integrated Gigabit Logic -- State of the Art Assessment and Performance Projections." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 50-53.

After an overview of a wide range of technologies featuring sub-nanosecond ring oscillator stage delays, a simple method is described to convert such data into gate delays and flipflop clock rates in larger monolithic integrated circuits. Performance and chip complexity advancement for 1980 and 1985 are projected.



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Abstracts

A Multi-Gigabit Signal Processing System

C.R. Ryan. "A Multi-Gigabit Signal Processing System." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 54-57.

Signal processing in the multi-gigabit per second range can be accomplished by making use of a very simple ring diode structure imbedded in a MIC. This circuit can be characterized as a single pole double throw switch with switching times of less than 100 ps. It is capable of performing as the basic element in a variety of processing functions including signal multiplexing, demultiplexing signal sampling and as a shift register. Data rates up to 4 GB/S have been processed using this technique.



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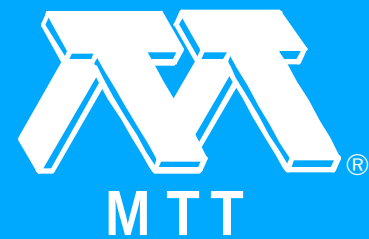
Microwave GaAs FET Switching

R.A. Gaspari and H.H. Yee. "Microwave GaAs FET Switching." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 58-60.

Microwave switching using GaAs field effect transistors offers very high speed and low drive control power. Using arrays of such FETs, an 8 x 8 switch matrix was constructed for 4 GHz SS-TDMA spacecraft applications which achieved 1 ns transition time at 10 mW drive control power. Matrix isolation over 500 MHz bandwidth was 50 dB.

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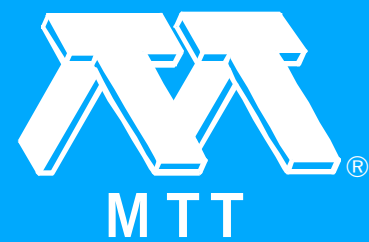
1.6Gb/s 16-level Superposed APSK MODEM with Baseband Signal Processing Coherent Demodulator (1978 [MWSYM])

M. Washio, N. Komiyama, Y. Takimoto and T. Shimamura. "1.6Gb/s 16-level Superposed APSK MODEM with Baseband Signal Processing Coherent Demodulator (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 61-63.

A 1.6Gb/s 16-level superposed APSK MODEM using newly developed baseband signal processing coherent demodulator is described. The MODEM has much improved performance characteristics while having much simplified configuration comparing with the already reported one. Jitter power of the recovered carrier is less than -36dB and required C1/N for BER of 10^{-9} is better than 25.4dB through the MODEM loop back test (BT = 1.35).

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An Integrated DQPSK Demodulator for 14-GHz Satellite Communications Applications

W.H. Childs, C.E. Mahle and J. Potukuchi. "An Integrated DQPSK Demodulator for 14-GHz Satellite Communications Applications." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 64-66.

An MIC assembly for direct DQPSK demodulation at 14 GHz is described. A time delay of 16.6 ns (120 Mbit/s) is achieved by edge-coupled bandpass filters. Quadrature phase detection is provided by a novel MIC topology that causes RF and IF ports to occur in adjacent pairs. An electronic phase shifter provides near linear phase shift with bias voltage. Temperature compensation maintains the phase errors to within 5° for a 20°C temperature change.

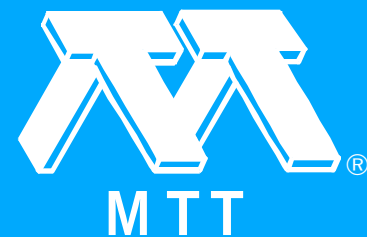
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6 GHz 5W GaAs FET Power Amplifier for 78 Mb/s 8-Phase PSK Signal Transmission

Y. Saito, S. Akasaka, S. Fukuda and I. Haga. "6 GHz 5W GaAs FET Power Amplifier for 78 Mb/s 8-Phase PSK Signal Transmission." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 67-69.

This paper describes the configuration and performance of a 6 GHz 5W power amplifier using GaAs power FET's, developed for transmission of a 78 Mb/s. 8-phase PSK signal.



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Abstracts

A Logic Module Using Transferred-Electron Logic Devices for Time-of-Arrival Determination of GHz Signals

W.R. Curtice. "A Logic Module Using Transferred-Electron Logic Devices for Time-of-Arrival Determination of GHz Signals." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 70-72.

An experimental logic module for high precision time interval measurements is described. The fast switching properties of transferred-electron devices, MESFETs and SRDs are utilized in novel circuit designs for subnanosecond, single event measurements.



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Abstracts

A Network Reduction Technique for Microstrip Three-Dimensional Problems

C.L. Chao. "A Network Reduction Technique for Microstrip Three-Dimensional Problems." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 73-75.

A method is presented for obtaining the equivalent capacitances of microstrip discontinuity structures. The method of formulation and solution is based on the resistive network reduction technique. The formulation results in a matrix eigenvalue problem and permits us to obtain more accurate results with a relatively short computer time requirement. Numerical results for a variety of discontinuity configurations are presented and compared with results published by other investigators. Excellent agreement has been obtained in all cases.



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Abstracts

Generalized Spectral Domain Method for Multi-Conductor Printed Lines and its Application to Tunable Suspended Microstrips (1978 [MWSYM])

T. Itoh, D. Ratliff and A.S. Hebert. "Generalized Spectral Domain Method for Multi-Conductor Printed Lines and its Application to Tunable Suspended Microstrips (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 76-78.

An efficient method is developed for obtaining propagation characteristics of microstrip-line type structures in which a number of conductors are located on various interfaces. Specific computations have been carried out for suspended microstrip line structures with tuning conductive septums. A number of data useful for design are included.



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Abstracts

New Results in Network Simulation, Sensitivity and Tolerance Analysis for Cascaded Structures (1978 [MWSYM])

J.W. Bandler, M.R.M. Rizk and H.L. Abdel-Malek. "New Results in Network Simulation, Sensitivity and Tolerance Analysis for Cascaded Structures (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 79-81.

An attractive, exact and efficient approach to network analysis for cascaded structures presented. It is useful for sensitivity and tolerance analyses, in particular, for a multiple of simultaneous large changes in design parameter values.



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Abstracts

Exact Calculation of the Uncertainty on the Input Reflection Coefficient of Arbitrary Two-Ports, due to Mismatches and Arbitrary Reference Planes (1978 [MWSYM])

H. Tromp. "Exact Calculation of the Uncertainty on the Input Reflection Coefficient of Arbitrary Two-Ports, due to Mismatches and Arbitrary Reference Planes (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 82-84.

Exact formulas are derived for the upper and lower limits of the amplitude of the input reflection coefficient of an arbitrary two-port, in the presence of mismatched source and load and/or indefinite reference planes. The derivation is based on certain properties of the bilinear transformation.



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Device-Circuit Interaction Simulation of a TRAPATT Amplifier

R.K. Mains, N.A. Masnari and G.I. Haddad. "Device-Circuit Interaction Simulation of a TRAPATT Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 85-87.

Computer programs have been developed which perform a device-circuit interaction simulation of a TRAPATT amplifier for which experimental results were previously reported. The coaxial line with tuning slugs and the TRAPATT diode are simulated in the time domain. All of the device and circuit parameters reported experimentally are incorporated in the computer simulation. Theoretical results are presented and compared with experimental data.



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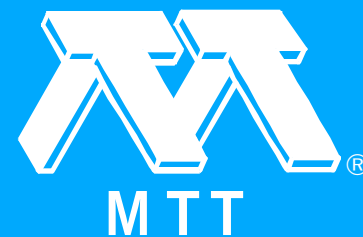


Abstracts

Computer-Aided Design of Highly Linear, High-Power Varactor-Tuned Frequency Modulators

E. Marazzi and V. Rizzoli. "Computer-Aided Design of Highly Linear, High-Power Varactor-Tuned Frequency Modulators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 88-90.

A systematic approach to the design of linear high-power varactor-tuned frequency modulators is presented. It is shown that a few simple measurements on the free-running oscillator together with a suitable use of modern general-purpose optimization programs allow the designer to predict and control all aspects of the design problem, including linearity of the frequency-voltage characteristic, the R.F. voltage swing across the varactor junction, and the optimum choice of the varactor diode itself.



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Abstracts

Evaluation of SUPER-TSD Network-Analyzer Calibration Programs by Computer Simulation

R.A. Speciale. "Evaluation of SUPER-TSD Network-Analyzer Calibration Programs by Computer Simulation." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 91-93.

Two Fortran programs, which implement the SUPER-TSD calibration method for automated network analyzers, have been written for the conventional case of two-port scattering parameter measurements. These SUPER-TSD error-computation and error-removal programs are being evaluated by using computer-generated simulated calibration data representing known system errors, including leakage and switching errors. The results obtained so far confirm all the predictions of the SUPER-TSD theory, including the theoretically unlimited capability of removing leakage errors. This capability is limited in real measurements only by the finite system resolution and stability and by noise.



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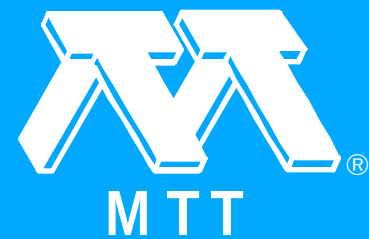
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Non-Reciprocal Ferrite Phase Shifters for Millimeter Applications

R.W. Babbitt and R.A. Stern. "Non-Reciprocal Ferrite Phase Shifters for Millimeter Applications." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 94-96.

The design, fabrication and evaluation of 35 GHz, 65 GHz and 94 GHz non-reciprocal, ferrite latching phase shifters is described. These devices are waveguide structures which utilize the novel arc plasma spray (APS) process for fabricating the lithium ferrite toroids used in these phasors in order to achieve low cost and high performance. Currently, APS techniques are being developed to produce hybrid integrated phasor assemblies for use in millimeter phased array radars operating up to 94 GHz and possibly higher.

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New Configurations of the Nonreciprocal Remanence Ferrite Phase Shifter

A. Mizobuchi and H. Kurebayashi. "New Configurations of the Nonreciprocal Remanence Ferrite Phase Shifter." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 97-99.

For the purpose of improving the performance characteristics of the nonreciprocal remanence ferrite phase shifter, new configurations are proposed here which are characterized by the adoption of the grooved waveguide. Some results calculated mainly as a function of the grooved waveguide height are shown and compared, in good agreement, with experimental values. The Figure-of-Merit and handling power level of the proposed phase shifter are discussed in comparison with those of the ordinary one.

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Reliability Evaluation of the RARF Ferrite Phase Shifter

G.A. Lindauer. "Reliability Evaluation of the RARF Ferrite Phase Shifter." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 100-102.

Reliability evaluation is made on the more than 3600 phase shifters of the RARF Array. Types of failures, and numbers of each type, and analysis of their cause are given where known.

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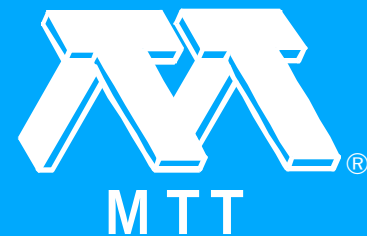


Abstracts

Low Loss, High Power Latching Waveguide Switch

W.S. Piotrowski and J.E. Raue. "Low Loss, High Power Latching Waveguide Switch." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 103-104.

This paper describes a new approach to the design of high power waveguide latching circulating switches featuring simple cylindrical junction parts and exceptional RF performance: typical insertion loss is 0.15 dB at X-band, with a CW power handling capability of 200 W.



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Abstracts

Slim-Guide Circulators in C, X, K and U Bands

A. D'Ambrosio. "Slim-Guide Circulators in C, X, K and U Bands." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 105-107.

The performance is here discussed of circulators and switches using the evanescent mode approach. Units have been manufactured and tested from 4 GHz up to 50 GHz. The relevant results are likewise reported.



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YIG Resonator Circuit with Isolator Property and its Application to Gunn Diode Oscillator (1978 [MWSYM])

F. Okada, K. Ohwi and Y. Yokochi. "YIG Resonator Circuit with Isolator Property and its Application to Gunn Diode Oscillator (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 108-110.

This paper presents analysis and experiments of a newly developed YIG resonator circuit with isolator property, which is constructed with a YIG sphere, a 3 dB directional coupler and three coupling loops. The paper then goes on to describe experiments of a magnetically tunable Gunn diode oscillator with the YIG circuit. It has been confirmed that the YIG circuit applied to a tunable oscillator is useful in frequency pulling and in the variation of output power level.

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Abstracts

Optical Fiber Communication and Integrated Optics (Abstract)

E.A.J. Marcatili. "Optical Fiber Communication and Integrated Optics (Abstract)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 111-111.

In about ten years, efficient research and diligent technology have carried the field of optical communication to such a level that many systems operating with a wide range of requirements have been developed throughout the world. Thus, cables containing up to more than one hundred easy-to-splice multimode fibers can transmit thousands of telephone channels; injection lasers and light emitting diodes made of GaAlAs operating at about $0.85\mu\text{m}$ can be directly modulated at rates as high as hundreds of MHz; silicon PIN and the more sophisticated avalanche gain detectors, both with superb characteristics, are widely used.



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Abstracts

Review of Techniques for Propagation in Slab and Fiber Waveguides (Abstract)

L.B. Felsen. "Review of Techniques for Propagation in Slab and Fiber Waveguides (Abstract)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 112-112.

Slab, fiber waveguides of homogeneous and inhomogeneous cross section find application for guiding optical signals. The propagation characteristics of such guides can be analyzed by modal methods, ray methods, or a combination of these. This paper reviews various methods, with emphasis on their physical interpretation, on the relation between them. Attention is given to a new asymptotic theory for guided modes in graded index media that is based on the propagation properties of evanescent waves. Also discussed are new techniques for dealing with the excitation of slab, fiber waveguides by incident Gaussian beams.



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Abstracts

Scattering from an Arbitrarily-Located Off-Axis Inhomogeneity in a Step-Index Optical Fiber (1978 [MWSYM])

A. Safaai-Jazi and G.L. Yip. "Scattering from an Arbitrarily-Located Off-Axis Inhomogeneity in a Step-Index Optical Fiber (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 113-115.

A Green's function formulation of an arbitrarily oriented off-axis dipole radiating in a dielectric rod waveguide is carried out. The analysis is applied to the problem of scattering from an arbitrarily-located inhomogeneity in a step-index optical fiber.



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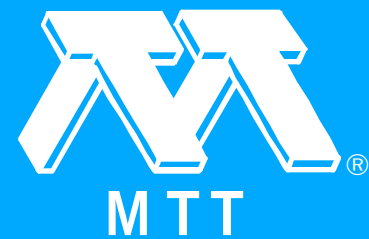
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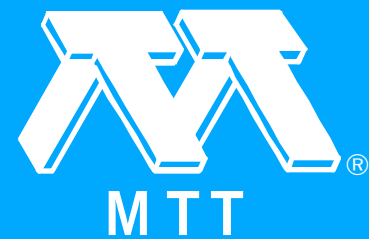
Quantitative Mode Analysis in Optical Fibers

H. Shigesawa and K. Takiyama. "Quantitative Mode Analysis in Optical Fibers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 116-118.

An accurate method of determining the modal power distribution along optical fibers is described. Experimental results with the observation of launching conditions on an optical fiber demonstrate the accuracy of this method. Various factors having an important influence upon the accuracy are discussed, and also appropriate methods of minimizing the systematic errors are presented.

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Scattering Characteristics of a Beam Mode in Dielectric-Slab Optical Waveguide

M. Imai, S. Miyanaga and T. Asakura. "Scattering Characteristics of a Beam Mode in Dielectric-Slab Optical Waveguide." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 119-120.

The amount and directivity of scattering light in dielectric-slab optical waveguides, produced in a propagating beam mode due to refractive-index inhomogeneities of the thin film and due to boundary irregularities film-substrate and film-air interfaces are calculated by means of a perturbation method together with the use of a stationary phase method and obtained as a function of their correlation length and variance, thin film thickness, and refractive index difference.

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Abstracts

Resonant Characteristics of Dielectric Resonators for Millimeter-Wave Integrated Circuits

T. Itoh and C. Chang. "Resonant Characteristics of Dielectric Resonators for Millimeter-Wave Integrated Circuits." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 121-122.

An approximate but accurate method is presented for computing the characteristics of dielectric resonators used in millimeter-wave integrated circuits. Physical interpretation of the modal fields, numerical results and experimental verification are included.



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Abstracts

Large Bandwidth Optical Modulators Utilizing Millimeter Wavelength Drivers

A.E. Popa, T.K. Plant and R.E. Johnson. "Large Bandwidth Optical Modulators Utilizing Millimeter Wavelength Drivers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 124-126.

This paper describes the research and development effort under way at Hughes Research Laboratories (HRL) to design, fabricate, and test infrared traveling-wave modulators that can be excited by millimeter-wavelength drivers. The modulators are designed for eventual use in high-data-rate communication systems and for laser wave-length shifting in isotope separation experiments. These programs have demonstrated that millimeter-wavelength excited infrared modulators have the potential to advance the state of the art for optical modulation bandwidth by a factor of three and reduce driver power by at least an order of magnitude.



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Abstracts

Laser Diode Characterizations for Multi-Channel Applications

C.S. Kim. "Laser Diode Characterizations for Multi-Channel Applications." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 127-128.

Commercially available laser diodes for multi-channel applications are characterized; results on intermodulation distortions and S/N levels, obtained using a new procedure in the RF frequency range and at various operating points above threshold levels, are included.



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Abstracts

A Low Noise Single-Ended GaAs Schottky FET Amplifier for a 14 GHz Satellite Communication Application

P. Estabrook, C.M. Krowne, E.J. Crescenzi, Jr. and R.E. Stegens. "A Low Noise Single-Ended GaAs Schottky FET Amplifier for a 14 GHz Satellite Communication Application." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 129-131.

A 14.0 - 14.5 GHz amplifier consisting of a cascade of three single-ended stages which realizes a noise figure of 3.5 dB and a gain of 17 dB has been designed. This has been achieved with a new design technique which is tolerant of changes in FET S-parameters and yet capable of extracting the maximum performance of the device. Results on a 10 GHz amplifier designed with the above technique will also be given.



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Abstracts

A Technique for Predicting Large Signal Performance of a GaAs MESFET (1978 [MWSYM])

H.A. Willing, C. Rauscher and P. de Santis. "A Technique for Predicting Large Signal Performance of a GaAs MESFET (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 132-134.

A method is described for accurately predicting nonlinear microwave performance of GaAs MESFET devices. The method utilizes time-domain analysis and is based upon experimentally characterized bias-dependence of device circuit model elements. Precise predictions are made of fundamental and harmonic power levels up to 6 dB of gain compression.



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Intermodulation Distortion Behavior of GaAs Power FETs

E.W. Strid and T.C. Duder. "Intermodulation Distortion Behavior of GaAs Power FETs." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 135-137.

The 4 GHz intermodulation distortion (IMD) behavior of several Power GaAs FETs from different manufacturers is studied. The two-tone IMD and AM to PM conversion is a function of the source and load impedances. The IMD is not "well-behaved" in general (3:1 IMD slope), and therefore the third-order intercept point is not valid in characterizing these power FET's. This data was applied in the design of a 2 watt 3.7-4.2 GHz linear amplifier. Its linearity performance is compared to that of a 2 GHz linear bipolar amplifier.



Abstracts

Intermodulation Distortion in GaAs FETs

J.A. Higgins. "Intermodulation Distortion in GaAs FETs." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 138-141.

The influence that the active layer profile plays in determining the Intermodulation Distortion levels (IMD) in a power GaAs FET has been analyzed. A simplified model of a tuned amplifier containing the device sources of nonlinearity has yielded an improved understanding of generation of IMD products in such applications as GaAs FET power amplifiers.



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Abstracts

A 7 Watt C-Band FET Amplifier Using Serial Power Combining Techniques

P.T. Ho. "A 7 Watt C-Band FET Amplifier Using Serial Power Combining Techniques." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 142-144.

This paper describes the development of a 7 watt FET amplifier operated in the satellite communication band (3.7 GHz to 4.2 GHz) using serial power combining techniques. This three-stage MIC power amplifier provides 16.6 dB power gain, 33.1% power added efficiency, and over 500 MHz 1 dB bandwidth. The FET power amplifier features good efficiency, low noise figure, and excellent linearity. It is an ideal solid state replacement for the traveling wave tube amplifier in future communication systems.



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Abstracts

A 1.0 Watt GaAs MESFET Oscillator at X-Band

R.M. Rector and G.D. Vendelin. "A 1.0 Watt GaAs MESFET Oscillator at X-Band." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 145-146.

The design and performance of high power GaAs MESFET oscillators are described for two commercially available MESFET transistors. The oscillators were fabricated with packaged common-gate transistors on microstrip circuits. Power levels, and efficiencies are comparable to amplifier performance at the same frequency.



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Phase Characteristics of I-Band Pulsed Gate GaAs FET Power Amplifiers

R.L. Camisa, R.L. Ernst, J. Goel and H.J. Wolkstein. "Phase Characteristics of I-Band Pulsed Gate GaAs FET Power Amplifiers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 147-149.

The measured phase sensitivities and transients of FET power amplifiers having pulsed gate voltages are very low and are suitable for phased array applications. Gate pulsing requires that the FETs have good rf performance and a drain-to-gate breakdown voltage large enough to support the sum of the gate voltage, drain voltage, and maximum rf voltage swing.

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Current-Voltage Characteristics, Small-Signal Parameters, Switching Times and Power-Delay Products of GaAs MESFET's

M.S. Shur and L.F. Eastman. "Current-Voltage Characteristics, Small-Signal Parameters, Switching Times and Power-Delay Products of GaAs MESFET's." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 150-152.

New simple computer and analytical models of GaAs MESFET's are proposed. The models are based on the assumption that the current saturation in GaAs MESFETs is related to the stationary Gunn domain formation at the drain side of the gate rather than to a pinch-off of the conducting channel under the gate. The results of the calculation are in good agreement with experimental data. The models can be used for a computer-aided design of GaAs integrated circuits.

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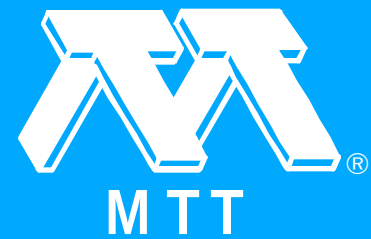


Abstracts

Millimetric Waveguide Line in a Cable Tunnel

F. Nihei, K. Yanagimoto and F. Ishihara. "Millimetric Waveguide Line in a Cable Tunnel." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 153-155.

An intra-city millimetric waveguide system, utilizing a cable tunnel, has been developed. This paper describes the development of waveguides for bends to make a meandering waveguide line with low loss and low wave-form distortion. Field test results are also described.



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Abstracts

Low Loss Flexible Helix Waveguide

T. Hayakawa, I. Takashima, K. Inada and M. Miyauchi. "Low Loss Flexible Helix Waveguide." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 156-159.

We have found the optimum wall structure of small inner diameter flexible helix waveguides which scarcely cause TE/sub 01/ mode conversion despite a bending or elliptical deformations. TE/sub 01/ mode loss is below 0.25dB for a wide millimeter wave range. The attenuation is lower than that of a single corner waveguide which has been generally used at the severe curved segment of waveguide line. Moreover, there is no generation of unwanted higher order TE/sub on/ modes. These low loss flexible helix waveguides will be useful for the wide frequency range of the millimetric waveguide communication systems.



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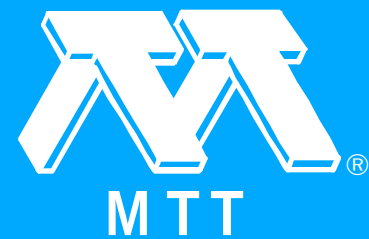


The GaAs TUNNETT Diodes

J. Nishizawa, K. Motoya and Y. Okuno. "The GaAs TUNNETT Diodes." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 159-161.

The Tunnel injection transit time (Tunnett) diode operates in higher frequency region and with lower noise level than that of the Impatt diode. In thin carrier generating region, the tunnel injection which depends steeply on the electric field intensity over 1000 kV/cm, where the ionization of carriers can be neglected, leads to the higher efficiency operation of the Tunnett than that of the Impatt. GaAs Tunnett diodes with p+n and p+nn+ structure have been fabricated by a new LPE method (TDM under CVP). The fundamental oscillation at the frequency from about 100 GHz up to 248 GHz has been obtained from the p+nn+ diode.





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Impedance Measurement of Millimeter-Wave IMPATT Diodes

N. Kanmuri, K. Yamamoto, E. Hagihara and M. Akaïke. "Impedance Measurement of Millimeter-Wave IMPATT Diodes." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 162-164.

Impedance measurement for characterizing a millimeter-wave IMPATT diode mounted in a waveguide is described. Passive parameters and active impedances of Si SDR IMPATT diodes, measured under various conditions, are presented.

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Thermoelectric Transducers for Short Millimeter-Wave Power Measurement

I. Sugiura and H. Toda. "Thermoelectric Transducers for Short Millimeter-Wave Power Measurement." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 165-167.

Experimental results on the thermoelectric transducers for short millimeter-wave power measurements up to 260 GHz are described. The transducers showed low VSWR and flat sensitivity of more than 60 μ V/mW throughout their full waveguide frequency ranges.

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Radar Sensor for Automotive Collision Prevention

T. Tamama, A. Iwabe, K. Ban, M. Tsudo, S. Mitsui, K. Baba, M. Kiyoto, H. Endo and N. Fujiki. "Radar Sensor for Automotive Collision Prevention." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 168-170.

A pulse-Doppler radar of 20 ns pulsewidth was developed and tested as an automotive collision prevention sensor. A simple but effective super-heterodyne structure was realized by the use of one FM Gunn oscillator as both the transmitter and the local oscillator. It is a unique feature of the system that the IF signal is coherent in every pulse repetition, which contributes to the realization of a pulse-Doppler system in a very simple configuration. A micro-computer is utilized in the signal processor unit which calculates danger evaluation and false alarm prevention.



Abstracts

Millimeter Wave Propagation Experiment with Geostationary Satellite ETS-II of Japan

R. Hayashi and N. Fugono. "Millimeter Wave Propagation Experiment with Geostationary Satellite ETS-II of Japan." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 171-173.

Engineering Test Satellite Type II (ETS-II) [Kiku-2] was successfully lifted off on February 23, 1977 and stationed at 130°E of the geostationary orbit on March 5, 1977. This paper will introduce outline of the experimental system and preliminary results using the data until end of the August, for over three thousand hours of test time.



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Abstracts

An Overview of the Six-Port Measurement Technique

G.F. Engen. "An Overview of the Six-Port Measurement Technique." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 174-175.

The advent of digital technology and the automatic network analyzer has had a major impact on the evolving microwave metrology. The six-port measurement technique provides an alternative method for implementing the automatic network analyzer, which yields significant advantages. This paper will review the major features of this measurement approach.



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Calibrating Two Six-Port Reflectometers with an Unknown Length of Precision Transmission Line

C.A. Hoer. "Calibrating Two Six-Port Reflectometers with an Unknown Length of Precision Transmission Line." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 176-177.

This paper describes a technique for calibrating a pair of 6-port reflectometers for measuring the complex reflection coefficient of 1-port devices, or the scattering parameters of reciprocal 2-port devices. The operations in the calibration consist of connecting the two 6-ports together, connecting each 6-port to a calibration circuit consisting of two unknown terminations and a leveling loop, and then connecting the standard. The standard can be one termination whose complex impedance is known, or a length of precision transmission line whose cross-sectional dimensions are known. The length and loss of the line are not required. The solution for the constants which characterize each 6-port is closed, requiring no iteration.

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Abstracts

A New Technique for Calibrating Dual Six-Port Networks with Application to S Parameter Measurements

L. Susman. "A New Technique for Calibrating Dual Six-Port Networks with Application to S Parameter Measurements." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 179-181.

This paper describes a new technique for the simultaneous calibration of two six-port networks as reflectometers. Once calibrated, the complete S parameters of an unknown two-port network can be obtained from power measurements alone. The technique requires only a uniform transmission line, of unknown length and loss, and a short circuit as calibrating standards. Its application to an automated microwave measurement system is described and potential error sources are quantitatively discussed.



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Abstracts

Calibrating the Six-Port Reflectometer

G.F. Engen. "Calibrating the Six-Port Reflectometer." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 182-183.

Because complex heterodyne methods may be replaced by simple amplitude detectors, the six-port technique promises to have a major impact on the next generation of automatic network analyzers. This projection, however, is predicated upon the existence or development of calibration techniques which permit one to conveniently and accurately obtain the parameters which characterize the six-port. This paper describes a number of substantial refinements to a previously described procedure which is based upon the use of sliding terminations.



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Abstracts

The Application of "Thru-Short-Delay" to the Calibration of the Dual Six-Port

G.F. Engen and C.A. Hoer. "The Application of "Thru-Short-Delay" to the Calibration of the Dual Six-Port." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 184-185.

In a companion paper, in this digest, a scheme for reducing the (single) six-port calibration problem to that of an equivalent four-port reflectometer has been described. This now makes it possible to apply existing four-port calibration schemes. One such method is the "thru-short-delay" (TSD) procedure. This paper briefly outlines this calibration approach.



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Abstracts

A Microprocessor Controlled Automatic Network Analyzer in a Microwave Computer-Aided Design System

P. Froysa, E. Hammerstad and J. Kuhnle. "A Microprocessor Controlled Automatic Network Analyzer in a Microwave Computer-Aided Design System." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 186-188.

A microprocessor controlled automatic network analyzer with a frequency range of 0.045-18 GHz with typical accuracies of 0.1 dB and 1° and low cost compared to comparable commercially available systems is described. The software has been designed for ease of use and to allow direct access to the measurement data by other computer programs. A program for processing the data on a graphical terminal is described. Efforts to make the data available to computer aided design programs on a large computer installation are discussed.



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Abstracts

Analysis of Nonuniform Transmission Lines on Curved Cross-Sections

P.A. McGovern. "Analysis of Nonuniform Transmission Lines on Curved Cross-Sections." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 189-191.

Tapered plate nonuniform lines are analyzed using nonorthogonal coordinate descriptions and perturbation expansions emphasizing one-dimensional baseband waves and the field structure, with single term exact solution for the uniform wedge. Coaxial lines may also be treated by this method.



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Abstracts

Analysis of a Three-Dimensional Arbitrarily-Shaped Dielectric or Biological Body Inside a Rectangular Waveguide (1978 [MWSYM])

J.J.H. Wang. "Analysis of a Three-Dimensional Arbitrarily-Shaped Dielectric or Biological Body Inside a Rectangular Waveguide (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 192-194.

This paper presents a method for the analysis of three-dimensional arbitrarily-shaped dielectric obstacles inside a rectangular waveguide. The moment method is used to solve an integral equation formulated with a dyadic Green's function.



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Filter Characteristics of Radial Waveguides Coupled by Annular Slots

B. Azarbar and L. Shafai. "Filter Characteristics of Radial Waveguides Coupled by Annular Slots." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 195-197.

Using a boundary value treatment, a method is established which gives the internal fields of two coupled radial waveguides. The coupling is achieved by an array of annular slots on the common boundary. It is shown that, in general, higher order modes have significant effect on the solution, for a precise evaluation of the field their contribution must also be included. The possible application of the method for the design of microwave filters with band-pass characteristics is also discussed.

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Abstracts

Field Behaviour Near a Dielectric Edge

J.B. Andersen and V.V. Solodukhov. "Field Behaviour Near a Dielectric Edge." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 198-200.

A review of the theory of field behaviour near a dielectric edge is presented. An overview of the static results is given and it is shown that the series of Meixner for the dynamic case in general is non-existing. Numerical results for scattering by a dielectric cylinder of square-section indicate that the static results give an accurate account for the rate of growth of the fields in the singular cases, but some disagreement in non-singular cases.



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Abstracts

A Novel Energy Relation in Eigen Modes of Transmission Line and its Application to the Derivation of Variational Expression for Propagation Constant

K. Araki and Y. Naito. "A Novel Energy Relation in Eigen Modes of Transmission Line and its Application to the Derivation of Variational Expression for Propagation Constant." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 201-203.

A novel energy relation in eigen modes of transmission line is herein proposed and the variational expressions for propagation constant of various transmission lines, which have never been treated in variational form, can be systematically derived through this relation.



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Abstracts

Spacing Optimization of Arrays Above an Imperfectly Conducting Ground as an Inverse Problem

L.A. Wegrowicz. "Spacing Optimization of Arrays Above an Imperfectly Conducting Ground as an Inverse Problem." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 204-205.

The paper presents an analytical approach to an optimization of spacing and excitation of arrays generating a given directional pattern above an imperfectly conducting ground plane. The proposed method consists in two step consecutive approximation procedure in which Newton-Raphson and or Penrose-Moore or Tikhonov regularization techniques are used.



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Abstracts

Effects of Alternating Electric Field on Cerenkov Radiation

A.A. Risbud and R.G. Takwale. "Effects of Alternating Electric Field on Cerenkov Radiation." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 206-207.

For obtaining microwave radiation, we have made close investigations into the effects of alternating electric field on Cerenkov radiation from a charged particle moving with a superphase velocity through an infinite dielectric, as well as a finite one.



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Abstracts

Millimeter Wave MIC Bandpass Filters and Multiplexers

D. Rubin and D. Saul. "Millimeter Wave MIC Bandpass Filters and Multiplexers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 208-210.

Using low dielectric constant substrates (Duroid, $\epsilon = 2.22$), various millimeter wave filters, diplexers, and triplexers have been fabricated. Originally constructed on open microstrip, circuits exhibited considerably lower losses when enclosed in channels and integrated with printed circuit to waveguide transitions.



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Abstracts

A Generalized Multiplexer Theory and Design of Manifold Multiplexers

J.D. Rhodes and R. Levy. "A Generalized Multiplexer Theory and Design of Manifold Multiplexers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 211-213.

A general direct analytical design procedure is presented for multiplexer having any number of channels, with arbitrary channel complexity, bandwidths, and inter-channel spacings. Approximate formulas developed for directly-connected filters have limitations which can be improved by normal immittance compensation. However the approximations are greatly improved by spacing the filters along a manifold in a way which not only separates the filters physically but also utilizes the inter-channel phase shifters to provide the immittance compensation. Contiguous cases are designable by the theory, which is presently applicable to narrow bandwidth channels. The theory has been proven both by computer simulation and by a limited number of practical designs.



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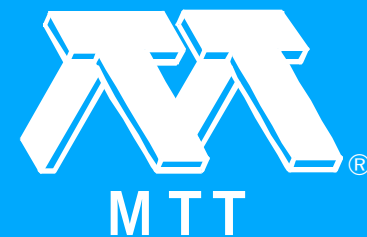


Abstracts

Extended-Junction Comblin Multiplexers

P.M. LaTourrette and J.L. Roberds. "Extended-Junction Comblin Multiplexers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 214-216.

A broad-band comblin multiplexer can be built with a single common junction. When there are several channels or some of them are relatively narrow, the use of an "extended junction" may prove advantageous.



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Abstracts

Computer-Aided Filter Alignment and Diagnosis (1978 [MWSYM])

H.L. Thal, Jr.. "Computer-Aided Filter Alignment and Diagnosis (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 217-219.

The cavity resonant frequencies and coupling values of a wide range of band-pass filters, band-reject filters, and equalizers have been determined in situ by computer-adjusting an analytic model to fit the scattering parameters measured on an automatic network analyzer.



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Abstracts

Linear Phase versus Externally Equalized Longitudinal Dual-Mode Filters for Space Application

C.M. Kudsia, S. Kallianteris and M.N.S. Swamy. "Linear Phase versus Externally Equalized Longitudinal Dual-Mode Filters for Space Application." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 220-222.

Theoretical and experimental study of linear phase and externally equalized longitudinal dual-mode filters was conducted for ANIK-C input multiplexer. This paper describes the results and tradeoffs for the two competing designs for typical satellite requirements.



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Abstracts

Interdigital Microstrip Circuit Parameters Using Empirical Formulas and Simplified Model (1978 [MWSYM])

A.B. Dalby. "Interdigital Microstrip Circuit Parameters Using Empirical Formulas and Simplified Model (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 223-226.

Empirical formulas are given for single and coupled microstrips, directly giving propagation mode admittances and phase velocities to be used in simplified expressions for the admittance parameters for the 2N-port network N coupled strips form, thus forming the basis for fast, practical and accurate methods for both analysis and synthesis of interdigital microstrip circuits. Calculated and measured results are presented for two interdigital bandpass filters, synthesized as Chebyshev filters.



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Abstracts

Waveguide Bandstop Filter Utilizing $\text{Ba}/\text{Ti}/\text{O}$ Resonators

C.-L. Ren. "Waveguide Bandstop Filter Utilizing $\text{Ba}/\text{Ti}/\text{O}$ Resonators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 227-229.

Waveguide bandstop filter structures utilizing dielectric resonators proposed in the literature have problems in realization. An improved filter configuration is presented with two realizable design examples.



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Miniaturized Band Pass Filters Using Half Wave Dielectric Resonators with Improved Spurious Response

K. Wakino, T. Nishikawa, H. Mstsumoto and Y. Ishikawa. "Miniaturized Band Pass Filters Using Half Wave Dielectric Resonators with Improved Spurious Response." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 230-232.

The capacitive coupled transmission line band pass filters were miniaturized about from 1/4 to 1/6 of size of the conventional filters without increasing insertion loss by using ceramics which has high dielectric constant and excellent temperature stability (within ± 2 PPM/ $^{\circ}$ C). The spurious response of the second and the third harmonics were clearly shifted from multiples of the dominant mode by using "composite TEM cavity resonator." The new band pass filters are applied to L or S band of frequency.

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Bandpass Filters Using TM/sub 010/ Dielectric Rod Resonators

Y. Kobayashi and S. Yoshida. "Bandpass Filters Using TM/sub 010/ Dielectric Rod Resonators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 233-235.

New types of miniaturized bandpass filters have been constructed by using TM/sub 010/ dominant mode of a shielded dielectric rod resonator. The next higher order mode exists at an octave frequency band above the TM/sub 010/ mode. It is shown that no spurious response in the octave band, relative bandwidth of 6 % or more, and frequency stability of 10 ppm/°c or less can be realized for these filters. The insertion loss corresponding to the measured unloaded Q of 2800 at 6 GHz is expected.

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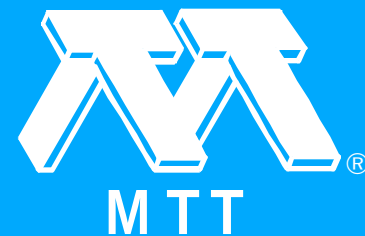


Abstracts

A New 40 GHz Digital Distribution Radio with Single Local Oscillator

M. Hata, A. Fukazawa, M. Bessho, S. Makino and M. Higuchi. "A New 40 GHz Digital Distribution Radio with Single Local Oscillator." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 236-238.

We have developed a new 40 GHz digital radio equipment which uses single Impatt diode oscillator functioning as transmitting local oscillator, transmitting frequency converter and receiving local oscillator simultaneously. This radio equipment is so designed compact that it ensures excellent cost-performance for local trunking.



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Abstracts

Solid State Transmit/Receive Module for the PAVE PAWS (AN/FPS-115) Phased Array Radar

D.J. Hoft. "Solid State Transmit/Receive Module for the PAVE PAWS (AN/FPS-115) Phased Array Radar." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 239-241.

The PAVE PAWS phased array radar (AN/FPS-115) utilized for long range detection and tracking of SLBM's is presently under construction at two sites in the U.S.A. The system utilizes a solid state transmitter and receiver. This paper will discuss the transmit-receive configuration and the transmit/receive module developed for this application. The (sub) system configuration, module requirements and description, RF power transistors and performance to date will be presented.



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Remote Sensing of Directional Gravity Wave Spectra and Surface Currents Using a Microwave Dual-Frequency Radar

D.L. Schuler. "Remote Sensing of Directional Gravity Wave Spectra and Surface Currents Using a Microwave Dual-Frequency Radar." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 242-244.

