

Microwave Digital Archive

IEEE Microwave Theory and Techniques Society

1982-1984

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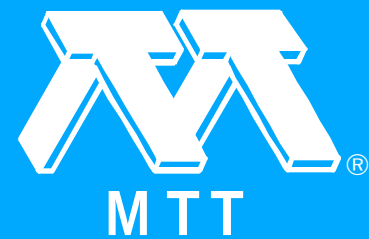
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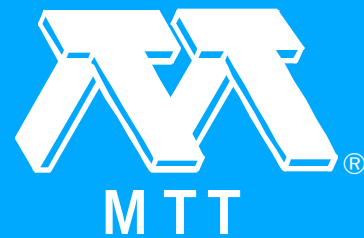
ACKNOWLEDGMENTS

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

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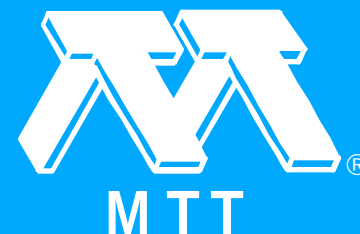
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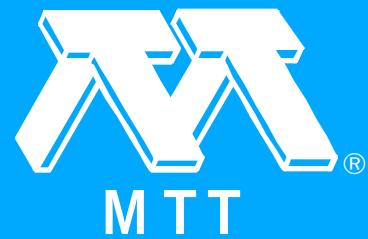
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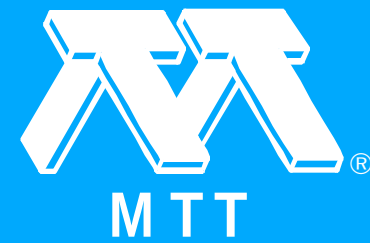
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INTRODUCTION

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.

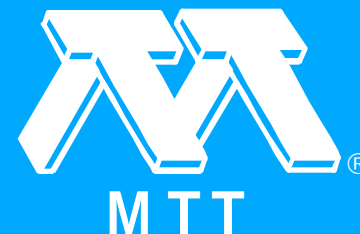


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To make viewing and searching easier, we recommend changing two default Acrobat Preferences (found under File > Preferences on the menu bar.)



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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

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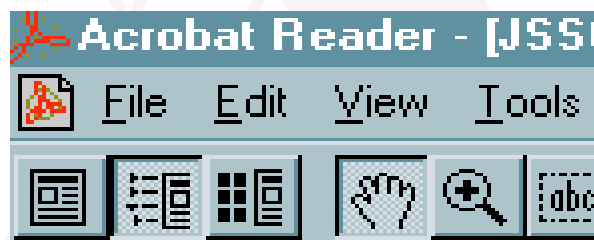
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USING BOOKMARKS

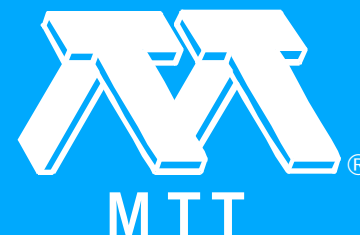
In addition to links, you can navigate through the Electronic Guide using Bookmarks. If they are not already visible, choose View > Bookmarks and Page from the menu bar or press the “Display Page and Bookmarks” button on the tool bar. A panel opens on the left side of the screen displaying Bookmarks 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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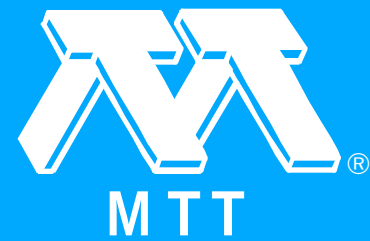
Articles may have text outside normal print-area defaults. We recommend selecting “Shrink to Fit” in the print menu (File > Print) to capture the complete image for your printout. This setting will become your new default.

SELECTING GRAPHICS

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

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

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



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NAVIGATION BUTTONS

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

Section Map

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

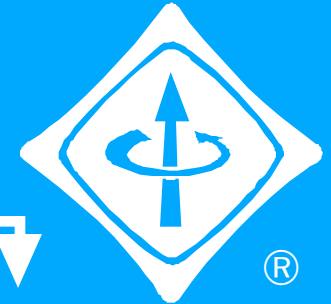
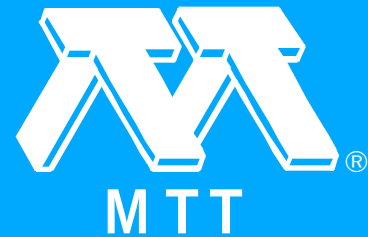
Next Page button

Click to advance to the next page in the section.

Previous Page button

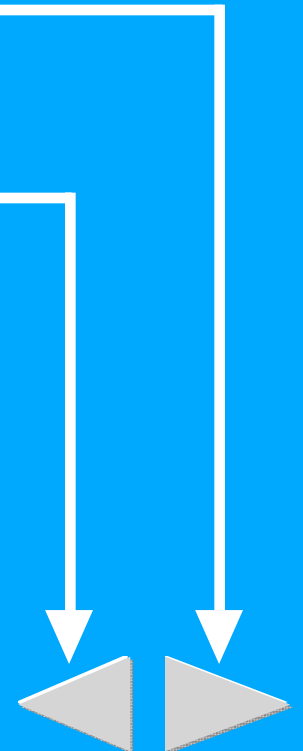
Click to go back to the previous page in the section. The first and last pages of a section show only one button.

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



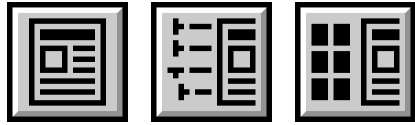
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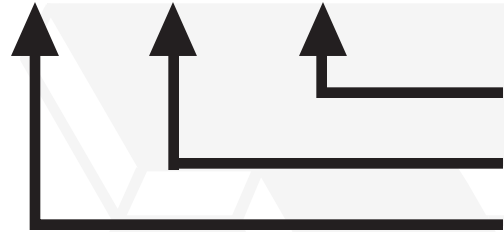


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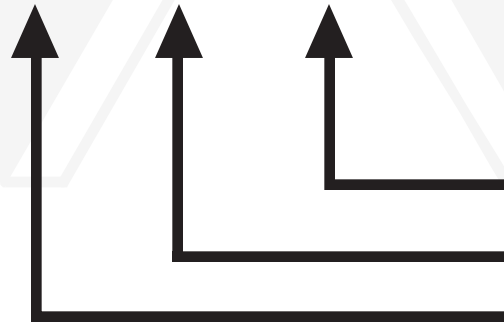
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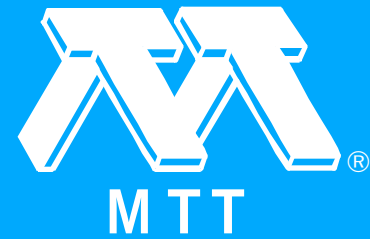
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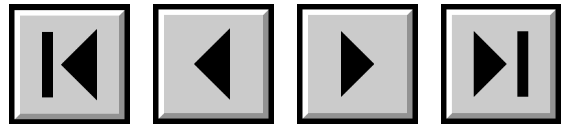
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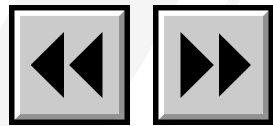
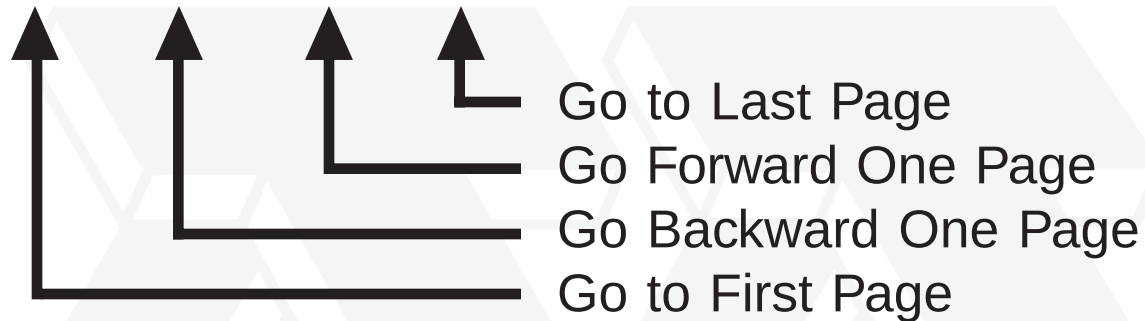


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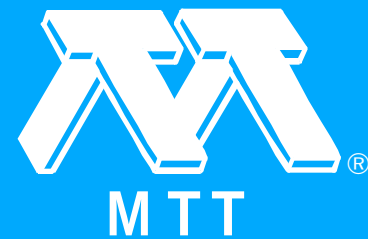
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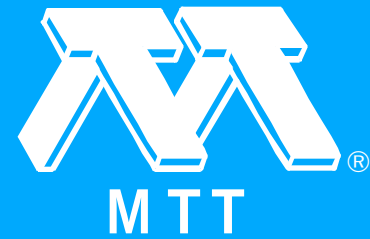
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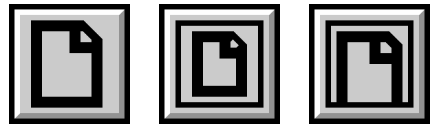
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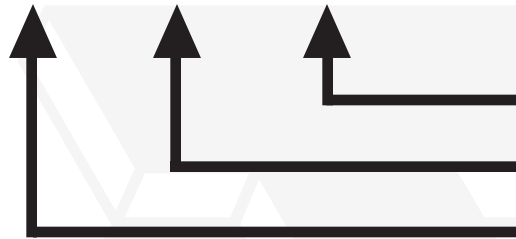
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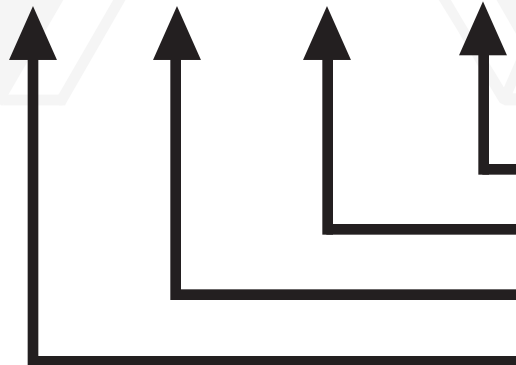
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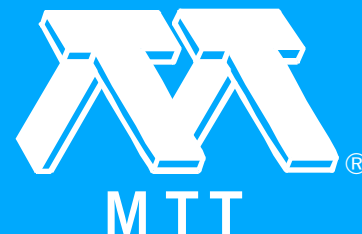
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SEARCHING

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.



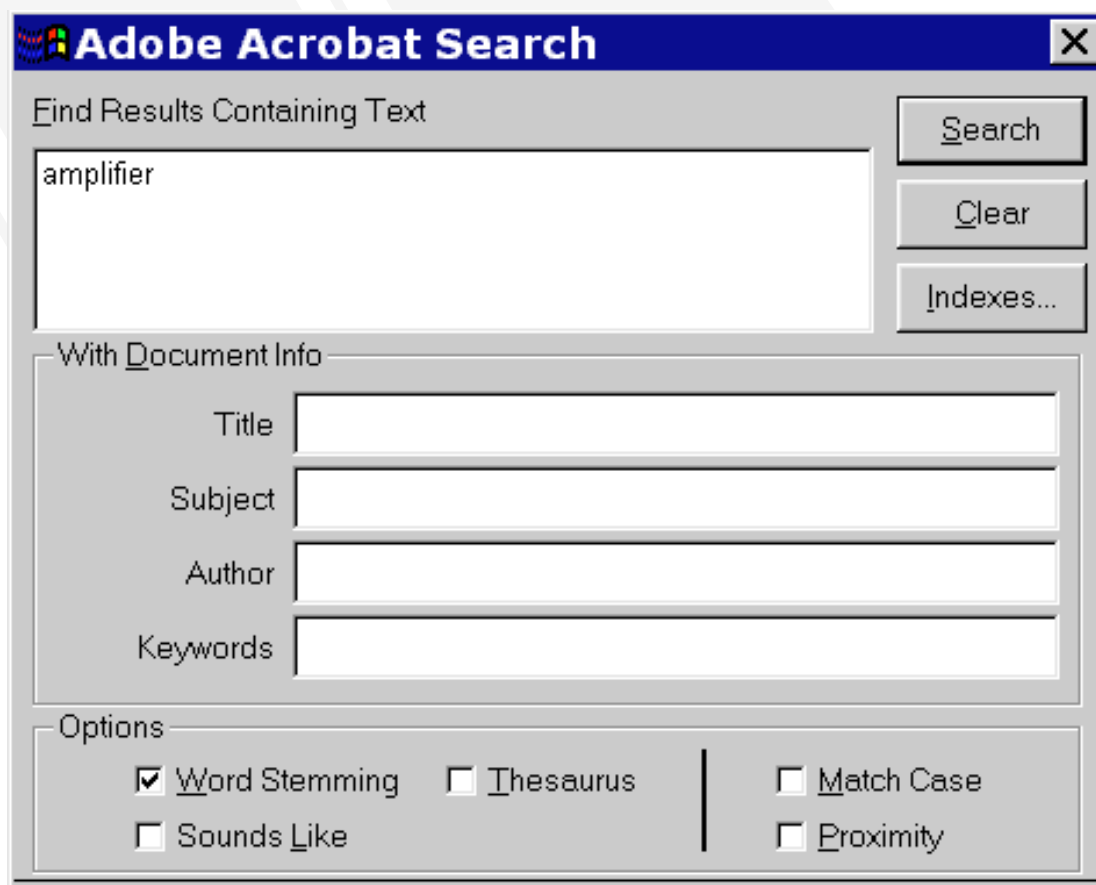
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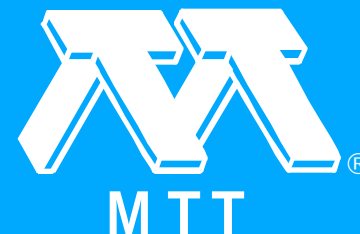
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If you are not finding files you think should show in the results list, Acrobat may not be attached to the correct index file. To check, press the “Indexes...” button for a list of available indexes. If this title is not listed, press the “Add...” 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 the main input field 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). The 'Proximity' checkbox is also present but is partially obscured by the bottom edge of the dialog box.



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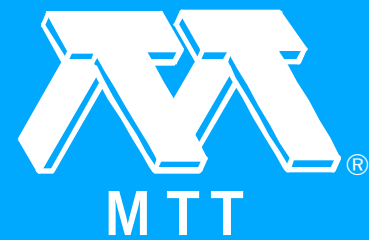


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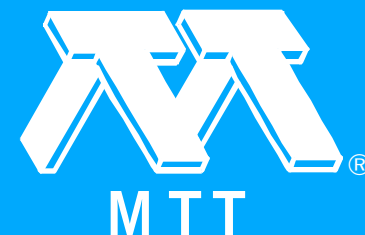
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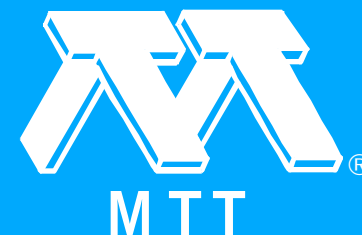
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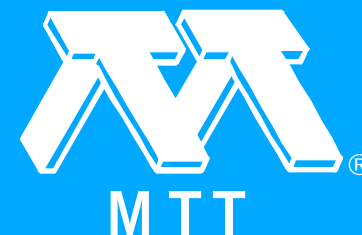
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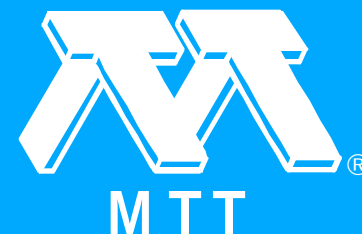
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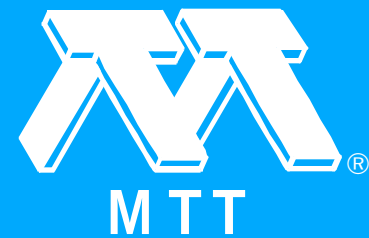
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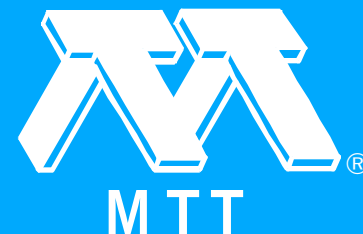
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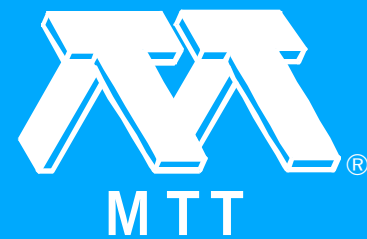
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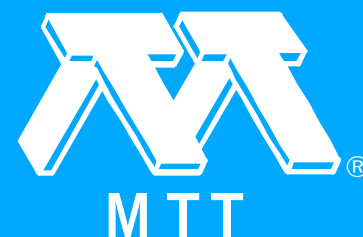
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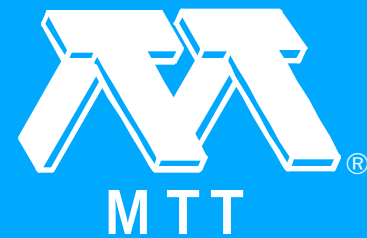
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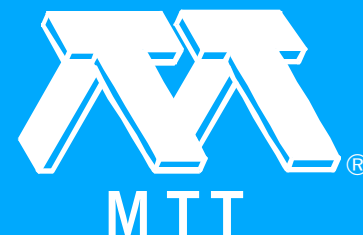
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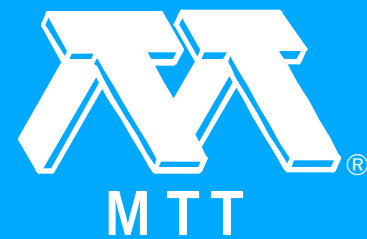
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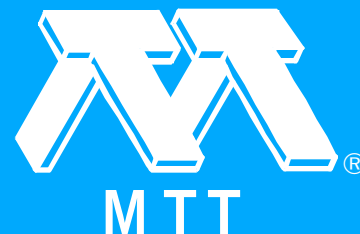


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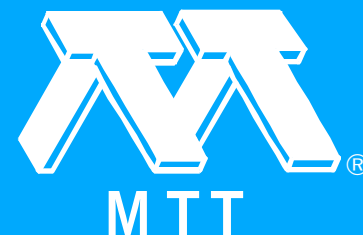
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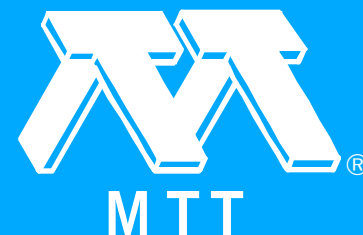


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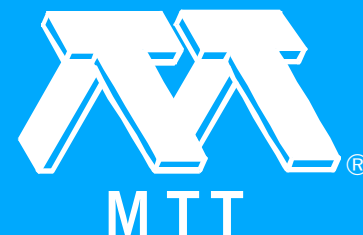
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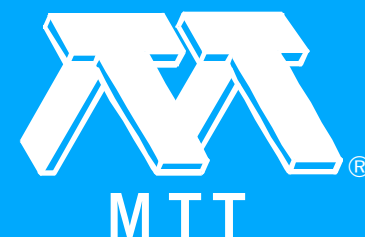
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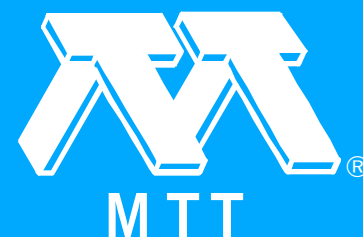
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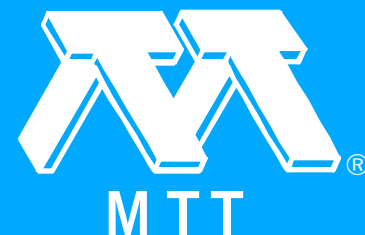
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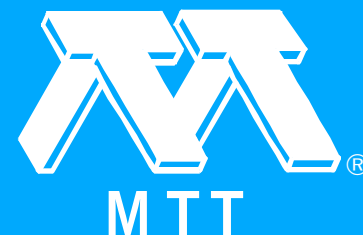
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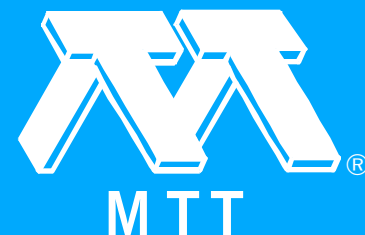
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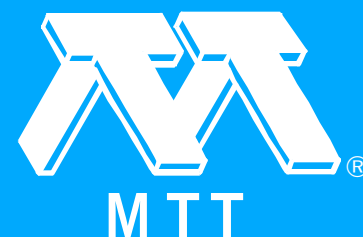
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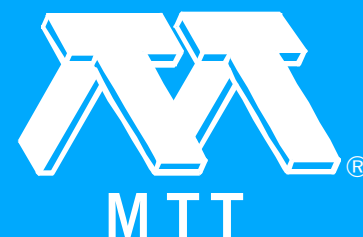
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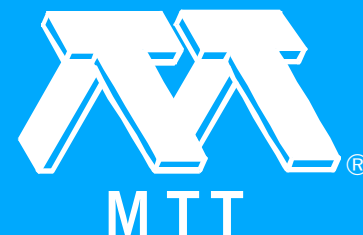
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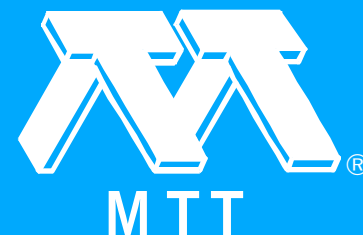
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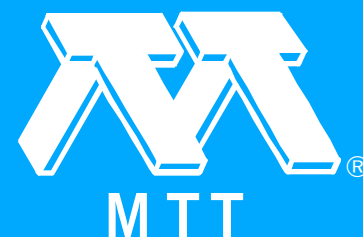
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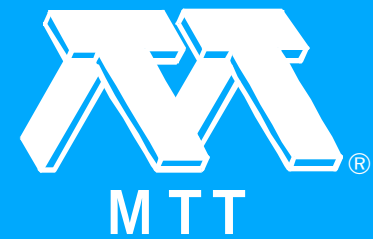
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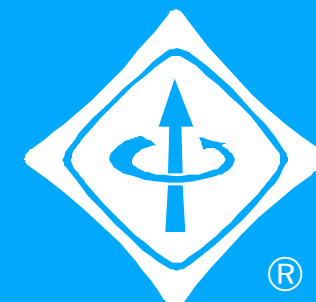
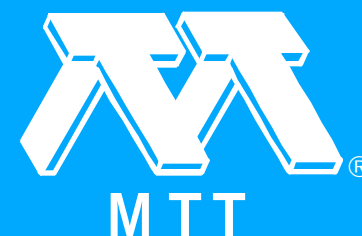
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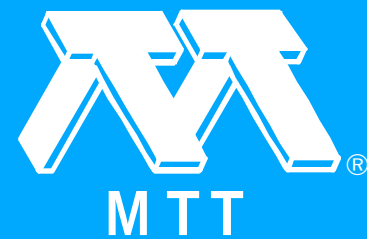
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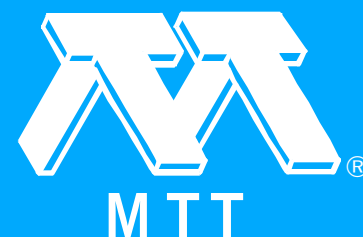
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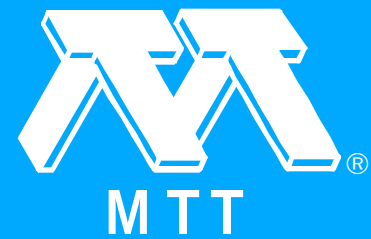
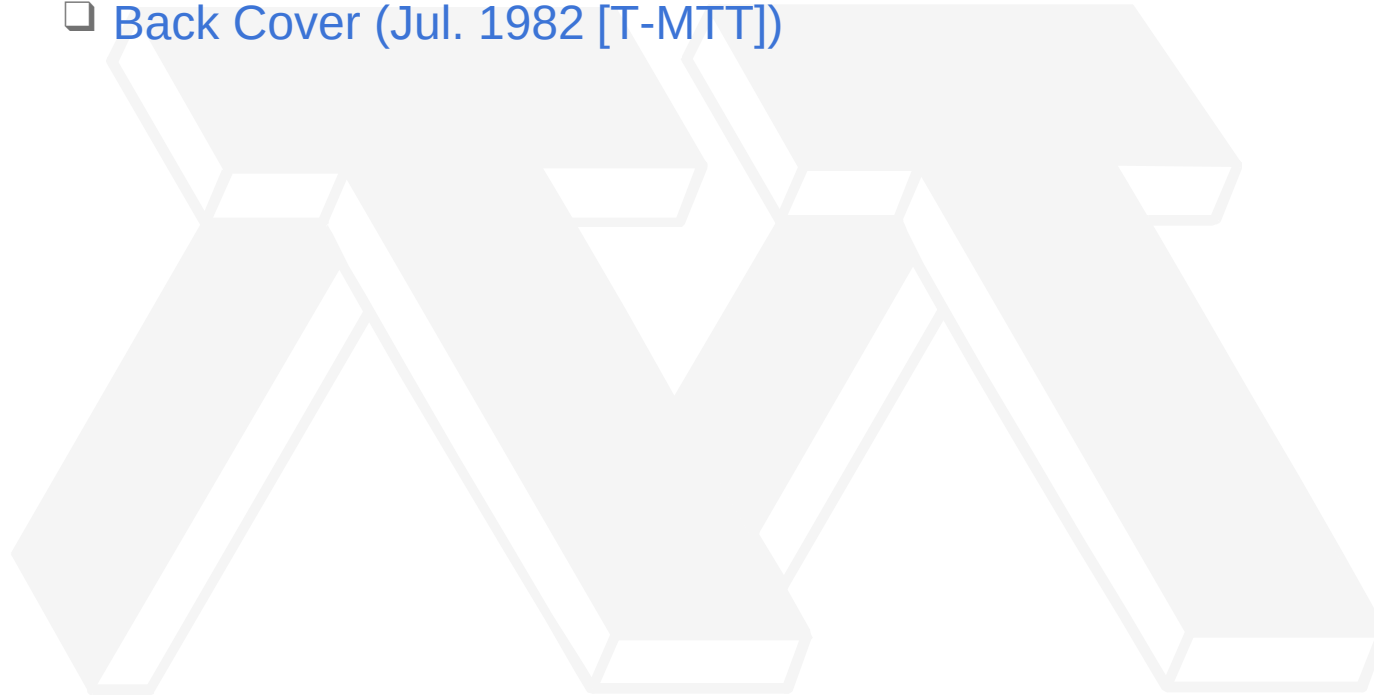
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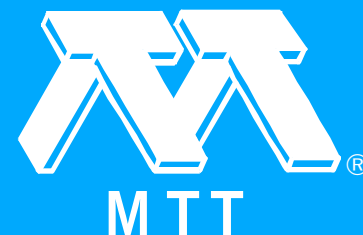
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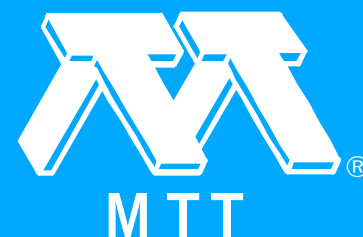
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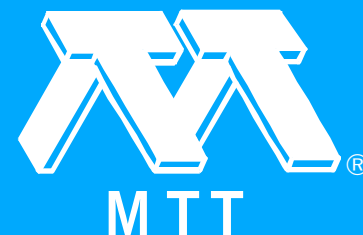
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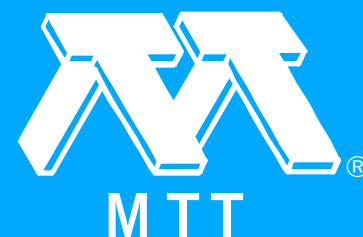
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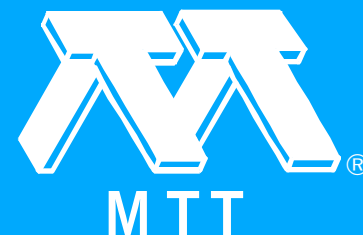


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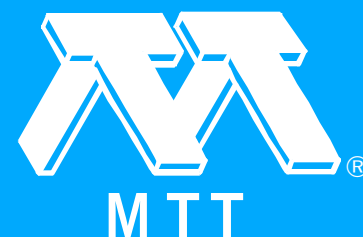
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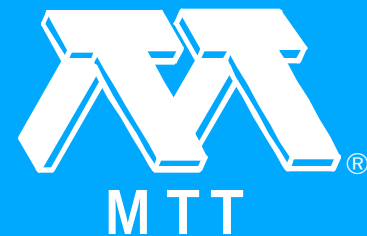
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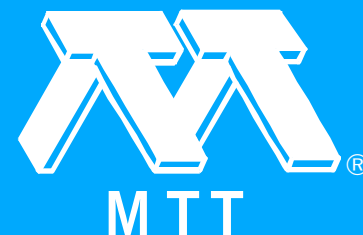
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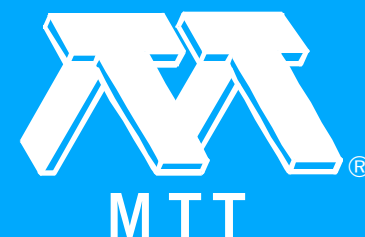
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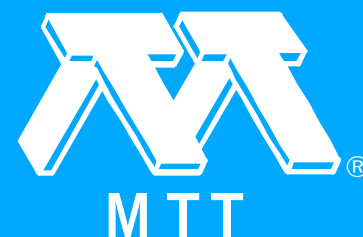
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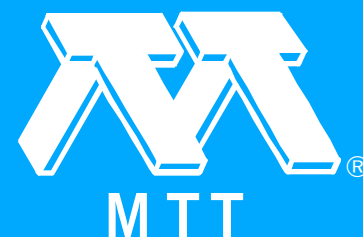
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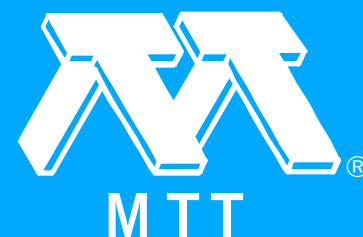
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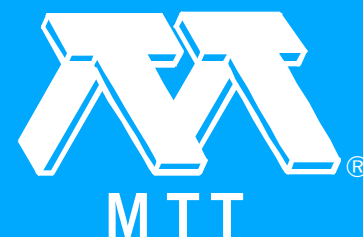
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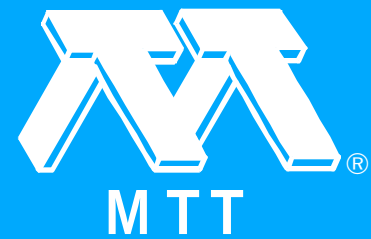
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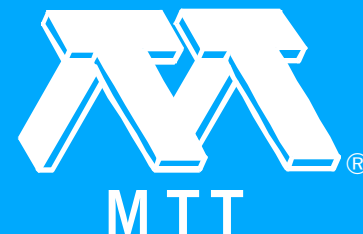
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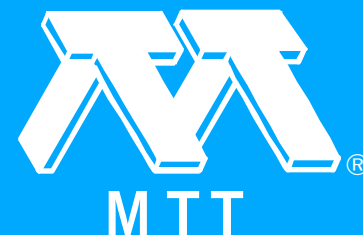
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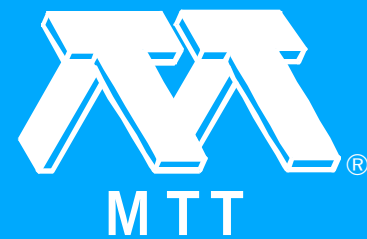
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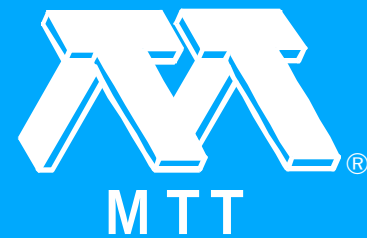
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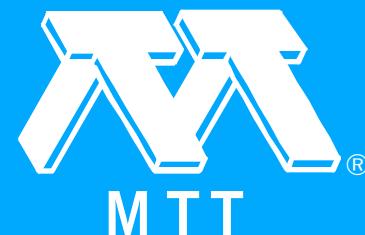
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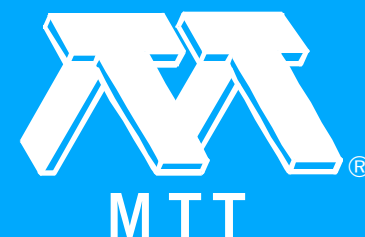
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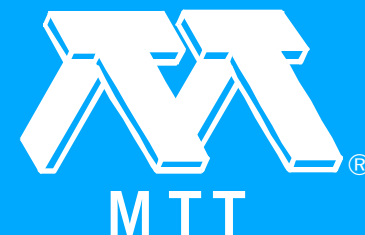
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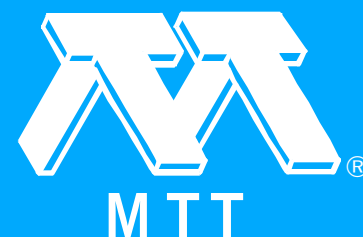
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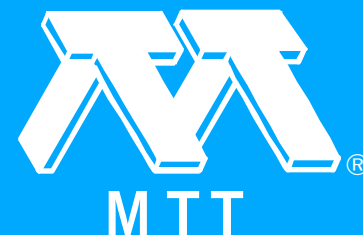
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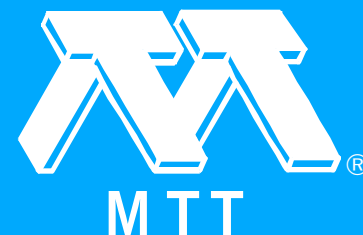
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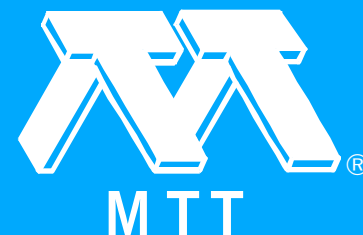
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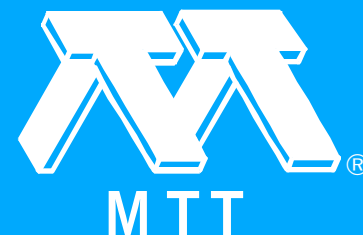
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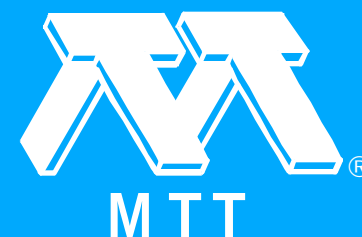
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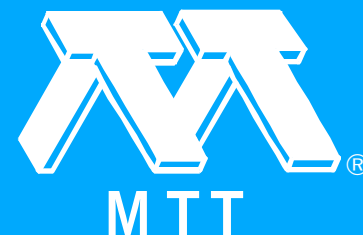
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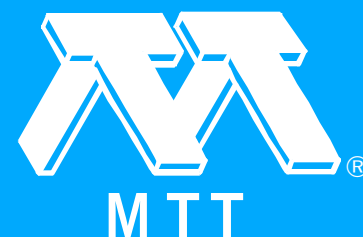
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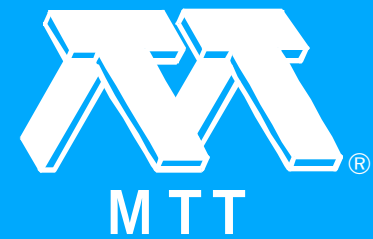
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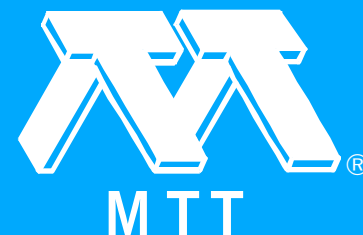
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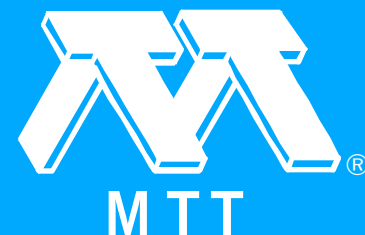
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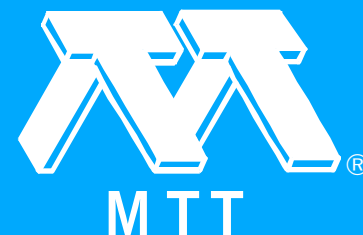
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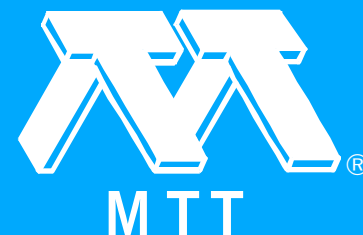
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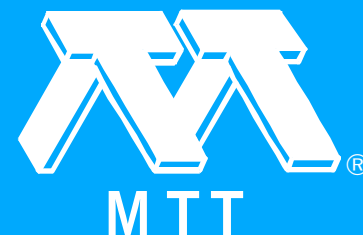
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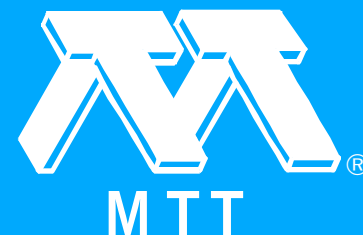
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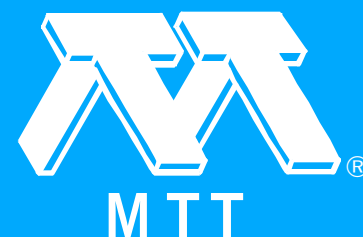
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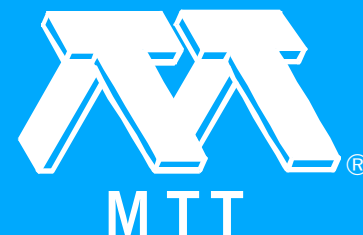
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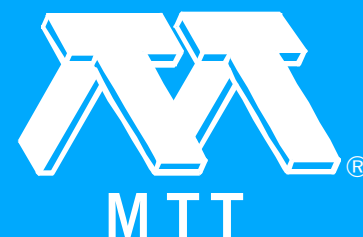
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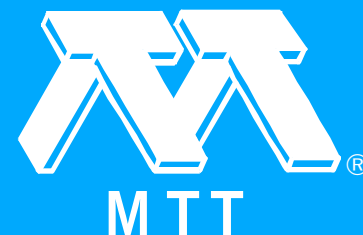
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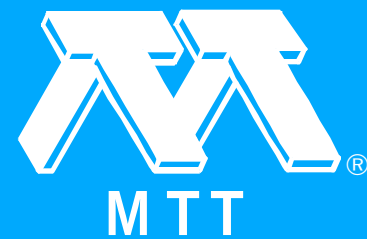
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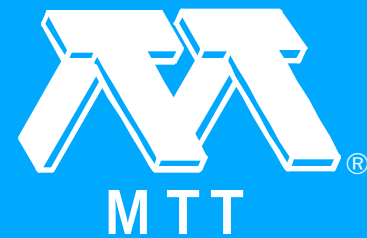
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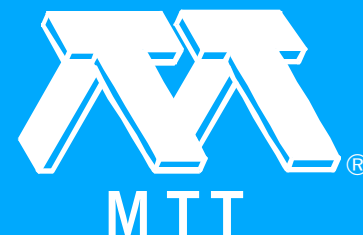
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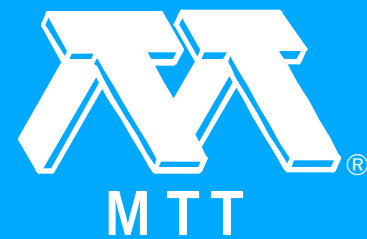
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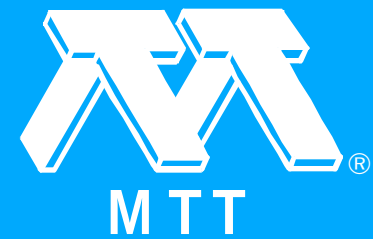
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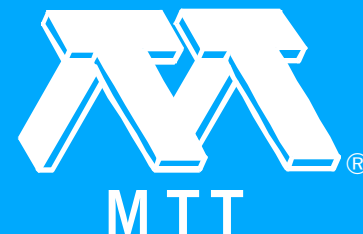
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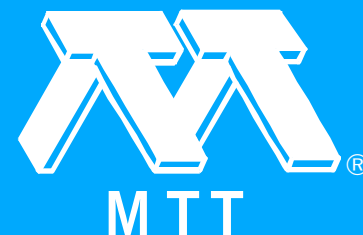
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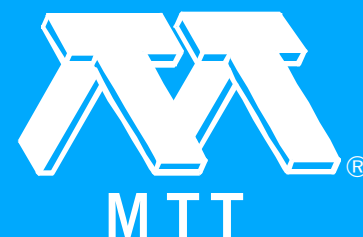
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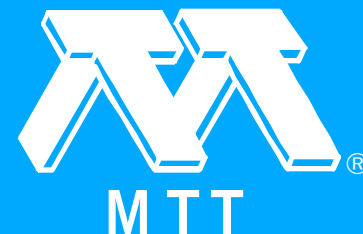
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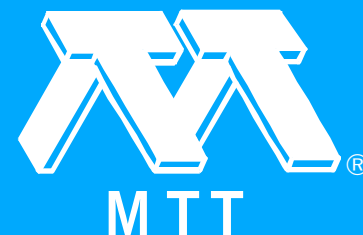
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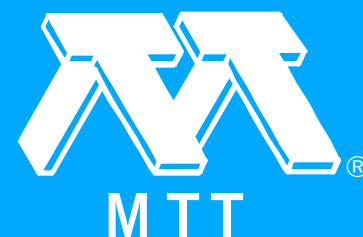
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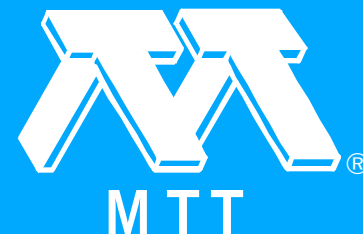
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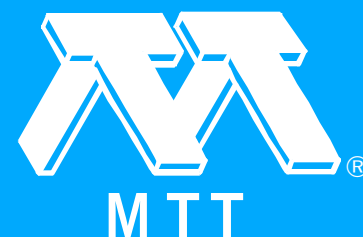
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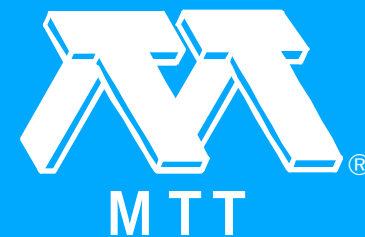
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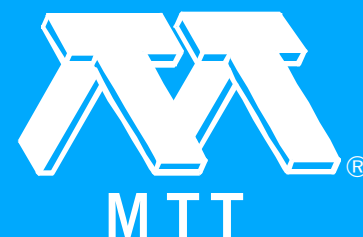
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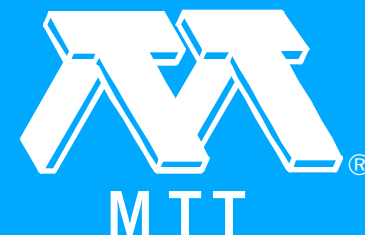
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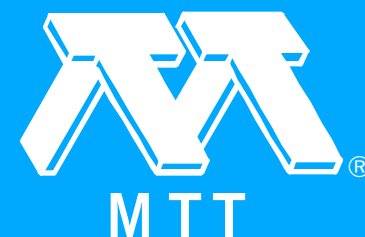
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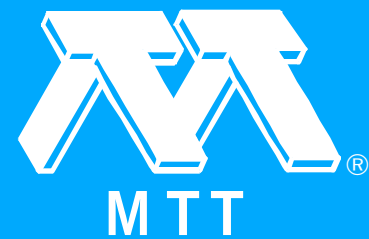
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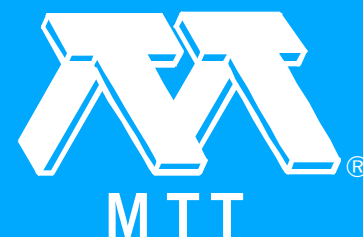
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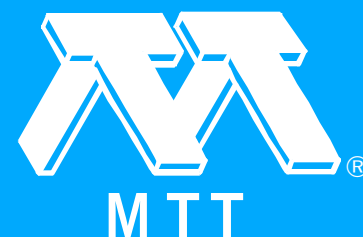
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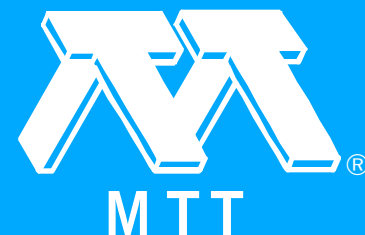
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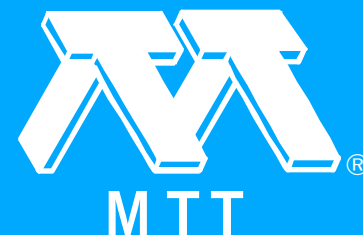
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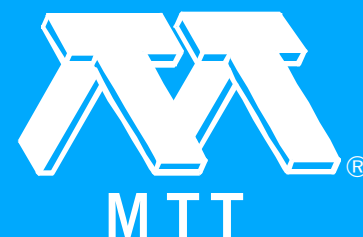
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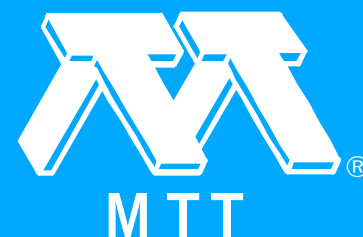
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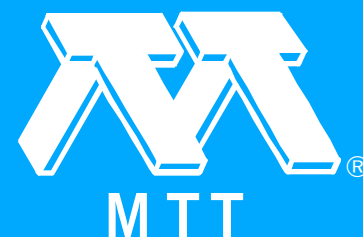
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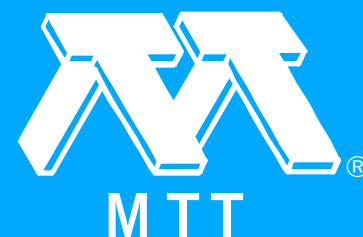
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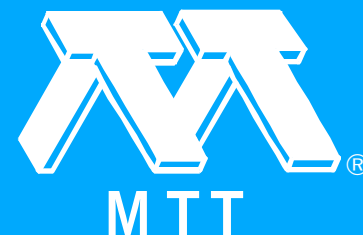
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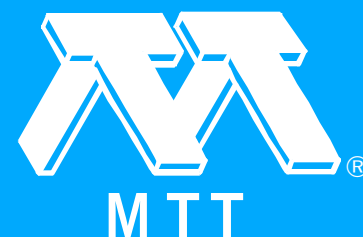
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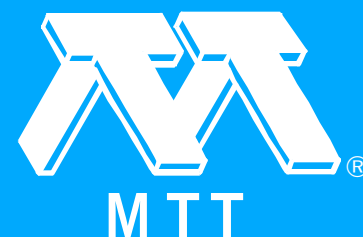
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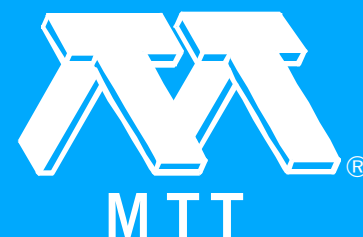
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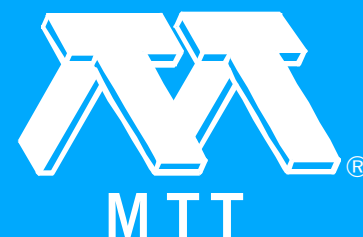
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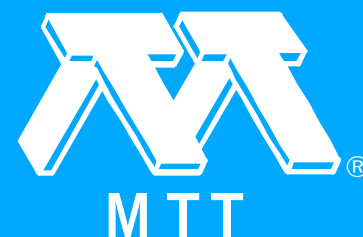
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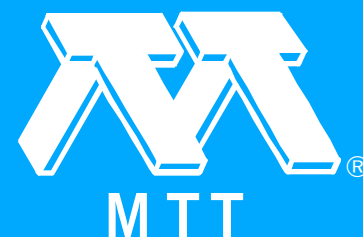
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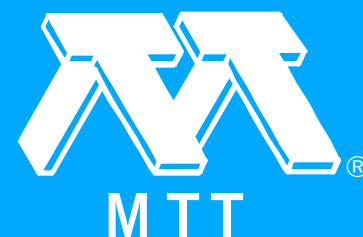
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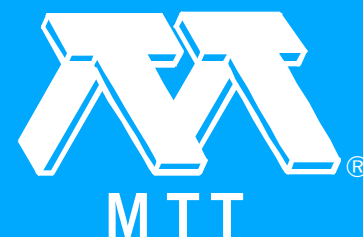
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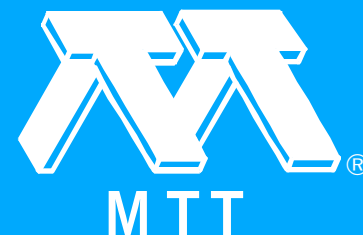


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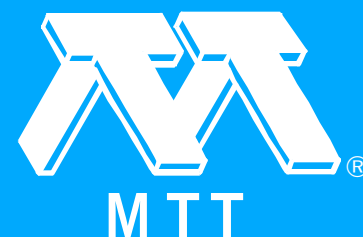
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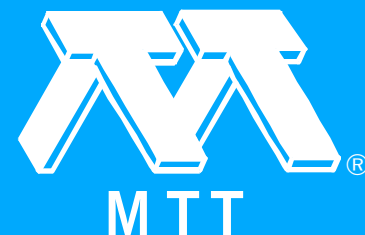
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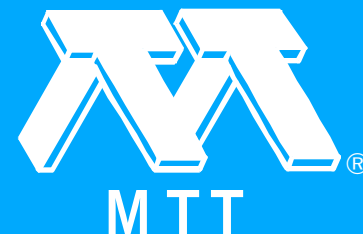


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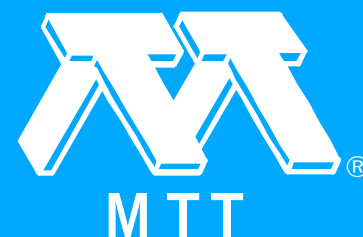
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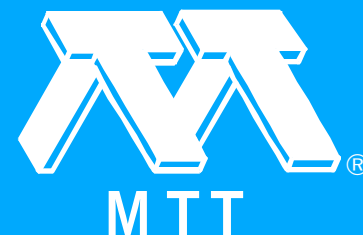
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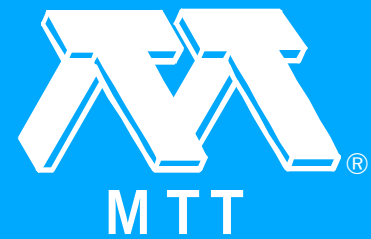
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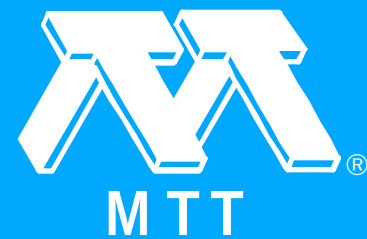
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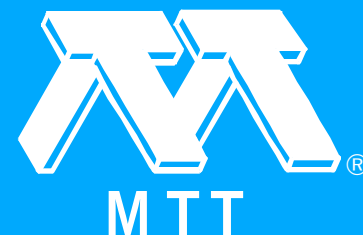
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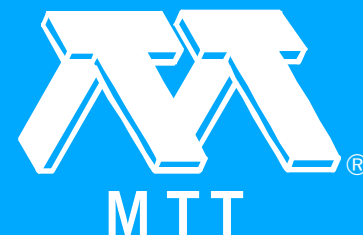
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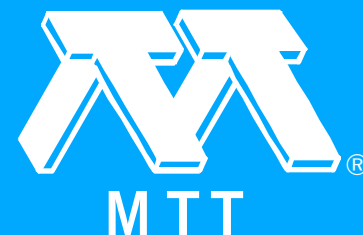
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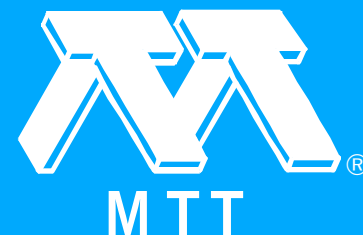
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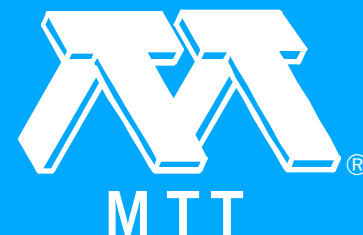
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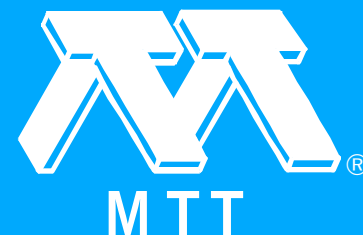
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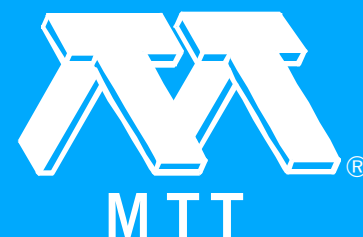
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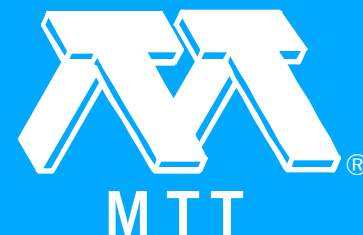
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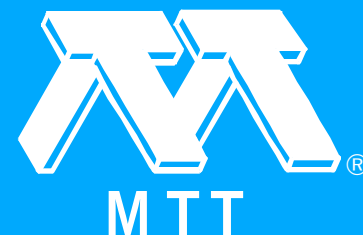
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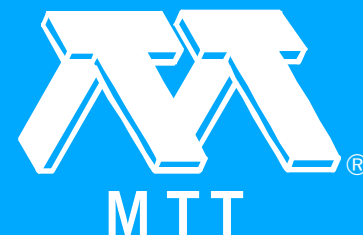
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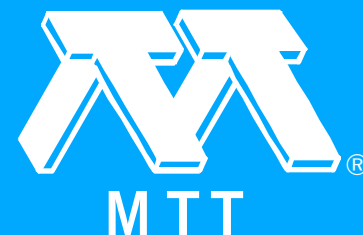
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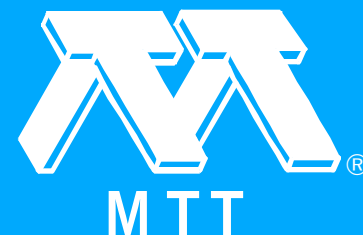
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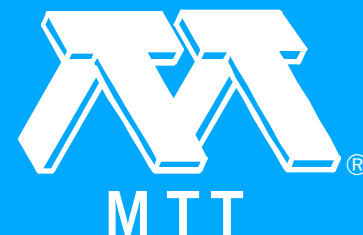
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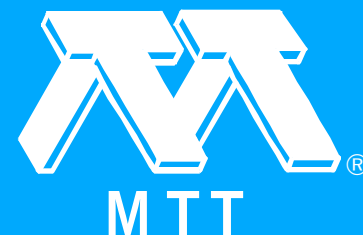
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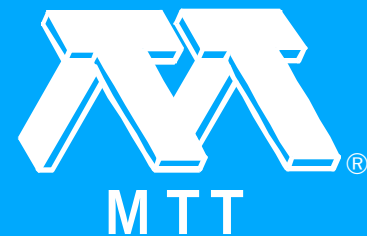
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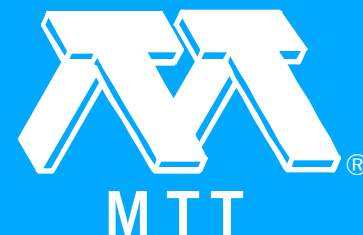
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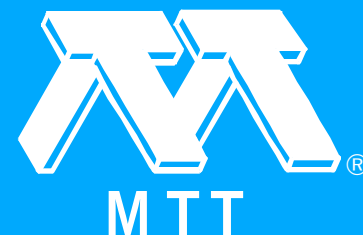
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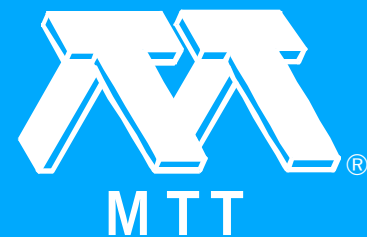
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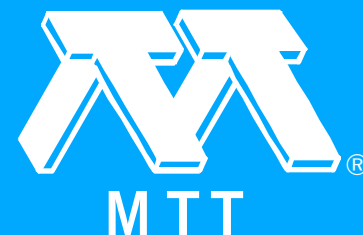
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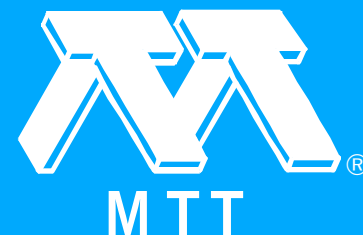
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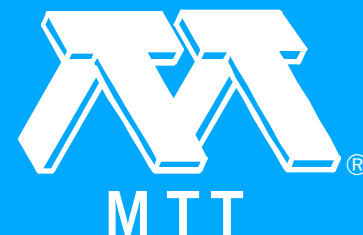
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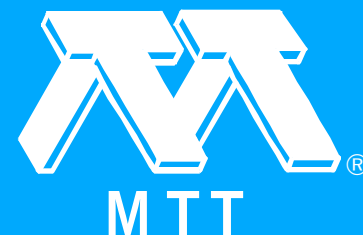
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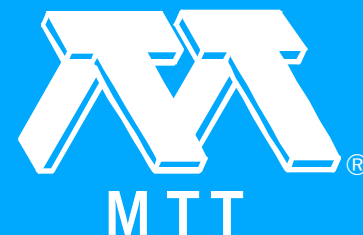
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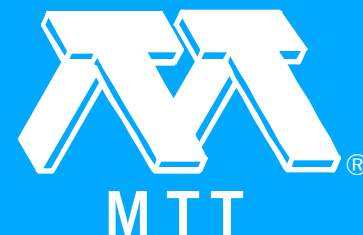
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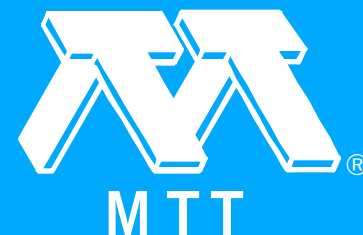
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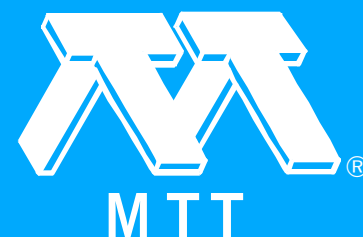
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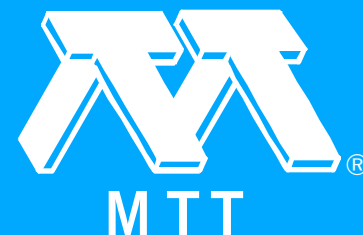
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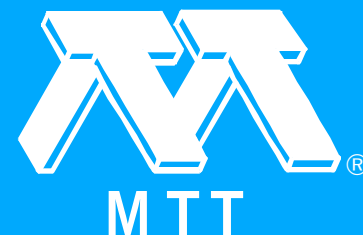
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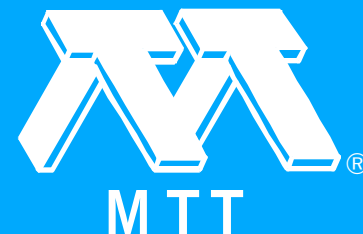
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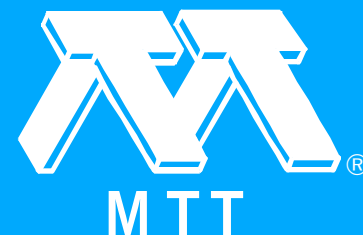
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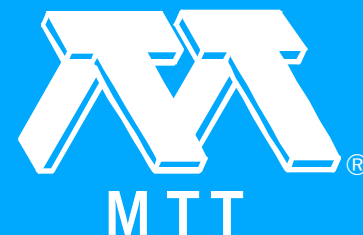
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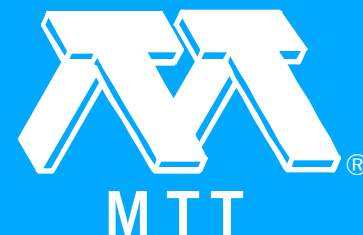
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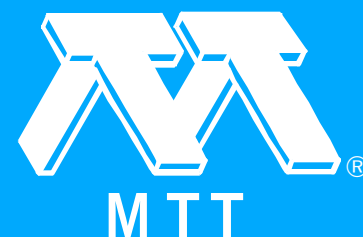
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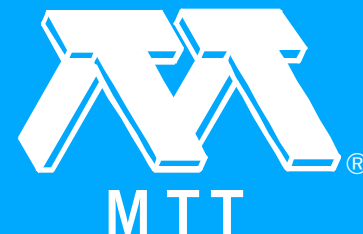
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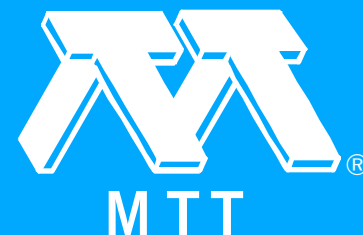
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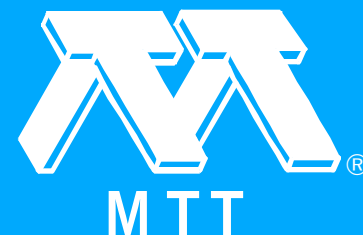
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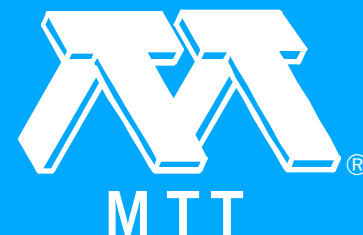
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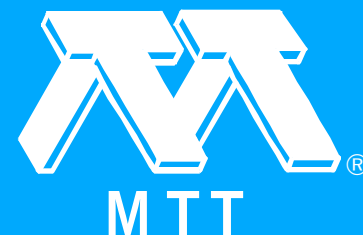
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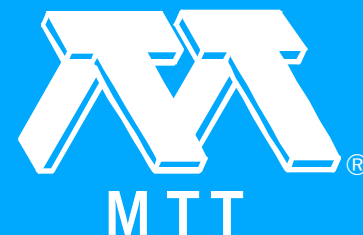
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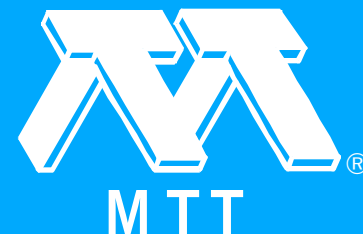
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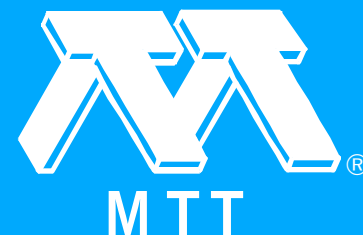
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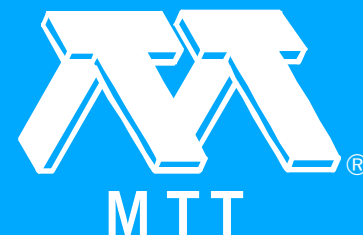
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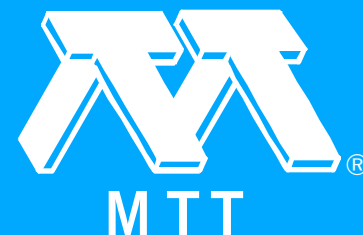
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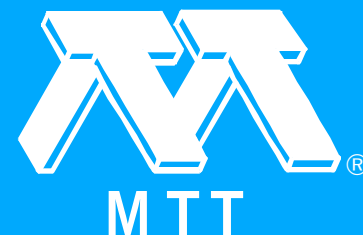
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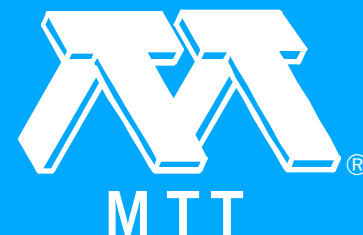
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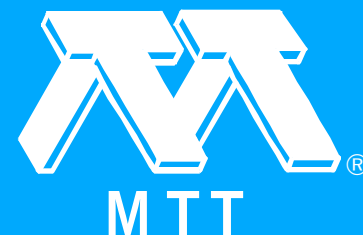
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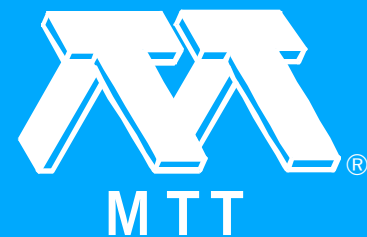
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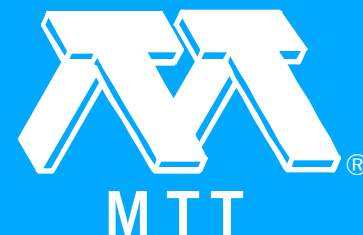
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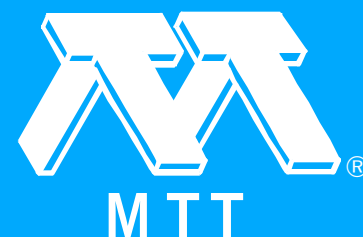
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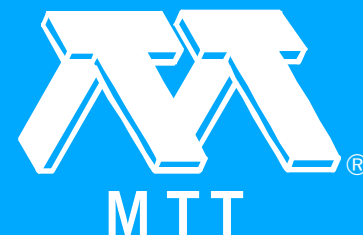
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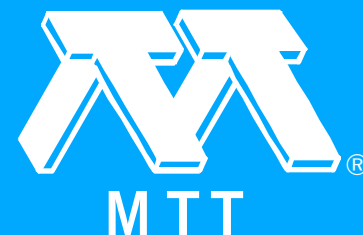
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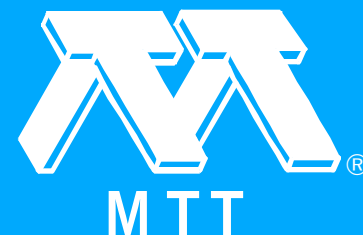
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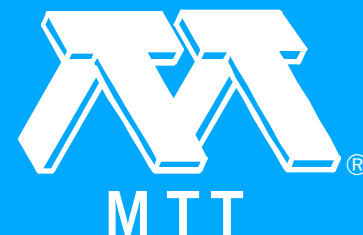
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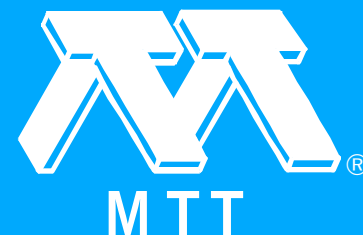
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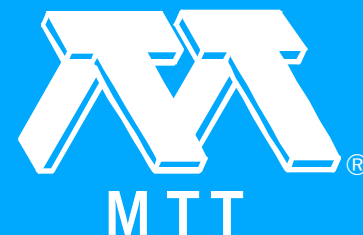
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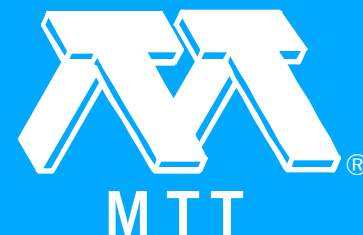
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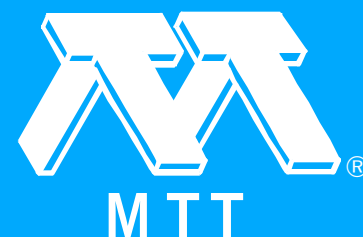
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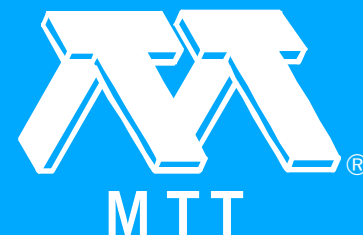
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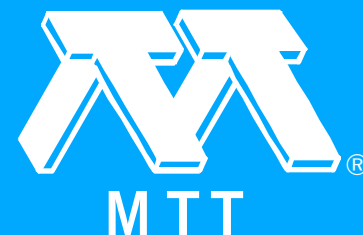
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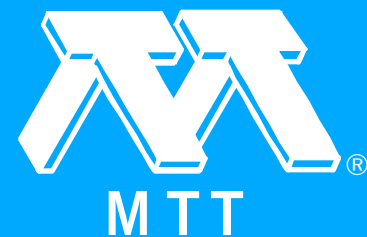
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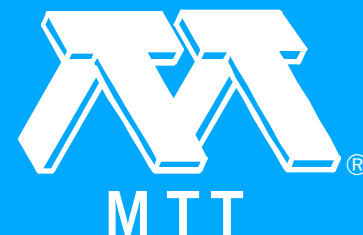
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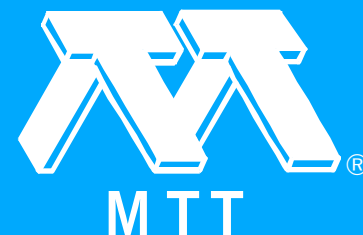


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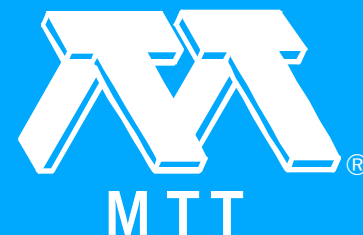
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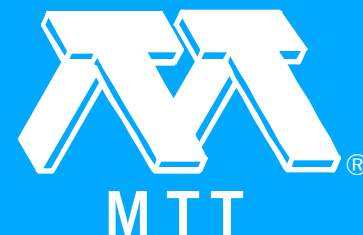
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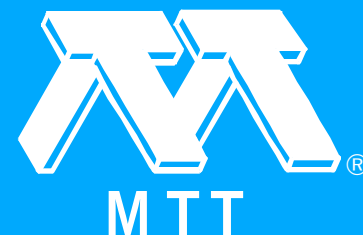
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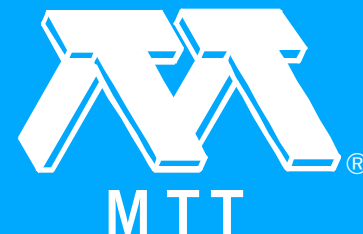
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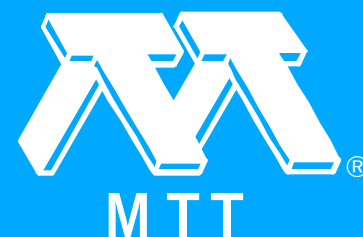
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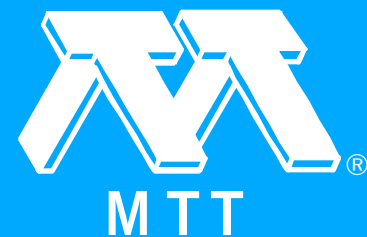
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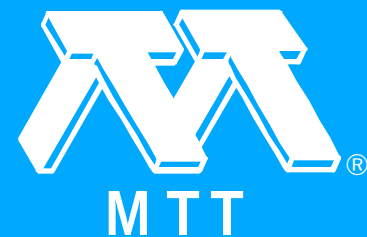
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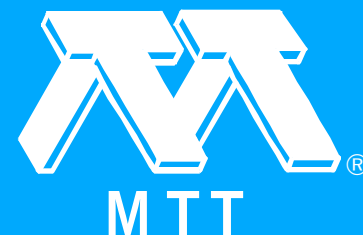
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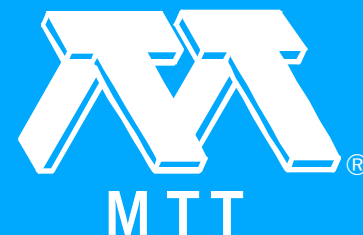
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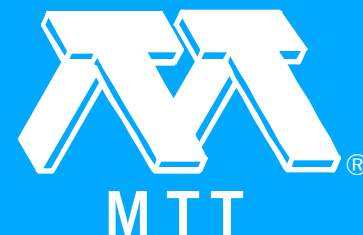
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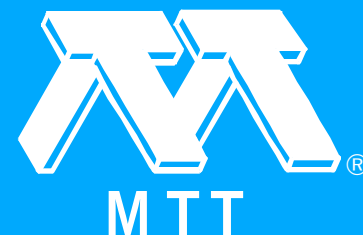
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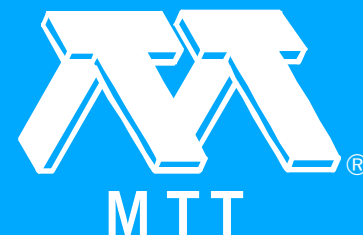
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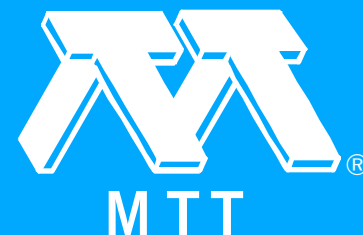
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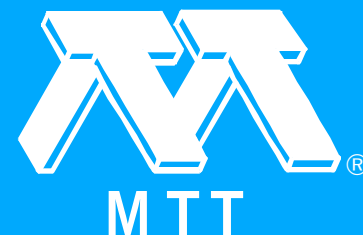
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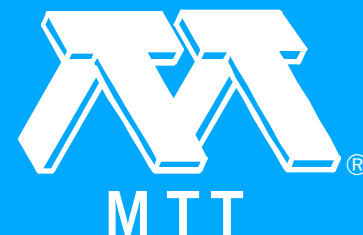
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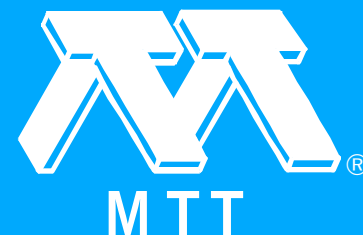
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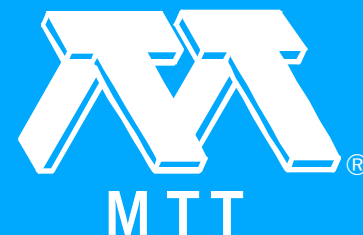
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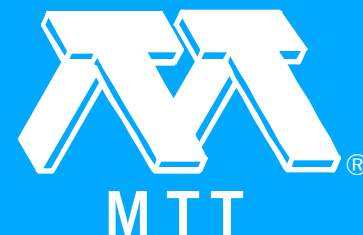
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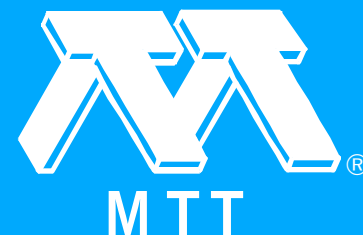
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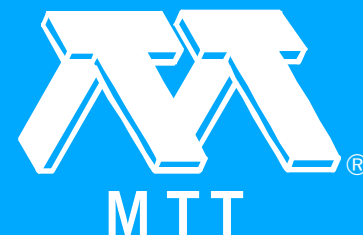
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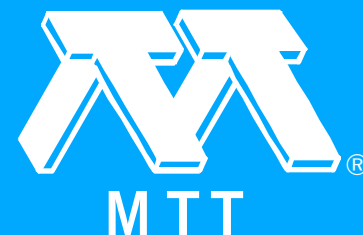
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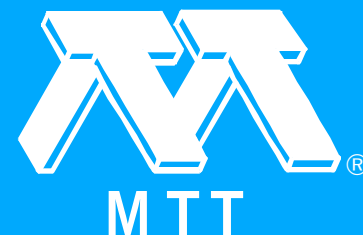
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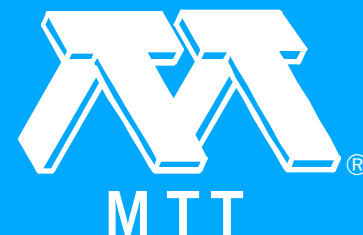
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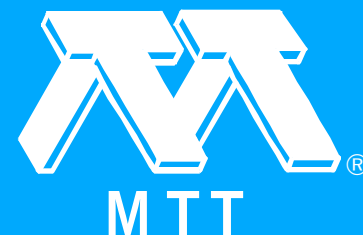
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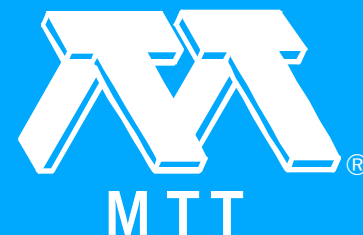
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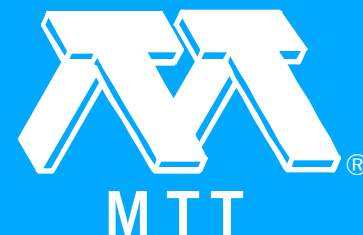
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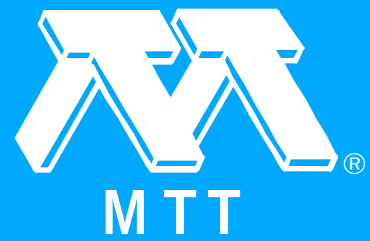
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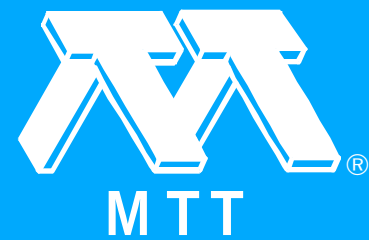
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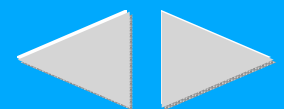
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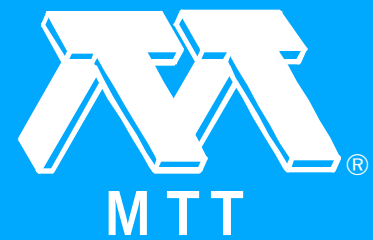
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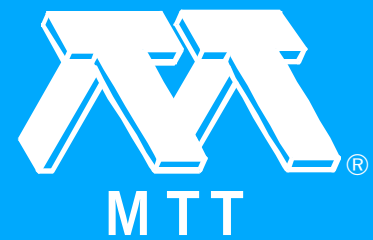
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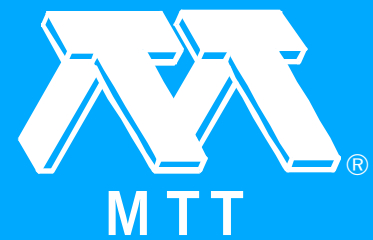
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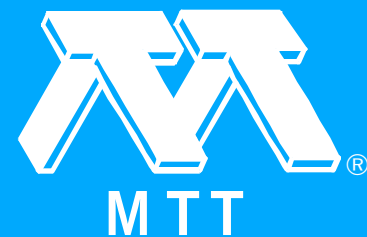
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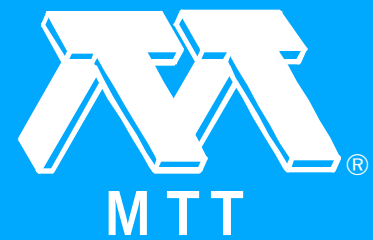
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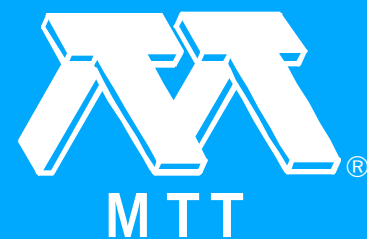
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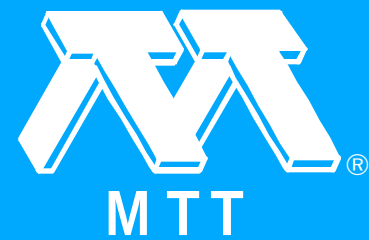
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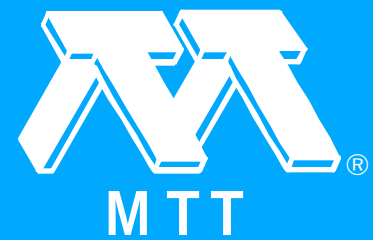
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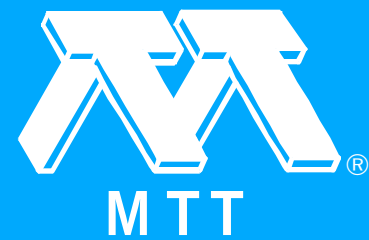
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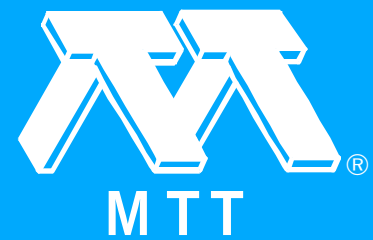
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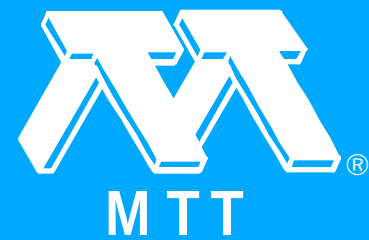
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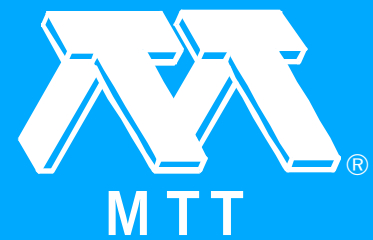
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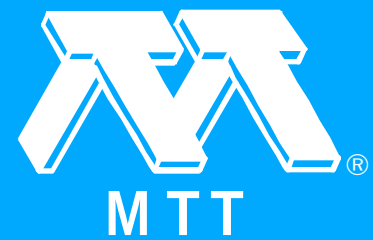
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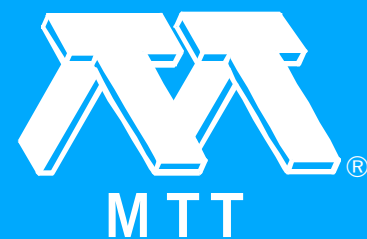
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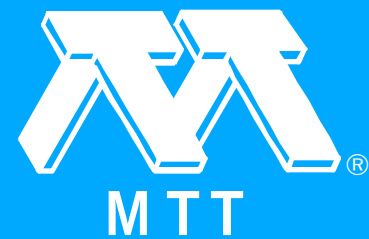
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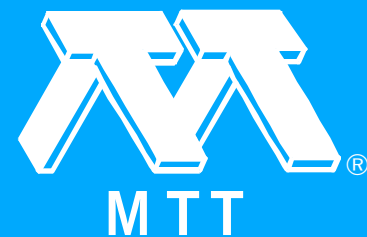
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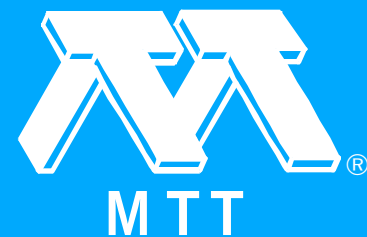
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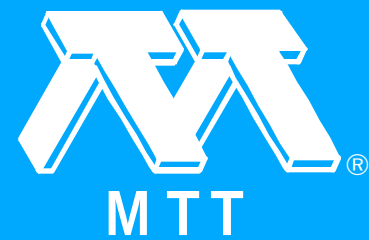
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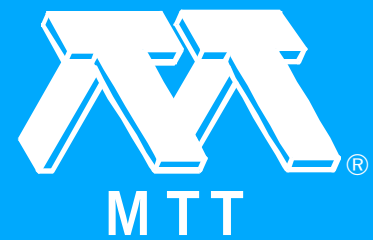
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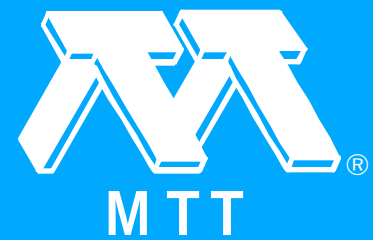
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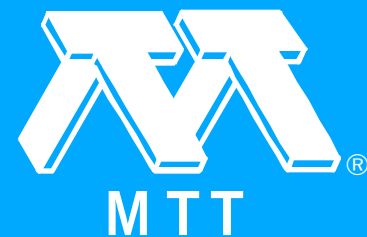
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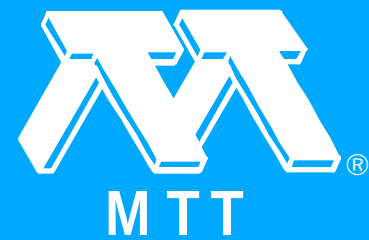
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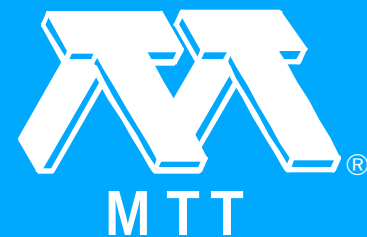
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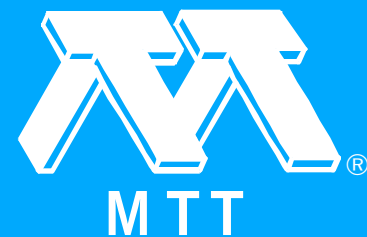
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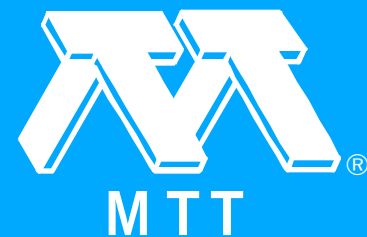
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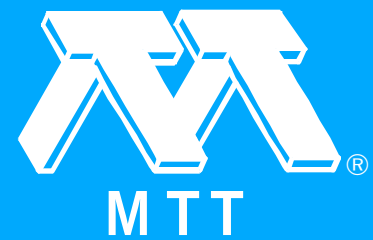
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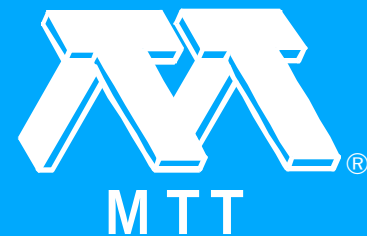
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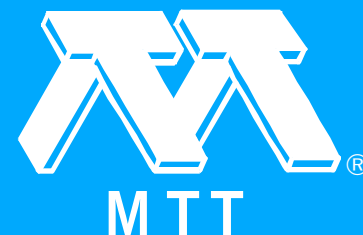
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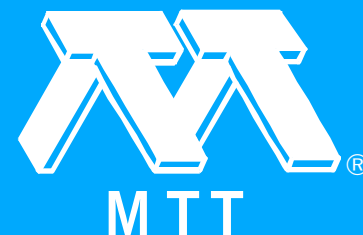
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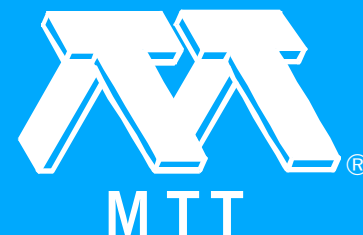
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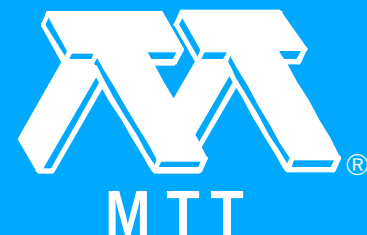
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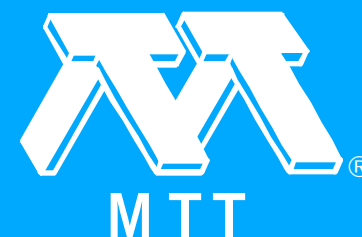
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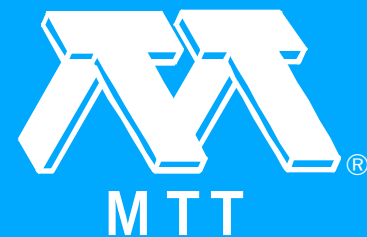
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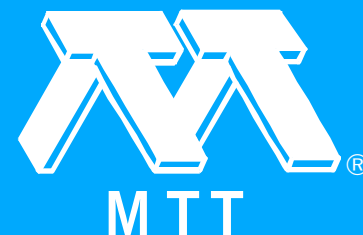
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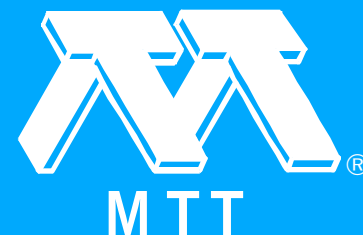
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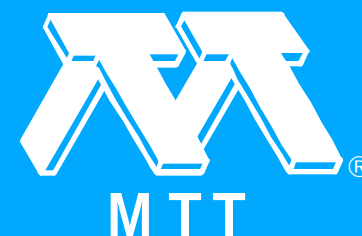
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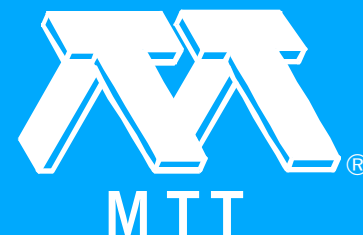
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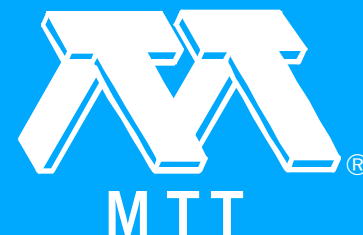
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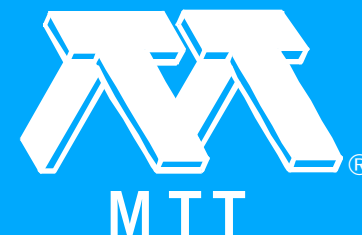
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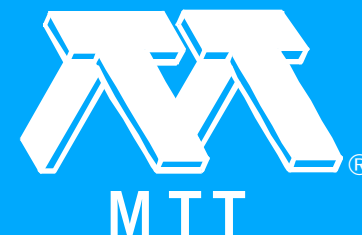
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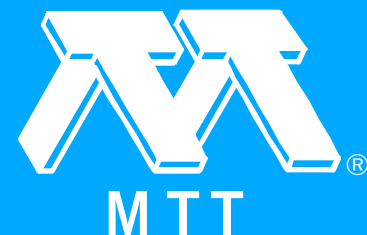
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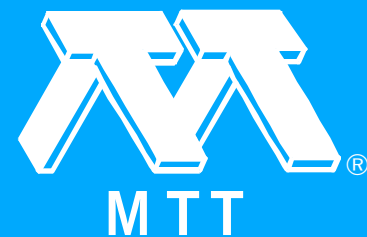
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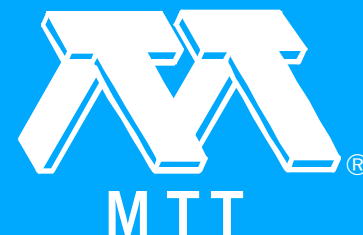
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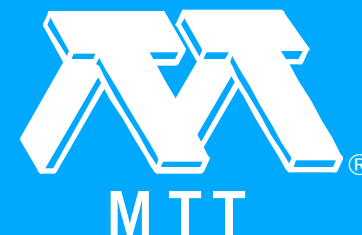
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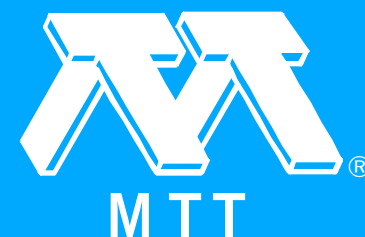
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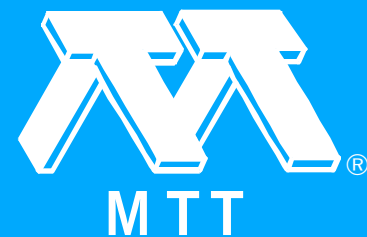
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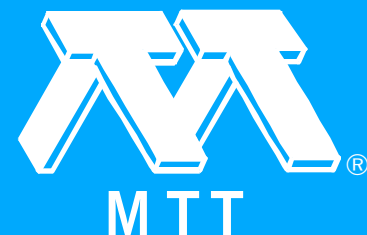
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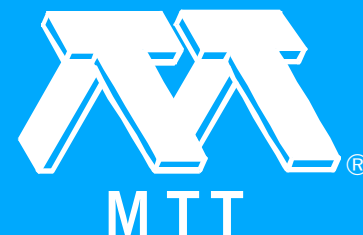
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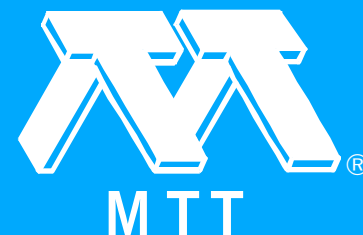
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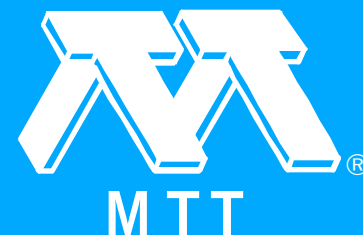
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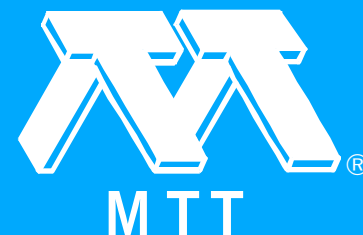
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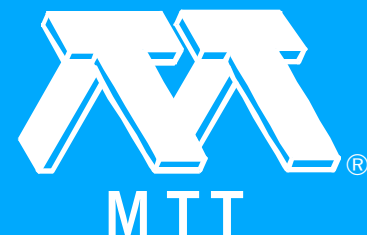
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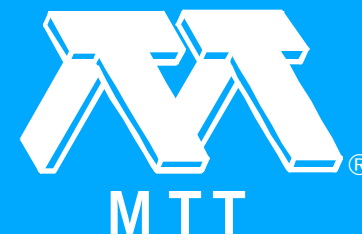
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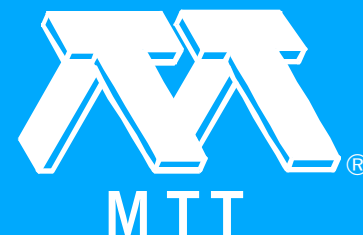
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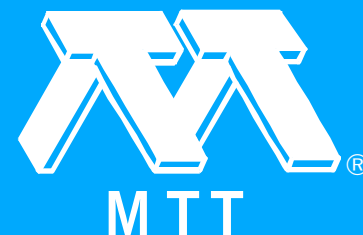
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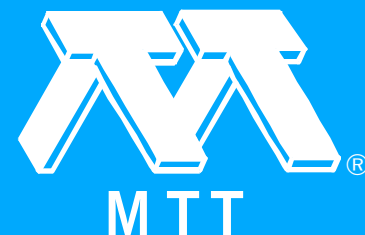
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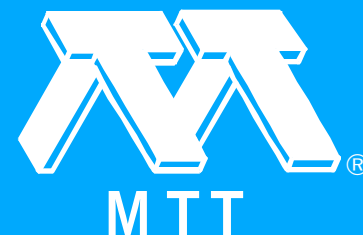
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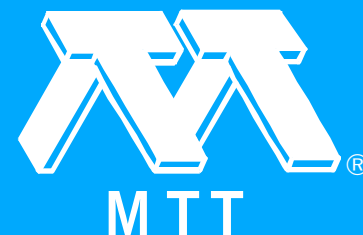
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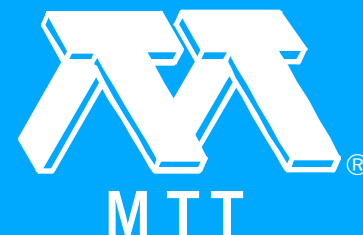
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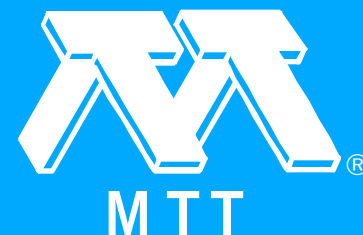
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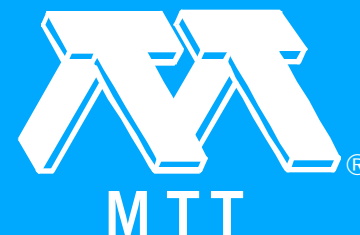
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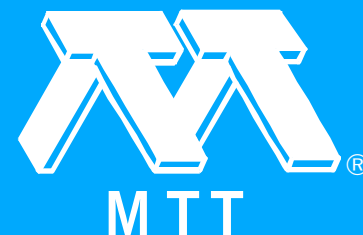
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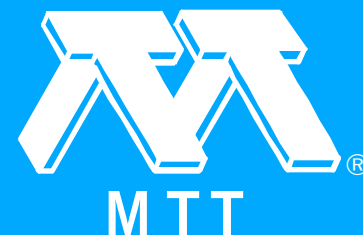
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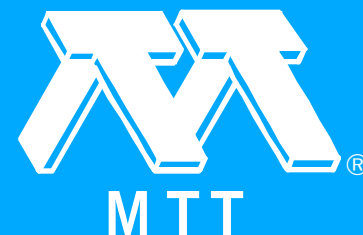


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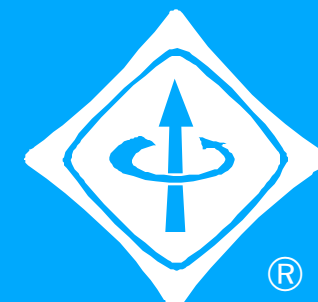
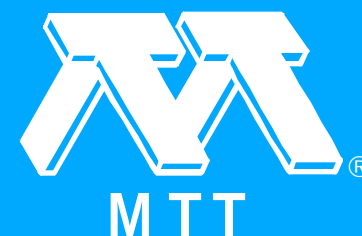
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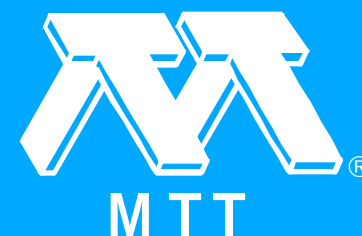
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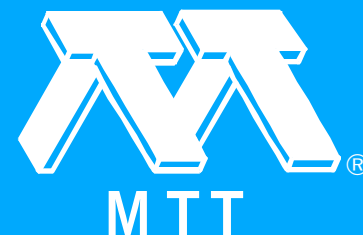
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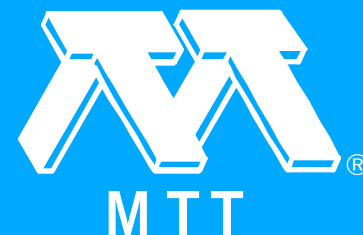
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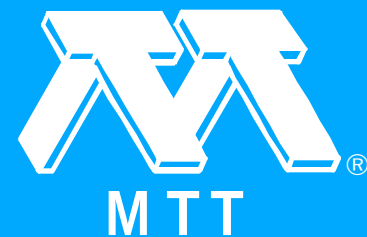
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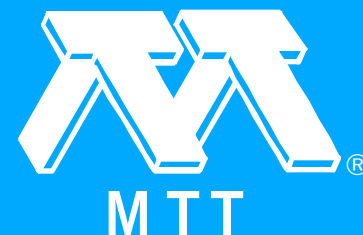
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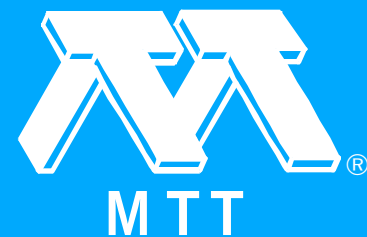
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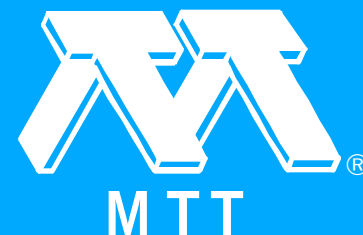
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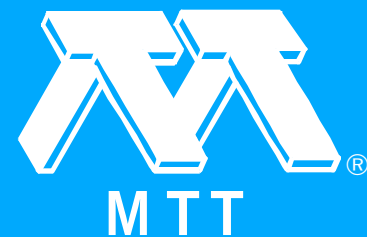
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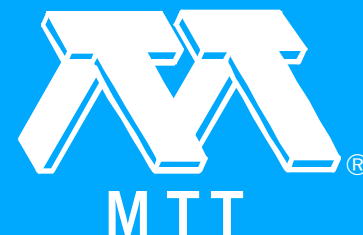
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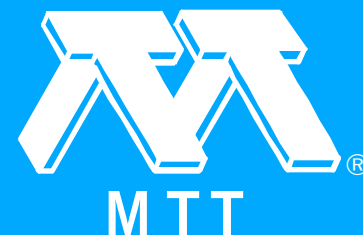
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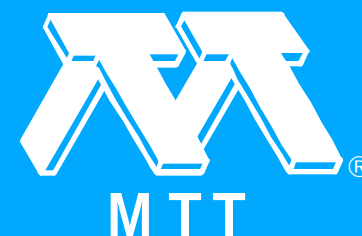
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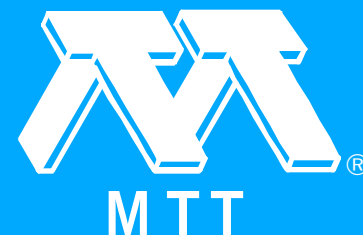
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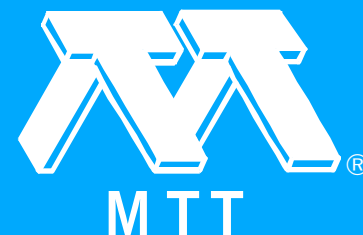
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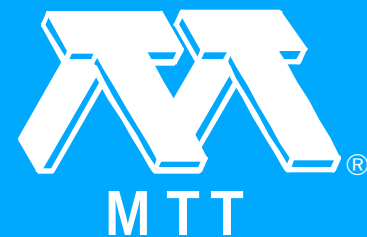
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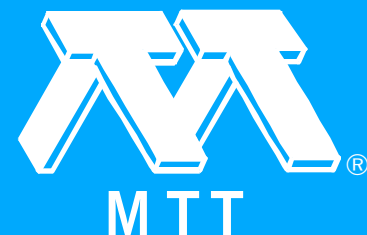
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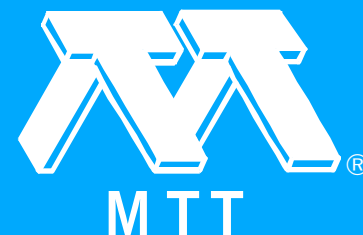
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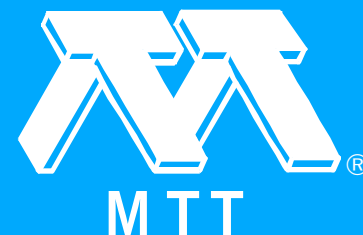
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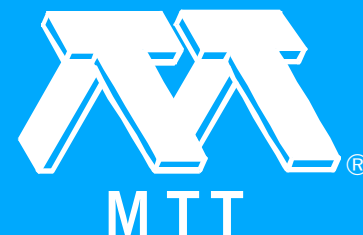
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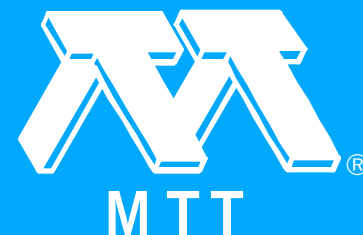
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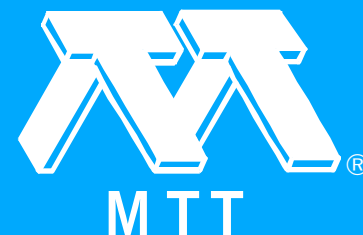
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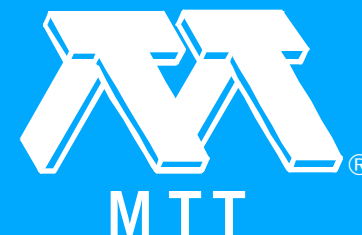
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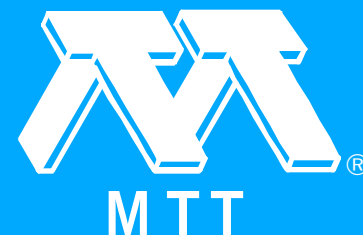
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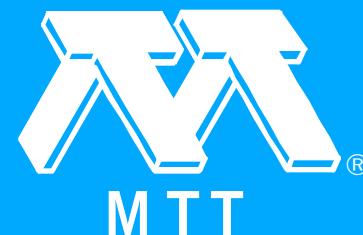
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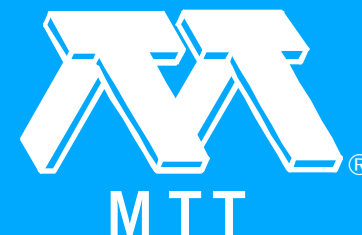
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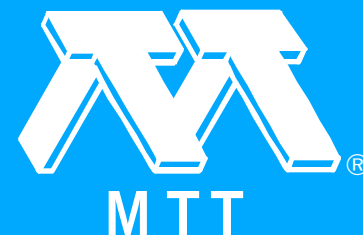
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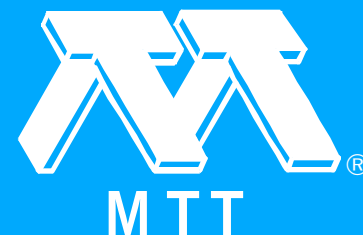
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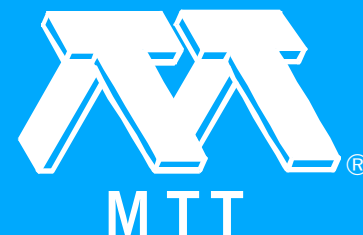
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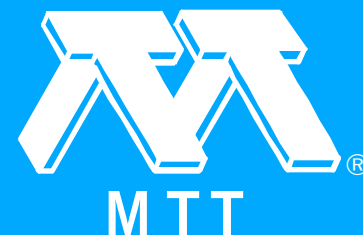
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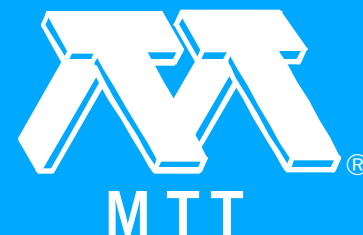
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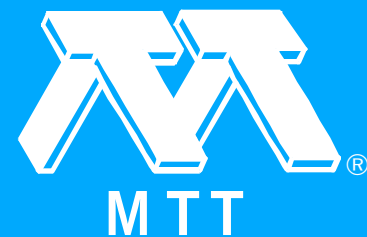
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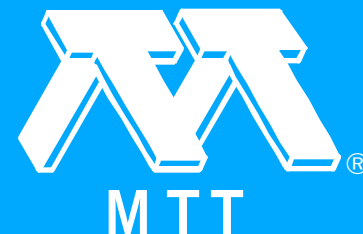
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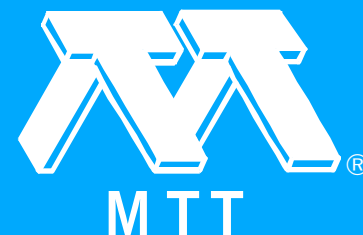
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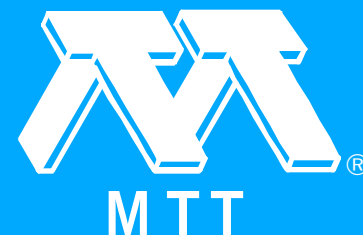
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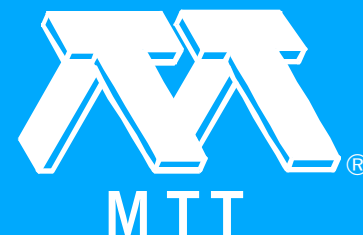
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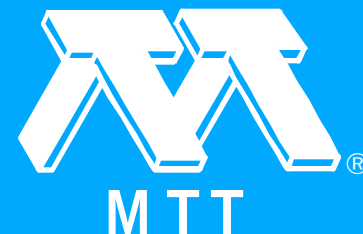
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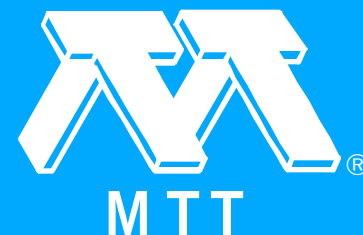
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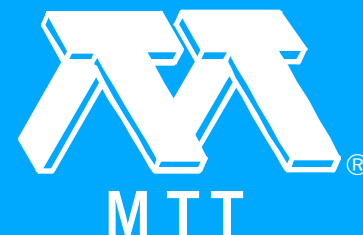
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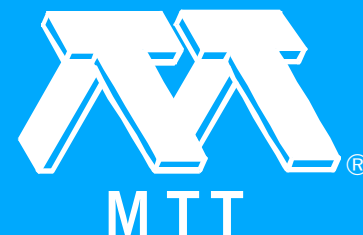
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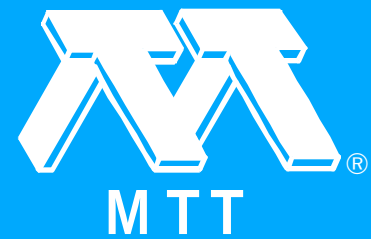
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Design Consideration on Broad-Band W-Type Two-Mode Optical Fibers

Y. Kato, K.-I. Kitayama and S. Seikai. "Design Consideration on Broad-Band W-Type Two-Mode Optical Fibers." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 1-5.