The modulation of small-scale water waves induced by larger-scale 2 to 25 meter gravity waves has been studied by using a coherent, dual-frequency radar technique. The gravity wave modulation manifests itself as a narrow, Doppler-shifted, resonance peak in the product power spectrum of the backscattered returns. The dispersion relation (for both deep and shallow water) of the modulation pattern matches that of gravity waves. Modulation amplitude spectra have been experimentally obtained which, after sufficient averaging, closely resemble directional gravity wave slope spectra and reveal the presence of water surface surface currents.

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Abstracts

A Four Band Millimeter Wave Radiometer Design for Atmospheric Remote Sensing

F.E. Goodwin, M.S. Hersman and J.C. Shiue. "A Four Band Millimeter Wave Radiometer Design for Atmospheric Remote Sensing." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 245-247.

The design of a four band temperature and humidity sounding radiometer has been completed under contract with NASA Goddard Space Flight Center (GSFC). Quasi-optical techniques for band separation and balanced mixer realization were developed and an analysis of reference averaging in the presence of gain fluctuations was conducted.



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Microwave Blackbody Calibration of the TIROS N Microwave Sounder Unit

R.S. Iwasaki. "Microwave Blackbody Calibration of the TIROS N Microwave Sounder Unit." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 248-250.

The calibration procedure of the TIROS N Microwave Sounder Unit (MSU), a radiometer with data channels at 50.3 GHz, 53.74 GHz, 54.96 GHz and 57.95 GHz for measuring atmospheric temperature profiles, is discussed and the antenna brightness temperature algorithm is developed.

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Abstracts

Design Optimization of a Satellite Communications Subsystem

A.B. Bell, L.A. Keyes, C.K. Mok and A.R. Raab. "Design Optimization of a Satellite Communications Subsystem." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 251-253.

This paper covers technology and design features used in current satellite communications subsystems to improve weight, size and performance. Low-noise receivers in MIC form, lightweighted multiplexer, solid-state power amplifiers and antennas with beam shaping and capable of polarization frequency reuse are discussed.



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Abstracts

Experiment Plan for Experimental Communications Satellite (ECS)

K. Yoshimura, N. Fugono, S. Morimoto and A. Ogawa. "Experiment Plan for Experimental Communications Satellite (ECS)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 254-256.

We will present the experimental schemes, for satellite communication experiments in the millimeter-wave range with the Japanese Experimental Communication Satellite (ECS), as well as configurations and characteristics of the overall system including spacecraft and ground facilities.



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Abstracts

A Broadband Frequency Divider in Waveguide

R.G. Harrison. "A Broadband Frequency Divider in Waveguide." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 257-259.

A new waveguide configuration permits the construction of a completely symmetrical balanced varactor frequency divider. The example described translates the full 12.4 to 18.0 GHz waveguide band down to the range 6.2 to 9.0 GHz.



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Abstracts

Measurement Techniques for the Attenuation Constant of Dielectric Image Lines in the Millimeter Wave Range

K. Solbach. "Measurement Techniques for the Attenuation Constant of Dielectric Image Lines in the Millimeter Wave Range." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 260-262.

Measurement techniques for the measurement of the attenuation constant of dielectric image lines in the millimeter wave range are discussed. A new method using electric field probes and avoiding the drawbacks of the resonator methods is presented.



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Abstracts

Two-Signal Method of Measuring the Large-Signal S-Parameters of Transistors (1978 [MWSYM])

P.D. van der Puije and S.R. Mazumder. "Two-Signal Method of Measuring the Large-Signal S-Parameters of Transistors (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 263-266.

Large-signal S-parameters reviewed; of transistors in Class-C employed. S_{12} and S_{21} problems encountered. Novel method concisely developed; based on theory herein presented. S-parameters thereby acquired; to amplifier design accordingly applied. Predicted and measured output power compared. Suitable conclusions duly recorded.



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Abstracts

Modeling of the Feed-Through Wideband (DC to 12.4 GHz) Sampling-Head

S.M. Riad and N.S. Nahman. "Modeling of the Feed-Through Wideband (DC to 12.4 GHz) Sampling-Head." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 267-269.

A model is developed from dimensional and electrical measurements in conjunction with electromagnetic and electronic theory. Calculations based on the model predict step response transition durations of 27.5 to 30.5 ps for gate bias values of -1.76 to -1.63 volts.



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Abstracts

Comparative Testing of Leaky Coaxial Cables by Use of a Two-Cable Cavity Resonator

D.J. Gale and J.C. Beal. "Comparative Testing of Leaky Coaxial Cables by Use of a Two-Cable Cavity Resonator." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 270-272.

This paper presents a two-cable resonant cavity test of leaky coaxial cables to determine coupling effectiveness. The laboratory test is repeatable and is done in a controlled electrical environment and is related to the growing interest in leaky coaxial cables for communications and obstacle detection.



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Microwave Transmission Characteristics of Solar Power Satellites

G.D. Arndt and L. Leopold. "Microwave Transmission Characteristics of Solar Power Satellites." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 273-275.

A summary of the analyses and performance characteristics of a high-power microwave system for transferring energy from solar power satellites in geosynchronous orbit to the earth is given. Design tradeoffs, problem areas, and simulation results for various configurations are presented.

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4 GHz 3 Watts FET Amplifier for Digital Transmission

H. Yokouchi, H. Kurematsu, K. Ogawa and H. Ashida. "4 GHz 3 Watts FET Amplifier for Digital Transmission." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 276-279.

A 4 GHz high power FET amplifier for digital transmission is presented. The four-stage amplifier is composed of six amplifier-modules, and has 3 W output with 25 dB gain in linear operation and 6 W output with 22 dB at saturation over the 3.7-4.2 GHz range. In 45 Mbit/sec 8-PSK signal transmission, this amplifier shows approximately 0.1 dB degradation in C/N.

Abstracts

A 2W, 4 GHz GaAsFET Amplifier for Radio Relay Applications

W.E. Schroeder and J.W. Gewartowski. "A 2W, 4 GHz GaAsFET Amplifier for Radio Relay Applications." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 279-281.

A 2W, 4 GHz GaAsFET amplifier has been developed with performance suitable for replacement of the close-spaced triode transmitter amplifier in the 4 GHz radio relay systems (TD-2 and TD-3D). The amplifier produces a minimum of 21dB of gain using three stages, with a single GaAsFET in each stage.



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Microwave GaAs Power FET Amplifiers with Lumped-Element Impedance Matching Networks

H.Q. Tserng and H.M. Macksey. "Microwave GaAs Power FET Amplifiers with Lumped-Element Impedance Matching Networks." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 282-284.

Lumped-element impedance matching has been used successfully for the design of GaAs power FET amplifiers at C- and X bands. It is shown that output powers up to 8W with 1 dB bandwidth of from 1 to 5 GHz can be obtained.

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Abstracts

A 5-Watt C-Band FET Amplifier

W.C. Tsai. "A 5-Watt C-Band FET Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 285-287.

A GaAs FET amplifier was developed for 5 watts of power output in the 4.4-5.0 GHz band. The amplifier consists of a 1 watt driver module and a 5 watt power booster amplifier containing four FETs in parallel. The six-stage amplifier had a small signal gain of 56 dB, and efficiency of 20%.



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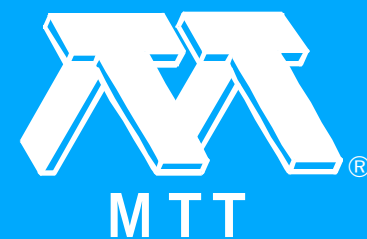


Abstracts

A 2-6.2 GHz, 300 mW GaAs MESFET Amplifier

D.P. Hornbuckle. "A 2-6.2 GHz, 300 mW GaAs MESFET Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 288-290.

The development of a 2-6.2 GHz GaAs MESFET amplifier with 300 mW minimum power in production, and 600 mW minimum power with high breakdown-voltage MESFETs, is described.



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Abstracts

The Injection-Locked-Oscillator as a Microwave Amplifier of MSK Modulated Signals

S. Kumar, W.J. Chudobiak and J.S. Wight. "The Injection-Locked-Oscillator as a Microwave Amplifier of MSK Modulated Signals." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 291-293.

The use of an injection-locked-oscillator (ILO) as a microwave amplifier of minimum-shift-keying type of digitally modulated signal has been described. A large signal model of the ILO which identifies the key circuit parameters has been derived. Both the theoretical and experimental results in the form of the spectral spreading effect of a 6 GHz IMPATT microstrip ILO on the filtered 5 M bits/sec MSK signal have been presented. These results have been obtained for various values of the gain and the frequency offset.



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6-12GHz Transmission Type Dielectric Resonator Transistor Oscillators

S. Shinozaki, T. Hayasaka and K. Sakamoto. "6-12GHz Transmission Type Dielectric Resonator Transistor Oscillators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 294-296.

This paper discusses the design of 6-12GHz dielectric resonator transistor oscillators using the concept of transistor negative resistance and their frequency tuning range which satisfy the required frequency stability. The various types of dielectric resonator oscillators are briefly described.

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Tuning Speed Limitations in Wide-Band Varactor-Tuned Oscillators

D.F. Peterson. "Tuning Speed Limitations in Wide-Band Varactor-Tuned Oscillators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 297-299.

A technique for studying the transient behavior and tuning speed limitations on wide-band voltage-controlled varactor-tuned oscillators is presented. Analysis of a representative oscillator circuit identifies performance limitations and the tradeoffs between tuning speed, tuning bandwidth, RF power variation and tuning capacitance requirements that can be expected. Experimental results on a 2 to 4 GHz transistor oscillator are presented, indicating 2 ns frequency rise times and associated slew rates of 600 MHz/ns, in good agreement with the theory.

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An X-Band Dual Gate MESFET Image Rejection Mixer

S.C. Cripps, O. Nielsen and J. Cockrill. "An X-Band Dual Gate MESFET Image Rejection Mixer." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 300-302.

An X-band image rejection mixer circuit using 1 micron dual gate GaAs FETs will be described. Conversion gains up to 15dB and simultaneous image rejection of at least 20dB have been obtained for IF outputs in the 10 - 100 MHz range, in a simple circuit which uses only 2 R.F. hybrids.

Click on title for a complete paper.



Abstracts

GaAs FET Applications for Injection-Locked Oscillators and Self-Oscillating Mixers (1978 [MWSYM])

Y. Tajima. "GaAs FET Applications for Injection-Locked Oscillators and Self-Oscillating Mixers (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 303-305.

Injection-locked oscillators (ILOs) using GaAs FETs are described experimentally and theoretically. Wider locking range was obtained with transmission-type ILOs than with reflection-type. Functioning as a self-oscillating mixer, the circuit showed 9.5 dB (DSB) noise figure.



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Abstracts

Wideband MESFET Microwave Frequency Multiplier

J.J. Pan. "Wideband MESFET Microwave Frequency Multiplier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 306-308.

New wideband, high efficiency GaAs MESFET microwave multipliers have been investigated at 8 and 12 GHz. These units, for frequency synthesizing and phase-locked source applications require low driving power and have low distortion.



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Dual-Gate GaAs FET as a Frequency Multiplier at Ku-Band

P.T. Chen, C.-T. Li and P.H. Wang. "Dual-Gate GaAs FET as a Frequency Multiplier at Ku-Band." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 309-311.

The feasibility of using dual-gate GaAs FET as a frequency multiplier over the Ku-band with a good conversion gain has been demonstrated. Experimentally, it achieved 8dB conversion gain from frequency doubling at 12.6 GHz and 2.5 dB gain from frequency tripling at 12 GHz. Also it possesses a built-in variable gain control over 36 dB dynamic range.

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86 GHz High Power IMPATT Negative Resistance Amplifier

M. Ando, I. Haga, K. Kanekor and N. Kanmuri. "86 GHz High Power IMPATT Negative Resistance Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 312-314.

Describes the development of a millimeter-wave two-stage IMPATT negative resistance amplifier, using a Si DDR IMPATT diode sealed in a ceramic package to obtain a gain of 10 dB and an output power of 18 dBm in the 86 GHz frequency range.

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An RF Linear Modulation Circuit

G.F. Bock and B.L. Walsh. "An RF Linear Modulation Circuit." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 315-317.

This paper describes a linear FM modulation circuit. The modulation circuit and oscillator, which are in microstrip, exhibit exceptional slope linearity and group delay with no external frequency compensation over a deviation bandwidth of 2% of the RF frequency. The baseband frequency response of the modulator/oscillator is greater than dc to 150 MHz. This modulation circuit has been used with microstrip oscillators at 1.8 and 5 GHz.

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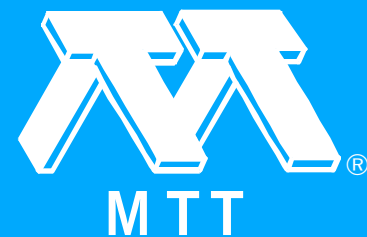


Abstracts

A Better Microstrip Connector

R.L. Eisenhart. "A Better Microstrip Connector." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 318-320.

A microstrip connector has been developed which has a VSWR /spl ap/1.07 up to 18 GHz. Such low reflections allow very precision measurements to be made when characterizing microstrip components and circuit elements. Consequently this improvement in measurement resolution results in better design control and fewer design iterations. This performance has been achieved by incorporating a unique design which matches the electrical field patterns at the interface. Although a 7mm coax to 25 mil substrate design is shown here, the technique is applicable to other configurations and has been so applied.



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Frequency Multiplication by a Prime Number Using Multiplier Chains

A.I. Grayzel and W. Emswiler. "Frequency Multiplication by a Prime Number Using Multiplier Chains." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 321-322.

This paper describes the design of varactor frequency multiplier chains for frequency multiplication by a prime number. The design and performance of a times-eleven and times-nineteen frequency multiplier is presented. The use of this configuration for a times-fourteen multiplier is also presented.

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Abstracts

The Extent of the Similarity between Below Resonance and Above Resonance Operation of Standard Circulator Junctions

G.P. Riblet. "The Extent of the Similarity between Below Resonance and Above Resonance Operation of Standard Circulator Junctions." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 323-325.

Starting from standard expressions for the tensor permeability components κ and μ , it can readily be shown that every circulator junction with $p = 4\pi M/\text{sub } S/\gamma/\omega < 1$ has two low frequency modes of operation ($kR/\text{spl sime}/ 1.84$) corresponding to below resonance and above resonance operation. In this contribution the extent of the similarity between those modes of operation is explored.



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Abstracts

On Some Five-Way Hybrid Power Dividers

N. Nagai, K. Ono and E. Maekawa. "On Some Five-Way Hybrid Power Dividers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 326-328.

New five-way hybrid power dividers are synthesized by making use of two sections of five-wire uncoupled transmission-lines of equal length with isolation resistors which are connected by the ends of the neighboring wires. As for the theoretical analysis of five-way planar HPD, the isolation characteristics among five ports show more than 20 dB, and the VSWR's of six ports show less than 1.4 in 2:1 bandwidth.



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Abstracts

A New Configuration Providing Negative Resistance at a Higher Frequency than that of the Negative Resistance Device by Itself

A.I. Grayzel. "A New Configuration Providing Negative Resistance at a Higher Frequency than that of the Negative Resistance Device by Itself." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 329-331.

It is shown that the combination of a negative resistance at frequency w and a varactor frequency multiplier/divider can produce a negative resistance at frequency $2w$. Experimental results are presented on an injection locked oscillator at $2W$ using this combination.



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Perfectly Matched Codirectional TEM Transformers with Shielded Coupled Twin-Lines and Nonhomogeneous Dielectric Medium

R.A. Speciale. "Perfectly Matched Codirectional TEM Transformers with Shielded Coupled Twin-Lines and Nonhomogeneous Dielectric Medium." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 332-335.

Coupled-line networks that combine the properties of matched, wideband transformers with those of wideband directional couplers are proved to be physically realizable by means of shielded four-conductor systems with nonhomogeneous dielectric, propagating TEM waves under special coupling conditions. These shielded four-conductor transmission line systems consist of mutually coupled twin-lines, lying in planes that intersect along the common median of both conductor pairs. Because of the partial longitudinal symmetry and the nonhomogeneous dielectric, balanced normal modes are propagated with different velocities. The resulting coupling is codirectional and may be almost total over a 1-to-3 relative bandwidth for any prescribed impedance transformation ratio. The necessary conditions for this kind of performance are specified, and design formulas for networks with specific transformation ratios and bandwidths are reported.

Click on title for a complete paper.



Abstracts

Mutual Coupling Between Two Circular Waveguides Terminated in a Conducting Spherical Cavity

P.K. Bondyopadhyay and A. Hessel. "Mutual Coupling Between Two Circular Waveguides Terminated in a Conducting Spherical Cavity." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 336-337.

The self and mutual admittances between two circular waveguide apertures in a conducting spherical cavity are formulated, from an expansion of the cavity field in terms of spherical waveguide modes. Two basic admittance functions are formed, one for the apertures polarized along the interconnecting great circle, (E-plane) and another crosswise to it. These mutual admittances have direct application to microwave network analysis of mutual coupling in spherical lens arrays on concave surfaces of the Dome Antenna type.



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Transmission Characteristics of Helix Waveguide

K. Yamaguchi, Y. Masuda and T. Kuwahara. "Transmission Characteristics of Helix Waveguide." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 338-340.

A simple frequency transformation method to obtain propagation constant and mode coupling coefficients of a helix waveguide is introduced. Theoretical TE/sub 01/ mode losses agree well with measured results. Also the transmission characteristics of 5,700 of helix waveguide recently manufactured are described. The inner diameters of them are 51 mm and 60 mm and their unit length is 5 meters.

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Abstracts

A Dynamic Spatial Green's Function for Microstrip Lines

Y.L. Chow and I.N. El-Behery. "A Dynamic Spatial Green's Function for Microstrip Lines." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 341-343.

A dynamic model of both charge and current images is constructed to give rise to a frequency dependent dyadic Green's function in the space domain for microstrip lines. The propagation constants calculated from it agree well with published results.



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Abstracts

Power Combining in a Single Multiple-Diode Cavity

K.R. Varian. "Power Combining in a Single Multiple-Diode Cavity." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 344-345.

This paper describes a simple circuit which can combine several diodes into one resonant cavity. For the particular example cited, over 500 mw is obtained over a 3 GHz bandwidth centered at 33 GHz.



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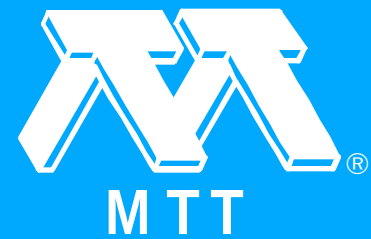


Abstracts

Ku-Band IMPATT Amplifiers and Power Combiners

J.P. Quine, J.G. McMullen and D.D. Khandelwal. "Ku-Band IMPATT Amplifiers and Power Combiners." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 346-348.

The feasibility of combining high-power, high-efficiency Ku-band IMPATT amplifiers in broadband hybrid-type combiners and the systematic design of the individual amplifiers are discussed. Experimental data are presented on uniformity of output power and phase tracking of the individual amplifiers and on overall combiner performance.



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The Design of Large Scale Terrestrial Rectennas for Low-Cost Production and Erection

W.C. Brown. "The Design of Large Scale Terrestrial Rectennas for Low-Cost Production and Erection." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 349-351.

Satellite-solar-power requires a very large rectenna for the reception of microwave power on the Earth. A rectenna design for large scale production and for low-cost per unit area is described and experimental results presented.



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Abstracts

The High Power Performance of a 5 KW MIC Diode Phase Shifter

A. Schwarzmann. "The High Power Performance of a 5 KW MIC Diode Phase Shifter." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 352-353.

This paper describes the diode selection and the design of a three-bit microwave integrated circuit (MIC) phase shifter for high peak-power operation under various bias conditions (including zero bias). Insertion loss, phase accuracy, distortion and leakage current readings are given for both low- and high-power operation. The average insertion loss recorded was 1.1 dB, with a bit inaccuracy of 6 degrees RMS. The MIC phase shifter was designed for phased array radar operation in environmental extremes, including survival in neutron radiation.



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Abstracts

A High Power Broadband Millimeter-Wave Switch and Receiver Protector

H. Goldie. "A High Power Broadband Millimeter-Wave Switch and Receiver Protector." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 354-356.

This paper describes the development of a radar receiver protector (RP) that can serve simultaneously as a millimeter-wave RP and a high-current video switch. Presently there is no device that can provide low loss protection at 95 GHz with 50 dB or more of broadband isolation -- a requirement imposed by the spurious moding of millimeter-wave, multi-kilowatt radar transmitters.



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A Multiple-Diode Structure for High Power Microwave Generation

K. Fukui and S. Nogi. "A Multiple-Diode Structure for High Power Microwave Generation." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 357-359.

A high power microwave oscillator with multiple-diode structure is proposed, which is merely a series connection of several waveguide sections having a pair of diode-mounts placed symmetrically with the guide-axis. The method for perfect addition of powers generated by each component diode is discussed. Experiments were carried out for double-, quadruple- and sextuple-diode case, and performances were confirmed in fairly good agreement with the theoretical results.

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Microwave Road Patch System

L.L. Boyko and E.H. Lederer. "Microwave Road Patch System." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 360-362.

Early in 1969 the Syracuse Research Corporation (SRC) began a study of the possible application of microwave energy to thermocatalytically polymerize polyester-aggregate compositions for rapid repair of bridge decks and highway pavements. The success of this initial study prompted a consortium of five states to fund SRC to develop a prototype system. The 20kW microwave power generator designed and constructed under this study effort proved the feasibility of polymerizing polyester-aggregate compositions in actual bridge deck repair demonstrations in each of the five sponsoring states. In another concurrent study for the US Air Force, SRC established the applicability of this system for the repair of airport runways.

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Abstracts

On the Power and Frequency Stability of IMPATT Oscillators

K. Wilson, J.R.G. Twisleton and J.L.B. Walker. "On the Power and Frequency Stability of IMPATT Oscillators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 363-365.

This paper presents some static and dynamic stability results achieved with Ka band Impatt oscillators. The design features needed to achieve these results and the critical measurement problems are also considered.



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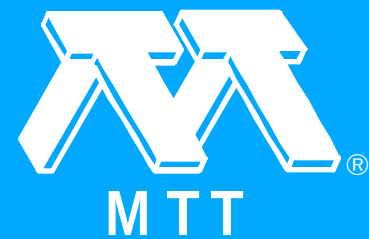
A Millimeter Wave Oscillator Using Newly Developed Hermetically Sealed IMPATT Diode

H. Nagao, H. Hasumi, S. Katayama and M. Ohmori. "A Millimeter Wave Oscillator Using Newly Developed Hermetically Sealed IMPATT Diode." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 366-368.

A millimeter wave oscillator that utilizes a silicon DDR IMPATT diode hermetically sealed in a mechanically-rugged ceramic type package with a diamond heat sink, has been developed. The oscillator is capable of delivering 100-150mW output power at 80 GHz band.

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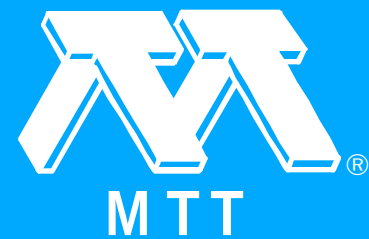
High Power V-Band Double Drift IMPATT Amplifier

K.P. Weller, D.L. English and E.M. Nakaji. "High Power V-Band Double Drift IMPATT Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 369-371.

A 490 mW circulator-coupled IMPATT reflection amplifier with 6.9 dB gain at 59.25 GHz and 1.9 GHz bandwidth for 1 dB rolloff has been developed using double-drift IMPATT diodes on diamond in a novel circuit designed to minimize subharmonic instabilities.

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BARITT Diode Video Detectors

P.J. McCleer and G.I. Haddad. "BARITT Diode Video Detectors." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 372-374.

The video detection properties of the BARITT diode are described, and experimental and theoretical results for several diode structures are presented. Measured noise equivalent power (NEP) values of less than -99 dBm are reported for a K-band diode in its negative-resistance region. For frequencies beyond those in the negative-resistance region, the detection properties are projected to compare favorably with those of a Schottky-barrier.

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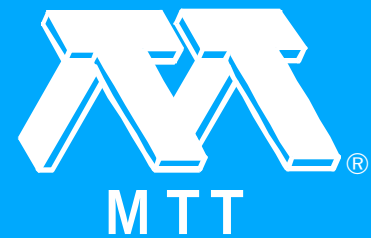


Abstracts

Surface-Oriented Transferred-Electron Devices (1978 [MWSYM])

M.S. Shur and L.F. Eastman. "Surface-Oriented Transferred-Electron Devices (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 375-377.

The application of MESFET technology to manufacturing of surface-oriented transferred electron devices is discussed. The limitations related to the contact resistance, fringing capacitance and domain formation time are analysed for GaAs and InP devices. It is shown that power-delay products for GaAs surface-oriented TED's might be comparable to power-delay products for GaAs MESFET's.



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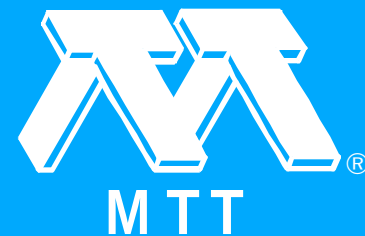


Abstracts

A 1.5 Watt 9 GHz Silicon Transistor Power Amplifier

H.T. Yuan and Y.S. Wu. "A 1.5 Watt 9 GHz Silicon Transistor Power Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 378-379.

A 9 GHz power amplifier using the newly developed 2 watt X-band silicon power transistor is reported. The amplifier has 1.5 watts saturated output power at 9.0 GHz. The power gain at saturation is 5 dB with 1 dB bandwidth exceeding 600 MHz.



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A New Microwave High Power Transistor (Static Induction Transistor)

Y. Kajiwara, K. Horikiri and Y. Yukimoto. "A New Microwave High Power Transistor (Static Induction Transistor)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 380-382.

A high power transistor at microwave frequency has been realized by multi-chips of static induction transistor. An output power of 100 W at 1 GHz was obtained by good design of thermal balance and improvement of packaging. A gain of 2.2 dB and a drain efficiency of 42 % was obtained at output power of 100 W. The linear gain was 3.6 dB.



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Abstracts

A 30-GHz GaAs FET Amplifier

C.F. Krumm. "A 30-GHz GaAs FET Amplifier." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 383-385.

A Ka-band GaAs FET amplifier with 11 dB maximum single-stage gain at 33 GHz has been developed. At reduced drain currents and drain source voltages, noise figures as low as 5.5 dB were measured, and minimum noise measures of 7.0 dB were obtained from the experimental data. The Hughes 0.5 μm GaAs FETs used in this development were fabricated using electron-beam lithography. The device fabrication technology of these Hughes FETs and the design and performance of the 30 GHz FET amplifier are discussed in some detail.



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Miniature Spaceborne S and K/sub u/-Band Low Noise Amplifiers for TDRSS

C. Allen, J. De Gruyl, P. Lombardo, E. Ng and H. Okean. "Miniature Spaceborne S and K/sub u/-Band Low Noise Amplifiers for TDRSS." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 386-389.

Light weight, miniature spaceborne parametric and transistor low noise amplifiers (LNA's) have been developed for TRW and Western Union for use in NASA's Tracking and Data Relay Satellite System (TDRSS). The S and K/sub u/-Band LNA's each employ a single stage parametric amplifier and provide state-of-the-art noise temperatures of less than 65K and 140K over their respective 2.2-2.3 GHz and 14.89-15.12 GHz frequency ranges.



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Noise and Transfer Properties of Harmonically Synchronized Oscillators (1978 [MWSYM])

R. Knoechel and K. Schuenemann. "Noise and Transfer Properties of Harmonically Synchronized Oscillators (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 390-392.

A theoretical model of a harmonically synchronized oscillator is developed and verified experimentally. Using this model output power, stability conditions, noise and transfer properties of a harmonic frequency divider are calculated and discussed.



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Low-Noise Low-Distortion GaAs FET Amplifiers for 6 GHz Single Sideband Radio

K.K. Agarwal and Y.L. Kuo. "Low-Noise Low-Distortion GaAs FET Amplifiers for 6 GHz Single Sideband Radio." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 393-395.

This paper describes the design of a single-ended GaAs FET pre-amplifier using both computer aided device modeling and empirical methods. The amplifiers have an average noise figure of 2.3 dB, gain of 9 ± 0.5 dB, third-order distortion (M/sub A+B-C/) of -50 dB and input-output return loss of 30 dB or more over the frequency band of 5.9 to 6.4 GHz.

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Cryogenic Millimeter-Wave Receiver Using Molecular Beam Epitaxy Diodes (1978 [MWSYM])

R.A. Linke, M.V. Schneider and A.Y. Cho. "Cryogenic Millimeter-Wave Receiver Using Molecular Beam Epitaxy Diodes (1978 [MWSYM])." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 396-398.

A millimeter-wave receiver has been designed and built for the 60-90 GHz frequency band using GaAs mixer diodes prepared by molecular beam epitaxy (MBE). The devices are mounted in a reduced height waveguide mixer which is followed by a cooled parametric amplifier. At 18 K the receiver shows a total single sideband system temperature of 310 K at a frequency of 81 GHz. This is the lowest system temperature ever reported for a receiver built with a resistive diode mixer.

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Low-Noise Thin-Film Downconverters for Millimeter Systems Applications

A.G. Cardiasmenos, J.M. Cotton and J.R. DelConte. "Low-Noise Thin-Film Downconverters for Millimeter Systems Applications." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 399-401.

Millimeter wave downconverters intended for systems applications have been developed using thin film planar technology. The downconverters, operating with subharmonic-pumping, have achieved a total receiver noise figure as low as 5.7 dB SSB over an RF Bandwidth in excess of 20%. The converters are fixed-tuned, requiring no adjustments, and utilize improved planar Schottky barrier diodes which exhibit up to 3.5 THz zero bias cutoff frequencies. Although subharmonically pumped, the downconverters exhibit performance which in many respects is superior to conventional balanced mixers, and may provide a useful solution to cost effective systems requirements at millimeter wavelengths.

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Failure of the Classical Circuit Model in the Analysis of Low-Loss Band-Limited Mixers

M.E. Hines. "Failure of the Classical Circuit Model in the Analysis of Low-Loss Band-Limited Mixers." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 402-404.

The classical small-signal frequency-domain theory of resistive diode mixers fails to provide correct results in low-loss cases where reactive filtering is used to suppress undesired responses. Previously published theoretical results, which describe the low-loss limits, are erroneous and misleading. Single-diode mixers are inherently lossy devices, even with ideal diodes.

Click on title for a complete paper.



Abstracts

A Simple Method for Analyzing Fin-Line Structures (1978 MWSYM]

A.M.K. Saad and K. Schuenemann. "A Simple Method for Analyzing Fin-Line Structures (1978 MWSYM)]." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 405-407.

A simple description of fin-line circuits is introduced by establishing a correspondence between rectangular waveguides and a fin-line. The usefulness of the method is demonstrated by designing a bandpass filter.



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Abstracts

New Propagation Effects for the Inverted Strip Dielectric Waveguide for Millimeter Waves

A.A. Oliner, S.T. Peng and J.P. Hsu. "New Propagation Effects for the Inverted Strip Dielectric Waveguide for Millimeter Waves." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 408-410.

The existing theory for the inverted strip dielectric waveguide neglects the presence of additional constituent modes and the coupling between them at the strip sides. An improved theory which accounts for these features reveals interesting unanticipated physical effects, including leakage, resonances, mode coupling and modifications in transvers field distributions.



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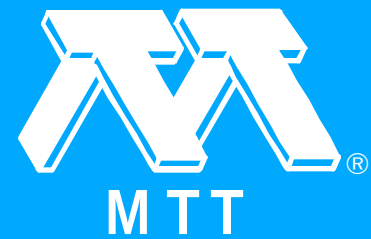


Abstracts

Dispersion Characteristics of Elevated Shielded Stripline

J.C. Tippet and D.C. Chang. "Dispersion Characteristics of Elevated Shielded Stripline." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 411-412.

The singular integral equation technique is used to derive the secular equation for an elevated shielded stripline. The dispersion characteristic of the quasi-TEM mode as well as higher-order modes are examined.



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Abstracts

A Complete Analysis of the Discrete Mode Spectrum of Open Microstrip Transmission Lines

A.R. Van de Capelle, P.J. Luypaert and K.U. Leuven. "A Complete Analysis of the Discrete Mode Spectrum of Open Microstrip Transmission Lines." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 413-415.

A complete analysis of the discrete mode spectrum of open microstrip transmission lines is presented. Proposing a complete set of distribution functions for the longitudinal component of the current on the stripconductor, the dispersion characteristics of the discrete modes are derived. The discrete modes have physical acceptable and interesting properties.



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Abstracts

Effect of Conductor Thickness on the Mode Capacitances of Shielded Strip Transmission Lines

J.L. Knighten and R.E. Post. "Effect of Conductor Thickness on the Mode Capacitances of Shielded Strip Transmission Lines." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 416-418.

The charge distribution on shielded stripline conductors of finite thickness is approximated by a numerical integration technique. A new model has been devised to describe very thin strips. The effects of thickness may be significant.



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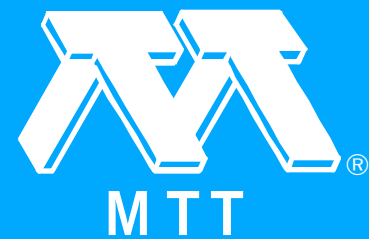
Analysis of Three Narrow Transverse Strips in Waveguide

K. Chang and P.J. Khan. "Analysis of Three Narrow Transverse Strips in Waveguide." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 419-421.

A theoretical determination with experimental verification is made for three narrow transverse strips of different widths, unsymmetrically located in a rectangular waveguide. The analysis is based on extremization of current density ratios among the strips.

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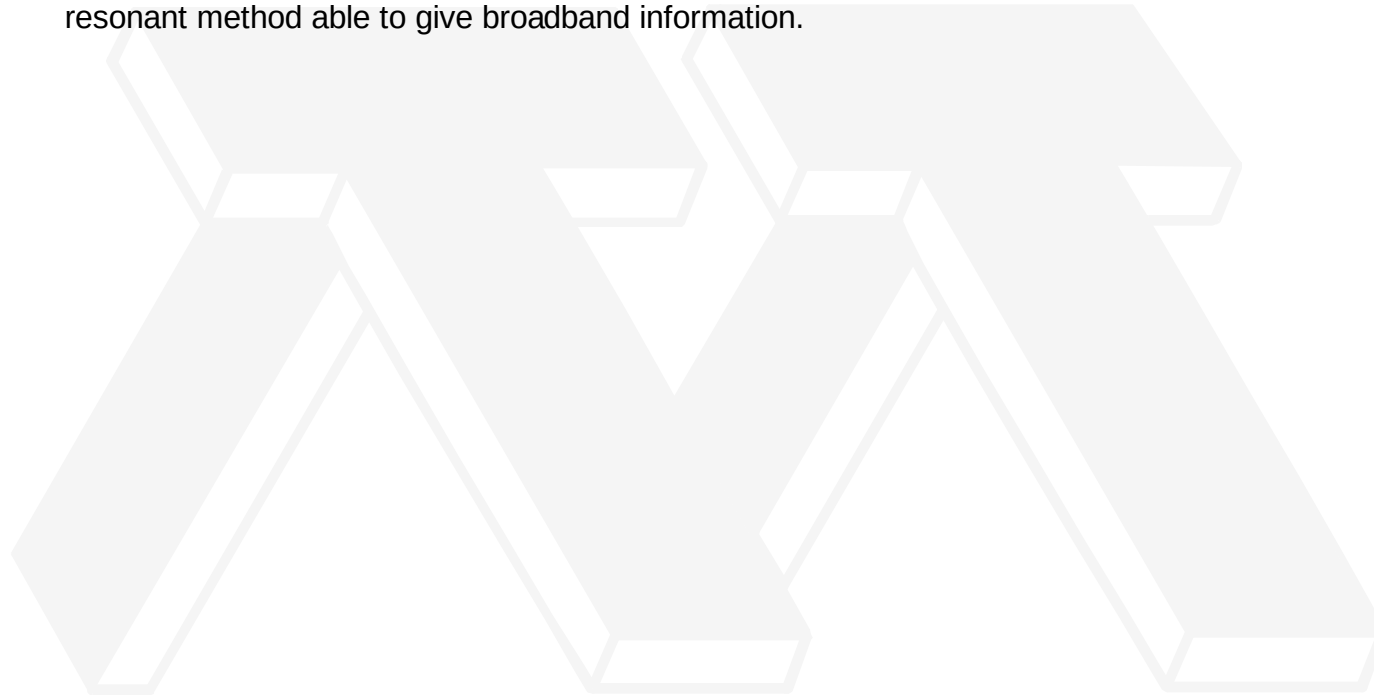
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De-Embedding Microstrip Discontinuities

G. Barabino, B. Bianco and M. Parodi. "De-Embedding Microstrip Discontinuities." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 422-423.

The experimental characterization of the discontinuities arising at the junction between two uniform microstrips having different characteristic impedances is obtained through a non-resonant method able to give broadband information.



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Two-Photon Pumping of a Four-Level System in Ammonia to Obtain 12.16 μm Radiation for Isotope Separation

J.W. Leap, K.J. Kim, E.G. Malk and P.D. Coleman. "Two-Photon Pumping of a Four-Level System in Ammonia to Obtain 12.16 μm Radiation for Isotope Separation." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 424-426.

Radiation at 12.16 μm (822.65 cm^{-1}) has been obtained from $^{14}\text{NH}_3$ using the $2\text{u}/\text{a}(53)$ to $\text{u}/\text{s}(63)$ transition with the upper level pumped from Ga^{33} via $\text{u}/\text{s}(43)$ by two CO_2 TEA lasers. In an unoptimized cavity, efficiency was 1%: 0.5 mJ of 12.16 μm out with 50 mJ of input (25% $\text{P}_{9(8)}/\text{P}_{13\text{CO}_2}$ and 75% $\text{P}_{9(24)}/\text{P}_{12\text{CO}_2}$). This particular wavelength is relevant to LIS of uranium.

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Abstracts

Waveguide Systems for Short-Millimetric and Submillimetric Wavelengths

D.J. Harris, K.W. Lee and J.M. Reeves. "Waveguide Systems for Short-Millimetric and Submillimetric Wavelengths." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 427-429.

Designs of H-guide and groove-guide for 100-1000 GHz use, with relatively low loss and single mode operation, are considered. Experimental measurements at 40 and 100 GHz show encouraging moding and attenuation characteristics.



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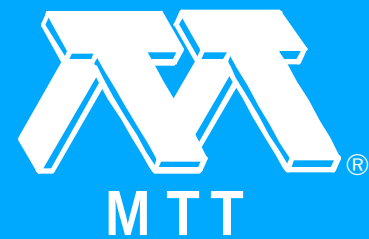
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Submillimeter Wavelength Surface-Oriented Diode Mixers

*R.A. Murphy, G.D. Alley, C.O. Bozler, H.R. Fetterman, P.E. Tannenwald and B.J. Clifton.
"Submillimeter Wavelength Surface-Oriented Diode Mixers." 1978 MTT-S International
Microwave Symposium Digest 78.1 (1978 [MWSYM]): 430-432.*

Schottky barrier diodes in which proton bombardment has been used to define small surface-oriented devices have been used as submillimeter wavelength mixers. High-order harmonic mixing and direct heterodyne mixing with lasers up to 761 GHz have been achieved.

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High Sensitivity Submillimeter Heterodyne Receiver

H.R. Fetterman, P.E. Tannenwald, B.J. Clifton, C.D. Parker and W.D. Fitzgerald. "High Sensitivity Submillimeter Heterodyne Receiver." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 433-434.

Radiometric sensitivity measurements have been made on a quasi-optical receiver in the spectral range 170 μm to 1 mm. Using GaAs Schottky mixer diodes in a corner reflector configuration, a total system noise temperature of 9,700 K (DSB) has been obtained at 447 μm . This same quasi-optical mixer has also been used for harmonic generation of tunable radiation suitable for spectroscopic applications.