Structural design for broad-band W-type two-mode optical fibers is investigated. The optimum parameters are numerically determined as follows: the operating V-value with zero group delay time difference $\Delta\lambda$ between the LP/sub 01/ and LP/sub 11/ modes is 6.7, the ratio of core radius to inner cladding radius is 0.6, and the index profile parameter is 2.02. then, the core radius is 12.3 μm for $\Delta=0.3$ percent at the operating wavelength of 1.3 μm . The V-value deviation tolerance from the optimum to maintain $\Delta\lambda$ less than ± 20 ps/km is 21 percent, which is 20 times larger than that of the earlier design made on two-layer index profile.

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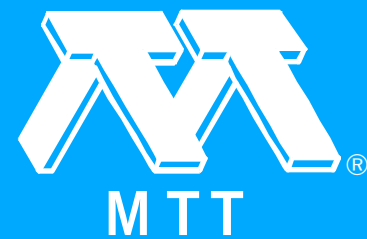


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A Method Extending the Boundary Condition for Analyzing Guided Modes of Dielectric Waveguides of Arbitrary Cross-Sectional Shape

N. Morita. "A Method Extending the Boundary Condition for Analyzing Guided Modes of Dielectric Waveguides of Arbitrary Cross-Sectional Shape." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 6-12.

A method based on the extended boundary condition method is presented for analyzing guided modes of dielectric waveguides of arbitrary cross-sectional shape. Numerical integration needed in this method is only over the boundary periphery line of the waveguide. Nevertheless, it is applicable to the waveguides with any refractive index difference between core and cladding ranging from negligibly small to considerably large difference, as well as to certain types of waveguide with inhomogeneous core. Approximate formulas for the case of weakly guiding are also derivable from the general basic set of equations presented. Numerical examples are given to verify the usefulness and accuracy of this method.



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Refraction at a Curved Dielectric Interface: Geometrical Optics Solution

S.-W. Lee, M.S. Sheshadri, V. Jamnejad and R. Mittra. "Refraction at a Curved Dielectric Interface: Geometrical Optics Solution." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 12-19.

The transmission of a spherical or plane wave through an arbitrarily curved dielectric interface is solved by the geometrical optics theory. The transmitted field is proportional to the product of the conventional Fresnel's transmission coefficient and a divergence factor (DF), which describes the cross-sectional variation (convergence or divergence) of a ray pencil as the latter propagates in the transmitted region. The factor DF depends on the incident wavefront, the curvatures of the interface, and the relative indices of the two media. We give explicit matrix formulas for calculating DF, illustrate its physical significance via examples.

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Abstracts

A Wide Scan Quasi-Optical Frequency Diplexer

J.J. Fratamico, Jr., M.J. Gans and G.J. Owens. "A Wide Scan Quasi-Optical Frequency Diplexer." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 20-27.

A wide scan quasi-optical frequency diplexer is required for certain antenna applications. A waveguide array is a structure which can fill this requirement and also discriminate proximal frequencies. The wide scan characteristics are enhanced by tilting the waveguide axes with respect to the waveguide-free-space interface. A variational analysis of this structure is presented, as well as experimental verification using a Ku-band model.



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Numerical Evaluation of Lumped Inductance Influences of Superconducting Circuit Interconnections on Ultrafast Switching Signal Propagation Characteristics

J. Temmyo and H. Yoshikiyo. "Numerical Evaluation of Lumped Inductance Influences of Superconducting Circuit Interconnections on Ultrafast Switching Signal Propagation Characteristics." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 27-34.

The lumped inductance influence of superconducting circuit interconnection on ultrafast switching (~ 10 ps) signal propagation characteristics, such as propagation delay, degraded switching time, reflections, amplitude distortions, and crosstalk, were for the first time quantitatively evaluated by using the LNAP computer simulation, including the influences of matching capacitors and terminated resistor value.



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A 26-GHz Band Integrated Circuit of a Double-Balanced Mixer and Circulators

H. Ogawa, M. Akaike, M. Aikawa, T. Karaki and J. Watanabe. "A 26-GHz Band Integrated Circuit of a Double-Balanced Mixer and Circulators." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 34-41.

Integration of a double-balanced mixer and ferrite-disk type circulators have been successfully achieved in the 26-GHz band. The total single-sideband noise figure of the integrated circuit, composed of a mixer and two circulators, is 8.5 dB, including the noise contribution from an IF amplifier. The double-balanced mixer is composed of microstrip lines, slot lines, coupled slot lines, coplanar lines, Au wires, and four beam lead Schottky-barrier diodes. The minimum conversion loss of the mixer is 5.3 dB at a signal frequency of 25.4 GHz. Isolation between RF and LO ports is greater than 30 dB. The ferrite-disk type circulator is produced by a newly developed precise machining technique. The minimum insertion loss of the circulator is 0.45 dB, and the isolation is greater than 20 dB. The integrated circuit with the ferrite-disk type circulators will be extended to the millimeter-wave band.

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Experimental Examination of the Enhancement of Gyrotron Efficiencies by Use of Profiled Magnetic Fields

M.E. Read, K.R. Chu and A.J. Dudas. "Experimental Examination of the Enhancement of Gyrotron Efficiencies by Use of Profiled Magnetic Fields." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 42-46.

An experiment in which the enhancement of the efficiency of gyrotron oscillators through profiling of the magnetic field at the cavity is discussed. Electronic efficiencies to 65 percent were obtained, with power levels of 1-100 kW at 35 GHz. Satisfactory agreement with theory was found.



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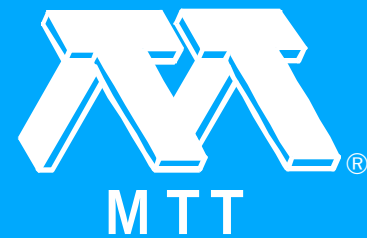


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Millimeter-Wave Device Technology

A. Rosen, M. Caulton, P. Stabile, A.M. Gombar, W.M. Janton, C.P. Wu, J.F. Corboy and C.W. Magee. "Millimeter-Wave Device Technology." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 47-55.

We have investigated novel techniques for the fabrication of silicon IMPATT diodes for use at frequencies of 220 GHz and beyond. We report on diodes yielding 25 mW CW at 102 GHz with 2-percent conversion efficiency, and 16 mW CW at 132 GHz with 1-percent conversion efficiency. The basic techniques described are ion implantation, laser annealing, unique secondary-ion mass spectrometry (SIMS) profile diagnostics, and novel wafer thinning, yielding ultrathin, reproducible wafers. The utilization of these technologies, as they are further refined, can result in the development of silicon monolithic integrated sources.



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Specific Equations for One and Two Section Quarter-Wave Matching Networks for Stub-Resistor Loads

R. Levy and J. Helszajn. "Specific Equations for One and Two Section Quarter-Wave Matching Networks for Stub-Resistor Loads." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 55-63.

Given a load network consisting of a conductance in parallel with a short-circuited stub, the admittance values of optimum one and two section commensurate transmission line matching networks are derived. These values are expressed in closed form as functions of the bandwidth and ripple level. It is shown that optimum networks have nonzero reflection coefficient minima, as predicted by classical broad-band matching theory.



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Noise in Broad-Band GaAs MESFET Amplifiers with Parallel Feedback

K.B. Niclas. "Noise in Broad-Band GaAs MESFET Amplifiers with Parallel Feedback." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 63-70.

The influence of the circuit elements of a single-ended feedback amplifier module on noise figure and gain, as well as on input and output reflection coefficients is discussed. Theoretical results are supported by tests performed on a five-stage single-ended amplifier. The unit exhibits 41.5 ± 0.8 dB of small-signal gain and a maximum noise figure of 4.0 dB between 2.4 and 8.0 GHz. Maximum reflection coefficients of 1.7:1 for the input and 1.5:1 for the output terminal were measured. The unit's overall circuit dimensions are 25x3.6 mm.



Abstracts

The Design of Directional Couplers Using Exponential Lines in Inhomogeneous Media

M.I. Sobhy and E.A. Hosny. "The Design of Directional Couplers Using Exponential Lines in Inhomogeneous Media." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 71-76.

Coupled exponential transmission lines in inhomogeneous media are analyzed and an accurate solution is obtained. The solution is used to design microwave directional couplers. The designed couplers have much improved coupling characteristics compared with couplers using uniform lines. Practical measurements show very good agreement with theoretical results.



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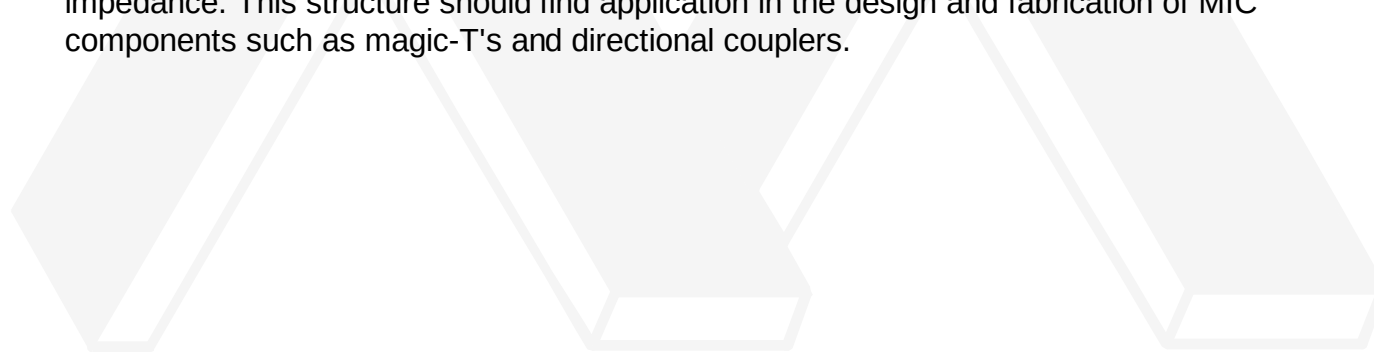
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Suspended Broadside-Coupled Slot Line with Overlay

R.N. Simons. "Suspended Broadside-Coupled Slot Line with Overlay." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 76-81.

This paper presents a rigorous analysis of symmetric, broad-side-coupled slot line with overlay. The structure is assumed to be suspended inside a conducting enclosure of arbitrary dimensions. The dielectric substrate and the overlay are assumed to be isotropic and homogeneous and are of arbitrary thickness and relative permittivity. The conducting enclosure and the zero thickness metallization on the substrate are assumed to have infinite conductivity. The computed results illustrate a) the dispersion characteristics and characteristic impedance of the coupled slot line structure, b) the variation of the even-mode and also the odd-mode relative wavelength ratio and characteristic impedance with slot width, and c) the effect of shielding on the even-mode and also the odd-mode dispersion and characteristic impedance. This structure should find application in the design and fabrication of MIC components such as magic-T's and directional couplers.



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Abstracts

Measurement of Radio Frequency Permittivity of Biological Tissues with an Open-Ended Coaxial Line: Part I

T.W. Athey, M.A. Stuchly and S.S. Stuchly. "Measurement of Radio Frequency Permittivity of Biological Tissues with an Open-Ended Coaxial Line: Part I." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 82-86.

An open-ended coaxial line is analyzed as a sensor for in vivo measurement of the complex permittivity of biological substances. The measurement system, based on two computerized network analyzers operating at frequencies from 10 MHz to 1 GHz, is described. Experimental results are presented in a companion paper.



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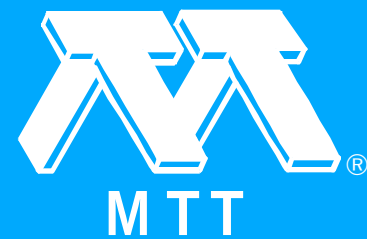


Abstracts

Measurement of Radio Frequency Permittivity of Biological Tissues with an Open-Ended Coaxial Line: Part II -- Experimental Results

M.A. Stuchly, T.W. Athey, G.M. Samaras and G.E. Taylor. "Measurement of Radio Frequency Permittivity of Biological Tissues with an Open-Ended Coaxial Line: Part II -- Experimental Results." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 87-92.

The permittivity of several reference liquids and selected biological tissues in vivo was measured in the frequency range from 0.01 to 1 GHz. Open-ended coaxial line sensors and computer-controlled network analyzer systems, described in a companion paper, were used. The results were analyzed and compared with the estimated uncertainties. The described method proved to be convenient, fast, and relatively accurate for in vivo measurements.



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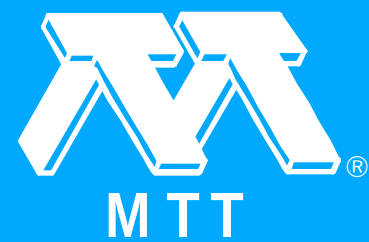
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Waveguide Technique for the Calibration of Miniature Implantable Electric-Field Probes for Use in Microwave-Bioeffects Studies

D.A. Hill. "Waveguide Technique for the Calibration of Miniature Implantable Electric-Field Probes for Use in Microwave-Bioeffects Studies." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 92-99.

A new S-band waveguide technique has been developed for the calibration of miniature probes used in determining electric fields in biological tissues at 2.45 GHz. A section of waveguide is filled with tissue-equivalent liquid separated from the air-filled waveguide by a very thin (0.25-mm) planar dielectric spacer. The probe response is measured as a function of position on each side of the spacer and extrapolated to the interface. The ratio of probe response in air to that in test liquid is then determined assuming continuity of tangential E-field across the spacer. In the water-glycerol solution modelling wet tissue, the probes are 3.0 ± 0.6 times more sensitive to E^2 than in air. A wide variety of both wet and dry tissues may be simulated using liquids of different dielectric properties--a check on the properties is provided by comparing the measured depth of penetration of the wave in the liquid with the calculated value. Problems using the probes in biological tissues are also discussed.

Click on title for a complete paper.



Abstracts

Composite Hole Conditions on Complex Permittivity Measurements Using Microwave Cavity Perturbation Techniques (Short Papers)

S. Li and R.G. Bosisio. "Composite Hole Conditions on Complex Permittivity Measurements Using Microwave Cavity Perturbation Techniques (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 100-103.

This paper examines the edge effects of introducing a dielectric test cylinder with a test material into a cavity via a metallic support tube extending outside the cavity. A first-order perturbation theory is used for this metallic hole containing two different concentric dielectric materials. The Galerkin method is used to determine the amplitudes of numerous evanescent modes which exist in such composite hole geometries. Comparisons are made with the effects produced by a simple hole in which a single dielectric is postulated inside the metallic support tube. The effects of the composite hole on the measurement of the dielectric properties of materials are given.



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Abstracts

Substitution Method for Swept-Frequency Measurements of Dielectric Properties at Microwave Frequencies (Short Papers)

M.J. Hagmann and O.P. Gandhi. "Substitution Method for Swept-Frequency Measurements of Dielectric Properties at Microwave Frequencies (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 103-106.

A solid-state computer-controlled system has been used to make swept-frequency measurements of the insertion loss and reflectance of biological specimens and other media. A substitution procedure was used for direct comparison of samples to allow determination of small differences (on the order of 0.1 dB) in insertion loss and reflectance.



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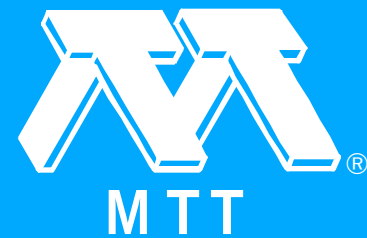


Abstracts

A Harmonic Mixer for the 20-40-GHz Range (Short Papers)

T. Mazilu and A.K. Talwar. "A Harmonic Mixer for the 20-40-GHz Range (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 106-107.

The design and performance of a wide-band harmonic mixer are described. The circuit is built on a microstrip substrate and uses a single GaAs Schottky-barrier diode.



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Abstracts

A Simple Numerical Method for the Cutoff Frequency of a Single-Mode Fiber with an Arbitrary Index-Profile (Comments)

J.P. Meunier, J. Pigeon and J.N. Massot. "A Simple Numerical Method for the Cutoff Frequency of a Single-Mode Fiber with an Arbitrary Index-Profile (Comments)." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 108-109.

In the above paper, Sharma and Ghatak have proposed a numerical method for calculating the cutoff frequency of single mode operation in optical fibers with an arbitrary index profile. We want to comment on the validity of their results using their notations. The referenced paper requires in particular the knowl-edge of the boundary conditions on the modal field Ψ and its derivatives at $R=0$. To this aim, Sharma and Ghatak have used a series solution method. Their series expansion [1, eq. (A. 1)] is valid only in the vicinity of an ordinary point but the point $R=0$ is a regular singular point for the scalar wave differential equation [1, eq. (A.3)].



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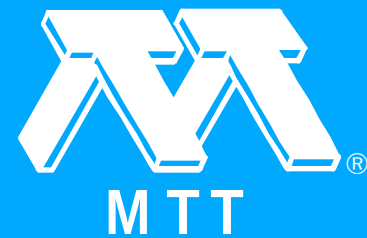


Abstracts

Exact Analysis of Shielded Microstrip Lines and Bilateral Fin Lines (Correction)

A.-M.A. El-Sherbiny. "Exact Analysis of Shielded Microstrip Lines and Bilateral Fin Lines (Correction)." 1982 *Transactions on Microwave Theory and Techniques* 30.1 (Jan. 1982 [T-MTT]): 109-109.

The following corrections should be made to the above paper. On page 670, column 2, paragraph 2, the expression "electric wall symmetry (microscope case)" should read "electric wall symmetry (microstrip case)."



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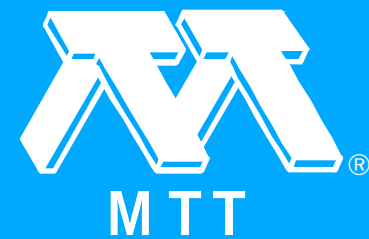
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Second Special Issue on Guided Wave Technology (Announcement) (Jan. 1982 [T-MTT])

*"Second Special Issue on Guided Wave Technology (Announcement) (Jan. 1982 [T-MTT])."
1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 115-115.*



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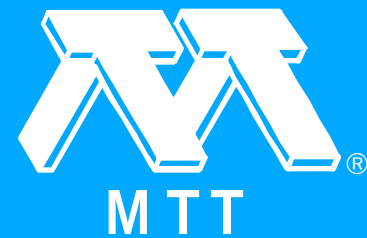
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Call for Papers - 1982 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium (Jan. 1982 [T-MTT])

"Call for Papers - 1982 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium (Jan. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.1 (Jan. 1982 [T-MTT]): 116-116.



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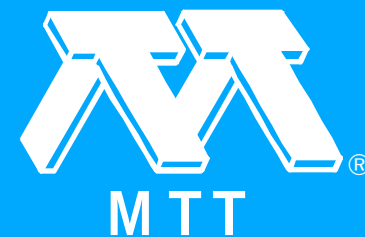
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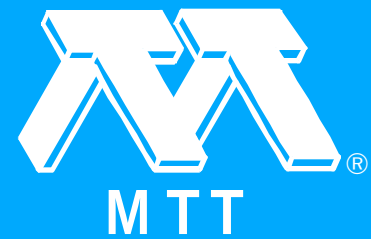
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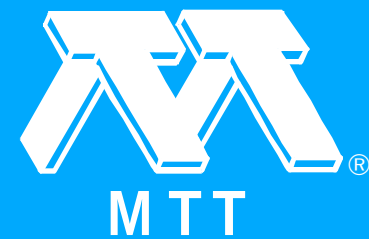
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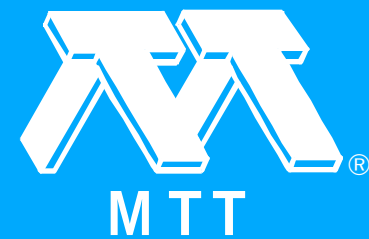
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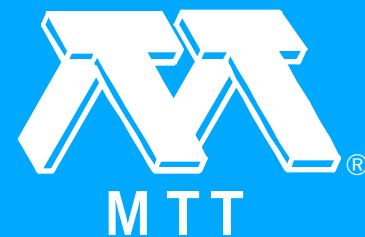


Abstracts

Recent Developments in Fiber Optic Devices

K. Shirahata, W. Susaki and H. Namizaki. "Recent Developments in Fiber Optic Devices." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 121-131.

The advent of the fundamental transverse mode laser diode and low loss optical fiber has extended the wavelength range for communication systems into the optical spectrum region. The indispensable elements for the optical communication systems are light source, transmission medium, and detector. Recent developments in this area in Japan, with particular emphasis on the fundamental transverse mode laser diode and low loss quartz optical fiber, are reviewed.



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Prediction of Laser Wavelength for Minimum Total Dispersion in Single-Mode Step-Index Fibers

P.S.M. Pires, D.A. Rogers, E.J. Bochove and R.F. Souza. "Prediction of Laser Wavelength for Minimum Total Dispersion in Single-Mode Step-Index Fibers." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 131-140.

Pulse dispersion in single-mode optical fibers with step-index profiles has been analyzed in the past using asymptotic methods. One of these methods is based on the approximate characteristic equation for the dominant mode of propagation in these structures, obtained using the "weakly guided" condition. Other methods use approximations for certain parameters of this equation. Utilizing numerical methods of differentiation and interpolation, we have developed a method for the analysis of pulse dispersion in these fibers that is based on solutions of the exact characteristic equation. Exact formulas for the parameters necessary for this study have been established and developed to the point where the steps that would follow, involving extensive analytical effort, are replaced by computational procedures. We make comparisons between our method and those that, although based on asymptotic expressions, present the best theoretical characteristics. The differences found are discussed. This method permits greater precision in prediction of the ideal laser wavelength for use with a given single-mode optical fiber.





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Equivalent Representations of Nonuniform Transmission Lines Based on the Extended Kuroda's Identity

K. Kobayashi, Y. Nemoto and R. Sato. "Equivalent Representations of Nonuniform Transmission Lines Based on the Extended Kuroda's Identity." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 140-146.

Kuroda's identity may be extended to circuits consisting of lumped reactance elements and nonuniform transmission lines. It is shown that these circuits are equivalent to circuits consisting of cascade connections of nonuniform transmission lines whose characteristic impedance distributions are different from original ones, lumped reactance elements, and ideal transformers. If a characteristic impedance distribution $W(x)$ of an original nonuniform transmission line is given, a characteristic impedance distribution $Z(x)$ of a transformed nonuniform transmission line may be uniquely obtained using $W(x)$. Moreover, by using these equivalent transformations, network functions of these transformed nonuniform transmission lines can be derived exactly.

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Abstracts

A Study on Circular Disk Resonators on a Ferrite Substrate

K. Araki, D.I. Kim and Y. Naito. "A Study on Circular Disk Resonators on a Ferrite Substrate." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 147-154.

In this paper, an exact analysis of a circular disk resonator on a magnetized ferrite substrate which can be used for tunable filters and circular polarizing radiators is presented. The method makes use of Galerkin's method applied in the Hankel transform domain and is quite suitable for numerical calculation. The calculated values of the resonant frequencies and unloaded Q's are shown to be in good agreement with the measured data and the validity of the present theory is confirmed. Furthermore, the characteristics of the traveling wave filters are investigated theoretically and experimentally, and their advantages over the standing wave filters are demonstrated in terms of reflection and sensitivity of the $Q_{\text{sub L}}$ on the coupling strength.



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Theory and Design of Low-Insertion Loss Fin-Line Filters

F. Arndt, J. Bornemann, D. Grauerholz and R. Vahldieck. "Theory and Design of Low-Insertion Loss Fin-Line Filters." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 155-163.

A design theory is described for low-insertion loss fin-line filters that includes both higher order mode propagation and finite thickness of the dielectric substrate and the metallic fins. Design data for three-resonator type fin-line filters with several substrate thicknesses are given for midband frequencies of about 15, 34, and 66 GHz. The measured insertion losses in the passband are 0.25, 0.5, and 1.3 dB, respectively, for these three frequencies.

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Radial-Symmetric N-Way TEM-Line IMPATT Diode Power Combining Arrays

D.F. Peterson. "Radial-Symmetric N-Way TEM-Line IMPATT Diode Power Combining Arrays." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 163-173.

Circuit design and stability criteria are developed for a new class of IMPATT diode power combiners. These combiners make use of radial-symmetric circuits and provide an optimal integration of device and circuit properties to perform the power adding function. Both lossless N-way combiners and resistively stabilized N-way combiners are considered. Theoretical examples of this combining technique are given at X-band frequencies which make use of realistic experimentally determined IMPATT diode properties. Predictions for a 30-W ten-diode lossless X-band combiner indicate a 1-dB locking bandwidth of 300 MHz and 10-dB gain. A 100-W resistively stabilized 10-GHz ten-diode combiner predicts a 150-MHz locking bandwidth, also at 10-dB locking gain.

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Tunable Low-Loss UHF Circulator for Cryogenic Applications

J. Kadlec. "Tunable Low-Loss UHF Circulator for Cryogenic Applications." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 173-176.

A 600-MHz above-resonance circulator operating at 4.2 K has been constructed and successfully tested. Its high isolation (>30 dB), extremely low insertion loss (<0.1 dB), low VSWR (< 1.1), and acceptable instantaneous bandwidth (~ 6 percent) make it a promising device for utilization in narrow-band very low-noise systems.

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The Thermal Response of a Human in the Near-Zone of a Resonant Thin-Wire Antenna

R.J. Spiegel. "The Thermal Response of a Human in the Near-Zone of a Resonant Thin-Wire Antenna." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 177-185.

The thermal response of a human in the near-zone of an antenna was determined by numerical procedures. The approach taken was to modify the heat transfer equations for man in air to account for thermal loading due to the energy absorbed from the radiating antenna. The absorbed power density distribution in the human body was determined by considering the body and antenna to be a coupled system in which the resulting system of equations were solved by moment method procedures. This information was then analyzed by a thermal response model consisting of a series of transient conduction equations with internal heat generation due to metabolism, internal convective heat transfer due to blood flow, external interaction by convection and radiation, and cooling of the skin by sweating and evaporation. Internal heating patterns were calculated for two cases: a human in the near-zone of a quarter-wave monopole and a half-wave dipole operating at 45 and 200 MHz, respectively. It was found that negligible heating occurred for antennas with input power levels of less than 50 W.

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Abstracts

A Six-Port Reflectometer and its Complete Characterization by Convenient Calibration Procedures

P.I. Somlo and J.D. Hunter. "A Six-Port Reflectometer and its Complete Characterization by Convenient Calibration Procedures." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 186-192.

A simple six-port reflectometer and two methods of calibration using either $5\frac{1}{2}$ or $6\frac{1}{2}$ standard terminations are described. High precision is obtained using diode detectors, which are calibrated in situ against a single thermistor power meter. The addition of a few extra components provides a moderately accurate visual display in real time over the 1-8-GHz band.



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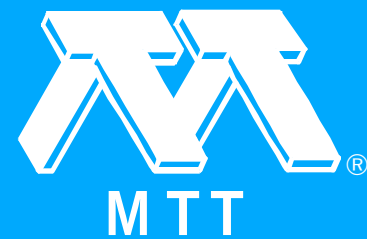


Abstracts

A Broad-Band Amplifier Output Network Design (Short Papers)

A.N. Riddle and R.J. Trew. "A Broad-Band Amplifier Output Network Design (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 192-196.

An analytic design method for a lossy gain-compensating network is presented and the advantages of lossy networks are discussed. Examples of two-stage amplifiers using FET's and bipolar transistors are presented to show the feasibility of this particular network in low power amplifier designs. These amplifiers obtain gains of 15.4 ± 0.5 dB with a 2.5-dB maximum noise figure in the 4.0--6.0-GHz frequency range and 16.5 ± 1.2 dB with a maximum input VSWR of 1.78:1 over the 1.0--2.0-GHz frequency range, respectively.



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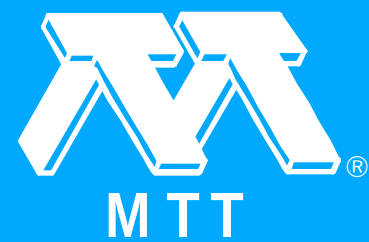
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Application of the Galerkin Method for Determination of Quasi TE/sub i0k/ Mode Frequencies of a Rectangular Cavity Containing a Dielectric Sample (Short Papers)

A. Kedzior and J. Krupka. "Application of the Galerkin Method for Determination of Quasi TE/sub i0k/ Mode Frequencies of a Rectangular Cavity Containing a Dielectric Sample (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 196-198.

A new method determination of quasi TE/sub i0k/ mode frequencies of a rectangular cavity containing a dielectric sample is presented. A centrally loaded dielectric sample fills completely only one dimension of a cross section of the cavity. The calculations are based on the Galerkin method using a new suitable set of basis functions. The theoretical results are illustrated by experiments. The obtained results of calculations and experiments demonstrate the advantages of the new basis as compared with the classical one. The presented method may be applied for the analysis of two-dimensional boundary problems for various resonant cavities with inhomogeneous filling.



Abstracts

The Conservation of Complex Power Technique and E-Plane Step-Diaphragm Junction Discontinuities (Short Papers)

E.M. Sich and R.H. MacPhie. "The Conservation of Complex Power Technique and E-Plane Step-Diaphragm Junction Discontinuities (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 198-201.

The singular integral equation solution due to L. Lewin and his colleagues for the E-plane step-diaphragm junction discontinuity are extended by the conservation of complex power technique (CCPT). The singular integral equation method provides formulas for the junction susceptance (both with and without a diaphragm) which are valid only in the quasi-static limit. In contrast, the CCPT provides numerical solutions for larger guides. It is applied to a step with a diaphragm of nonvanishing thickness.



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Multifrequency Cryogenically Cooled Front-End Receivers for the Westerbork Synthesis Radio Telescope (Short Papers)

J.L. Casse, E.E.M. Woestenburg and J.J Visser. "Multifrequency Cryogenically Cooled Front-End Receivers for the Westerbork Synthesis Radio Telescope (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.2 (Feb. 1982 [T-MTT]): 201-209.

Four of the fourteen 25-m antennas of the Westerbork Synthesis Radio Telescope have been equipped with 6- and 21-cm wave-length receivers based on cryogenically cooled parametric amplifiers and up-converters. Special care has been given to the design of the input network to achieve maximum sensitivity. An integrated feed launcher and preamplifier system are housed in a dewar at cryogenic temperatures. The receiver noise temperature at 21- and 6-cm wavelength are on the average 14 K and 20 K, respectively. At 21 cm, two systems have even yielded receiver noise temperature as low as 11 K. This paper concentrates particularly on the cooled section of the receiver system.



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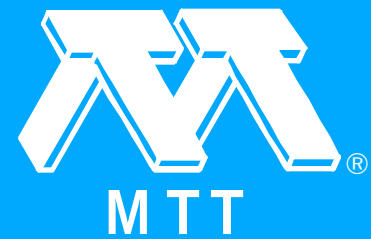
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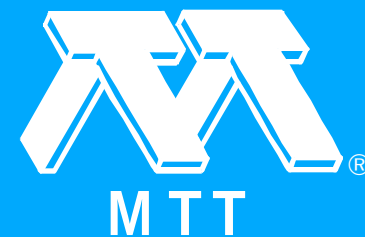
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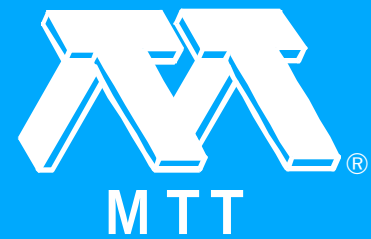
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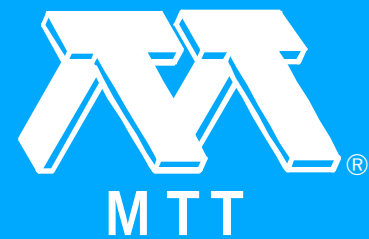
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Analysis of the Symmetrical Modes for an Eccentrically Cladded Fiber

N.M. Metrou, J.D. Kanellopoulos, J.A. Roumeliotis and J.G. Fikioris. "Analysis of the Symmetrical Modes for an Eccentrically Cladded Fiber." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 217-220.

This paper examines the core and the cladding modes of an eccentrically cladded three-layer dielectric waveguide. The solutions are specialized to small eccentricities, and exact closed-form expressions for the normalized deviations of the cutoff wavenumbers from those of the concentric case are determined. Numerical results for the symmetrical cladding modes of the fiber are given.

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Ridged Waveguides for Ultra-Broad-Band Light Modulators

G. Magerl and P.W. Froehling. "Ridged Waveguides for Ultra-Broad-Band Light Modulators." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 220-226.

The electromagnetic field of the dominant mode propagating in the inhomogeneously dielectrically loaded double ridged waveguide is given in terms of a modal series expansion. The numerical evaluation of the propagation constant reveals a remarkably linear dispersion diagram in close agreement with measurements performed in the 8-40-GHz range. Based on this analysis, the bandwidth of a ridged waveguide CO/sub 2/-laser modulator is calculated to exceed 40 GHz, when a 25-mm long CdTe crystal is used as electrooptic material.

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



Integrated Balanced BPSK and QPSK Modulators for the Ka-Band

H. Ogawa, A. Masayoshi and M. Akaike. "Integrated Balanced BPSK and QPSK Modulators for the Ka-Band." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 227-234.

Microwave integrated circuit (MIC) balanced biphase-shift-keying (BPSK) and quadri-phase-shift-keying (QPSK) modulators have been achieved in the 27-GHz band. The modulators are fabricated using a combination of microstrip lines and slot lines, viz., tow-sided MIC. The diodes used are beam-lean Schottky-barrier diodes. Balanced BPSK modulation is performed by path-switching and mode transformation from the slot line to microstrip lines. The insertion loss is 2.2 dB at a carrier frequency of 27 GHz. The phase error and the amplitude deviation are less than 1° and 0.5 dB, respectively. The QPSK modulator consists of two BPSK modulators, a power divider, and a branch-line hybrid coupler. The configuration of the modulator is the parallel-connected type. The insertion loss is 6.3 dB at a carrier frequency of 27 GHz. The phase error is less than 2° , and the rise time and fall time of the modulated carrier are less than 300 ps. The isolation between the carrier input port and the QPSK modulated carrier output port is greater than 25 dB. These modulators can be extended to the millimeter-wave band.





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A 26-GHz Miniaturized MIC Transmitter/Receiver

E. Hagihara, H. Ogawa, N. Imai and M. Akaike. "A 26-GHz Miniaturized MIC Transmitter/Receiver." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 235-242.

A very compact 26-GHz transmitter/receiver for high-speed digital radio subscriber systems has been developed. The transmitter/receiver makes extensive use of MIC technology in the RF sections. Transmitting power of 18 dBm and a receiving noise figure of less than 12 dB is obtained. The frequency of the local oscillator is stabilized to within ± 100 ppm by means of a high-Q dielectric resonator. The bit error rate is measured in order to evaluate the overall system, and good performance of the equipment is obtained. A field test using this equipment is now under way. The technique described in the text can be extended to transmitter/receiver for terrestrial radio relay systems and satellite communication systems. In addition, the various MIC components developed here can be scaled to the millimeter-wave region.

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



Microwave Wide-Band Model of GaAs Dual Gate MESFET's

C. Tsironis and R. Meierer. "Microwave Wide-Band Model of GaAs Dual Gate MESFET's." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 243-251.

A multioctave model of GaAs dual gate MESFET's is presented. It consists of 28 frequency independent elements and is valid between 2 and 11 GHz. Dual gate FET's with and without intergate ohmic contact have been considered. The modeling method utilized consists in separate dc and HF characterization and equivalent circuit determination of the active device parts in their actual bias conditions. Thereby, two goals are obtained: a) The topology of the overall model can be derived from well-known simpler, partial ones; and b) the starting values of optimization are precise enough to allow reliable physical solutions.



Abstracts

Numerical Analysis of Nonlinear Solid-State Device Excitation in Microwave Circuits

R.G. Hicks and P.J. Khan. "Numerical Analysis of Nonlinear Solid-State Device Excitation in Microwave Circuits." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 251-259.

This paper presents an efficient technique for the numerical determination of voltage and current waveforms when a microwave circuit containing one or more nonlinear elements is excited by a single frequency source. The approach described here is readily applied to microwave networks represented by a large number of equivalent circuit elements, either lumped or distributed. A significant feature of this paper is the detailed investigation of the problem of convergence, using this new technique. The generality of the technique is illustrated through its application to studies of the excitation of varactor, Schottky-barrier, and IMPATT diodes in waveguide circuits. In addition, the relationship of this method to the multiple reflection approach is discussed and the convergence mechanism of this reflection technique is studied.



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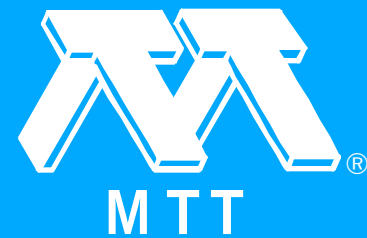


Abstracts

Harmonic Power Combining Of Microwave Solid-State Active Devices

D.F. Peterson. "Harmonic Power Combining Of Microwave Solid-State Active Devices." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 260-268.

A method for combining the power in a selected harmonic of the fundamental frequency for a symmetrical array of oscillating solid-state devices is described and demonstrated. These combiners convert fundamental power to harmonic power with filtering accomplished by symmetry. This technique appears useful for improving the performance of microwave and millimeter-wave power sources by effectively enhancing the frequency-power limitations of existing solid-state devices. An example of the method is provided by a simple three-phase frequency-tripling varactor-tuned transistor oscillator.



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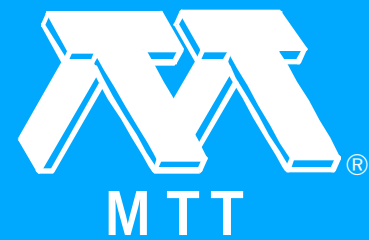


Abstracts

Symmetrical Combiner Analysis Using S-Parameters

D.M. Kinman, D.J. White and M. Afendykiw. "Symmetrical Combiner Analysis Using S-Parameters." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 268-277.

A general theory is developed to predict the potential efficiency (η) and input impedance (Z_{in}) of symmetrical N-way combining networks in terms of scattering parameters. A simplified version of the theory, assuming perfect symmetry, is then implemented on a semiautomatic network analyzer (SANA) which is used to characterize 2-way and 16-way TM₀₁₀ combining networks. These simplified theoretical assumptions have also been used to predict the degradation effects of power combiners when one or more sources fail. Results indicate that there is room for improvement if proper design techniques are applied.



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TE/sub 11/ to HE/sub11/ Cylindrical Waveguide Mode Converters Using Ring-Loaded Slots

G.L. James and B.M. Thomas. "TE/sub 11/ to HE/sub11/ Cylindrical Waveguide Mode Converters Using Ring-Loaded Slots." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 278-285.

A theoretical parameter study is given of a TE/sub 11/ to HE/sub 11/ mode converter consisting of a section of cylindrical corrugated waveguide with ring-loaded slots. The analysis, using modal field-matching techniques to determine the scatter matrix of the converter, allows the return loss to be computed accurately. For a wide range of waveguide sizes it is shown that a bandwidth ratio of 1.5 with a return loss better than 30 dB is possible. The low-frequency performance of the converter is limited by the deterioration in return loss, while at high frequencies the generation of a small amount of unwanted EH/sub 12/ mode is the restriction. If the effects of this mode can be neglected, operation over a wider bandwidth is possible, particularly for larger waveguide size.

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Abstracts

Measurement of the Dielectric Constant and Loss Tangent of Thallium Mixed Halide Crystals KRS-5 and KRS-6 at 95 GHz

W.B. Bridges, M.B. Klein and E. Schweig. "Measurement of the Dielectric Constant and Loss Tangent of Thallium Mixed Halide Crystals KRS-5 and KRS-6 at 95 GHz." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 286-292.

The dielectric constants and loss tangents of KRS-5 and KRS-6 thallium halide mixed crystals have been measured at 95 GHz using both the shorted waveguide (SWG) reflection method and the Fabry-Perot (F-P) transmission method on samples filling standard WR-10 waveguide. The results--KRS-5: $\epsilon'/\sub r = 31$; $\tan \delta = 1.8 \times 10^{-2}$; KRS-6: $\epsilon'/\sub r = 29$, $\tan \delta = 2 \times 10^{-2}$ -- agree reasonably well with a simple theoretical fit to the far-infrared lattice absorption of TIBr and TlCl centered at about 1400 GHz. The dielectric samples were hot-pressed into copper wafers with dimensions matching WR-10 waveguide, and then machined and polished to obtain flat, parallel air-dielectric interfaces.



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Abstracts

A More Accurate Model of the TE/sub 10/ Type Waveguide Mode in Suspended Substrate (Short Papers)

S.B. Cohn and G.D. Osterhues. "A More Accurate Model of the TE/sub 10/ Type Waveguide Mode in Suspended Substrate (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 293-294.

An analytical model of the suspended substrate transmission line which includes the grooves used to support the substrate is presented. The model predicts a lower cutoff frequency of the TE/sub 10/ type waveguide mode than that without the grooves. The analysis is confirmed by experiments.



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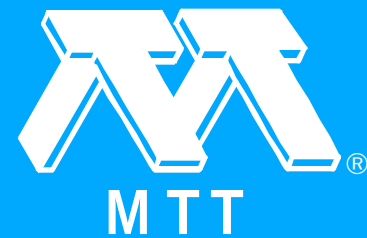


Abstracts

Optimizing Wide-Band MIC Switch Performance (Short Papers)

F.G. Ananasso. "Optimizing Wide-Band MIC Switch Performance (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 294-296.

A detailed analysis is presented of a well-known shunt p-i-n diode configuration -- tee low-pass filter -- particularly useful in high frequency applications and easily realizable in a practical MIC structure. Behavior of both single and double 0-spaced low-pass cell is examined.



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Asymptotic High-Frequency Modes of Homogeneous Waveguide Structures with Impedance Boundaries (Correction)

I.V. Lindell. "Asymptotic High-Frequency Modes of Homogeneous Waveguide Structures with Impedance Boundaries (Correction)." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 296-296.

The treatment of Section V in the above paper was incomplete and, as such, a bit misleading. In fact, the existence question for solutions of equation (53) for $f_{/2} = (\pi_{/2}, m_{/2})$ did not properly take into account the degeneracy of the basic modes $f_{/1} = (\pi_{/1}, m_{/1})$. It is known that for a solution to exist, the right-hand side of a deterministic equation like (53) must be orthogonal to all solutions of the homogeneous adjoint problem, which in this case is the basic problem with solutions $f_{/1}$. Without degeneracy, equation (56) would be that condition. However, since there are at least two linearly independent solutions $f_{/1i}$, there are at least two such conditions, which leads to a contradiction except if $f_{/1}$ in (53) is chosen in a special way. Let us denote the admissible $f_{/1}$ in (53) by $f'_{/1}$ and it can be written as a linear combination of any complete set of degenerate basic modes corresponding to the same parameter $\beta_{/1}: f_{/1} = \sum \alpha_{/i} f_{/1i}$.

Abstracts

Patent Abstracts (Mar. 1982 [T-MTT])

"Patent Abstracts (Mar. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.3 (Mar. 1982 [T-MTT]): 297-300.



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Front Cover (Apr. 1982 [T-MTT])

"Front Cover (Apr. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): f1-f2.



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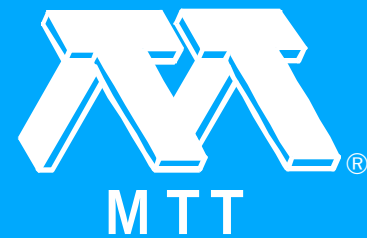


Abstracts

Editorial Comment (Apr. 1982 [T-MTT])

R.H. Knerr. "Editorial Comment (Apr. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 301-301.

The Microwave Theory and Techniques Society has traditionally been involved in guided wave theory and components derived therefrom. We have always pushed our technology and theories to higher and higher frequencies such as millimeter and submillimeter wave frequencies. Our papers on dielectric waveguides covered very high frequencies, including optical frequencies.



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Abstracts

Foreword to the Special Issue on Optical Guided Wave Technology (Apr. 1982 [T-MTT])

T.G. Giallorenzi. "Foreword to the Special Issue on Optical Guided Wave Technology (Apr. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 303-304.

During the past decade, optical guided wave technology has progressed from a laboratory endeavor to a commercial activity. With guided wave technology, one can realize greatly improved data handling and passive sensing capabilities with completely new devices such as represented by the family of sensors being developed using fiber-optical components. Building upon the substantial technological base developed in the 1970's, long, very high bandwidth unrepeatered links appear possible and will find application in long intercity links and undersea transmission cables. The componentry base already permits implementation of many practical intracity, intrabuilding, and intraplatform (e.g., aircraft, ships) links. A competitive and healthy market has been developed to service these opportunities. Just evolving is the fiber-sensor area in which magnetic, acoustic, gyro, temperature, acceleration, pressure, fluid level, flow, etc., sensors can be fabricated using optical fibers as sensing elements. While this area has not yet transitioned to commercial production, the capabilities demonstrated recently in several laboratories indicate that previously unachievable levels of sensor performance can now be realized, thus ensuring future commercial involvement.



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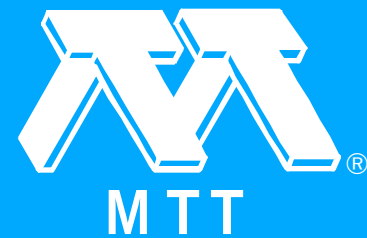


Abstracts

An Overview of the Modified Chemical Vapor Deposition (MCVD) Process and Performance

S.R. Nagel, J.B. MacChesney and K.L. Walker. "An Overview of the Modified Chemical Vapor Deposition (MCVD) Process and Performance." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 305-322.

This paper reviews the MCVD process, with special emphasis on fiber design and material choices, understanding of mechanisms involved in the process, process improvements, and performance.



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Development of Low- and High-Birefringence Optical Fibers

D.N. Payne, A.J. Barlow and J.J. Ramskov Hansen. "Development of Low- and High-Birefringence Optical Fibers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 323-334.

The polarization properties of single-mode optical fibers are easily modified by environmental factors. While this can be exploited in a number of fiber sensor devices, it can be troublesome in applications where a stable output polarization-state is required. Fibers with both low and high birefringence have been developed to enhance or diminish their environmental sensitivity, and recent progress in each area is reviewed. Low-birefringence fibers are described which are made by spinning the preform during the draw. In addition, developments in high-birefringence fibers which maintain a polarization state over long lengths are summarized. The effect on performance of external factors such as bends, transverse pressure, and twists is analyzed. Consideration is also given to polarization mode-dispersion as a potential limiting factor in ultrahigh bandwidth systems.

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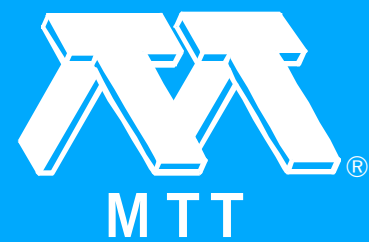
Degree of Polarization in Anisotropic Single-Mode Optical Fibers: Theory

J.-I. Sakai, S. Machida and T. Kimura. "Degree of Polarization in Anisotropic Single-Mode Optical Fibers: Theory." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 334-341.

The degree of polarization for propagation waves in anisotropic single-mode fibers is formulated in terms of light source spectrum, incident polarization condition, and fiber parameters. The polarization degree deterioration is based on the incident wave split into two eigenpolarization modes inherent in the fiber. Since the two eigenpolarization modes have different group velocities from each other, the degree of polarization is degraded when both of the modes are excited. Polarization degree is preserved when only one of the eigenpolarization modes is excited. The degradation is determined by the mutual correlation function γ , between the two modes, which depends on the light source spectra, fiber polarization dispersion, and fiber length.

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Linearly Single Polarization Fibers with Zero Polarization Mode Dispersion

K. Okamoto, T. Hosaka and Y. Sasaki. "Linearly Single Polarization Fibers with Zero Polarization Mode Dispersion." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 342-349.

The optimum waveguide structure for linearly single polarization fibers, which satisfies the large modal birefringence and the zero polarization mode dispersion simultaneously, has been investigated. The basic waveguide structure is the single-mode optical fiber that has an elliptical core and stress-applying parts with a different expansion coefficient from that of the cladding. Waveguide parameters, such as index difference, core ellipticity, and cutoff wavelength, are first determined to obtain highly birefringent fibers with $B = 1 \times 10^{-5}$ or $B = 5 \times 10^{-5}$. The structure of the stress-applying parts that provides zero polarization mode dispersion is then determined.

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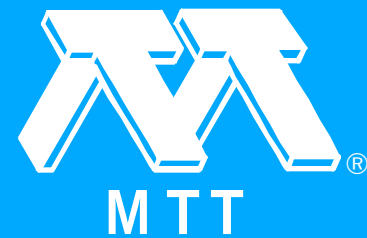


Abstracts

Developments in Single-Mode Fiber Design, Materials, and Performance at Bell Laboratories

P.D. Lazay and A.D. Pearson. "Developments in Single-Mode Fiber Design, Materials, and Performance at Bell Laboratories." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 350-356.

Some aspects of single-mode fiber research and development at Bell Laboratories are presented. The most recent evolution in single-mode fiber design and fabrication technology has resulted in a fiber in which mode size and zero dispersion wavelength can be independently chosen at a fixed cutoff wavelength.



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Tunable InGaAsP Lasers for Spectral Measurements of High Bandwidth Fibers

J. Stone and L.G. Cohen. "Tunable InGaAsP Lasers for Spectral Measurements of High Bandwidth Fibers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 357-359.

An ultrashort-cavity thin-film laser of InGaAsP, pumped with a mode-locked and Q-switched Nd: YAG laser, has been used as the source and an InGaAs/InP p-i-n photodiode as the detector to demonstrate a system capable of measuring bandwidths of 8.5 GHz in single-mode optical fibers. The film laser emits pulses shorter than 10 ps and is tunable over 1700 Å near the chromatic dispersion minimum in fibers.

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The Design and Fabrication of Monomode Optical Fiber

B.J. Ainslie, K.J. Beales, C.R. Day and J.D. Rush. "The Design and Fabrication of Monomode Optical Fiber." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 360-369.

The design of monomode fibers is discussed in the context of optimizing fiber loss and dispersion simultaneously, with reference to the materials choices and limitations to preform and fiber fabrication by the MCVD technique. Two classes of monomode structure-matched cladding and depressed cladding-are considered. Ultralow attenuation has been achieved reproducibly in both classes of fiber. The control of fiber geometry and dispersion is also discussed. Matched cladding fiber suitable for systems operating at both 1.3 and 1.55 μm has been studied and mean losses of 0.45 dB/km at 1.3 μm and 0.28 dB/km at 1.55 μm have been achieved for a total of 130 km. The behavior of depressed cladding fiber is compared with predictions from the theory of propagation in W fibers. Depressed cladding fiber with stable guidance has been demonstrated with attenuation of 0.37 dB/km at 1.3 μm and 0.21 dB/km at 1.55 μm .

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Practical Three-Dimensional Profiling of Optical Fiber Preforms

P.-L. Francois, I. Sasaki and M.J. Adams. "Practical Three-Dimensional Profiling of Optical Fiber Preforms." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 370-381.

The spatial filtering technique has been used in the practical implementation of three-dimensional profile reconstruction for preforms of arbitrary cross section. An interpolation algorithm has been developed which enables accurate three-dimensional profiles to be obtained with a relatively modest number of azimuthal projections of the preform. With the aid of this algorithm it has been found, for both simulated and measured profiles, that for the majority of near-circular preforms only three projections need to be used; the storage requirements are now within the range of a minicomputer and the procedure is thus a practical tool for routine preform assessment.

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Propagation in Doubly Clad Single-Mode Fibers

M. Monerie. "Propagation in Doubly Clad Single-Mode Fibers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 381-388.

General propagation properties and universal curves are given for doubly clad single-mode fibers with inner cladding index higher or lower than outer cladding index, using the two parameters inner cladding/core radii ratio and inner cladding/core index differences ratio. LP01, LP11, and LP02 cutoff conditions are examined. It is shown that dispersion properties largely differ from the singly clad single-mode fiber case, leading to large new possibilities for low-loss dispersion-free fibers at any wavelength between 1.3 and 1.7 μm .

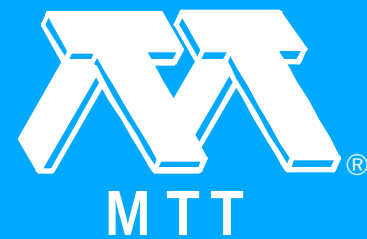
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Abstracts

Noise and Distortion Characteristics of Semiconductor Lasers in Optical Fiber Communication Systems

K. Peterman and G. Arnold. "Noise and Distortion Characteristics of Semiconductor Lasers in Optical Fiber Communication Systems." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 389-401.



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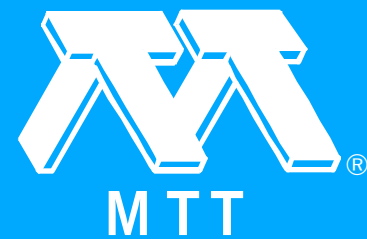


Abstracts

Spectral Characteristics of Semiconductor Lasers with Optical Feedback

L. Goldberg, H.F. Taylor, A. Dandridge, J.F. Weller and R.O. Miles. "Spectral Characteristics of Semiconductor Lasers with Optical Feedback." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 401-410.

Optical feedback-induced changes in the output spectra of several GaAlAs lasers operating at 0.83 μm are described. The feedback radiation obtained from a mirror 60 cm away from the laser is controlled in intensity and phase. Spectral line narrowing or broadening is observed in each laser depending on the feedback conditions. Minimum linewidths observed with feedback are less than 100 kHz. Improved wavelength stability is also obtained with optical feedback resulting in 15 dB less phase noise. Analytical model for the three-mirror cavity is developed to explain these observations.



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Noise in an AlGaAs Semiconductor Laser Amplifier

T. Mukai and Y. Yamamoto. "Noise in an AlGaAs Semiconductor Laser Amplifier." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 410-421.

The noise characteristics in a Fabry-Perot (FP) cavity type semiconductor laser amplifier, biased at just below its oscillation threshold current, have been studied theoretically and experimentally. Quantum mechanical multimode rate equations containing a Langevin shot noise source and an input signal term were numerically solved for an exponential band-tail model with no k-selection rule. Noise power calculated using this rate equation was compared with a simpler photon statistic master equation method. The experimental results on noise power for an AlGaAs laser amplifier are in reasonable agreement with the two different theoretical predictions. Dominant noise powers in a semiconductor laser amplifier are beat noise powers between signal and spontaneous emission, and between spontaneous emission components. Noise characteristics in a Fabry-Perot cavity type laser amplifier can be improved both by the reduction of the facet mirror reflectivities and by use of an asymmetric cavity configuration with low-input and high-output mirror reflectivities. Two beat noise powers are expressed in simple analytic form by introducing an equivalent noise bandwidth and an excess noise coefficient as figures of merit in an optical amplifier.



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Optical FM Signal Amplification by Injection Locked and Resonant Type Semiconductor Laser Amplifiers

S. Kobayashi and T. Kimura. "Optical FM Signal Amplification by Injection Locked and Resonant Type Semiconductor Laser Amplifiers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 421-427.

Optical FM signal amplification by semiconductor lasers is studied by emphasizing their bandwidth characteristics. The laser is operated either in an injection-locked mode or in a resonant amplification mode by keeping the drive current above or just below its threshold. The bandwidths of both amplifiers are evaluated by the reduction in modulation sidebands and are compared with the bandwidths measured statically by scanning the frequency of incident CW wave. The radic $G = 25$ GHz gain bandwidth product is obtained for both operation modes using a double heterostructure AlGaAs semiconductor laser. The bandwidth obtained in the above procedure is in good agreement with theoretical results.





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Direct Frequency Modulation in AlGaAs Semiconductor Lasers

S. Kobayashi, Y. Yamamoto, M. Ito and T. Kimura. "Direct Frequency Modulation in AlGaAs Semiconductor Lasers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 428-441.

Direct frequency modulation characteristics in three different AlGaAs lasers - a channeled-substrate planar (CSP) laser, a buried-heterostructure (BH) laser, and a transverse-junction-stripe (TJS) laser- are studied theoretically and experimentally. Experimental FM responses are measured by using the Fabry-Perot interferometer and birefringent optical filters in the 0-5.2 GHz modulation frequency region. Experimental FM response dependence on modulation frequency, dc bias level, and stripe structure are successfully explained by the theoretical analyses considering both the carrier density modulation effect and the temperature change effect. FM response in the low modulation frequency region from 0 to 10 MHz, gradually decreasing with the modulation frequency, stems from the thermal effect. FM response in the high modulation frequency region from 10 MHz to 5.2 GHz is caused by the carrier effect. A flat FM response of several hundred MHz per 1 mA is observed in the CSP and TJS lasers, but a V-shaped FM response is obtained in the BH laser. Resonance peak due to relaxation oscillation and cutoff characteristics are observed in several gigahertz regions. Weak lateral mode confinement, strong vertical mode confinement, carrier injection outside the effective core region, and p-side down mounts are effective ways to achieve a flat and efficient FM response with a small spurious intensity modulation.



Abstracts

Superhigh Differential Quantum Efficiency and Strong Self-Sustained Pulsation in CW DH Laser Diodes

C.-M. Wang, L.-Q. Zhao, W.-R. Zhuang, J.-M. Chang, C.-S. Chang and Z.-Q. Wu. "Superhigh Differential Quantum Efficiency and Strong Self-Sustained Pulsation in CW DH Laser Diodes." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 441-447.

Some experimental results in GaAs DH lasers having a stable, long operating-time, such as nonlinear superhigh differential quantum efficiency, the behavior of light output saturation and sudden growth again in the same filament, strong self-sustained pulsation, and so on, are presented. A model of double filaments caused by the non-uniform distribution of aluminum in the active layer of the laser diode is present to explain their anomalous behavior qualitatively.



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A Theoretical Analysis on Transmission Characteristics of Semiconductor Lasers

Y.-Z. Shan and B.-X. Du. "A Theoretical Analysis on Transmission Characteristics of Semiconductor Lasers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 447-455.

In this paper, on the basis of classical control theory transmission characteristics of semiconductor lasers will be analyzed. In the case of small-signals semiconductor lasers is considered as an isolated linear system and the rate equation describing its physical process is linearized; four kinds of transmission functions showing its transmission characteristics have been obtained by using network theory; response characteristics to optical-electrical input signals and corresponding equivalent network are then given according to the transmission functions, and transmission characteristics are, in turn, analyzed and synthesized according to the transmission functions and the equivalent network.

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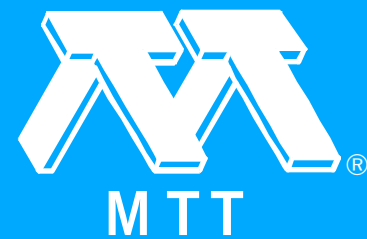


Abstracts

Studies of Semiconductor Lasers of the Interferometric and Ring Types

S. Wang, H.K. Choi and I.H.A. Fattah. "Studies of Semiconductor Lasers of the Interferometric and Ring Types." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 456-463.

In this paper we present an analysis of semiconductor lasers of the interferometric and ring types, using the scattering-matrix formulation. The purpose of our analysis is to find new applications for semiconductor lasers beyond serving merely as a source for coherent radiation. Potential applications include wavelength stability, possibility for wavelength tuning and switching, operation as a traveling wave laser, and possible reduction in feedback effect. An initial set of experiments has been carried out and the results have borne out some theoretical predictions. These lasers should offer promises for use in integrated optics and fiber optical communication. Furthermore, the scattering-matrix formulation should be useful in treating other complex laser structures and lasers in an optical network environment.



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Abstracts

An Analytical Solution of the Lateral Current Spreading and Diffusion Problem in Narrow Oxide Stripe (GaAl)As/GaAs DH Lasers

G. Lengyel, P. Meissner and K.-H. Zschauer. "An Analytical Solution of the Lateral Current Spreading and Diffusion Problem in Narrow Oxide Stripe (GaAl)As/GaAs DH Lasers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 464-471.

An exact solution is presented to the problem of lateral current spreading in the resistive layer of oxide stripe geometry DH lasers. The two-dimensional Laplace equation was solved by conformal mapping using the Schwarz-Christoffel transformation. The diffusion equation containing nonlinear recombination terms was solved numerically. Computed examples demonstrate that the customary one-dimensioned treatment of the resistive layer or the assumption of constant current density under the stripe contact are not always justified, particularly for narrow stripe widths and low specific resistivities. This region of low values of the resistivity and stripe width, however, is of great practical interest in the design of oxide stripe lasers having high thermal stability and kink-free characteristics.



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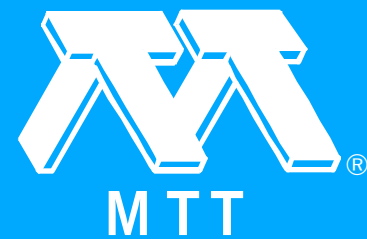


Abstracts

Optical Fiber Sensor Technology

T.G. Giallorenzi, J.A. Bucaro, A. Dandridge, G.H. Sigel, Jr., J.H. Cole, S.C. Rashleigh and R.G. Priest. "Optical Fiber Sensor Technology." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 472-511.

The current state of the art of optical fiber sensors is reviewed. The principles of operation are detailed and the various types of fiber sensors are outlined. Achievable performance and limitations are discussed and a description of technology used to fabricate the sensor is presented. The characteristics of acoustic, magnetic, gyro, laser diode, and other sensors are described. Trends in the development of this sensor technology and expected application areas are briefly outlined.



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The Dynamical Behavior of a Single-Mode Optical Fiber Strain Gage

M. Martinelli. "The Dynamical Behavior of a Single-Mode Optical Fiber Strain Gage." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 512-516.

A comparison is reported between the dynamical response of a single-mode fiber optic and resistive strain gages in the frequency range 25-250 Hz. The integral phase change of the laser light propagation into the vibrating fiber optic is evaluated. A mechanical system was designed to exactly delimitate the put of the optical fiber which is subjected to vibration. The frequency spectrum of the phase change signal and the resistive strain gage signal show equivalent behavior. This result is in good agreement with the theoretically expected shares and confirms the validity of the analysis performed.

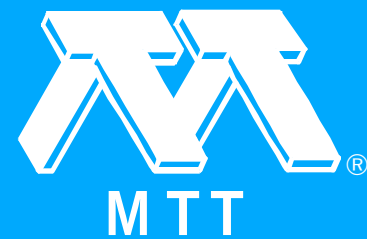


Abstracts

An Electric Field Sensor Utilizing a Piezoelectric Polyvinylidene Fluoride (PVF/sub 2/) Film in a Single-Mode Fiber Interferometer

K.P. Koo and G.H. Sigel, Jr.. "An Electric Field Sensor Utilizing a Piezoelectric Polyvinylidene Fluoride (PVF/sub 2/) Film in a Single-Mode Fiber Interferometer." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 516-521.

A polyvinylidene fluoride (PVF/sub 2/) phase shifter is characterized in terms of amplitude response uniformity, frequency response uniformity, and ultimate sensitivity to electric field. Phase-drift compensation with this PVF/sub 2/ device is demonstrated in a Mach-Zehnder fiber interferometer. The compensator can be operated at the $\pi/2$ -phase mode for maximum sensitivity in detection applications, or the π -phase mode for maximum frequency mixing efficiency.



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Fiber-Optic Instrument for Temperature Measurement

K. Kyuma, S. Tai, T. Sawada and M. Nunoshita. "Fiber-Optic Instrument for Temperature Measurement." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 522-525.

A practical fiber-optic measurement instrument for temperature was constructed consisting of a small sensor responding to optical absorption change in a semiconductor, and a unique signal processing system with two different-wavelength light emitting diodes (LED's). The fiber-optic sensor with a semiconductor chip is quite small, very sensitive, highly reliable, and easy to manufacture at low cost. The most outstanding feature of this system is that it is free from optical-stray-loss. The accuracy of about $\pm 1^\circ$ and the response time of about 2 s were obtained in the temperature range from -10°C to 300°C .

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Abstracts

Single-Mode Fiber Ultrasonic Sensor

R.P. De Paula, L. Flax, J.H. Cole and J.A. Bucaro. "Single-Mode Fiber Ultrasonic Sensor." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 526-529.

An acoustooptic ultrasonic sensor using a single-mode fiber is discussed. The sensor is based on acoustically induced modal birefringence which alters the polarization state of the optical beam.



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Optimizing Fiber Coatings for Interferometric Acoustic Sensors

N. Lagakos, E.U. Schnaus, J.H. Cole, J. Jarzynski and J.A. Bucaro. "Optimizing Fiber Coatings for Interferometric Acoustic Sensors." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 529-535.

The pressure sensitivity of the phase of light propagating in an optical fiber is studied both analytically and experimentally. The analysis, which takes into account the exact composition and geometry of multilayer fibers, is utilized to identify coating properties which optimize the fiber acoustic sensitivity. In order to predict the fiber acoustic sensitivity, the elastic parameters of commonly used coating materials, thermoplastics, and UV curable elastomers have been studied in bulk samples as a function of frequency (10^2 - 10^4 Hz) and temperature (0-35°C). The analytically predicted frequency dependence of the acoustic sensitivity is found to be in agreement with that obtained experimentally from fibers with coatings of various materials.

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Frequency Modulated Heterodyne Optical Fiber Sagnac Interferometer

B. Culshaw and I.P. Giles. "Frequency Modulated Heterodyne Optical Fiber Sagnac Interferometer." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 536-539.

This paper describes a new approach to the detection of rotation rate using the optical fiber Sagnac interferometer. An inherently reciprocal heterodyne system gives the advantages in terms of signal-to-noise ratios (SNR's) of heterodyne detection, while independent electronic monitoring of each propagation path through the interferometer significantly enhances signal processing flexibility. The system may thus be used as a probe to evaluate fiber properties in a way compatible with other architectures, and these measurements should lead to advances in performance characteristics. A prototype system has established noise levels in the region of $100^\circ/\text{h}$, and improvement to the signal processing will soon improve on this figure.

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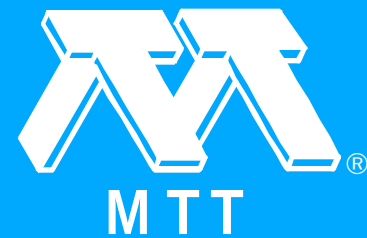


Abstracts

Synthetic-Heterodyne Interferometric Demodulation

J.H. Cole, B.A. Danver and J.A. Bucaro. "Synthetic-Heterodyne Interferometric Demodulation." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 540-543.

A new interferometric demodulation technique is described. This technique employs phase swept multicarrier demodulation (synthetic-heterodyne) to optimize the interferometer output.



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Abstracts

Undersea Fiber Cable Technology

K. Amano. "Undersea Fiber Cable Technology." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 543-550.

Compared with the conventional coaxial undersea cable systems, an optical fiber undersea cable system has a great technical and economical advantage. It is also suitable for digital transmission. In this paper, the optical fiber undersea cable technology (including optical fiber cables and repeaters), which is now in the research and development stage in several countries, is reviewed.



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Abstracts

Optical Componentry Utilized in Field Trial of Single-Mode Fiber Long-Haul Transmission

J.-I. Minowa, M. Saruwatari and N. Suzuki. "Optical Componentry Utilized in Field Trial of Single-Mode Fiber Long-Haul Transmission." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 551-563.

Realization of large-capacity long-haul transmission systems is now quite promising due to rapid development in the field of optical fibers. The paper describes single-mode fiber optical components for use in the above-mentioned system. In particular, LD modules, optical connectors are most important for construction of a practical system. Thus, they are explained in detail along with their development procedures. Important field trial results of these components are also presented.



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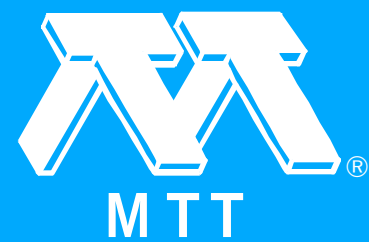
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Characteristics of Gbit/s Optical Receiver Sensitivity and Long-Span Single-Mode Fiber Transmission at 1.3 μm

J.-I. Yamada and T. Kimura. "Characteristics of Gbit/s Optical Receiver Sensitivity and Long-Span Single-Mode Fiber Transmission at 1.3 μm ." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 564-573.

Sensitivity of a 1.3 μm Ge APD receiver was measured at data rates ranging from 100 Mbits/s to 2 Gbits/s, using a high-speed GaAs FET RZ driver, low-noise Si bipolar transistor (BIT) receiver amplifier, a highly sensitive TD comparator. The required received optical level at a 10/sup -9/ error rate was -31.9 dBm for 2 Gbits/s with a Ge APD/Si BIT front end having a 50 Omega input impedance. A Ge APD/ GaAs FET front end, with a 500 Omega input impedance, brought about 2 dB improvement at 100 Mbits/s, as compared with a Ge APD/Si BIT (50 Omega) front end. A coupling loss of 4 dB, achieved by a hemispherical microlens tipped on a single-mode fiber, and a low fiber loss of 0.57 dB/km, including splice loss, enabled 44.3 km single-mode fiber transmission at 2 Gbits/s. The 1.3 μm transmission system has a data rate repeater-spacing product of 88.6 (Gbit/s)km. Prospects of Gbit/s receiver sensitivity, the 2 Gbit/s transmission system, with more than 50 km repeater spacing, are also discussed.



Abstracts

Single-Mode Fiber Design for Long Haul Transmission

L. Jeunhomme. "Single-Mode Fiber Design for Long Haul Transmission." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 573-578.

By using simple yet accurate approximations for the propagation characteristics of a single-mode optical fiber, we obtain a simple model for the total loss and chromatic dispersion of single-mode fiber transmission lines as a function of the operating conditions such as splice offset, microbending loss, bends, etc. This model is then applied to typical cases of terrestrial and submarine systems and we obtain single-mode fiber designs which are stable with respect to slight operating condition changes for both 1.3 and 1.55 μm wavelengths. It appears that the same fiber can be used at 1.3 μm for both terrestrial and submarine systems, and even for 1.55 μm terrestrial systems if monochromatic sources become available at this wavelength. A general comparison between the two wavelengths is carried out and shows under which conditions the 1.55 μm wavelength is of practical interest. It is emphasized that the availability of monochromatic sources at 1.55 μm would make a major breakthrough for the repeater spacing.



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Studies on Designing of Submarine Optical Fiber Cable

N. Kojima, Y. Miyajima, Y. Murakami, T. Yabuta, O. Kawata, K. Yamashita and N. Yoshizawa. "Studies on Designing of Submarine Optical Fiber Cable." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 579-586.

This paper describes important studies necessary to design submarine optical fiber cables. These include a study for deciding the optimum single-mode fiber parameters to suppress losses during cabling, cable laying, and so on. It also includes a study on the necessary fiber proof test conditions to prevent fiber breakage during cable handling, that is, during cable laying and recovery and to assure long-term fiber reliability. Submarine optical fiber cable sea trial results we also stated for cables designed applying these studies.

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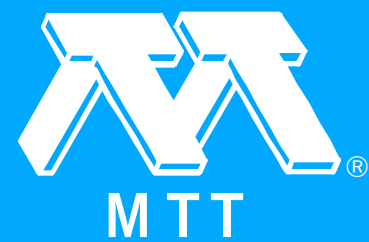


Gigahertz Analog Repeater for Fiber Optic Delay Lines

C.-T. Chang. "Gigahertz Analog Repeater for Fiber Optic Delay Lines." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 587-591.

A gigahertz analog fiber optic repeater is used to extend the achievable delay time for radar delay line applications. The repeater consists of a silicon avalanche photodiode (APD), a wide-band amplifier, and a GaAlAs laser diode transmitter. This repeater has an optical gain of 14.5 dB, a 42 dB electrical dynamic range, and a noise figure of approximately 6.5 dB. The frequency response is flat within ± 2 dB over the frequency range from 10 MHz to 1.3 GHz. The nanosecond pulse fidelity is such that the subtraction between input and output pulses is 20 dB below the pulse amplitude.





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Analysis of a Tunable Single Mode Optical Fiber Coupler

M.J.F. Digonnet and H.J. Shaw. "Analysis of a Tunable Single Mode Optical Fiber Coupler." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 592-600.

We report the operation and the theoretical modeling of an efficient, tunable, and low-loss single mode fiber coupler. The coupler design follows a scheme previously reported, in which two optical fibers mounted in curved grooves in separate quartz substrates are polished until sufficient cladding material has been removed to permit optical coupling between the mated polished faces of the fibers. The results of a computer analysis of the distributed coupling taking place between the fibers are discussed, emphasizing the intuitive dependence of the coupling coefficient and effective interaction length of the device on its geometrical parameters. A detailed experimental analysis of fiber couplers follows in which we characterize two types of couplers made with different brands of single-mode fibers. Operation up to 100 percent coupling ratio and 50 dB extinction ratio between coupled and direct branch as well as operation in overcoupling regimes are demonstrated, both at visible and infrared signal wavelengths. Tuning curves are shown that emphasize the excellent tunability properties of such couplers in which the coupling ratio can be smoothly and continuously tuned between 0 and 100 percent. Experimental evidence of the relatively low loss level and very low polarization dependence of the fiber couplers are also presented. All experimental results, including an analysis of the influence of the refractive index of the intermediate layer of index-matching liquid between the polished faces of the fibers, are found to be very well predicted by our theoretical model.

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Exact Splice Loss Prediction for Single-Mode Fiber

Y. Usui, T. Ohshima, Y. Toda, Y. Kato and M. Tateda. "Exact Splice Loss Prediction for Single-Mode Fiber." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 601-604.

This paper describes the direct measurement method of spot size for single-mode fibers and its application to the splice loss prediction. Using a core-centering-type automatic fusion splicing machine, predicted splice loss is examined for several MCVD and VAD fibers. The accuracy of splice loss predicted by this method is better than that calculated from core radius and refractive index. The experimental splice loss is equal to the sum of the loss predicted by this method and the loss caused by the splicing technique.

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Two-Wave Sum-Frequency Light Generation in Optical Fibers

Y. Ohmori and Y. Sasaki. "Two-Wave Sum-Frequency Light Generation in Optical Fibers." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 604-608.

The generation of phase-matched two-wave sum-frequency light has been observed in optical fibers. A Nd: YAG laser by simultaneous mode-locking and Q-switching or only Q-switching operation is used as a pump laser. The input power dependence and fiber length dependence of the sum-frequency light are investigated in the two pumping methods. The observed coherence length for the sum-frequency light generation is about 200 m.

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Electrooptic Polarization Modulation in Multielectrode Al/sub x/Ga/sub 1-x/As Rib Waveguides

F.K. Reinhart, R.A. Logan and W.R. Sinclair. "Electrooptic Polarization Modulation in Multielectrode Al/sub x/Ga/sub 1-x/As Rib Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 609-612.

A single mode rib waveguide (RWG) polarization modulator is described with a measured extinction ratio /spl gsim/27 dB, a power conversion /spl ap/0.99, and a switching voltage of 12.5 V at /spl lambda/ = 1.064 μ m. The modulator is based on a modified step delta beta-reversal configuration. Contact with CdO and an Au overlay ensures low optical losses (/spl lsim/1 cm/sup -1/) for both polarizations.





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Integrated-Optical Single-Sideband Modulator and Phase Shifter

F. Heismann and R. Ulrich. "Integrated-Optical Single-Sideband Modulator and Phase Shifter." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 613-617.

A scheme of spatially weighted coupling between two wave-guide modes is proposed in which the weights form an electrooptically induced periodic coupling structure that can be moved at variable speeds forward or backward along the guide. The device can operate as an optical phase shifter with unlimited phase range, as a single-sideband amplitude modulator or frequency shifter, or as a polarization transformer.

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Crosstalk Characteristics of Ti-LiNbO₃/sub 3/ Intersecting Waveguides and Their Application as TE/TM Mode Splitters

H. Nakajima, T. Horimatsu, M. Seino and I. Sawaki. "Crosstalk Characteristics of Ti-LiNbO₃/sub 3/ Intersecting Waveguides and Their Application as TE/TM Mode Splitters." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 617-622.

Crosstalk characteristics of an intersecting waveguide are presented. Two straight channel waveguides which intersect at an angle of a few degrees on y-cut LiNbO₃/sub 3/ were fabricated by in-diffusion of Ti. Experimental results show that the crosstalk characteristics are determined by the refractive index change profile and the geometry of intersection associated with guided wave modes. In a special case, a TE/TM mode splitter was obtained by using the intersecting waveguide which provides adequate anisotropy by the change in refractive indices. Splitting ratio was 17 and 14 dB for the TE and TM modes, respectively.

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Abstracts

Multimode Deposited Silica Waveguide and its Application to an Optical Branching Circuit

H. Mori and N. Shimizu. "Multimode Deposited Silica Waveguide and its Application to an Optical Branching Circuit." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 622-627.

A fabrication procedure has been developed for multimode deposited silica waveguide (DS guide), consisting of uniform and thick glass layer formation for core and cladding, and amorphous Si mask film for reactive sputter etching. The embedded multimode DS guide with a square core cross section has a transmission loss of 1.3 dB/cm at 633 nm wavelength. Waveguide parameters, such as core dimension, refractive index, and index difference, are similar to those of a multi-mode silica fiber. A multimode optical branching circuit with eight output ports was demonstrated by the above fabrication procedure. Excess insertion loss was 2 dB.



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Mode Coupling Between Dielectric and Semiconductor Planar Waveguides

T.E. Batchman and G.M. Mc Wright. "Mode Coupling Between Dielectric and Semiconductor Planar Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 628-634.

Computer modeling studies on four-layer silicon-clad planar dielectric waveguides indicate that the attenuation and mode index behave as exponentially damped sinusoids when the silicon thickness is increased. This effect can be explained as a periodic coupling between the guided modes of the lossless structure and the lossy modes supported by the high refractive index silicon. Furthermore, the attenuation and mode index are significantly altered by conductivity changes in the silicon. An amplitude modulator and phase modulator have been proposed using these results. Predicted high attenuations in the device may be reduced significantly with a silicon dioxide buffer layer.

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Scattering Pattern Measurement and Analysis of Sputtered-Glass Optical Waveguides for Integrated Optics

M. Imai, Y. Ohtsuka and M. Koseki. "Scattering Pattern Measurement and Analysis of Sputtered-Glass Optical Waveguides for Integrated Optics." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 635-641.

The radiation patterns from optical waveguides prepared by sputtered 7059 glass thin film onto pyrex glass substrates are measured in order to clarify the loss mechanisms producing the scattering. The angular distributions of the scattered light can be explained by the presence of its surface roughness at film-substrate and film-air inter-faces and/or of bulk inhomogeneities of the waveguide core. For waveguides with a relatively high loss of several dB/cm, for example, the patterns are consistent with the theory based on a cross-correlated model of these imperfections, assuming correlation lengths of the order of 0.1λ in the normal direction and of the same order as the wavelength λ in the parallel direction to the waveguide. The rms value of surface roughness to that of bulk inhomogeneities divided by α is also determined by comparing the measured scattering curves with the theoretically calculated curves.





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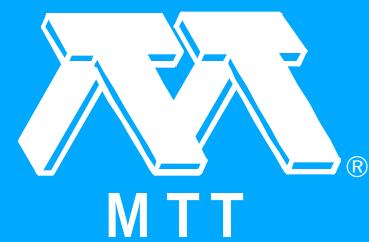
GaAs/GaAlAs Curved Rib Waveguides

M.W. Austin. "GaAs/GaAlAs Curved Rib Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 641-646.

Curved dielectric optical waveguides suffer from radiation loss due to bending. To minimize the bending loss and reduce the radius of curvature, it is necessary to fabricate guides which provide strong optical confinement. This paper gives a brief review of curved waveguide analysis and presents some experimentally measured loss values for GaAs/GaAlAs curved rib waveguides. The rib waveguides, fabricated using ion beam milling, have a large rib height and are tightly guided structures. When corrected for reflection losses and input coupling efficiency, a minimum loss of approximately 3 dB has been achieved for a multimode 90° curved guide with a radius of curvature of 300 μm , and 8.5 dB for a single-mode curved guide with a radius of curvature of 400 μm . It is believed that most of this residual loss is not radiation loss due to bending, but rather scattering loss due to rib wall imperfections.

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CO₂ Laser Annealing of Si₃N₄, Nb₂O₅, and Ta₂O₅ Thin-Film Optical Waveguides to Achieve Scattering Loss Reduction

S. Dutta, H.E. Jackson, J.T. Boyd, R.L. Davis and F.S. Hickernell. "CO₂ Laser Annealing of Si₃N₄, Nb₂O₅, and Ta₂O₅ Thin-Film Optical Waveguides to Achieve Scattering Loss Reduction." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 646-652.

Significant reductions in the optical scattering losses of Si₃N₄, Nb₂O₅, and Ta₂O₅ waveguides fabricated on SiO₂/Si substrates have been measured following CO₂ laser annealing. The largest improvements were observed for Si₃N₄ waveguides, where waveguide attenuation values of about 6.0 dB/cm before laser annealing were reduced to as low as 0.1 dB/cm afterwards. An improvement of more than an order of magnitude was obtained for a Nb₂O₅ waveguide upon laser annealing, the attenuation coefficient decreasing from 7.4 to 0.6 dB/cm. In the case of one Nb₂O₅ waveguide no improvement was obtained upon laser annealing. The attenuation coefficient of a reactively sputtered Ta₂O₅ waveguide was found to decrease from 1.3 dB/cm before laser annealing to 0.4 dB/cm afterwards. In the case of a thermally oxidized Ta₂O₅ waveguide a small initial improvement in waveguide attenuation was followed by degradation upon further laser annealing.



Abstracts

Patent Abstracts (Apr. 1982 [T-MTT])

"Patent Abstracts (Apr. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint Special Issue on Optical Guided Wave Technology)): 653-660.



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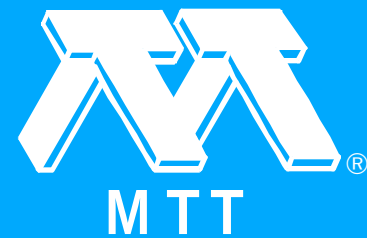
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Low-Noise Microwave Transistors and Amplifiers (Announcement) (Apr. 1982 [T-MTT])

"Low-Noise Microwave Transistors and Amplifiers (Announcement) (Apr. 1982 [T-MTT])."
1982 Transactions on Microwave Theory and Techniques 30.4 (Apr. 1982 [T-MTT] (Joint
Special Issue on Optical Guided Wave Technology)): 660-660.



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Back Cover (Apr. 1982 [T-MTT])

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Abstracts

A Rigorous Technique for Measuring the Scattering Matrix of a Multiport Device with a 2-Port Network Analyzer

J.C. Tippet and R.A. Speciale. "A Rigorous Technique for Measuring the Scattering Matrix of a Multiport Device with a 2-Port Network Analyzer." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 661-666.

A new measurement technique is described that eliminates the mismatched-induced errors that occur when the scattering matrix of a multiport device is measured with a 2-port network analyzer. These errors arise from neglecting the finite reflections from the imperfect auxiliary loads terminating the unused ports of the device under test in each of the required 2-port measurements. It is shown how a systematic application of the generalized scattering matrix renormalization transform completely eliminates these errors. This new method is completely general and can therefore be applied to measurements of the scattering matrix of an n-port device with an m-port network analyzer ($m < n$).



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An Automatic Network Analyzer Using a Slotted Line Reflectometer

E. Martin, J. Margineda and J.M. Zamarro. "An Automatic Network Analyzer Using a Slotted Line Reflectometer." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 667-670.

An automatic network analyzer (ANA) based on a 5-port reflectometer is presented. The measuring circuit consists of a slotted waveguide with sliding probe. A group of three fixed probes may be used instead. A microwave source, frequency counter, and power meter are used all controlled by a desktop computer. The theory is simple and the algorithm for obtaining the complex reflection coefficient from experimental data is fast. Some results are given for measurements earned out at X-band frequencies. Successful measurement accuracy is achieved with relatively noncomplex hardware. Multioctave bandwidth operation is expected for the proposed technique.

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Loss Increases in Multimode Rectangular Infrared Waveguides Due to Helical Deformations

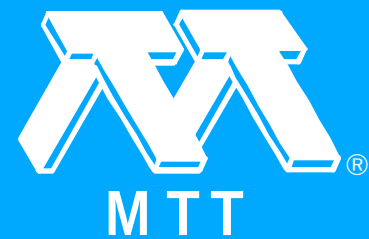
M.E. Marhic. "Loss Increases in Multimode Rectangular Infrared Waveguides Due to Helical Deformations." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 671-678.

The coupling coefficients for all TE/sub pq / and TM/sub pq / modes of multimode rectangular waveguides, caused by elementary rotations about the three axes of symmetry, are calculated in the microwave approximation. The modes b coupled to a common mode a by these independent rotations form three nonoverlapping families. Furthermore if a deformation consisting of no more than two of these rotations is considered, none of the modes b are coupled to each other by that deformation. These properties lead, in the case of mild deformations, to the formulation of a multimode coupling theory which shows that the loss increase due to such deformations can then be viewed as the result of multiple two-mode coupling. Explicit formulas are derived for the loss increase of TE/sub $p0$ / due to mild circular bending. Qualitative features of twists and helical deformations are also brought out.

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Unified Approach to Solve a Class of Strip and Microstrip-Like Transmission Lines

B. Bhat and S.K. Koul. "Unified Approach to Solve a Class of Strip and Microstrip-Like Transmission Lines." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 679-686.

This paper presents a unified analytical approach to solve a class of shielded strip and shielded microstrip-like transmission lines with multilayer dielectrics under TEM-wave approximation. The analysis makes use of the variational technique in the space domain combined with the "transverse transmission line" method. Expressions are derived for the capacitance of a single line, coupled two-line and coupled four-line structures. The same formulas can be used for a class of such structures by the substitution of a single parameter, namely, the admittance at the charge plane, which can be obtained using the standard transmission line formulas. Numerical results of two special structures, namely, the broadside-coupled suspended microstrip lines, and broadside-coupled inverted microstrip lines, using two suspended, dielectric substrates are included. The technique presented is the simplest compared to any other analytical procedures reported in the literature.

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Abstracts

A Review of SAW-Based Direct Frequency Synthesizers

A.J. Budreau, A.J. Slobodnik, Jr. and P.H. Carr. "A Review of SAW-Based Direct Frequency Synthesizers." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 686-693.

Many new electronic systems, including spread spectrum links, require frequency synthesizers capable of providing accurate signals of high spectral purity, and must be able to change frequencies in fractions of a microsecond. Three such synthesizers based on comb generators, SAW filterbanks, and fast switches are reviewed. Each of these synthesizers can provide an output at approximately 1.3 GHz from one of over 200 frequencies of integral megahertz value.



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Compensation of Intermodal Dispersion by Splicing Two Graded-Index Multimode Fibers

K. Morishita, H. Ikeda and N. Kumagai. "Compensation of Intermodal Dispersion by Splicing Two Graded-Index Multimode Fibers." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 694-700.

The deviations from the group delays expected for the optimum power-law index profile are numerically calculated for several types of undesired fibers using a scalar multilayer approximation method. This paper shows the way two fibers are selected from among undesired fibers so that the fiber spliced to each other becomes broad band.

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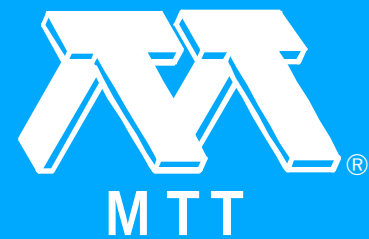
Slow Wave Gyrotron Amplifier with a Dielectric Center Rod

J.Y. Choe, H.S. Uhm and S. Ahn. "Slow Wave Gyrotron Amplifier with a Dielectric Center Rod." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 700-707.

The broad-band capability of the gyrotron amplifier with a dielectric center rod is investigated. The dispersion relation for the TE mode perturbation is obtained, and the system parameters for the optimum bandwidth are obtained for a small axial velocity spread. It is found that the dielectric center rod extends the frequency range of the intermediate wavelength mode (IWM), and reduces the contribution of the troublesome short wavelength mode (SWM). The bandwidth and the gain due to the IWM for the center rod geometry are superior to those for the wall clad dielectric gyrotron.

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Dual-Harmonic Noncontacting Millimeter Waveguide Backshorts: Theory, Design, and Test

M.K. Brewer and A.V. Raisanen. "Dual-Harmonic Noncontacting Millimeter Waveguide Backshorts: Theory, Design, and Test." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 708-714.

Noncontacting backshorts are necessary in many applications to avoid the wear characteristic of contacting shorts. To reduce losses, it is desirable to eliminate the passband at second harmonic frequencies inherent in conventional quarter-wavelength designs. To this effect, empirically and theoretically designed shorts have been fabricated. The theoretical design extends low-frequency Chebyshev filter theory techniques for use at millimeter-wave frequencies. Both designs have been tested using swept frequency reflectometer techniques. Tests have been carried out over a 40-GHz bandwidth at 100 GHz and a 30-GHz bandwidth at 200 GHz. The results are superior to those obtained with $\Lambda/4$ backshorts tested in the same manner.

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Some Pitfalls in Millimeter-Wave Noise Measurements Utilizing a Cross-Correlation Receiver

A.D. Sutherland and A. Van der Ziel. "Some Pitfalls in Millimeter-Wave Noise Measurements Utilizing a Cross-Correlation Receiver." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 715-718.

It is shown that the use of a hybrid junction as the power splitter in a cross-correlation receiver for millimeter-wave (94-GHz) noise measurements at low temperature (2 K) introduces an unwanted source of noise which defeats the purpose of the measurements. The same is the case when isolators are introduced to prevent cross-coupling of the noise from the two receiver channels.





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A MESFET Variable-Capacitance Model for GaAs Integrated Circuit Simulation

T. Takada, Y. Kiyoyuki, M. Ida and T. Sudo. "A MESFET Variable-Capacitance Model for GaAs Integrated Circuit Simulation." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 719-724.

A simple MESFET capacitance model which has a clearly explained physical meaning for a wide bias voltage range has been developed for use in simulations of GaAs integrated circuits. In this model, gate-source, gate-drain capacitances are represented by analytical expressions which are classified into three different regions for bias voltages: a before-pinch-off region including the neighborhood of the built-in voltage, an after-pinch-off region, a transition region. 2-dimensional analysis results support the validity of the analytically derived capacitance model. The model is applicable to MESFET's used in integrated circuits that have low donor-thickness product.

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Power Combiner with Gunn Diode Oscillators

J.J. Potoczniak, H. Jacobs, C.M. Locasio and G. Novick. "Power Combiner with Gunn Diode Oscillators." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 724-728.

Combiners were developed using two Gunn diodes in dielectric waveguide (image line) oscillator circuits. The optimum configuration consisted of each Gunn diode being imbedded in a separate dielectric cavity as a primary source of oscillation. The dielectric resonators were then radiatively coupled to a common dielectric resonator from which the combined power could be obtained. It was found that the combined power was greater than the sum of the power obtainable from separate isolated oscillators. The proposed combiner appears attractive from the point of view of simplicity of construction and low cost and should be applicable to the millimeter-wave region, where the difficulties of precision machined metal-walled cavities are very great.





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Dynamic Theory of Intermodulation Distortion

T.C. Best, C.A. Lee and G.C. Dalman. "Dynamic Theory of Intermodulation Distortion." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 729-734.

This paper studies the third-order intermodulation distortion of signals in a reflection amplifier that are separated by an appreciable fraction of the bandwidth. This large separation of input signals requires taking account of the energy interchange between diode and circuit. A theory of intermodulation distortion accounting for this interaction is developed for large-order nonlinearities. Previous analyses of this problem have been limited to small nonlinearities and small separation of the input signals. Experimental verification of the theory developed here is demonstrated for an IMPATT diode reflection amplifier as a function of power level and tone separation.

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Optimum Design and Performance of a Microwave Ladder Oscillator with Many Diode Mount Pairs

S. Nogi and K. Fukui. "Optimum Design and Performance of a Microwave Ladder Oscillator with Many Diode Mount Pairs." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 735-743.

This paper presents a detailed discussion on the optimum design of a microwave ladder oscillator which is essentially an array of modules having a pair of diode mounts placed symmetrically with the waveguide-axis. A quantitative description of the power-combining mechanism for optimum operation is also given. The validity of the optimum design formula is confirmed by experiments on X-band oscillators with as many as twenty Gunn diodes, for which combining efficiency greater than 92 percent was obtained. Neither undesired single-mode nor simultaneous multimode oscillations were observed in the vicinity of the optimum circuit condition, this was supported by mode-analytical discussion. A ladder structure with equally spaced diode mount pairs is also treated because of its practical importance, shown by theory, experiment to yield good combining efficiency.

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Finite Element Analysis of Skin Effect Resistance in Submillimeter Wave Schottky Barrier Diodes

J.S. Campbell and G.T. Wrixon. "Finite Element Analysis of Skin Effect Resistance in Submillimeter Wave Schottky Barrier Diodes." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 744-750.

The skin effect resistance of GaAs Schottky barrier diodes, operating at high frequency, has been obtained using a specially developed finite element computer program. The devices were analyzed as multilane finite element models entailing curved high-order numerically integrated isoparametric elements. These models coped easily with complexity of shape and with the near singularity associated with the geometry of the anode. A parametric study entailing twenty-six analyses was carried out, from which it was concluded that the skin effect resistance can be minimized by the correct choice of topographical features such as the extent of the ohmic contact and the anode shape.

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Millimeter-Wave Performance of Shielded Slot-Lines

A.-M.A. El-Sherbiny. "Millimeter-Wave Performance of Shielded Slot-Lines." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 750-756.

The high frequency characteristics of shielded slot-lines are investigated using a modified Wiener-Hopf technique. The analysis includes the case of uniaxially anisotropic substrates when the principal axis is directed normal to the substrate. The obtained solution is especially useful at higher frequencies where other methods tend to be less effective. Numerical results are given for lines on high dielectric constant substrates over the full usable frequency range. It is shown that lines can be used as transmission elements up to a certain limiting frequency beyond which they will radiate. Physical aspects of the propagation in slot-lines are discussed and the effect of the shields on the properties of the guided modes is explained.

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Effects of Trains on Cutoff Frequency and Field in Rectangular Tunnel as Waveguide

J. Chiba and K. Sugiyama. "Effects of Trains on Cutoff Frequency and Field in Rectangular Tunnel as Waveguide." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 757-759.

Effects of trains in a rectangular tunnel on the cutoff frequency and field were determined at the range of VHF, UHF, and SHF bands by the finite-element method. According to this study, the tunnel is a transmission channel of high-pass type waveguide. The tunnel and the trains were assumed to be infinitely long and fully conductive. Generally speaking, the trains in the tunnel lowered TE/sub nm/ wave cutoff frequencies and raised TM/sub nm/ cutoff frequencies. Closer monitoring, however, has shown that the above results may be reversed, depending on the conditions. The field is represented by contour lines. Thus, its change is clearly shown by a change in the distribution of the lines caused by the train in the tunnel. Although the train changed field distribution for both TE/sub nm/ and TM/sub nm/ mode, greater changes were usually observed in higher order mode fields.

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Scattering by Abrupt Discontinuities on Planar Dielectric Waveguides

G.H. Brooke and M.M.Z. Kharadly. "Scattering by Abrupt Discontinuities on Planar Dielectric Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 760-770.

Two unifying aspects of the problem of scattering by an abrupt discontinuity on a planar dielectric waveguide are considered. The first aspect is concerned with the numerical solution of the scattering problem through consideration of a corresponding bounded waveguide problem in which perfect electric or magnetic conductor bounds with variable locations are introduced. It is shown that the solutions to the bounded problem, when numerically integrated over a range of bound locations defined within half a wavelength, allow the complete mode spectra of the unbounded waveguide to be accurately accounted for. Scattering solutions for both TE- and TM-modes are presented for a wide range of discontinuities and, in the TE-mode case, are in agreement with results obtained using the method due to Rozzi. The second aspect is concerned with the relationship between scattering and "inter-waveguide mode orthogonality." Based on a simple iterative scheme, a meaningful physical interpretation of the scattering process is developed. This allows the scattering to be classified as being of first or higher order, to be explained in terms of the physical characteristics of the mode fields.

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Abstracts

Double-Plane Steps in Rectangular Waveguides and Their Application for Transformers, Irises, and Filters

H. Patzelt and F. Arndt. "Double-Plane Steps in Rectangular Waveguides and Their Application for Transformers, Irises, and Filters." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 771-776.

Double-plane steps in rectangular waveguides are investigated with the method of field expansion into eigenmodes. The method takes into account the influence of evanescent fields and power transmission due to higher order modes. The scattering coefficients of a P- (Ku-) to X-band waveguide transition as well as of resonant irises with finite thickness are calculated and compared with measured results. An optimum short double-plane three-section transformer is designed which shows equal-ripple behavior in passband. The performance of a reactance-coupled four resonator half-wave filter is improved by additional optimized double-plane steps.



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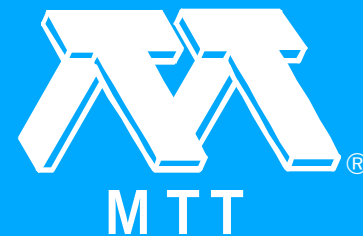


Abstracts

On Performance Limitations of Aperture Coupling Between Rectangular Waveguides

C.-H. Liang and D.K. Cheng. "On Performance Limitations of Aperture Coupling Between Rectangular Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 777-781.

The conditions for and expressions of the best coupling flatness and optimum directivity obtainable over a given bandwidth from broad-wall aperture coupling between rectangular waveguides are derived. An inequality representing a constraining relationship among coupling flatness, directivity, and bandwidth is established.



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An Alternative Theory of Optical Waveguides with Radial Inhomogeneities

A. Tønning. "An Alternative Theory of Optical Waveguides with Radial Inhomogeneities." 1982 *Transactions on Microwave Theory and Techniques* 30.5 (May 1982 [T-MTT]): 782-789.

The field equations are solved for an inhomogeneous dielectric cylinder with azimuthal symmetry. The solutions are shown to satisfy particular orthogonality relations and allow derivation of simple, generally valid expressions for dispersion relation, power flow, energy density, and group delay. A method for numerical solution of the equations, the modified staircase method, is proposed. It is shown that it leads to expressions similar to those of the Wentzel-Kramer-Brillouin (WKB) method, but, unlike the latter, is valid for the lowest order guided modes. The method has been tested in a computer program.

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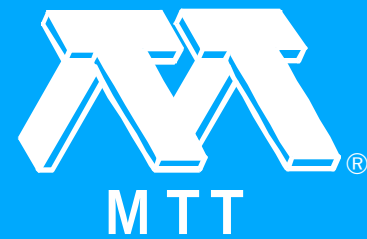


Abstracts

Circularly Symmetric Optical Waveguide with Strong Anisotropy

A. Tønning. "Circularly Symmetric Optical Waveguide with Strong Anisotropy." 1982 *Transactions on Microwave Theory and Techniques* 30.5 (May 1982 [T-MTT]): 790-794.

A solution to the problem of wave propagation in an anisotropic, circularly symmetric optical waveguide is presented. Exact solutions are given for the step-index case when the core and the cladding consist of uniaxial materials with their optical axes parallel with the axis of the cylindrical waveguide.



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Propagation in a Waveguide Partially Filled with Anisotropic Dielectric Material

J.I.H. Askne, E.L. Kollberg and L. Pettersson. "Propagation in a Waveguide Partially Filled with Anisotropic Dielectric Material." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 795-799.

A rectangular waveguide partially filled with an anisotropic dielectric material has been studied. The method of analysis has been shown to be quite powerful. A new configuration with a rectangular waveguide unsymmetrically loaded with a rectangular dielectric insert has been analyzed, tested experimentally. The special effects of mode coupling by breaking the symmetry of the structure are studied and the consequences for single-mode operation with application to masers in the millimeter-wave region are demonstrated.