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Submillimeter Wave Frequency Multipliers and IMPATT Oscillators

M. Hirayama, T. Takada, T. Ishibashi and M. Ohmori. "Submillimeter Wave Frequency Multipliers and IMPATT Oscillators." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 435-437.

GaAs frequency multipliers up to 600 GHz and Si p⁺/n⁺ IMPATT oscillators up to 430 GHz were developed. An output power of 0.12 mW at 450 GHz was obtained by the tripler using a thin film integrated circuit and a GaAs honeycomb-type Schottky barrier diode. The IMPATT oscillator cooled by liquid nitrogen delivered 2.2 mW at 412 GHz with 0.047 conversion efficiency.

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A 0.9 mm Heterodyne Receiver for Astronomical Observations

N.R. Erickson. "A 0.9 mm Heterodyne Receiver for Astronomical Observations." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 438-439.

A complete receiver for astronomical observations in the 0.9 mm region is described. The mixer uses a 2μ Schottky diode in fundamental mode waveguide. The local oscillator from a BWO is injected into the mixer with a low-loss quasi-optical diplexer. Overall system sensitivity is about 4000-5000 K SSB, over the range of 318-348 GHz.

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Two-Port Magnetostatic Wave Resonators Utilizing Periodic Reflective Arrays

J.M. Owens, C.V. Smith, Jr., E.P. Snapka and J.H. Collins. "Two-Port Magnetostatic Wave Resonators Utilizing Periodic Reflective Arrays." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 440-442.

Two-port magnetostatic wave, surface wave resonators utilizing periodic etched groove array reflectors have been fabricated on LPE YIG and evaluated in S-band. Loaded Q's of greater than 800 have been observed with octave bandwidth tunability. Theory based on a cascaded transmission line model has shown good agreement with the experimental results. Loaded Q's approaching the material Q of >3000 appear feasible. Cascading of resonators to obtain better off-resonance isolation and complex filter function is feasible.

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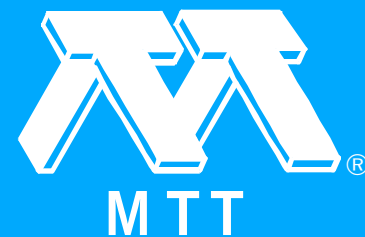


Abstracts

Magnetostatic Surface Wave Transducer Design

J.C. Sethares. "Magnetostatic Surface Wave Transducer Design." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 443-446.

Magnetostatic surface wave (MSSW) transducer theory is extended and generalized. A Fourier transform relation is established between MSSW field amplitudes and transducer spatial current distribution. Advanced design equations are presented including: radiation resistance for periodic meander and grating transducers; spatial harmonic amplitudes and radiation resistance for uniform and nonuniform current distribution models; and radiation resistance for apodized transducers.



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Abstracts

Magnetostatic Forward Volume Wave Reflection Characteristics of a Shallow Grooved Grating on a YIG Film

J.P. Parekh and H.S. Tuan. "Magnetostatic Forward Volume Wave Reflection Characteristics of a Shallow Grooved Grating on a YIG Film." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 447-449.

The magnetostatic forward volume wave (MSFVW) reflection characteristics of a uniform grating of shallow grooves etched on the planar surface of an epitaxial YIG film are treated using an approach which integrates field theory with the coupled mode approach. The MSFVW reflection per groove is found to be significantly large considering that the volume waves are reflected by surface-localized and shallow grooves.



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Theoretical Considerations on Velocity Change of Lamb Waves by Magnetoelastic Effect

M. Tsutsumi, T. Morimoto and N. Kumagai. "Theoretical Considerations on Velocity Change of Lamb Waves by Magnetoelastic Effect." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 450-452.

The propagation characteristics of the magnetoelastic Lamb waves in a YIG film magnetized tangentially are analyzed using perturbation technique. It is found that a velocity change by magnetic field is of order few percent and the waves attenuates near magnetic resonance frequency.

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Abstracts

Slanted Reflective Array Correlator

B.R. Potter, C.S. Hartmann and W.R. Shreve. "Slanted Reflective Array Correlator." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 453-455.

The first surface acoustic wave slanted reflective array correlator has been designed, constructed and tested. Slanted transducers are utilized for input and output and a slanted metal reflector array for large time-band-width (BT) products. The transducers each have a BT product of 40 and the entire device has a BT product of 1000. Slanted transducer finger placement is presented with some transducer test results. The design of the slanted reflector array is presented along with overall test results. Finally, areas of continued development are presented.



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A New A/D Converter Using Surface Acoustic Waves

M. Feldmann and J. Henaff. "A New A/D Converter Using Surface Acoustic Waves." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 456-458.

A new analog to digital (A/D) converter is described. The analog signal is first converted into a frequency swept modulated signal by means of a surface acoustic wave (SAW) voltage controlled oscillator. On the same substrate, the acoustic beam is scattered by a multistrip reflective array arranged in a N-track filter bank, with $N = 2^n$ for a n-bit converter. The output transducers are arranged in order to use the Gray code and a cheap logic restores the binary code. The first experiments on a multitrack 3 bit-converter working in the frequency range 144.5-151 MHz are reported. Such a device meets the requirements of moderate precision and relatively fast A/D converter. At last, potential capabilities-number of bits, conversion time, power supply, size, etc. . . of these new devices are discussed.

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Abstracts

Planning Electronic Developments for Industry (Abstract)

C.H. Phipps. "Planning Electronic Developments for Industry (Abstract)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 459-459.

The relationship of principal electronic sectors to macroeconomic factors provides a useful alternative for assessing the long-term potential of the electronic industry. This alternative forecast suggests that the principal world electronic market have a potential to increase their growth rates through the 1980's as compared to recent growth history. This accelerated growth is spurred by semiconductor technology, particularly by low-cost logic and memory, which are just now beginning to be dispersed broadly in consumer and industrial applications.



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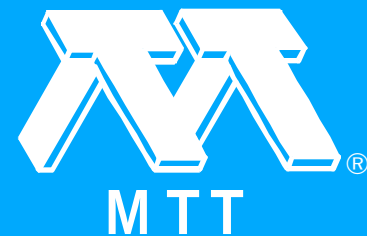


Abstracts

Microwave Devices in Japan

T. Irie. "Microwave Devices in Japan." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 460-462.

The paper describes how the Japanese industries have shaped the microwave semiconductor devices and how they will participate in shaping the device business and technologies to meet the ever-advancing social needs.



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Abstracts

Digital Satellite Communications - Systems, Components, and Limitations

C.L. Cuccia. "Digital Satellite Communications - Systems, Components, and Limitations." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 463-465.

Digital satellite communications is conducted in a bandwidth and power limited system of noise contributors, filters, nonlinear amplifiers, and adjacent channel interference. This paper will discuss the overall system architecture, identifying all types of filters, amplifiers, and modulation techniques in a system involving a transmitting earth terminal and up-link, a satellite transponder, and a down-link and receiving earth terminal which includes the receivers. The parameters relating to overall link performance will be discussed for a wide variety of modulation techniques and for various bandwidth efficiencies.



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Abstracts

Scattering Calculations Using the Boundary Element Method

M.H. Lean, G. Jeng and A. Wexler. "Scattering Calculations Using the Boundary Element Method." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 466-467.

The use of isoparametric finite-elements, as a viable replacement for existing practices in the geometrical modelling of scattering surfaces, is presented. The boundary integral approach, together with the variational procedure, allows scattering parameters to be computed accurately.



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Abstracts

High Power Stable Pulsed X-Band IMPATT Amplifiers Using Resonant Cavity Power Combiners (Abstract)

R.G. Mastroianni and A.C. Levitan. "High Power Stable Pulsed X-Band IMPATT Amplifiers Using Resonant Cavity Power Combiners (Abstract)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 468-468.

The characteristics of fundamental mode and overmoded resonant cavity IMPATT diode power combiners operating as stable reflection amplifiers are described. The spectral purity of this class of RF amplifier has been measured and was found to be satisfactory for use in sophisticated radar systems.



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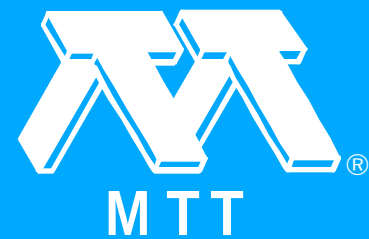
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A Submillimeter-Wave Polarimeter for Plasma Diagnostics

C.H. Ma, D.P. Hutchinson and K.L. Vander Sluis. "A Submillimeter-Wave Polarimeter for Plasma Diagnostics." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 469-470.

A submillimeter-wave laser polarimeter with ferrite polarization modulators is described. The poloidal magnetic field and the plasma current density of a tokamak can be determined by measuring the Faraday rotation of the laser beam in plasma. High polarization sensitivity was observed in a stimulated tokamak plasma experiment.

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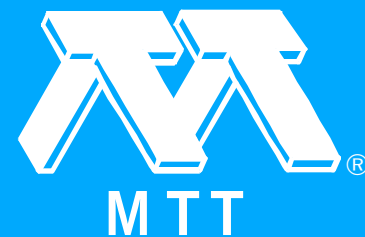


Abstracts

Fin Line Design Made Easy

W.J.R. Hoefer. "Fin Line Design Made Easy." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 471-471.

Fin line is an attractive transmission medium at millimeter wavelengths for its ease of fabrication and its compatibility with semiconductor devices. Its wide bandwidth, low dispersion and moderate attenuation (when compared with microstrip in that at frequency range) would make it a favorite candidate for many designers, were it not for the cumbersome design procedures available to date.



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Two-Port SAW Resonator Utilizing Piezoelectric Surface Shear Wave Mode

Y. Kinoshita, H. Kojima and T. Tabuchi. "Two-Port SAW Resonator Utilizing Piezoelectric Surface Shear Wave Mode." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 472-474.

Piezoelectric Surface Shear Wave (SSW) and its reflections at LiNbO₃/substrate edges, have been newly utilized for two-port resonators. The resonator of SSW mode exhibits a broader bandwidth compared with Rayleigh mode resonators.

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Abstracts

A Survey of Automatic Network Analyzers Configured with the IEEE-488 Interface Bus (Abstract)

J.K. Fitzpatrick. "A Survey of Automatic Network Analyzers Configured with the IEEE-488 Interface Bus (Abstract)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 475-475.

A variety of IEEE bus automatic network analyzers are discussed highlighting a microwave system incorporating a phase-locked source. Also presented are configurations to perform: (1) antenna measurements, (2) frequency translator characterizations, and (3) pulsed measurements.



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Abstracts

Panel - Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems

"Panel - Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 476-476.



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Abstracts

Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems (Panel Discussion)

Y. Kvarna. "Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 477-477.

In radio link equipment, frequency control of the transmitter by the use of a resonant cavity has been used since the very early days of the radio link technology and many different AFC arrangements have been designed. One simple design uses a cylindrical cavity where both the two orthogonal TE/sub 111/ modes are excited. One mode is tuned slightly lower than the other, and diode detectors sample the power from the two modes but with opposite polarity, so the combined voltage from the two detectors appears as a discriminator curve.



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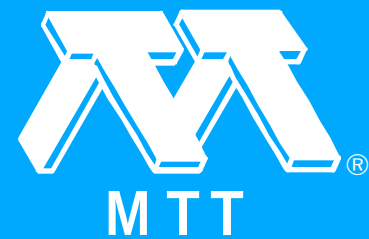
Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems

H. Yokouchi. "Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 478-478.

The cavity stabilized microwave fundamental oscillator shown in Fig. 1 is conveniently used in IF heterodyne repeater systems for the receiver local oscillator. The frequency stability of the transmitter local oscillator is nearly the same as the receiver local oscillator, and shift oscillator stability determines the overall frequency stability of the transmitter. Harmonics of the shift oscillator do not affect either local signal.

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Microwave Transistor Oscillators Stabilized with Dielectric Resonator (Panel Discussion)

H. Abe. "Microwave Transistor Oscillators Stabilized with Dielectric Resonator (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 479-479.

Owing to their high thermal stability and high Q value, BaO-TiO/sub 2/ system ceramic resonators have been investigated as frequency controlling devices and are now in practical use. Relatively high dielectric constant makes it possible to obtain a small size resonator which is compatible with stabilized oscillator design. Dielectric resonators are readily incorporated into MIC transistor oscillators and result in a highly-stabilized, low-noise microwave power source.

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Frequency Stability of Dielectric Resonator Oscillators (Panel Discussion)

J.K. Plourde. "Frequency Stability of Dielectric Resonator Oscillators (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 480-480.

Dielectric resonators now provide small, high Q, temperature stable, resonant elements for use in microwave oscillators. In recent years, several suitable ceramics have been developed. Compositions in the BaO-TiO/sub 2/, SnO/sub 2/-TiO/sub 2/-ZrO/sub 2/ or SrO-Nb/sub 2/O/sub 5/-TiO/sub 2/ systems offer the best combination of properties for microwave applications at this time. They possess temperature stabilities and Q's comparable to or approaching those of Invar waveguide resonators. Also they provide dielectric constants in the 36 to 40 range which results in approximately 80% of the energy stored within the ceramic. Therefore, dielectric resonators formed from these ceramics approximate lumped resonant elements well.

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Abstracts

Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems -- Microwave BAW and SAW Oscillators (Panel Discussion)

J. Henaff. "Stabilization of Fundamental-Frequency Microwave Oscillators for Radio-Relay Systems -- Microwave BAW and SAW Oscillators (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 481-481.

High frequency fundamental operation up to 2-3 GHz is possible with both surface acoustic wave (SAW) and bulk acoustic wave (BAW) oscillators. The present characteristics and the estimated future capabilities are described in view of radio-relay communication requirements.



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Surface Acoustic Wave (SAW) Controlled Oscillators (Panel Discussion)

T.E. Parker. "Surface Acoustic Wave (SAW) Controlled Oscillators (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 482-482.

The surface acoustic wave (SAW) controlled oscillator consists of a narrow band SAW delay line or resonator used as a feedback element, an amplifier with sufficient gain to overcome the insertion loss of the SAW device, and a means to couple out part of the signal. The SAW oscillator is related to the quartz crystal oscillator in that the stabilizing element is provided by the long delay time of an acoustic device. The surface wave device is also generally fabricated on quartz because of the inherent stability of this material. However, the planar technology of SAW devices allows fabrication of devices with operating frequencies up to the range of 1 to 2 GHz. Also, great flexibility is available in SAW design because either a resonator or delay line may be used. Delay line type oscillators are particularly useful for applications where frequency modulation is required since a tuning range of up to 1 percent can be achieved. In general, SAW controlled oscillators are small, simple, and rugged devices operating in the frequency range of 50 MHz to above 1 GHz.

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Abstracts

Applications of High-Speed Integrated Circuits to Microwave Systems (Panel Discussion)

P.T. Greiling. "Applications of High-Speed Integrated Circuits to Microwave Systems (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 483-483.

This panel will present the current status of both silicon and gallium arsenide high-speed integrated circuits and discuss their impact on future microwave systems. A comparison of the more mature silicon and the emerging gallium arsenide integrated circuit technologies will be presented with emphasis on speed, power and system performance.



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Abstracts

Applications of Millimeter-Wave and Optical/IR Technologies (Panel Discussion)

R.H. Knerr, D.B. Anderson, P.J. Meier, L. Young, L. Biberman, M. Kaswen, P. Kruse, N. Levine, J. Payne and J. Taub. "Applications of Millimeter-Wave and Optical/IR Technologies (Panel Discussion)." 1978 MTT-S International Microwave Symposium Digest 78.1 (1978 [MWSYM]): 484-484.

Background Millimeter waves have been "around the corner" for at least 25 years. Every few years there is a revival of interest, some special millimeter-wave symposia are organized, and perhaps a special issue of the MTT Transactions is published. Then interest fades, only to revive again a few years later, repeating the cycle.



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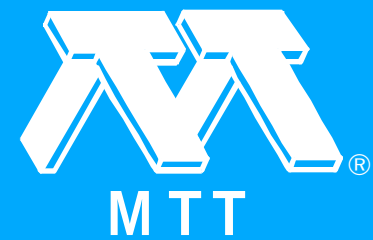
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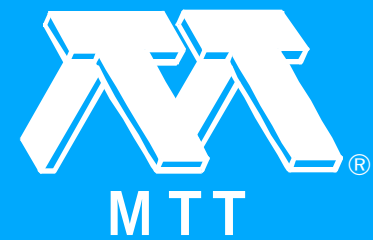
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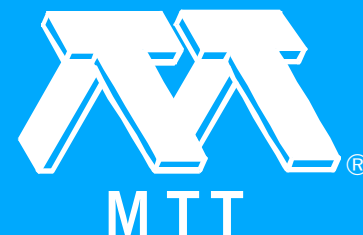


Abstracts

Foreword (1979 [MWSYM])

R. Henning. "Foreword (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): ii-ii.

Welcome to the biggest MTT Symposium ever! Our program offers everyone new insights and angles on their own key areas of interest as well as a new perspective on the continuously expanding "World of Microwaves." Your local hosts, the Orlando and Florida West Coast Chapters, have striven to provide you with a congenial setting for this symposium - a setting which will make it easy and pleasant for you to absorb new ideas and to accept the new developments thrust on you. At the same time, we hope the atmosphere will help you to relax, renew old ties, and establish new friendships and professional contacts.



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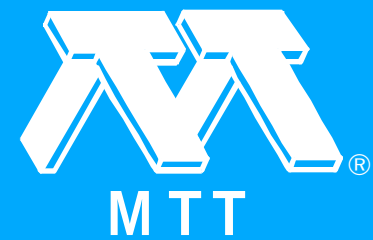
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Abstracts

Session A -- The World of Microwaves - What Next?

"Session A -- The World of Microwaves - What Next?." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 1-1.



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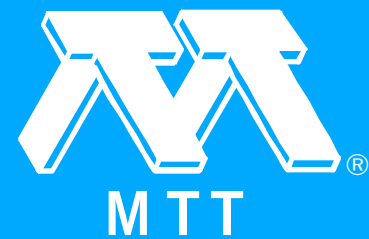


Abstracts

Technology for the Microwave Solid State Devices of the 80's: Molecules, Electrons and Ions

B. Berson. "Technology for the Microwave Solid State Devices of the 80's: Molecules, Electrons and Ions." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 3-3.

Circuit, system and device designers, encouraged by the success of the past ten years, are conspiring to accelerate the pace of device development. What they want is improved performance, higher levels of integration, more uniformity, better reliability, and lower cost. Getting there will require a new generation of semiconductor technologies. Traditional methods of materials growth may need to be replaced by the tailoring of materials on a molecule by molecule basis; device structures may be fabricated using ion implantation and laser annealing, eliminating furnace operations; wet etching of devices may be replaced by dry plasma and ion etching; optical exposure of photo-resists may be replaced by exposure to electrons or x-rays; and masks may be eliminated by direct exposure of wafers.



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Millimeter Wave Trends for the '80's

J.C. Wiltse. "Millimeter Wave Trends for the '80's." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 4-5.

Millimeter-wave activity has been increasing for the past several years, motivated by technology advances and an increased need for sensors capable of operating in adverse environments (smoke, fog, dust, rain) or making special remote measurements. Numerous applications are being investigated, but those involving missile guidance, target acquisition and tracking, and remote sensing appear to be providing the greatest impetus. Major measurement programs have been initiated to obtain better characterization of propagation effects (attenuation, backscatter), ground or sea clutter, multipath effects, and target signatures at both millimeter and submillimeter wavelengths.

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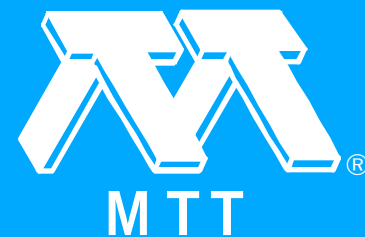


Abstracts

Logic at Microwave Frequencies - Courtship or Marriage?

M.N. Yoder. "Logic at Microwave Frequencies - Courtship or Marriage?." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 7-10.

The recent advent of logic and pseudo-logic devices operating at microwave frequencies poses many questions and the investigations to date provide some--but not all--of the answers. Perhaps the most frequently asked question is "why do we need logic at microwave frequencies and how will it be used." These questions are inevitably followed by "how do we fabricate gigabit logic devices and who is already in the business." This paper will address these questions, pose others, and attempt to assess the future of both the technology itself and its relationship to future microwave systems. Competing and overlapping base technologies such as silicon, gallium arsenide (GaAs), indium phosphide (InP), Josephson junction (JJ), and others will be compared and their state-of-the-art and future capabilities assessed. Also addressed are such issues as the "cross pollination" of microwave engineers and logic device designers as well as selected application examples.



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Abstracts

Microwaves in the Media: Truth or Consequences

J.M. Osepchuk. "Microwaves in the Media: Truth or Consequences." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 11-13.

Over the last decade there has developed a public concern and in many cases public fear over potential biological hazards of exposure to non-ionizing radiation - with a unique fearful connotation to "microwaves." How did this happen and what can be done about it. We believe the basic problem is that of a propaganda war - not scientific or technical. The tools required to restore rational perspective are rhetorical and require expression in the media if the public is to be reached.



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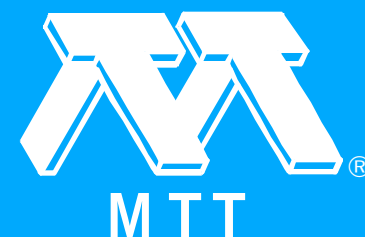
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Abstracts

Session B -- Millimeter Wave Mixers/Low Noise Amplifiers

"Session B -- Millimeter Wave Mixers/Low Noise Amplifiers." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 15-15.



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Noise and Conversion Loss Analysis of Two-Diode Subharmonically Pumped and Balanced Mixers

A.R. Kerr. "Noise and Conversion Loss Analysis of Two-Diode Subharmonically Pumped and Balanced Mixers." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 17-18.

The theory of noise and frequency conversion in two-diode mixers is presented. The diodes are assumed to have non-linear conductance and capacitance, series resistance, and shot and thermal noise. The series resistance can include a frequency dependent skin-effect component. Any linear embedding network is allowed. Computed examples are given showing the effect of the loop inductance in subharmonically pumped mixers.

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Abstracts

Development of a 183 GHz Subharmonic Mixer

R.E. Forsythe, V.T. Brady and G.T. Wrixon. "Development of a 183 GHz Subharmonic Mixer." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 20-21.

Experimental results are presented for a 183.3 GHz subharmonic mixer operating in a broad IF (0.75 GHz-10.0 GHz) radiometer system. The results are compared to a low frequency (6.8 GHz) mixer model. Results from a similarly designed fourth harmonic low frequency model are also presented.



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Abstracts

A 94 GHz Balanced Mixer using Suspended Substrate Technology

A.G. Cardiasmenos and P.T. Parrish. "A 94 GHz Balanced Mixer using Suspended Substrate Technology." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 22-24.

A 94 GHz balanced mixer has been developed using suspended substrate technology and advanced GaAs Beam Lead Diodes. The mixer, using a waveguide hybrid and a novel waveguide to suspended stripline transition exhibits average conversion loss of 6.5dB and a 5.6dB DSB noise figure including the IF contribution.



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Abstracts

An Approach to Optimal Mixer Design at Millimeter and Submillimeter Wavelengths

D.N. Held. "An Approach to Optimal Mixer Design at Millimeter and Submillimeter Wavelengths." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 25-27.

The mixer performance analysis procedures reported by the author in (1,2) have been incorporated into an optimal synthesis technique. The technique has been experimentally verified at 115 GHz and should produce good results at frequencies in excess of 300 GHz.



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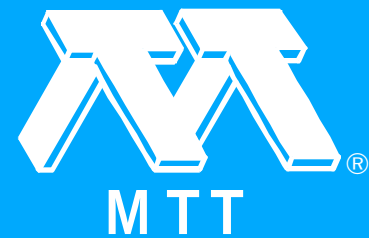
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Low Temperature Performance of GaAs MESFETs at L-Band

J. Pierro and K. Louie. "Low Temperature Performance of GaAs MESFETs at L-Band." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 28-30.

A considerable amount of work has been reported on the use of GaAs MESFET amplifiers at cryogenic temperatures. Most of the applications were for frequencies above 4 GHz. In this paper we discuss a 1.4-GHz GaAs MESFET amplifier cooled to 77 K with a noise temperature of less than 20 Kelvins over a 100-MHz bandwidth. The amplifier serves as an IF amplifier for a millimeter-wave cooled mixer.

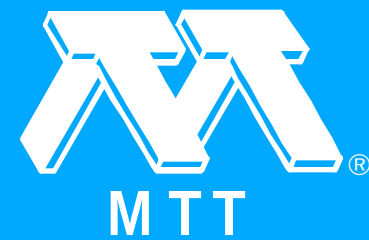
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Abstracts

Session C -- Panel Session: Professional Activities

"Session C -- Panel Session: Professional Activities." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 31-31.



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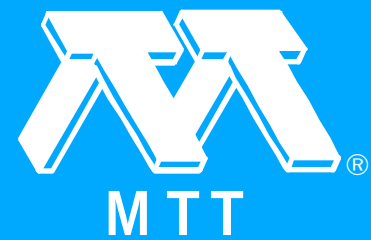
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Session D -- Microwaves in the Bioenvironment

"Session D -- Microwaves in the Bioenvironment." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 33-33.



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Abstracts

An Overview of Satellite Power Systems-- Microwave Health and Ecology Program

D.F. Cahill. "An Overview of Satellite Power Systems--Microwave Health and Ecology Program." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 35-36.

The Satellite Power System (SPS) is a concept under consideration by the Department of Energy (DOE) for its potential as an alternative source of energy. In the basic system design for SPS, solar energy will be converted to microwave energy and transmitted to receiving antennae on earth. The microwave power transmission system presently under consideration would employ continuous (CW) 2450 MHz radiation. The main beam power densities within a control exclusion zone at a rectenna site are anticipated to range up to 23 mW/cm². Scatter from the main beam, side lobe radiation, and antenna reradiation would also result in low level microwave exposures of the general public and the ecology outside of the controlled area. Many questions regarding health and ecological impacts of low to moderate exposures to microwaves must be addressed in assessing the feasibility of the SPS as an energy alternative. The overview will present the organization, philosophy, and program direction of the SPS microwave health and ecology program.



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Abstracts

A Combined Monitor-Dosimeter for Non-Ionizing Radiation

G.E. Fanslow, R.A. Hendrickson and A.M. Fanslow. "A Combined Monitor-Dosimeter for Non-Ionizing Radiation." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 37-38.

The temperature-dependent light-scattering properties of cholesteric liquid crystals and the thermal fade characteristics of pre-irradiated thermoluminescence dosimetry tags are combined in a differential calorimeter configuration to provide measures of present, average and accumulated exposures to non-ionizing electromagnetic radiation.



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Abstracts

Tumor Detection Using Microwave Enhanced Thermography and Computer Aided Image Analysis

J.E. Thompson, J. Faulk, R.G. Fellers, M.N. Huhns, T.L. Simpson and J.B. Caulfield. "Tumor Detection Using Microwave Enhanced Thermography and Computer Aided Image Analysis." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 39-44.

Thermography is an alternative to X-Ray mammography for tumor detection. Sensitivity of thermography is increased by application of low level microwave energy. Data obtained using guinea pig and rat implantable tumors is presented. Computer aided analysis techniques of the data is discussed.



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Teratological Studies of Fetal Exposure of Mice to RF Radiation

J.C. Nelson, J.C. Lin and M.E. Ekstrom. "Teratological Studies of Fetal Exposure of Mice to RF Radiation." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 45-46.

The teratogenic potential (in utero damage of fetuses) of repeated whole body exposure of pregnant mice to low-level 148MHz radiation is studied. The dams were exposed daily for one hour at 1 mW/cm/sup2/ from day one to day nineteen of gestation. Preliminary results suggest significant fetal weight differences but no significant incidence of abnormalities and growth retardation.

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Response of a Model Mouse Cancer to Free-Field Microwave Hyperthermia

D. McCulloch, J.E. Robinson, A.Y. Cheung, G.H. Harrison and W.A. McCready. "Response of a Model Mouse Cancer to Free-Field Microwave Hyperthermia." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 47-49.

274 mouse tumors, in batches of up to seven mice, were given free-field hyperthermal treatment at 2450 MHz. Regrowth studies show greater thermal sensitivity than with water bath heating, suggesting temperature heterogeneities, microwave effects, or physiological factors.

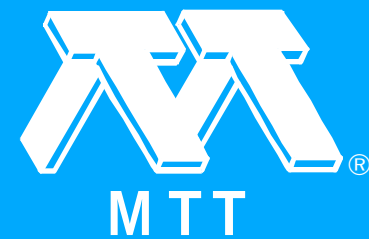
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Abstracts

Session E -- Six Ports

"Session E -- Six Ports." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 51-51.



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Abstracts

Thru-Load-Delay: An Improved Technique for Calibrating the Dual Six-Port

G.F. Engen and C.A. Hoer. "Thru-Load-Delay: An Improved Technique for Calibrating the Dual Six-Port." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 53-53.

In some earlier papers the use of a "thru-short-delay" technique for calibrating the dual six-port was described. Another scheme required only a length of precision transmission line and a calibration circuit. The better features of these two somewhat different approaches have now been combined and the requirement for either a known short, or a "calibration circuit" eliminated. This paper will discuss this new procedure and also describe its application in a practical dual six-port system.



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Abstracts

Performance of a Dual Six-Port Automatic Network Analyzer (1979 [MWSYM])

C.A. Hoer. "Performance of a Dual Six-Port Automatic Network Analyzer (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 54-56.

The precision, accuracy, and stability of an experimental dual 6-port automatic network analyzer operating in the 2-18 GHz range are given. Accuracy of 0.001 in reflection coefficient and 0.003 dB in attenuation have been maintained at 3 GHz over a 10 week period without recalibration.



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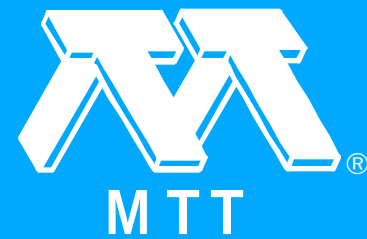


Abstracts

Phasor Signal Analysis of the Six-Port

A.L. Lance and W.D. Seal. "Phasor Signal Analysis of the Six-Port." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 57-59.

This paper presents a detailed mathematical and physical representation of phasor signals in the six-port device. The interpretation and analysis provides a clear insight and precise knowledge of how and why the six-port actually works. A composite diagram is presented which makes it possible to select the design parameters and illustrates the interrelationships of six-port parameters.



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Abstracts

A Compact Waveguide 'Resolver' for the Accurate Measurement of Complex Reflection Coefficients Using the 6 Port Measurement Concept

G.P. Riblet. "A Compact Waveguide 'Resolver' for the Accurate Measurement of Complex Reflection Coefficients Using the 6 Port Measurement Concept." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 60-62.

A compact waveguide network is described which allows one to accurately determine complex reflection coefficients over waveguide bandwidths from the measurement of two referenced power levels using simple formulae.



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Analysis of Six-Port Measurement Systems

R.A. Speciale. "Analysis of Six-Port Measurement Systems." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 63-68.

A comparative scattering parameter analysis of various microwave six-port circuit configurations has been performed in relation to applications in single and dual six-port automated microwave measurement systems. The aim of this analysis was a confirmation of the predictions of the existing general six-port theories and a search for possible simplifications of these theories to be achieved through selective restrictions of their generality. Two circuit configurations have been, so far, analyzed. The first is the proposed preferred configuration having three q-points close to the 120° optimum locations and a fourth q-point at a great distance from the origin. The second is a "pseudo-symmetric" circuit configuration having four q-points nominally at the cardinal points of the gamma-plane unit circle. Microwave measurement systems based on the six-port principle fully reconstruct complex wave-vector ratios from sets of redundant magnitude-only readings. This leads to determining points in a complex plane as intersections of three or more circles. A simple conformal mapping may be used to visualize the resolution of this method and its sensitivity to errors in the magnitude readings. This mapping transforms families of constant-magnitude-ratio circles in straight parallel lines. The coordinates in the transformed plane are the measured magnitude ratio in dB and the angle between the tangents to the intersecting circles at the intersection points.

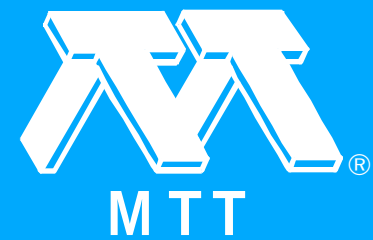
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Abstracts

Session F -- Millimeter-Wave Devices

"Session F -- Millimeter-Wave Devices." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 69-69.



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High Power 94-GHz Pulsed IMPATT Oscillators

K. Chang, C. Sun, D.L. English and E.M. Nakaji. "High Power 94-GHz Pulsed IMPATT Oscillators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 71-72.

High peak power oscillators using double-drift IMPATT diodes have been developed in W-band. The diodes were operated with 100 ns pulsewidth and 0.5 percent duty cycle. Peak power of 13 watts were consistently achieved. As a best result, over 15W peak power was achieved with selected diodes.

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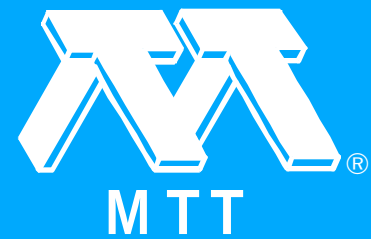


Abstracts

High Power Pulsed IMPATT Oscillator Near 140 GHz

Y.C. Ngan and E.M. Nakaji. "High Power Pulsed IMPATT Oscillator Near 140 GHz." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 73-74.

IMPATT diodes with a double drift p+-p-n-n+ doping profile were fabricated and tested for high power pulsed operation. Using a pulse width of 100 ns and a 0.5% duty factor, a peak output power of 3.0W with 2.8% conversion efficiency has been measured at 140 GHz.



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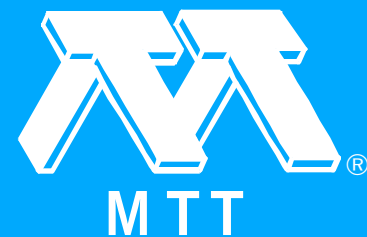


Abstracts

A 90 GHz FM-CW-Radar Transmitter

H. Barth and M. Bischoff. "A 90 GHz FM-CW-Radar Transmitter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 75-78.

The design and the performance of an FM-CW-Radar transmitter for 90 GHz set up synchronized and powercombined IMPATT-oscillators are presented in this paper. The synchronising source consists of a 45 GHz-Gunn-oscillator which is simultaneously swept and doubled by the same varactor. The outputpower of the entire unit is 240 mW achievable sweep range amounts to 1 GHz.



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Abstracts

93 GHz Self-Mixing Gunn Oscillator

J.A. Paul. "93 GHz Self-Mixing Gunn Oscillator." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 79-80.

Gallium Arsenide Gunn diodes have been used to develop self-mixing oscillators in the 94 GHz region. Experiments have been performed to measure conversion loss, excess noise, minimum detectable signal and IF impedance. The results are compared with balanced mixers and video detectors to place the self-mixing oscillator in proper perspective in terms of performance.



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Abstracts

Low Noise Millimeter Wave Schottky Barrier Diodes with Extremely Low Local Oscillator Power Requirements

D.R. Vizard, N.J. Keen, W.M. Kelly and G.T. Wrixon. "Low Noise Millimeter Wave Schottky Barrier Diodes with Extremely Low Local Oscillator Power Requirements." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 81-83.

Low capacitance Schottky barrier diodes have been fabricated which yield extremely low noise performance and require exceptionally low local oscillator power. Measurements made at 111 GHz and 170 GHz are presented.



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Printed-Circuit Balanced Mixer for the 4- and 5-mm Bands

P.J. Meier. "Printed-Circuit Balanced Mixer for the 4- and 5-mm Bands." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 84-86.

A printed-circuit balanced mixer for the 4-mm window and 5-mm oxygen-absorption band is described. The circuit integrates fin-line, coplanar line, and microstrip on a single board suspended in the E-plane of a WR-12 housing. With the LO fixed at 68 GHz, this low-cost mixer has a conversion loss of 6.6 ± 1.0 dB across the signal band of 61 to 72 GHz.

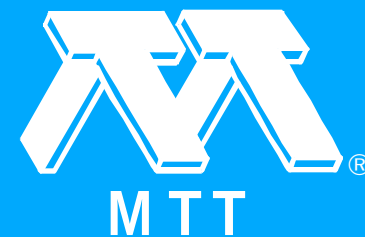
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Abstracts

Special Invited Session -- Engineering Technology and Education in Mainland China

*"Special Invited Session -- Engineering Technology and Education in Mainland China." 1979
MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 87-87.*



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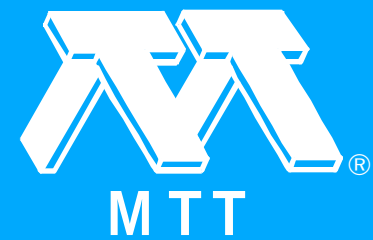
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Abstracts

Session G -- Microwave Measurements

"Session G -- Microwave Measurements." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 89-89.



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Abstracts

Measuring Anisotropy in Microwave Substrates

M. Olyphant, Jr.. "Measuring Anisotropy in Microwave Substrates." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 91-93.

A split TE/sub 111/ cavity is described which enables the accurate measurement of the within-plane dielectric constant of a 1 inch disk cut from substrates in the range 25 to 125 mils in thickness. HP 67/97 programs are included for both end and center located specimens.



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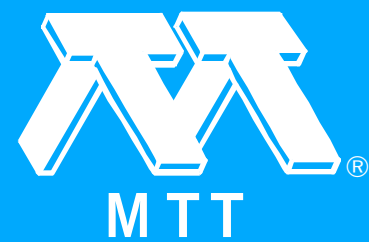
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Comparative Microwave Measurements of Complex Dielectric Constant of High Permittivity Thin Films

P. Pramanick and C. Dasgupta. "Comparative Microwave Measurements of Complex Dielectric Constant of High Permittivity Thin Films." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 95-97.

In the proposed work, complex dielectric constants of high permittivity thin films of BaTiO/sub 3/ and PbNbO/sub 3/ are measured at microwave frequencies. Working equations are presented for epsilon' and tgdelta by means of a new method of measurement, earlier reported by the author, with corrections for supporting substrate reactance in the present work. Verification of experimental results are done by means of multilayered dielectric slab loaded waveguide method and modified Drude's method. The working equations for latter two methods are also presented. Experimental results of BaTiO/sub 3/ and PbNbO/sub 3/ thin films as measured by these three methods are given.

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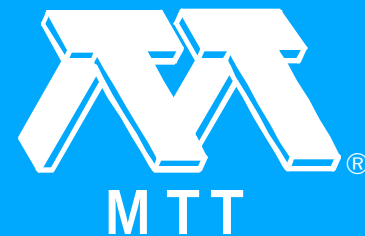


Abstracts

A New Self-Calibrating Transistor Test Fixture

R.Q. Lane and G.L. McCollum. "A New Self-Calibrating Transistor Test Fixture." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 99-101.

The design of a test fixture for strip line microwave transistors, accommodating precision coaxial calibration standards, is described. A wide variety of package styles may be measured without disturbing the initial calibration. Test data to 16 GHz is shown.



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Abstracts

A Computer Aided Measurement Program for Intrinsic Insertion Loss of Bilateral Microwave Devices

M.R. Gillette. "A Computer Aided Measurement Program for Intrinsic Insertion Loss of Bilateral Microwave Devices." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 102-104.

A BASIC language program for the measurement of and data reduction for the intrinsic insertion loss of a bilateral device using Deschamp's method has been written for the Hewlett Packard Model 8542B automatic network analyzer. The program has been applied to wideband RF intrinsic loss measurements of helix structures from 2000. to 12400. MHz.



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Abstracts

Capacitance Detector for Video Discs

K. Kawamoto and E. Denlinger. "Capacitance Detector for Video Discs." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 105-105.