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Quarter-Wave Coupled Junction Circulators Using Weakly Magnetized Disk Resonators

J. Helszajn. "Quarter-Wave Coupled Junction Circulators Using Weakly Magnetized Disk Resonators." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 800-806.

The simple classic theory of very weakly magnetized junction circulators using disk resonators indicates that the loaded Q-factor of the junction is completely determined by the magnetic variables of the garnet or ferrite resonator. An exact theory using numerical methods suggests that this approximation is nearly met for all values of the coupling angle ψ suspended by the striplines at the resonator terminals, provided the ratio of the off-diagonal and diagonal elements K and p of the tensor permeability has an upper bound of about 0.30. The corresponding minimum realizable value of the loaded Q-factor is approximately 2. This value of loaded Q-factor is suitable for the realization of quarter-wave coupled junction circulators with bandwidths of 25 percent at the 20-dB frequencies or 18 percent at the 26-dB frequencies. The improved closed form solution is based on a seven-mode description of this class of circulator is obtained in this paper by adding a correction polynomial to the classic very weakly magnetized formulation.

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Equivalent Circuit Representation for the E-Plane Circulator

K. Solbach. "Equivalent Circuit Representation for the E-Plane Circulator." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 806-809.

The resonator structure employed in an E-plane circulator may be described by a series-resonant circuit as opposed to a parallel circuit in the case of comparable H-plane devices. This is shown to result in a change of the direction of circulation at the edges of the circulator passband. Employing the equivalent circuit representation methods to increase the bandwidth of the E-plane circulator are discussed.

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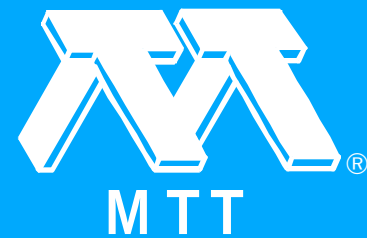


Abstracts

Higher Order Mode Interaction in Nonreciprocal Periodic Structures

T.A. Enegren and M.M.Z. Kharadly. "Higher Order Mode Interaction in Nonreciprocal Periodic Structures." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 809-812.

This paper is an extension of previous work on nonreciprocal periodic structures where only dominant mode interaction was considered. Higher order mode interaction is taken into account by using multimode wave matrix analysis. Numerical results for the propagation coefficient characteristics are given for a specific example of a twin-slab ferrite-loaded rectangular waveguide, periodically loaded with thin metallic diaphragms. These characteristics show similar trends to those observed in a previous experimental investigation.



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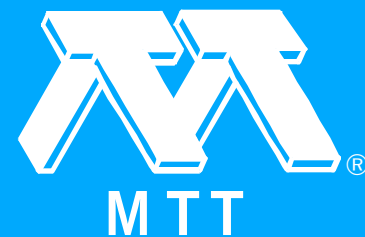


Abstracts

Energy and Power Relations for an Electron Beam in a Cylindrical Waveguide (Short Papers)

S.R. Seshadri. "Energy and Power Relations for an Electron Beam in a Cylindrical Waveguide (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 813-816.

The characteristics of the energy per unit length and power flow are analyzed for the transverse magnetic mode supported by an electron beam drifting with a relativistic velocity parallel to the axis of a cylindrical waveguide. The parts of the dispersion curve corresponding to the positive and the negative energy waves are identified.



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Abstracts

Single-Frequency Electronic-Modulated Analog Line Scanning Using a Dielectric Antenna (Short Papers)

R.E. Horn, H. Jacobs, K.L. Klohn and E. Freibergs. "Single-Frequency Electronic-Modulated Analog Line Scanning Using a Dielectric Antenna (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 816-820.

A line scanning antenna is described whereby means of periodic perturbations and conductivity changes in p-i-n diode modulators, analog angular shifts of 5° can be obtained. The system is electronically modulated with relatively small power requirements.



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Diffraction Loss in Dielectric-Filled Fabry-Perot Interferometers (Short Papers)

P.F. Goldsmith. "Diffraction Loss in Dielectric-Filled Fabry-Perot Interferometers (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 820-823.

We analyze the transmission of dielectric-filled Fabry-Perot interferometers excited by a spherical wave having a Gaussian amplitude distribution transverse to the axis of propagation. The loss due to diffraction experienced by the incident mode is found to be reduced by a factor $\geq n^4$ when n , the index of refraction of the dielectric, is significantly greater than unity, thus permitting such devices to be used with low loss in beams of considerably angular divergence than possible with air-filled interferometers. Measurements at 3-mm wavelength of devices made of quartz and sapphire are presented, which are in good agreement with theoretical calculations.

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



Abstracts

A High Performance Frequency Doubler for 80 to 120 GHz (Short Papers)

J.W. Archer. "A High Performance Frequency Doubler for 80 to 120 GHz (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 824-825.

A frequency doubler for the 80- to 120-GHz output band is described. The device may be operated in either a fixed-tuned or a tuneable mode. When operated fixed-tuned, with a constant dc bias applied to the diode, the conversion loss for any output frequency between 80 and 120 GHz is 9.2 dB, ± 1.2 dB. When used so that toning and bias are optimized at each operating frequency, the doubler exhibits conversion loss less than 7.5 dB for any frequency between 90 and 124 GHz.



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Spectral Domain Analysis of a Hexagonal Microstrip Resonator (Short Papers)

A.K. Sharma and W.J.R. Hoefer. "Spectral Domain Analysis of a Hexagonal Microstrip Resonator (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 825-828.

The capacitance of an open regular hexagonal microstrip resonator is calculated with the quasi-static spectral domain technique. From the capacitance values, the effective hexagonal side and the effective dielectric constant are determined, yielding resonant frequencies which agree well with measured values. Numerical data for several dielectric constants are included. The capacitance values are also compared with those of circular and triangular microstrip resonators. A simple formula relates the resonant frequencies of commensurate hexagonal and circular resonators.

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



Abstracts

S-Parameter Equivalents of Current and Voltage Noise Sources in Microwave Devices (Short Papers)

A.D. Sutherland and M.W. Trippe. "S-Parameter Equivalents of Current and Voltage Noise Sources in Microwave Devices (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 828-830.

The representation of noise sources in terms of signal flow graph equivalents is derived, enabling one to model noisy electron devices in terms of their S-parameters.



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Abstracts

On the Inherent Noise of an Ideal Two-Port Isolator (Short Papers)

A.D. Sutherland. "On the Inherent Noise of an Ideal Two-Port Isolator (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 831-832.

The inherent noise of an ideal isolator, predicted by Siegman from a simple thermodynamic argument, is verified by examining in detail the behavior of a common two-port isolator configuration, insofar as its sources of noise are concerned. Siegman's conclusion that any ideal isolator is the equivalent of a terminated three-port circulator is vindicated.



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Abstracts

The Exact Noise Figure of Amplifiers with Parallel Feedback and Lossy Matching Circuits (Short Papers)

K.B. Niclas. "The Exact Noise Figure of Amplifiers with Parallel Feedback and Lossy Matching Circuits (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 832-835.

Exact formulas for the noise parameters and noise figure of amplifiers with parallel feedback and lossy input and output matching circuits are derived. The formulas which take into account the thermal agitation of all circuit elements are applicable to feedback and lossy match amplifiers, as well as amplifiers that employ both principles simultaneously.



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Abstracts

Back Plate Mounted X-Band Lumped Element Gunn Oscillator (Short Papers)

A.B. Bereskin. "Back Plate Mounted X-Band Lumped Element Gunn Oscillator (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 835-837.

A lumped X-Band Gunn oscillator, mounted on the waveguide hack plate, provides full power output and tunability with provisions for altering the coupling to the waveguide in steps and/or continuously.



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Abstracts

An Empirical Relationship for Electromagnetic Energy Absorption in Man for Near-Field Exposure Conditions (Corrections)

I. Chatterjee, M.J. Hagmann and O.P. Gandhi. "An Empirical Relationship for Electromagnetic Energy Absorption in Man for Near-Field Exposure Conditions (Corrections)." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 838-838.
In the above referenced paper, the following corrections should be made.



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Patent Abstracts (May 1982 [T-MTT])

"Patent Abstracts (May 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 838-844.



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Low-Noise Microwave Transistors and Amplifiers (Announcement) (May 1982 [T-MTT])

"Low-Noise Microwave Transistors and Amplifiers (Announcement) (May 1982 [T-MTT])."
1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 845-845.



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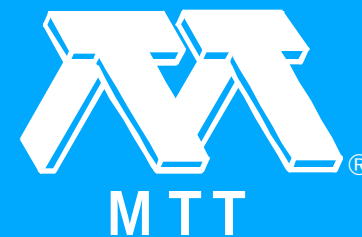
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IEEE Conference Records (Advertisement) (May 1982 [T-MTT])

"IEEE Conference Records (Advertisement) (May 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 846-846.



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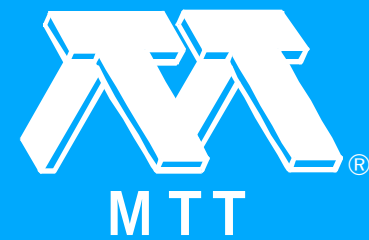
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IEEE on Microfilm (Advertisement) (May 1982 [T-MTT])

"IEEE on Microfilm (Advertisement) (May 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 847-847.



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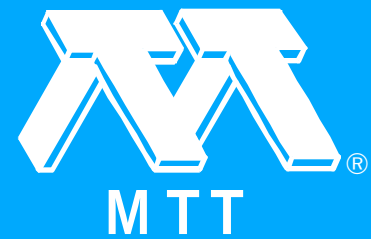
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Abstracts

Membership Application (May 1982 [T-MTT])

"Membership Application (May 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): 848-848.



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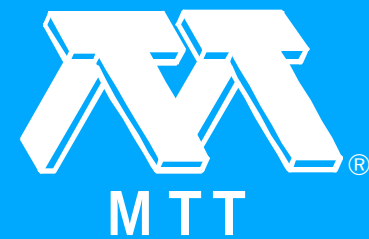
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Abstracts

Back Cover (May 1982 [T-MTT])

"Back Cover (May 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.5 (May 1982 [T-MTT]): b1-b2.



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Front Cover (Jun. 1982 [T-MTT])

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Ultra-Low-Noise 1.2- to 1.7-GHz Cooled GaAsFET Amplifiers

S. Weinreb, D.L. Fenstermacher and R.W. Harris. "Ultra-Low-Noise 1.2- to 1.7-GHz Cooled GaAsFET Amplifiers." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 849-853.

A 3-stage GaAsFET amplifier operating at 13 K, utilizing source inductance feedback is described. The amplifier has a noise temperature of <10 K, input return loss >15 dB over the 1.2- to 1.7-GHz frequency range.

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GaAsFET Mount Structure Design for 30-GHz-Band Low-Noise Amplifiers

H. Mizuno. "GaAsFET Mount Structure Design for 30-GHz-Band Low-Noise Amplifiers." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 854-858.

This paper describes a GaAsFET mount design method for 30-GHz-band low-noise reflection-type amplifiers with the metal wall as a feedback circuit. Two examples of 30-GHz-band low-noise amplifiers are described; one with wide-band response and the other with high-gain response. The wide-band amplifier has 13-dB gain and 8.5-dB noise figure in the frequency range from 27.5 GHz to 29.1 GHz. The high gain amplifier has 15-dB gain and 9-dB noise figure in the frequency range from 27.7 GHz to 28.7 GHz. These results demonstrate the utility of this design approach.

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Analysis of Image Recovery Down Converter Made by Planar Circuit Mounted in a Waveguide

Y. Utsumi. "Analysis of Image Recovery Down Converter Made by Planar Circuit Mounted in a Waveguide." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 858-868.

This paper presents an analysis of a superhigh frequency (SHF) down converter using a Schottky-barrier mixer diode and a planar circuit mounted in a waveguide. The analysis assumes that the mixer diode consists of a nonlinear conductance g , a junction capacitance $C/\text{sub } j/$, an ohmic spreading resistance $R/\text{sub } s/$, and several parasitic susceptances. The frequency performance of the impedance of external circuits at the signal, image, and intermediate frequency bands is considered. This analysis also includes consideration of the mismatching effect between the converter and the IF amplifier, and the optimum design procedure for the down converter. Using this theoretical method, a SHF down converter was designed and constructed. Its application is low noise receivers for satellite broadcasting. The design used the optimum image condition (the image impedance takes a low value, i.e., nearly a short). The RF band is 11.7 - 12.2 GHz, the IF band is 0.96 - 1.46 GHz, and the total noise figure is 3.3 - 3.7 dB. The noise figure is in good agreement with the (3.2 - 3.6 dB) obtained from this analysis.

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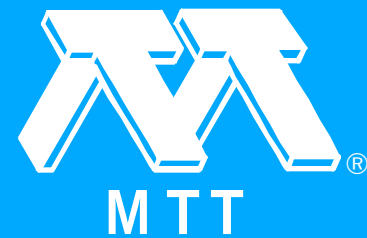


Abstracts

Single-Gate MESFET Frequency Doublers

A. Gopinath and J.B. Rankin. "Single-Gate MESFET Frequency Doublers." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 869-875.

A simple analytic model of the FET frequency doubler is used to determine the relative contributions of the various nonlinearities to harmonic generation. FET doubler conversion gain and its variation with frequency relative to the fundamental frequency available gain is also estimated. Large-signal computer simulations are used to determine the validity of the analytic model and provide further information on conversion gain and its frequency dependence. The analytic and computer predictions are compared with experimental measurements on a 4- to 8-GHz single-gate FET frequency doubler.



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p-i-n Diodes for Low-Frequency High-Power Switching Applications

M. Caulton, A. Rosen, P.J. Stabile and A. Gombar. "p-i-n Diodes for Low-Frequency High-Power Switching Applications." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 875-882.

The development of high-power low-frequency diodes, conditions for their operation, and results measured in actual circuits are described. Harmonic distortion at 500 kHz and 2 MHz has been found to decrease with increasing diode lifetime and forward-bias current. Large reverse bias voltages are necessary at low frequencies to keep the RF voltage swing from penetrating the forward conduction region. The improvement of p-i-n diode lifetimes with thicker I-layers or with planar construction has been studied and the performance of these diodes in a routing switch is reported.

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Coupling Characteristics Between Single-Mode Fiber and Square Law Medium

R. Kishimoto and M. Koyama. "Coupling Characteristics Between Single-Mode Fiber and Square Law Medium." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 882-893.

The coupling characteristics between a single-mode fiber and a square law medium are theoretically and experimentally discussed in order to obtain the optimum coupling design for a variety of single-mode fiber optical devices using square law media. In theoretically analyzing coupling efficiency, it has been possible to evaluate a Gaussian beam, in a dielectric, which has passed through a square law medium with the help of mode-expansion technique and one of the generating functions of the Hermite polynomials. As a result, it has been possible to analytically obtain coupling efficiency even when the output beam from the single-mode fiber is off-axis and tilted. Through this analysis, it has been made clear that the ray matrix analysis used previously agrees with the analysis without the off-axis and tilt factors analyzed in this paper. The experimental results concerning the optimum coupling design, the off-axis characteristics, and the off-axis tolerances have been presented and agree well with the theoretical analysis.

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Abstracts

Propagation in Transversely Magnetized Compressible Plasma Between Two Parallel Planes

H. Unz. "Propagation in Transversely Magnetized Compressible Plasma Between Two Parallel Planes." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 894-899.

The propagation of waves in compressible single fluid macroscopic plasma between two parallel, perfectly conducting planes, with a transverse static magnetic field parallel to the boundaries is investigated. It is shown that the TE waves are not affected by either the static magnetic field or the compressibility of the plasma, while the TM wave will be affected by both.



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Network Representation and Transverse Resonance for Layered Anisotropic Dielectric Waveguides

O. Schwelb. "Network Representation and Transverse Resonance for Layered Anisotropic Dielectric Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 899-905.

First, the matrix wave impedance in an unbounded uniaxial lossless dielectric material is determined. Next, the transformation properties of the input impedance of a terminated anisotropic layer are established. It is then demonstrated that the boundary conditions in an anisotropic dielectric slab waveguide lead to a generalized transverse resonance condition involving the previously obtained matrix input impedances. Network equivalent representations are given for waveguides fabricated with dielectrics in polar and longitudinal orientations. The results show that a circuit approach to the analysis and design of planar anisotropic dielectric waveguides is feasible and practicable.

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Abstracts

Accurate Analysis of Coupled Strip-Finline Structure for Phase Constant, Characteristic Impedance, Dielectric and Conductor Losses

D. Mirshekar-Syahkal and J.B. Davies. "Accurate Analysis of Coupled Strip-Finline Structure for Phase Constant, Characteristic Impedance, Dielectric and Conductor Losses." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 906-910.

Propagation constant, characteristic impedance, dielectric loss, and conductor loss of coupled strip-unilateral finline is here computed for the first time. The technique of analysis is based on the assumption of hybrid wave propagation implemented through the spectral domain approach for the phase constant. A perturbation method together with the spectral analysis has been applied to find the losses. The basis functions used to approximate fields within unilateral finline gap and currents on the strip have been selected as Legendre polynomials for the unbounded field or current and trigonometric functions for bounded field or current. The Green's function matrix in the spectral domain for the two distinct planes of the coupled strip-unilateral finline has also been presented. This gives the opportunity for direct implementation in the analysis of other similar structures. The possibility of the extension of the technique to shielded stratified dielectric with distributed planar conductor within different layers has been also discussed.



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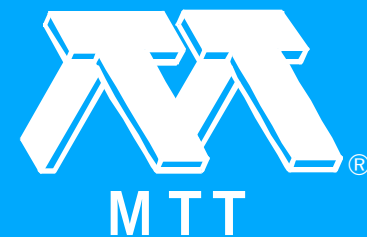


Abstracts

Assessing the Error in a Finite Element Solution

R.W. Thatcher. "Assessing the Error in a Finite Element Solution." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 911-915.

In this paper a method of error assessment for the finite element method is discussed. This idea is used to optimize grid refinement schemes both for singularities and also for handling unbounded regions. It is shown how those elements, or groups of elements, that make large contributions to the error term can be identified so that local grid refinements can be placed in the most advantageous regions.



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Abstracts

Analysis of a Microwave FET Oscillator Using an Efficient Computer Model for the Device (Short Papers)

A. Madjar. "Analysis of a Microwave FET Oscillator Using an Efficient Computer Model for the Device (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 915-917.

This paper presents a time domain analysis of a microwave 10-GHz FET oscillator, which employs a practical and efficient computer model for the FET. Good agreement is demonstrated between the predicted and measured performance. A sensitivity analysis of the circuit is performed with respect to some of the FET parameters. This is useful information to estimate variation in production.



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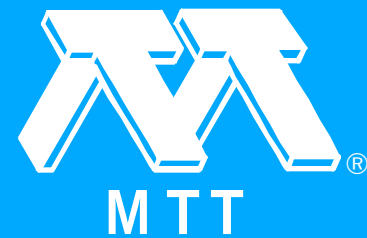


Abstracts

100 MHz to 17 GHz Dual-Gate Variable-Gain Amplifier (Short Papers)

N. Mamodaly, P. Quentin, P. Dueme and J. Ogregon. "100 MHz to 17 GHz Dual-Gate Variable-Gain Amplifier (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 918-919.

A simple analytical approach to wide-band amplification using commercially available dual-gate FET's has enabled an ultra-wide-band flat-gain amplifier to be built in the 100-MHz to 17-GHz bandwidth with a VSWR less than 3.5- and 15-dB gain control. A description is given, including first experimental results.



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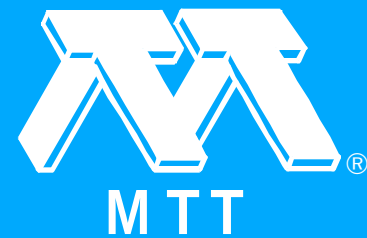


Abstracts

Comparison of Single- and Dual-Gate FET Frequency Doublers (Short Papers)

A. Gopinath, A.J. Seeds and J.B. Rankin. "Comparison of Single- and Dual-Gate FET Frequency Doublers (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 919-920.

The performance of single- and dual-gate FET frequency doublers is studied by analysis and computer simulation. The theoretical predictions are in good agreement with experimental results. It is shown that the superior performance of the dual-gate FET doubler is largely due to the higher intrinsic gain of the active device.



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Abstracts

Quasi-Static Characteristics of Coplanar Waveguide on a Sapphire Substrate with its Optical Axis Inclined (Short Papers)

T. Kitazawa and Y. Hayashi. "Quasi-Static Characteristics of Coplanar Waveguide on a Sapphire Substrate with its Optical Axis Inclined (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 920-922.

A variational expression is presented for the line capacitance of a coplanar waveguide on a single-crystal sapphire substrate with a tilted optical axis. Numerical results are obtained by means of the Ritz procedure.



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Abstracts

Nonreciprocal Propagation Characteristics of YIG Thin Film (Short Papers)

T. Mizumoto and Y. Naito. "Nonreciprocal Propagation Characteristics of YIG Thin Film (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 922-925.

The characteristics of an optical nonreciprocal phase shifter, with which optical circulators can be constructed, are investigated. We have measured the nonreciprocal phase shift of an appropriately magnetized yttrium iron garnet (YIG) thin film and thus confirmed experimentally that an AIR/YIG/GGG structure can function as an optical nonreciprocal phase shifter.



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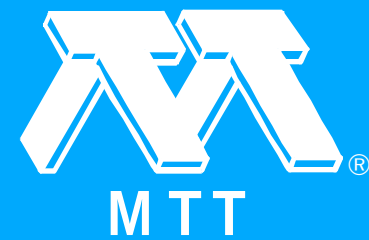
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IEEE Open Order Plan (Advertisement) (Jun. 1982 [T-MTT])

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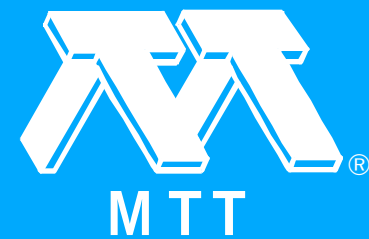
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Abstracts

Membership Application (Jun. 1982 [T-MTT])

"Membership Application (Jun. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.6 (Jun. 1982 [T-MTT]): 931-931.



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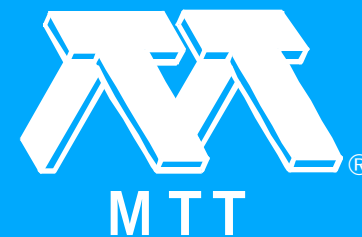
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Front Cover (Jul. 1982 [T-MTT])

"Front Cover (Jul. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): f1-f2.



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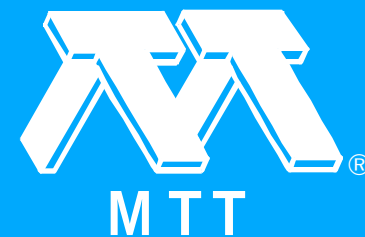


Abstracts

Foreword (Jul. 1982 [T-MTT])

J.E. Davey and J.G. Oakes. "Foreword (Jul. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 933-934.

This special issue on GaAs Integrated Circuits covers a selection of the best papers presented at the 1981 IEEE GaAs Integrated Circuits Symposium held in San Diego, CA.



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Abstracts

A Manufacturing Process for Analog and Digital Gallium Arsenide Integrated Circuits

R.L. Van Tuyl, V. Kumar, D.C. D'Avanzo, T.W. Taylor, V.E. Peterson, D.P. Hornbuckle, R.A. Fisher and D.B. Estreich. "A Manufacturing Process for Analog and Digital Gallium Arsenide Integrated Circuits." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 935-942.

A process for manufacturing small-to-medium scale GaAs integrated circuits is described. Integrated FET's, diodes, resistors, thin-film capacitors, and inductors are used for monolithic integration of digital and analog circuits. Direct implantation of Si into $>10^{15}/\text{cm}^2$ resistivity substrates produces n-layers with ± 10 -percent sheet resistance variation. A planar fabrication process featuring retained anneal cap (SiO_2), proton isolation, recessed Mo-Au gates, silicon nitride passivation, and a dual-level metal system with polyimide intermetal dielectric is described. Automated on-wafer testing at frequencies up to 4 GHz is introduced, and a calculator-controlled frequency domain test system described. Circuit yields for six different circuit designs are reported, and process defect densities are inferred.



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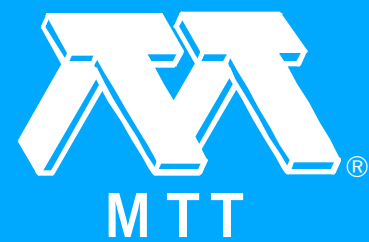
Dislocation Density and Sheet Resistance Variations Across Semi-Insulating GaAs Wafers

R.T. Blunt, S. Clark and D.J. Stirland. "Dislocation Density and Sheet Resistance Variations Across Semi-Insulating GaAs Wafers." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 943-949.

Dislocation densities and sheet resistances have been measured across (001) orientated wafers cut from Cr-doped liquid encapsulated Czoehralski (LEC) grown semi-insulating (W) GaAs diodes. A defect-sensitive etch was used to reveal dislocations while a novel scanning technique has been developed for measurement of sheet resistance. The general patterns of dislocation density and sheet resistance variations are shown to be similar at the seed end of the crystal. Both agree well with recent work on electron trap density variations across a GaAs wafer and with a theoretical study of the genesis of dislocations during LEC growth of GaAs. Dislocation interactions during crystal growth have been shown to occur even at the seed end of the boule. The pattern of sheet resistance variations across wafers is shown to change down the length of the boule.

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Compensation Mechanism in Liquid Encapsulated Czochralski GaAs: Importance of Melt Stoichiometry

D.E. Holmes, R.T. Chen, K.R. Elliott, C.G. Kirkpatrick and P. Won Yu. "Compensation Mechanism in Liquid Encapsulated Czochralski GaAs: Importance of Melt Stoichiometry." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 949-955.

It is shown that the key to reproducible growth of undoped semi-insulating GaAs by the liquid encapsulated Czochralski (LEC) technique is the control over the melt stoichiometry. Twelve crystals were grown from stoichiometric and nonstoichiometric melts. The material was characterized by secondary ion mass spectrometry, localized vibrational mode far infrared spectroscopy, Hall-effect measurements, optical absorption, and photoluminescence. A quantitative model for the compensation mechanism in the semi-insulating material was developed based on these measurements. The free carrier concentration is controlled by the balance between EL2 deep donors and carbon acceptors; furthermore, the incorporation of EL2 is controlled by the melt stoichiometry, increasing as the As atom fraction in the melt increases. As a result, semi-insulating material can be grown only from melts above a critical As composition. The practical significance of these results is discussed in terms of achieving high yield and reproducibility in the crystal growth process.

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Proton Isolation for GaAs Integrated Circuits

D.C. D'Avanzo. "Proton Isolation for GaAs Integrated Circuits." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 955-963.

Significant improvement in the electrical isolation of closely spaced GaAs integrated circuit (IC) devices has been achieved with proton implantation. Isolation voltages have been increased by a factor of four in comparison to a selective implant process. In addition, the tendency of negatively based ohmic contacts to reduce the current flow in neighboring MESFET's (backgating) has been reduced by at least a factor of three. The GaAs IC compatible process includes implantation of protons through the SiO₂/sub field oxide layer and a three-layered dielectric- Au mask which is definable to 3- μ m linewidths and is easily removed. High temperature storage tests have demonstrated that proton isolation, with lifetimes on the order of 10/sup 5/ h at 290° C, is not a lifetime limiting component in a GaAs IC process.

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Backgating in GaAs MESFET's

C. Kocot and C.A. Stolte. "Backgating in GaAs MESFET's." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 963-968.

The phenomenon of backgating in GaAs depletion mode MESFET devices is investigated. The origin of this effect is electron trapping on the Cr/sup 2+/ and EL(2) levels at the semi-insulating substrate-channel region interface. A model describing backgating, based on DLTS and spectral measurements, is presented. Calculations based on this model predict that closely compensated substrate material will minimize backgating. Preliminary experimental data support this prediction.

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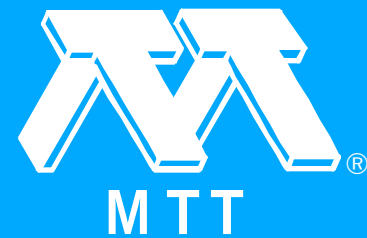


Abstracts

A DC-12 GHz Monolithic GaAsFET Distributed Amplifier

E.W. Strid and K. Gleason. "A DC-12 GHz Monolithic GaAsFET Distributed Amplifier." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 969-975.

A monolithic balanced traveling-wave amplifier stage using GaAs MESFET's is demonstrated. The amplifier achieves 7-9-dB gain with about 40-ps risetime and a -3-dB bandwidth of 12 GHz, on a 0.91 X 0.97-mm die. Its gain versus frequency is very flat, and $|S_{11}|$, $|S_{12}|$, and $|S_{22}|$ are less than 0.2 from 0-18 GHz. S-parameter uniformity and yield data are measured on-wafer with a special hybrid wafer probe.



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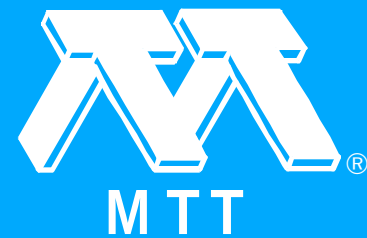


Abstracts

A Monolithic GaAs 1--13-GHz Traveling-Wave Amplifier

Y. Ayasli, R.L. Mozzi, J.L. Vorhaus, L.D. Reynolds and R.A. Pucel. "A Monolithic GaAs 1--13-GHz Traveling-Wave Amplifier." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 976-981.

This paper describes a monolithic GaAs traveling-wave amplifier with 9-dB gain and ± 1 -dB gain flatness in the 1-13-GHz frequency range. The circuit is realized in monolithic form on a 0.1-mm GaAs substrate with 50- Ω input and output lines. In this approach GaAs FET's periodically load input and output microstrip lines and provide the coupling between them with proper phase through their transconductance. Experimental results and the circuit details of such a structure are discussed. Initial results of a noise analysis and predictions on the noise performance are also given.



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Monolithic Dual-Gate GaAs FET Digital Phase Shifter

J.L. Vorhaus, R.A. Pucel and Y. Tajima. "Monolithic Dual-Gate GaAs FET Digital Phase Shifter." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 982-992.

The design, fabrication, and characterization of a fully monolithic FET digital phase-shifter circuit is described. The circuit is designed around a unique dual-gate FET structure operating as a switchable single-pole, double-throw amplifier. Each 2.5 X 3.0-mm chip has one bit (e.g., 22.5°, 90°, etc.) of phase control. The circuit, which includes all dc bypass circuitry on-chip, features thin-film lumped element capacitors and inductors, air-bridge crossovers and interconnects, via-hole frontside grounding, and integral beam leads. The fabrication of these elements is described in some detail. The phase-shifter circuit gives a peak gain of 3 dB across a 10-percent bandwidth in X-band. A method of achieving continuous phase and amplitude control using a 90° bit chip is described. Finally, phase performance of a four-bit digital phase shifter realized by cascading four monolithic active phase-shifter chips is reported.

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New Technology Towards GaAs LSI/VLSI for Computer Applications

M. Abe, T. Mimura, N. Yokoyama and H. Ishikawa. "New Technology Towards GaAs LSI/VLSI for Computer Applications." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 992-998.

For future large-scale computer applications, new device technologies towards GaAs LSI/VLSI have been developed self-aligned fully implanted planar GaAs MESFET technology and high electron mobility transistor (HFMT) technology by molecular beam epitaxy (MBE). The self-aligned GaAs MESFET logic with 1.5- μm gate length exhibits a minimum switching time of 50 ps and the lowest power-delay product of 14.5 fJ at room temperature. The enhancement/depletion (E/D) type direct coupled HEMT logic has achieved a switching time of 17.1 ps with 1.7- μm gate length at liquid nitrogen temperature and more recently a switching time of 12.8 ps with 1.1- μm gate HEMT logic, which exceeds the top speed of Josephson Junction logic and shows the highest speed of any device logic ever reported. Optimized system performances are also projected to system delay of 200 ps at 10-kilogate integration with GaAs MESFET VLSI, and 100 ps at 100-kilogate with HEMT VLSI. These values of system delay correspond to the computer performance of over 100 million instructions per second (MIPS).

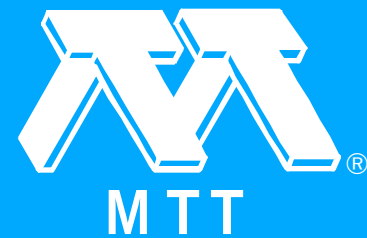


Abstracts

A GaAs MSI Word Generator Operating at 5 Gbits/s Data Rate

C.A. Liechti, G.L. Baldwin, E. Gowen, R. Joly, M. Namjoo and A.F. Podell. "A GaAs MSI Word Generator Operating at 5 Gbits/s Data Rate." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 998-1006.

This paper describes a monolithic MSI GaAs word generator that operates at data rates from a few bits/s up to 5 Gbits/s. This circuit, with 600 active devices, consists of an 8:1 parallel-to-serial converter, a timing generator, control logic, and ECL-interface networks. The circuit generates multiple 8-bit words with dynamic word-length control. The paper discusses the fabrication technology, the design of the word generator and its building blocks, and the performance of the complete chip.



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Saturated Resistor Load for GaAs Integrated Circuits

C.-P. Lee, B.M. Welch and R. Zucca. "Saturated Resistor Load for GaAs Integrated Circuits." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1007-1013.

Saturated resistors, two-terminal load devices, have been fabricated and evaluated as pull-up loads for GaAs digital integrated circuits. The saturated resistor loads exhibit superior device characteristics compared with FET active loads. Up to 100-percent improvement in the uniformity of the saturation current has been obtained. Ring oscillators with saturated resistor pull-up loads have shown ~20-percent lower speed-power products than ring oscillators with FET active loads. This superior circuit performance is attributed to 1) no gate capacitance, and 2) less backgating effect. Reliability studies using accelerated aging have shown that circuits are more reliable when saturated resistor loads are used.

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High-Speed GaAs Static Random-Access Memory

G. Bert, J.-P. Morin, G. Nuzillat and C. Arnodo. "High-Speed GaAs Static Random-Access Memory." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1014-1019.

An 8-bit fully decoded RAM test circuit has been designed and fabricated using enhancement-mode GaAs-MESFET's with the LPFL circuit approach. Correct operation of the circuit has been observed for a supply voltage varying from 3.5 to 7 V. An access time of 0.6 ns was measured for a total power consumption of 85 mW under nominal operating conditions. This circuit was used to develop and validate both a design strategy and computer-aided design (CAD) tools oriented towards cache or buffer memories of realistic complexity. It is shown that a performance-optimized 1-kbit RAM exhibiting an access time of 1.1 ns for a power dissipation of 850 mW would be feasible with the present fabrication technology.



Abstracts

High-Speed GaAs SDFL Divider Circuit

E.R. Walton, Jr., E.K. Shen, F.S. Lee, R. Zucca, Y.-D. Shen, B.M. Welch and R. Dikshit. "High-Speed GaAs SDFL Divider Circuit." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1020-1026.

High-speed divider circuits find numerous applications in prescalers for counters, frequency synthesizers, and digital phase locked loops. To accommodate these applications, a high-speed multimode divider circuit has been designed, fabricated, and tested. This circuit, fabricated on semi-insulating Gallium Arsenide substrates, and utilizing Schottky diode FET logic (SDFL) technology, has been tested at a maximum clock frequency of 1.84 GHz. High yields of circuits operating over 1 GHz have been obtained over a number of wafers.



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Ultra-Broad-Band GaAs Monolithic Amplifier

K. Honjo, T. Sugiura and H. Itoh. "Ultra-Broad-Band GaAs Monolithic Amplifier." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1027-1033.

GaAs monolithic IC design and fabrication techniques suitable for baseband pulse amplification have been developed. The developed GaAs monolithic amplifier has a two-stage construction using two source-grounded FET's. To reduce input VSWR without serious noise-figure degradation, an inter-gate-drain negative feedback circuit was adopted. An interstage circuit is a dc-coupled circuit consisting of an appropriate impedance transmission line. Gate voltage for the second-stage FET is self-biased. The amplifier has 13.5-dB gain over the 3-dB bandwidth from below 500 MHz to 2.8 GHz. Less than 6-dB (7-dB) noise figure was obtained from 700 MHz to 2.2 GHz (150 MHz to 3 GHz). Input VSWR is less than 1.5 (2.5) from 600 MHz to 1.1 GHz (500 kHz to 2.1 GHz). Output VSWR is less than 1.6 from 500 kHz to 4.5 GHz. By introducing a low-pass matching network high-cutoff frequency for the amplifier could be extended to 4.7 GHz without degrading low-frequency characteristics.





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Equivalent Transformations for Mixed-Lumped and Multiconductor Coupled Circuits

K. Kobayashi, Y. Nemoto and R. Sato. "Equivalent Transformations for Mixed-Lumped and Multiconductor Coupled Circuits." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1034-1041.

Distributed circuits consisting of a cascade connection of m -port stub circuits and multiconductor coupled transmission lines are equivalent to ones consisting of cascade connections of multiconductor coupled transmission lines whose characteristic impedances are different from original ones, m -port stub circuits, and an m -port ideal transformer bank. Because of the reciprocity of the circuit, values of transformer ratio must be identified. In the special case of a one conductor transmission line, these equivalent transformations are equivalent to Kuroda's identities. These extended equivalent transformations may be applied to mixed-lumped and multiconductor coupled circuits. By using these equivalent transformations, equivalent circuits and exact network functions of multiconductor nonuniform coupled transmission lines can be obtained.

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Extracted-Pole Filter Manifold Multiplexing

R.J. Cameron, H. Gregg, C.J. Radcliffe and J.D. Rhodes. "Extracted-Pole Filter Manifold Multiplexing." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1041-1050.

A transformation method is introduced for enabling filters of the extracted-pole variety to be match-multiplexed onto a manifold using standard waveguide multiplexer computer programs. Thus the advantages that accrue from the extracted-pole realization for filters may now be extended to multiplexers, which will be particularly useful in narrow-band high-power low-loss multiplexing applications. The measured performance of a 12-GHz contiguous-channel quadruplexer comprising TE/sub 011/ cavity extracted-pole elliptic filters is presented, demonstrating the very low insertion losses attainable with this form of realization. Since the majority of applications envisaged for this type of multiplexer is in high-power output circuitry, a discussion on thermal aspects is included.



Abstracts

A New Approach to the Computer-Aided Design of Nonlinear Networks and its Application to Microwave Parametric Frequency Dividers

A. Lipparini, E. Marazzi and V. Rizzoli. "A New Approach to the Computer-Aided Design of Nonlinear Networks and its Application to Microwave Parametric Frequency Dividers." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1050-1058.

A new cost-effective method allowing nonlinear microwave circuits to be designed by computer is demonstrated by application to parametric frequency dividers. The method is based on frequency-domain representations of both nonlinear circuit components and network voltages and currents. A special optimization strategy determines the unknown parameters of the linear part of the circuit while estimating the need for a complete analysis of the nonlinear network at each step of the iterative process.



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Extension of Volterra Analysis to Weakly Nonlinear Electromagnetic Field Problems with Application to Whistler Propagation

D.C. Dalpe, G. Kent and D.D. Weiner. "Extension of Volterra Analysis to Weakly Nonlinear Electromagnetic Field Problems with Application to Whistler Propagation." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1059-1068.

In this study, Volterra analysis is extended to weakly nonlinear electromagnetic field problems. Generalized Green's functions and their Fourier transforms are introduced. These are used to express the n th order system response explicitly in terms of the system input. Although the theory is developed in general, homogeneous media are assumed in the examples for simplicity. Application of the Volterra approach is illustrated by investigating whistler-mode propagation in a cold collisionless electron plasma. After defining the nonlinear differential equations for propagation at an angle θ to the uniform magnetic field, exponential probing inputs are used to generate the generalized Green's functions. The second-order responses, which are expressed in terms of the generalized Green's functions, are examined in detail. Computer programs are used to numerically evaluate the second-order response to a sinusoidally varying time function.

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Abstracts

A Study of the Noise-Temperature Performance of a Satellite Communications Low-Noise Amplifier Subsystem

M. Kajikawa. "A Study of the Noise-Temperature Performance of a Satellite Communications Low-Noise Amplifier Subsystem." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1068-1078.

The heart of the low-noise amplifier (LNA) subsystem is the parametric amplifier which consists of a parametric amplifier proper and a circulator. The LNA subsystem can be simplified into an equivalent circuit, to evaluate its noise-temperature performance by assuming that it consists of a parametric amplifier proper and a circulator, which in its overall sense includes the additional components of the input line as elements in one arm of the circulator. Using this simplified equivalent circuit, the noise-temperature performance is analyzed theoretically and provides a precise value for the LNA subsystem noise-temperature degradation, the noise-temperature increase of the earth-station receiving system caused by connecting an actual antenna to the subsystem and the measurement error of the HOT/COLD load noise temperature measurement method.



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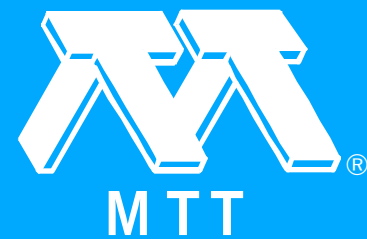


Abstracts

Analysis of an Elliptical Conducting Rod Between Parallel Ground Planes by Conformal Mapping

B.N. Das and K.V.S. Rao. "Analysis of an Elliptical Conducting Rod Between Parallel Ground Planes by Conformal Mapping." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1079-1085.

The paper presents a conformal mapping analysis of an elliptic conducting rod between parallel ground planes, where one of the principal axes of the rod is parallel to but not necessarily centered between the ground planes. The conditions under which this analysis can be applied to the cases of planar and circular conductors between ground planes are obtained. Also, the formulation is extended to the special case of the conductor above a single ground plane.



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Calibration of Multiport Reflectometers by Means of Four Open/Short Circuits

S. Li and R.G. Bosisio. "Calibration of Multiport Reflectometers by Means of Four Open/Short Circuits." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1085-1090.

This paper presents a simple method for calibrating any practical multiport reflectometer by means of four reflection standards with known complex reflection coefficients. It is shown that these four standards can be such that their reflection coefficient modulus = 1. Computer simulation proves that no singularity appears for both ideal and nonideal five- and six-port reflectometer in a wide range of phase distribution of reflection coefficients. A group of calibration results for a practical simple six-port is listed to show this calibration procedure; by the use of these calibrated network parameters, some measurement results are presented and compared with the values obtained at the National Bureau of Standard, U.S.A. Both computer simulation and experimental results show that the numerical singularities which may be encountered in multiport calibration procedures are not an intrinsic properties of multiport but from related mathematical treatment.

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Microstrip Loop Radiators for Medical Applications

I.J. Bahl, S.S. Stuchly, M.A. Stuchly and J.J.W. Lagendijk. "Microstrip Loop Radiators for Medical Applications." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1090-1093.

Three microstrip loop radiators designed to operate at frequencies of 433, 915, and 1300 MHz are described. Empirical design methods and experimental results obtained with phantoms and human tissues are presented. The radiators are relatively well matched when applied to water boluses followed by muscle phantoms or human tissues. When used with the boluses, the radiators have circular surface-temperature distribution while the in-depth heating patterns are similar to those of the aperture-type radiators.

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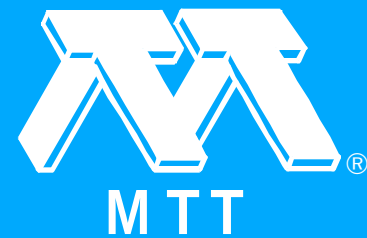


Abstracts

Coupled Slot Line Field Components

R.N. Simons and R.K. Arora. "Coupled Slot Line Field Components." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1094-1099.

The paper presents expressions for the odd- and even-mode electric field components and the magnetic field components in the air and dielectric regions of the coupled slot line structure. These expressions are numerically computed and the fields in the cross section and the longitudinal sections are illustrated.



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Design and Performance of GaAs DCFL Frequency Divider (Short Papers)

R. Kawasaki, M. Ino, M. Hirayama and Y. Takayama. "Design and Performance of GaAs DCFL Frequency Divider (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1100-1101.

GaAs frequency dividers for application to gigahertz-band equipment have been developed with E/D DCFL circuits. The relationship between maximum counting frequency and threshold voltage combination of the E-MESFET's and the D-MESFET's has been investigated in detail. The measured performance was as follows maximum counting frequency is 1.1 GHz with low dissipation power of 17 mW, and the values of dissipation power-divided-by-maximum-counting-frequency are as small as 1.6-16 pJ.



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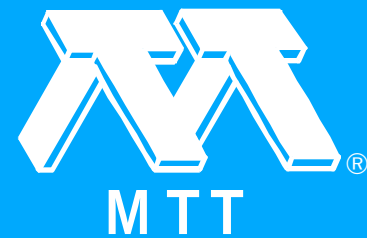


Abstracts

Losses in Coplanar Waveguides (Short Papers)

A. Gopinath. "Losses in Coplanar Waveguides (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1101-1104.

Conductor losses in coplanar waveguides have been calculated using a quasi-static Green's function approach. These calculations and others on dielectric and radiation losses are used to compute the quality factor of half-wavelength resonators, and comparison with measurements show good agreement.



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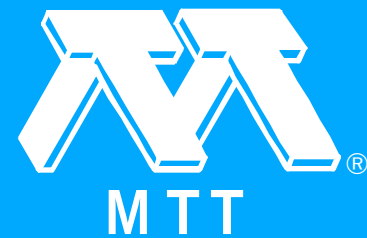


Abstracts

Transmission Loss of Thick-Film Microstriplines (Short Papers)

S. Nishiki and S. Yuki. "Transmission Loss of Thick-Film Microstriplines (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1104-1107.

Thick-film microstripline transmission loss is measured and discussed, and an empirical formula for thick-film microstripline transmission loss is obtained. It is found that the transmission loss of copper thick film is nearly equal to that of thin film for frequencies up to 10 GHz.



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Taking Into Account the Edge Condition in the Problem of Diffraction Waves on Step Discontinuity in Plate Waveguide (Short Papers)

V.P. Lyapin, V.S. Mikhalevsky and G.P. Sinyavsky. "Taking Into Account the Edge Condition in the Problem of Diffraction Waves on Step Discontinuity in Plate Waveguide (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1107-1109.

A way of improving the convergence of the field-matching method by means of taking into account the edge conditions is proposed. The unknown function, as defined on the matting lines, should be expanded into an infinite set of the orthogonal Gegenbauer polynomials having the required singularity.



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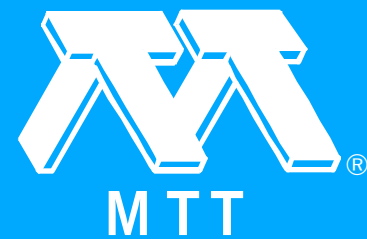


Abstracts

Exact Derivation of the Nonlinear Negative-Resistance Oscillator Pulling Figure (Short Papers)

J. Obregon and A.P.S. Khanna. "Exact Derivation of the Nonlinear Negative-Resistance Oscillator Pulling Figure (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1109-1111.

Only approximate relations are so far available for the pulling figure of an oscillator. An exact derivation of the pulling figure is presented here, taking fully into account the nonlinearity of the oscillator admittance. Effect of the oscillator nonlinearity on the asymmetry of the pulling range is presented.



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Patent Abstracts (Jul. 1982 [T-MTT])

"Patent Abstracts (Jul. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.7 (Jul. 1982 [T-MTT] (Joint Special Issue on GaAs IC's)): 1112-1118.



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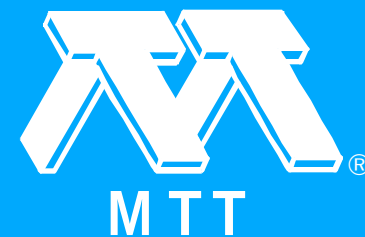
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IEEE on Microfilm (Advertisement) (Jul. 1982 [T-MTT])

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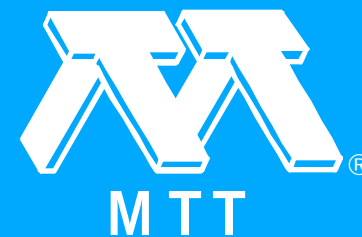
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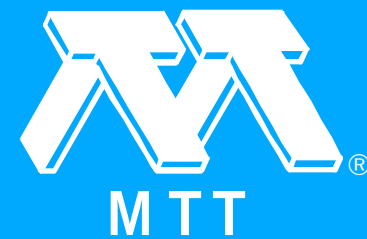


Abstracts

Waveguide Electrooptic Modulators

R.C. Alferness. "Waveguide Electrooptic Modulators." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1121-1137.

We give a tutorial review and brief summary of the present status of waveguide electrooptic modulators.



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Abstracts

Heterodyne and Coherent Optical Fiber Communications: Recent Progress

T. Okoshi. "Heterodyne and Coherent Optical Fiber Communications: Recent Progress." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1138-1149.

The technical significance, history of research and development, relevant technical tasks, and recent progress in heterodyne and coherent optical fiber communications are described. The achievements of 1-MHz frequency stability (peak-to-peak) and 0.1-MHz spectral purity (3-dB spectral width) with semiconductor lasers have been two principal motivations that accelerated the research and development. Rapid progress in the single-polarization single-mode fiber technology is also encouraging. The bit-error rate of a PCM-ASK/heterodyne optical communication system has been measured as a function of the received signal level, showing a good error performance close to the quantum-noise limitation.



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Clinical RF Hyperthermia by Magnetic-Loop Induction: A New Approach to Human Cancer Therapy

F.K. Storm, R.S. Elliott, W.H. Harrison and D.L. Morton. "Clinical RF Hyperthermia by Magnetic-Loop Induction: A New Approach to Human Cancer Therapy." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1149-1158.

There has been mounting laboratory evidence that temperatures of $\geq 42^{\circ}\text{C}$ (108°F) are tumoricidal in tumor cell cultures and animal models. Localized heat by electromagnetic waves appears to be the most practical means for producing hyperthermia and has been shown to be potentially effective against human surface tumors. However, attempts to treat deep internal human cancers with available techniques have been either ineffective or dangerous because of injury to surface tissue. A fundamentally new approach magnetron magnetic-loop induction hyperthermia, which was cooperatively developed by electrical engineers and oncologists for the treatment of deep-seated human tumors, is the subject of this report. The concept, rationale, design, and performance of this applicator in phantoms, animals, and humans is presented, as are the early results of clinical cancer trials. The data suggest reason for enthusiasm for the future treatment of advanced human tumors.



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Heat Transfer in Surface-Cooled Objects Subject to Microwave Heating

K.R. Foster, P.S. Ayyaswamy, T. Sundararajan and K. Ramakrishna. "Heat Transfer in Surface-Cooled Objects Subject to Microwave Heating." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1158-1166.

Several investigators in microwave bioeffects research have exposed biological preparations to intense microwave fields, while at the same time cooling the sample with flowing water. We examine the heat transfer characteristics of this situation, to estimate the maximum temperature increase and thermal time constants that might be encountered in such an experiment. The sample is modeled as a uniform sphere, cylinder, or slab subject to uniform heating, which is located in an unbounded coolant flow. The heat transfer is determined by the Biot and Reynolds numbers (which reflect the geometry, fluid flow, and material thermal properties of the system) the temperature rise is governed by the heat conduction equation coupled with external convection. The results are expressed in terms of nondimensional quantities, from which the thermal response of a heated object of arbitrary size can be determined. At low coolant flow rates, the maximum temperature rise can be biologically significant, even for relatively small objects (of millimeter radius) exposed to moderate levels of microwave energy (with a SAR of ca. 100 mW/g). The results are valid also where the coolant is a gas or a liquid different from water, the only restriction being on the Reynolds number of the flow.

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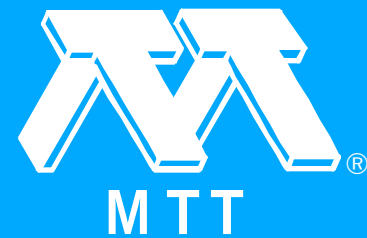


Abstracts

Numerical Analysis of Arbitrarily Shaped Bodies Modeled by Surface Patches

J.J.H. Wang and C.J. Drane. "Numerical Analysis of Arbitrarily Shaped Bodies Modeled by Surface Patches." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1167-1173.