Paper not Received in Time for Publication in the Symposium Digest



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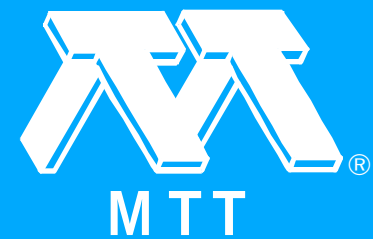
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Abstracts

Session H -- Microwave Integrated Circuits

"Session H -- Microwave Integrated Circuits." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 107-107.



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Abstracts

A Comparison of Coplanar Waveguide and Microstrip for GaAs Monolithic Integrated Circuits

A. Gopinath. "A Comparison of Coplanar Waveguide and Microstrip for GaAs Monolithic Integrated Circuits." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 109-110.

Conductor and dielectric losses height is equal to the round plane are lower in microstrip than in coplanar waveguides (CPW) when the substrate spacing in CPW. When radiation loss is included and the ground plane spacing is allowed to increase in the CPW, the guides are comparable.



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The Coplanar-Slot Transition and a Digital Phase Modulator

R.A. Davidheiser. "The Coplanar-Slot Transition and a Digital Phase Modulator." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 112-114.

Designed in a planar metal geometry for use at 15 GHz, a quadriphase modulator uses Schottky barrier diodes as its switching elements. The data transition time for two circuits used as a phase modulator/demodulator pair is 200 ps, yielding a modulator useful for 0-2 Giga bit data rates. The phase and amplitude errors of the modulator's best static alignment is ± 0.55 deg and ± 0.07 dB (typically ± 1.0 deg and ± 0.15 dB), its insertion loss 9 dB, and its carrier suppression 25-35 dB. The circuit employs a novel microstrip power splitter-dc block, slotline to microstrip and coplanar to microstrip transitions, and a Lange 90° hybrid. The interface between a coplanar and slot transmission line connected by two beam lead Schottky barrier diodes forms the biphasic switch. The design is useful for carrier frequencies between 4 and 40 GHz and for data rates to 15% of that frequency.

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Various Excitation of Coplanar Waveguide

M. Houdart and C. Aury. "Various Excitation of Coplanar Waveguide." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 116-118.

This paper reviews various methods to excite propagation along coplanar waveguide (C.P.W.); some very useful transitions are completely described and the performances obtained on transitions such as coplanar to coax, coplanar to microstrip or coplanar to slot line are given. Examples of application in microwave integrated circuits illustrate the employment of these transitions.

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Abstracts

A Quadriphase Modulator in Fin-Line Technique

E. Kpodzo, K. Schuenemann and H. El-Hennawy. "A Quadriphase Modulator in Fin-Line Technique." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 119-121.

A hybrid-coupled, quadriphase modulator is described, which has been realized in fin-line technique. It operates over an 8 per cent frequency band around 15 GHz with an insertion loss of 1.7 dB.



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Abstracts

Session I -- Microwave Systems

"Session I -- Microwave Systems." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 123-123.



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Technology Considerations for the Use of Multiple Beam Antenna Systems in Communication Satellites (1979 [MWSYM])

E.W. Matthews, C.L. Cuccia and M.D. Rubin. "Technology Considerations for the Use of Multiple Beam Antenna Systems in Communication Satellites (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 125-127.

Design constraints for a six-beam reconfigurable satellite antenna system are reviewed, and show that losses in the variable beam-forming network (BFN) limit performance achievable with a conventional common power amplifier/receiver system. An alternate design for an active BFN is presented, and relative performance predicted at 4/6, 11/14 and 20/30 GHz.

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Abstracts

A 10-Watt, C-Band FET Amplifier for TWTA Replacement

P.T. Ho, C.M. Pham and R.L. Mencik. "A 10-Watt, C-Band FET Amplifier for TWTA Replacement." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 128-130.

This paper describes the development and performance of a 10 W, high efficiency FET amplifier to be used in communication satellites for TWTA replacement. This seven-stage MIC power amplifier provides 50 dB gain with DC to RF conversion efficiency of 33.4% at C-band frequency (3.7 to 4.2 GHz).



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Abstracts

High Performance 30/20 GHz Transponder System Using Suspended Substrate MIC Down and Upconverters

A.G. Cardiasmenos and R.H. Swartley. "High Performance 30/20 GHz Transponder System Using Suspended Substrate MIC Down and Upconverters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 131-133.

In order to fully realize the operating potential of millimeter-wave communications systems, a 20/30 GHz spacecraft transponder system has been designed around the use of subharmonically pumped down and up converters. These converters, exhibiting the lowest commercially available system noise figures, provide a reliable nucleus for use in multichannel transponder architecture. SSB receiver noise temperatures of less than 1250°K including the 250°K contribution from an 8 GHz IF amplifier have been achieved for the subharmonically pumped down-converter operating between 30.2 and 31.2 GHz.



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Octave Input, S- to Q-Band Large-Signal Upper-Sideband Varactor Upconverter

H.C. Okean, L.J. Steffek and H. DeGruyl. "Octave Input, S- to Q-Band Large-Signal Upper-Sideband Varactor Upconverter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 134-136.

The S-to Q-band varactor upconverter described herein provides significantly greater power output/bandwidth capability than obtainable from a conventional single-sideband resistive upconverter, 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 (16-22 mW), 2 GHz-wide Q-band output power-frequency response with minimum Q-band pump power expenditure.

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MIC Front End for an I Band Monopulse Airborne Radar

J.I. Soula and Y. Amblard. "MIC Front End for an I Band Monopulse Airborne Radar." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 137-139.

This paper describes a new way to realize a complete monopulse receiver for an airborne radar in a very compact microwave assembly; then a unique package contains all microwave components joining aerial to IF receiver. Thin film technique on alumina substrate is employed in each integrated RF circuit; FET amplifiers realized in MIC techniques are used to reduce noise figure. The required and obtained electrical performances are consistent with the typical specifications of a multifunction airborne radar.

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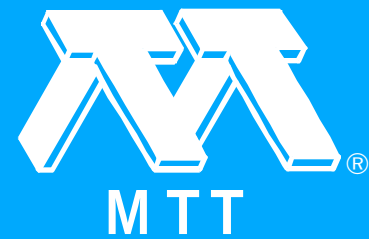


Abstracts

2.5 W Amplifier for 11 GHz 1800 FDM Channels System

E. Cesani, G. Corbetta and M. Molinari. "2.5 W Amplifier for 11 GHz 1800 FDM Channels System." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 140-143.

This paper describes the design and development of an 11 GHz amplifier, suitable for FDM signals and using a divider-amplifier-multiplier chain. The overall power amplifier in the 10.7-11.7 GHz bandwidth provides a 32 dB gain, a typical 5.7% efficiency and a 2.5 W power output with expected reliability exceeding 200,000 hours. This amplifier not only has better performances than the well-known Impatt solution, but it is also competitive with FET amplifiers now available on the market.



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New Heterodyne Receiver Head

T. Hayasaka, M. Noguchi and K. Sakamoto. "New Heterodyne Receiver Head." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 144-146.

Low noise GaAs FET amplifiers are widely employed for heterodyne receiver heads in order to improve their noise figure. In the new heterodyne receiver head discussed here, the low noise GaAs FET amplifier used to improve the noise figure is also used for oscillation of the local signal without any degradation of the transmission characteristics, so that the local oscillator, used in a conventional heterodyne receiver head can be dispensed with. The configuration of the new heterodyne receiver head is a very effective low cost, low power consumption design for a MIC receiver head.

Click on title for a complete paper.



Abstracts

An Ultra Low Noise Microwave Synthesizer (1979 [MWSYM])

G.D. Alley and H.C. Wang. "An Ultra Low Noise Microwave Synthesizer (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 147-149.

A silicon bipolar transistor together with a Ba/sub 2/Ti/sub 9/O/sub 20/ dielectric resonator were used to design a low noise microwave synthesizer. The resulting FM noise Δf_{rms} , was less than 0.0003 Hz in any 1 Hz band greater than 1000 Hz from the 1 GHz carrier.



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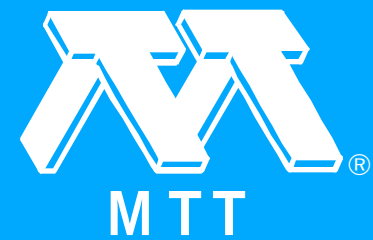
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Abstracts

Session J -- Microwave Acoustics and Magnetostatic Waves

"Session J -- Microwave Acoustics and Magnetostatic Waves." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 151-151.



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Abstracts

Systems Applications of Magnetostatic and Acoustic Wave Devices

P.H. Carr and J.C. Sethares. "Systems Applications of Magnetostatic and Acoustic Wave Devices." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 153-153.

The applications and use of magnetostatic and acoustic wave signal processing devices in systems will be described. Magnetostatic wave and surface acoustic wave (SAW) technologies are complementary in that the frequency range of SAW devices is 10 MHz to 1 GHz, the traditional range of intermediate frequency processing, while that for magnetostatic devices is 1 to 15 GHz, the traditional microwave range.



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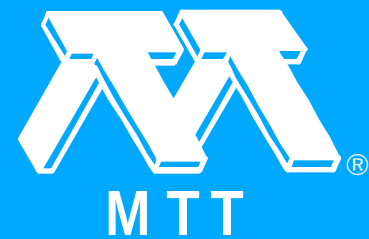
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Magnetostatic Wave Reflective Array Filter

J.M. Owens, C.V. Smith, Jr. and T.J. Mears, II. "Magnetostatic Wave Reflective Array Filter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 154-156.

Results from experimental and theoretical studies, carried out in the 3 GHz region in epitaxial YIG, on tunable magnetostatic forward volume wave (MSFVW) oblique Incidence reflective array filters are reported. Uniform reflecting gratings consisting of either metal bars or metal dot arrays have been studied as MSFVW reflectors and yield an octave tunable bandpass filter. Width weighting of the bar widths has yielded significant reduction in side lobe levels of these bandpass filters. Initial experiments on double reflection from a pair of 10 element metal bar reflecting arrays has been carried out. A graded 14 element metal bar reflecting array has yielded a constant 100 nsec delay 400 MHz bandwidth linear phase filter with a phase ripple of $\pm 15^\circ$ from linear. This is the first reported controlled dispersion MSFVW filter. Initial studies of quadratic phase MSFVW filters are reported.

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Magnetostatic Volume Wave Resonators

J.P. Castera. "Magnetostatic Volume Wave Resonators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 157-159.

The purpose of this paper is to report new advances about magnetostatic volume wave (MSVW) resonators. The waves have been propagated in an epitaxial yttrium iron garnet (YIG) film at GHz frequencies. These devices use periodic etched groove gratings as distributed reflectors for MSVW. The design and experimental data about a magnetostatic forward volume wave (MSFVW) and a magnetostatic backward volume wave (MSBVW) resonators are given. The frequency response, the Q value and the tunability are reported and compared to those obtained with magnetostatic surface wave (MSSW) resonators.

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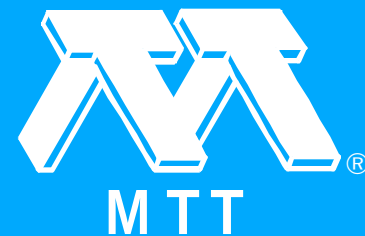


Abstracts

A Temperature Stabilized Magnetostatic Wave Device

J.D. Adam. "A Temperature Stabilized Magnetostatic Wave Device." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 160-161.

A narrow band magnetostatic volume wave delay line with rare earth cobalt bias magnets has been constructed whose center frequency of nominally 7.58 GHz drifts by less than 2 MHz over the temperature range 25°C to 70°C.



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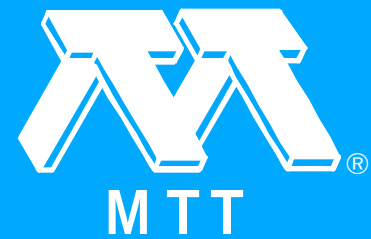


Abstracts

Shallow Bulk Acoustic Wave Devices

A. Ballato and T. Lukaszek. "Shallow Bulk Acoustic Wave Devices." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 162-164.

A brief overview of shallow bulk acoustic wave generation, propagation, and properties is presented. It is shown how the effect is manifested in doubly rotated crystal plates, and how certain features of device performance may be inferred from pre-existing calculations for bulk wave plates.



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Abstracts

Practical Aspects of Surface Acoustic Wave Oscillators (1979 [MWSYM])

S.K. Salmon. "Practical Aspects of Surface Acoustic Wave Oscillators (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 165-167.

A SAW delay-line integrated with a thin film amplifier can form the basis of a small, high stability, microwave oscillator. Practical aspects of delay-lines and the noise properties, stabilisation, frequency setting and modulation of oscillators are presented.



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Application of SAW Oscillators to Low-Noise Communications Systems

E.J. Staples, J.S. Schoenwald, S.J. Dolochycki, J. Wise and T.C. Lim. "Application of SAW Oscillators to Low-Noise Communications Systems." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 168-170.

During the 1980's and beyond, there will be a need for low-cost, low-noise oscillator circuitry in high-frequency communications systems, such as JTIDS, GPS, Packet Radio, as well as in commercial satellite communications and navigation systems. In this paper, the use of SAW oscillators to achieve low phase noise in the 300-400 MHz frequency range without phase-locked loops or multiplier chains is described. In addition to low phase noise, SAW oscillators utilizing "chip-mounted" resonators reduce system size, weight, power, and cost.

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Abstracts

Temperature Characteristics of Microwave Acoustic Resonators

R.A. Moore, B.A. Newman, B.R. McAvoy and J. Murphy. "Temperature Characteristics of Microwave Acoustic Resonators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 171-173.

Bulk acoustic resonators offer Q's greater than are available by any other means for microwave frequencies. The use of separate resonant substrates and transducers allow higher Q media not available when excitation is by means of the piezoelectricity of the substrate. Resonators with Q's to 20,000 have been tested. Analysis of temperature propagation characteristics for high Q materials is reported with examples illustrated. Diamond appears to be a candidate for low temperature sensitivity.



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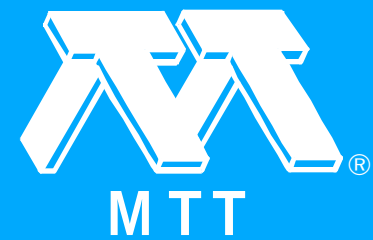
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Abstracts

Session K -- Solid State Sources

"Session K -- Solid State Sources." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 175-175.



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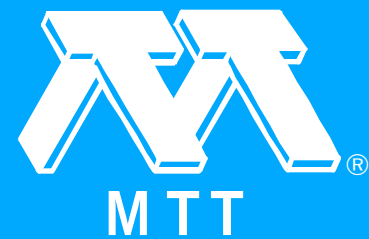


Abstracts

Varactor Tuned Gunn Oscillators with Wide Tuning Range for the 25 to 75 GHz Frequency Band

L.D. Cohen. "Varactor Tuned Gunn Oscillators with Wide Tuning Range for the 25 to 75 GHz Frequency Band." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 177-179.

Wideband electronic tuning (to 13 GHz) has been achieved at millimeter wavelengths with varactor tuned Gunn oscillators (VCO's) by use of a simple, lumped element circuit. The VCO's operate as fundamental oscillators in the 25 to 40 GHz band and as second harmonic oscillators in the 50 to 75 GHz band.



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A Microstrip Low-Noise X-Band Voltage-Controlled Oscillator (1979 [MWSYM])

E.C. Niehenke and R.D. Hess. "A Microstrip Low-Noise X-Band Voltage-Controlled Oscillator (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 180-182.

Design and performance of an X-band microstrip bipolar varactor-tuned oscillator integrated with an FET amplifier is presented. Wide temperature operation (-55° to 71°C), constant high power (0.5 W), low post-tuning drift (0.75 MHz) for 8 percent tuning range, and exceptionally low FM noise (-132 dB/Hz at 1 MHz) is reported.

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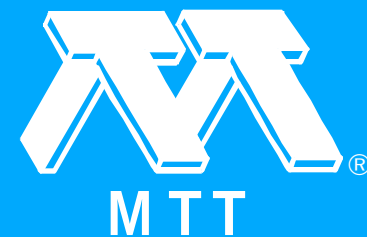


Abstracts

An 8-18 GHz FET Yig-Tuned Oscillator

R.T. Oyafuso. "An 8-18 GHz FET Yig-Tuned Oscillator." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 183-184.

A unique FET yig tuned oscillator with buffer amplifier is described. Power output is 10 dBm minimum from 8-18GHz and extended tuning range is from 6GHz to 19.5GHz.



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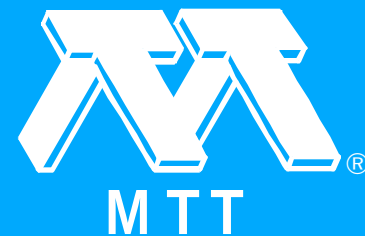


Abstracts

Harmonic Load-Pull

R.B. Stancliff and D.B. Poulin. "Harmonic Load-Pull." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 185-187.

A unique operator-interactive load-pull system which allows independent tuning of a signal and its harmonics is presented. Various tuning techniques are described and data on MESFET's in amplifier and oscillator configurations is presented.



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Optical-Microwave Effects in IMPATT Diode Oscillators

H.P. Vyas, R.J. Gutmann and J.M. Borrego. "Optical-Microwave Effects in IMPATT Diode Oscillators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 188-190.

Significant difference in optical-microwave interactions, in Si IMPATT oscillators, due to electron and hole initiated avalanches have been demonstrated using ring device structures and modified disc and post type waveguide cavity. A large signal model accounting for this difference gives a good agreement with the experimental results.

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Abstracts

3 GHz, 15 W Silicon Bipolar Transistors (1979 [MWSYM])

I. Uchizaki, S. Hori, Y. Oda and N. Tomita. "3 GHz, 15 W Silicon Bipolar Transistors (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 191-193.

Silicon bipolar transistors delivering 15W output power with 4.8dB gain and 38% collector efficiency have been developed at 3GHz. The transistors have been fabricated by boron ion-implantation for base region and As diffusion from doped poly silicon for emitter region. Chemical dry etching techniques for fine patterning, and internal matching-techniques have been applied.



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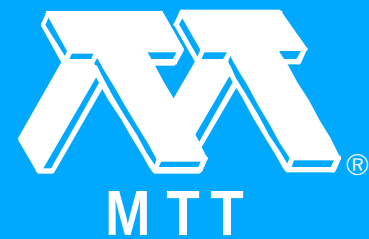
FM Noise of Transmission-Type Injection-Locked GaAsFET Oscillators and Amplifiers

K. Mishima and Y. Tajima. "FM Noise of Transmission-Type Injection-Locked GaAsFET Oscillators and Amplifiers." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 194-196.

FM noise performance of transmission-type injection locking was investigated using GaAsFET oscillators. Lower off-carrier FM noise for transmission-type than for reflection-type was observed when the injection power was kept equal for both types.

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A 6 GHz Highly Stabilized GaAs FET Oscillator Using a Dielectric Resonator

T. Saito, Y. Arai, Y. Itoh, T. Nishikawa and H. Komizo. "A 6 GHz Highly Stabilized GaAs FET Oscillator Using a Dielectric Resonator." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 197-199.

A 6 GHz GaAs FET feedback oscillator stabilized by a dielectric resonator with a new frequency tuning mechanism has been developed. The oscillator has a frequency tuning range of 50 MHz with a frequency stability of about ± 10 PPM (0°C - 50°C).

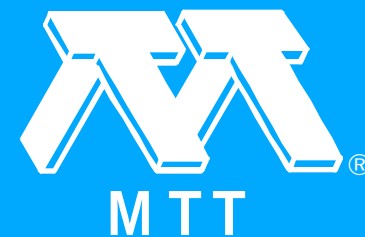
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Abstracts

Session L -- Millimeter Wave Integrated Circuits (1979 [MWSYM])

"Session L -- Millimeter Wave Integrated Circuits (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 201-201.



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Abstracts

Transmission Media for Millimeter-Wave Integrated Circuits

F.J. Tischer. "Transmission Media for Millimeter-Wave Integrated Circuits." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 203-207.

A description and comparative evaluation is presented of the characteristics of major transmission means from a viewpoint of their usefulness in integrated planar circuitry for millimeter waves in the frequency range of 30 to 300 GHz.



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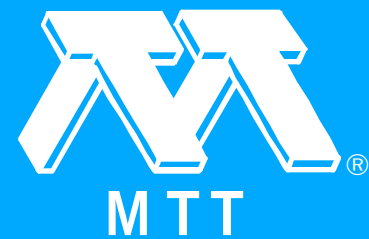
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Measurements of Dispersion Characteristics and Field Distributions in Inverted Strip Dielectric Waveguide in Millimeter Wavelength

M.N. Azarmaneche and B. Chan Song Lint. "Measurements of Dispersion Characteristics and Field Distributions in Inverted Strip Dielectric Waveguide in Millimeter Wavelength." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 208-210.

Numerically analyzed propagation constant and field distributions of inverted strip dielectric waveguides are reviewed. Measurements of these characteristics in the 50 - 75 GHz range are presented. A directional coupler is realized and tested about 70 GHz. The dimensions of this component are different from those proposed by ITOH. Our structure is essentially single mode and has low loss in transmission. There is a good agreement between theoretical and experimental results.

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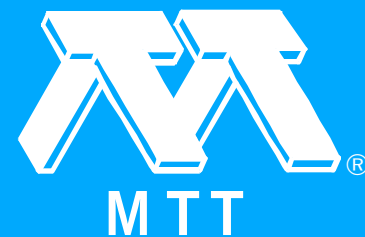


Abstracts

Multimode Waveguide Components for Millimeter-Wave Integrated Circuits

R. Mittra and S. Bhooshan. "Multimode Waveguide Components for Millimeter-Wave Integrated Circuits." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 211-213.

In this paper, we report the results of an investigation of multimode, planar dielectric waveguides for integrated circuit application at millimeter wavelengths. Two multimode devices have been fabricated and tested using the inverted strip guide (ISG), and a comparison between the theoretical and experimental results is given.



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E-Band Leaky Wave Antenna Using Dielectric Image Line with Etched Radiating Elements

K. Solbach. "E-Band Leaky Wave Antenna Using Dielectric Image Line with Etched Radiating Elements." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 214-216.

The design of a dielectric image line leaky wave antenna using etched copper disks on top of the guide as the radiating elements is described together with measurements of the properties of the antenna.

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Abstracts

A Distributed Feedback Dielectric Waveguide Oscillator with a Built-In Leaky-Wave Antenna

B.-S. Song and T. Itoh. "A Distributed Feedback Dielectric Waveguide Oscillator with a Built-In Leaky-Wave Antenna." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 217-219.

The high VSWR of a broadside-firing dielectric leaky-wave antenna is used for providing a feedback mechanism for the Gunn oscillator in a dielectric waveguide. The result is a Gunn oscillator with a built-in broadside antenna useful for dielectric microwave and millimeter wave integrated circuits.



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Abstracts

Active Integrated Devices on Dielectric Substrates for Millimeter-Wave Applications

R. Mittra, B. Kirkwood and N. Deo. "Active Integrated Devices on Dielectric Substrates for Millimeter-Wave Applications." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 220-223.

Step-by-step evolution of active integrated devices on a dielectric substrate from conventional metal waveguide design is described. Designs of oscillators, mixers and receivers are presented, and their measured performance characteristics are reported.



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Abstracts

Frequency Stabilization Technique for Millimeter-Wave Microstrip Oscillators

D. Rubin and D. Saul. "Frequency Stabilization Technique for Millimeter-Wave Microstrip Oscillators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 224-226.

The crossover frequency of an integrated microstrip diplexer has been used in a feedback arrangement to stabilize a microstrip millimeter-wave Gunn oscillator. Changes in the microstrip effective dielectric constant with temperature can be compensated for by the use of a temperature transducer in the feedback loop.



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Abstracts

Session M -- Semiconductor Control

"Session M -- Semiconductor Control." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 227-227.



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Abstracts

Practical Design of C-Band, MIC, PIN Phase Shifters

K. Hirai and S. Kamihashi. "Practical Design of C-Band, MIC, PIN Phase Shifters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 229-231.

Characteristics of branch-line-hybrid coupled phase shift circuits were clarified using S-parameters, and 4-bit circuit simulation taking transmission-line losses into consideration was performed for the circuit optimization. Then the results were applied to C-band, MIC phase shifters. The simulation program was also utilized to estimate the effects of circuit parameter variations.



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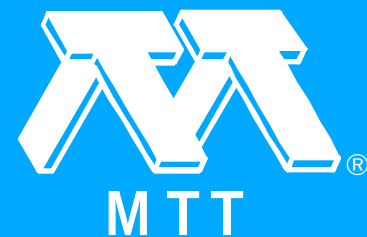


Abstracts

A Fast Switching, Low Loss, Low Drive, 12 GHz PIN Phase Shifter

B. Glance and W. Amitay. "A Fast Switching, Low Loss, Low Drive, 12 GHz PIN Phase Shifter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 232-234.

A 4-bit PIN microstrip phase shifter switching in 1 ns/bit with only 9 mW/bit of driving power is described. The phase shifter is combined with its TTL-compatible driver in a single compact package. RF insertion loss is $1.6 \text{ dB} \pm 0.2 \text{ dB}$ for the 16 phase states over the 11.7 - 12.2 GHz band. Forty-two phase shifter modules have been built. A linear phase array employing these modules has been constructed.



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Abstracts

Rectified RF for High Power PIN Duplexing

H.S. Maddix and D.C. Broderick. "Rectified RF for High Power PIN Duplexing." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 235-236.

Thin PIN diodes, loosely coupled to the main line, generate bias currents capable of driving high power PIN diodes in a low insertion loss duplexer with a capability greater than 300 kw peak - 5 kw average.



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Biased PIN FDR 45KW, X-Band Duplexing

B.K. Sarkar. "Biased PIN FDR 45KW, X-Band Duplexing." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 241-242.

Branched duplexer in a radar system usually uses gas filled TR and ATR tubes. These gas filled devices are getting replaced by more reliable PIN diode limiter and switches. Though in literature PIN diode limiter design is thoroughly described, PIN diode switch used as ATR tube is not discussed at all. This paper gives design and experimental results of waveguide PIN diode ATR tube. The design takes into consideration of high power handling capacity. The unit handled 45 KW peak power, 1 us pulse width at a frequency of 9.375 GHz as ATR tube in branched duplexer with external bias. Insertion loss of 0.4 db and isolation of 40 db were achieved.

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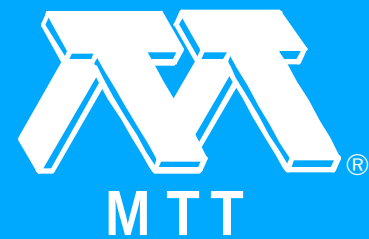
Self Activated, 20 kW X-Band Bulk Effect Semiconductor Limiter

G. Morris, V. Higgins, G. Hall, Y. Anand, R. Bilotta and F. Jellison. "Self Activated, 20 kW X-Band Bulk Effect Semiconductor Limiter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 243-248.

A self activated solid-state X-band multi-stage receiver protector using a high power bulk semiconductor limiter followed by a two-stage junction diode limiter has been developed for military radar applications. The receiver protector handles 20 kW of peak power at a 0.25 μ sec pulse width and 4000 Hz pulse repetition frequency. Spike and flat leakage powers are less than 250 mW and 50 mW respectively. High volume semiconductor batch processes and fabrication techniques were implemented to obtain this low cost, yet reliable receiver protector. In addition the bulk limiter concept has been successfully applied to millimeter wave frequency.

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New Millimeter-Wave Fin-Line Attenuators and Switches

H. Meinel and B. Rembold. "New Millimeter-Wave Fin-Line Attenuators and Switches." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 249-252.

New diode-controlled mm-wave attenuators and switches using fin-line technique are presented. Design considerations and measurements show, that ultra broadband devices (18-40 GHz; attenuation adjustable from 1.5 to 25 dB) as well as narrow band circuits at higher frequencies (91-93 GHz; attenuations adjustable from 2.9 to 20 dB) can be realized using PIN-diodes. For high speed switching in the subnanosecond range Schottky-Barrier-diodes can be taken (31-33 GHz; attenuation switchable from 2.5 to 25 dB).

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GaAs SAMP Device for Ku-Band Switching (1979 [MWSYM])

P.L. Fleming, T. Smith, H.E. Carlson and W.A. Cox. "GaAs SAMP Device for Ku-Band Switching (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 253-255.

Switchable attenuating medium propagation (SAMP) devices are coplanar transmission lines on an epitaxial semiconductor (GaAs) substrate. These transmission lines can be switched rapidly between states of high and low attenuation. Because they are uniform transmission lines they can easily be characterized for impedance matching purposes, and are well suited for use in microwave integrated circuits (MICs). Experimental performance data and theoretical background will be presented.

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Abstracts

Wide Band, Dual-Gate GaAs F.E.T. Output Limiters

R.J. Hamilton, Jr.. "Wide Band, Dual-Gate GaAs F.E.T. Output Limiters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 256-258.

The use of dual-gate, GaAs FET devices as lower power output limiters in S- and X-Band is presented. Device characteristics, circuit design and advantages including a sharper saturation knee, small signal suppression, low loss and wide bandwidth performance are discussed.



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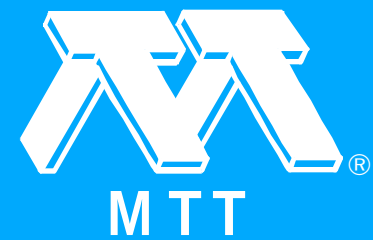
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Abstracts

Session N -- Microwave Filters

"Session N -- Microwave Filters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 259-259.



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Abstracts

A 14-GHz High-Power Filter

A.E. Atia. "A 14-GHz High-Power Filter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 261-261.

A new design of a 14-GHz narrowband bandpass low-loss high-power waveguide filter is described. The design incorporates circular waveguide dual TE/sub 113/ mode Invar cavities for thermal stability and copper thick irises for dissipated heat removal. Experimental results on the filter are presented which show excellent electrical performance under high-power conditions (up to 400 watts). Under higher-power conditions, the temperature rise of the new design is an order of magnitude less than that for a similar all-Invar filter.



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Abstracts

Realization of Dual Mode Band Rejection Filters

R. Snyder. "Realization of Dual Mode Band Rejection Filters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 264-268.

Band-rejection filters comprise a set of resonant circuits connected to a transmission line and to each other, such that an undesired band of frequencies is selectively removed from the incident spectrum. Commonly, the resonant circuits take the form of cavities, which are iris-coupled to a main line. The cavities are spaced an odd multiple of $\lambda/4$, where λ refers to the main line guide wavelength. This spacing results in properly phased addition of the attenuation due to each resonant cavity. The amount of attenuation contributed at any frequency is set by the coupling iris, and is pre-determined by the particular network synthesis utilized.



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TE/sub 011/ Mode Sectorial Circular Cylindrical Cavity Filters (1979 [MWSYM])

P.R. Karmel. "TE/sub 011/ Mode Sectorial Circular Cylindrical Cavity Filters (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 269-271.

This paper presents a new cavity resonator for the TE/sub 011/ circular mode which allows a compact mechanical structure for a multiple-cavity filter while retaining many of the electrical characteristics of larger filters. Theoretical values of Q are obtained, mode separation is demonstrated, and a 4-cavity experimental model with an elliptic transfer function is described.



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Abstracts

Cylindrical TE/sub 011//TM/sub 111/ Mode Control by Cavity Shaping (1979 [MWSYM])

H.L. Thal, Jr.. "Cylindrical TE/sub 011//TM/sub 111/ Mode Control by Cavity Shaping (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 272-274.

An appropriate modification of the shape of a cylindrical filter cavity has been used to separate the degenerate TM/sub111/ (doublet) modes while at the same time providing a slight increase in the already high unloaded Q of the desired TE/sub 011/ mode.



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Abstracts

Wide-Bandwidth Compline Filters with High Selectivity

P.M. LaTourrette. "Wide-Bandwidth Compline Filters with High Selectivity." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 275-277.

The selectivity of wide-bandwidth compline filters can be greatly enhanced with the addition of a relatively small number of finite transmission zeros. Techniques for introducing them are described and examples are given.



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Quarter Wave Dielectric Transmission Line Diplexer for Land Mobile Communications

K. Wakino, T. Nishikawa, H. Matsumoto and Y. Ishikawa. "Quarter Wave Dielectric Transmission Line Diplexer for Land Mobile Communications." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 278-280.

Small sized Diplexer with high selectivity and low insertion loss for 800 MHz band land mobile communication systems has been developed using two port quarter wave coaxial dielectric resonators. A couple of resonators including inductive film electrode construct a compact resonance unit of the Diplexer and it is coupled by capacitive air gap spacings which operates as a part of J-inverter.

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Rectangular Waveguide Type Variable Band-Pass Filters

S. Toyoda and M. Ozasa. "Rectangular Waveguide Type Variable Band-Pass Filters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 281-283.

Two rectangular waveguide type variable band-pass filters for 10 GHz and 4 GHz bands have been proposed and tested. The pass-band width varied from 600 MHz to 2.2 GHz in the filter using ridge resonant irises, and it varied 260 MHz to 1.02 GHz in the filter using varactor-diodes. The center frequency of both filters could be changed arbitrarily.

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Abstracts

A Numerically Optimized Contiguous Diplexer

R.L. Mole. "A Numerically Optimized Contiguous Diplexer." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 285-286.

A contiguous diplexer is designed using a numerical optimization technique to meet the critical performance requirements of a spacecraft communication system. The diplexer consists of two, 3 section, bridge-coupled, singly terminated filters. The diplexer is realized in a coaxial structure whose measured performance is in good agreement with the predicted response.



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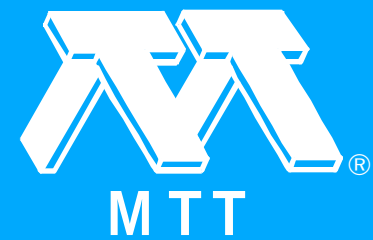
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Abstracts

Session O -- Solid State Power Combining

"Session O -- Solid State Power Combining." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 287-287.



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15-Watt Internally Matched GaAs FETs and 20-Watt Amplifier Operating at 6 GHz

K. Honjo, Y. Takayama, T. Furutsuka, A. Higashisaka and F. Hasegawa. "15-Watt Internally Matched GaAs FETs and 20-Watt Amplifier Operating at 6 GHz." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 289-291.

6-GHz 15-Watt and 8-GHz 10-Watt internally matched GaAs FETs have been developed. The lumped-element two section input matching network is formed on ceramic plates with a high dielectric constant. The distributed single section output circuit is formed in microstrip pattern on an alumina plate. A 6-GHz 20-Watt balanced amplifier module has been realized using the internally matched devices which operate without any external matching.

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Abstracts

A 25KW Solid State Transmitter for L-Band Radars

K.J. Lee. "A 25KW Solid State Transmitter for L-Band Radars." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 298-302.

A 25KW L-Band solid in its output stage has state radar transmitter which uses forty high power, parallel modules in its output stage has been developed. The high power techniques which preserve intermodule stability and efficient power combining at this power level are presented. The overall transmitter design approach and resultant characteristics are discussed.



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Abstracts

A 10 Watt Broadband FET Combiner/Amplifier

M. Cohn, B.D. Geller and J.M. Schellenberg. "A 10 Watt Broadband FET Combiner/Amplifier." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 292-297.

The development of a 10W MIC combiner/amplifier which combines the powers of 12 FET elemental amplifiers over a 24%, 1 dB band is described. The combining efficiency is greater than 90 percent. The design of both the radial combiner and the elemental amplifiers is described. Extension of the combiner design to operation over an octave will be discussed.



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Abstracts

Multichip IMPATT Power Combining: A Summary with New Results (1979 [MWSYM])

C.T. Rucker. "Multichip IMPATT Power Combining: A Summary with New Results (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 303-305.

X-band IMPATT diode chips have been efficiently combined in parallel, in series on diamond, stacked with diamond heat sinks and using lumped element circuit techniques with mode suppression. Combined device types include c.w. silicon p/sup +/-n-n/sup +/, c.w. GaAs Schottky lo-hi-lo, pulsed GaAs p/sup +/-hi-lo and pulsed GaAs double-drift. This paper will summarize tasks performed over a four year period and will attempt to place some of the results in perspective with respect to practical applications. Work at 35 GHz, begun in December 1978, will also be described.



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Abstracts

Trapped Inverted Microstrip (TIM) Circuits for Combining the Outputs of High-Power IMPATT Oscillators

R.F. Bera and R.N. Wallace. "Trapped Inverted Microstrip (TIM) Circuits for Combining the Outputs of High-Power IMPATT Oscillators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 306-308.

High-power IMPATT oscillators were combined through balanced hybrids realized in trapped inverted microstrip (TIM) line. Combining efficiencies approached 80 percent, with CW power outputs of 42 W at 5 GHz and 22 W at 9.3 GHz from four-oscillator arrays.



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Abstracts

Efficient Power Combining (1979 [MWSYM])

M. Dydyk. "Efficient Power Combining (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 309-313.

The objective of this paper is to establish understanding of the single/multi-mode oscillator circuits used in combiners. A model is developed with emphasis on the selection and realization of the input/output coefficients, optimum stabilizing and output loads, equalizing network synthesis and other cogent features. The application of this theory to the highly successful and efficient design of J-band pulsed oscillators is discussed.



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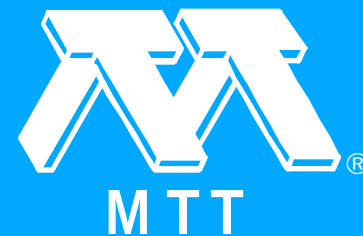


Abstracts

Power Combining in Evanescent Mode Resonators

J. Reich and K. Schuenemann. "Power Combining in Evanescent Mode Resonators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]).

Waveguide-below-cutoff techniques have been utilized to combine the power of a multiple-diode oscillator. Two structures are described; a simple T-junction with narrowband performance and a transmission cavity oscillator showing low noise and a large tuning range.



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Session P -- Japanese Session

"Session P -- Japanese Session." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 315-315.



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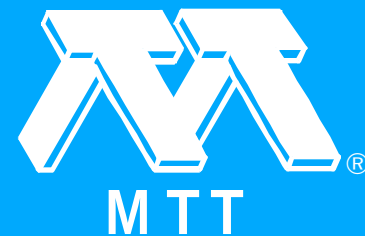


Abstracts

Recent Progress of Microwave Integrated Circuits In Japan

K. Miyauchi. "Recent Progress of Microwave Integrated Circuits In Japan." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 317-319.

This paper reviews the recent progress of microwave integrated circuits in Japan. Trends and some topics of research and development on microwave integrated circuits, and their impacts on microwave systems are presented.



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Abstracts

An Approximate Dispersion Formula of Microstrip Lines for Computer Aided Design of Microwave Integrated Circuits (1979 [MWSYM])

E. Yamashita, K. Atsuki and T. Ueda. "An Approximate Dispersion Formula of Microstrip Lines for Computer Aided Design of Microwave Integrated Circuits (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 320-322.

A simple approximate formula for the CAD of the dispersion property of microstrip lines is reported in this paper which well fits the calculated curves based on a rigorous method.



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Abstracts

An Active Microwave Filter with Dielectric Resonator

H. Matsumura and Y. Konishi. "An Active Microwave Filter with Dielectric Resonator." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 323-325.

An active microwave filter has been newly developed by using dielectric resonators combined with active elements. The purpose of this paper is to describe about the new technique and the performance of the active filter at 6 GHz band. The value of the equivalent unloaded Q of the resonant element exceeds 37,000 in our experiment.



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400 Mb/s QPSK MIC Regenerator at Carrier Frequency Using GaAs MESFET

O. Kurita and S. Komaki. "400 Mb/s QPSK MIC Regenerator at Carrier Frequency Using GaAs MESFET." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 326-328.

A novel MIC (microwave integrated circuit) GaAs MESFET (metal-semiconductor field effect transistor) direct phase regenerator without detection is described. An experimental 400 Mb/s QPSK (quadri-phase shift keying) regenerator at 1.7 GHz carrier frequency, shows as good performance as conventional baseband regenerator.