Numerical modeling techniques for arbitrarily shaped conducting bodies using triangular surface patches are presented. Computer codes based on the magnetic field integral equations, the electric field integral equations, the reaction integral equations were developed, tested with various degrees of success.



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Delay-Line Based Techniques for Microwave and Millimeter-Wave Transmission/Reflection Test Sets

A. Boulouard. "Delay-Line Based Techniques for Microwave and Millimeter-Wave Transmission/Reflection Test Sets." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1174-1183.

A technique for filtering hardware-related errors and obtaining amplitude/phase information, with the aid of precision delay lines and swept-frequency source is investigated theoretically for microwave and millimeter-wave transmission/reflection test sets. A computer simulation is carried out on a p-pole, Butterworth-type model to obtain a measure of the filtering technique in this particular case. A quasi-exact solution is found for the swept-frequency vector reflectometer equation and a closed-form solution is obtained for the swept-frequency amplitude/delay transmission/ reflection parameters.



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Spectral Domain Analysis of an Open Slot Ring Resonator

K. Kawano and H. Tomimuro. "Spectral Domain Analysis of an Open Slot Ring Resonator." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1184-1187.

A full wave analysis of an open slot ring resonator on a dielectric substrate is presented. It is based upon Galerkin's method in the Hankel transform domain. The computed resonant frequencies for several slot widths agree well with the experimental values on alumina substrate with $\epsilon_r = 9.6$ in the 26-37-GHz frequency range.

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Spectral Domain Analysis of Frequency Dependent Propagation Characteristics of Planar Structures on Uniaxial Medium

H. Lee and V.K. Tripathi. "Spectral Domain Analysis of Frequency Dependent Propagation Characteristics of Planar Structures on Uniaxial Medium." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1188-1193.

The propagation characteristics of single and multilayered uniaxial dielectric waveguides and planar structures on uniaxial medium can be determined by utilizing Hertzian potentials along the optical axis. The electric and magnetic Hertzian potentials, having components along the optical axis only, lead to TM and TE modes, respectively, with respect to that axis. The dyadic Green's function in Fourier transform domain (immittance matrix) required to solve for the propagation characteristics of planar structures on uniaxial medium are derived for all three orientations of the optical axis. The immittance matrix for all three cases is in the same form as that for the isotropic medium and hence the known Galerkin's method can be used to solve for the propagation characteristics of the structure.

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Variational Methods for Nonstandard Eigenvalue Problems in Waveguide and Resonator Analysis

I.V. Lindell. "Variational Methods for Nonstandard Eigenvalue Problems in Waveguide and Resonator Analysis." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1194-1204.

The nonstandard (general) eigenvalue problem is defined in operator form by $L(\lambda)f = 0$ and $B(\lambda)f = 0$, where L and B are linear operators, and for a standard problem L is a linear function of the parameter λ and B does not depend on λ . It is shown by examples, that nonstandard problems arise in electromagnetic problems, and a unified variational principle is formulated from which stationary functional for the nonstandard eigenvalues can be constructed. The examples include cutoff problem of a waveguide with surface reactance, propagation problem of an azimuthally magnetized ferrite-filled waveguide, the cutoff problem of a corrugated waveguide and the problem of a material insert in a resonator. It is demonstrated with these simple but nontrivial examples that the present method leads to a good engineering accuracy with very elementary test functions.

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Microstrip-Slot Coupler Design -- Part I: S-Parameters of Uncompensated and Compensated Couplers

R.K. Hoffmann and J. Siegl. "Microstrip-Slot Coupler Design -- Part I: S-Parameters of Uncompensated and Compensated Couplers." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1205-1210.

Using the even-odd mode analysis of four-port networks with double symmetry, the scattering parameters of the microstrip-slot coupler are derived from the even- and odd-mode parameters of the coupler cross section. The uncompensated coupler and the coupler compensated by extending the slot lines are treated and design specifications are given covering the compensation slot lines. A comparison with experimental data will be given in Part II.

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Microstrip-Slot Coupler Design -- Part II: Practical Design Aspects

R.K. Hoffmann and J. Siegl. "Microstrip-Slot Coupler Design -- Part II: Practical Design Aspects." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1211-1216.

Practical aspects of designing microstrip-slot couplers on an Al/sub 2/O/sub 3/ ceramic substrate ($\epsilon_r = 9.8$) are treated in supplementation of the theoretical analysis of the coupler presented in Part I. Comparison with implemented couplers yields rules for specification of the reference planes at the ends of the coupling section, for the appropriate choice of definition for the slot-line characteristic impedance. Design data of the standard versions of the microstrip transmission line, the slot line are shown to be adequate for the microstrip-slot coupler. Computed S -parameter curves plotted for various 3-dB couplers yield information on realizable transmission characteristics.

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Abstracts

A Synthesis Procedure for Designing 90° Directional Couplers with a Large Number of Sections

B. Ulriksson. "A Synthesis Procedure for Designing 90° Directional Couplers with a Large Number of Sections." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1216-1219.

A synthesis method for designing symmetrical directional couplers with an arbitrary realizable coupling is described. The method is based on a transformation of the coupling to the time domain, where the couplings of the different sections are easily identified. The fundamental operation of the method is the Fast Fourier Transform, which makes it very efficient in computer time and memory requirements. The method is illustrated by the design of a 8.34 ± 0.3 -dB equal-ripple coupler with 201 sections.



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The Use of Symmetry to Simplify the Integral Equation Method with Application to 6-Sided Circulator Resonators

G.P. Riblet and E.R.B. Hansson. "The Use of Symmetry to Simplify the Integral Equation Method with Application to 6-Sided Circulator Resonators." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1219-1223.

In this paper it is shown that for planar two-dimensional problems with symmetry, the dimensions of the matrices, which must be inverted to obtain a solution using the integral equation method, can be substantially reduced. For instance, for a three-fold symmetric hexagonal circulator junction with N segments about the periphery, the dimension of matrices to be inverted is reduced to $N/3$ from the usual N . It is demonstrated that for six-sided resonators with three-fold symmetry, a very good approximation to the equivalent admittance can be obtained with only 12 segments around the periphery, meaning that only 4×4 matrices need be inverted.

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Design of Linear Phase Selective Comb-Line Filter

I.H. Zabalawi. "Design of Linear Phase Selective Comb-Line Filter." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1224-1228.

A multiwire approach has been used to develop design equations for linear phase selective comb-line filter. The filter under consideration consists of two rows of inductive resonators separated by a slotted coupling surface. Through the development process a multipath prototype network has been considered. A frequency transformation has been formulated to relate the multipath prototype network and the multiwire comb-line structure. Hence, once the element-values of the prototype network are chosen to meet prescribed requirements, the corresponding comb-line filter element values can be computed through the developed explicit formulas. To illustrate the design procedure a brief design example is presented.





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Combining the Powers from Multiple-Device Oscillators

M. Madihian and S. Mizushina. "Combining the Powers from Multiple-Device Oscillators." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1228-1233.

This paper describes the results of power combining with multiple-device oscillators. A combiner circuit consisting of 3 oscillators and a directional coupler is analyzed. Conditions are set to obtain the maximum combining efficiency and a key approach is developed to control the frequency of the combiner. It is shown that the performance of the system is not seriously affected by the dissimilarity of the oscillators used in the combiner. A prototype 84-diode power combiner is constructed and total output power of 1.72 W with combining efficiency of 98.3 percent is obtained at 9.7 GHz. No fundamental limiting factor for the maximum number of devices to be combined was found.

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Simulation Study of Harmonic Oscillators

K. Solbach. "Simulation Study of Harmonic Oscillators." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1233-1237.

In the last few years, the operating modes of Gunn oscillators for frequencies above 60 GHz have been discussed controversially. In this context, a general theoretical circuit model for oscillators operating in the fundamental and in the second-harmonic modes is studied. The model employs a simple cubic I - V characteristic of the active element and separate embedding circuits for the fundamental and second-harmonic frequencies. The current and voltage waveforms of both modes are contrasted. The oscillator source impedances and the external Q of the second-harmonic mode oscillator are calculated.

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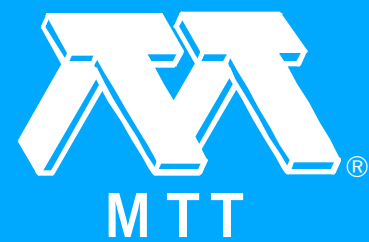
A Waveguide-Cavity Multiple-Device FET Oscillator

A. Materka and S. Mizushina. "A Waveguide-Cavity Multiple-Device FET Oscillator." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1237-1241.

A waveguide-cavity oscillator, applicable to power-combining circuits, has been developed using probe for coupling between active device and, cavity. No lossy stabilizing element is required. The control of output power, oscillation frequency, and injection locking bandwidth are performed easily. Output power of 44 mW and dc-RF conversion efficiency of 33.2 percent were obtained at 9.2GHz for a single-device low-power FET oscillator. A simple technique of cascading the pretuned oscillator modules was used to construct multiple-device oscillators incorporating up to four FET's with combining efficiency of about 100 percent.

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Monolithic Integration of a Dielectric Millimeter-Wave Antenna and Mixer Diode: An Embryonic Millimeter-Wave IC

C. Yao, S.E. Schwarz and B.J. Blumenstock. "Monolithic Integration of a Dielectric Millimeter-Wave Antenna and Mixer Diode: An Embryonic Millimeter-Wave IC." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1241-1247.

A monolithic silicon integrated circuit consisting of a mixer diode and an all-dielectric receiving antenna has been built and tested at 85 GHz. Radiation is coupled into the device optically with a coupling loss of 2.7 dB. No external metal structure is required for coupling. The design can be used efficiently at considerably higher frequencies, and can be elaborated into more complex integrated circuits. From measurements of video responsivity the losses of various parts of the device are estimated. A simple theory of conversion efficiency is found to agree well with experiment this theory is then used to predict the performance of improved versions of the device. The conversion efficiency obtained with this demonstration device is low; it is shown, however, that acceptable conversion efficiencies can be obtained with a more advanced diode fabrication technology using epitaxial Si or GaAs. Integrated millimeter-wave receivers of this kind should be suitable for short-path terrestrial communications, in applications where compactness and low cost are required.

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All Solid-State Low-Noise Receivers for 210-240 GHz

J.W. Archer. "All Solid-State Low-Noise Receivers for 210-240 GHz." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1247-1252.

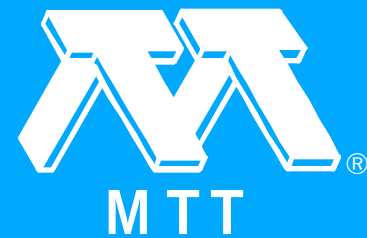
Low-noise all solid-state receiver systems for room temperature and cryogenic operation between 210 and 240 GHz are described. The receivers incorporate a single-ended fixed tuned Schottky barrier diode mixer, a frequency-tripled Gunn source as local oscillator and a GaAsFET IF amplifier. Single sideband receiver noise temperatures are typically 1300 K (7.39-dB noise figure) for a room temperature system and 470 K (4.18-dB noise figure) for a cryogenically cooled receiver operating at 20 K.

Abstracts

A New Design for 1-CM Rutile Traveling Wave Masers (Short Papers)

J. Askne, S. Galt and E. Kollberg. "A New Design for 1-CM Rutile Traveling Wave Masers (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1252-1255.

A new design of a rutile traveling wave maser is described. A dielectric rod waveguide is used as the interaction circuit. Essential mode coupling problems have been worked out in order to make the maser work properly. The advantage with this type of maser is the simplicity in the manufacturing and the very low insertion loss. A maser designed for the frequency range 26-29 GHz has been built, tested, and used in radio astronomical observations.



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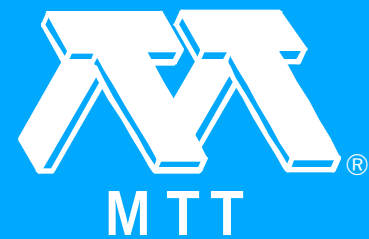
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Determination of Microwave Transistor Noise and Gain Parameters through Noise-Figure Measurements Only (Short Papers)

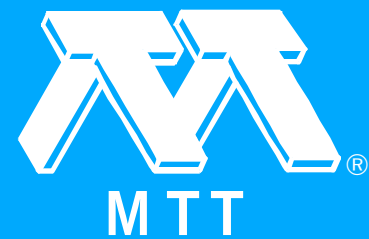
G. Martines and M. Sannino. "Determination of Microwave Transistor Noise and Gain Parameters through Noise-Figure Measurements Only (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1255-1259.

A novel method for measuring noise and gain parameters of linear two-ports solely from noise-figure measurements is applied here to perform noise and gain characterization of microwave transistors versus frequency and collector current in S-band. The method results in a simpler procedure and improved accuracy compared to conventional methods. In addition, a technique to estimate the loss of the input tuner of the measuring setup is presented, which yields a further improvement in accuracy. As experimental verification, the noise and gain parameters of a microwave transistor versus collector current in the 2-4-GHz frequency range are reported.

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Comparison Decrement Method for Microwave Resonator Q Measurements (Short Papers)

I. Kneppo. "Comparison Decrement Method for Microwave Resonator Q Measurements (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1259-1260.

The sensitivity of resonator quality-factor measurements using the decrement method can be improved by the comparison of the decay curve of a measured resonator with that of a reference standard resonator. The decay curves are compared using the integral of the function given as difference between decay curves. The comparison method, to be proposed, also has the advantage that the calibration of neither time base nor power scale is needed. Some results of the experimental verification are presented.

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Abstracts

A 94-GHz Diode-Based Single Six-Port Reflectometer (Short Papers)

H.M. Cronson and R.A. Fong-Tom. "A 94-GHz Diode-Based Single Six-Port Reflectometer (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1260-1264.

This paper describes design considerations and gives measurement results for a single six-port reflectometer constructed from WR-10 waveguide with silicon Schottky diode detectors. Tradeoffs between various types of power detectors are discussed along with criteria for six-port junction design. The merits of two calibration procedures are compared. Measurements at 94 GHz indicate good agreement between expected and experimental values of q-points and of a sliding mismatch with nominal 0.1 reflection coefficient.



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Analysis of the Shielded-Strip Transmission Line with an Anisotropic Medium (Short Papers)

H. Shibata, S. Minakawa and R. Terakado. "Analysis of the Shielded-Strip Transmission Line with an Anisotropic Medium (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1264-1267.

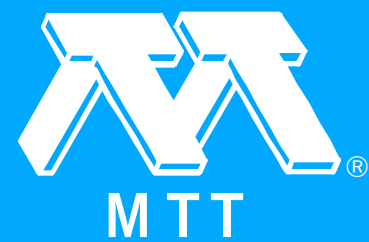
Analysis of the shielded stripline with an anisotropic medium is presented by means of an affine transformation and a conformal mapping technique. The capacitance is represented in the function $K'(k) / K(k)$ with a modified modulus k , which is obtained by multiplying d , the width between the ground planes in [1, table I], by α . The parameter α relates to the anisotropic medium. The exact distributions of equipotentials and lines of electric flux in the anisotropic medium are also presented.



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Characteristics of Microstrip Directional Couplers on Anisotropic Substrates (Short Papers)

N.G. Alexopoulos and S.A. Maas. "Characteristics of Microstrip Directional Couplers on Anisotropic Substrates (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1267-1270.

The properties of directional couplers fabricated on anisotropic substrates are examined on a quasistatic basis. Three substrate materials are considered sapphire, Epsilam (a ceramic-filled polytetrafluoroethylene dielectric), and boron nitride. VSWR, directivity, and coupling are presented for several representative 10-dB coupler designs, as well as variations in these parameters with crystal axis offsets. It is demonstrated that high directivity can be achieved by making use of the substrate anisotropy in conjunction with a top cover to equalize even- and odd-mode phase velocities.

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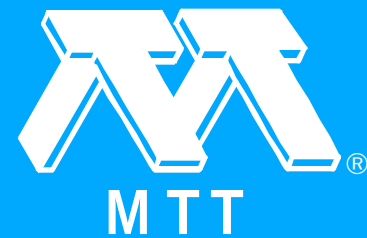


Abstracts

Propagation of Picosecond Pulses on Microwave Striplines (Short Papers)

K.K. Li, G. Arjavalingam, A. Dienes and J.R. Whinnery. "Propagation of Picosecond Pulses on Microwave Striplines (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1270-1273.

Dispersion of picosecond pulses propagating on a microstrip line is calculated in the time domain. Numerical calculations are by the fast Fourier transform, but a simple analytical model shows separation of high-and low-frequency components.



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The Equivalent Circuit of the Asymmetrical Series Gap in Microstrip and Suspended Substrate Lines (Short Papers)

N.H.L. Koster and R.H. Jansen. "The Equivalent Circuit of the Asymmetrical Series Gap in Microstrip and Suspended Substrate Lines (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1273-1279.

The microwave properties of the series gap in microstrip and suspended substrate lines with unequal widths of the involved lines are described by means of suitable equivalent circuit data. These data have been computed using a rigorous three-dimensional spectral domain hybrid-mode approach developed by Jansen for the numerical characterization of the frequency-dependent scattering parameters of a wide class of strip and slot discontinuities. The results presented extend considerably the range of published gap data. In particular, they show that the stray-susceptances in the equivalent pi-network of the asymmetric series gap exhibit an inductive behavior for the case of tight coupling.

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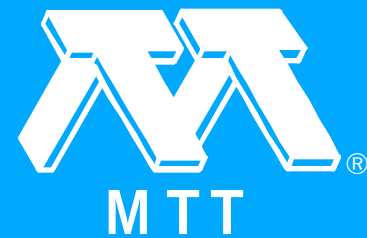


Abstracts

Evaluation of the Integrals Occurring in the Study of Circular Microstrip Disk (Short Papers)

K. Hongo and M. Takahashi. "Evaluation of the Integrals Occurring in the Study of Circular Microstrip Disk (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1279-1282.

We have derived rigorous series expressions for the integrals which appear in the study of a circular microstrip disk separated from the grounded dielectric substrate when the problem is formulated by the method of dual integral equation or using Kobayashi potentials. The validity of the approximate expression of the integrals for small separation is verified numerically.



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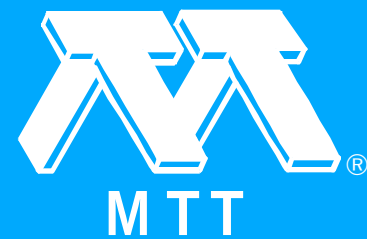


Abstracts

The Measurement of the Electric Field Inside a Finite Dielectric Cylinder Illuminated by a Plane Wave (Short Papers)

R. Bansal, R.W.P. King and T.T. Wu. "The Measurement of the Electric Field Inside a Finite Dielectric Cylinder Illuminated by a Plane Wave (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1282-1286.

An experimental study of the distribution of the electric field induced inside a finite circular cylinder of water illuminated by an approximately plane electromagnetic wave is presented. The incident field was generated by using a monopole above the ground plane with a 90° corner reflector. The cylinder of water included a thin conducting tube at its center to shield the transmission lines leading to the probes. The graphs of selected measured distributions are displayed and interpreted. The measurements were earned out at 100, 300, and 600 MHz. The conductivity of the 50-cm long column of water was varied from approximately zero to 3.5 S/m. Both the amplitude and the phase of the induced electric field were measured in the experiment. Comparisons with a new theoretical solution developed by the authors are also included.



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Abstracts

Automatic Noise Temperature Measurement through Frequency Variation (Short Papers)

V.D. Larock and R.P. Meys. "Automatic Noise Temperature Measurement through Frequency Variation (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1286-1288.

The dependence of two-port noise temperature on the source reflection factor does not lend itself to easy automated measurement. This paper shows that a noise analysis performed over a small frequency interval centered about the frequency of interest and with a source circuit having fast phase variations leads to a straightforward solution of the problem. The conditions for applying the procedure are broad enough to enable measuring most components like transistors and amplifiers over the entire microwave range. An example of practical implementation is presented.



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Abstracts

A 0.15 -- 12-GHz Matched Feedback Amplifier Using Commercially Available FET's (Short Papers)

F. Perez and V. Ortega. "A 0.15 -- 12-GHz Matched Feedback Amplifier Using Commercially Available FET's (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1289-1290.

Using a graphical approach followed by a simple computer optimization, an ultra-broad-band feedback amplifier covering the frequency range from 150 MHz to 12 GHz has been designed. Experimental results show that using commercially available FET's and parallel configuration, 5-dB flat gain and small VSWR'S can be obtained.



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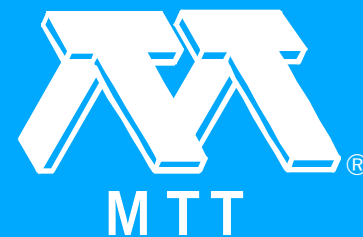


Abstracts

A New Fin-Line Ferrite Isolator for Integrated Millimeter-Wave Circuits (Comments)

F.J.K. Lange. "A New Fin-Line Ferrite Isolator for Integrated Millimeter-Wave Circuits (Comments)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1290-1291.

In the above paper the authors give a separation equation for "TE-eigenmodes" in a transversely magnetized ferrite as $k_{\text{sup}(2)}^2 / \mu_{\text{eff}} + (n\pi/b)^2 + \beta^2 = \omega^2 \epsilon_{\text{sup}(2)}$.



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Abstracts

A More Accurate Model of the TE/sub 10/-Type Waveguide Mode in Suspended Substrate (Corrections)

S.B. Cohn and G.D. Osterhues. "A More Accurate Model of the TE/sub 10/-Type Waveguide Mode in Suspended Substrate (Corrections)." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1291-1291.

The following corrections should be made to the above paper. On page 293, should read $Z_{\text{sub } 2} / \tan \phi_{\text{sub } 2} - Z_{\text{sub } 1} / \cot \phi_{\text{sub } 1} = 0$.



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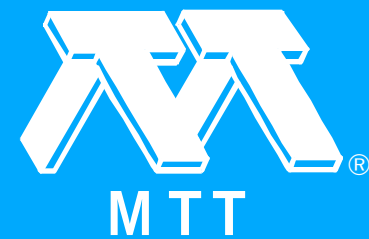
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Abstracts

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"IEEE Annual Combined Index (Advertisement) (Aug. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.8 (Aug. 1982 [T-MTT]): 1296-1296.



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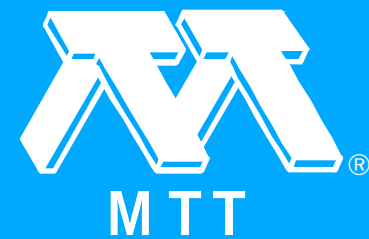
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Abstracts

Front Cover (Sep. 1982 [T-MTT])

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Abstracts

Foreword (Sep. 1982 [T-MTT])

S.B. Cohn. "Foreword (Sep. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1297-1297.

New Systems continue to require microwave filters with ever more stringent passband and stopband control, smaller size, and lighter weight. Today's communications satellites, as an example, demand the tightest possible packing of channels in specific total bands. This requirement has stimulated especially sophisticated advances in insertion-loss and group-delay performance, more practical and compact configurations, and more versatile and useful theoretical design theory for bandpass two-ports and multiplexer.



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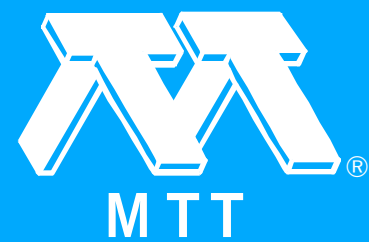
Introduction - Microwave Filters: A Maturing Art

A.E. Williams and A.E. Atia. "Introduction - Microwave Filters: A Maturing Art." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1298-1299.

Since the publication in September 1965 of the first special issue on microwave filters, significant theoretical and technological developments have occurred in this field. Because the major stimulus has been the ever-increasing demand to conserve bandwidth in the congested microwave frequency spectrum, a premium is placed on optimum filter transfer functions that achieve sharp frequency selectivity and flat group delay. In particular, the continued development and expansion of satellite communications systems was the primary driving force behind the development of the dual-mode waveguide bandpass filters. These filters combine both optimum transfer functions with minimum mass and volume, allowing the achievement of significant efficiencies in satellite transponder design. These requirements have also provided an important stimulus for developing new technologies to improve filter construction and manufacturing. In addition, newly developed ceramic materials that combine excellent temperature stability with low dielectric tangents (losses) and high dielectric constants are becoming readily available, thereby further reducing mass, volume, and production cost while maintaining the high-quality performance characteristics of metal cavity filters.

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Synthesis and Realization of Narrow-Band Canonical Microwave Bandpass Filters Exhibiting Linear Phase and Transmission Zeros

G. Pfitzenmaier. "Synthesis and Realization of Narrow-Band Canonical Microwave Bandpass Filters Exhibiting Linear Phase and Transmission Zeros." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1300-1311.

The present study is concerned with the synthesis and realization of narrow-band canonical microwave bandpass filters exhibiting additional couplings between nonsuccessive resonant circuits. These bypass couplings effect, on the one hand, attenuation poles at finite frequencies and, on the other hand, make the bandpass filter nonminimum-phase, and therefore offer degrees of freedom for group delay equalization in the passband. The realization of canonical network structures with bypass couplings is possible by extracting from the chain matrix an ideal transformer, the input of which is connected, for example, in shunt with and its output in series with the remainder two-port. The extraction is associated with the reduction by 2 of the degree of the denominator polynomial of the chain matrix elements. To realize a clear correlation between the bypass elements and the electrical performance, canonical structures with sections that are bypassed only once or twice are proposed. Theoretical and measured curves of the examples of realization for 1235 MHz, consisting of coaxial cavities, and for 4000 MHz, consisting of dual-mode cavities, are seen to be in close agreement.





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Dual-Mode Dielectric Resonator Loaded Cavity Filters

S.J. Fiedziuszko. "Dual-Mode Dielectric Resonator Loaded Cavity Filters." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1311-1316.

A new miniature realization of dust-mode filters is presented. As a basic building element of the filter, the dielectric resonator axially mounted in a waveguide below cutoff and resonating in a hybrid, degenerate mode is used. A dramatic reduction in size and weight, and excellent temperature performance with minimum degradation of resonator Q was achieved. Dust-mode configuration, preferred in satellite applications, allows simple realization of high-performance elliptic function filters. Experimental results are presented and demonstrate excellent agreement with the theory. Bandpass filter configuration is discussed however, realizations of bandstop, directional, etc., filters are also possible.

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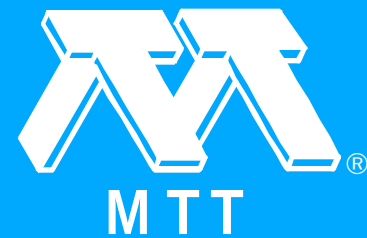


Abstracts

A 450-W Output Multiplexer for Direct Broadcasting Satellites

D.J. Rosowsky and D. Wolk. "A 450-W Output Multiplexer for Direct Broadcasting Satellites." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1317-1323.

The development and design of high power manifold type output multiplexer are described. The results obtained on Invar multiplexers with up to 450-W input power per channel are reported. The multiplexer are equipped with heat pipes in order to remove the heat generated in the filters.



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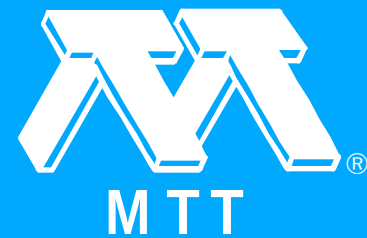


Abstracts

Transmit-Receive Multiplexer for the 12-14-GHz Band

H.L. Thal, Jr.. "Transmit-Receive Multiplexer for the 12-14-GHz Band." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1324-1330.

A compact low-loss transmit-receive multiplexer for direct satellite broadcast of two television channels is described. The response synthesis for the two contiguous transmit channels is outlined. A circuit model for the filter-to-manifold coupling, methods for its control, and the optimization of the manifold spacings are discussed. A technique for improving the transmitter-to-receiver isolation is shown. Experimental responses are given.



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Microwave Filter Loss Mechanisms and Effects

H.L. Thal, Jr.. "Microwave Filter Loss Mechanisms and Effects." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1330-1334.

The losses in coupled cavity filters due to coupling apertures, tuning screws, and surface roughness have been determined experimentally. The results show, for example, that the shapes of the coupling apertures have a significant effect on filter losses. They may be used to estimate how the effective unloaded Q of a filter, and thus its insertion loss, varies as a function of bandwidth configuration (e.g., single- or dual-mode), and response type (e.g., Chebyshev or elliptic). Also, they may be used to predict other effects such as response skewing and spatial distribution of dissipated power.

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Canonical Asymmetric Coupled-Resonator Filters

H.C. Bell, Jr.. "Canonical Asymmetric Coupled-Resonator Filters." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1335-1340.

A direct (noniterative) procedure is presented for realizing canonical, structurally asymmetric lowpass prototypes for coupled-resonator bandpass filters with "bridge" couplings. An asymmetric prototype is obtained from the canonical symmetric prototype (which is realizable without matrix methods) by applying simple plane rotations to the coupling matrix. The resulting asymmetric prototype may be a more desirable structure, and may have fewer couplings, than the canonical symmetric prototype. The procedure is applicable to filters with symmetric or asymmetric frequency responses.

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Abstracts

A Novel Class of Generalized Chebyshev Low-Pass Prototype for Suspended Substrate Stripline Filters

S.A. Alseyab. "A Novel Class of Generalized Chebyshev Low-Pass Prototype for Suspended Substrate Stripline Filters." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1341-1347.

A novel class of low-pass prototype filters having an equiripple passband response with three transmission zeros at infinity and the remainder at a finite real frequency is presented. The prototypes are synthesized using the alternating pole technique to obtain directly the even-mode or the odd-mode admittance and little accuracy is lost for prototypes up to degree 15. Tables of element values for commonly used specifications are included. The tables are useful for the design of TEM-mode microwave broad-band filters, diplexers, and multiplexers, particularly for a printed circuit form a realization. A design example of a low-pass microwave broad-band filter designed and constructed in suspended substrate stripline (SSS) configuration is given and experimental results are also presented.



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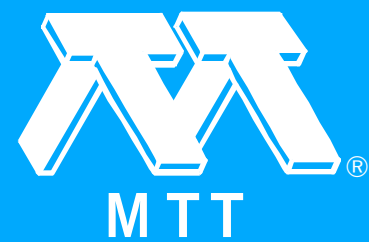
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Design of Low-Pass Elliptic Filters by Means of Cascaded Microstrip Rectangular Elements

F. Giannini, M. Salerno and R. Sorrentino. "Design of Low-Pass Elliptic Filters by Means of Cascaded Microstrip Rectangular Elements." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1348-1353.

A new method for synthesizing nonredundant low-pass elliptic filters in a microstrip configuration is presented. The realization consists of the cascade connection of proper rectangular elements, each one corresponding to four reactive elements of the lumped-constant prototype. This allows an effective control of parasitic and unwanted reactance which results in the possibility of realizing higher order filters with cutoff frequencies up to X-band. Fifth- and seventh-order filters were fabricated on alumina substrates showing very good performance, particularly in the passband.

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Electronically Tunable Microwave Bandpass Filters

I.C. Hunter and J.D. Rhodes. "Electronically Tunable Microwave Bandpass Filters." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1354-1360.

Combine filters with novel input and output coupling networks which enable broad-band tuning to be achieved with minimum degradation in passband performance are discussed. Explicit design formulas for these filters are presented. Computer analysis of varactor tuned combine bandpass filters including the small signal varactor equivalent circuit is presented enabling filter performance to be easily evaluated. The design and experimental performance of a varactor tuned combine filter, realized in suspended substrate stripline is described. This filter tuned from 3.2 GHz to 4.9 GHz exhibited low passband insertion loss and its performance was in close agreement with theoretical expectations.

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Electronically Tunable Microwave Bandstop Filters

I.C. Hunter and J.D. Rhodes. "Electronically Tunable Microwave Bandstop Filters." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1361-1367.

The design procedures for varactor tuned bandstop filters are presented. A novel circuit technique for realizing bandstop filters with a symmetrical frequency response is described and explicit design formulas are presented. The physical design and experimental performance of a three cavity varactor tuned bandstop filter tunable around 4 GHz is presented. Experimental results are substantiated with computer analysis which includes the effects of varactor resistance.

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Analysis and Composition of a New Microwave Filter Configuration with Inhomogeneous Dielectric Medium

A. Fukasawa. "Analysis and Composition of a New Microwave Filter Configuration with Inhomogeneous Dielectric Medium." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1367-1375.

A theoretical study has been undertaken to solve inter-resonator coupling problems, and to design a new structure of microwave bandpass filter. This filter is composed of quarter-wavelength resonators arranged in a housing with the same ends short-circuited. This arrangement of resonators has never been utilized to compose bandpass filters because of the small inter-resonator coupling. The coupling coefficient of TEM resonant lines has been derived theoretically and expressed with capacitive parameters of the coupled lines. The accurate values of capacitances of the lines were obtained by the numerical analysis of the TEM field. By a simple method to make the medium inhomogeneous through removing the dielectric partially, a simplified structure of filter has first been realized based on the theory. Through numerical analysis by the finite difference method, this structure is also shown to have higher unloaded Q of resonator than conventional dielectric-filled coaxial filters to minimize the volume of filters.

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Synthesis and Realization of Multisection Tandem Stripline Bandpass Filters

G. Saulich. "Synthesis and Realization of Multisection Tandem Stripline Bandpass Filters." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1375-1380.

A bandpass filter is described which is made up of two identical multi-element coupled symmetrical striplines in tandem connection. For the filter, a precise synthesis procedure is presented reducing the design to the synthesis of a directional coupler. The required equal-ripple polynomials are calculated by an iterative method. Relations for the polynomial extreme values are provided, derived from the attenuation requirements in passband and stopband. On the basis of this procedure the coupling factors of two 21-element filters are calculated and realized three-layer polyolefin. Measurements show good agreement with theoretical results.

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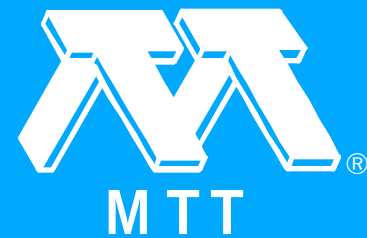


Abstracts

The Design of a Multiple Cavity Equalizer (Short Papers)

M.H. Chen. "The Design of a Multiple Cavity Equalizer (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1380-1383.

A simplified design method for a group delay equalizer with multiple poles has been developed, which replaces the conventional approach of cascading several C- and D-type equalizers by one equalizer with multiple poles. A prototype 4-pole equalizer has been designed and tested with satisfactory performance.



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Improved Selectivity in Cylindrical TE/sub 011/ Filters by TE/sub 211//TE/sub 311/ Mode Control (Short Papers)

D.E. Kreinheder and T.D. Lingren. "Improved Selectivity in Cylindrical TE/sub 011/ Filters by TE/sub 211//TE/sub 311/ Mode Control (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1383-1387.

A new method is presented for the design of low loss cylindrical TE/sub 011/-mode resonators whereby transmission nulls can be placed near the TE/sub 011/, resonance by controlling the TE/sub 211/, and TE/sub 311/, modes that are naturally excited in the same resonator. The frequencies at which the nulls occur are controlled by the angular offset of the sidewall coupling apertures and the relative amplitude of the TE/sub 011/ mode compared to the TE/sub 211/ and TE/sub 311/ modes. It is also shown that a lumped constant circuit model can be used to accurately represent the multimode response of the resonator.

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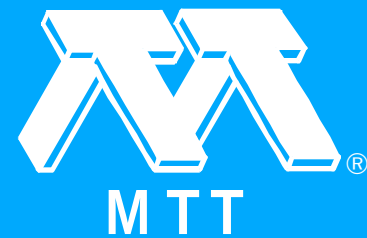


Abstracts

Quarter-Wavelength Coupled Variable Bandstop and Bandpass Filters Using Varactor Modes (Short Papers)

S. Toyoda. "Quarter-Wavelength Coupled Variable Bandstop and Bandpass Filters Using Varactor Modes (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.9 (Sep. 1982 [T-MTT] (Special Issue on Microwave Filters)): 1387-1389.

A quarter-wavelength coupled bandstop filter using varactor diodes for the 6-GHz band has been proposed and tested. Frequency giving maximum attenuation varies from 4.4 GHz-7 GHz. A quarter-wavelength coupled variable bandpass filter using varactor diodes for the 4-GHz band is also proposed and tested. The passband width varies from 730 MHz-1.22 GHz. The center frequency of the filter can also be changed.



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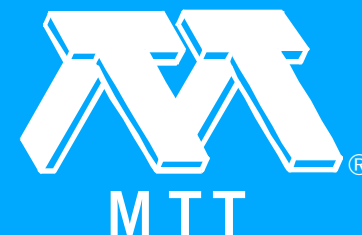
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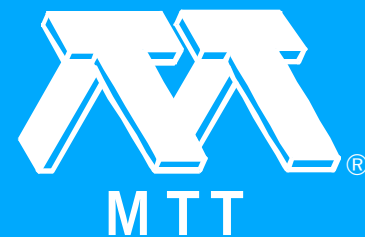
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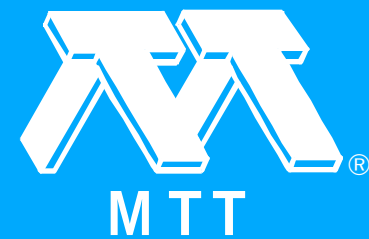
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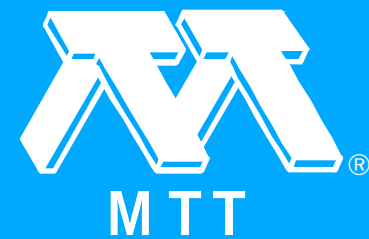
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Table of Contents (Oct. 1982 [T-MTT])

"Table of Contents (Oct. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1401-1403.



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Abstracts

Foreword to the Special Issue on Optical Guided Wave Technology (Oct. 1982 [T-MTT])

T.G. Giallorenzi. "Foreword to the Special Issue on Optical Guided Wave Technology (Oct. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1404-1405.

This Special Issue of the Journal of Quantum Electronics is the third in a series dedicated to optical guided wave technologies. The first two Special Issues were published in June 1981 and April 1982. The purpose of these three issues was to present the readership with an accurate snapshot of the technology, to illustrate the state-of-the-art and the research trends, and to provide a survey for the IEEE and the Optical Society as to the extent of activity in this field. The continued growth both of R&D and applications of guided wave technology has been made apparent by the responses these special issues. As a consequence of this survey and as result of the expressed interest of the memberships of the IEEE and the Optical Society, a new journal which is entitled, Journal of Lightwave Technology has been established. It is planned that this journal becomes the principal vehicle for the publication of works in guided wave related technologies. During the calendar year 1983, quarterly issues are planned, growing to at least bimonthly issues in 1984. Applications well as technological developments are expected to be covered in this new journal.



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Abstracts

The Outside Vapor Deposition Method of Fabricating Optical Waveguide Fibers

M.G. Blankenship and C.W. Deneka. "The Outside Vapor Deposition Method of Fabricating Optical Waveguide Fibers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1406-1411.

The outside vapor deposition (OVD) process for fabricating high performance glass optical waveguide fibers is reviewed. Starting metal halide chemicals, porous soot preform fabrication, sintering steps, and fiber drawing are discussed. Preform target size and its effect in obtaining deposition rates to 4 g/min is presented. Data comparisons of OVD fiber performance with other vapor deposited techniques are presented for attenuation, hydroxyl content, and strength (0.7 GPa / M² for 49.5 km of fiber). Single-mode fiber results including excellent geometric concentricity are also discussed.



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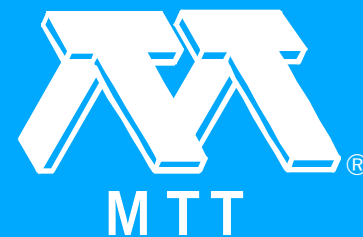


Abstracts

Recent Progress in Fiber Fabrication Techniques by Vapor-Phase Axial Deposition

K. Inada. "Recent Progress in Fiber Fabrication Techniques by Vapor-Phase Axial Deposition." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1412-1419.

Five years have passed since the invention of the VAD technique. Fabrication techniques for the various kinds of VAD fibers such as graded index fibers, single-mode fibers, high NA fibers, and single polarization fibers have been developed. This paper mainly outlines the recent improvements in the VAD fiber manufacturing techniques such as the preform fabrication technique, dehydration technique, refractive index profile formation technique, and the single-mode fiber manufacturing technique.



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Infrared Optical Fibers

T. Miyashita and T. Manabe. "Infrared Optical Fibers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1420-1438.

A state of the art review of nonsilica based infrared fibers is presented. Two types of fiber materials have been investigated--crystals and glasses. Crystal fiber work appears to be focused on development of short haul CO/sub 2/ laser power delivering lines at 10.6 μm . The maximum delivering power of the CW CO/sub 2/ laser has reached up to about 100 W by the polycrystalline KRS-5 fiber. A number of glass fibers are being developed in fluorides, sulfides and heavy metal oxides. The best optical attenuation of each glass fiber has been respectively reduced to 21 dB/km at 2.55 μm for ZrF/sub 4/-based glass fiber with a core-clad structure, 78 dB/km at 2.4 μm for As-S unclad glass fiber, and 13 dB/km at 2.05 μm (70 dB/km at 2.40 μm) for GeO/sub 2/-Sb/sub 2/O/sub 3/ glass fiber with a core-clad structure. Recent progress of these infrared fibers offers great potential for new wavelength fiber links operating in the 2-10 μm region which have not been realized by silica-based fiber.



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Optical Fiber and Preform Profiling Technology

W.J. Stewart. "Optical Fiber and Preform Profiling Technology." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1439-1454.

A comprehensive review of state-of-the-art optical fiber and preform index-profiling methods has been prepared. The advantages and disadvantages of the various approaches are discussed. Important parameters include measurement accuracy, resolution, simplicity, and the nondestructive features of some methods. Both optical and non-optical techniques have been treated. Resolution considerations probably favor the refracted near-field technique and this may be a decisive factor for the measurement of single-mode fibers. Simplicity of apparatus lies with near-field methods generally so that the bound near-field method is most often used for dimensioned measurements. Preform profiling is dominated by deflection function methods, usually accompanied by spatial filtering or focusing. Methods restricted to certain classes of fiber, such as the far-field approaches, are less attractive and, consequently, do not receive as much use.

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Radiating Leaky-Mode Losses in Single-Mode Lightguides with Depressed-Index Claddings

L.G. Cohen, D. Marcuse and W.L. Mammel. "Radiating Leaky-Mode Losses in Single-Mode Lightguides with Depressed-Index Claddings." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1455-1460.

Cutoff characteristics are calculated for the fundamental mode in a single-mode double-clad lightguide structure whose refractive index in the inner cladding is less than the index of the outer cladding. Results of this study indicate how to choose the proper depressed cladding width, depth in order to reduce long-wavelength losses that have been observed in experimental MCVD fibers with fluorine-doped phosphosilicate claddings.

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Maximum Measurable Distances for a Single-Mode Optical Fiber Fault Locator Using the Stimulated Raman Scattering (SRS) Effect

Y. Murakami, K. Noguchi, F. Ashiya, Y. Negishi and N. Kojima. "Maximum Measurable Distances for a Single-Mode Optical Fiber Fault Locator Using the Stimulated Raman Scattering (SRS) Effect." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1461-1465.

Maximum measurable distances for a single-mode optical fiber fault locator using the stimulated Raman scattering effect were calculated. Calculations were carried out on the assumption that the light source is an Nd: YAG laser operating at 1.06 μm and the photo-detector is a germanium avalanche photodiode (Ge-APD). The first to the seventh Stokes lights can be detected by the Ge-APD. Calculations show that a break can be measured in an up to 165km long ultra-low-loss single-mode fiber.

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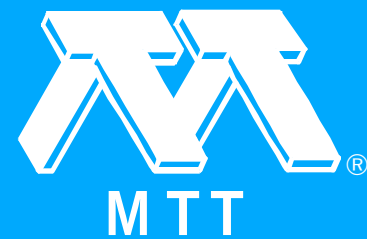


Abstracts

Application of the Backscattering Technique to the Determination of Parameter Fluctuations in Multimode Optical Fibers

M. Eriksrud and A. Mickelson. "Application of the Backscattering Technique to the Determination of Parameter Fluctuations in Multimode Optical Fibers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1466-1471.

An experimental study of backscattering traces from fibers with random variations of core diameter and numerical aperture has been carried out. The "mode-filtering" technique, which is employed in the measurements, is shown to be a powerful means of separating the parameter fluctuation effects from the actual exponential power decay. The experimental results are then found to be in excellent agreement with the predictions of a recent backscattering theory. It is shown that backscattering measurements can easily be used to place upper limits on the magnitudes of parameter fluctuations in present day fibers.



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Propagation Characteristics of Single Mode Optical Fibers with Arbitrary Index Profiles: A Simple Numerical Approach

E.K. Sharma, A. Sharma and I.C. Goyal. "Propagation Characteristics of Single Mode Optical Fibers with Arbitrary Index Profiles: A Simple Numerical Approach." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1472-1477.

We present here a rapidly converging numerical procedure for the direct evaluation of the propagation constant and its first and second derivatives in single mode optical fibers with arbitrary refractive index profiles. To illustrate the procedure we have also used it to evaluate the propagation constant and its derivatives in single mode optical fibers with power law profiles in the presence of a Gaussian axial index dip, and hence, studied the effect of a dip on the dispersion characteristics of the fibers.



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Tolerance Requirements for Dispersion Free Single-Mode Fiber Design: Influence of Geometrical Parameters, Dopant Diffusion, and Axial Dip

P.-L. Francois. "Tolerance Requirements for Dispersion Free Single-Mode Fiber Design: Influence of Geometrical Parameters, Dopant Diffusion, and Axial Dip." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1478-1487.

The dispersion sensitivity to small changes in index-differences, radius, and wavelength is investigated in the case of dispersion free single-mode fibers. If a minimum bandwidth is required, tolerances on the various parameters can then be deduced: singly- and doubly-clad structures are compared. Constant reference is made to the HE/sub 11/ mode spot-size to relate dispersion properties and attenuation. A nonzero fundamental mode cutoff is shown to induce an enhanced sensitivity to a change in fiber geometrical characteristics. The effect of dopant diffusion and axial dip on dispersion is then considered and conclusions are drawn concerning the use of profiles measured on preforms to predict fiber propagation properties.



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Single-Mode Fiber OTDR: Experiment and Theory

D.L. Philen, I.A. White, J.F. Kuhl and S.C. Mettler. "Single-Mode Fiber OTDR: Experiment and Theory." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1487-1496.

An OTDR measurement technique with an end detection dynamic range of 63 dB is described for use with single-mode fibers. A theoretical analysis of single-mode fiber backscattering is presented which predicts loss penalties in single-mode OTDR'S compared with multimode fibers. The prediction of the critical power levels of about 3 - 4 W for the onset of nonlinear effects in fibers is shown to be in good agreement with experiment. Fusion welded splices do not demonstrate significant backscattered power.

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Phase Shift Technique for the Measurement of Chromatic Dispersion in Optical Fibers Using LED's

B. Costa, D. Mazzoni, M. Puleo and E. Vezzoni. "Phase Shift Technique for the Measurement of Chromatic Dispersion in Optical Fibers Using LED's." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1497-1503.

A sinusoidal technique is reported, which allows simple and accurate measurements of chromatic dispersion in optical fibers. It is based on the phase shift which a sinusoidally modulated light beam undergoes while traveling along a fiber when its wavelength is changed. The choice of a multiple LED's source permits the continuous spectral covering from 750 to 1600 nm; easily available instrumentation and devices are needed for the measurement setup. The technique is reported in detail by showing results obtained in multimode fibers; statistical evaluation of its accuracy and a comparison with conventional methods are carried out. An accuracy of a few picosecond in relative delay and of ± 1 ps/nm $\cdot$ km in chromatic dispersion are demonstrated, that compare very favorably with the existing techniques.

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Polarization Holding in Elliptical-Core Birefringent Fibers

S.C. Rashleigh and M.J. Marrone. "Polarization Holding in Elliptical-Core Birefringent Fibers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1503-1511.

Polarization holding in high-birefringence elliptical-core fibers is evaluated for the fiber birefringence spatial frequency range $1.5 \text{ cm/sup } -1/ < \text{Beta/sub } i/ < 40 \text{ cm/sup } -1/$, corresponding to beat lengths from 1.6 mm to 4.2 cm. This range of spatial frequencies is spanned by making measurements with a broad-band light source on four fibers with different degrees of birefringence. In this way, the strength of the internal birefringence perturbations is mapped to give the first experimental measure of their power spectrum. It is shown that commonly available fiber jackets can significantly degrade the polarization holding. For low spatial frequencies, the strength of the perturbations decreases rapidly with increasing frequency, but this rate decreases by more than half over a one-and-a-half order of magnitude increase in spatial frequency. A possible origin of the perturbations is suggested and it is shown that the strength of these perturbations must be reduced if polarization holding to a very high degree is to be realized in elliptical-core fibers. Presently, internal perturbations limit the polarization holding to $\leq 14.4 \text{ dB}$ over 1 km.



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A Comparison of Lightwave, Microwave, and Coaxial Transmission Technologies

J.R. Jones. "A Comparison of Lightwave, Microwave, and Coaxial Transmission Technologies." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1512-1524.

The relative performance, complexity, and cost for three digital transmission technologies-microwave, coaxial, and lightwave- are compared from the point of view of the lightwave technologist. It is found that lightwave systems are inherently noisier than the others. However, its bandwidth advantage can be exploited through bandwidth expansion techniques to overcome the noise disadvantage. It is further found that lightwave systems are potentially less complex than their radio and wireline counterparts given the advancements expected in the near future. Lastly, it is found that present-day lightwave systems can be less costly than the other technologies. Furthermore, it is found that anticipated near-term improvements to the technology will make lightwave systems even more attractive from the cost point of view. It is concluded that digital lightwave and microwave systems will continue to grow in usage-each has its own unique advantages relative to the other-and that digital coaxial systems will decline in usage.

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Gigabit/s Optical Receiver Sensitivity and Zero-Dispersion Single-Mode Fiber Transmission at 1.55 μm

J.-I. Yamada, A. Kawana, T. Miya, H. Nagai and T. Kimura. "Gigabit/s Optical Receiver Sensitivity and Zero-Dispersion Single-Mode Fiber Transmission at 1.55 μm ." 1982 *Transactions on Microwave Theory and Techniques* 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1525-1535.

High-speed pulse response and receiver sensitivity at 1.55 μm were measured at data rates ranging from 400 Mbits/s to 2 Gbits/s, in order to elucidate characteristics of a reach-through p/sup +/nn/sup -/ Ge APD. The p/sup +/nn/sup -/ Ge APD receiver provided a 2 Gbit/s received optical power level of -32.0 dBm at 1.55 μm and a 10/sup -9/ error rate, which was 4 dB better than the receiving level with a p/sup +/n Ge APD. Detector performance at 1.3 μm was also studied for comparison with performance at 1.55 μm . Single-mode fibers, which have 0.54 dB/km loss and zero dispersion at 1.55 μm , and an optical transmitter-receiver, whose repeater gain is 29.2 dB, have enabled 51.5 km fiber transmission at 2 Gbits/s. The transmission system used in this study has a data rate repeater-spacing product of 103 (Gbits/s) /spl dot/ km at 1.55 μm . Optical pulse broadening and fiber dispersion were also studied, using 1.55 and 1.3 μm dispersion free fibers. Future repeater spacing prospects for PCM-IM single-mode fiber transmission systems are discussed based on these experimental results.

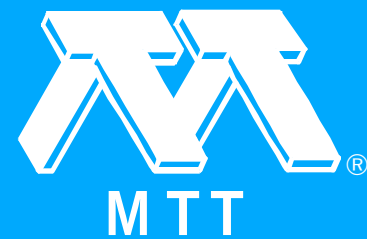


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Optical Digital High-Speed Transmission: General Considerations and Experimental Results

W. Albrecht, C. Baack, G. Elze, B. Enning, G. Heydt, L. Ihlenburg, G. Walf and G. Wenke.
"Optical Digital High-Speed Transmission: General Considerations and Experimental Results."
1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special
Issue on Optical Guided Wave Technology)): 1535-1547.