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High-Power MIC Diode Limiters for S- and X-Band Radars

S. Hori, M. Kuroda, K. Kanema and S. Okano. "High-Power MIC Diode Limiters for S- and X-Band Radars." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 329-331.

S- and X-band passive MIC diode limiters have been developed for high power applications. Two PIN diodes with I layer thickness of 9.5 μm and 1.5 μm are shunt-mounted to 50 ohm microstrip lines. The limiters can handle 2-kW peak input power with less than 100mW peak leakage power for pulsed RF signals of 1 μs width and 0.1 percent duty ratio.

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UHF High-Power Low-Distortion Transistor Amplifier with High-Dielectric ($\epsilon_r=39$) Substrate

Y. Kajiwara, T. Noguchi, T. Sugiura, H. Takamizawa, K. Hirakawa and K. Sasaki. "UHF High-Power Low-Distortion Transistor Amplifier with High-Dielectric ($\epsilon_r=39$) Substrate." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 332-334.

A hybrid-integrated UHF power amplifier has been designed and fabricated on high-dielectric ($\epsilon_r=39$) substrate. The amplifier was developed to replace TWTs in television transposers and provides a rated output peak power of 32W with low-distortion characteristic over the 650~770 MHz frequency range.

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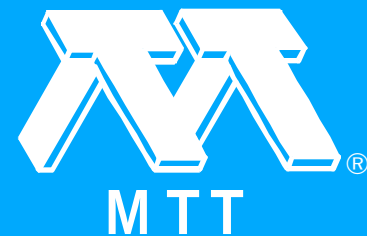


Abstracts

4-8 GHz Miniaturized GaAs FET Amplifier

S. Yamamura, N. Hidaka, Y. Tokumitsu and M. Fukuta. "4-8 GHz Miniaturized GaAs FET Amplifier." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 335-337.

A 4-8 GHz GaAs FET balanced amplifier has been constructed on a 4mm x 5mm sapphire substrate. Lumped elements used in microwave- and DC bias-circuits, and 3-dB coupler were fabricated on the substrate using thin film technology.



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Session Q -- Computer Aided Design

"Session Q -- Computer Aided Design." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 339-339.



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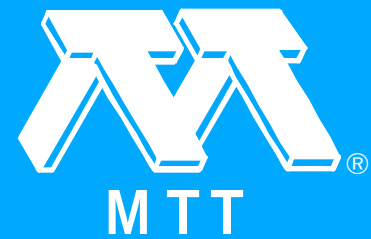


Abstracts

Fin Line Parameters Calculated with the TLM - Method

W.J.R. Hoefer and A. Ros. "Fin Line Parameters Calculated with the TLM - Method." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 341-343.

The guided wavelength in fin line is calculated using the Transmission Line Matrix (TLM) method. The resonant frequencies of fin line cavities are evaluated on a computer, yielding the dispersion characteristic of the fundamental and higher order modes of propagation.



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Abstracts

Spectral Domain Analysis of Dominant and Higher Order Modes in Fin-Lines (1979 [MWSYM])

C. Chang and T. Itoh. "Spectral Domain Analysis of Dominant and Higher Order Modes in Fin-Lines (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 344-346.

The spectral domain analysis is applied to deriving dispersion characteristics of the dominant, higher order modes in the fin-line structures. Numerical results are compared with those by a modified spectral domain technique as well as other data.



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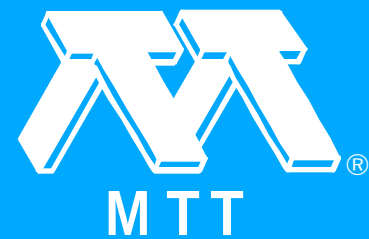
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Approximation of Complex Functions by Vector Projection Using Least Mean-Square Methods

W. Gopfert. "Approximation of Complex Functions by Vector Projection Using Least Mean-Square Methods." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 347-349.

A novel method for the approximation of complex functions even in the case of relatively poor starting values of the approximation-parameters for using least mean-square methods is described. The method relies largely on the introduction of an appropriate approach by vector projection for reducing complex variables to real variables.

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



Abstracts

Improved Device Modeling for Matching Network Synthesis

M.W. Medley, Jr. and J.L. Allen. "Improved Device Modeling for Matching Network Synthesis." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 350-352.

A new technique is presented for determining equivalent source and load device models applicable to GaAs FET or other devices for which measured data is available. The new technique provides a more accurate starting point for matching network synthesis, better prediction of achievable circuit performance, and does not require the unilateral device assumption. Simple computer optimization and elements with negative reactance slope parameters are utilized. A description of the method and an example of its application to GaAs FET amplifier design is presented.



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Abstracts

Computer Aided Design of the Microwave Broadband Linear Phase Modulator with Varactor Diode

J. Modelski. "Computer Aided Design of the Microwave Broadband Linear Phase Modulator with Varactor Diode." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 353-355.

This paper describes the method of analysis and design of the microwave broadband analog phase modulator with varactor diodes for any phase shift range ΔP ($\Delta P \leq 180^\circ$). Problem is reduced to the impedance matching network.



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Abstracts

The Impact of Generalized Symmetry on Computer-Aided Design of Cascaded Structures

J.W. Bandler, R.M. Biernacki and M.R.M. Rizk. "The Impact of Generalized Symmetry on Computer-Aided Design of Cascaded Structures." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 356-358.

New theoretical and computational tools are presented which deal with generalized symmetry concepts related to the computer-aided design of cascaded structures. The presentation includes the computational implications of networks consisting of symmetrically located reverse adjoint subnetworks with and without scaling, as well as antisymmetry. Formulas presented are designed to be used in simulation, sensitivity and tolerance analyses as well as in optimal design.



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Realistic Tolerance Analysis of Microwave Networks

H. Tromp. "Realistic Tolerance Analysis of Microwave Networks." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 359-361.

A general formulation of the network tolerance problem is presented. It allows to deal, in a unified way, with all the disturbing effects, that may affect the network response. It can be used for the realistic analysis and design of networks. Possible simplifications of the formulation are discussed.

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Abstracts

Simulation and Design of Microwave Class-C Amplifiers through Harmonic Analysis (1979 [MWSYM])

F. Filicori, V.A. Monaco and C. Naldi. "Simulation and Design of Microwave Class-C Amplifiers through Harmonic Analysis (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 362-364.

Microwave class-C amplifier analysis is performed by solving a non-linear system whose unknowns are the harmonic components of the wave variables at the ports connecting the linear and non-linear parts of the amplifier. An application example is given.



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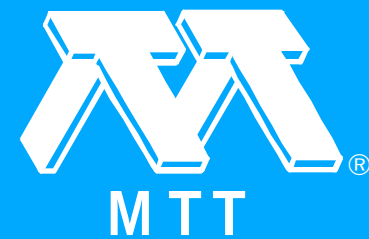
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Abstracts

Session R -- Microwave Ferrites

"Session R -- Microwave Ferrites." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 365-365.



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Abstracts

Future Directions for Microwave Ferrite Components

L.R. Whicker. "Future Directions for Microwave Ferrite Components." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 367-369.

This paper reviews the present status of ferrite control components and attempts to predict areas for further work. The components considered here are primarily from the junction circulator or phase shifter groups. It is pointed out that while ferrite control component technology is reaching a mature state, the market for circulators and phase shifters is expected to be quite good for the next several years.



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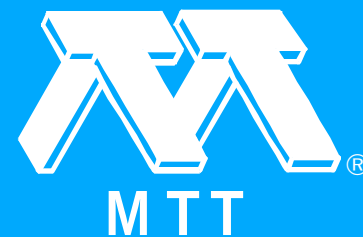


Abstracts

Accuracy Study for a Moderate Production Quantity of Reciprocal Ferrite Phase Shifters

C.R. Boyd. "Accuracy Study for a Moderate Production Quantity of Reciprocal Ferrite Phase Shifters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 370-372.

A moderate quantity of X-band dual-mode reciprocal, latching ferrite phase shifters has been built and tested in a computer-controlled station. Ensemble phase shift distributions and statistics have been investigated using stored test data. Variation with frequency is small over the design band, and the phase state dependent data show the effects of curve-fitting computed during testing.



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Abstracts

Optimization and Design of Millimeter Wavelength Phase Shifters

E. Gimonet and B. Chan Song Lint. "Optimization and Design of Millimeter Wavelength Phase Shifters." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 373-375.

Future millimeter wavelength radar and communication systems will require phase control components. Among these devices, the reciprocal phase shifters seem of great interest. A theoretical optimization of millimeter wavelength phase shifters is described. Design and test data for a new low loss reciprocal ferrite phase shifter in 4 millimeter wavelengths are presented. A figure of merit of about $360^\circ/1.4$ dB is measured at 70 GHz.



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Abstracts

The Edge Guided Mode Nonreciprocal Phase Shifter (1979 [MWSYM])

D.M. Belle and S.H. Talisa. "The Edge Guided Mode Nonreciprocal Phase Shifter (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 376-378.

Results of a theoretical study are presented for a model of non-reciprocal dielectric-ferrite loaded stripline phase shifter employing the edge guided dynamic mode.



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New Edge Guided Wave on Ferrite Strip

Y. Naito, K. Araki and S. Enjouji. "New Edge Guided Wave on Ferrite Strip." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 379-381.

Electromagnetic wave propagation along ferrite strip whose cross section is square immersed in D.C. magnetic field is investigated experimentally. The existence of the mode similar to edge guided mode in ferrite substrate microstrip line was discovered. This mode may be useful for nonreciprocal circuit in millimeter and optical integrated circuit.

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High Power X-Band Ferrite Frequency Doubler

L. Dubrowsky, D. Buck, A. Kern and D. Schubert. "High Power X-Band Ferrite Frequency Doubler." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 382-384.

This paper describes the development and optimization of an X to K-band frequency doubler. A conversion loss of 3.45 dB was achieved with an input power of 20 kW peak, 12 W average. Efficiency and average power output exceeded previously reported results. The power saturation mechanism is attributed to fundamental processes in the uniform precession mode rather than to spin waves.

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Abstracts

Session S -- FETs and FET Modeling

"Session S -- FETs and FET Modeling." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 385-385.



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Abstracts

An X-Band GaAs FET Monolithic Power Amplifier

R.A. Pucel, P. Ng and J. Vorhaus. "An X-Band GaAs FET Monolithic Power Amplifier." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 387-389.

Experimental results obtained with a monolithic, one-stage X-band power FET amplifier will be presented along with the CAD design techniques used. Some general considerations relating to the feasibility of GaAs as a monolithic circuit substrate will be given.



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Abstracts

Techniques for Improving the Stability and Amplifier Performance of X-Band GaAs Power FETs

S.J. Temple, Z. Galani, R.M. Healy and B.S. Hewitt. "Techniques for Improving the Stability and Amplifier Performance of X-Band GaAs Power FETs." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 390-392.

Via hole source connections together with on-carrier matching significantly improve X-band power FET performance. Via hole connections eliminate spurious oscillations by reducing common-lead source inductance. On-carrier matching networks improve the power and gain of X-band FET amplifiers by partially matching the very low input and output impedance of large periphery devices with impedance transformation networks located as close to the transistor as possible.



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Abstracts

Highly Reliable GaAs MESFETs with a Static Mean NF/sub min/ of 0.89 dB and a Standard Deviation of 0.07 dB at 4 GHz (1979 [MWSYM])

T. Suzuki, A. Nara, M. Nakatani, T. Ishii, S. Mitsui and K. Shirahata. "Highly Reliable GaAs MESFETs with a Static Mean NF/sub min/ of 0.89 dB and a Standard Deviation of 0.07 dB at 4 GHz (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 393-395.

Optimization of structure and configuration of GaAs MESFETs for high performance and high reliability was investigated. GaAs MESFETs with the NF/sub min/ of 0.89 dB and the standard deviation of 0.07 dB at 4 GHz, the CW and pulse input power capability more than 0.4 W and 2 W, respectively and the failure rate less than 180 Fit have become practical.



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Abstracts

High Frequency Performance of Implanted Si-MOSFETs

C. Tsironis and U. Niggebrugge. "High Frequency Performance of Implanted Si-MOSFETs." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 396-398.

Silicon MOSFETs with a $0.8/\mu$ long channel, made by conventional technology and optimized for microwave applications, have noise figure of 3.5 dB at 4 GHz and $f_{\text{sub max}}$ of 10 to 12 GHz. The noise and RF small signal performance are very slightly affected by channel ion implantation, used to shift the threshold voltage to positive values. The RF equivalent circuit analysis indicates negligible parasitic lead resistances but high feedback capacitance.



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Abstracts

A Practical AC Large-Signal Model for GaAs Microwave MESFETs

A. Madjar and F.J. Rosenbaum. "A Practical AC Large-Signal Model for GaAs Microwave MESFETs." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 399-401.

An AC large-signal model for the GaAs FET is presented. It incorporates the device geometry and semiconductor properties and relates the terminal currents to the instantaneous applied voltages and their derivatives. Its form is suitable for large-signal component design and optimization.



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Abstracts

Quasi-Static Approach to Simulating Nonlinear GaAs FET Behavior

C. Rauscher and H.A. Willing. "Quasi-Static Approach to Simulating Nonlinear GaAs FET Behavior." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 402-404.

A technique is described for accurately predicting nonlinear performance of microwave GaAs field-effect transistors in arbitrary circuit embedding using a quasi-static device model. Excellent agreement with experimental results at X-band is demonstrated.



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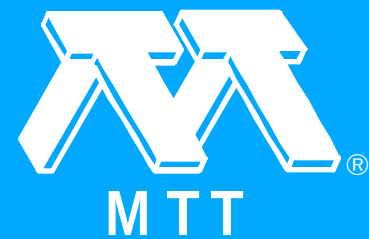
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Intermodulation Distortion in Microwave MESFET Amplifiers

R.K. Gupta, C.G. Englefield and P.A. Goud. "Intermodulation Distortion in Microwave MESFET Amplifiers." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 405-407.

The third-order intermodulation distortion (IM/sub 3/) of a MESFET amplifier has been analysed using Volterra series representation. A model is described that takes into account the MESFET nonlinearities and their interaction with the surrounding microwave circuit. A theoretical and experimental study of the amplifier intermodulation products has been conducted. Their dependence on the input frequency and power-level of a two-tone test signal is investigated. For power inputs less than -10 dBm, the agreement obtained between measured and predicted IM/sub 3/ is within 3-dB over an amplifier bandwidth of 400 MHz.

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Abstracts

Extension of Existing Models to MESFET's with Arbitrary Doping Density Profiles

P. de Santis. "Extension of Existing Models to MESFET's with Arbitrary Doping Density Profiles." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 408-410.

This work extends uniform MESFET's analyses to arbitrary doping density profiles. Analytical expressions and numerical computations are provided for equivalent circuit elements of MESFET's with gaussian, exponential, inverse cubic, and "power series" profiles. A good agreement with experiment is found for ion implanted devices.



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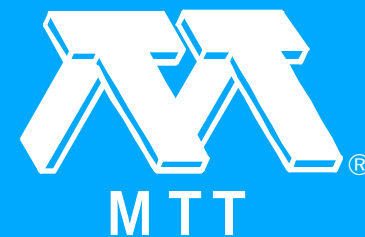
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Abstracts

Session T -- Active and Passive Components

"Session T -- Active and Passive Components." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 411-411.



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Abstracts

Computer-Simulated Design of an Active Microwave Allpass Network (1979 [MWSYM])

S.E. Sussman-Fort. "Computer-Simulated Design of an Active Microwave Allpass Network (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 413-415.

A new microwave active allpass network is proposed. In a computer simulation, it is shown that the network, even with markedly non-ideal transistors, can provide a true allpass response over 8 - 12 GHz.



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Abstracts

High-Speed, Varactor-Tunable Microwave Filter Element

A. Presser. "High-Speed, Varactor-Tunable Microwave Filter Element." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 416-418.

A varactor-tunable filter element at I-band frequencies is described in which the negative resistance of a GaAs FET is used to overcome varactor losses and attain a high unloaded Q over a 500-MHz frequency band.



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Temperature-Compensated BaTi/sub 4/O/sub 9/ Microstrip Delay Line

Y.S. Lee and W.H. Childs. "Temperature-Compensated BaTi/sub 4/O/sub 9/ Microstrip Delay Line." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 419-421.

A temperature-stable 16-ns delay element operating at 14 GHz has been developed using barium tetratitanate (BaTi/sub 4/O/sub 9/) ceramic microstrip lines with a short sapphire (single crystal Al/sub 2/O/sub 3/) microstrip section for temperature compensation. The measured transmission phase temperature coefficient of the delay element is +0.6 (± 0.3) ppm/ $^{\circ}\text{C}$ over the temperature range of $23^{\circ}\text{C} \pm 30^{\circ}\text{C}$.

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Abstracts

Continuously Variable Coaxial-Line Attenuator

E.G. Cristal. "Continuously Variable Coaxial-Line Attenuator." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 422-424.

This paper reports on a new continuously variable coaxial-line attenuator that utilizes a center conductor of semi-insulating material. Experimental data and design details for an octave bandwidth prototype attenuator are presented and discussed. The attenuator theory is developed and several interesting theoretical results are described.



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Abstracts

Multilayer Hybrid in Circular Waveguide (1979 [MWSYM])

E.T. Harkless and D.N. Zuckerman. "Multilayer Hybrid in Circular Waveguide (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 425-427.

A circular-waveguide multilayer dielectric sheet hybrid junction having nearly constant power division over 40-110 GHz and minimal spurious mode generation is designed using ray optics. Experimental results are given and broadband filter applications are examined.



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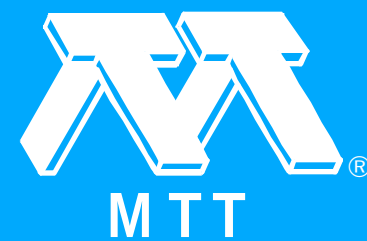
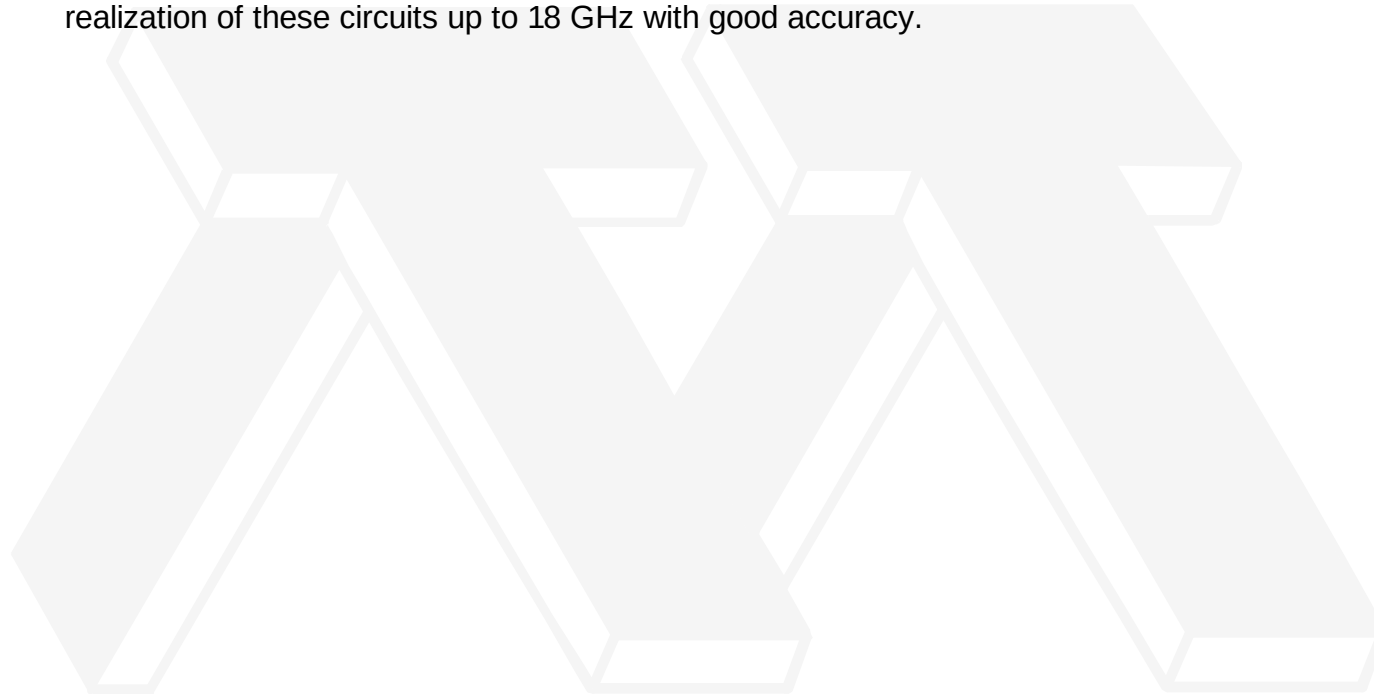


Abstracts

A Hybrid Coupler for Microstrip Configuration

S. Hopper. "A Hybrid Coupler for Microstrip Configuration." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 428-430.

A hybrid coupler for microstrip, modelled along the lines of the "re-entrant coupled section" of a coaxial system, is described. Complete design information is available, leading to the realization of these circuits up to 18 GHz with good accuracy.



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Abstracts

Improved Large Aperture Waveguide Coupling Theory

R. Levy. "Improved Large Aperture Waveguide Coupling Theory." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 431-433.

Bethe's small aperture coupling theory, modified by Cohn for large coupling apertures, is improved by including correction terms obtained by averaging the fields over the large aperture. Additionally, inclusion of nonempirical thickness correction factors derived previously by McDonald give coupling formulas which result in theoretical predictions for multi-aperture couplers substantially in exact agreement with experiment (correcting small discrepancies previously noted by the author in a 1968 paper).



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Session U -- Microwave High Power

"Session U -- Microwave High Power." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 435-435.



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Abstracts

A High Power Low Passive Intermodulation (PIM) UHF Duplexer for Space Application

C.M. Kudsia, K.R. Ainsworth, J. Heierli and F. Daniels. "A High Power Low Passive Intermodulation (PIM) UHF Duplexer for Space Application." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 437-439.

This paper describes the development of a high power, low passive intermodulation (PIM) UHF duplexer to determine the feasibility of such a unit for space application. Tests carried out on the final prototype model demonstrate low loss, high power handling in vacuum (>200 watts) and low PIM - thus establishing it as a candidate design for the multi-purpose UHF satellite currently under consideration by the Canadian Government.



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Abstracts

Ultra, Reliable 2.5 KW, Solid State L-Band Amplifier

G. Hanley, R. Viola and P. Iassogna. "Ultra, Reliable 2.5 KW, Solid State L-Band Amplifier." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 440-442.

A 2.5 KW Solid State L-Band Amplifier has been designed to achieve 2 orders of magnitude improvement in reliability. This improvement is achieved by the use of stand-by modules controlled by performance monitoring/fault locating networks which are incorporated in RF and DC circuitry. A failed module is automatically switched out of the RF circuit and replaced with a stand-by unit. This self-healing technique maintains amplifier performance with minimum interruption time.



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Abstracts

Microwave Nanosecond Pulse Burnout Properties of GaAs MESFETs (1979 [MWSYM])

J.J. Whalen, M. Thorn and M.C. Calcaterra. "Microwave Nanosecond Pulse Burnout Properties of GaAs MESFETs (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 443-445.

Microwave nsec pulse burnout data have been measured at 9 GHz for three 1 micron gate MESFETs. Values of incident pulse power and absorbed energy required to cause burnout are presented and discussed. Also discussed are the dominant failure modes for the overstressed MESFETs.



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Abstracts

An Electron-Bombarded Semiconductor (EBS) Modulator and Switch Driver

T.O. Perkins, III. "An Electron-Bombarded Semiconductor (EBS) Modulator and Switch Driver." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 446-448.

High power PIN diodes hot switching control devices require large amplitude, fast risetime, forward bias current and reverse bias voltage pulse commands. Performance exceeding that available from present state-of-the-art binary state transistor drivers is highly desirable. This paper describes use of an Electron-Bombarded Semiconductor permitting faster and more reliable microwave high power switching.



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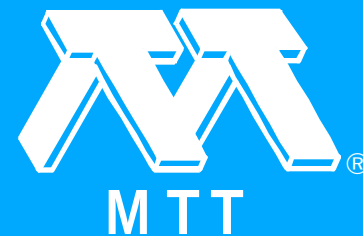


Abstracts

Theoretical and Experimental Study of Relativistic Magnetrons

M. Fuchs and V. Nechajev. "Theoretical and Experimental Study of Relativistic Magnetrons." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 449-449.

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Abstracts

Operation of Pulsed Millimeter Wavelength Extended Interaction Oscillators

G.W. Ewell, D.S. Ladd and J.C. Butterworth. "Operation of Pulsed Millimeter Wavelength Extended Interaction Oscillators." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 450-452.

This paper discusses the problems of pulsing Extended Interaction Oscillators (EIO's), summarizes some experience gained in operating EIO's in several experimental systems with pulse lengths from ten to several hundred ns, and contrasts EIO operation with operation of conventional millimeter wave magnetrons.



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Abstracts

Power Combining in an Array of Microwave Power Rectifiers (1979 [MWSYM])

R.J. Gutmann and J.M. Borrego. "Power Combining in an Array of Microwave Power Rectifiers (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 453-455.

To obtain useful power levels for proposed freespace microwave power transmission applications, numerous rectifier outputs are interconnected in series and/or parallel to share a common DC load. This work analyzes the resultant efficiency degradation when identical rectifiers operate at different RF power levels as caused by the power beam taper. The efficiency degradation is nearly identical with series and parallel combining and a closed form analytical model provides results which are similar to a detailed computer simulation model.



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Abstracts

Monopulse Antenna Networks for a Multielement Feed with Independent Control of the Three Monopulse Modes

S. Pizette and J. Toth. "Monopulse Antenna Networks for a Multielement Feed with Independent Control of the Three Monopulse Modes." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 456-458.

This paper deals with the design of a multielement monopulse feed network for which the illumination function corresponding to each of the three beams (SUM, ELEVATION DIFFERENCE, AZIMUTH DIFFERENCE) is independently specified and controlled. This control eliminates the need to tradeoff performance between the sum and two difference beams.



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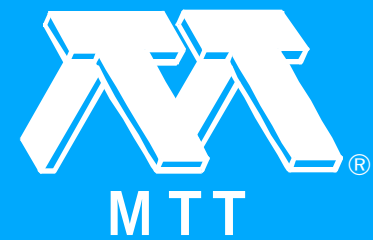
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Abstracts

Session V -- Fiber and Guided Wave Optics

"Session V -- Fiber and Guided Wave Optics." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 459-459.



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Abstracts

RF Spectrum Analysis Using Optical Waveguides

T.G. Giallorenzi and M.C. Hamilton. "RF Spectrum Analysis Using Optical Waveguides." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 461-463.

Military radar environments require wideband, high resolution, high probability of intercept RF receivers for signal sorting. An Integrated Optical RF Spectrum Analyzer utilizing the Bragg diffraction of guided optical waves by surface acoustic waves has great potential for furnishing that capability. Besides having projected performance competitive with other technologies, Integrated Optics offers reduced size and cost. The state-of-the-art of optical waveguide componentry has now progressed sufficiently to make possible the development of a feasibility model of such a circuit.



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An Analysis of Nonreciprocal Light Coupler

I. Awai, S.-I. Miyazaki and J.-I. Ikenoue. "An Analysis of Nonreciprocal Light Coupler." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 464-466.

A nonreciprocal light coupler without anisotropic crystal is analysed. An oblique magnetic field application causes nonreciprocal coupling between two dielectric waveguides through the magneto-optical medium between the guides. In principle, an optical isolator may be realizable which is-tunable after fabrication.





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Evanescent Wave Method for Propagation in Graded Index Slab Waveguides

E. Navon and L.B. Felsen. "Evanescent Wave Method for Propagation in Graded Index Slab Waveguides." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 467-468.

The evanescent wave method employed previously for construction of high-frequency asymptotic modal solutions in symmetric slab waveguides with unbounded analytic refractive index profiles is generalized to account for an inhomogeneous guiding region embedded in a homogeneous exterior medium. Analytical and numerical results are presented for various classes of profiles.

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An Electromagnetic Analysis of the Transmission Properties of Radial Offsets in Round Optical Fibers

E. Bianciardi and V. Rizzoli. "An Electromagnetic Analysis of the Transmission Properties of Radial Offsets in Round Optical Fibers." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 469-471.

The transmission loss of a radial offset in a round optical fiber is computed by a rigorous electromagnetic approach. The e.m. field in both the incoming and outgoing fibers is developed into a sum of modes and the power transmission properties of the offset are established on a mode-to-mode basis. This gives an extremely accurate and complete picture of the physical phenomenon, whose validity is confirmed by the very close agreement with available experimental data. The theory can also account for the reflected Power which may be non-negligible for fibers with a large numerical aperture.

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



Mode Dispersion in Graded-Index Optical Fiber with Near Parabolic-Index Profiles

H. Ikuno and H. Watanabe. "Mode Dispersion in Graded-Index Optical Fiber with Near Parabolic-Index Profiles." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 472-474.

The propagation constants and the group delay time of the guided modes in the graded-index fiber with near parabolic-index profiles can be determined in almost analytic form within the WKBJ approximation. The minimum mode dispersion in this fiber can be attained by correcting the fourth order term to the square law profile after the refractive-index of the cladding can be adjusted.



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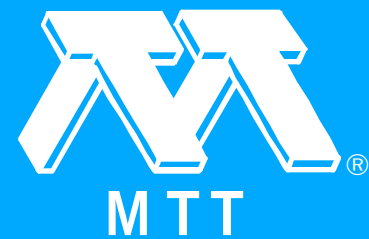
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Fundamental Mode Propagation on Dielectric Fibers of Some Noncircular Cross Sections

E.F. Kuester and R.C. Pate. "Fundamental Mode Propagation on Dielectric Fibers of Some Noncircular Cross Sections." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 475-477.

The behavior of the propagation constants of the fundamental modes on dielectric fibers of arbitrary cross-section is studied by a variational formulation of the integral equation for the modal electric field. An approximate eigenvalue equation is obtained which involves functions defined as series expansions easily and accurately evaluated by computer, into which the cross-sectional shapes enter only through a set of constants calculated ahead of time. These constants are calculable analytically for elliptical, polygonal, and several other shapes, and used to obtain dispersion curves which compare favorably in the single-mode regime with results for rectangular, elliptical and triangular cores computed by other methods.

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Abstracts

Study of Submillimeter Whisker Structures by Microwave Experimental Simulation and the Geometrical Theory of Diffraction

J.C. Bolomey, J. Cashman and S. El Habiby. "Study of Submillimeter Whisker Structures by Microwave Experimental Simulation and the Geometrical Theory of Diffraction." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 478-480.

This paper describes two complementary studies of whisker structures used in submillimeter detectors. The radiation patterns can be determined both from measured surface currents and the geometrical theory of diffraction. Particular attention has been given to the effective length of the structure and the influence of the geometry.



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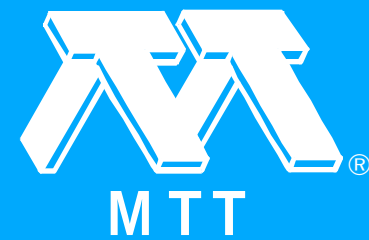
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Abstracts

Session W -- Active Microwave Integrated Circuits

"Session W -- Active Microwave Integrated Circuits." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 481-481.



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Abstracts

12 GHz 1W GaAs FET Amplifier for SHF TV Signal Transmission

S. Aihara, Y. Fujiki, S. Fukuda, S. Akasaka and I. Haga. "12 GHz 1W GaAs FET Amplifier for SHF TV Signal Transmission." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 483-485.

An all-solid-state RF amplifier using GaAs Schottky barrier gate FETs for use as SHF-band TV broadcast power amplifiers has been recently developed. The amplifier is composed of five unit amplifiers and designed to operate with 40 dB gain, and +24 dBm output.



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A 12 GHz 1 W GaAs MESFET Amplifier (1979 [MWSYM])

Y. Kadowaki, M. Nakatani, T. Ishii, S. Mitsui and K. Shirahata. "A 12 GHz 1 W GaAs MESFET Amplifier (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 486-488.

A simple and convenient method on the design of GaAs MESFET power amplifiers are presented. Based on this method are constructed five-stage MIC amplifiers, which deliver 1 W power outputs at the 12 GHz band. Further brush-up of the power performance is investigated using newly developed flip-chip power MESFETs, resulting in 2 W power output.

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Abstracts

A 4W, 56dB Gain, Microstrip Amplifier at 15 GHz Utilizing GaAs FETs and IMPATT Diodes (1979 [MWSYM])

V. Sokolov, M.R. Namordi and F.H. Doerbeck. "A 4W, 56dB Gain, Microstrip Amplifier at 15 GHz Utilizing GaAs FETs and IMPATT Diodes (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 489-491.

Performance results and design considerations are presented for an all solid-state power amplifier suitable for spacecraft transmitter applications. Design emphasis is placed on high power, high efficiency and high reliability operation, as well as on compact amplifier construction.



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Abstracts

100-Milliwatt Output Up-Converter Using Four Schottky Diodes

B.R. Hanford. "100-Milliwatt Output Up-Converter Using Four Schottky Diodes." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 492-494.

Description is given for a compact double-balanced strip hybrid up-converter that translates a modulated 70-MHz signal to the 2-GHz frequency range. Four high-voltage Schottky barrier diodes are pumped at a +28 dBm to provide a single sideband power output of +20 dBm. Pump level is more than 20 dB below the sideband power level over an octave bandwidth.



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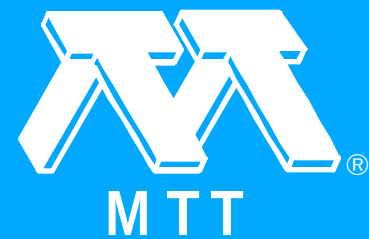
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An X-Band Dual-Gate FET Up-Converter

W.C. Tsai, S.F. Paik, B.S. Hewitt, N. Gregory and P. Tanzi. "An X-Band Dual-Gate FET Up-Converter." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 495-497.

An up-converter using dual-gate GaAs FET was operated at X-band output frequencies with an IF input at 700 MHz. The FET up-converter offers advantages of conversion gain (up to 15 dB), low noise figure (3.2 dB) and built-in port-to-port isolation. The power output saturated at +9 dBm, and the third-order IM product at the 1 dB compression point was -22 dBC.

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Frequency Multiplication with High-Power Microwave Field-Effect Transistors

M.S. Gupta, R.W. Laton and T.T. Lee. "Frequency Multiplication with High-Power Microwave Field-Effect Transistors." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 498-500.

The experimentally measured characteristics of a 4-to-8 GHz FET frequency doubler are described. A nonlinear circuit model for microwave FETs is proposed and is shown useful for predicting and optimizing the doubler performance, and for calculating the design parameters.

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Abstracts

An Actively Broadbanded MIC Parametric Amplifier

R.E. Pearson, G. Payne and D.H. Paul. "An Actively Broadbanded MIC Parametric Amplifier." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 501-503.

The design, construction and performance of an actively broadbanded MIC parametric amplifier is described. The broadbanding technique is simple with no multiple tuned circuits; the result is a 500 MHz bandwidth amplifier at 7.5 GHz that is five times less susceptible to pump instability than one of conventional design.



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Abstracts

The Hybrid Parametric Amplifier (1979 [MWSYM])

C.S. Aitchison and A.S Wong. "The Hybrid Parametric Amplifier (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 504-506.

This paper describes in theory and in practice a non-degenerate non-oscillatory Parametric Amplifier called the Hybrid Parametric Amplifier. Practical measures confirm the theory and, in particular, at 30 MHz a noise temperature of 18°K coupled with a gain of 6dB is obtained.



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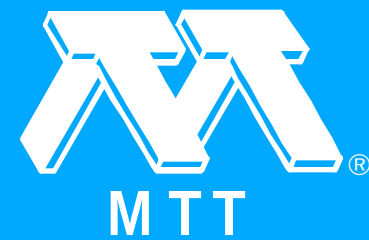
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Abstracts

Session X -- Microwave Devices and Circuits for Gigabit, Digital Systems

"Session X -- Microwave Devices and Circuits for Gigabit, Digital Systems." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 507-507.



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Abstracts

MSI High Speed Low Power GaAs ICs Using Schottky Diode FET Logic (1979 [MWSYM])

S.I. Long, B.M. Welch, R.C. Eden, F.S. Lee and R. Zucca. "MSI High Speed Low Power GaAs ICs Using Schottky Diode FET Logic (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 509-511.

A new approach to the design and fabrication of planar high speed GaAs integrated circuits is described. Experimental digital circuits of MSI level complexities have been fabricated showing high gate density, low dynamic switching energies and very high switching speeds.



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Abstracts

Gigabit Logic Prospects of GaAs E-JFET Integrated Circuits

R. Zuleeg, J.K. Notthoff and A.F. Behle. "Gigabit Logic Prospects of GaAs E-JFET Integrated Circuits." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 512-515.

Computer simulation and experimental results will be presented for a 1 μ m GaAs enhancement mode JFET. Logic performance of 250 ps propagation delay time with a power dissipation of 200 μ W/gate at a fan-out of 3 offers gigabit logic for LSI, i.e. delay-power product of 50 fJ. A planar integration will be described which utilizes selective ion implantation of n- and p- impurities for the channel and pn-junction gate formation in semi-insulating GaAs substrate material.



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Abstracts

Applications of Josephson Processor Technology

B.C. Troutman. "Applications of Josephson Processor Technology." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 516-518.

Several future Navy signal processing applications were analyzed, and the computation requirements quantified. The anticipated performance of Josephson logic and memory devices was incorporated into a processor sizing model, and Josephson processor configurations estimated.



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Abstracts

Regeneration of 1-Gbit/s Signals After Transmission Over an Optical Fiber

U. Wellens and B.G. Bosch. "Regeneration of 1-Gbit/s Signals After Transmission Over an Optical Fiber." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]).

A circuit containing step-recovery diodes is used to regenerate signals in the 1Gbit/s range: A PN sequence modulates a GaAlAs laser and is then transmitted over 0.91 km of graded-index fiber. The received signal, distorted mainly due to fiber dispersion, is fully restored to the original NRZ format.



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Abstracts

Phase Synchronization of Digitally Modulated Burst Carriers in TDMA Systems - A Technology Overview

C.L. Cuccia. "Phase Synchronization of Digitally Modulated Burst Carriers in TDMA Systems - A Technology Overview." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 519-521.

Time division use of the radio spectrum has created new multiple access techniques involving transmission of bursts of digitally modulated carriers using phase shift keyed modulation. Such systems are known as TDMA and involve burst carriers incorporating data rates from kilobits to gigabits per second. In order for these digitally modulated bursts to be demodulated at a terminal remote from the transmitter or source, it is necessary to provide a means to "recover" carrier frequency and phase from the received burst in order to be able to operate a coherent receiver. This paper will discuss the types of carrier burst synchronization techniques now in use, including the use of preambles to each burst which contain modulation by unique bit words which can be used to phase synchronize the receiver demodulator oscillator on a burst-to-burst basis. This paper will discuss the new microwave techniques of multipliers, tracking filters, anti-hangup resonators, which can be used to accomplish this synchronization for data rates from 40 Mbps to 1.6 Gbps.



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Abstracts

Two Gbps QPSK Modem

G.S. Des Brisay, Jr., D.F. Horwood and G.E. Lee. "Two Gbps QPSK Modem." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 522-524.

A 2 Gbps QPSK modulator and demodulator were developed and BER performance was evaluated over a millimeter wave data channel. The error rate measurements taken with the breadboard equipment showed system performance to be less than 2 dB from theoretical at an error rate of 10^{-5} . Additionally, a second QPSK modulator was constructed and combined with the first to generate 4 Gbps QASK data for future evaluation.



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The Injection-Locked-Oscillator as a Microwave Amplifier of MSK Modulated Signals - Part II

S. Kumar, W.J. Chudobiak and J.S. Wight. "The Injection-Locked-Oscillator as a Microwave Amplifier of MSK Modulated Signals - Part II." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 525-530.