Laboratory experiments on digital optical transmission systems at bit rates of 1 and 2 Gbits/s are described. Systems with graded-index and single-mode fibers in the optical short and long wavelength region were investigated. All systems include complete circuits for clock and signal regeneration. Special emphasis was laid on the development of electronic circuits for gigabit signal processing and on the investigations of the noise sources of the optical channel, which appear especially pronounced in broad-band systems. The experimental results confirm the possibility to set up reliable high-speed optical transmission systems under laboratory conditions with available components. The remaining problems are of optical and not of electronic nature, despite the fact that monolithic integrated circuits for gigabit applications are hardly commercially available today.



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S/N and Error Rate Performance in AlGaAs Semiconductor Laser Preamplifier and Linear Repeater Systems

T. Mukai, Y. Yamamoto and T. Kimura. "S/N and Error Rate Performance in AlGaAs Semiconductor Laser Preamplifier and Linear Repeater Systems." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1548-1556.

The applications of AlGaAs semiconductor laser preamplifier and linear repeaters in single mode optical fiber transmission systems were studied through the baseband signal-to-noise ratio and bit error rate performance measurement. Experiments were carried out with the Fabry-Perot cavity laser amplifiers whose characteristics are improved by reducing the input mirror reflectivity to 6 percent. The use of a preamplifier improves the minimum detectable power by 7.4 dB over the Si-APD direct detection level when the received signal is amplified by 30 dB before photodetection. The use of two linear repeaters increases the regenerative repeater gain by 37 dB. These experimental results are in good agreement with theoretical predictions based on the photon statistic master equation analysis.



Single-Mode Fiber-Type Polarizer

T. Hosaka, K. Okamoto and J. Noda. "Single-Mode Fiber-Type Polarizer." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1557-1560.

The simple and novel fabrication technique of the fiber-type polarizer has been demonstrated and the polarization characteristics of the polarizer have been investigated. The polarizer structure consists of the eccentric core and the metal coat on the thin buffer layer whose thickness is controlled by chemical etching. The maximum extinction ratio of 41 dB (polarizer length $L = 40.8$ mm) was obtained at $\lambda = 1.15$ μm when the buffer layer thickness was about 0.3 μm . Although the insertion loss increases with decreasing the buffer layer thickness, the insertion loss of 0.66 dB was obtained with the extinction ratio of 22 dB (polarizer length $L = 21.4$ mm). An aluminum coat was superior to a gold coat for low propagation loss and a high extinction ratio.

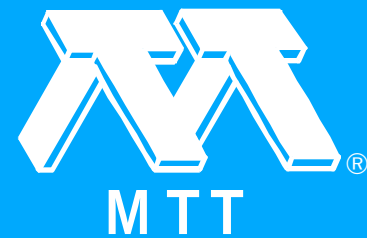


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Single-Mode Fiber Connector Using Core-Centered Ferrules

G.-D. Khoe and J.H.F.M. Van Leest. "Single-Mode Fiber Connector Using Core-Centered Ferrules." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1561-1568.

Fiber connectors using single-mode fibers have been fabricated with an average connection loss of 0.32 dB without index matching. All dimensions of the connector parts, including those of the ferrules and fibers require only low precision. A special lathe is used, in a simple operation, to eliminate the errors of the ferrule-terminated fiber assembly.



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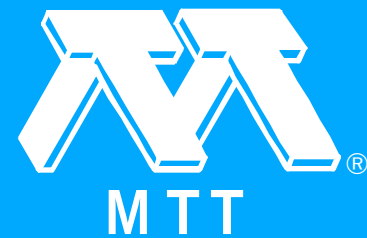


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The Nonlinear Coherent Coupler

S.M. Jensen. "The Nonlinear Coherent Coupler." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1568-1571.

This paper discusses the nonlinear coherent coupler (NLCC), a device useful for optical processing, but not bistable. This device utilizes the coherent interaction of two optical waveguides placed in close proximity. Because of the evanescent field overlap, these waveguides periodically exchange power. Nonlinear interactions modify the exchange of power and lead to strongly nonlinear transmission characteristics.



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Development of an Electrostatically Bonded Fiber Optic Connection Technique

M.B. Spitzer, P.R. Younger, F.C. Allard and L.D. Olin. "Development of an Electrostatically Bonded Fiber Optic Connection Technique." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1572-1576.

This paper describes the development and fabrication of prototype multichannel fiber optic connector subassemblies. The design is based on state-of-the-art fabrication techniques which use anisotropic silicon etching and electrostatic bonding. The advantages of these techniques, as well as the manner in which they are employed in a fabrication sequence, are discussed in detail. It is shown that accurate fiber positioning in a two-dimensional array can be achieved without stringent control of fiber diameter. Results of fabrication of prototypes are presented.

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Polarization Characteristics of Single-Mode Fiber Couplers

C.-L. Chen and W.K. Burns. "Polarization Characteristics of Single-Mode Fiber Couplers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1577-1588.

The polarization characteristics of fiber couplers made of birefringent single-mode fibers are studied. The effect of anisotropic interfiber coupling, fiber birefringence, angular misalignment of fibers, and twisting on the coupler characteristics are identified. The polarization characteristics of the couplers are compared with that of isolated uncoupled fibers of the same birefringence and length. The equivalent lumped element representations for three classes of fiber couplers are also presented.

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Abstracts

Analysis of Fiber Interferometer Utilizing 3 x 3 Fiber Coupler

R.G. Priest. "Analysis of Fiber Interferometer Utilizing 3 x 3 Fiber Coupler." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1589-1591.

An analysis of the properties of the 3 X 3 fiber coupler is made. The analysis reveals that four parameters are required to characterize the power transfer properties of this type of coupler. The performance of a fiber interferometer is analyzed in terms of these four parameters.



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2 x 2 Optical Waveguide Matrix Switch Using Nematic Liquid Crystal

M. Kobayashi, H. Terui, M. Kawachi and J. Noda. "2 x 2 Optical Waveguide Matrix Switch Using Nematic Liquid Crystal." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1591-1598.

A 2 X 2 nonblocking optical matrix switch, composed of four elemental switches formed in a slab waveguide, is described. Switching action is based on total internal reflection caused by an electrically controlled change in refractive index of the liquid crystal. Propagation loss was remarkably reduced to 2.3 dB/cm, both by using liquid crystal as a cladding layer and by operating at the 1.31 μm wavelength. The experimental matrix switch exhibited 7.3-7.7 dB insertion loss, -17.3 to -18.2 dB crosstalk, and a 14° switching angle.



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Guided Wave Approaches to Optical Bistability

G.I. Stegeman. "Guided Wave Approaches to Optical Bistability." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1598-1607.

We have analyzed four different guided wave approaches to achieving a power dependent refractive index and optical bistability. These include surface plasmons at the interface between a metal and a semiconductor, symmetric surface plasmon modes guided by thin metal films, conventional single film integrated optics waveguides, and multifilm integrated optics. The relative merits of each geometry are discussed for utilizing the large cubic nonlinearities in the semiconductors GaAs and InSb. Both the mode attenuation and the minimum power required for a nonlinear phase shift of $\pi/2$ are evaluated numerically and it is shown that usable propagation distances can be obtained, even for highly lossy media such as GaAs.

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Fiber Optic Measuring System for Electric Current by Using a Magneto optic Sensor

K. Kyuma, S. Tai, M. Nunoshita, T. Takioka and Y. Ida. "Fiber Optic Measuring System for Electric Current by Using a Magneto optic Sensor." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1607-1611.

A practical fiber optic measuring system for heavy electric current was developed by using the magneto optic (Faraday) material. In order to obtain better SNR and smaller temperature dependence, the most suitable combination of the light source and Faraday material was experimentally and theoretically determined. Consequently, it was emphasized that an LED and magnetic SF-6 flint glass gave the superiority of overall system capability over LD's and para- or ferro-magnetic. A novel type of fiber optic current sensor was constructed of the Faraday rotator of SF-6 flint glass with two thin-film polarizers. By using this sensor and a high radiance LED, high accuracy within ± 0.5 percent was obtained for magnetic field between 20 and 500 Oe, and at temperatures from -25°C up to 80°C .

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Fiber-Optic Fabry-Perot Interferometer and its Sensor Applications

T. Yoshino, K. Kurosawa, K. Itoh and T. Ose. "Fiber-Optic Fabry-Perot Interferometer and its Sensor Applications." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1612-1621.

Fiber-optic Fabry-Perot interferometers using monomode fibers are fabricated and their basic properties of finesse, polarization, and thermal response are studied. Fiber-optic Fabry-Perot interferometers are applied to the sensors of temperature, mechanical vibration, acoustic wave including human voice, ac voltage, and ac and dc magnetic fields. It has been demonstrated that a fiber-optic Fabry-Perot interferometer can simplify the interferometric fiber sensor system and that high measurement sensitivity can be obtained by using a high-finesse and/or long-distance fiber Fabry-Perot interferometer.

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Microbend Fiber-Optic Sensor as Extended Hydrophone

N. Lagakos, W.J. Trott, T.R. Hickman, J.H. Cole and J.A. Bucaro. "Microbend Fiber-Optic Sensor as Extended Hydrophone." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1621-1626.

A novel microbend fiber-optic acoustic sensor has been studied, both analytically and experimentally. The sensor is simple mechanically, insensitive to acceleration, and achieves shape flexibility by utilizing fairly long fiber lengths for the sensing element. The acoustic sensitivity and minimum detectable pressure of the sensor were found to be significantly improved over previously reported microbend sensors. Further optimization of the sensor appears possible.

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Passive Demodulation of Optical Interferometric Sensors

E.L. Green and P.G. Cable. "Passive Demodulation of Optical Interferometric Sensors." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1627-1632.

Two techniques for passive (no-feedback) demodulation of signals from a remote two-beam interferometric sensor are discussed. Termed "synthetic heterodyne" and "quadrature recombination," both methods are based on forced sinusoidal modulation of phase within the interferometer. If the phase modulation is generated by linearly proportional frequency modulation of the laser light source, then the interferometer, deployed by means of optical fibers, can be a completely passive remote sensor, and an array of identical sensors can be operated from one light source. The former technique, proposed by Cole, Denver, and Bucaro permits standard FM demodulation. The latter technique, proposed by Cable and Green, employs arithmetic operations that are appropriate to digital implementation. Constraints on application of the technique, especially frequency distribution and amplitude of phase noise (out-of-band) versus signal amplitude (in-band), are analyzed and an implementation is proposed that is consistent with contemporary analog-to-digital conversion technology.





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Polarization Fading in Fiber Interferometric Sensors

D.W. Stowe, D.R. Moore and R.G. Priest. "Polarization Fading in Fiber Interferometric Sensors." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1632-1635.

Mach-Zehnder interferometer sensors fabricated with conventional nonpolarization-preserving fibers are subject to polarization fading caused by temperature variations and minor positional changes in the sensor. For such sensors, we calculate the probability of a given decrease in sensitivity and in signal-to-noise ratio due to fading assuming the polarization of the light in the signal and reference legs is uncorrelated and drifts randomly. The resultant reduction of the signal-to-noise ratio may exceed 10 dB 10 percent of the time and exceed 20 dB more than 2 percent of the time.

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Homodyne Demodulation Scheme for Fiber Optic Sensors Using Phase Generated Carrier

A. Dandridge, A.B. Tveten and T.G. Giallorenzi. "Homodyne Demodulation Scheme for Fiber Optic Sensors Using Phase Generated Carrier." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1635-1641.

A method of homodyne demodulation using a phase generated carrier is described and experimentally demonstrated. The method has a large dynamic range, good linearity, and is capable of detecting phase shifts in the microradian range. The detection scheme obviates the phase tracker resetting problem encountered in active homodyne detection schemes. Two methods of producing the carrier are presented, one employing a piezoelectric stretcher, the other using current induced frequency modulation of the diode laser source. These two methods are compared. The origins of the noise limiting the system are briefly discussed.

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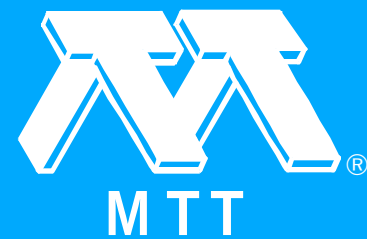


Abstracts

Recent Developments in Monolithic Integration of InGaAsP/InP Optoelectronic Devices

U. Koren, S. Margalit, T.R. Chen, K.L. Yu, A. Yariv, N. Bar-Chaim, K.Y. Lau and I. Ury.
"Recent Developments in Monolithic Integration of InGaAsP/InP Optoelectronic Devices." 1982
Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue
on Optical Guided Wave Technology)): 1641-1650.

Monolithically integrated optoelectronic circuits combine optical devices such as light sources (injection lasers and light emitting diodes) and optical detectors with solid-state semiconductor devices such as field effect transistors, bipolar transistors, and others on a single semiconductor crystal. Here we review some of the integrated circuits that have been realized and discuss the laser structures suited for integration with emphasis on the InGaAsP/InP material system. Some results of high frequency modulation and performance of integrated devices are discussed.



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Optical Phase Modulation in an Injection Locked AlGaAs Semiconductor Laser

S. Kobayashi and T. Kimura. "Optical Phase Modulation in an Injection Locked AlGaAs Semiconductor Laser." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1650-1657.

Optical phase modulation obtained by injecting coherent CW light into a directly frequency-modulated semiconductor laser is reported. Phase modulation at up to a 1 GHz modulation frequency has been obtained without compression for a 1.4 GHz half locking band-width. Phase deviation can be represented by the ratio of the original FM deviation to the locking half bandwidth. The phase deviation normalized by the frequency deviation is inversely proportional to the cutoff modulation frequency. A static phase shift of π took place with a 0.48 mA drive current change in the injection locked laser. Reduction in FM noise by means of CW light injection and FM noise accumulation in cascaded injection locked laser amplifiers are discussed, together with the optimum design for an injection locked repeater system.

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Suppression of Mode Partition Noise by Laser Diode Light Injection

K. Iwashita and K. Nakagawa. "Suppression of Mode Partition Noise by Laser Diode Light Injection." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1657-1662.

This paper describes the improvement in mode partition noise characteristics when a laser light is injected into a laser diode modulated at 400 Mbits/s. A single-mode fiber transmission experiment is carried out for the 1.5 μm region. A 20 km repeater spacing at 400 Mbit/s modulation is achieved by LD light injection. The center longitudinal mode power is increased to 94 percent of the total modes. Relative noise in the center longitudinal mode is improved 30 dB by optical injection of -18.2 dBm. However, the mode partition noise generated by noninjected modes is not completely suppressed. The relationship between the half-power width of the spectral envelope and signal-to-noise ratio (SNR) degradation is obtained at 20 km fiber length. If 3 dB excess SNR degradation is allowed for the mode partition noise, then the necessary half-power width of the spectral envelope is less than 0.6 nm.

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Abstracts

Relationship Between Carrier-Induced Index Change and Feedback Noise in Diode Lasers

D.M. Fye. "Relationship Between Carrier-Induced Index Change and Feedback Noise in Diode Lasers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1663-1666.

An improved theoretical analysis of single-mode diode laser dynamics reveals that feedback-induced intensity pulsations and frequency modulation are consequences of the carrier-dependent modal refractive index of the laser cavity. A stability criterion based on injection-locking theory indicates that gain-guided diode lasers are more likely to exhibit feedback-induced pulsations than are index-guided devices. Numerical simulation of feedback-induced noise is shown to be in excellent agreement with previously reported experimental data.



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Etched Mirror and Groove-Coupled GaInAsP/InP Laser Devices for Integrated Optics

L.A. Coldren, K. Furuya, B.I. Miller and J.A. Rentschler. "Etched Mirror and Groove-Coupled GaInAsP/InP Laser Devices for Integrated Optics." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1667-1676.

Recent advances in wet and dry etching techniques for GaInAsP/InP laser structures allow the reproducible fabrication of planar and vertical walled facets and grooves. These elements provide efficient mirrors and interstage couplers that may provide the basis for a new generation of monolithic integrated optical devices. Initial experimental results on etched facet lasers and groove-coupled two-section lasers verify theoretical expectations.

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Buried Convex Waveguide Structure (GaAl)As Injection Lasers

K. Shima, K. Hanamitsu and M. Takusagawa. "Buried Convex Waveguide Structure (GaAl)As Injection Lasers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1676-1683.

The fabrication technique, analysis of the waveguide property, lasing characteristics of buried convex waveguide structure (BCS) lasers are described. An improved BCS laser structure having a truncated convex active region was produced by using a novel selective etching technique. It was found that the truncated convex waveguide is very effective in suppressing higher order mode king when compared with a convex waveguide. The improved BCS lasers showed stable fundamental transverse mode lasing up to 20 mW/facet, typical threshold current of 20 mA, an external differential quantum efficiency of 28 percent/facet.



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Single Transverse Mode Condition of Lens-Like Strip Waveguide GaInAsP/InP Lasers

K. Moriki and K. Iga. "Single Transverse Mode Condition of Lens-Like Strip Waveguide GaInAsP/InP Lasers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1684-1691.

The theoretical analysis of the single transverse mode condition and lasing properties of a lens-like strip GaInAsP/InP laser is described. First, extended rate equations have been derived which include the carrier diffusion in the active layer and the carrier spread in the cladding layer and the dependency of the carrier lifetime on the current density. Next, it has been shown that the reasonably good assumption that the field of a lasing mode is determined by the built-in index waveguide is effective for simplifying to solve these equations. The result on lasing properties from the theory has been compared with experiments which were made on GaInAsP/InP $\lambda = 1.3 \mu\text{m}$ lens-like strip and terraced substrate lasers. In addition, the single transverse mode condition is discussed and criteria have been obtained.

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V-Grooved Substrate Buried Heterostructure InGaAsP/InP Laser Emitting at 1.3 μm Wavelength

H. Ishikawa, H. Imai, T. Tanahashi, K.-I. Hori and K. Takahei. "V-Grooved Substrate Buried Heterostructure InGaAsP/InP Laser Emitting at 1.3 μm Wavelength." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1692-1699.

Details of the fabrication, optimization of the dimensions of the active region, characteristics, and the aging results of the V-grooved substrate buried heterostructure (VSB) InGaAsP/InP laser are described. It is shown that the VSB laser can be fabricated in one-step epitaxy as well as two-step epitaxy. The active region width below 2.5 μm and the thickness of 0.15-0.2 μm are shown to give stable fundamental mode operation and good temperature characteristics. The fundamental mode operation up to the optical output of 20 mW/facet at 25°C and the CW operation above 100°C are obtained. The pulse response showed the strongly damped relaxation oscillation with a frequency as high as 4.5 GHz. The spectral width under the modulation of 400 Mbit/s RZ single is as narrow as 25 Å in full width at half maximum. Highly stable aging characteristics at an elevated temperature of 50°C are obtained in both two-step epitaxy lasers and one-step epitaxy lasers.





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Optical Feedback Effects Upon Laser Diode Oscillation Field Spectrum

F. Favre, D.L. Guen and J.C. Simon. "Optical Feedback Effects Upon Laser Diode Oscillation Field Spectrum." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1700-1705.

Optical feedback effects on spectral properties of a semiconductor laser diode coupled to a single-mode fiber cavity are investigated. Linewidth reduction from 6 MHz to less than 30 kHz and frequency stability improvement with increasing feedback are reported. Experiments are in good agreement with theory for short fiber cavities.

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High-Frequency Characteristics of GaAlAs Injection Lasers

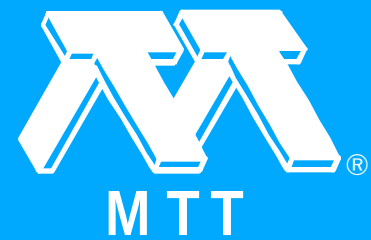
L. Figueroa, C.W. Slayman and H.-w. Yen. "High-Frequency Characteristics of GaAlAs Injection Lasers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1706-1715.

This paper discusses the results of an extensive experimental study of the high-frequency characteristics of several commercial (GaAl)As injection lasers. The lasers tested included the Hitachi buried heterostructure (BH), the Hitachi channel substrate planar (CSP), the Mitsubishi transverse junction stripe (TJS), the General Optronics stripe (GO), and the RCA constricted double heterostructure (CDH). We find that the maximum practical analog modulation frequency $f_{\text{sub o/}}$ is in the range of 5 GHz. This practical modulation frequency is limited by a combination of laser-relaxation resonance, laser parasitic, and drive current necessary for long-life operation. The relationship between laser-relaxation oscillation resonance frequency $f_{\text{sub o/}}$ and drive current can be expressed as $f_{\text{sub o/}} = K(I/I_{\text{sub th/}} - 1)^{1/2}$ GHz where I and $I_{\text{sub th/}}$ are the laser drive and threshold currents, respectively. The value of K is experimentally determined to lie in the range $3.0 < K < 5.3$ GHz for all the lasers studied. An equivalent circuit for the injection laser for frequencies in the range of 100 MHz-6 GHz has been experimentally determined. We find that the isolated injection laser can be modeled by the parallel combination of a resistance $R_{\text{sub j/}}$ and a capacitance $C_{\text{sub j/}}$. The product of $R_{\text{sub j/}}/C_{\text{sub j/}}$ has been experimentally determined for both the Hitachi CSP and BH laser and lies in the range of $1-1.1 \times 10^{10}$ s. The effect of laser mount and packaging can also be included in the equivalent circuit by the addition of series inductors and shunt capacitors. Lastly, all injection lasers studied displayed a dip in the small signal modulation response prior to the onset of the relaxation oscillation resonance. In particular, there is a pronounced dip even for lasers with good lateral carrier confinement at dc, such as the buried heterostructure (BH). Previous workers have attributed the dip in the modulation response as resulting from either lateral diffusion of injected carriers, or the effect of junction capacitance. Our experimental results indicate that while the effect of the junction capacitance may play some role in explaining the dip for the BH laser, it is not the dominant mechanism. We speculate that lasers with good lateral carrier confinement at dc (BH) may suffer a significant degradation of carrier confinement at gigahertz rates. A simple qualitative model is proposed to explain this



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mechanism and methods for reducing the effect are discussed.



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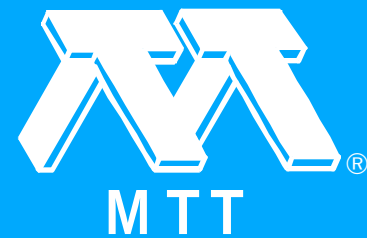


Abstracts

Intrinsic Pulsation in Stripe-Geometry DH Semiconductor Lasers

C.-Z. Guo and K.-G. Wang. "Intrinsic Pulsation in Stripe-Geometry DH Semiconductor Lasers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1716-1725.

The effects of lateral optical and carrier distributions and their interaction on dynamic processes in stripe-geometry DH semiconductor lasers are analyzed theoretically. The rate equations and field equations are rigorously solved simultaneously for numerical transient solutions. The calculated results show that, when the index waveguiding of the carrier distribution and the carrier diffusion become pronounced, in a certain range of injected current, the "intrinsic" pulsation, whose distinct feature is that the lateral optical beam width oscillates continuously and significantly during pulsation, may occur in the laser output.



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Correlation of Low-Frequency Intensity and Frequency Fluctuations in GaAlAs Lasers

A. Dandridge and H.F. Taylor. "Correlation of Low-Frequency Intensity and Frequency Fluctuations in GaAlAs Lasers." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1726-1738.

The intensity and frequency noise in single-mode GaAlAs lasers have been measured and the correlation between these instabilities investigated. The measurements were made over the range from 10 Hz to 25 kHz in CSP, TJS, and BH laser structures. It is found that the coherence function for frequency noise and intensity noise from one facet is near unity at the lasing threshold, decreases rapidly with decreasing current below threshold, and also decreases, but more slowly, as the current is increased above threshold. Qualitatively similar behavior is found for the correlation between intensity noise from the two laser facets. Junction voltage fluctuations are not correlated with the other types of noise, except when longitudinal mode hopping is occurring. A model in which both intensity and frequency noise are related to local current variations and optical backscattering in the diode active region is developed to explain the results.

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Observations and Theory of High-Power Butt Coupling to LiNbO₃-Type Waveguides

J.M. Hammer and C.C. Neil. "Observations and Theory of High-Power Butt Coupling to LiNbO₃-Type Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1739-1746.

We report the study and observation of high-efficiency (greater than 60 percent) and high-power (13 mW CW and 27 mW, 5 μ s 5 percent duty cycle pulse) butt coupling of diode lasers to indiffused LiNbO₃-type waveguides. We verified the predictions of the existing coupling theory at previously unreported power levels, and present a novel theoretical explanation of the effect of multiple reflections on laser output and waveguide coupling. The theory predicts our experimental observation that the amplitude of the periodic variation of laser output with laser-waveguide separation distance is a nonmonotonic function of laser drive current. Our measurements also lead us to infer that the onset of optical damage in Ti:LiNbO₃ occurs at a CW power density of 4×10^5 W/cm² in the 0.83 μ m wavelength region.

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Integrated Optical Switch Matrix for Single-Mode Fiber Networks

M. Kondo, Y. Ohta, M. Fujiwara and M. Sakaguchi. "Integrated Optical Switch Matrix for Single-Mode Fiber Networks." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1747-1753.

Design analysis and experiments on optical directional coupler switch integration into an LiNbO₃/sub 3/ chip with arrayed fiber pigtails has been made at 1.3 μ m wavelength. A limitation for high integration was discussed by taking into account radiation losses at connecting waveguides between switch elements and at the input/output curved waveguide, switching voltage, and crosstalk caused by applied electric field leakage. An optimum designed low-loss 4 X 4 switch matrix with arrayed fiber pigtails at 1.3 μ m wavelength has been developed. Its insertion loss was measured to be as low as 6 dB.

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Measurement and Analysis of Periodic Coupling in Silicon-Clad Planar Waveguides

G.M. Mc Wright, T.E. Batchman and M.S. Stanziano. "Measurement and Analysis of Periodic Coupling in Silicon-Clad Planar Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1753-1759.

Computer modeling studies indicate that planar dielectric waveguides clad with silicon exhibit a damped periodic oscillation in their attenuation and phase characteristics. The effect is due to a periodic coupling between the lossy, guided modes in the silicon film and the TE/sub 0/ mode of the dielectric waveguide. Experimental confirmation of the periodic coupling for a wavelength of 632.8 nm is presented. Propagation characteristics for a wavelength of 1150 nm were investigated for application in integrated optical modulators. Frequency filtering properties, of silicon-clad waveguides are also examined and it is shown that the silicon thickness controls the filter response curve.

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Polarization-Independent Optical Switch with Multiple Sections of Delta Beta Reversal and a Gaussian Taper Function

O.G. Ramer, C. Mohr and J. Pikulski. "Polarization-Independent Optical Switch with Multiple Sections of Delta Beta Reversal and a Gaussian Taper Function." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1760-1770.

Multiple section Delta Beta reversal polarization-independent integrated optic switches have been designed and demonstrated at a 0.83 μm wavelength. These switches use a Gaussian taper function to achieve low crosstalk in the parallel state. Calculated switch characteristics as related to an ideal Gaussian taper and approximations that can be fabricated by mask making are described. Experimental demonstration shows that these switches have useful switching characteristics with relatively high switching voltages.

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LiNbO₃/sub 3/ Waveguide Modulator with 1.2 μm Thick Electrodes Fabricated by Lift-Off Technique

P.-L. Liu. "LiNbO₃/sub 3/ Waveguide Modulator with 1.2 μm Thick Electrodes Fabricated by Lift-Off Technique." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1763-1770.

In order to make efficient high-frequency electrooptic modulators, the microwave loss in the electrodes has to be minimized. A lift-off technique using chlorobenzene to harden the top of AZ1350-J photoresist was adopted to fabricate 1.2 μm thick metal electrodes. A 1 cm long 15 μm wide strip electrode has a dc resistance of 11 Ω , which is substantially less than that of the 2000 $\text{\AA}$ thick electrodes routinely fabricated. A 1 cm long traveling-wave phase modulator consisting of a single waveguide was tested. The measured -3 dB bandwidth is 3.8 GHz.

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A Novel Deposit/Spin Waveguide Interconnection (DWSI) for Semiconductor Integrated Optics

K. Furuya, B.I. Miller, L.A. Coldren and R.E. Howard. "A Novel Deposit/Spin Waveguide Interconnection (DWSI) for Semiconductor Integrated Optics." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1771-1777.

We propose an efficient and simple optical interconnection between active semiconductor components by deposition and spin coating. Details of the waveguide design, the fabrication technique, and a promising material combination are given. Experimental results with an integrated laser-polyimide/SiO₂/sub x/ ($x \sim 2$) waveguide combination demonstrate low-threshold (2.0 kA/cm²) laser operation and a low-loss waveguide interconnection (81 percent coupling efficiency) on a GaInAsP/InP chip.

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3 × 2 Channel Waveguide Gyroscope Couplers: Theory

W.K. Burns and A.F. Milton. "3 × 2 Channel Waveguide Gyroscope Couplers: Theory." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1778-1784.

Gyroscope couplers with three input ports and two output ports which can be implemented in a planar geometry are studied theoretically. Using a local normal mode description in the approximation of coupled mode theory, analytic output power expressions are obtained for the 3 × 2 branching waveguide coupler and the 3 × 2 directional waveguide coupler. When optimized, these devices behave identically to each other and to the three-dimensional 3 × 3 coupler from which they are derived.

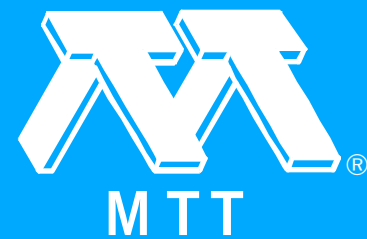


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Mode Size and Method for Estimating the Propagation Constant of Single-Mode Ti: LiNbO/sub 3/ Strip Waveguides

S.K. Korotky, W.J. Minford, L.L. Buhl, M.D. Divino and R.C. Alferness. "Mode Size and Method for Estimating the Propagation Constant of Single-Mode Ti: LiNbO/sub 3/ Strip Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1784-1789.

We have formulated a model to calculate the mode size and propagation constant of single-mode titanium-lithium niobate diffused strip waveguides directly from controllable fabrication parameters and basic constants. The model is compared to measurements of the lateral and vertical mode width of Ti:LiNbO/sub 3/ waveguides for a variety of diffusion conditions. We show that the model accurately predicts the geometrical mean mode size of the two-dimensional waveguide. The model provides a simplified method for estimating the mode size and propagation constant of the guide, and is useful in designing waveguide devices having low fiber/waveguide coupling and bending losses.



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Low-Loss Ti: LiNbO₃ Waveguide Bends at $\lambda = 1.3 \mu\text{m}$

W.J. Minford, S.K. Korotky and R.C. Alferness. "Low-Loss Ti: LiNbO₃ Waveguide Bends at $\lambda = 1.3 \mu\text{m}$." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1790-1794.

Low-loss waveguide bends are necessary for many proposed integrated optical circuits. The bend loss associated with an S-shaped transition connecting offset $6 \mu\text{m}$ wide titanium-indiffused lithium niobate strip waveguides has been measured as a function of transition length and initial Ti metal thickness for $1.3 \mu\text{m}$ wavelength. Losses as low as $0.2 \pm 0.2 \text{ dB}$ have been achieved for a transition between offset parallel waveguides with a 0.1 mm lateral and 3.25 mm longitudinal separation. The bend loss is shown to be strongly dependent on the mode confinement and less sensitive to the shape of the transition curve.

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Efficient Single-Mode Fiber to Titanium Diffused Lithium Niobate Waveguide Coupling for $\lambda = 1.32 \mu\text{m}$

R.C. Alferness, V.R. Ramaswamy, S.K. Korotky, M.D. Divino and L.L. Buhl. "Efficient Single-Mode Fiber to Titanium Diffused Lithium Niobate Waveguide Coupling for $\lambda = 1.32 \mu\text{m}$." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1795-1801.

We report detailed results on the achievement of very high optical throughput for titanium diffused lithium niobate waveguides coupled between input and output single-mode fibers. By determining appropriate diffusion parameters to obtain excellent dimensional match between the fiber and waveguide modes and simultaneously low propagation loss, we have achieved total measured fiber-waveguide-fiber insertion loss as low as 1 dB for a 1 cm long waveguide at $\lambda = 1.32 \mu\text{m}$. The relative contributions of coupling and propagation loss are determined. Very good correlation is found between the coupling loss and the match between the fiber and waveguide mode dimensions. Design data for diffusion parameters to obtain good mode match for arbitrary fiber dimension are presented.





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Analysis of Integrated-Optics Near 3 dB Coupler and Mach-Zehnder Interferometric Modulator Using Four-Port Scattering Matrix

R.H. Rediker and F.J. Leonbeger. "Analysis of Integrated-Optics Near 3 dB Coupler and Mach-Zehnder Interferometric Modulator Using Four-Port Scattering Matrix." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1801-1804.

The scattering matrix formalism for a lossless four-port device is used to describe the interferometric performance of the integrated optics near 3dB coupler and, consequently, the Mach-Zehnder interferometric modulator as a function of coupler and/or power imbalance. For the case of a coupler consisting of three single-mode dielectric guides forming a Y junction, a fourth port is incorporated which takes W the power radiated out of the guided-wave system in the vicinity of the junction. The interferometric properties of the coupler are shown to be relatively insensitive to fabrication and/or design errors of a magnitude which would make the use of this junction in the reverse direction as a 3 dB divider very marginal. A coupler with an extinction ratio as an interferometer better than -26 dB corresponds to a power divider which couples 22 percent more power into one arm than the other. It is also shown that the near 3 dB coupler used as the output of an interferometric modulator is similarly insensitive to the inequality of the powers in the two arms.

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Abstracts

Patent Abstracts (Oct. 1982 [T-MTT])

"Patent Abstracts (Oct. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1805-1807.



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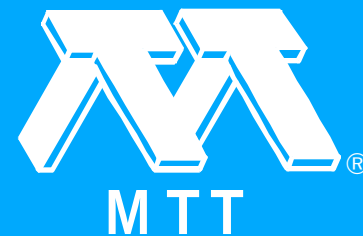
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"IEEE Conference Records (Advertisement) (Oct. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1808-1808.



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Back Cover (Oct. 1982 [T-MTT])

"Back Cover (Oct. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.10 (Oct. 1982 [T-MTT] (Special Issue on Optical Guided Wave Technology)): 1809-1810.



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Direct Modulation of Semiconductor Injection Lasers

P. Russer and G. Arnold. "Direct Modulation of Semiconductor Injection Lasers." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1809-1821.

Narrow stripe geometry double-heterostructure injection lasers for optical communication applications allow direct modulation up into the Gbit/s range. Modulation behavior and influence of modulation on the laser spectrum are discussed. The spectral and modulation properties of gain-guided and index-guided laser types differ significantly. Limitations arise from intensity fluctuations due to intrinsic quantum noise, dynamic instabilities, and reflected optical power, and also, in the case of analog modulation, from harmonic distortion. By coherent injection locking, single mode operation and strongly damped transient response can be achieved. Electronic circuits for Gbit/s direct modulation are discussed.

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An Exact Analysis of Group Velocity for Propagation Modes in Optical Fibers

K. Morishita, Y. Obata and N. Kumagai. "An Exact Analysis of Group Velocity for Propagation Modes in Optical Fibers." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1821-1826.

A method for calculating exactly the group velocity of propagation modes in optical fibers is proposed. In this analysis, optical fibers can contain uniaxial and dispersive media. The group velocity obtained by using the scalar approximate analysis is compared numerically with the rigorous group velocity computed by this method for square-law index optical fibers.

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Hollow Image Guide and Overlayed Image Guide Coupler

J.-F. Miao and T. Itoh. "Hollow Image Guide and Overlayed Image Guide Coupler." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1826-1831.

A dielectric waveguide structure, hollow image guide, is described. This structure has several interesting characteristics useful for millimeter-wave applications. Dispersion characteristics and field distributions are theoretically and experimentally studied. The structure can also be considered as two parallel image guides coupled strongly by a dielectric overlay. Coupling characteristics between two image guide arms are studied numerically and experimentally.

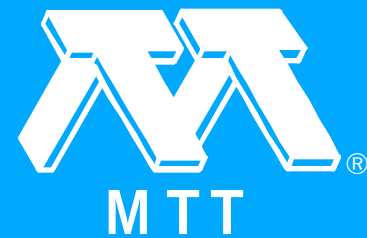


Abstracts

Biological Effects and Medical Applications of RF Electromagnetic Fields

O.P. Gandhi. "Biological Effects and Medical Applications of RF Electromagnetic Fields." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1831-1847.

The paper summarizes replicable biobehavioral effects including ocular and auditory effects and the low-level efflux of calcium ions from chick and cat cortex tissues exposed to sinusoidally modulated fields. Highlights of studies of long-term and ultra-long-term low-level exposures on rat behavior and blood and urine biochemistry are also given. The new ANSI C95 recommended safety standard and its rationale are presented, as are some of the present and potential medical applications including hyperthermia for cancer therapy. The paper concludes with identified gaps in knowledge where more research is needed.



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Human Whole-Body Radiofrequency Absorption Studies Using a TEM-Cell Exposure System

D.A. Hill. "Human Whole-Body Radiofrequency Absorption Studies Using a TEM-Cell Exposure System." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1847-1854.

A system has been constructed for measuring radiofrequency absorption in the human body resulting from exposure to high-frequency (HF) electromagnetic radiation. The exposure chamber is a 6.1 X 7.3 X 13.0-m rectangular-coaxial transverse-electromagnetic (TEM) cell. The absorbed power, determined from signal-averaged measurements of incident, reflected, and transmitted power, is measured to a precision of 0.06 percent of incident power (0.003 dB in insertion loss). A detailed analysis of systematic errors in the method has shown that a directional-coupler directivity approaching 50 dB is necessary for high accuracy in absorbed-power measurements and that any dielectric-loading effect of the subject on the cell absorption is undetectable. The total systematic error in determining absorption rate per unit exposure rate is about ± 35 percent of the measurement. Operating frequencies are currently limited to the 3 to 20-MHz range due to the occurrence of the first cell resonance, associated with the TE/sub 01/ mode, at 20.7 MHz. The first set of human whole-body absorption results is presented for three subjects exposed in free space to 11 $\mu\text{W}/\text{cm}^2$ at 18.5 MHz in six different body orientations with respect to the TEM wave. The measured absorption rates for the two principal E orientations are larger than the published predictions by a factor of 2 to 3.

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Abstracts

An Accurate, Unified Solution to Various Fin-Line Structures, of Phase Constant, Characteristic Impedance, and Attenuation

D. Mirshekar-Syahkal and J.B. Davies. "An Accurate, Unified Solution to Various Fin-Line Structures, of Phase Constant, Characteristic Impedance, and Attenuation." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1854-1861.

The analysis of several fin-line configurations (unilateral fin-line, bilateral fin-line, antipodal fin-line, and coupled fin-lines) has been completed accurately. In this unified method, propagation constant is achieved via the generalized spectral domain technique where the basis functions for the bounded and unbounded fields are chosen to be trigonometric functions and Legendre polynomials, respectively. The conduction loss and dielectric loss solution for the first time are found through a perturbation method. The conductor loss so derived is believed to be sufficiently accurate for practical purposes. Characteristic impedances of these transmission lines using tentative definitions have been presented. The CPU time on an IBM 360/65 for calculation of the mentioned parameters does not exceed five seconds if the fourth-order solution in the spectral analysis gives the required accuracy. The programs are also capable of detection of higher order modes.



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Theory and Design of a Ku-Band TE/sub 21/-Mode Coupler

Y.H. Choung, K.R. Goudey and L.G. Bryans. "Theory and Design of a Ku-Band TE/sub 21/-Mode Coupler." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1862-1866.

This paper describes a TE/sub 21/-mode tracking coupler for satellite earth stations communications antennas which require autotrack capability. The paper covers theoretical coupler designs as well as laboratory test results from Ku-band hardware.



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A New Type of Isolator for Millimeter-Wave Integrated Circuits Using a Nonreciprocal Traveling-Wave Resonator

M. Muraguchi, K. Araki and Y. Naito. "A New Type of Isolator for Millimeter-Wave Integrated Circuits Using a Nonreciprocal Traveling-Wave Resonator." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1867-1873.

A nonreciprocal traveling-wave resonator critically coupled to a waveguide becomes an isolator with high isolation. The dielectric image-line isolator with a magnetized ferrite pillbox as the nonreciprocal traveling-wave resonator is described. The validity of the theory is verified by experiments earned out at the 50-GHz range. The theoretical and experimental estimations of the coupling coefficient between a pillbox resonator and a straight dielectric waveguide are also included.



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Broadside, Edge-Coupled, Symmetric Strip Transmission Lines

S.K. Koul and B. Bhat. "Broadside, Edge-Coupled, Symmetric Strip Transmission Lines." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1874-1880.

This paper analyzes the propagation parameters of the general, shielded, broadside, edge-coupled, symmetric strip transmission line using the transverse transmission line method combined with the variational technique in the space domain. A simple approximation to the charge distribution on the conducting strip is assumed. Extensive design data on the characteristic impedances, effective dielectric constants are generated for a) broadside, edge-coupled, homogeneous striplines, b) broadside, edge-coupled, microstrip lines, c) broadside, edge-coupled, microstrip lines with inverted dielectric. The effect of the shielding side walls on the characteristic impedances is investigated. The results presented should find application in the design, fabrication of directional couplers, filters having complex electric responses.

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Capacitance of Coupled Circular Microstrip Disks

M. Takahashi and K. Hongo. "Capacitance of Coupled Circular Microstrip Disks." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1881-1888.

The coupling between circular disks placed on a grounded dielectric substrate is studied analytically and numerically. The problem is formulated exactly by applying the Kobayashi potential, which uses discontinuity properties of Weber-Schafheitlin integrals, as an electrostatic problem when the potentials on the disks are specified. Numerical results for charge distribution and gap capacitance are presented. The potential distribution on the disks is calculated numerically to check if it satisfies the specified boundary condition.



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Quasistatic Characteristics of Covered Coupled Microstrips on Anisotropic Substrates: Spectral and Variational Analysis

M. Horno. "Quasistatic Characteristics of Covered Coupled Microstrips on Anisotropic Substrates: Spectral and Variational Analysis." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1888-1892.

In this paper, expressions to compute the upper and lower bounds on true values of the even- and odd-mode capacitances of covered coupled microstrips over anisotropic substrates are obtained by using the Fourier transform and the variational approach. The method provides accurate calculation and yields the margins of error in the computation. Some examples are shown.

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Abstracts

Classes of Sub-Miniature Microwave Printed Circuit Filters with Arbitrary Passband and Stopband Widths

B.J. Minnis. "Classes of Sub-Miniature Microwave Printed Circuit Filters with Arbitrary Passband and Stopband Widths." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1893-1900.

Four new classes of microwave bandpass filters are defined herein. They are realized in triplate stripline and are exceedingly small devices as a result of using transmission line elements which are a quarter-wavelength well above the frequency of the passband. Each filter corresponds to a bandpass S-plane prototype which is derived using exact synthesis procedures from a specification of transmission zero locations. Passband and stopband widths may be independently specified and an extremely high degree of selectivity can be achieved when necessary. The slope of a filter skirt can be chosen to be such that 60 dB of attenuation is reached at a frequency < 3 percent from the corner of the passband.



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On Design and Performance of Lossy Match GaAs MESFET Amplifiers

K.B. Niclas. "On Design and Performance of Lossy Match GaAs MESFET Amplifiers." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1900-1907.

The noise figure, the gain, and the reflection coefficients of lossy match amplifiers and their dependence on circuit elements are studied. Theoretical results are supported by measured data taken on a two-stage unit. In addition, the performance characteristics of a 100-8800 MHz four-stage lossy match amplifier are discussed. The unit exhibits 23.3 ± 1.1 dB of gain over the nearly 6-1/2 octaves. Its maximum noise figure is 10.9 dB from 100-8800 MHz and 6.6 dB from 2000-8000 MHz. The amplifier's overall circuit dimensions are 10 X 5.7 mm..





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Weakly Coupled Dielectric Resonators

J. Van Bladel. "Weakly Coupled Dielectric Resonators." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1907-1914.

The resonant modes of a pair of coupled resonators of high ϵ_r are considered in the limit of large spacings D between resonators. Attention is focused on the lowest "magnetic-moment" mode, where the coupling effect leads to a split of the original mode into an even and an odd part. Formulas are obtained for the coupling coefficient, the resonant frequencies and Q of the modes. They are strikingly similar to those for weakly-coupled R-L-C circuits. The accuracy of the formulas is verified by comparing their predictions with direct numerical data, available for coupled circular cylindrical resonators.

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Improved Waveguide Diode Mount Circuit Model Using Post Equivalence Factor Analysis

R.G. Hicks and P.J. Khan. "Improved Waveguide Diode Mount Circuit Model Using Post Equivalence Factor Analysis." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1914-1920.

This paper presents an improved wide-band equivalent circuit for a diode mount consisting of a gapped cylindrical post in a rectangular waveguide. The empirical round post to flat strip equivalence factor used in an earlier study by Eisenhart and Khan is replaced by one which is calculated via an accurate analysis. Results indicating the dependence of this equivalence factor on post diameter, post position, and frequency are shown, allowing a more accurate interpretation from the Eisenhart and Khan analysis.

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11-GHz MIC QPSK Modulator for Regenerative Satellite Repeater

G. Ohm and M. Alberty. "11-GHz MIC QPSK Modulator for Regenerative Satellite Repeater." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1921-1926.

An 11-GHz MIC QPSK modulator for a 14/11-GHz, 120-Mbit/s regenerative satellite repeater is described. The modulator consists of cascaded 90° and 180° phase switches, realized with circulators and PIN diodes. The static and the dynamic behavior are presented. It is shown how the bit-error-rate performance is deteriorated by slow switching transients and timing errors.



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Broad-Band Bias-Current-Tuned IMPATT Oscillator for 100-200 GHz

E. Hagihara, M. Akaike and K. Yamamoto. "Broad-Band Bias-Current-Tuned IMPATT Oscillator for 100-200 GHz." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1927-1933.

Broad-band bias-current-tuned IMPATT oscillators rising harmonic oscillations have been realized for the short-millimeter wave-length region (100-300 GHz). The relationship between diode and wave-guide parameters (breakdown voltage, junction diameter, and waveguide cutoff frequency) to obtain broad-band tunable oscillations is investigated theoretically and experimentally. Consequently, a tuning bandwidth of 35 GHz is obtained with IMPATT oscillators in the 160-GHz band, and 30 GHz in the 200-GHz band.

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Broad-Band Characteristics of EHF IMPATT Diodes

L.H. Holway, Jr. and S.L. Chu. "Broad-Band Characteristics of EHF IMPATT Diodes." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1933-1939.

Measurements have been made of the oscillator characteristics when a GaAs EHF double-drift IMPATT diode designed for a frequency of 35 GHz is operated over an extended frequency range from 33-50 GHz. The diode which was designed for 35 GHz has a broad-band capability which allows it to produce 2.15 W at 44.1 GHz. An analytic model is shown to predict accurately the observed results. The model indicates that the upper limit in frequency can be increased by reducing the diode area or the series resistance as well as by reducing the length of the drift region.





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A Multiple-Device Cavity Oscillator Using Both Magnetic and Electric Coupling Mechanisms

M. Madihian, A. Materka and S. Mizushina. "A Multiple-Device Cavity Oscillator Using Both Magnetic and Electric Coupling Mechanisms." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1939-1944.

This paper presents a novel concept to increase the number of active devices combined in a cavity oscillator by coupling them to both electric and magnetic fields inside the cavity. The structure employs probes and coaxial lines for electric and magnetic coupling, respectively. The sum of the output powers from individual devices combined can be obtained by properly adjusting the coupling factors of the circuit. Operation principles of the circuit are analyzed for probe coupling, and results are applied to explain the operation of the circuit when both probe and coaxial coupling are used. The circuits described here are free from moding instabilities. Prototype circuits have been constructed at X-band, using Gunn diodes, for experimental confirmation of the theory developed.

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Thermally Induced Switching and Failure in p-i-n RF Control Diodes

R.J. Chaffin. "Thermally Induced Switching and Failure in p-i-n RF Control Diodes." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1944-1947.

This paper measures and analyzes a thermally induced, breakdown-like effect in p-i-n RF switching diodes. The effect is found to be due to thermally generated carriers increasing the I-region conductivity and loss. This is a positive feedback situation which, with increasing power levels, eventually causes the diode to switch to a low-impedance state. In the low-impedance state, further increases in temperature have a negative feedback effect on the absorbed power and hence this mode is stable with a very large hysteresis effect. Unfortunately, the high temperatures encountered in the low-impedance mode ($\sim 400^{\circ}\text{C}$) have a detrimental effect on diode reliability. The threshold power at which switching to this mode occurs can be increased somewhat by reverse biasing the diode or improving its heat sink.

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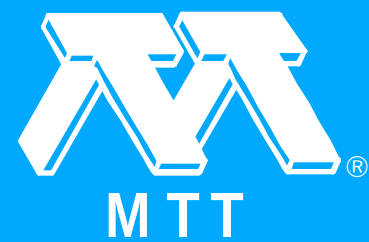
Wave Propagation in Inhomogeneous Slab Waveguides Embedded in Homogeneous Media

A. Yata and H. Ikuno. "Wave Propagation in Inhomogeneous Slab Waveguides Embedded in Homogeneous Media." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1947-1951.

Wave propagation in inhomogeneous slab waveguides embedded in homogeneous media is analyzed by rising the uniform asymptotic technique. This technique accurately evaluates the effect of the refractive-index profiles with various core and cladding structures on the guided modes. We calculate the guided modes of waveguides with asymmetric claddings in the cases of a near-parabolic profile core and a quasi-Gaussian profile core. The results show that the third-order asymptotic solution is accurate for all the guided modes in the case of the near-parabolic profile core and for modes far from cutoff in the quasi-Gaussian core case. The dispersion relation indicates that modes guided in strongly asymmetric profiles have almost the same propagation constants as odd-order modes of propagation in the symmetric structure.

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Analytical and Experimental Considerations on the Resonant Frequency and the Quality Factor of Dielectric Resonators

M. Tsuji, H. Shigesawa, H. Aoki and K. Takiyama. "Analytical and Experimental Considerations on the Resonant Frequency and the Quality Factor of Dielectric Resonators." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1952-1958.

A dielectric pillbox resonator placed on a dielectric substrate is analyzed by a new method, the approximate mode matching method, in which the cross section of such a resonator is subdivided into several sub-sections having a simple geometry of the boundaries, i.e., dielectric slab radial waveguides, and the continuity condition of fields between subsections is treated in the least-squares sense. The resonant frequencies and the intrinsic Q values due to the leakage loss through the dielectric substrate calculated by this method are presented together with experimental results obtained in the 50-GHz region. As a result, it is found that the experimental results for both the resonant frequencies and the Q values agree better with our calculated ones than with the results by other approximate method, and so it will be concluded that the analytical method presented here is almost enough to discuss precisely the resonant characteristics of a dielectric pillbox resonator.

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Uniform Asymptotic Technique for Analyzing Wave Propagation in Inhomogeneous Slab Waveguides

H. Ikuno and A. Yata. "Uniform Asymptotic Technique for Analyzing Wave Propagation in Inhomogeneous Slab Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1958-1963.

The guided modes of inhomogeneous dielectric slab waveguides are analyzed by a uniform asymptotic technique based on the related equation method. This technique gives highly accurate solutions in the sense of asymptotic expansion. The algorithm for calculating the guided modes of slab waveguides with an even polynomial refractive-index medium is presented. As an example, we calculate the third-order approximate solutions for the guided modes in an analytic form. The results show that the WKB solutions for higher order modes are more accurate than for the lower order modes and the correction to the WKB solutions is significant for the lower order modes. The numerical result for eigenvalues and modal fields confirms that the third-order asymptotic solution is accurate for all the guided modes of the near-parabolic profile waveguides and for higher order modes in the case of the quasi-Gaussian profile.

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A Finite Element Analysis of Planar Circulators Using Arbitrarily Shaped Resonators

R.W. Lyon and J. Helszajn. "A Finite Element Analysis of Planar Circulators Using Arbitrarily Shaped Resonators." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1964-1974.

A planar circulator consists, in general, of three transmission lines, connected through suitable matching networks to a magnetized ferrite resonator having three-fold symmetry. This paper describes a finite element analysis which enables the Z-matrix of a planar circulator using arbitrary shaped resonators to be calculated. This technique allows quite general computer programs to be written which permit tables of circulation solutions to be calculated. Results for junctions using disk, triangular, and irregular hexagonal resonators are included in the text. The frequency response of junction circulators using various configurations whose magnetic variables have been chosen so that they operate over the widely used tracking interval has also been evaluated. The optimum response is in each case associated with a unique coupling angle.