Because of its phase continuous nature a Minimum-Shift-Keying (MSK) type of digitally modulated microwave signal may be amplified with an Injection-Locked-Oscillator Phase-Locked-Amplifier (ILO-PLA) Experimental bit-error-rate results for an ILO-PLA are presented in this paper for MSK modulated signals. The results show that for MSK signals an ILO-PLA does not display the large performance degradation previously reported for QPSK signals. Further a two sided locking bandwidth equal to 1.8 times the input signal bit-rate results in about .3 dB degradation in the bit-error-rate performance due to the ILO-PLA. A positive or negative frequency offset of about ten per cent of the locking bandwidth causes negligible further degradation of the performance.

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Gigabit 4-Phase Modulation-Demodulation Circuits for Microwave Digital Systems

K. Miyauchi, S. Seki and K. Yanagimoto. "Gigabit 4-Phase Modulation-Demodulation Circuits for Microwave Digital Systems." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 531-533.

An extremely high speed modulation-demodulation performance is discussed when data-rate becomes close to carrier frequency. A 4-phase PSK modulation-demodulation circuit with a newly designed transformer is described. The error-rate performance on 1.6 Gb/s data-rate was successfully undertaken at a 1.7 GHz carrier frequency.

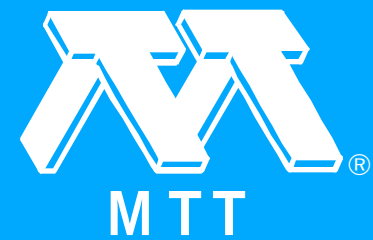
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Abstracts

Session Y -- Active and Passive Remote Sensing

"Session Y -- Active and Passive Remote Sensing." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 535-535.



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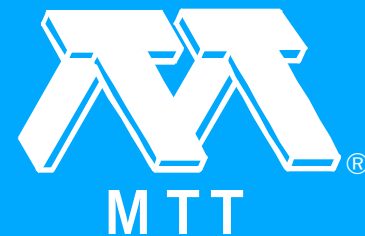


Abstracts

Passive and Active Microwave Sensors in Satellites for Remote Sensing of the Earth

K. Tomiyasu. "Passive and Active Microwave Sensors in Satellites for Remote Sensing of the Earth." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 537-539.

Microwave sensors which can operate day and night, and through clear and adverse weather have very high potential in inferring oceanic wind field, precipitation, and sea ice. Both passive radiometry and active radars can be operated from satellites.



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Dual Frequency Multi-Channel Millimeter Wave Radiometers for High Altitude Observation of Atmospheric Water Vapor

J.Y. Schuchardt, J.A. Stratigos, J.A. Gagliano, D.O. Gallentine and J.L. King. "Dual Frequency Multi-Channel Millimeter Wave Radiometers for High Altitude Observation of Atmospheric Water Vapor." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 540-542.

This paper describes three generations of a millimeter wave radiometer operating at 94 and 183 GHz designed for airborne atmospheric measurements on-board NASA Convair 990 and RB-57 aircraft. Airborne measurements in 1977 and 1978 have substantiated theoretical conclusions on millimeter wave atmospheric properties.



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Abstracts

An Airborne Remote Sensing 4.5 to 7.2 Gigahertz Stepped Frequency Microwave Radiometer

R.F. Harrington, R.H. Couch and J.C. Fedors. "An Airborne Remote Sensing 4.5 to 7.2 Gigahertz Stepped Frequency Microwave Radiometer." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 543-544.

A microwave stepped frequency radiometer operating from 4.5 to 7.2 gigahertz has been designed, fabricated and flight tested in an airborne remote sensing mission by NASA Langley Research Center. This paper describes the design of this precision microwave Dicke-switched noise feedback radiometer, calibration techniques and presents typical results from remote sensing mission employing this radiometer.



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Abstracts

Reflectance of Ice and Seawater at Millimeter Wavelengths

M.D. Blue. "Reflectance of Ice and Seawater at Millimeter Wavelengths." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 545-546.

Measurements of reflectance of sea water and ice at 100 GHz, 140 GHz, and 180 GHz are reported. Results are compared with recent dielectric property models derived from data at other wavelengths.



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Abstracts

The SEASAT - A Synthetic Aperture Radar

R. Jordan and D. Held. "The SEASAT - A Synthetic Aperture Radar." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 547-547.

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Abstracts

The Surface Contour Radar, a Unique Radar Remote Sensing Instrument (1979 [MWSYM])

E.J. Walsh and J.E. Kenney. "The Surface Contour Radar, a Unique Radar Remote Sensing Instrument (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 548-550.

An 8 mm computer controlled airborne radar has been developed by NRL and NASA WFC which generates a false-color coded elevation map of the sea surface below the aircraft in real-time and can routinely produce ocean directional wave spectra with off-line data processing.



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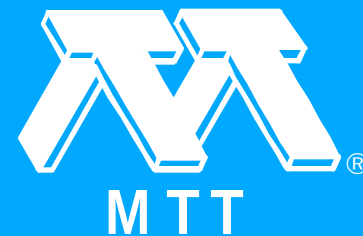


Abstracts

1-35 GHz Microwave Scatterometer

F.T. Ulaby, W.H. Stiles, D. Brunfeldt and E. Wilson. "1-35 GHz Microwave Scatterometer." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 551-553.

The Microwave Active Spectrometer is a truck-mounted radar capable of continuous frequency measurements over the 1-18 GHz region, and at 35.6 GHz. Its design and operational characteristics are presented, along with brief descriptions of military and civilian applications.



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Effects of System Parameter Variations on Microwave Intrusion Detector Performance

C.D. McGillem, H. Bostic, C. Frank, D. Gilbert and F. Hasseld. "Effects of System Parameter Variations on Microwave Intrusion Detector Performance." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 557-559.

A mathematical model of a microwave fence used for intrusion detection is described. The model includes the effects of ground reflections by employing images of the antennas and of the target. The bistatic radar cross-section of opaque targets is employed with an appropriate directional gain function for bistatic angles near 180° . A comparison of analytical and experimental results is presented for a system operating at 37 GHz.

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Abstracts

Session Z -- Microwave Field Theory

"Session Z -- Microwave Field Theory." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 561-561.



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Analysis of Open Dielectric Waveguides Using Mode-Matching Technique and Variational Methods (1979 [MWSYM])

R. Mittra, Y. Hou and V. Jamnejad. "Analysis of Open Dielectric Waveguides Using Mode-Matching Technique and Variational Methods (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 563-565.

The mode-matching technique is employed for computing the propagation constants and field distributions of an inverted strip dielectric waveguide. The results derived in this manner are further improved by using variational formulas expressly designed for open dielectric waveguides. Illustrative numerical results are presented and compared with experimental measurements as well as those based on approximate methods found in the literature.

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Abstracts

Dielectric Antennas for Millimeter-Wave Applications

S. Kobayashi, R. Lampe, N. Deo and R. Mittra. "Dielectric Antennas for Millimeter-Wave Applications." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 566-568.

A systematic study of traveling wave dielectric-rod antennas of different types is described. Development of design for several leaky-wave antennas is presented together with experimental results. Existence of surface-wave radiation in end-fire direction is exhibited and methods to suppress it are discussed.



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Abstracts

A New Class of Leaky Modes on Open Dielectric Waveguides

A.A. Oliner and S.T. Peng. "A New Class of Leaky Modes on Open Dielectric Waveguides." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 569-571.

It is not generally known that most guided modes on many open dielectric waveguides for integrated optics and millimeter waves can be leaky, rather than purely bound, as is customarily assumed. The previously-unrecognized leakage on this new class of modes is the result of coupling between constituent TE and TM waves produced at the sides of the waveguide when these waves bounce back and forth inside the dielectric waveguide, as part of the guiding process. A generally-applicable simple criterion will be presented which predicts when such leakage can occur.



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Abstracts

Some Recent Theoretical Studies on Open Microstrip

E.F. Kuester and D.C. Chang. "Some Recent Theoretical Studies on Open Microstrip." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 572-574.

An approximate analytical theory for open microstrip recently developed by the authors was compared with existing theoretical results; however detailed examination pointed up discrepancies among these results for strips of width comparable to or greater than substrate thickness. Since these disagreements appear to arise from approximations made on the charge and current distributions on the strip, the authors undertook an investigation of these distributions for wide microstrip which are reported here. Significant differences are found in contrast to the case of narrow strips, which can affect the accuracy of numerical procedures for finding the effective dielectric constant. An analytical approach to excitation of microstrip by an idealized voltage generator is also discussed.



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Abstracts

Method of Analysis of Some Microwave Planar Networks

R. Mehran. "Method of Analysis of Some Microwave Planar Networks." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 575-577.

A method of analysis of some planar microwave structures is presented. It is shown that the frequency dependent scattering parameters of more complex structures can be given by simple formulas, which contain the frequency dependent scattering parameters of discontinuities and junctions. The filtering properties of ring-filters are investigated in detail.



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Abstracts

Systematic Derivation of Variational Principles in Electromagnetic Field Theory

K. Kalikstein. "Systematic Derivation of Variational Principles in Electromagnetic Field Theory." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 578-579.

Variational principles for a wide class of functional can be constructed in a routine fashion. The procedure is illustrated by deriving a stationary expression for the resonant frequencies of a cavity, Shwinger's variational principle, and a variational principle for a function itself.



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Abstracts

A Variational Approach to Compute the Equivalent Capacitance of Coaxial Line Discontinuities

L. Gogioso, M. Marchesi and M. Parodi. "A Variational Approach to Compute the Equivalent Capacitance of Coaxial Line Discontinuities." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 580-582.

A variational approach is presented which enables both to compute the discontinuity capacitance in coaxial structures and to state its frequency behaviour. The results compare favorably with the ones previously given in literature. Moreover, the method enables to consider structures having different dielectric permittivities at the sides of the discontinuity.



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Abstracts

A Variational Expression for the Scattering Matrix of a Step Discontinuity in a Coaxial Line and its Application to the Study of a Multimode Coaxial TEM Cell

I. Sreenivasiah and D.C. Chang. "A Variational Expression for the Scattering Matrix of a Step Discontinuity in a Coaxial Line and its Application to the Study of a Multimode Coaxial TEM Cell." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 583-585.

A variational expression, for the scattering matrix of a step discontinuity in a multimode coaxial transmission line, is obtained and the result is used to analyze the transmission characteristics of a coaxial TEM cell.



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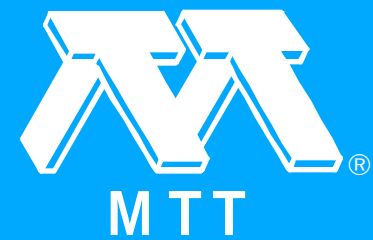
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Abstracts

Index of Authors (1979 [MWSYM])

"Index of Authors (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 586-587.



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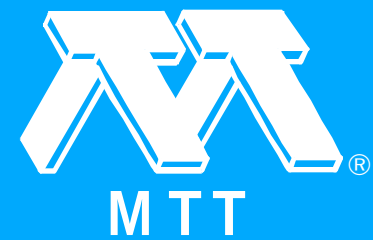
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Abstracts

Exhibitors Guide (1979 [MWSYM])

"Exhibitors Guide (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): 588-589.



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Abstracts

Back Cover (1979 [MWSYM])

"Back Cover (1979 [MWSYM])." 1979 MTT-S International Microwave Symposium Digest 79.1 (1979 [MWSYM]): b1-b1.



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Abstracts

Front Cover (1980 [MWSYM])

"Front Cover (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): f1-f1.



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Abstracts

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Abstracts

Foreword (1980 [MWSYM])

L.R. Whicker. "Foreword (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): iii-iii.

On behalf of the Steering Committee, I hope that everyone attending the 1980 International Microwave Symposium will find it an informative and rewarding experience. The theme for the meeting this year is "Technology Growth for the 80's". The large number of excellent papers which are contained in this Digest attest to the appropriateness of this theme.



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"Committees (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): v-ix.



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"Awards (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): x-xiii.



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Abstracts

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"Program (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): xv-xx.



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Abstracts

Session B -- Microwave Power Transistors

"Session B -- Microwave Power Transistors." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 1-1.



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Improved Elementary Cell GaAs Power FET Structure

P. Baudet. "Improved Elementary Cell GaAs Power FET Structure." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 3-5.

An improved design for the elementary cell of X-band power GaAs FETs is described. It includes: a buffer layer, a graded doping profile, an offset recessed gate structure, a multifinger high density gate structure and via holes. Furthermore, three different types of source interconnections for the interdigitated cell will be compared.

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Abstracts

10 GHz-10 W Internally Matched Flip-Chip GaAs Power FETs (1980 [MWSYM])

Y. Mitsui, M. Kobiki, M. Wataze, K. Segawa, M. Otsubo, M. Nakatani and T. Ishii. "10 GHz-10 W Internally Matched Flip-Chip GaAs Power FETs (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 6-8.

The flip-chip GaAs power f.e.t. delivering 10 W power output with 3 dB gain has been realized at 10 GHz by using a newly developed internal matching technique, in which the f.e.t. chips are directly connected to the lumped dielectric capacitors prepared for the matching networks.



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Abstracts

A 6GHz-25W GaAs MESFET with an Experimentally Optimized Pattern

A. Higashisaka, K. Honjo, Y. Takayama and F. Hasegawa. "A 6GHz-25W GaAs MESFET with an Experimentally Optimized Pattern." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 9-11.

A high power GaAs MESFET with a high packing density has been developed by optimizing the gate finger width. The developed power MESFET is the crossover structure and has a total gate width of 15 mm in a 2.2 mm wide chip. The output powers of 25 W at 6 GHz and 20 W at 8 GHz were obtained with 3 dB associated gain from the internally matched four chip devices.



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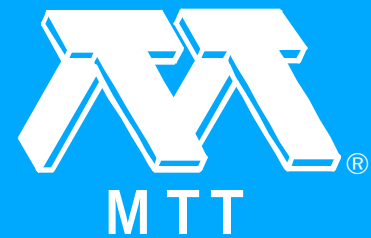


Abstracts

Microwave Dual Transistor Delivers 100w CW

D.C. Anderson. "Microwave Dual Transistor Delivers 100w CW." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 12-14.

This paper reports the results of a dual transistor employing two separate RF bipolar transistors within one package operating near 1 GHz. Significantly improved performance has been achieved over conventional single transistor devices. The final results yielded greater than 100W CW output power with a collector efficiency above 60%.



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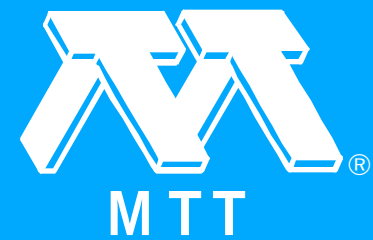
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Abstracts

Session C -- Millimeter Receivers and Components

"Session C -- Millimeter Receivers and Components." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 15-15.



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Abstracts

140 GHz All Solid State Receiver with System Noise Figure Less Than 6 dB DSB

J. Putnam, A. Cardiasmenos, P. Boyd and M. Blustine. "140 GHz All Solid State Receiver with System Noise Figure Less Than 6 dB DSB." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 17-18.

This paper describes implementation of beam lead GaAs diodes in a suspended stripline mixer at 140 GHz to obtain noise figures of less than 6 dB DSB. This compares quite favorably with previous commercial practice, where total receiver noise figures of less than 10 dB DSB were rarely obtained. These low overall noise figures were achieved over an instantaneous bandwidth of greater than 1000 MHz, while requiring only 3.5 mW from an integrated all solid state local oscillator source. Construction details for both the mixer-preamplifier and all the solid state L.O. source will be presented.



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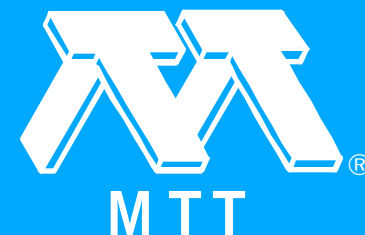


Abstracts

A 200-300 GHz Heterodyne Receiver

N.R. Erickson. "A 200-300 GHz Heterodyne Receiver." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 19-20.

A heterodyne receiver for the 200-300 GHz region has been developed and used in astronomical observations. Two room temperature Schottky diode mixers are used to cover this range, with LO power provided by frequency multiplied klystrons. A single crossed-waveguide frequency multiplier covers the entire range, and is found to produce adequate output power by either doubling or tripling. Signal-local oscillator diplexing is done with a quasi-optical diplexer based on a Martin-Puplett interferometer. The best system sensitivities obtained with the two mixers have been 2500 K SSB at 230 GHz and 2900 K at 285 GHz.



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Cryogenic 90 GHz Receiver for Airborne Radiometry

B. Vowinkel, J.K. Peltonen, W. Reinert, K. Gruner and B. Aumiller. "Cryogenic 90 GHz Receiver for Airborne Radiometry." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 21-23.

A cryogenic 90 GHz receiver has been developed that has a noise figure of 2.36 dB (DSB) with an instantaneous bandwidth of 1.2 GHz. The cooled front-end consists of a Schottky-barrier mixer with built-in GaAs FET IF amplifier. The system is small in size and has a relatively low weight, so that it can be used for airborne radiometry even in small aircrafts.



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Noise Measurements of M-Band (75-110 GHz) CW GaAs Gunn and Silicon IMPATT Oscillators

J. Ondria. "Noise Measurements of M-Band (75-110 GHz) CW GaAs Gunn and Silicon IMPATT Oscillators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 24-26.

This paper presents AM and FM noise data measured on commercially available CW Gunn and silicon IMPATT oscillators, and shows characteristic differences between these sources having similar external quality factors. Measured phase noise power spectral density of free running and injection locked IMPATT oscillators are shown to compare favorably with theoretical values predicted by a dynamic feedback servo model. The system used measure external quality factor, $Q_{\text{sub ex}}$, and the noise measuring systems employed in these investigations are described briefly.

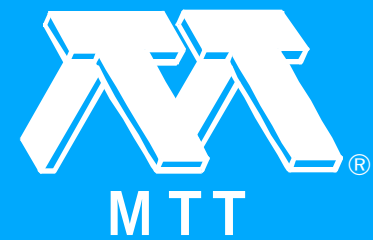
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Abstracts

Session D -- Microwave Acoustics and Magnetostatic Waves

"Session D -- Microwave Acoustics and Magnetostatic Waves." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 27-27.



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Abstracts

The Implementation of Surface Acoustic Wave Devices in Avionics Systems

W.C. Eppers, Jr. and W.J. Edwards. "The Implementation of Surface Acoustic Wave Devices in Avionics Systems." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 29-29.

The introduction of Surface Acoustic Wave Devices into military electronic systems has resulted in equipment which has improved performance characteristics and greater reliability. This paper presents a brief review of the techniques and materials utilized in the construction of SAW devices. SAW devices function as frequency control elements, pulse compression filters and correlators, nondispersive filters, nondispersive time delays, matched filters and correlators, and acousto-optic modulators. A compilation of various military systems incorporating SAW devices is included with commentary on selected implementations. Although SAW devices have been applied in over thirty Air Force systems, their use (quantities) is dwarfed by their widespread use in commercial TV. The production of SAW devices for avionics systems is very limited with production rates ranging from as low as ten per year to a few thousand per year.



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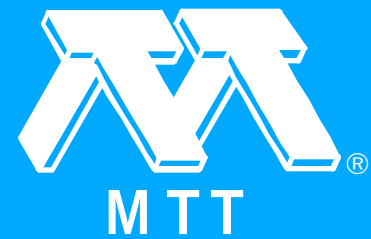


Abstracts

System Aspects of Surface Acoustic Wave Convolvers

J. Cafarella. "System Aspects of Surface Acoustic Wave Convolvers." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 30-30.

Text of paper not available at time of publication.



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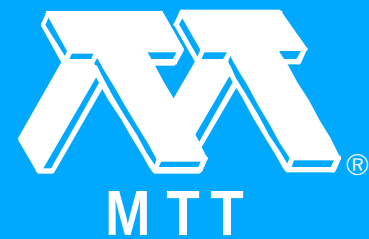
Efficient Thin Film InSb/LiNbO₃/ Convolver

K. Yamanouchi, S. Mitsui and K. Shibayama. "Efficient Thin Film InSb/LiNbO₃/ Convolver." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 31-33.

A thin film InSb/LiNbO₃/ acoustoelectric convolver has been successfully fabricated and operated at a center frequency of 100 MHz. The InSb is first deposited and then etched to the waveguide with the width of 1 mm. The Hall mobility and σ_h of the InSb with a thickness of about 500 Å are $\mu_H = 1041 \text{ cm}^2/\text{V} \cdot \text{sec}$ and $\sigma_h = 34.3 \text{ } \mu\text{S}$, respectively. A convolution efficiency of -59 dBm was obtained experimentally.

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Low Loss Multipole SAW Resonator Filters

E.J. Staples, J.S. Schoenwald, J. Wise and T.C. Lim. "Low Loss Multipole SAW Resonator Filters." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 34-36.

Associated with modern rf communications systems is need to perform complex signal processing. Multipole crystal filter technology performs a unique function in these systems. A new type of low loss multipole filter technology using surface acoustic wave resonators is described in this paper. Previous attempts to fabricate coupled resonator filters with more than four poles were frustrated by low Q in these structures. More recent fabrication techniques, to be described in this paper, have led to high Q surface wave structures. Multipole resonator structures with up to eight poles of selectivity are now possible. Applications for narrowband crystal filters have traditionally been limited to the vhf frequency range. Using surface acoustic waves, the frequency range for these types of filters can be extended to the upper UHF range and perhaps into L-band itself.

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Adjustable Magnetostatic Surface Wave Directional Coupler

J.P. Castera and P. Hartemann. "Adjustable Magnetostatic Surface Wave Directional Coupler." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 37-42.

This paper describes a new magnetostatic surface wave (MSSW) component: an adjustable MSSW directional coupler. This device, similar to the surface-acoustic-wave (SAW) multistrip coupler, has been realized on an yttrium iron garnet (YIG) film. A 100% power transfer from one track to the other has been obtained at 2.5 GHz. The unidirectional coupling has frequency filtering characteristics due to the dispersion of MSSW. The device presents a feature very important for applications: the coupling is continuously adjustable by an applied magnetic field, a variation of about 50 Oe being necessary to switch the power from one track on to the other.





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Simple Magnetostatic Delay Lines in Microwave Pulse Compression Loops

K.W. Reed, J.M. Owens, C.V. Smith, Jr. and R.L. Carter. "Simple Magnetostatic Delay Lines in Microwave Pulse Compression Loops." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 40-42.

A magnetostatic surface wave (MSSW) delay line has been evaluated theoretically and experimentally as a microwave pulse compression filter in an active generation compression loop. The MSSW delay line had a 570 MHz bandwidth (based on the half pulse width), centered at 2.9 GHz, with 53 nsec of delay dispersion, for a time-bandwidth product of 30. Measured time-sidelobes were 15.8dB below the main pulse with a theoretically predicted peak-to-sidelobe ratio of 19.6dB. Effects of Doppler shifts, delay line characteristics, spectral weighting, and FM predistortion were included.

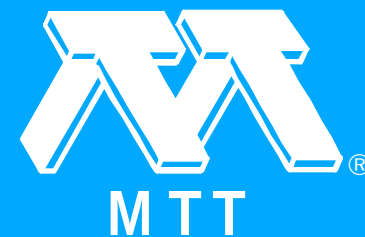
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Abstracts

Session E -- Microwave Engineering for Export (Special Invited Session)

"Session E -- Microwave Engineering for Export (Special Invited Session)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 43-43.



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U.S. Export Procedures

R. Garnitz. "U.S. Export Procedures." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 45-45.

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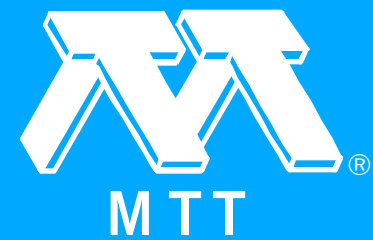


Abstracts

Import and Export Commodity Codes and Data

W. Fletcher. "Import and Export Commodity Codes and Data." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 46-46.

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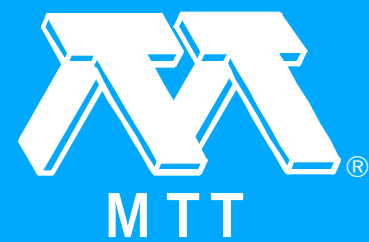
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Supplier Reliability: A Prerequisite for Export Expansion

S.R. Abrahamson. "Supplier Reliability: A Prerequisite for Export Expansion." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 47-49.

Many years ago, the United States found that efforts of governments to manipulate international economic relations in the hope of achieving political objectives not only strangled world economic progress but also helped cause world wars. Despite this finding, congress passed the Export Control Act in 1949. Although it has been modified slightly and its title has been changed to the Export Administration Act, it continues to provide the President with virtually unlimited discretionary power to intervene in private business transactions involving widely available commercial products between U.S. firms and their overseas customers. Since passage of the statute, its authority to intervene has not been used judiciously. Instead, it has been used capriciously and vindictively. The result has been the loss of untold billions of dollars of export sales. The losses have come about in several different ways. First by refusing to issue export licenses, the Commerce Department has caused orders to be cancelled. Second, overseas buyers experiencing cancellations or protracted delays in shipments have refused to reorder from U. S. suppliers. Third, U. S. firms have dropped out of exporting because they were unwilling to incur the additional and frequently unpredictable costs associated with export licensing. Fourth, the demonstration effect of the dropouts has discouraged nonexporting firms from getting involved in exporting. Finally, some U.S. firms have gone abroad with their technology to avoid or minimize the effects of U.S. export control regulations. Export expansion programs can be effective only if there is a radical shift in U.S. export policy to one that is unambiguously supportive of market-determined trade in commercial goods. Stop-go export licensing of commercial transactions must be discontinued -- the sooner the better. This could, of course, be done with a revised statute. It also could be achieved by a new Executive Order. Healthy and sustained export expansion cannot be attained without one or the other.



Abstracts

Critique of Microwave Export Performance

T.S. Saad. "Critique of Microwave Export Performance." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 50-50.

The history of the microwave industry has been one of feast or famine. Not too many years ago most of us relied primarily on the Department of Defense for our well-being. In more recent years, however, with the growth in non-DOD microwave communications and radar, and commercial and industrial applications, our reliance on the DOD has diminished. We have also seen a growing interest in non-U.S. markets. The object of this paper is to discuss and critique the Export Performance of U.S. Microwave Companies.



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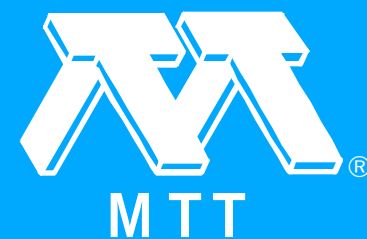


Abstracts

Exporting Microwave Components & Instruments

B.O. Weinschel. "Exporting Microwave Components & Instruments." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 51-54.

This is a practical discussion covering such fundamentals as: product modification for foreign market, shipping terms, pricing and various methods of payment.



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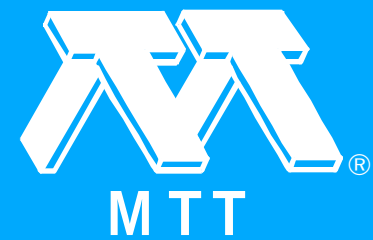


Abstracts

Exporting Microwave Systems

J. Bunker. "Exporting Microwave Systems." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 55-55.

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Japanese Exports of Microwave Equipment

"Japanese Exports of Microwave Equipment." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 56-56.

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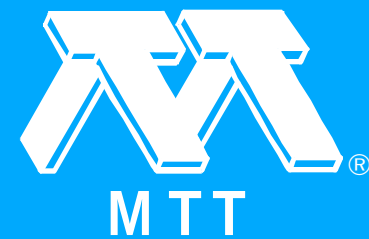
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Abstracts

Session F -- Millimeter Wave Power Generation

"Session F -- Millimeter Wave Power Generation." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 57-57.



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Abstracts

MM-Wave Gunn Oscillator with Distributed Feedback Fin-Line Circuit

H. Hofmann. "MM-Wave Gunn Oscillator with Distributed Feedback Fin-Line Circuit." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 59-61.

Periodic fin-line structures are used to create specified reflection, coupling and matching in a mm-wave Gunn oscillator. The design of the distributed reflector is described and the performance of oscillators in Ka-band is shown.



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Multi-Diode Ka-Band Oscillators Using Hybrid Planar Circuit Design

F. Sicking and H. Meinel. "Multi-Diode Ka-Band Oscillators Using Hybrid Planar Circuit Design." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 62-64.

Design and performance of integrated power combining Ka-band oscillators will be presented in this paper. Planar circuitry is employed for DC-biasing and matching of the semiconductor devices, whereas the resonator is built up using waveguide techniques. Thus high Q-factor of the waveguide is combined with planar fabrication techniques. TWO and FOUR diode power combining devices have been realized. Up to 630 mW CW-output power at 34 GHz has been achieved using Gunn-elements. The maximum total efficiency amounts to more than 4%. A VCO with 700 MHz tuning range delivers an output power of around 60 mW at 33 GHz. Several 39.5 GHz Gunn oscillators with integrated harmonic mixer (factor 11) have been built for a phase locked communication system. The output power ranges from 80 to 150 mW with a single Gunn-element.

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



Abstracts

Gunn Diode Power Combining at U-Band

Y. Ma and C. Sun. "Gunn Diode Power Combining at U-Band." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 65-66.

A modular approach for combining many Gunn devices has been developed. By stacking simple two-diode wafer modules, output power of 620 mW was achieved at around 45 GHz from 6 Gunn devices with a combining efficiency of 86 percent. The locking bandwidth was about 200 MHz with 20 dB locking gain.



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Abstracts

Millimeter-Wave Microstrip Amplifier Using Indium Phosphide Gunn Diodes

D. Rubin. "Millimeter-Wave Microstrip Amplifier Using Indium Phosphide Gunn Diodes." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 67-69.

Using small signal data obtained from coaxially mounted low noise Indium Phosphide amplifier diodes, computer optimization has led to a measured reflection stage gain of 4 dB over 28.5 to 38.5 GHz. Higher gain, more narrow band circuits were also derived analytically, and some preliminary results have been obtained with hybrid coupled microstrip amplifiers.



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Abstracts

The Behavior of a Pulsed Millimeter Wave (70 Ghz) Impatt Diode Oscillator During Laser Illumination

H.W.A. Gerlach and R. Wellman. "The Behavior of a Pulsed Millimeter Wave (70 Ghz) Impatt Diode Oscillator During Laser Illumination." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 70-72.

The effect of photon injection on a 70-GHz pulsed IMPATT diode was investigated. With the diode mounted in a waveguide oscillator, two useful modes of operation, the "enhancement" mode and the "inhibition" mode, were observed. The enhancement mode permits fast on and off switching (and modulation) of the IMPATT diode oscillator. The inhibition mode permits pulse width control and reduction of undesired intrapulse frequency shift (chirp).



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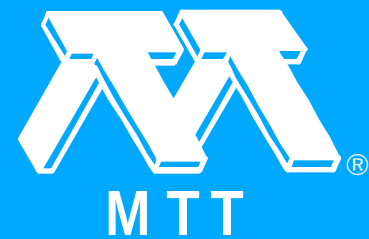
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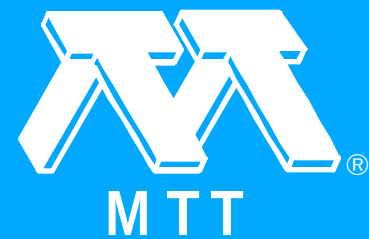
V-Band High-Power IMPATT Amplifier

Y. Ma, C. Sun and E.M. Nakaji. "V-Band High-Power IMPATT Amplifier." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 73-74.

A high-power IMPATT combiner/amplifier has been developed at V-band. The amplifier consists of two stages with an overall gain of 50 dB. The maximum output power is 2.5 W at 61 GHz with overall DC to RF conversion efficiency of 3.7 percent.

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Performance of 94 GHz Coherent Pulsed IMPATT Transmitters

M.D. Simonutti, D.L. English and F.J. Bernues. "Performance of 94 GHz Coherent Pulsed IMPATT Transmitters." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 75-77.

Millimeter-wave injection-locked pulsed oscillators using double drift silicon IMPATT diodes have been developed for coherent radar applications at 94 GHz. Measurements of the intra-pulse phase ripple, the additive phase noise, and the locking bandwidth of these devices, as determined by means of a phase bridge, are described.

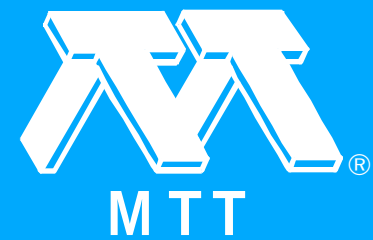
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Abstracts

Session G -- High Power Devices & Techniques

"Session G -- High Power Devices & Techniques." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 79-79.



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High-Power X-Band MIC Diode Phase Shifters

S. Kamihashi, M. Kuroda and K. Hirai. "High-Power X-Band MIC Diode Phase Shifters." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 81-83.

High-power X-band MIC diode phase shifters have been developed using glass-passivated PIN diodes with a grooved-mesa structure. Although they have outer dimensions of 20mm x 41mm x 10mm, they can handle 300W and 500W peak rf power depending upon the diodes used.

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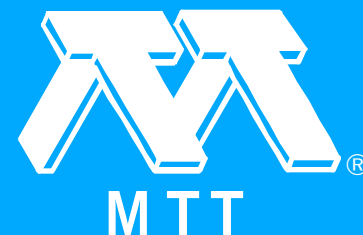


Abstracts

RF Energy Compressor

Z.D. Farkas. "RF Energy Compressor." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 84-86.

The RF Energy Compressor, REC described here, transforms cw rf into periodic pulses using an energy storage cavity, ESC, whose charging and discharging is controlled by 180/spl degree/ bi-phase modulation, PSK, and external Q switching, beta s. Compression efficiency, $C/\text{sub } e/$, of 100% can be approached at any compression factor $C/\text{sub } f/$.



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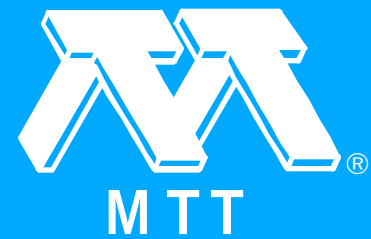


Abstracts

The Stability of Magnetrons Under Short Pulse Conditions

B. Vyse and H. Levinson. "The Stability of Magnetrons Under Short Pulse Conditions." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 87-89.

The relationship between missing pulses, front edge jitter and video spectrum inter-line noise is discussed for magnetrons operating under short pulse conditions. The measurement of missing pulse count can determine the rate of rf power growth at the start of oscillation.



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Abstracts

A Novel Approach to the Design of a High Power Automatic Impedance Measuring Scheme

C.-L.J. Hu. "A Novel Approach to the Design of a High Power Automatic Impedance Measuring Scheme." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 90-92.

This paper reports a novel design of a swept-frequency, swept-power, microwave automatic impedance measuring scheme using multiple probes and low-frequency signal processors. It can be used, for example, in FM radar or microwave-communication-system monitoring and nonlinear, swept-frequency, real-time z -measurements.



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Abstracts

Mode Coupling and Power Transfer in a Coaxial Sector Waveguide with a Sector Angle Taper (1980 [MWSYM])

A.W. Fliflet, L.R. Barnett and J.M. Baird. "Mode Coupling and Power Transfer in a Coaxial Sector Waveguide with a Sector Angle Taper (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 93-95.

We report a theoretical study of mode coupling and power transfer in a coaxial sector taper. The power transferred from the TE/sub 01/ mode into other low lying modes is calculated as a function of taper length and operating frequency. This type waveguide taper is utilized to feed a wide band input coupler for a 35 GHz Gyrotron Traveling Wave Amplifier.



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Abstracts

Circular-Electric Mode Waveguide Couplers and Junctions for use in Gyrotron Traveling-Wave Amplifiers (1980 [MWSYM])

L.R. Barnett, J.M. Baird, A.W. Fliflet and V.L. Granatstein. "Circular-Electric Mode Waveguide Couplers and Junctions for use in Gyrotron Traveling-Wave Amplifiers (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 96-98.

Recent gyrotron traveling-wave amplifier experiments in the $TE^{\circ}/\text{sub } 01/$ mode have led to the developing of 2-port and 4-port devices useful as input couplers, severers, and beam-rf separators for collector designs. We present analytical and experimental results.



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Recent Advances in Gyrotrons

J.F. Shively, P. Ferguson, H.R. Jory, J. Moran and R.S. Symons. "Recent Advances in Gyrotrons." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 99-101.

The gyrotron is a new type of microwave tube capable of producing high-power output at millimeter wavelengths. Oscillator results have been described in recent Soviet publications. This paper describes work in progress to develop oscillators of the gyrotron type to deliver 200 kW CW at 28 and 60 GHz. Although considerable progress had been made with gyroklystron amplifier stability to the point that amplifier gains of over 40 dB had been measured in a pulsed experimental gyroklystron amplifier, efficiency problems, potential dilution of effort and reconsideration of requirements resulted in dropping gyroklystron amplifier effort in favor of the gyrotron oscillator. Pulsed oscillators have been delivered which produced 246 kw peak power at 28 GHz with 38% efficiency. A CW oscillator has been tested to 212 kW with 40% efficiency and 119 kW with 46% efficiency also at 28 GHz. Other areas of R and D are discussed, including gyro-TWT amplifiers with increased instantaneous bandwidth (5 - 10%).

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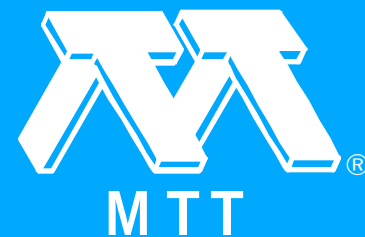


Abstracts

Gain of the Gyrotron with High Circular Waveguide Mode (Whispering Gallery Mode)

S. Ahn and J. Choe. "Gain of the Gyrotron with High Circular Waveguide Mode (Whispering Gallery Mode)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 102-103.

One of two Russian efforts to increase gyrotron output power has been to experiment with oscillator devices utilizing high order resonator modes, particularly the whispering gallery modes. We present the result of design analyses for this case and some design parameters will be given at the end. The potential application of whispering gallery modes in the solid-state gyrotron is also briefly described.



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Abstracts

Session H -- Microwave Systems - 1

"Session H -- Microwave Systems - 1." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 105-105.



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A Monolithic GaAs Decision Circuit for Gbit/s PCM Transmission Systems

M. Peltier, G. Nuzillat and M. Gloanec. "A Monolithic GaAs Decision Circuit for Gbit/s PCM Transmission Systems." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 107-110.

A new monolithically integrated GaAs decision circuit has been fabricated in order to satisfy speed requirements of a 840 Mbit/s coaxial cable PCM transmission system. The circuit is of SSI complexity (about 60 integrated components) and utilizes normally-on type MESFETs with 0.75- μ m gate length, exhibiting a cutoff-frequency $f_{\text{sub T}} = 20$ GHz. The main features of the circuit performance are: high clock frequency capability (up to 3 GHz), 100-ps rise- and fall-times, high dynamic sensitivity (65 mV peak-to-peak over a 1 GHz bandwidth), and moderate power consumption (350 mW typically). The described IC is able to drive low impedance transmission lines (output signal 600 mV/50 Ω) and can be used for multilevel signal regeneration in the 1-2 Gbit/s range.



Abstracts

Digital Generation of Wideband Linear FM Waveforms

F.W. Hopwood and R.A. Tracy. "Digital Generation of Wideband Linear FM Waveforms." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 111-113.

A technique for the direct digital generation of linear FM waveforms with up to 900 MHz bandwidth and T-B products to 450,000 is presented. The technique is applicable to high resolution Synthetic Aperture Radars, and to target identification and target count modes in multimode airborne radars. Origins of representative system requirements are outlined, mechanization details are described, and testing methods and results showing waveforms of excellent coherence and fidelity are presented.



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6 GHz 16 QAM MIC Modulator with Phase Linearity Improved

T. Takano, M. Niori, Y. Tokumitsu, H. Komizo and K. Ogawa. "6 GHz 16 QAM MIC Modulator with Phase Linearity Improved." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 114-116.

A 6GHz 16 QAM linear MIC ring modulator with improved linearity has been developed. The BER measurements show S/N degradation by the MIC modulator to be 0.3 dB greater than that of an IF modulator at an error rate of 10^{-6} .

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High-Power Upconversion for SSB-AM Signals

E. Loser and K. Schunemann. "High-Power Upconversion for SSB-AM Signals." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 117-119.

Negative feedback is used to linearize the upconverter of an SSB-AM transmitter. The upconverter is realized with evanescent mode resonators and contains two MIS varactors. An output power of 5 W with an IM-level, which is -55 dB down, have been achieved.

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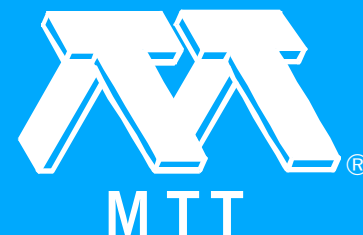


Abstracts

Instantaneous Bearing Discriminators with Omnidirectional Coverage and High Accuracy

S. Rehnmark. "Instantaneous Bearing Discriminators with Omnidirectional Coverage and High Accuracy." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 120-122.

Monopulse Bearing Discriminators, with full omniazimuthal coverage, designed specifically for high probability of detection in dense signal environments are presented. S-band (2-4 GHz) developmental models give angle of arrival information on a single pulse basis with bearing errors less than 1.7 degrees RMS within ± 40 degrees of elevation angle. The theoretical bearing error (perfect components) is less than ± 1 degree peak.



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Abstracts

The Tiros-N Microwave Sounder Unit

P.N. Swanson, W.M. Harris, E.J. Johnston and F.S. Soltis. "The Tiros-N Microwave Sounder Unit." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 123-125.

The TIROS-N Microwave Sounder Unit (MSU) is described. The MSU uses passive radiometry in the 50 to 60 GHz region to remotely measure the three-dimensional temperature distribution of the Earth's atmosphere.



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Abstracts

Two Microwave Complex Weighting Circuits

M.J. Fithian. "Two Microwave Complex Weighting Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 126-128.

Two types of complex weighting circuits were implemented for use in adaptive phased array antennas. The first is an S-band circuit using p-i-n diodes. The second is an active X-band circuit using dual-gate GaAs FET's. A comparison of the two is presented with experimental data.



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Abstracts

Calculation of Impedance Variations at the Transceivers in Electronically Beam-Steered Active Lens Antennas for Space Based Radar

D.W. Griffin. "Calculation of Impedance Variations at the Transceivers in Electronically Beam-Steered Active Lens Antennas for Space Based Radar." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 129-131.

Design specifications require estimates to be made of the impedances presented to the monolithic microwave transceivers being investigated for use in electronically beam-steered active lens antennas for space based radar systems. A method of calculation is explained and applied to active lenses composed of large planar arrays of dipoles on either side of a screening plane upon which the transceivers are mounted and connected by parallel wire lines to the dipoles.



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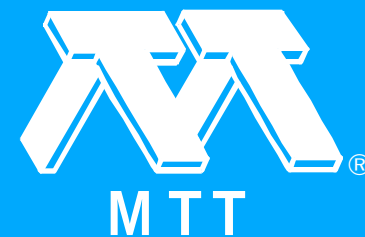
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Abstracts

Session J -- Microwave Filters and Multiplexers

"Session J -- Microwave Filters and Multiplexers." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 133-133.



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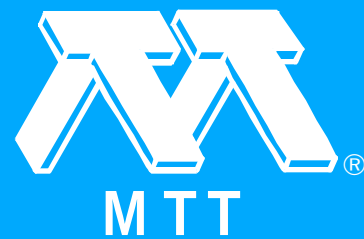


Abstracts

Synthesis of Commensurate Comb-Line Band-Pass Filters with Half-Length Capacitor Lines, and Comparison to Equal-Length and Lumped-Capacitor Cases

S.B. Cohn. "Synthesis of Commensurate Comb-Line Band-Pass Filters with Half-Length Capacitor Lines, and Comparison to Equal-Length and Lumped-Capacitor Cases." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 135-137.

Comb-line band-pass filters have previously been synthesized as circuits having equal-length short-circuited and open-circuited TEM lines. Practical designs, however, usually use almost-lumped capacitors. This paper presents an exact synthesis method for commensurate circuits in which the capacitor lines are exactly half the length of the inductor lines. Computed examples show that the pass-band response and stop-band skirts agree much closer to that of lumped and almost-lumped capacitors than that of the equal-line-length case. Also, a remarkable improvement in spurious response degradation will occur. Implementation of the half-length design is explained and is rather simple to carry out.



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Asymmetric Realisations for Dual-Mode Bandpass Filters

R.J. Cameron and J.D. Rhodes. "Asymmetric Realisations for Dual-Mode Bandpass Filters." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 138-140.

Two realisations are discussed for dual mode inline bandpass microwave filters which have asymmetrically-valued couplings about the physical centre of the filter. Advantages are gained in the first type of realisation which has no realisability conditions on the pattern of the transmission zeros in the complex-plane representation of the transfer function, and in the second which needs less coupling elements.

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Abstracts

Bandpass Filters Using Parallel Coupled Strip-Line Stepped Impedance Resonators

M. Makimoto and S. Yamashita. "Bandpass Filters Using Parallel Coupled Strip-Line Stepped Impedance Resonators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 141-143.

Design formulae for bandpass filters using parallel coupled strip-line stepped impedance resonators (S.I.R.) are derived. The formulae take into account the arbitrary coupling length as well as quarter-wavelength coupling. One of the important advantages of this filter is its ability to control spurious response by changing the structure of the resonator. Using the design formulae an experimental bandpass filter was designed and fabricated and its performance closely matched design data.



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Abstracts

Genenal Extracted Pole Synthesis Technique with Applications to Low-Loss TE/sub 011/ Mode Filters

J.D. Rhodes and R.J. Cameron. "Genenal Extracted Pole Synthesis Technique with Applications to Low-Loss TE/sub 011/ Mode Filters." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 144-146.

A new synthesis technique is developed for filters which exhibit arbitrary transfer characteristics. The real frequency transmission zeros are extracted using simple resonators separated by phase shifters. The remaining transmission zeros are realised by a cross-coupled double array with the entire filter possessing complex conjugate symmetry. Since all of the coupling elements are positive, TE/sub 011/ mode filters may be directly realized and an example of a 6th degree filter at 19.6 GHz with both real and imaginary transmission zeros is cited.



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Abstracts

Design of MIC Broadband Contiguous Multiplexer

J.E. Dean and J.D. Rhodes. "Design of MIC Broadband Contiguous Multiplexer." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 147-149.

A novel design and construction technique for MIC broadband filters and contiguous multiplexer is presented. A contiguous multi-plexer having outputs 4-8, 8-12 and 12-18 GHz has been constructed on a single substrate only 2" x 1 1/4", with low passband loss in each channel and highly selective responses at the bandedges. The multiplexer meets most environmental conditions and is very reproduceable.



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A Low Cost Multiplexer for Channelized Receiver Front Ends at Millimeter Waves

K.D. Breuer and N. Worontzoff. "A Low Cost Multiplexer for Channelized Receiver Front Ends at Millimeter Waves." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 150-152.

Work with millimeter-wave components using printed-circuit techniques has led to the successful development of multiplexers that are compatible with low-cost fabrication and packaging techniques. This paper will describe a 26 to 42-GHz multiplexer exhibiting 1.2 to 2.8 -dB insertion loss over a 4-GHz channel passband and a 45-dB rejection bandwidth of less than 8 GHz. This multiplexer uses a channel-dropping filter technique that splits the band into 4-GHz subbands (channels). Each channel-dropping filter consists of dual band-pass filters separated by a pair of 3-dB directional couplers. Fabrication costs are kept low by using chemically-milled broadwall couplers and E-plane filter resonators. A series of normalized filter design nomograph's have been generated. Measured multiplexer performance will be presented.

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Microstrip Variable Band-Pass Filters Using Varactor-Diodes

S. Toyoda. "Microstrip Variable Band-Pass Filters Using Varactor-Diodes." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 153-155.

Two microstrip variable band-pass filters for 6 GHz and 4 GHz bands are proposed and tested. The pass-band width varies from 310 MHz to 1.24 GHz for the varactor-diode coupled filter, and it varies from 380 MHz to 2.18 GHz for the filter which is composed of low-pass and high-pass filters connected in series. The center frequency of the both filters can be changed arbitrarily.

Abstracts

Design of Optimum Equalizers for Microwave Broad Band Solid State Amplifiers

W.H. Ku. "Design of Optimum Equalizers for Microwave Broad Band Solid State Amplifiers." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 156-156.

Analytical and computer-aided design techniques for broadband GaAs FET amplifiers are presented. Based on distributed models of the FET, optimum gain-bandwidth limitations have been derived. These results are similar to those published previously which are based on lumped equivalent circuit models of the transistor. The distributed case was also studied by Tucker and some explicit results for a class of different ideal gain functions were derived. The effect of altering the commensurate line length of the models has also been studied.



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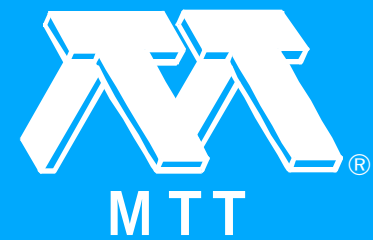
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Abstracts

Session K -- High-Power Solid-State Circuits

"Session K -- High-Power Solid-State Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 157-157.



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Abstracts

A High-Power X-Band Diode Amplifier

R.J. Pankow and R.G. Mastroianni. "A High-Power X-Band Diode Amplifier." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 159-161.

The requirement for high power solid state amplifiers at X-Band has necessitated a close investigation of diode power combiners for use as reflection amplifiers. A brassboard amplifier incorporating 17 diodes in all and using a 10 diode TM/sub 010/ mode resonant cavity combiner has been fabricated in a 4 inch diameter 10 inch long cylindrical configuration. A power level of 74 watts peak at a 0.33 duty ratio and 34 dB gain has been achieved.



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X-Band Pulsed Solid State Transmitters

S.E. Hamilton, R.S. Robertson, F.A. Wilhelmi and M.E. Dick. "X-Band Pulsed Solid State Transmitters." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 162-164.

This paper describes a pulsed X-band solid state transmitter capable of power levels greater than 135 watts peak and 45 watts average. Three separate transmitters were built, two used silicon double drift IMPATTs and the third used Gallium Arsenide single drift IMPATTs as the active RF elements. Hybridized constant current pulse modulators were used to bias the diodes. A comparison of the RF performance of the three transmitters is given. The transmitter is form factored for use in missile or airborne applications.

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



Abstracts

Efficient, Higher Order Mode Resonance Combiner

M. Dydyk. "Efficient, Higher Order Mode Resonance Combiner." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 165-167.

This paper will discuss a power combining approach that uses a higher order mode cavity resonance without mode suppressors to achieve a highly stable and efficient combiner. This is made possible by proper handling of the undesirable resonances. The application of this approach to a Ku-band 12 GaAs IMPATT diode combiner will be discussed.



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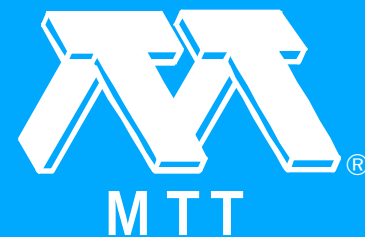


Abstracts

A Corporate Structure for Combining Power from $3/\sup N/$ Oscillators

S. Mizushina, H. Kondoh and M. Ashiki. "A Corporate Structure for Combining Power from $3/\sup N/$ Oscillators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 168-170.

The output power from three Gunn oscillators was combined with a short-slot coupler with power combining efficiency of about 100 percent at 9.7 GHz. Using the 3-oscillator structure as the building-block, we constructed $(3^2=)9$ -oscillator corporate structure and $(2 \times 4 + 1 =)9$ -oscillator tandem structure to demonstrate power combining efficiency of 92 and 95 percent, respectively, at 9.6 GHz.



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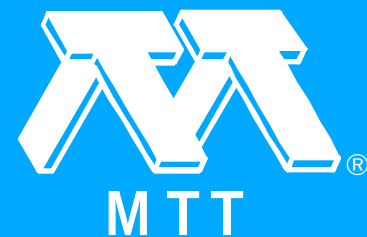


Abstracts

An Improved TRAPATT Oscillator Circuit

R. Davies, P.L. Booth and B.H. Newton. "An Improved TRAPATT Oscillator Circuit." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 171-173.

The interaction between TRAPATT diodes and circuits is reconsidered and a new TRAPATT oscillator circuit based on the resulting design criteria is proposed and evaluated; the new circuit exhibits improved characteristics over conventional TRAPATT oscillators.



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Influence of Non-Ideal Circulator Effects on Negative-Resistance Amplifier Design

B.D. Bates and P.J. Khan. "Influence of Non-Ideal Circulator Effects on Negative-Resistance Amplifier Design." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 174-176.

It is well known that the non-ideal properties of a circulator (non-unity VSWR, non-zero insertion loss, finite isolation) have a marked effect on the design of single-stage and multi-stage negative-resistance amplifiers. These effects are due to the frequency dependence of the circulator parameters, the feedback associated with multiple reflections between circulator ports and terminations, and the possibility of spurious pass-bands in the circulator characteristics away from the desired operating frequency range. Noise degradation also occurs with a low-noise amplifier circuit.

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Pulsed Power Performance of GaAs FETS at X-Band

S.J. Temple, Z. Galani, J. Dormail, R.M. Healy and B.S. Hewitt. "Pulsed Power Performance of GaAs FETS at X-Band." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 177-179.

The pulsed operation of X-band amplifiers using 4.8 mm power FETs resulted in a nominal output power improvement of 2 dB when operated at elevated drain voltages of up to 18 volts. An output power of 6 W peak with 6 dB gain at 10 GHz was obtained from a balanced amplifier.

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



Abstracts

A K-Band 1 Watt GaAs FET Amplifier

J. Sone and Y. Takayama. "A K-Band 1 Watt GaAs FET Amplifier." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 180-182.

Lumped-element impedance matching techniques were successfully adopted for K-band power GaAs FET amplifiers. The 18 GHz band two-stage amplifier provides 1.05 Watt power output at 1 dB gain compression with 8.1 dB small-signal gain, and 20 GHz band one-stage amplifier has 1.04 Watt power output with 3 dB associated gain.



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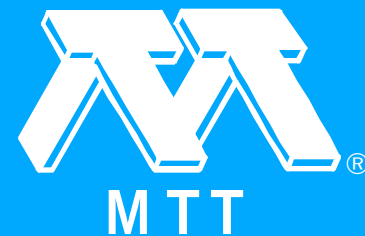


Abstracts

32 Diode Waveguide Power Combiner

S.E. Hamilton. "32 Diode Waveguide Power Combiner." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 183-185.

An extension to a previously developed IMPATT diode power combining scheme is presented. The new design doubles the diode capacity over the previously presented scheme. The design concept and performance of the combiner using 32 GaAs IMPATT diodes is also described.



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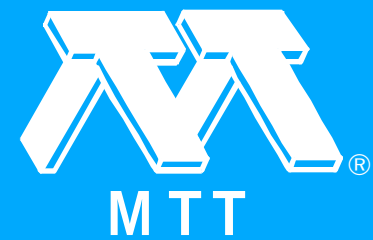
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Abstracts

Session L -- Satellite Communication Systems in Europe (Invited)

"Session L -- Satellite Communication Systems in Europe (Invited)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 187-187.



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Abstracts

Communication Satellite Payloads: A Review of Past, Present and Future ESA Developments

M. Lopriore. "Communication Satellite Payloads: A Review of Past, Present and Future ESA Developments." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 189-191.

The successful launch of OTS in 1978 has demonstrated in orbit the capability of European Industry to produce a number of microwave "firsts" in the 14/11 GHz band. Some of these "firsts" e.g. parametric amplifier, downconverter and TWTA's are or will be reused in other satellites. Such equipment was the outcome of a preparatory programme started in the early '70 and intended to foster development of space hardware for the Ku band.



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Abstracts

GaAs FET's in Present and Future Communication Satellite Programs

J. Turner. "GaAs FET's in Present and Future Communication Satellite Programs." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 192-192.

Text of paper not available at time of publication.



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Abstracts

Microwave Technology Developments in Italian Space Programs

M. Massani. "Microwave Technology Developments in Italian Space Programs." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 193-194.

The Italian aerospace industry demonstrated its ability to carry out a national space program by successfully launching into orbit the Italian satellite Sirio in 1977. The scientific background as well as the technological advances necessary to achieve that goal has been developed through participation at various international and European space programs. The inception of this type of activity dates back to 1965 when the ELDO program for a European launcher was started.



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Abstracts

West German Microwave Activity - State of the Art in Satellite Communications

H.H. Brand. "West German Microwave Activity - State of the Art in Satellite Communications." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 195-197.

The paper deals with the West German contributions to the growing field of microwave technology with special emphasis on satcom applications. After briefly reviewing the historical development, the earth stations and some new satellite systems are described in more details. Research and development activities in industry and governmental laboratories conclude the overview.



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Abstracts

Some Aspects of French Solid-State Component Space Technology

J. Magarshack. "Some Aspects of French Solid-State Component Space Technology." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 198-199.

This paper will describe three particular aspects of work in FRANCE which has been carried out in the field of solid-state components for space applications. These are: Domestic television reception at 12 GHz for the ground sector in which a better than 4 dB noise figure is obtained for an all-FET receiver (made by LEP). A switching matrix for an SSTDMA space borne system which is a rapid (less than 50 ns), redundant (each channel has 4 possible routes), PIN diode 8 x 8 way matrix (THOMSON CSF). A description of the reliability test programme for components (the Space Components Coordination Group) which is supported by the French Space Agency (CNES) and has defined a set of test procedures which is applied to other applications (not only space) and is used generally in EUROPE and beyond.



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Abstracts

Microwave Activities for Satellite Communication in Sweden

L. Afzelius. "Microwave Activities for Satellite Communication in Sweden." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 200-202.

Microwave activities for Satellite Communication in Sweden started in 1965 with the development of a complete experimental 4-6 GHz all solid state transponder designated for the ninth flight of the Eldo launcher. This was a very ambitious entrance into a market where the Swedish contribution has never exceeded 1% of the world's total expenditure. Our contribution in the last few years has been aimed mainly at four areas. Propagation experiments in the 11-14 GHz band (OTS), Maritime and mobile communication, TV broadcast, Telemetry and telecommand antennas. This paper briefly reports on microwave technology specifically developed within the context of the areas mentioned above and also some results from related studies and experiments.



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Session M -- Guides and Components

"Session M -- Guides and Components." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 203-203.



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A Metal-to-Dielectric Waveguide Transition with Application to Millimeter-Wave Integrated Circuits

T.N. Trinh, J.A.G. Malherbe and R. Mittra. "A Metal-to-Dielectric Waveguide Transition with Application to Millimeter-Wave Integrated Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 205-207.

In this paper we describe the development of an efficient, low-loss transition from a conventional metal waveguide to a planar dielectric guide of rectangular cross section. Such a transition finds important application in millimeter-wave integrated circuits. We show that for a given length of the flared horn used for launching energy into the dielectric waveguide, the insertion loss of the transition can be reduced to a very low figure by choosing the flare angle of the horn appropriately.

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



Abstracts

Trapped Image Guide for Millimeter-Wave Circuits (1980 [MWSYM])

T. Itoh and B. Adelseck. "Trapped Image Guide for Millimeter-Wave Circuits (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 208-210.

A novel dielectric waveguide is proposed for use in millimeter-wave integrated circuits. Radiation losses of this waveguide at curved sections are considerably less than those of the image guide.



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A Method for Reducing Radiation Losses at Bends in Open Dielectric Structures

M. Desai and R. Mittra. "A Method for Reducing Radiation Losses at Bends in Open Dielectric Structures." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 211-213.

In this paper we present the results of an experimental study of a scheme for reducing the radiation losses from bends in open dielectric waveguides used in millimeter-wave integrated circuits. We show that the radiation losses can be reduced significantly using an optimally designed, open shield placed near the guide. The shielding concept is especially useful for designing integrated circuit components, e.g., couplers and ring resonators. Illustrative examples are presented for a 180° bend and a ring resonator.

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Abstracts

Coupling Characteristics of Dielectric Waveguides of Rectangular Cross-Section

T.N. Trinh and R. Mittra. "Coupling Characteristics of Dielectric Waveguides of Rectangular Cross-Section." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 214-217.

An approximate but accurate analytical model has been developed for predicting the coupling characteristics of both symmetrical and nonsymmetrical dielectric couplers of rectangular cross section. The coupling is shown to depend on the field decay coefficient, guide spacing, and cross-sectional dimensions. Comparisons between experimental and theoretical results are presented.



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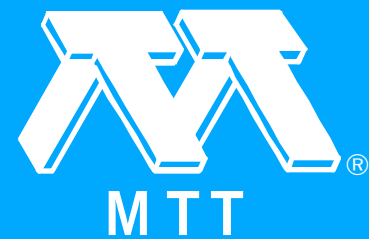
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Resonant Frequency of Dielectric Resonators in Inhomogeneous Media

R. Bonetti and A. Atia. "Resonant Frequency of Dielectric Resonators in Inhomogeneous Media." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 218-219.

An iterative analytical method is presented for the computation of resonant frequencies of high dielectric constant cylindrical resonators in inhomogeneous media. Theoretical calculations of barium tetratitanate dielectric discs above alumina substrates of a microstrip line agree with measurements of the resonant frequency to within 0.2 percent.

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Abstracts

Analysis of the Scattering Mechanism in an Abruptly Ended Rod Dielectric Waveguide. Application to the Determination of the Characteristics of Dielectric Resonators

P. Gelin, M. Petenzi, P. Kennis and J. Citerne. "Analysis of the Scattering Mechanism in an Abruptly Ended Rod Dielectric Waveguide. Application to the Determination of the Characteristics of Dielectric Resonators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 220-222.

The scattering mechanism of the magnetic dipolar mode TE/sub 10/ incident in an abruptly ended rod dielectric waveguide is analysed by means of a novel integral formulation. The accurate numerical solution is obtained from an iterative procedure based on successive scattering approximation. In the second part of this paper, we applied the previous results to determine the characteristics of circular dielectric resonators.



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Abstracts

A Note on the Complex Poynting Vector, and on the Fractional Current on the Upper Surface of a Microstrip Line

L. Lewin and T. Ruehle. "A Note on the Complex Poynting Vector, and on the Fractional Current on the Upper Surface of a Microstrip Line." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 223-224.

It is shown how the two forms $\mathbf{E} \times \mathbf{H}^*$ and $\mathbf{E}^* \times \mathbf{H}$ should be used when extracting reactance information from the complex Poynting Vector in a microstrip problem. When the strip is narrow, some of the axial current appears on top of the strip. Its value is calculated and the practical use of this information is indicated.



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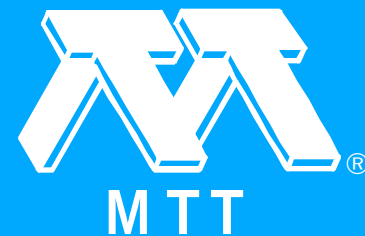


Abstracts

A 40 GHz Microstrip Array Antenna

W. Menzel. "A 40 GHz Microstrip Array Antenna." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 225-226.

A 40 GHz 4x24 element microstrip array consisting of rectangular microstrip resonators is described. The antenna is developed using scaling techniques. A microstrip feed network is calculated including discontinuity effects. Return loss, bandwidth and radiation characteristics are given.



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Abstracts

Session N -- Ferrite Applications (1980 [MWSYM])

"Session N -- Ferrite Applications (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 227-227.



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Parallel Component $\mu_{\parallel}$ of Partially Magnetized Microwave Ferrites

M. Igarashi and Y. Naito. "Parallel Component $\mu_{\parallel}$ of Partially Magnetized Microwave Ferrites." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 229-231.

A formula for the parallel component $\mu_{\parallel}$ of the microwave permeability tensor in the partially magnetized state is derived. The theory is in good agreement with experimental results.

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Planar Meanderline Ferrite Phase Shifters with Multi-Layer Ferrite/Dielectric Imbedding

E.R.B. Hansson. "Planar Meanderline Ferrite Phase Shifters with Multi-Layer Ferrite/Dielectric Imbedding." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 232-234.

This paper presents methods for rapid analysis of coupled lines in composite ferrite/dielectric materials. New expressions are given for the calculation of effective dielectric constants showing a linear relationship with respect to the dielectric constants of the materials in the structure. A similar linearity is shown to characterize the effective relative permeabilities. Conditions for matching of meanderlines are presented which are used in computer programs for the design of meanderline ferrite phase shifters. Measured characteristics of a phase shifter with a four layer ferrite/dielectric imbedding are presented. The phase shifter is well matched in the vicinity of the frequency for maximum differential phase shift. An optimum figure of merit ranging from 340 to 390°/dB for various magnetizations was obtained.

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Abstracts

New Nonreciprocal Devices in a Coplanar Waveguide

Y. Naito and Y. Yamanaka. "New Nonreciprocal Devices in a Coplanar Waveguide." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 235-237.

Some new nonreciprocal magnetic devices in a coplanar waveguide, using the edge-guided mode, is proposed. The structure of these devices are suitable for application to microwave integrated circuits, because of a plane configuration. Experimental results on some types of coplanar structures with ferrite material are described.



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Magnetostatic Surface Wave Signal-to-Noise Enhancer

S.N. Stitzer, H. Goldie, J.D. Adam and P.R. Emtage. "Magnetostatic Surface Wave Signal-to-Noise Enhancer." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 238-240.

Utilizing saturation of magnetostatic surface waves propagating in thin YIG films, the signal-to-noise enhancer (or power expander) performs the opposite function from that of the power limiter; weak signals suffer up to 20 to 30 dB greater attenuation than do strong signals. This discrimination takes place on a frequency selective basis over an instantaneous bandwidth of one-third octave or more. Basic principles, construction methods, and experimental results are discussed.

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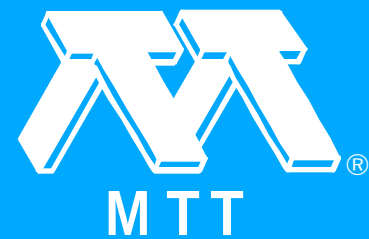
A New Accurate Equivalent Network for Stripline Circulators

G. Filipsson and B. Hansson. "A New Accurate Equivalent Network for Stripline Circulators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 241-243.

A new equivalent network accurately characterizing the immittance properties of a stripline circulator junction is proposed. The model is valid for circulators operating above as well as below resonance. Analytic expressions giving the element values of the equivalent network expressed in terms of the admittance properties of the junction are presented. The possibility of matching the new model for Chebyshev response using quarter wave transmission lines is shown. The usefulness of the new equivalent network is demonstrated by broadband matching of an experimental circulator.

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Characterisation of Planar WYE Shaped Resonators for Use in Circulator Hardware

W.T. Nisbet and J. Helszajn. "Characterisation of Planar WYE Shaped Resonators for Use in Circulator Hardware." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 244-249.

An important class of three port junction circulators consist of a network of six transmission lines alternatively terminated in 50 ohm lines and magnetic walls (open-circuits). In general, this network has threefold symmetry, since consecutive transmission lines differ both in impedance and electrical length. Properly adjusted, it exhibits a frequency response normally associated with a quarter-wave coupled junction circulator. For circulators, for which the in-phase eigennetwork may be represented by an ideal short circuit, the equivalent circuit is a 1-port network which may be formed from the definition of the constituent resonator. This feature is used in this paper to study the equivalent circuit of junction circulators using microstrip WYE resonators on garnet substrates.

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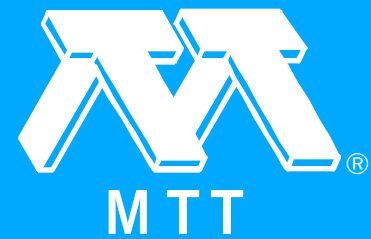


Abstracts

A New Type Circulator for Millimeter Integrated Circuits

Y. Naito, M. Muraguchi and A. Tsuji. "A New Type Circulator for Millimeter Integrated Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 250-252.

A new type of circulator, which is suitable for the millimeter-wave integrated circuits (MMIC), is proposed. The experimental results of the characteristics of the circulator in the 60GHz range are presented.



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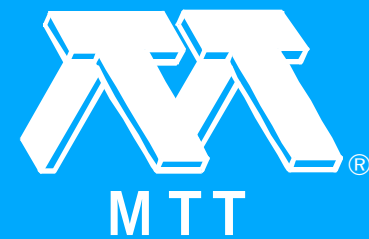
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Session O -- Millimeter Wave IC's

"Session O -- Millimeter Wave IC's." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 253-253.



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Characteristics of Unilateral Fin-Line Structures with Arbitrarily Located Slots (1980 [MWSYM])

L.-P. Schmidt, T. Itoh and H. Hofmann. "Characteristics of Unilateral Fin-Line Structures with Arbitrarily Located Slots (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 255-257.

Generalized unilateral fin-line configurations for extended mm-wave applications are analyzed using the equivalent transmission line concept in the spectral domain. Numerical results for the frequency dependent propagation constants and characteristic impedances of various structures are presented.

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Abstracts

A Solution of the Earthed Fin Line with Finite Metallization Thickness

A. Beyer and I. Wolff. "A Solution of the Earthed Fin Line with Finite Metallization Thickness." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 258-260.

A method is presented which solves the eigenvalue problem of an earthed fin line considering finite metallization thickness as well as a longitudinal slit in the metal waveguide-mount. Numerical and experimental results are given for the unilateral fin line.



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Cutoff Frequencies in Fin Lines Calculated with a Two-Dimensional TLM-Program

Y.-C. Shih, W.J.R. Hoefer and A.E. Ros. "Cutoff Frequencies in Fin Lines Calculated with a Two-Dimensional TLM-Program." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 261-263.

This paper presents the cutoff frequencies of selected insulated and unilateral fin line structures as calculated with a two-dimensional TLM-program. Through careful correction of truncation, velocity and coarseness errors associated with this method, an overall accuracy of 1% is achieved. This method therefore provides an excellent reference for verifying other existing methods.

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Abstracts

Advances in Printed Millimeter-Wave Oscillator Circuits

L.D. Cohen. "Advances in Printed Millimeter-Wave Oscillator Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 264-266.

Millimeter-wave Gunn oscillators and VCO's which use a printed fin-line oscillator circuit in the 55 to 100 GHz range are described. Demonstrated technological advances include the use of printed oscillator circuits to 100 GHz, wideband mechanical tunability (to 8 GHz), and varactor tuning.



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E-Plane Components for a 94-GHz Printed-Circuit Balanced Mixer

P.J. Meier. "E-Plane Components for a 94-GHz Printed-Circuit Balanced Mixer." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 267-269.

E-plane components for a new form of a 94-GHz printed-circuit balanced mixer are described. The components include a low-loss printed-probe hybrid, advanced beam-lead diodes, and fin-line mounts. The E-plane approach features production economy, effective shielding, high (> 400) unloaded Q, light dielectric loading, and simple waveguide interfaces.



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Abstracts

Phasing Type Image Recovery Mixers

T.H. Oxley. "Phasing Type Image Recovery Mixers." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 270-272.

This paper discusses the design of double balanced mixer circuits to effect image rejection, with the potential of low noise performance by recovery of image power. Performance of circuits at S, X and J(Ku) -bands is described.



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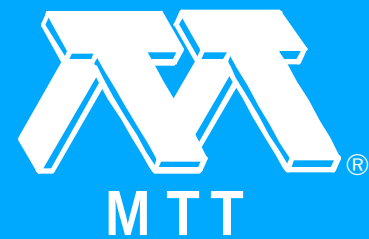
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Low Cost mm-Wave Dielectric Loaded Mixer

J.A. Paul and P. Yen. "Low Cost mm-Wave Dielectric Loaded Mixer." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 274-275.

A 60 GHz mixer compatible with beam lead diodes using a novel circuit configuration incorporating dielectric loaded waveguide, stripline and coaxial transmission lines has been designed and fabricated. The mixer was developed for low-cost, high volume applications.

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Abstracts

Millimeter-Wave IC Components Using Fine Grained Alumina Substrate

H. Yatsuka, M. Ishizaki, T. Takano and H. Komizo. "Millimeter-Wave IC Components Using Fine Grained Alumina Substrate." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 276-278.

To investigate the feasibility of millimeter-wave ICs using Fine Grained Alumina substrate, the propagation loss and effective dielectric constant of the microstrip lines were measured at 50 GHz and millimeter-wave IC components were successfully developed.



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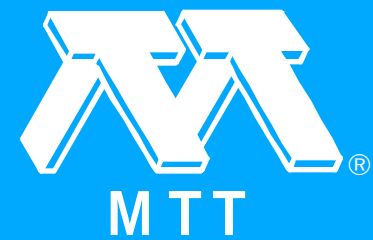
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Abstracts

Session P -- Satellite Broadcasting in Japan (Invited)

"Session P -- Satellite Broadcasting in Japan (Invited)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 279-279.



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Main Transmit and Receive Station in Japanese BSE Program

N. Imai, Y. Otsu and T. Tanaka. "Main Transmit and Receive Station in Japanese BSE Program." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 281-283.

The Japanese Medium-scale Broadcasting Satellite for Experimental Purpose (BSE) was launched successfully in April, 1978 and placed on the geostationary orbit of longitude 110 deg. E.. After the spacecraft initial performance check-up on orbit made by the National Space Development Agency of Japan (NASDA), the various broadcasting experiments were started in July, 1978, and will be conducted for about three years by the Radio Research Laboratories (RRL) of Ministry of Posts and Telecommunications (MOPT) and the Japan Broadcasting Corporation (NHK) in close cooperation with NASDA. The MTRS was installed as the key station for the BSE experiments and has been operating satisfactorily. In this paper are reported the system configuration, functions and characteristics of MTRS together with a brief description of the total experimental system in Japanese BSE program.



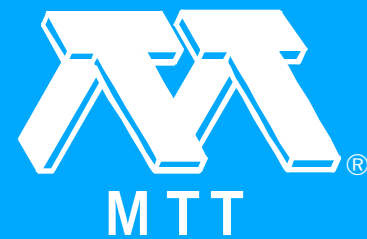
Abstracts

Performance Characteristics of a Transportable Transmit and Receive Station of A-Type for Japan's Medium-Scale Broadcasting Satellite for Experimental Purpose (BSE)

Y. Konishi, S. Hoshina, M. Takahashi, S. Nishimura, S. Betsudan and M. Nakanishi.

"Performance Characteristics of a Transportable Transmit and Receive Station of A-Type for Japan's Medium-Scale Broadcasting Satellite for Experimental Purpose (BSE)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 284-286.

The performance characteristics of a transportable type small-scale earth station of A-type that has been used in the experiments made with the Japan's medium-scale broadcasting satellite for experimental purpose are outlined in this paper. The experiments prove the practicality of establishing a TV broadcasting service on the 14/12 GHz-band.



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Abstracts

14/12 GHz Band Mobile-Type Earth Station for Japanese Broadcasting Satellite Communication

H. Hayashida, S. Hikosaka, F. Yamashita, I. Sato, H. Shimayama and K. Yoshizumi. "14/12 GHz Band Mobile-Type Earth Station for Japanese Broadcasting Satellite Communication." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 287-289.

This report describes function and performance of mobile-type earth station system and subsystems, designed for using higher carrier frequencies, and station construction for mobile use.



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Receive-Only Station for Broadcasting Satellite Experimental

M. Kaijima, S. Kikukawa, T. Chiba and Y. Sasaki. "Receive-Only Station for Broadcasting Satellite Experimental." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 290-292.

Receive-only stations (ROS), located in nine places in Japan, were developed as one of ground facilities for a series of experiments using the Medium -scale Broadcasting Satellite for Experimental Purpose (BSE). Each ROS is aimed at receiving broadcast from the BSE and obtaining basic data for design of future satellite broadcasting system through evaluation of picture quality and measurement of video/sound transmission characteristics. This report describes the system design and hardware of the ROS.

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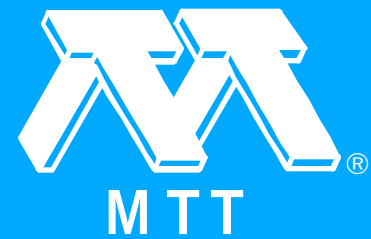


Abstracts

Satellite Broadcasting Receiver - Present and Future

Y. Konishi. "Satellite Broadcasting Receiver - Present and Future." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 293-295.

The present status and future trend of satellite broadcasting receiver are described in the view of low cost and low noise approach in connection with the construction and the performance. The recent results of the receiver developed by us are also shown.



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Abstracts

Development of 12GHz TWT for Broadcasting Satellites

K. Yamamoto, K. Sugimori and T. Kimura. "Development of 12GHz TWT for Broadcasting Satellites." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 296-298.

This paper describes the basic development of a 100W travelling-wave tube in 12GHz band for broadcasting satellites. This tube incorporates the impregnated cathode, helix slow wave circuit with velocity taper, and four stage depressed collector.



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Abstracts

A Cross-Shaped Horn and a Square Waveguide Polarizer for a Circularly Polarized Shaped Beam Antenna for a Broadcasting Satellite

N. Toyama. "A Cross-Shaped Horn and a Square Waveguide Polarizer for a Circularly Polarized Shaped Beam Antenna for a Broadcasting Satellite." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 299-301.

A cross-shaped horn and a square waveguide polarizer for a circularly polarized antenna for a broadcasting satellite are designed using a finite difference method and a beam contour of an offset parabolic reflector fed with three cross-shaped horns is given.



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Abstracts

Operational Achievements with Japanese Broadcasting Satellite for Experimental Purpose (BSE)

S. Shimizu and K. Arai. "Operational Achievements with Japanese Broadcasting Satellite for Experimental Purpose (BSE)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 302-304.

Sophisticated operational achievements reached with the Japanese Medium-scale Broadcasting Satellite for Experimental Purpose (BSE) are introduced. After initial checkup of the spacecraft functions in geostationary orbit, various TV broadcasting experiments have been started out on July 20, 1978. On performing these experiments, such operations as house keeping and station keeping together with attitude control have been in charge of National Space Development Agency of Japan (NASDA). This paper provides information on the operational achievements in these areas reached with the zero-momentum three-axis stabilized spacecraft during about one and a half years.



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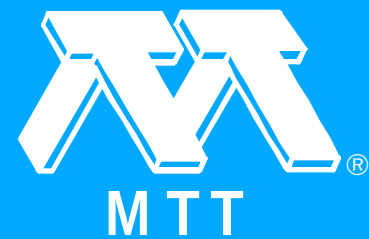


Abstracts

Evaluation of Service Area in the Satellite Broadcasting by the BSE

M. Yamamoto and S. Sonoda. "Evaluation of Service Area in the Satellite Broadcasting by the BSE." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 305-307.

We discuss received TV signal stability, a pointing error and radiation pattern of an on-board antenna, tracking errors of receiving antennas in earth terminals and rain attenuation in the BSE (Japanese Medium-scale Broadcasting Satellite for Experimental Purpose) experiments. The service area for the satellite broadcasting by the BSE is evaluated from these experimental results and statistical analyses. The receiving antenna diameters to assure excellent or fine picture in the satellite broadcasting will be about 1 meter around the beam center of the on-board antenna, about 1.6 meters in the fringe area of the Japanese main lands and about 2.8 to 4.5 meters in the remote islands of Japan.



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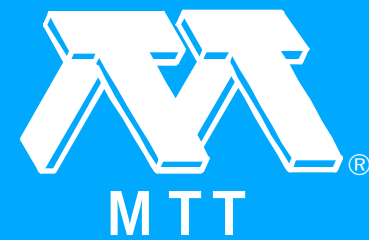
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Abstracts

Session Q -- Guided Wave Optics and Interactions

"Session Q -- Guided Wave Optics and Interactions." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 309-309.



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Abstracts

Guided-to-Radiation Mode Conversion in Hetero-Structure Planar Waveguides and its Application to a Light Modulator

H. Onodera, I. Awai, M. Nakajima and J. Ikenoue. "Guided-to-Radiation Mode Conversion in Hetero-Structure Planar Waveguides and its Application to a Light Modulator." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 311-313.

By making an investigation of the coupling strength of guided mode to radiation mode due to electrooptic effect in hetero-structure waveguides, it is suggested that a high-efficiency light intensity modulator can be built of a simplified structure and with ease of fabrication.



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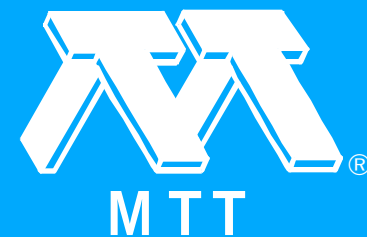


Abstracts

An Optically Coupled Microwave Switch

R.A. Kiehl and D.M. Drury. "An Optically Coupled Microwave Switch." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 314-316.

A new microwave switch that uses lightwaves to couple microwave energy between its ports is shown to offer outstanding performance in terms of on/off ratio and reverse isolation while exhibiting a state independent input impedance.



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Abstracts

An RF Field Strength Measurement System Using an Integrated Optical Linear Modulator

H.I. Bassen, C.H. Bulmer and W.K. Burns. "An RF Field Strength Measurement System Using an Integrated Optical Linear Modulator." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 317-318.

An electrically small dipole or loop antenna may be mated with an integrated optical linear modulator and optical fibers to form a broadband, minimally perturbing, RF field strength measurement device. Good preliminary results have been obtained with the modulator prototype.



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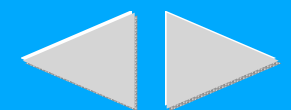
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Nonreciprocal Effects in an Open Dielectric Waveguide with Grating Structures

K. Araki, B.S. Song and T. Itoh. "Nonreciprocal Effects in an Open Dielectric Waveguide with Grating Structures." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 319-320.

Nonreciprocal phenomena in a grating structure created on an open waveguide containing anisotropic media are studied. Experimental investigations based on the theory predict that new nonreciprocal devices can be developed for millimeter-wave integrated circuits.

Click on title for a complete paper.



Abstracts

An Approximate Analysis of Rib Waveguides

H. Shigesawa, M. Tsuji and K. Takiyama. "An Approximate Analysis of Rib Waveguides." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 322-324.

The transmission characteristics of dielectric rib waveguides are analyzed by the approximate mode matching method and their experiments with newly developed techniques confirm the validity of our analysis. Moreover, a more advanced method in consideration of the coupling between TE and TM modes is discussed.



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Analysis of Chirped Grating Lenses

S. Forouhar and W.S.C. Chang. "Analysis of Chirped Grating Lenses." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 325-326.

Perturbed coupled mode theory and Fourier decomposition method of analyzing optical propagation in thick holographic chirped grating lenses are discussed. The effects of the chirping rate, the groove depth and profile and the grating thickness of the field distribution of the chirped grating lens have been calculated.

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Abstracts

Microwave Models of Blazed Dielectric Gratings for Intrgrated-Optics Applications

T. Tamir. "Microwave Models of Blazed Dielectric Gratings for Intrgrated-Optics Applications." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 327-328.

The behavior of leaky modes along microwave gratings shows that: (1) a Bragg-scattering approach provides simple design criteria for blazed dielectric gratings, and (2) broadband, highly efficient, optical beam-coupling devices using such gratings can be easily realized.



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Finite Element Analysis of Optical Waveguides (1980 [MWSYM])

N. Mabaya and P.E. Lagasse. "Finite Element Analysis of Optical Waveguides (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 329-331.

A finite element program for the analysis of anisotropic optical waveguides is described. The appearance of spurious numerical modes due to the fact that the functional is non positive definite is discussed and a possible solution to the problem is presented.

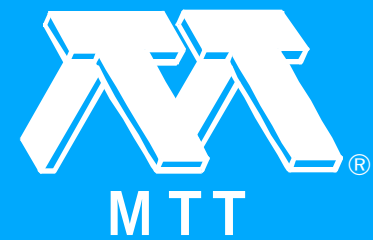
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Abstracts

Session R -- Biological Applications and Effects

"Session R -- Biological Applications and Effects." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 333-333.



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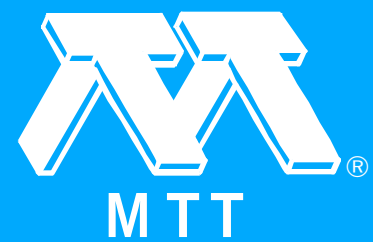
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Safety Level with Respect to Human Exposure to Radiofrequency Electromagnetic Fields (300 Khz-100 GHz)

A.W. Guy. "Safety Level with Respect to Human Exposure to Radiofrequency Electromagnetic Fields (300 Khz-100 GHz)." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 335-336.

The development of safety guides for human exposure to radiofrequency fields (RFF) must be based principally upon the results of animal experiments since, with the exception of obvious heating effects, there is a paucity of quantitative data relating to the action of these fields on mankind. In using the results of animal experiments, one must be careful to distinguish the difference between exposure fields and the fields in the tissues that produce the biological action. This difference, which varies markedly with frequency, body size, and exposure conditions, must be accounted for in the use of animal data for predicting safe human exposure levels over a broad frequency range. Based on a critical evaluation of the world literature on the subject, it is the consensus of the ANSI Subcommittee C95.4 (charged with developing voluntary safety standards for human exposure to RFF) that fields in the tissues should be restricted to levels that would limit average specific absorption rate (SAR) of the energy to less than 0.4 W/Kg. This led to recommended exposure fields equivalent to 100 mW/cm², for frequencies (f) 0.3 MHz to 3 MHz; 900/f² mW/cm², 3 MHz to 30 MHz; 1 mW/cm², 30 MHz to 300 MHz; f/300 mW/cm², 300 MHz to 1500 MHz; 5 mW/cm², 1.5 GHz to 100 GHz.





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Electromagnetic Energy Deposition in an Inhomogeneous Block Model of Man for Near-Field Irradiation Conditions

I. Chatterjee, M.J. Hagmann and O.P. Gandhi. "Electromagnetic Energy Deposition in an Inhomogeneous Block Model of Man for Near-Field Irradiation Conditions." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 337-340.

The plane wave spectrum approach is used to calculate the electromagnetic energy absorption and its distribution in a 180-cell, inhomogeneous model of man for a prescribed vector electric field generated by RF sealers and other electronic equipment. The whole-body-averaged absorption density increases approximately as $(\Delta/\lambda)^2$ to the asymptotic plane wave value where Δ/λ is the width in wavelengths of the best-fit half-cycle cosine function to prescribed E-values.

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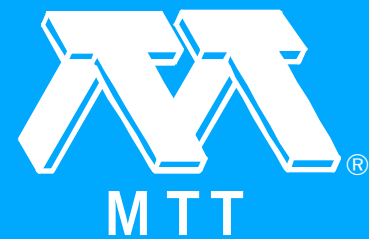


Abstracts

Microwave and Temperature Effects on the Murine Ocular Lens In-Vitro

P.J. Stewart-DeHaan, M.O. Creighton, L.E. Larsen, J.H. Jacobi, W.M. Ross and J.R. Trevithick. "Microwave and Temperature Effects on the Murine Ocular Lens In-Vitro." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 341-344.

Rat ocular lenses were studied by scanning electron microscopy (SEM) following exposures to elevated temperatures and/or microwave irradiation in a thermostatically controlled chamber. In this way, the temperature of the lens bathing medium was set independently of the temperature increase normally associated with application of microwave power. Irradiations were done at three final temperatures and three specific absorption ratios (SAR) for two durations. These were accomplished at 915 MHz in WR975 waveguide with either pulsed (Pu) or continuous wave (CW) radiation of equal average power. The parameters of the (Pu) radiation were selected to maximize the production of thermoacoustic expansion.



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Abstracts

A Microstrip Microwave Biological Exposure System

A.W. Friend and H. Howe, Jr.. "A Microstrip Microwave Biological Exposure System." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 345-346.

A compact microstrip system for exposing cells and subcellular particles to uniform precisely-measured fields at 2.45 GHz has been developed for use by experimenters performing medical research.



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Abstracts

Dual Mode Microwave System to Enhance Early Detection of Cancer

K.L. Carr, A.M. El-Mahdi and J. Shaeffer. "Dual Mode Microwave System to Enhance Early Detection of Cancer." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 347-350.

A dual mode microwave system has been developed that will permit early detection of cancer. The system combines the use of the passive microwave radiometer with an active transmitter. The active transmitter will provide localized heating to enhance early detection by taking advantage of the differential heating (i.e., tumor temperature with respect to surrounding tissue) associated with thermal characteristics of tumors.



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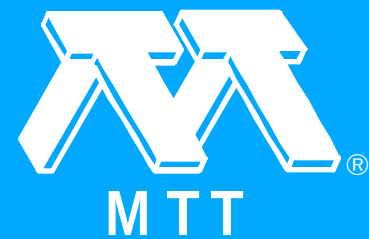
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Microwave Applicators for Localized Hyperthermia Treatment of Malignant Tumors

R.W. Paglione, F. Sterzer, J. Mendecki, E. Friedenthal and C. Botstein. "Microwave Applicators for Localized Hyperthermia Treatment of Malignant Tumors." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 351-354.

Three types of microwave applicators have been developed for treating malignant tumors in humans: waveguide applicators, conformal "bean-bag" applicators using printed circuit antennas, and coaxial applicators. These applicators operate at a frequency of 915 or 2450 MHz and can raise the temperature of tumors to the hyperthermic range of 42.5 to 43.5°C. Encouraging results have been obtained with these applicators in initial clinical trials involving approximately 50 patients.

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Abstracts

A 2450 Mhz Slab-Loaded Direct Contact Applicator with Choke (1980 [MWSYM])

G. Kantor and D.M. Witters. "A 2450 Mhz Slab-Loaded Direct Contact Applicator with Choke (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 355-357.

A Teflon-slab-loaded, direct contact microwave diathermy applicator has been developed. It produces minimal leakage radiation during effective heating of simulated planar tissue models. Because of TEM mode excitation, heating patterns are relatively uniform.



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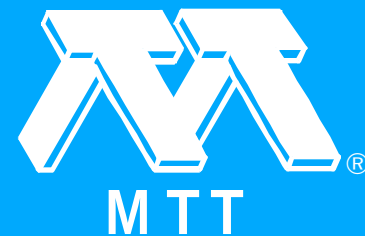


Abstracts

A Microstrip Antenna for Medical Applications

I.J. Bahl, S.S. Stuchly and M.A. Stuchly. "A Microstrip Antenna for Medical Applications." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 358-360.

A ring-type microstrip antenna as a potential microwave power radiator for biomedical applications is discussed. Heating pattern measurements show that the structure is capable of providing relatively uniform heating over a cylindrical volume.



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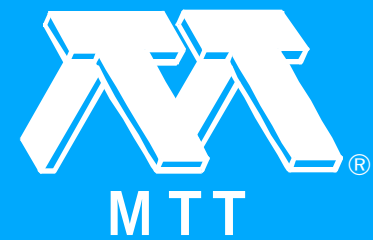
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Abstracts

Session S -- GaAs FET Circuits

"Session S -- GaAs FET Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 361-361.



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A Monolithic GaAs I.F. Amplifier for Integrated Receiver Applications

D.R. Decker, A.K. Gupta, W. Petersen and D.R. Ch'en. "A Monolithic GaAs I.F. Amplifier for Integrated Receiver Applications." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 363-366.

A monolithic GaAs integrated amplifier has been constructed for the 500 to 1000 MHz intermediate frequency band. The amplifier provides 8.0 ± 1.5 dB gain across the band. The output of the amplifier utilizes a source follower configuration to obtain a favorably low output VSWR of less than 1.5:1 (return loss >15 dB). All bias lines with integral bypass capacitors are contained on the chip and this amplifier is suitable for further integration as a building block of a monolithically integrated receiver front end.

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Abstracts

Super Low Noise Packaged GaAs FETs for Ku Band

T. Suzuki, M. Ito, A. Nara, Y. Kadowaki and M. Nakatani. "Super Low Noise Packaged GaAs FETs for Ku Band." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 367-369.

By selecting a high quality GaAs epitaxial wafer and reducing parasitics, packaged FETs with NF/sub min/ of 2.4 dB and G/sub a/ of 7.5 dB at 18 GHz were produced. Using these FETs, a single stage amplifler with NF of 2.7 dB and G of 6.4 dB at 18 GHz was constructed.



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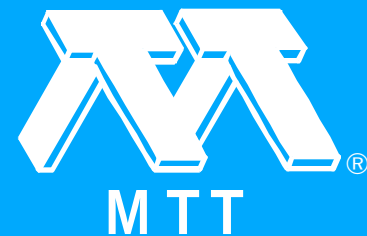


Abstracts

A 12 GHz 140k Low Noise GaAs FET Amplifier

Y. Fujiki, S. Fukuda, I. Haga and K. Ohata. "A 12 GHz 140k Low Noise GaAs FET Amplifier." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 370-372.

A low noise GaAs FET amplifier provided with the noise temperature of less than 140K (NF: 1.71 dB) at -50°C over 11.7 - 12.2 GHz band was developed using GaAs FET's with a recess structure and MIC technology.



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Abstracts

Optimum Large-Signal Design of Fixed-Frequency and Varactor-Tuned GaAs FET Oscillators

C. Rauscher. "Optimum Large-Signal Design of Fixed-Frequency and Varactor-Tuned GaAs FET Oscillators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 373-375.

An efficient technique is described for designing fixed-frequency and varactor-tuned GaAs FET oscillators for optimum large-signal performance. The discussion is centered around obtaining reliable performance predictions without the need to carry out large-signal r.f. measurements on the transistor.



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Abstracts

A Highly Stabilized GaAs FET Oscillator Using a Dielectric Resonator Feedback Circuit in 9-14 GHz (1980 [MWSYM])

T. Mori, O. Ishihara, M. Nakatani and T. Ishii. "A Highly Stabilized GaAs FET Oscillator Using a Dielectric Resonator Feedback Circuit in 9-14 GHz (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 376-378.

A new type of highly stabilized GaAs FET oscillator using a dielectric resonator and a stabilization resistor in the feedback circuit has been developed in 9-14 GHz. A small sized MIC oscillator has a frequency stability of ± 200 KHz ($-20 \sim +60^\circ\text{C}$) at 11.6 GHz.



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Abstracts

Ultra Low Chirp GaAs Dual Gate FET Microwave Oscillators

J.S. Joshi and R.S. Pengelly. "Ultra Low Chirp GaAs Dual Gate FET Microwave Oscillators." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 379-382.

Pulsed RF oscillators using dual gate gallium arsenide FETs have been realised in X and J band frequencies. These oscillators have excellent chirp characteristics. The dual gate MESFET properties which provides such chirp performance are discussed together with experimental results. Further work which needs to be undertaken to improve the performance of these oscillators for practical applications is outlined.



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Abstracts

An Osciplier Up to K-Band Using Dual-Gate GaAs MESFET

A.S. Chu and P.T. Chen. "An Osciplier Up to K-Band Using Dual-Gate GaAs MESFET." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 383-386.

The feasibility of using a dual-gate GaAs MESFET with Mo-Au gates as a Ku or K-band osciplier has been demonstrated. Two test oscipliers were measured, one osciplier in Ku-band delivered 16.3 dBm at 12 GHz, while the other in K-band offered 9.0 dBm output power at 18.2 GHz and 3.8 dBm at 22 GHz.



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Abstracts

GaAs IC Direct-Coupled Amplifiers

D. Hornbuckle. "GaAs IC Direct-Coupled Amplifiers." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 387-389.

Performance of six different direct-coupled GaAs IC amplifiers, with bandwidths up to 4.5 GHz, is described, along with that of one similar ac-coupled amplifier. Statistical data on gain, bandwidth, distortion, and noise is presented. The effectiveness of inductor peaking, resistive loads, and variable feedback is discussed.



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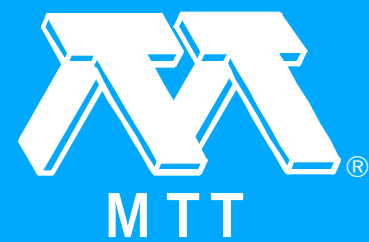
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Synthesis of Distributed Networks with Applications to the Design of Ultra-Wideband GaAs MESFET Power Amplifiers

W.H. Ku and H.A. Willing. "Synthesis of Distributed Networks with Applications to the Design of Ultra-Wideband GaAs MESFET Power Amplifiers." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 390-390.

This paper presents design techniques for the CAD and experimental fabrication of ultra-wideband GaAs MESFET power amplifiers which are directed to ECM and EW system applications. Fundamental gain-bandwidth limitations are derived for state-of-the-art GaAs MESFET power devices. Broadband designs are developed in the 2- to 18-GHz range using analytical and computer-aided optimization techniques. These designs are based upon small- and large-signal device characterization and modeling. Presented are systematic procedures required to arrive at the final designs. Modeling techniques and their utilization as a tool in achieving optimum performance are described. Included in this paper is a discussion of the laboratory methods employed to perform small- and large-signal device characterization and analysis. Experimental results on medium-power MIC amplifiers covering the entire 6-18 GHz frequency band using submicron gate-length MESFET chips are also presented in the paper.

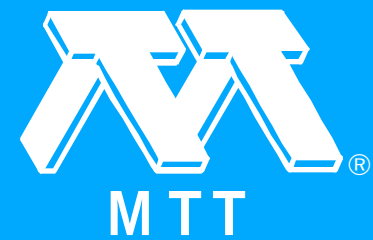
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Abstracts

Session T -- Computer Aided Techniques

"Session T -- Computer Aided Techniques." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 391-391.



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Abstracts

Computer Modeling of Monolithic GaAs IC's

R.L. Van Tuyl, D. Hornbuckle and D.B. Estreich. "Computer Modeling of Monolithic GaAs IC's." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 393-394.

The design of GaAs monolithically integrated circuits in the RF and low microwave frequency range is a process resembling low frequency IC design more than microwave circuit design. These GaAs circuits are directly coupled on-chip in a high-impedance environment. Since tuning and matching elements are not used, the traditional microwave CAD technique of computer optimizing passive element values is not required. Rather, the task of the GaAs IC designer is to predict with computer simulation what the performance of a proposed circuit design will be, then iterate as necessary to achieve the required results.



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Performance Optimization of Millimeter-Wave Mixer Circuits

L. Casner and J. Paul. "Performance Optimization of Millimeter-Wave Mixer Circuits." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 395-397.

The performance optimization of millimeter-wave mixers incorporating GaAS Schottky barrier diodes is investigated in terms of a computer-aided analysis of a waveguide mixer equivalent circuit verified by complex impedance measurements performed directly at the operating frequency of 94 GHz. A complex impedance bridge was devised to measure RF input impedance at an arbitrary reference plane. This was used to examine the embedding effects due to the full diode mounting structure with a matched load or variable position backshort. A parasitic conversion loss optimization program was devised based upon the time invariant elements of the experimentally derived model. Predictions of the model are compared with state-of-the-art mixer performance at 94 GHz.

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



Frequency Scaling for Computer-Aided Fourier Analysis of Mixer Diode Operation

H.C. Lin, N.A. Papanicolaou and J. McClintock. "Frequency Scaling for Computer-Aided Fourier Analysis of Mixer Diode Operation." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 398-400.

The operation of a mixer diode can be computed using Fourier analysis, which is contained in certain CAD programs such as SPICE. When the difference frequency is much smaller than the input and local oscillation frequencies, greater accuracy can be achieved by scaling down the frequency ratio and scaling up the values of the reactive components in the equivalent circuit.



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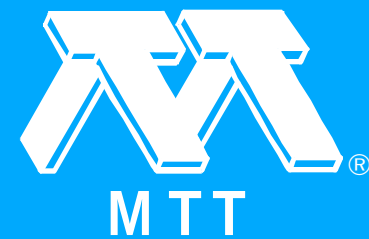


Abstracts

An MLS Simulation Facility

J. Beneke and C.W. Wightman. "An MLS Simulation Facility." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 401-403.

A Microwave Landing System (MLS) simulation facility is described that generates direct and multipath C-band signals suitable for evaluating an airborne receiver. Test scenarios and data reduction are accomplished by a PDP 11/10 computer. Typical test results are presented. Some future applications are considered.



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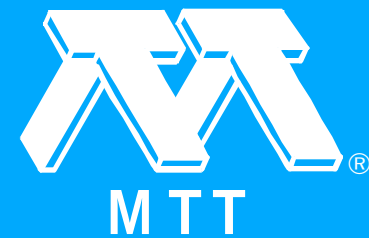


Abstracts

Analysis and Sensitivity Evaluation of 2p-Port Cascaded Networks

J.W. Bandler and M.R.M. Rizk. "Analysis and Sensitivity Evaluation of 2p-Port Cascaded Networks." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 404-406.

An exact analysis approach for efficiently evaluating the response and its sensitivities with respect to all design parameters for cascaded 2p-port networks is presented for any value of p . It is illustrated via a quasi-optical bandpass filter.



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Abstracts

Accurate Models for Microstrip Computer-Aided Design

E. Hammerstad and O. Jensen. "Accurate Models for Microstrip Computer-Aided Design." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 407-409.

Very accurate and simple equations are presented for both single and coupled microstrip lines' electrical parameters, i.e. impedances, effective dielectric constants, and attenuation including the effect of anisotropy in the substrate. For the single microstrip the effects of dispersion and non-zero strip thickness are also included.



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Abstracts

Computer Aided Optimization of Microwave Filter Networks for Space Application

C.M. Kudsia and M.N.S. Swamy. "Computer Aided Optimization of Microwave Filter Networks for Space Application." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 410-412.

An efficient computer-aided optimization procedure is presented to synthesize the general class of microwave filters that can be realized in dual-mode canonical configuration. Tradeoffs for new response functions of such filters for typical satellite requirements are highlighted.



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A New Computer Aid for Microwave Filter Design

G. Szentirmai and L. Besser. "A New Computer Aid for Microwave Filter Design." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 413-416.

A recent development for the synthesis, as well as the analysis, of microwave filters, multiplexers, and impedance matching circuits is described in this paper. The new program offers interactive design of filter networks constructed by commensurate transmission line stubs and unit elements. Lowpass, highpass, bandpass, linear-phase lowpass and band-reject filters can be specified with maximally flat or equal-ripple passband, having monotonic, equal-minimum or arbitrary stopband specifications. If finite transmission zero locations are not known, the program can compute them by an optimization procedure. Circuit topology may also be specified by the user, or the program can generate it internally. At the command level, all the known network manipulations (Norton Transformations, Kuroda Identities including Levy's Extension, etc.) are readily available; additional unit elements may be inserted at the source or the load side to increase the complexity of an existing network. Filter size may be specified by its degree or by the appropriate stopband specifications.

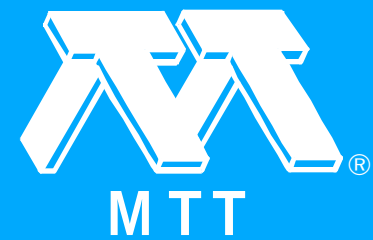
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Abstracts

Session U -- Microwave Measurements

"Session U -- Microwave Measurements." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 417-417.



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Density-Independent Moisture Metering in Fibrous Materials Using a Double Cut-Off Gunn-Oscillator (1980 [MWSYM])

W. Hoppe, W. Meyer and W. Schilz. "Density-Independent Moisture Metering in Fibrous Materials Using a Double Cut-Off Gunn-Oscillator (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 419-421.

A new principle of density independent moisture measurement using microwaves at one frequency is developed. As a first application a double cut-off Gunn-oscillator was build, stabilized by adjacent modes of one measuring cavity containing the moistureous fibrous specimen.

Click on title for a complete paper.



Abstracts

A General Approach to the Resonance Measurement of Asymmetric Microstrip Discontinuities

V. Rizzoli. "A General Approach to the Resonance Measurement of Asymmetric Microstrip Discontinuities." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 422-424.

The paper describes an experimental procedure suitable for broadband characterization of two-port microstrip discontinuities. The resonance frequencies of a cavity embedding the discontinuity under test and of a suitable set of reference resonators are measured and computer processed to obtain the scattering parameters of the discontinuity itself. The method features extreme ease of application thanks to the limited number and simple topology of the required test circuits, as well as highly accurate and repeatable results.



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Accurate and Automatic Noise Figure Measurements with Standard Equipment

N. Kuhn. "Accurate and Automatic Noise Figure Measurements with Standard Equipment." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 425-427.

Noise figure measures the amount of noise a receiver or a component adds to a system. Minimizing such noise, because it obscures low-level signals, is an important concern in most of today's microwave systems. Noise figure measurements are necessary at the device level, the component level and the system level. They are necessary during design, manufacture and maintenance. Yet noise measurements have been fraught with non-repeatability. If, for example, a vendor and his customer are to independently measure noise figure so they agree within 0.2 dB, they each must usually use a specially calibrated noise source and tediously and manually remove several insidious effects that must otherwise be accepted as measurement errors. Even then, they often go through a time-consuming and expensive period of exchanging components and measurement equipment to achieve repeatability from system to system.

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Precision Automated Reflectometer Using Air-Line Spans UHF through Millimeter Ranges

P. Lacy. "Precision Automated Reflectometer Using Air-Line Spans UHF through Millimeter Ranges." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 428-430.

The precision swept frequency reflectometer uses a precisely dimensioned coaxial air-line or waveguide of suitable length for the frequency resolution required as an in situ impedance reference. The unknown impedance at the far end of the above reference creates a rotating unknown reflection phasor at the near or measuring device end of the line during swept frequency measurement. A waveguide reflection measurement is described by Hollway and Somlo and the coaxial arrangement by Lacy and Oldfield.

Click on title for a complete paper.



Transmission Phase Measurements with a Single Six-Port

G.P. Riblet. "Transmission Phase Measurements with a Single Six-Port." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 431-433.

It is well known that two six-ports can be used to measure the S matrix parameters of a two port network. In this paper the point is emphasized that a single six-port is sufficient to measure the transmission phase of such a two port network. The transmission phase is frequently the quantity of most experimental interest. Two methods of measuring transmission phase with a single six-port are described and experimental confirmation is provided at X band (8.2 -12.4 GHz) and Ku band (12.4-18.0 GHz).



Abstracts

A Dual Six-Port Automatic Network Analyzer (1980 [MWSYM])

H.M. Cronson and L. Susman. "A Dual Six-Port Automatic Network Analyzer (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 434-436.

A 2 to 18 GHz dual six-port automatic network analyzer is described. The measurements showed accuracies better than 0.1 dB up to 40 dB insertion loss from 2 to 7 GHz. The cause of deviations at higher frequencies is discussed.



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Abstracts

Optimizing the Design of the Six-Port Junction

M.D. Rafal and W.T. Joines. "Optimizing the Design of the Six-Port Junction." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 437-439.

A set of optimum design objectives for the Six-Port technique is derived from an examination of the system equations. The optimization criterion is to minimize the sensitivity of the solution to calibration errors. The resulting set of design specifications gives significant improvement in error cancellation.



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Abstracts

A Least Squares Solution for Use in the Six-Port Measurement Technique (1980 [MWSYM])

G.F. Engen. "A Least Squares Solution for Use in the Six-Port Measurement Technique (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 440-441.

Because it permits the use of simple amplitude rather than complex ratio detectors, the six-port technique has captured the attention of the microwave community. Here, the determination of complex reflection coefficient, (Γ) is obtained from the intersection of three circles, in the complex plane, whose radii are obtained from the amplitude detectors. As a practical matter, however, these circles will not intersect in a point because of measurement error. This paper addresses two questions: 1) How does one choose Γ in this context, and 2) What can be inferred about the system accuracy from the extent of this intersection failure?



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Abstracts

A 0.01-18 GHz Wide Dynamic Range Precision Vector Ratio Meter

F.K. Weinert. "A 0.01-18 GHz Wide Dynamic Range Precision Vector Ratio Meter." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 442-444.

A dual channel complex vector ratio meter has a greatly improved dynamic range and higher accuracy than presently available Attenuator Calibrators or Network Analyzers. State-of-the-art performance is achieved through the application of a new Parallel IF Vector Substitution principle. It produces measurements in digital form over a 100 dB single step dynamic and display range, has 0.001 dB and 0.01° resolutions for a frequency range 10 MHz to 18 GHz.



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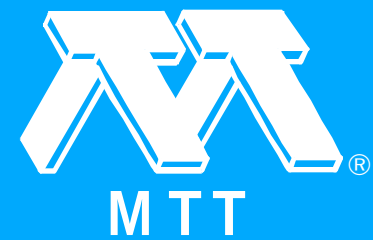
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Abstracts

Session V -- Field Theory (1980 [MWSYM])

"Session V -- Field Theory (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 445-445.



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Abstracts

Frequency Selective Surfaces with Applications in Microwaves and Optics

R. Mittra, C.H. Tsao and W.L. Ko. "Frequency Selective Surfaces with Applications in Microwaves and Optics." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 447-449.

There are numerous applications at microwave and optical frequencies for frequency selective surfaces, e.g., perforated screens which can either be freestanding or printed on dielectric substrates (see Figure 1). At optical frequencies, these surfaces can be used as mirrors for solar power applications, where it is desired to selectively filter out the UV or IR radiation, while retaining the visible range of the spectrum. These surfaces also find important application at far-infrared where they can be used for enhancing the spectral purity of a laser. Other applications at far-infrared include filtering and beam-splitting, as described in a review article by Uhlrich. At microwave frequencies, frequency selective surfaces are employed in radomes and satellite antennas.



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Abstracts

Calculation of Quasi-Static Characteristics of Microstrip on Anisotropic Substrate Using Mapping Method

M. Horno. "Calculation of Quasi-Static Characteristics of Microstrip on Anisotropic Substrate Using Mapping Method." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 450-452.

In this paper a mapping transforms a original microstrip line on anisotropic substrate into another on isotropic dielectric. This method is applied to compute the quasi-static impedance of single microstrip on an anisotropic sapphire substrate.



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Analysis and Application of a New Waveguide Structure with Dielectric Loading

A. Fukasawa, K. Hosoda and T. Sato. "Analysis and Application of a New Waveguide Structure with Dielectric Loading." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 453-455.

A new waveguide structure has been proposed for the design of a distributed constant circuit elements at a lower microwave frequency band. Theoretical and experimental analysis of the structure has been carried out, and it was applied to the design of a compact 850 MHz band radio frequency filter. The equivalent permittivity of the waveguide (ϵ_{eff}) is about half the permittivity of the medium dielectric material (ϵ_r). The amount of coupling between quarter wavelength resonators (the diameter of the dielectric rod is 15 mm and $\epsilon_r = 20$) within the cutoff waveguide (15 mm x 31 mm) is approximately 3×10^{-2} for spacing of 2 mm. Unloaded Q (Q_u) of the resonator is about 1,600 using the dielectric material of which $\tan \delta$ is about 1.4×10^{-4} at 6.3 GHz.

Click on title for a complete paper.



Abstracts

A Hybrid Method for Paraxial Beam Propagation in Multimode Waveguides

E.F. Kuester and D.C. Chang. "A Hybrid Method for Paraxial Beam Propagation in Multimode Waveguides." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 456-458.

A hybrid (non-ray, non-modal) method for computing the fields of a paraxial beam propagating in a multimode waveguide (parallel-plate or dielectric slab) at large axial distances is presented. The method is based on the Fourier and Fresnel self-imaging properties of these waveguides, and is capable of high accuracy. The method is much more efficient than ray or mode approaches, while giving complete field information which coupled-power equations do not provide.



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Abstracts

Exact Analysis of Shielded Microstrip Lines and Bilateral Finlines (1980 [MWSYM])

A.-M.A. El-Sherbiny. "Exact Analysis of Shielded Microstrip Lines and Bilateral Finlines (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 459-464.

An exact analysis is presented for shielded microstrip and bilateral finlines. The method is based on a function theoretic approach to solve a set of functional equations in the Fourier transform domain, representing the independent excitation of LSM and LSE modes in the system without strip or fin conductors. The solution is obtained in the form of highly convergent system of algebraic equations, which allow accurate calculation of fields and electrical parameters of these lines at any given frequency.



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Microstrip Analysis on Anisotropic and/or Inhomogeneous Substrate with the Finite Element Method

M. El Said and A.A. Ahmed. "Microstrip Analysis on Anisotropic and/or Inhomogeneous Substrate with the Finite Element Method." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 465-467.

The finite element method has been applied to solve an open microstrip deposited on anisotropic and/or inhomogeneous substrate in the quasi static case. The results show a reduction in computing time and memory size when compared to other known methods.



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Waveguide Treatment of the Suspended Microstrip Line with Tuning Septums Using the Spectral Domain Approach and the Finite-Element Method

K. Sachse, A. Sawicki, L. Faucon, S. Toutain, J. Citerne, J.P. Villotte, M. Aubourg and Y. Garault. "Waveguide Treatment of the Suspended Microstrip Line with Tuning Septums Using the Spectral Domain Approach and the Finite-Element Method." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 468-470.

The Spectral Domain Approach and the Finite-Element Method are simultaneously used for deriving the frequency dependence of effective dielectric permittivities and of equivalent characteristic impedances of the technically most relevant modes of the suspended microstrip line with tuning septums. The latter numerical technique helps the former one in the choice of well-behaved basis functions for surface currents on the strip and for tangential fields in the slot. The numerical superiority of the Spectral Domain Approach in modes fields computations is demonstrated.

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Abstracts

Attenuation in Microstrip Transmission Lines with Very Lossy Substrates

B.W. Jervis, R.M. Pannell and J.A.H. Steeden. "Attenuation in Microstrip Transmission Lines with Very Lossy Substrates." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 471-473.

The design and development of microstrip-based attenuators suitable for broad-band applications is described. Expressions are derived for the propagation constant and characteristic impedance of attenuating sections of microstrip. Some practical results are also given.



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Session W -- Microwave IC Components

"Session W -- Microwave IC Components." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 475-475.



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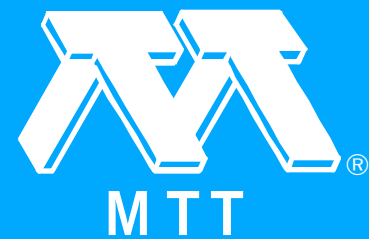
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A Spiral Microwave Directional Coupler for MIC Application

K. Shibata, K. Hatori, Y. Tokumitsu and H. Komizo. "A Spiral Microwave Directional Coupler for MIC Application." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 477-479.

A new spiral-shaped directional coupler for MIC is proposed. The feature is the compact size and the tight coupling with wide strip spacing. The analysis, design chart and test results are given.

Click on title for a complete paper.



Abstracts

Wide-Band High Directivity in MIC Proximity Couplers by Planar Means

F.C. de Ronde. "Wide-Band High Directivity in MIC Proximity Couplers by Planar Means." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 480-482.

A simple semi-empirical design method has been developed for serpentine -improved wiggling- and slotting of proximity couplers. Phase equalization of even-and odd mode resulted in 40 dB isolation from 2-8 GHz for 25 mil alumina couplers between -6 and -25 dB. Coupling values were within 1 dB with experimental ones.



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Abstracts

Planar, Multiport, Quadrature-Like Power Dividers/Combiners

A.A.M. Saleh. "Planar, Multiport, Quadrature-Like Power Dividers/Combiners." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 483-486.

A class of planar, multiport power dividers/combiners is presented that is a generalization of the familiar branch-line, 3-dB, quadrature hybrid. They are suitable for combining an arbitrary number of identical one-port or two-port devices while maintaining a match at the input port.



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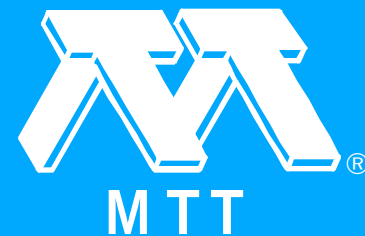


Abstracts

The Traveling Wave Power Divider/Combiner

A.G. Bert and D. Kaminsky. "The Traveling Wave Power Divider/Combiner." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 487-489.

A power divider/combiner circuit designed for application to octave bandwidth microstrip power transistor amplifier is presented. Circuit characteristics, design and advantages are discussed. Experimental results on a 4-way divider are presented and compared with theory.



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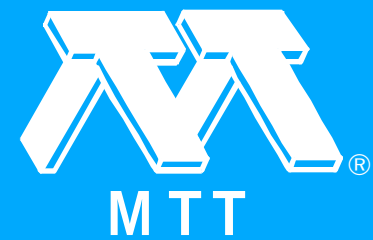
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Abstracts

Session X -- Microwave Systems - 2

"Session X -- Microwave Systems - 2." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 491-491.



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Abstracts

A Comprehensive Characterization of FET Power Amplifier Modules

C. Wong and J. Bender. "A Comprehensive Characterization of FET Power Amplifier Modules." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 493-495.

This paper reports on an investigation of the pertinent parameters of X-band GaAs FET power amplifier modules operating in both CW and pulse mode. Power compression, efficiency, AM/PM, bias sensitivities, output VSWR, AM and FM noise, IMD, harmonics, temperature, pulsewidth, duty cycle, intrapulse and interpulse data are presented.



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Abstracts

A 25 Watt, 5 GHz GaAs FET Amplifier for MLS

Y. Takayama and K. Honjo. "A 25 Watt, 5 GHz GaAs FET Amplifier for MLS." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 496-498.

A 25-Watt, 29-dB gain, 5-GHz FET amplifier for the transmitter in the Microwave Landing System has been developed using practical GaAs FETs assembled in ceramic packages with internal matching networks. This four-stage amplifier provides 30-Watt power output with 18.5% power efficiency at 17 dBm power input level.



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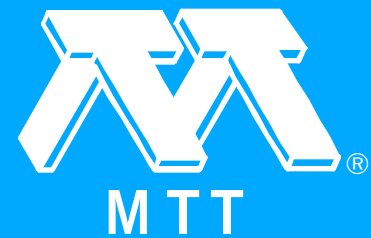


Abstracts

Very Linear X-Band MIC Bipolar VCO with 100MHz FM Rate

R.G. Winch and J.L. Matson. "Very Linear X-Band MIC Bipolar VCO with 100MHz FM Rate." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 499-500.

This paper describes a microstrip, doubling mode bipolar transistor oscillator (oscipier), varactor tunable over 8- 10GHz with an output power of 12dBm $\pm$ 1dB. It has an FM rate of 100MHz with a set-on accuracy of $\pm$ 8MHz from perfect linearity (i.e. $\pm$ 0.1%) and frequency pulling $\pm$ 1MHz into a 2:1 mismatched load. Power flatness and frequency pulling immunity is achieved using a two stage GaAS FET buffer/limiter. It maintains these specifications over a temperature range of -54°C to 100°C.



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Short-Range Microstrip Doppler Radar Sensor Using a BARITT Diode

B.M. Armstrong, R. Brown, E.J. Duffin and J.A.C. Stewart. "Short-Range Microstrip Doppler Radar Sensor Using a BARITT Diode." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 501-503.

In some short-range radars, the range and velocity of a moving target are required, in addition to target speed. A short-range radar (30 m) is described, which, by combining the duplex mode of operation with the use of a BARITT diode as a self-oscillating mixer in a microstrip circuit, provides the required information with a very simple microwave sensor.

Abstracts

Exhibition Guide (1980 [MWSYM])

"Exhibition Guide (1980 [MWSYM])." 1980 MTT-S International Microwave Symposium Digest 80.1 (1980 [MWSYM]): 505-508.



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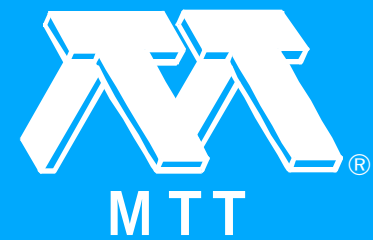
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