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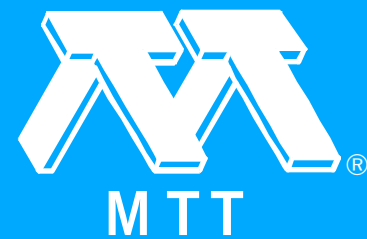


Abstracts

Finite Element Analysis of All Modes in Cavities with Circular Symmetry

J.B. Davies, F.A. Fernandez and G.Y. Philippou. "Finite Element Analysis of All Modes in Cavities with Circular Symmetry." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1975-1980.

A field analysis is presented of all modes in a hollow, conducting cavity with rotational symmetry about an axis. Cavities can be periodic along this axis, and the unit (or single) cell can be of arbitrary longitudinal section, with inhomogeneous dielectric loading. Modes of any angular dependence of arbitrary phase-shift per unit cell are analyzed. The finite element method is applied in the longitudinal plane, and uses a specially developed sparse matrix scheme.



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A Critical Study of the Coaxial Transmission Line Utilizing Conductors of Both Circular and Square Cross Section

W. Lin. "A Critical Study of the Coaxial Transmission Line Utilizing Conductors of Both Circular and Square Cross Section." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1981-1988.

By means of various conformal transformations we calculate the characteristic impedance of the coaxial line consisting of both square and circular cylinders. We also employ a complex potential function to match the boundary condition on one conductor completely and on either 12 points or 8 points on the other conductor to obtain exceptionally accurate results. Our present results are believed to be considerably better than our previous results quoted by Gunston.



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Theory and Application of Coupling Between Curved Transmission Lines

M. Abouzahra and L. Lewin. "Theory and Application of Coupling Between Curved Transmission Lines." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1988-1995.

An analytical method for deriving the fields, the reflection, and the directivity of two coupled curved transmission lines is described. The fields on both lines are found to be accurately in quadrature. The directivity and reflection are very small. The accuracy of the theoretical results for a 3 dB dielectric line coupler (designed at 94 GHz) is confirmed by experiment. Well-balanced outputs and a directivity of better than 40 dB are obtained. Though a substantial amount of insertion loss in the experimental model is found, this loss is believed to be largely dielectric loss. Design and performance data are presented.

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Abstracts

A Broad-Band Temperature-Controlled System for the Study of Cellular Bioeffects of Microwaves (Short Papers)

A. Riazi, D.W. Hill, M.J. Hagmann, O.P. Gandhi and J.A. D'Andrea. "A Broad-Band Temperature-Controlled System for the Study of Cellular Bioeffects of Microwaves (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1996-1998.

A system for the study of cellular bioeffects in the frequency range of 38 to 48 GHz and 65 to 75 GHz is described. High coupling efficiency (greater than 99 percent) provides a method for determining the energy absorption by the samples. An aqueous test medium was pumped through tapered waveguide sample holders. Temperature differences as low as $\pm 0.01^{\circ}\text{C}$ were measured using pairs of thermocouples. Compensatory electrical heating of the control sample holders was employed for reduction of temperature differences.



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Abstracts

Microwave Diffraction Tomography for Biomedical Applications (Short Papers)

J.C. Bolomey, A. Izadnegahdar, L. Jofre, C. Pichot, G. Peronnet and M. Solaimani.

"Microwave Diffraction Tomography for Biomedical Applications (Short Papers)." 1982

Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 1998-2000.

This short paper points out the realizability of a method suitable for quasi real-time coherent microwave tomography for biomedical applications.



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Abstracts

Numerical and Experimental Results for Near-Field Electromagnetic Absorption in Man (Short Papers)

I. Chatterjee, O.P. Gandhi and M.J. Hagmann. "Numerical and Experimental Results for Near-Field Electromagnetic Absorption in Man (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2000-2005.

Experimental results are presented for the whole-body-average energy absorption and the internal E-fields in man exposed to leakage-type near fields. An empirical relationship, previously presented.



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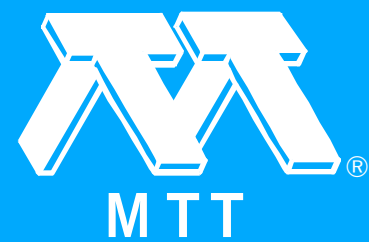
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Open-Ended Circular Waveguide with a Curved Corrugated Disk at its Aperture as a Diathermy Applicator (Short Papers)

P.S. Neelakantaswamy and A. Rajaratnam. "Open-Ended Circular Waveguide with a Curved Corrugated Disk at its Aperture as a Diathermy Applicator (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2005-2008.

A direct-contact type of diathermy applicator consisting of an open-ended circular waveguide loaded with a curved (concave) corrugated disk at its aperture is described. The waveguide is dimensioned to support the dominant TE/sub 11/ mode. Performance characteristics of this applicator are compared with those of an identical structure having a flat corrugated disk at the aperture rim. Also, the superiority of the proposed applicator in respect of improved beam symmetry and reduced edge-diffraction effect (leakage) is indicated. Experimental results on the near-field distributions in the principal planes of a test applicator are presented and are compared with relevant results obtained from a flat-disk loaded applicator of identical dimensions. Also, to get improved input VSWR performance (VSWR less than 1.6), off-setting the corrugated disk (flat or curved) behind the aperture is suggested and is also demonstrated experimentally. Furthermore, as a design flexibility and to simplify fabrication, filling the corrugation grooves with a suitable dielectric material is suggested and explained. Lastly, the feasibility of using a simple corrugated circular waveguide as an alternative direct-contact type of applicator is discussed.

Click on title for a complete paper.



Abstracts

Microwave Power Absorption in a Biological Specimen Inside a Standing-Wave Irradiation Waveguide (Short Papers)

O. Fujiwara and Y. Amemiya. "Microwave Power Absorption in a Biological Specimen Inside a Standing-Wave Irradiation Waveguide (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2008-2012.

An irradiation system consisting of a standing-wave in a waveguide is a convenient way to study biological effects of the individual components of the microwave fields. This paper describes microwave power absorption in a biological specimen exposed to standing waves inside the waveguide with a reflection plate. A method is presented to obtain the absorbed power distribution and total power absorption in a prolate spheroidal model of a specimen having small dimensions compared to the guide wavelength. Numerical results on the pupa of *Tenebrio molitor* are given, and also verified experimentally.



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Abstracts

Comparison of AM Noise from a Klystron and an IMPATT Oscillator at Around 90 GHz (Short Papers)

G.A. Ediss, N.J. Keen and P. Zimmerman. "Comparison of AM Noise from a Klystron and an IMPATT Oscillator at Around 90 GHz (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2012-2013.

This paper reports comparisons between the amplitude modulation noise performance of a Plessey IMPATT oscillator AT0273 and a Varian VRB-2113 klystron at millimeter wavelengths.



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Experimental Evaluation of a Ruby Maser at 43 GHz (Short Papers)

C.R. Moore and D. Neff. "Experimental Evaluation of a Ruby Maser at 43 GHz (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2013-2015.

The inversion ratio of pink ruby has been measured at several frequencies between 27 and 43 GHz for the push-puff pump angle of 54.7°. From these measurements a single-stage maser was designed which yielded 8 ± 1 -dB net gain and a 3-dB bandwidth of 180 MHz at a center frequency of 42.5 GHz. A multistage reflected wave maser could achieve bandwidths exceeding 1 GHz with 30-dB net gain at center frequencies near 40 GHz.





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Automatic Permittivity Measurements in a Wide Frequency Range: Application to Anisotropic Fluids (Short Papers)

J.P. Parneix, C. Legrand and S. Toutain. "Automatic Permittivity Measurements in a Wide Frequency Range: Application to Anisotropic Fluids (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2015-2017.

In this paper a new dielectric measurements method in the range 200 MHz-18 GHz is reported. The main features of the system are the following: a) automatic determination of the sample complex permittivities for each step of frequency previously chosen by using a numerical process; b) cells requiring only a very small sample volume (typically lower than .1 cm³); and c) cell structure allowing the dielectric characterization of anisotropic substances.

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Broad-Band GaAs Monolithic Amplifier Using Negative Feedback (Short Papers)

P.A. Terzian, D.B. Clark and R.W. Waugh. "Broad-Band GaAs Monolithic Amplifier Using Negative Feedback (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2017-2020.

A monolithic amplifier covering the 1-7-GHz frequency band has been fabricated using negative feedback. Small signal power gain of 6.0 dB $\pm$ 0.2 dB was achieved with maximum input and output VSWR of 2.3:1 and 1.7:1, respectively. Design considerations and processing techniques for active and passive elements are presented along with detailed performance data.

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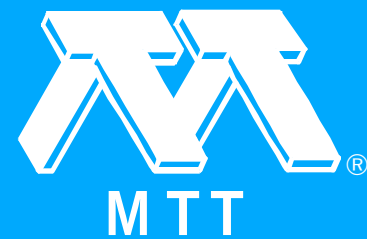


Abstracts

Slow Waves Guided by Parallel Plane Tape Guides (Short Papers)

H.J. Fink and J.R. Whinnery. "Slow Waves Guided by Parallel Plane Tape Guides (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2020-2023.

Waves guided by two parallel metallic plates of infinite extent, containing cuts at periodic intervals, are investigated for a number of cases with special emphasis upon the relative directions of the cuts in the top and bottom plates. Two fundamental slow-wave modes exist for all frequencies, in general. The latter are functions of tilt angles of the cuts, frequency, and plate separation. For tilt angles ψ in the top and $\pm \psi$ in the bottom plane, the amplitudes of the even and odd modes are independent of each other, while for other angles in the bottom plane a predetermined linear combination of even and odd terms exist for each mode.



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A Method to Generate Conservation Laws for Coupled Transmission Systems (Short Papers)

O. Schwelb. "A Method to Generate Conservation Laws for Coupled Transmission Systems (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2023-2026.

A systematic method is presented for generating a set of conservation laws for spatially distributed coupled linear systems. In contrast with previous practice, where energy balance equations were obtained by manipulating the fundamental equations of the interaction (the Maxwell equations or the equations of mechanics), or by determining the invariant quadratic forms of the motion, here the coupled systems equations are used as the point of departure. The results apply to lossy as well as to lossless devices. Illustrative examples examine the acoustic power flow in the surface acoustic-wave grating reflector and TE-TM-mode coupling in anisotropic dielectric waveguides.

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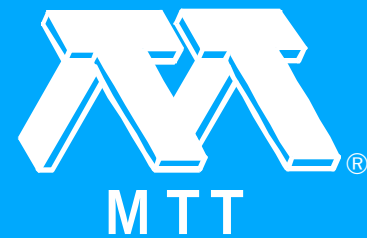


Abstracts

Equivalent Circuit of a Gap in the Central Conductor of a Coaxial Line (Short Papers)

S. Sen and P.K. Saha. "Equivalent Circuit of a Gap in the Central Conductor of a Coaxial Line (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2026-2029.

The equivalent circuit of a gap in the central conductor of a TEM coaxial line has been determined by the variational technique. Theoretically computed circuit parameters show excellent agreement with the experimental data available in the literature. The gap equivalent circuit has also been used to predict, within 2 percent, the experimentally measured tuning characteristic of a long cylindrical reentrant cavity resonator.



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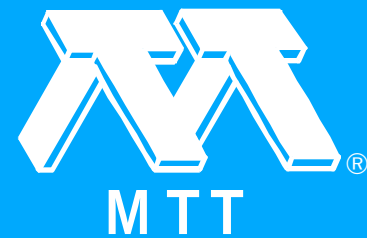


Abstracts

Analysis of Triangular Microstrip Resonators (Short Papers)

A.K. Sharma and B. Bhat. "Analysis of Triangular Microstrip Resonators (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2029-2031.

An isosceles triangular microstrip resonator is analyzed with the full wave formulation of the spectral domain technique. For a given apex angle and triangle height, the resonant frequency is evaluated from the numerical solution of the determinantal characteristic equation, obtained by neglecting the transverse current density. The agreement between the theoretical and experimental results is typically within ± 2 percent.



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Magnetostatic Wave Dispersive Delay Line (Short Papers)

P. Wahi and Z. Turski. "Magnetostatic Wave Dispersive Delay Line (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2031-2033.

The physical limits of the interdigital transducer (IDT) implementation for surface acoustic wave (SAW) devices beyond VHF/UHF have restricted their use in microwave systems. Inherent dispersion of magnetostatic wave (MSW) devices is suitable for signal processing directly at microwave frequencies. Dispersion enhancement tests performed on MSW delay lines confirm their suitability to an S-band simultaneous pulse separator for EW receiver applications.



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Nonresonant Semiconductor Phase Shifter (Short Papers)

G. Novick, H. Jacobs, C.M. Locasio and J. Londono. "Nonresonant Semiconductor Phase Shifter (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2034-2036.

Distributed p-i-n diodes were appended to the sidewalls of dielectric waveguides in order to produce phase shifters and line-scanning antennas since a change in conductivity of the bulk semiconductor material will change the wavelength in the dielectric guide. RF losses have been reported when the p-i-n modulators are used in this manner. One of the mechanisms of loss can be resonance absorption at specific frequencies. In order to eliminate resonant effects, the p-i-n diode modulator has been redesigned into small periodic segments where each modulator chip is much smaller than one half wavelength.

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An Expansion of the Terakado Solution with an Application (Short Papers)

H.J. Riblet. "An Expansion of the Terakado Solution with an Application (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2036-2039.

The capacitance of a concentric, symmetrical, rectangular coaxial line in which the outer conductor differs from the inner conductor by a factor of two is expanded to the eleventh power in $\exp[-\pi w/b]$. Here w is the width of the inner conductor and b is the height of the enter conductor. Approximate values obtained from this expansion agree with exact values within 0.06 percent for $w/b > .2$. This expansion permits the determination of the limiting value, as $w/b \rightarrow \infty$, of the error in an approximation for the characteristic impedance of those rectangular coaxial lines in which the thickness of the inner conduct is half the height of the outer conductor. It is then shown how this information can be used to improve the accuracy with which the characteristic impedance of rectangular coaxial lines may be approximated in the general case.

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Radiation Resistance in Radial Transducer (Short Papers)

E. Sawado. "Radiation Resistance in Radial Transducer (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2039-2040.

The purpose of the present paper is to give an intuitive explanation for the characteristics of radial wave and to demonstrate that this mode has no cutoff below the critical frequency $\omega = \gamma(BH)^{1/2}$, where ω is the angular frequency, $\gamma = 1.76 \times 10^{10} \text{ sec}^{-1} / (\text{oe sec})$ in CGS unit, $B = \mu_0(H + M)$ is the magnetic flux density, H the magnetic field, M the saturation magnetization. Ganguly and Webb, and others presented an initial theory and experiments for magnetostatic surface wave transducers. They obtained some of the useful results for resistance of a microstrip due to radiation. Previous investigations have calculated dispersion characteristics and characteristic impedance of composite microstrip slab structure. These investigations conclude that microstrip excitation of magnetostatic surface wave has proven particularly convenient, because of strong coupling from electromagnetic waves to magnetostatic waves. It is easy to see that the lowest operating frequency of the Ganguly type delay line is γH . Below this cutoff, no modes can exist. In view of the above, investigation of radial wave type delay line should produce useful developments in low frequency microwave (0.5 to 1.0 GHz) applications.

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Broad-Band Design of Improved Hybrid-Ring 3-dB Directional Couplers (Short Papers)

D.I. Kim and Y. Naito. "Broad-Band Design of Improved Hybrid-Ring 3-dB Directional Couplers (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2040-2046.

A broad-band design theory of an improved 3-dB hybrid-ring directional coupler is proposed and discussed. The synthesis of the improved broad-band hybrid-ring directional coupler starts by applying the concept of hypothetical port and generalizing the conventional hybrid-ring. The improved broad-band 3-dB hybrid-rings can be constructed very easily and their bandwidths are considerably wide, while the bandwidth of the reverse-phase hybrid-ring (one lambda ring) may be increased to approximately an octave, but it has not found wide acceptance because of its extreme difficulty of construction. The bandwidth of the improved broad-band 3-dB hybrid-ring directional coupler is 1.84 times as wide as the conventional rat race or hybrid-ring, extending from 0.747 to 1.253 in normalized frequency. Furthermore, the experimental verification has been achieved in microstrip network, and, hence, the validity of the design method proposed in this paper is confirmed. Although only the 3-dB hybrid-ring directional was considered here, the method itself is to be applicable to a hybrid-ring directional coupler with any degree of coupling.

Click on title for a complete paper.



Abstracts

New View on an Anisotropic Medium in a Moving Line Charge Problem (Short Papers)

M. Kobayashi. "New View on an Anisotropic Medium in a Moving Line Charge Problem (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2046-2049.

The electromagnetic field solution of the problem, in which the line charges move uniformly parallel or perpendicular to the interface of two different anisotropic media, is obtained by the method of moving images. The results are shown by representing the moving image line charges for such a problem. A new view on an anisotropic medium in such a problem is discussed by defining the equivalent metric factor and the equivalent normalized metric factor. The minimum principle shown in this short paper states that the electric flux emitted from the moving line charge chooses a trajectory that minimizes the equivalent effective length.



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Radial Line Transducer (Short Papers)

E. Sawado. "Radial Line Transducer (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2049-2050.

The purpose of this paper is to give a new excitation method of a radial-electromagnetic wave by a metallic cylinder with elliptical cross section. It was ascertained that the radial wave propagates in a medium of permeability of quantity $\mu_{\text{sub perp/}}$. The quantity $\mu_{\text{sub perp/}}$ is given by $\mu_{\text{sub perp/}} = (\mu^2 - \kappa^2)/\mu$, where μ and κ are the diagonal and nondiagonal components of the tensor permeability of a gyrotropic medium, respectively. The radial wave has interesting properties that this mode has not cutoff below the critical frequency $\omega = \gamma(BH)/\text{sup } 1/2/$, where ω is the angular frequency, $\gamma = 1.76 \times 10/\text{sup } 7/ ((\text{oe s})/\text{sup } -1/$ in CGS unit), $B = \mu_{\text{sub 0}}(H + M_{\text{sub s}})$, the magnetic flux density, H the magnetic field, and $M_{\text{sub s}}$ the saturation magnetization. Ganguly and Webb presented an initial theory and some experiments for a magnetostatic surface wave single bar transducer. These investigations have concluded that the lowest operating frequency of Ganguly-type delay line is $\gamma(BH)/\text{sup } 1/2/$. Below this cutoff, no surface modes can exist. In view of the above, investigation of a radial wave type delay line should produce developments in low frequency microwave (0.5 to 1.5 GHz) applications.



Abstracts

A Simple Formula for the Capacitance of a Disc on Dielectric on a Plane (Short Papers)

H.A. Wheeler. "A Simple Formula for the Capacitance of a Disc on Dielectric on a Plane (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2050-2054.

There is presented a simple explicit formula for the capacitance of a thin circular disc on a dielectric substrate on a plane (so-called "microstrip"). It gives continuous coverage of all shape ratios (r/h) and all dielectrics (k). The formula is developed by transition between asymptotic formulas for small and large discs, and by interpolation between bounding formulas for lo- k and hi- k . The presentation and development are facilitated by a reference formula which is the sum of the C is less than 0.004 for all conditions



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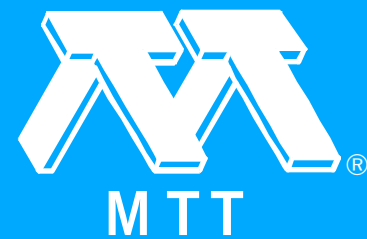


Abstracts

Frequency Dependent Characteristics of Microstrips on Anisotropic Substrates (Short Papers)

M. Kobayashi. "Frequency Dependent Characteristics of Microstrips on Anisotropic Substrates (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2054-2057.

Frequency dependent characteristics are discussed for the microstrip line on anisotropic substrate (original line) from the extension of the results obtained in an isotropic substrate case. In approximating the original line by the equivalent line on an isotropic substrate, it is best to maintain h and w of the equivalent line equal to those of the original line. The reason is that the inflection frequency $f_{\text{sub } i}$ is a function of w and h and that $f_{\text{sub } i}$ plays an important role in calculating the dispersion. Three approximate dispersion formulas are derived owing to this idea. The results obtained by these formulas are compared with the other available theoretical and experimental results for sapphire substrates. Good agreement is seen.



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Important Role of Inflection Frequency in the Dispersive Property of Microstrip Lines (Short Papers)

M. Kobayashi. "Important Role of Inflection Frequency in the Dispersive Property of Microstrip Lines (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2057-2059.

It is represented that the inflection frequency $f_{\text{sub } i/}$, has the important role in the dispersive property of microstrip lines. This $f_{\text{sub } i/}$ is related to the coupling between the TEM mode and the TM₀ mode. Using $f_{\text{sub } i/}$, an approximate dispersion formula is derived by improving Schneider's formula. The results obtained by the present formula are compared with the other available results; good agreement is seen.



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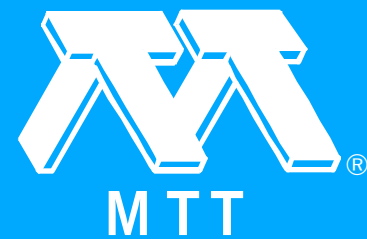


Abstracts

Scattering at Rectangular-to-Rectangular Waveguide Junctions (Short Papers)

R. Safavi-Naini and R.H. MacPhie. "Scattering at Rectangular-to-Rectangular Waveguide Junctions (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2060-2063.

This short paper presents formally exact solutions with convergent numerical results to the problems of scattering from a rectangular-to-rectangular waveguide junction and from a thick diaphragm with rectangular aperture in rectangular waveguide. The method uses normal mode expansions of the waveguide fields and the principle of conservation of complex power. A variety of configurations are considered and numerical convergence is confirmed by comparison with experiment.



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Effective Conductivity and Microwave Reflectivity of Thin Metallic Films (Short Papers)

R.C. Hansen and W.T. Pawlewicz. "Effective Conductivity and Microwave Reflectivity of Thin Metallic Films (Short Papers)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2064-2066.

Thin metallic films have reduced conductivity when thickness is not larger than electron mean free path, a phenomenon studied by Lord Thompson. Formulas given by Liao are valid for small thickness; a general formula is available for all ranges of film thickness. The result is in terms of an exponential integral which is easily computed, and is graphed. A simple and accurate formula for calculating microwave reflection from a thin metallic film is developed. The equivalent circuit has the film surface resistivity in shunt with 120 π (or the substrate impedance). Examples of surface resistivity and reflection coefficient for a gold film are given graphically.

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Abstracts

Unified Approach to Solve a Class of Strip and Microstrip-Like Transmission Lines (Corrections)

B. Bhat and S.K. Koul. "Unified Approach to Solve a Class of Strip and Microstrip-Like Transmission Lines (Corrections)." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2067-2067.

In the above referenced paper, the factor $P_{/n}$ is missing in (17 c).



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"Patent Abstracts (Nov. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2067-2071.



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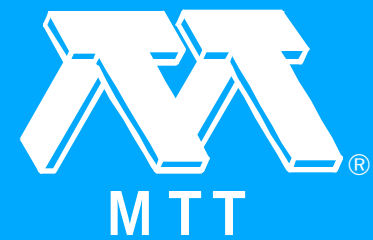
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Asian Abstracts (Nov. 1982 [T-MTT])

"Asian Abstracts (Nov. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2071-2077.



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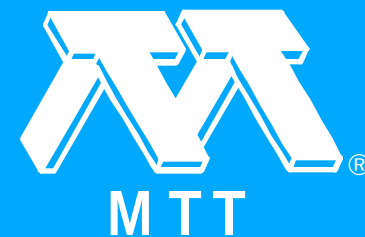
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IEEE Journal of Lightwave Technology (Announcement) (Nov. 1982 [T-MTT])

*"IEEE Journal of Lightwave Technology (Announcement) (Nov. 1982 [T-MTT])." 1982
Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2078-2078.*



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Call for Papers - Power and Low-Noise GaAs FET Circuits and Applications (Nov. 1982 [T-MTT])

"Call for Papers - Power and Low-Noise GaAs FET Circuits and Applications (Nov. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2079-2079.



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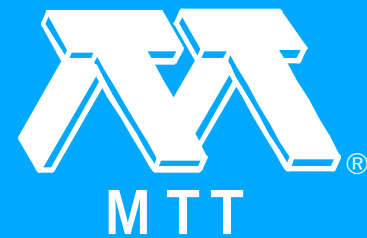
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Abstracts

Call for Papers - Electromagnetic Wave Interactions with Biological Systems (Nov. 1982 [T-MTT])

"Call for Papers - Electromagnetic Wave Interactions with Biological Systems (Nov. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): 2080-2080.



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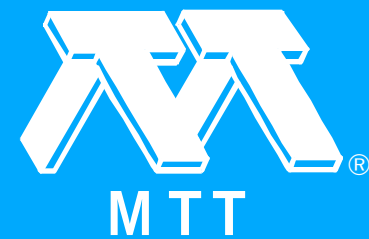
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"Back Cover (Nov. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.11 (Nov. 1982 [T-MTT]): b1-b2.



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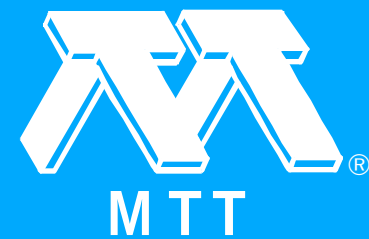
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"Front Cover (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): f1-f2.



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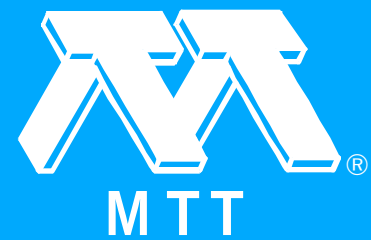
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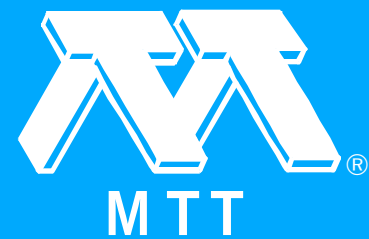
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Editors' Overview (Dec. 1982 [T-MTT])

J.K. Butler and S.L. March. "Editors' Overview (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2083-2084.

This issue includes a sampling of papers presented at the 1982 IEEE MTT-S International Microwave Symposium. These papers are expanded versions of the Symposium presentations, published to provide substantially more information than originally appeared in the Symposium Digest. In this issue we have provided a listing of all the papers presented at the Symposium by publishing the Table of Contents from the Symposium Digest. Also included are articles highlighting the 1982 International Microwave Symposium and recognizing the winners of the 1981 Microwave Theory and Techniques Society Awards.

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Abstracts

The 1982 MTT-S International Microwave Symposium (Dec. 1982 [T-MTT])

D.N. McQuiddy, Jr.. "The 1982 MTT-S International Microwave Symposium (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2085-2094.

The 1982 International Microwave Symposium, associated workshops, one day symposium on Microwave and Millimeter-Wave Monolithic Circuits, and exhibition were held at the Hyatt Regency Hotel, Dallas, TX, during the week of June 13 through June 19, 1982. As has been the case during the past few years, the symposium and related events were well attended. Officially, 1267 people registered for the symposium with an additional 51 people registering for the workshops only. The one day symposium on Microwave and Millimeter-Wave Monolithic Circuits drew 447 registrants, all but 30 of whom also registered for the International Microwave Symposium. Workshops registration was 257. Exhibitors and exhibits only registration totaled 2105. Including exhibitors, it was estimated that approximately 3300 Microwave people were at the Hyatt Regency during the week.



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1982 MTT-S Awards (Dec. 1982 [T-MTT])

"1982 MTT-S Awards (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2094-2099.



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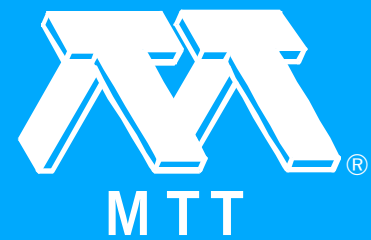
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Table of Contents, 1982 MTT Symposium Digest (Dec. 1982 [T-MTT])

"Table of Contents, 1982 MTT Symposium Digest (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2100-2112.



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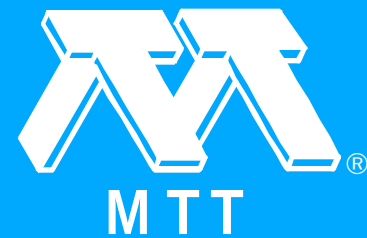


Abstracts

Numerical Analysis of Subharmonic Mixers Using Accurate and Approximate Models

R.G. Hicks and P.J. Khan. "Numerical Analysis of Subharmonic Mixers Using Accurate and Approximate Models." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2113-2120.

A full nonlinear numerical analysis technique is applied to subharmonically pumped mixer circuits where the two diodes are not identical. Results indicate that a slight imbalance in the diode parasitic parameters can significantly affect the mixer performance. A bilinear approximation of the Schottky-barrier diode characteristic is described, permitting accurate determination of the conversion loss peaks for millimeter-wave subharmonically pumped mixers. This approximation provides an analysis which requires significantly less computer time than a full nonlinear analysis.



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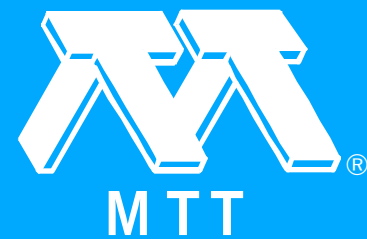


Abstracts

Aspects of the Calibration of a Single Six-Port Using a Load and Offset Reflection Standards (Dec. 1982 [T-MTT])

G.P. Riblet and E.R.B. Hansson. "Aspects of the Calibration of a Single Six-Port Using a Load and Offset Reflection Standards (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2120-2125.

In this contribution some aspects of the calibration of a single six-port using a load and offset reflection standards are discussed. The applicability of the methods developed is demonstrated by the successful calibration of several six-ports including one consisting of a directional coupler plus a symmetrical five-port junction.



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Efficient Eigenmode Analysis for Planar Transmission Lines

A.K. Saad and K. Schunemann. "Efficient Eigenmode Analysis for Planar Transmission Lines." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2125-2132.

A unified analysis for planar transmission lines is performed using the mode-matching technique. Exploiting the fact that the thickness of the metal coating (fins or strips) is normally very small in comparison to all other dimensions, the characteristic equations are formulated in a way which preserves the physical meaning of their individual terms. Thus, simplifications of far-reaching consequences can be introduced for all eigenmodes showing a cutoff frequency. It is shown in particular that the higher order modes can be derived approximately from the fundamental mode. Moreover, the dispersion relation of fin-lines can be given by a simple expression because the equivalent dielectric constant linearly depends on frequency. Both steps reduce the computer time by about two orders of magnitude in comparison to the spectral-domain method.

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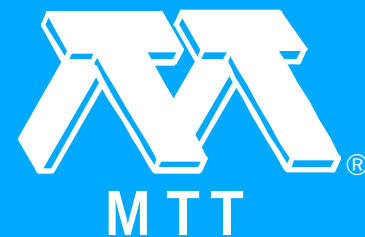


Abstracts

Hybrid Fin-Line Matching Structures

H. El Hennawy and K. Schunemann. "Hybrid Fin-Line Matching Structures." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2132-2139.

Two transitions between unilateral and bilateral fin-line mounted back to back show unique features for impedance transformation. The series reactance of the equivalent T-circuit are theoretically shown to be capacitive. This is exploited by designing a broad-band switch with two p-i-n diodes. Its isolation is about 20 dB throughout the Ku-band.



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Modal Solutions of Active Dielectric Waveguides by Approximate Methods

A. Linz and J.K. Butler. "Modal Solutions of Active Dielectric Waveguides by Approximate Methods." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2139-2145.

Approximate methods are used to obtain the modal properties of stripe-contact semiconductor injection lasers using a planar three-layer waveguide model. The central active layer has a dielectric constant that varies smoothly along the direction parallel to the heterojunction boundaries. The complex dielectric constant under the stripe contact is dependent on the gain and approaches a constant value at large lateral distances. The two methods are compared in terms of their modal propagation constants. An application of the effective index method facilitates a physical understanding of dielectric waveguide modes as well as providing an efficient calculation procedure.

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Bends in Nonradiative Dielectric Waveguides (Dec. 1982 [T-MTT])

T. Yoneyama, M. Yamaguchi and S. Nishida. "Bends in Nonradiative Dielectric Waveguides (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2146-2150.

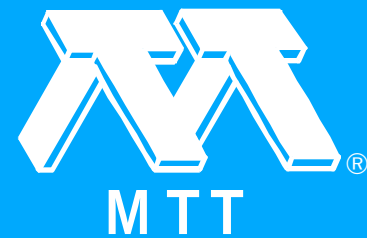
An experimental study was made of bends in the nonradiative dielectric waveguide (NRD-guide) at 50 GHz. The main cause of the bending losses was found to be due to the reflection at the transitions between the straight and curved waveguides rather than due to the radiation. The width of the dielectric strip was experimentally optimized in order to reduce the reflection, and a bend with a curvature radius as small as one guide wavelength could be realized. The experimental results are examined theoretically. The theory implies that the NRD-guide has a favorable tendency to suppress not only the radiation but also the reflection at the curved sections. It is also shown that the field maximum moves outwards or inwards from the mean path of the curved guide according to whether the dielectric strip is wider or narrower than a certain critical width. This critical width can be adopted as a design criterion for a low loss, very sharp NRD-guide bend.

Abstracts

Compensation of Discontinuities in Planar Transmission Lines (Dec. 1982 [T-MTT])

R. Chadha and K.C. Gupta. "Compensation of Discontinuities in Planar Transmission Lines (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2151-2156.

Compensation of discontinuity reactance associated with steps, right-angled bends, and T-junctions in planar transmission lines has been carried out by removing appropriate triangular portions from the discontinuity configurations. A two-dimensional analysis using a Green's functions approach has been employed.



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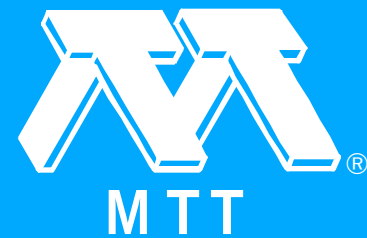


Abstracts

Millimeter-Wave Hybrid Coupled Reflection Amplifiers and Multiplexer

D. Rubin. "Millimeter-Wave Hybrid Coupled Reflection Amplifiers and Multiplexer." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2156-2162.

Multiple stage hybrid coupled reflection amplifiers and frequency multipliers are modeled using two-port analysis. A two-stage (4 diode) microstrip InP Gunn amplifier and a four-section suspended substrate multiplexer were fabricated in Ka band. Analysis shows that the performance of the hybrid coupled amplifier, both for packaged diodes and pure negative resistance (ideal monolithic) devices, is extremely sensitive to input and output VSWR's.



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Abstracts

Analysis of Trapped Image Guides Using Effective Dielectric Constant and Surface Impedances

W.-B. Zhou and T. Itoh. "Analysis of Trapped Image Guides Using Effective Dielectric Constant and Surface Impedances." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2163-2166.

A method has been introduced to accurately predict dispersion characteristics of the trapped image guide. Numerical results agreed much better with experimental results than those previously calculated by a simple effective dielectric constant (EDC) approach especially at the low frequency end.



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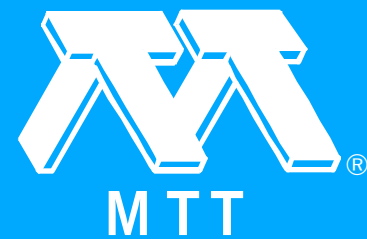


Abstracts

An Optimization Technique for Lumped-Distributed Two Ports

K.W. Iobst and K.A. Zaki. "An Optimization Technique for Lumped-Distributed Two Ports." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2167-2171.

A frequency domain direct efficient analysis and an optimization technique of a large class of lumped-distributed networks containing active elements are presented. Sensitivity and Hessian matrix calculations are performed using truncated Taylor series expansion of two-port parameters of subnetworks. An interactive computer program was developed to demonstrate the application of the method. Examples of network optimization are included to illustrate the powerfulness of the technique.



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Monolithic Voltage Controlled Oscillator for X- and Ku-Bands (Dec. 1982 [T-MTT])

B.N. Scott and G.E. Brehm. "Monolithic Voltage Controlled Oscillator for X- and Ku-Bands (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2172-2177.

A GaAs voltage controlled oscillator circuit that tones from 11.15 to 14.39 GHz and 16 to 18.74 GHz has been designed and fabricated. The 1.1 mm x 1.2-mm chip includes two varactors, a 300- μ m FET, bypass capacitors, tuning inductors, and isolation resistors. Wide-band circuit design techniques will be described. Varactor and circuit effects causing the noncontinuous bandwidth will be discussed showing the capability of continuous 11 to 18 GHz tuning using a single GaAs chip.



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An RF-Primed All-Halogen Gas Plasma Microwave High-Power Receiver Protector

H. Goldie and S. Patel. "An RF-Primed All-Halogen Gas Plasma Microwave High-Power Receiver Protector." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2177-2184.

A new type of keepalive for gaseous hybrid waveguide receiver protectors is shown to provide reliable and reproducible power limiting. The design allows halogen gases to be used in place of conventional gasfills, resulting in extremely fast recovery periods independent of duty cycle over a wide range. Recovery periods less than 100 ns were measured at incident power levels of 200-W peak at X-band frequencies using duty cycles up to 0.5.

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Wide-Band Subharmonically Pumped W-Band Mixer in Single-Ridge Fin-Line

P.J. Meier, J.A. Calviello and P.R. Bie. "Wide-Band Subharmonically Pumped W-Band Mixer in Single-Ridge Fin-Line." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2184-2189.

A subharmonic mixer is described that has an instantaneous bandwidth of 11 to 14 GHz centered near 95 GHz. A wide bandwidth is achieved by the close integration of a low-capacitance diode mount, printed circuit matching elements, and simple yet effective filters which are uniquely suited to realization in a single-ridge fin-line. The mixer also has a two-terminal shunt mount that will accept two conventional beam-lead diodes or a single dual-junction device. With the latter, a minimum conversion loss of 8.5 dB has been achieved with a drive level of only 4 dBm at 45 GHz.

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Closed-Form Expressions for the Parameters of Finned and Ridged Waveguides

W.J.R. Hoefer and M.N. Burton. "Closed-Form Expressions for the Parameters of Finned and Ridged Waveguides." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2190-2194.

Novel closed-form expressions for the cutoff frequency and the characteristic impedance of finned and ridged waveguides are presented. Agreement with previously published numerical data is better than one percent for all parameters of practical interest. The expressions considerably facilitate computer aided design and tolerance analysis of ridged waveguide structures without compromise in accuracy.

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A Compact Broad-Band Multifunction ECM MIC Module

E.C. Niehenke, R.D. Hess, J.S. Rosen, L.E. Dickens and J.A. Faulkner, Jr.. "A Compact Broad-Band Multifunction ECM MIC Module." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2194-2200.

A development effort is described that yielded a compact broad-band ECM module using soft and hard substrate material employing microstrip, slotline, and coplanar line. Integrated functions include coupling, limiting, upconversion, downconversion, broad-band amplification, amplitude modulation, switching, gating, and stable frequency generation. A high-level frequency converter with a + 28-dBm intercept point resulted in high dynamic range, spurious-free operation (-45 dBc). Extremely flat amplification with low-current drain is achieved with distributed and cascode FET amplifiers at S - C and X-bands.

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A Monolithic Single-Chip X-Band Four-Bit Phase Shifter

Y. Ayasli, A. Platzker, J. Vorhaus and L.D. Reynolds, Jr.. "A Monolithic Single-Chip X-Band Four-Bit Phase Shifter." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2201-2206.

X-band GaAs monolithic passive phase shifter with 22.5°, 45°, 90°, and 180° phase bits are developed using FET switches. By cascading all four bits, a four-bit digital phase shifter with 5.1±0.6-dB insertion loss is realized on a single 6.4 x 7.9 x 0.1-mm chip.

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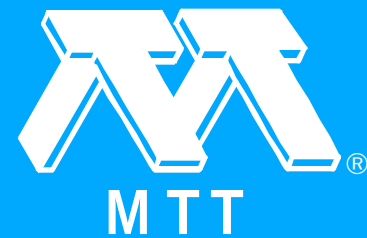


Abstracts

X-Band Burnout Characteristics of GaAs MESFET's (Dec. 1982 [T-MTT])

J.J. Whalen, R.T. Kemerley and E. Rastefano. "X-Band Burnout Characteristics of GaAs MESFET's (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2206-2211.

X-band μ s pulse, ms pulse, and CW-burnout data have been measured for two commercially available 1- μ m gate GaAs MESFET's. Values of incident pulse power required to cause burnout indicate a threshold level for pulse durations 0.2 μ s or longer and for CW. The incident power threshold level for burnout is in the range 3 to 6 W for the MESFET type with a Ti/Pt/Au gate metallization and in the range 1.5 to 3 W for the MESFET type with an Al gate metallization. Many MESFET's were observed to fail during a single pulse.



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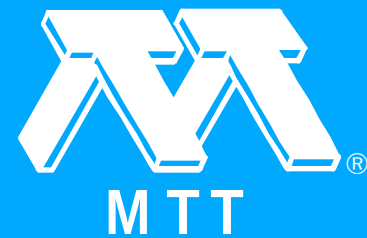


Abstracts

A Network Modeling and Design Method for a 2-18-Ghz Feedback Amplifier (Dec. 1982 [T-MTT])

A.M. Pavio, Jr.. "A Network Modeling and Design Method for a 2-18-Ghz Feedback Amplifier (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2212-2216.

An accurate network theory and modeling method, including feedback loop circuit parasitic and device limitations, is presented for the design of broad-band microwave feedback amplifiers. Discussed are circuit realization and measured performance in relation to VSWR, gain flatness, and stability of a 2-18-GHz three-stage amplifier.



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A Simplified "Real Frequency" Technique Applied to Broad-Band Multistage Microwave Amplifiers

B.S. Yarman and H.J. Carlin. "A Simplified "Real Frequency" Technique Applied to Broad-Band Multistage Microwave Amplifiers." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2216-2222.

A computer-aided design (CAD) procedure, which is a new and simplified "real frequency" technique, is introduced for treating the broad-band matching of an arbitrary load to a complex generator. The method can be applied to the design of interstage equalizers for microwave amplifiers. It utilizes the measured data obtained from the generator and the load networks. Neither an a priori choice of an equalizer topology, nor an analytic form of the system transfer function, is assumed. The optimization process of the design procedure is carried out directly in terms of a physically realizable, unit normalized reflection coefficient which describes the equalizer alone. Based on the load-generator matching technique, a sequential procedure to design multistage microwave amplifiers is presented. An example is given for a three-stage, FET amplifier proceeding directly from the measured scattering parameters of the FET devices. The example is in three parts and illustrates the sequential method; that is, first a single-stage, then a two-stage, and finally the three-stage system is computed.



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"Patent Abstracts (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2223-2227.



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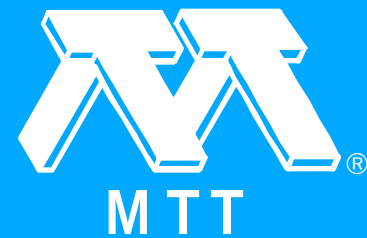
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Abstracts

Call for Papers - Power and Low-Noise GaAs FET Circuits and Applications (Dec. 1982 [T-MTT])

"Call for Papers - Power and Low-Noise GaAs FET Circuits and Applications (Dec. 1982 [T-MTT])." 1982 Transactions on Microwave Theory and Techniques 30.12 (Dec. 1982 [T-MTT] (1982 Symposium Issue)): 2228-2228.



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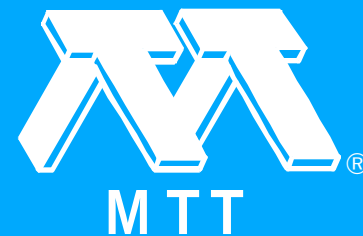
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*"Index, IEEE Transactions on Microwave Theory and Techniques, Volume MTT-30, 1982."
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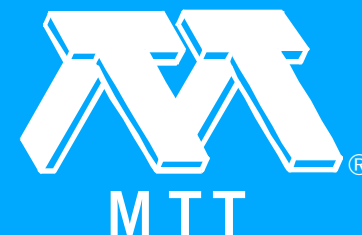
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Front Cover (Jan. 1983 [T-MTT])

"Front Cover (Jan. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): f1-f2.



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Foreword (Jan. 1983 [T-MTT])

V.G. Gelnovatch. "Foreword (Jan. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 1-1.

It has been my pleasure over the last year to be intensively involved with the birth of a new technical event: the annual Microwave and Millimeter-Wave Monolithic Circuits Symposium to be held in conjunction with the IEEE MTT-S International Microwave Symposium. To even the most casual observer it has been obvious that monolithic microwave and millimeter-wave circuits are a quantum leap in the state of the art and whose impact will truly be profound in the technical sense. To date representation and reporting of the art has been fragmentary in that isolated papers imbedded in unrelated work have been the norm. The ground swell of late has been to feature entire technical sessions and/or evening panel sessions. Obviously, a symposium aimed at the practitioner was the next evolutionary step.

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Design, Fabrication, and Evaluation of 2 and 3-Bit GaAs MESFET Analog-to-Digital Converter IC's

L.C. Upadhyayula, W.R. Curtice and R. Smith. "Design, Fabrication, and Evaluation of 2 and 3-Bit GaAs MESFET Analog-to-Digital Converter IC's." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 2-10.

The analog-to-digital converter (A/D) is a critical component of a signal processing system. GHz-rate A/D's will be required in many future systems. While Si bipolar based A/D's can easily meet 4-6-bit resolution requirements, excessive power dissipation (1 W per bit) limits their operation to 100-400-MHz sampling rates. Recently, GaAs MES-FET's have demonstrated high frequency operation with relatively low power dissipation. This paper describes the design of 2- and 3-bit A/D's using GaAs MESFET's. Monolithic integrated A/D circuits were fabricated and successfully operated at gigahertz sampling rates. This sampling rate is the highest reported for any A/D technology at room temperature. The power dissipation is 150-200 mW per bit. With further improvements in comparator sensitivity, the design can be extended to 4-bit A/D for GHz rate operation.





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Ka-Band Monolithic GaAs Balanced Mixers (Jan. 1983 [T-MTT])

C. Chao, A. Contolatis, S.A. Jamison and P.E. Bauhahn. "Ka-Band Monolithic GaAs Balanced Mixers (Jan. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 11-15.

Monolithic integrated circuits have been developed on semi-insulating GaAs substrates for millimeter-wave balanced mixers. The GaAs chip is used as a suspended stripline in a cross-bar mixer circuit. A double sideband noise figure of 4.5 dB has been achieved with a monolithic GaAs balanced mixer filter chip over a 30- to 32-GHz frequency range. A monolithic GaAs balanced mixer chip has also been optimized and combined with a hybrid MIC IF preamplifier in a planar package with significant improvement in RF bandwidth and reduction in chip size. A double sideband noise figure of less than 6 dB has been achieved over a 31- to 39-GHz frequency range with a GaAs chip size of only 0.5x0.43 in. This includes the contribution of a 1.5-dB noise figure due to if preamplifier (5-500 MHz).

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Yield Considerations for Ion-Implanted GaAs MMIC's (Jan. 1983 [T-MTT])

A. Gupta, W.C. Petersen and D.R. Decker. "Yield Considerations for Ion-Implanted GaAs MMIC's (Jan. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 16-20.

An ion-implantation based process is described for fabricating GaAs monolithic microwave integrated circuits (MMIC's) incorporating active devices, RF circuitry, and bypass capacitors. Low ohmic contact resistance and good control of metal-insulator-metal (MIM) capacitance values is demonstrated and some factors affecting FET and capacitor yield are discussed. High dc yield of typical amplifier circuits is shown indicating that this process has the potential for achieving very high overall yields in a production environment. Good yield of functional MMIC modules with multicircuit complexity is projected.

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A Two-Stage Monolithic IF Amplifier Utilizing a Ta/sub 2/O/sub 5/ Capacitor

A. Chu, L.J. Mahoney, M.E. Elta, W.E. Courtney, M.C. Finn, W.J. Piacentini and J.P. Donnelly. "A Two-Stage Monolithic IF Amplifier Utilizing a Ta/sub 2/O/sub 5/ Capacitor." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 21-26.

A two-stage monolithic IF amplifier incorporating a sputtered Ta/sub 2/O/sub 5/ capacitor has been fabricated. The monolithic capacitor is based on a composite layer structure consisting of Au, Ta, Ta/sub 2/O/sub 5/, Ta, and Au. This layered structure is sequentially deposited in a single sputtering run, which eliminates particulate contamination. As a result, a thin pinhole-free dielectric layer can be deposited over large areas, and 140-pF capacitors have been fabricated with excellent yields. The large unit area capacitance of 1500 pF/mm² available with the present process has the potential for reducing the size of matching and bias circuits in microwave monolithic circuits and hybrid thin-film circuits. The monolithic amplifiers exhibit a gain of 17.5 ± 1.0 dB from 1.2 to 2.6 GHz and a minimum noise figure of ~2.7 dB, with an associated gain of 17.5 dB at 1.7 GHz.

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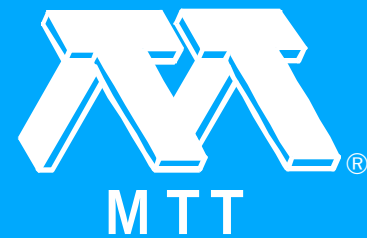


Abstracts

A Monolithic GaAs DC to 2-GHz Feedback Amplifier (Short Papers)

W.C. Petersen, A. Gupta and D.R. Decker. "A Monolithic GaAs DC to 2-GHz Feedback Amplifier (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 27-29.

Resistive feedback in low-frequency FET amplifiers is an attractive method of simultaneously attaining gain flatness and excellent input-output VSWR over wide bandwidths. Combined with simple matching circuitry, the feedback approach allows the design of general-purpose utility amplifiers requiring much less chip area than when conventional matching techniques are used. The 1.5- by 1.5-mm chip described in this paper provides 10-dB $\pm$ 1-dB gain, excellent input and output VSWR, and saturated output power in excess of +20 dBm, from below 5 MHz to 2 GHz. The noise figure is approximately 2 dB when biased for minimum noise, with an associated gain of 9 dB.



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Monolithic GaAs Interdigitated Couplers (Short Papers)

M. Kumar, S.N. Subbarao, R.J. Menna and H.-C. Huang. "Monolithic GaAs Interdigitated Couplers (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 29-32.

This paper describes the design, fabrication, and performance of two monolithic GaAs C-band 90° interdigitated couplers with 50- and 25- Ω impedances, respectively. A comparison of the performance of these two couplers shows that the 25- Ω coupler has the advantages of lower loss and higher fabrication yield. The balanced amplifier configuration using 25- Ω couplers will require a fewer number of elements in the input-output matching circuit of the FET amplifier. The fewer number of matching elements results in great savings in the GaAs real estate for microwave monolithic integrated circuits (MMIC's). Both the couplers have been fabricated on a 0.1-mm-thick GaAs S1 substrate. The measured results agree quite well with calculated results. The losses of the 50- and 25- Ω couplers are 0.5 and 0.3 dB, respectively, over the 4-8-GHz frequency band.

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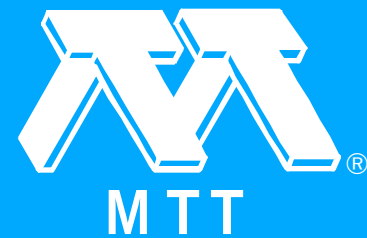


Abstracts

Editorial (Jan. 1983 [T-MTT])

R.H. Knerr. "Editorial (Jan. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 33-33.

As the outgoing Editor of this Transactions I look back at three interesting years. I ask myself what has been accomplished for the MTT-S membership and the authors. Since there is very little feedback from the readers I like to think that, at least based on the number of papers rejected, only about 25 percent of the authors who have submitted papers to me are dissatisfied with my performance. Over these three years a total of 588 papers plus 10 special issues have been published.



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Coupling Coefficient Between Microstrip Line and Dielectric Resonator

Y. Komatsu and Y. Murakami. "Coupling Coefficient Between Microstrip Line and Dielectric Resonator." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 34-40.

A formula of the coupling coefficient between a dielectric resonator and a microstrip line is derived from an analysis of the transmission characteristics of the microstrip line coupled to the dielectric resonator. A practical method of calculation is developed using Fourier analysis. The calculated values show good agreement with the experimental values.

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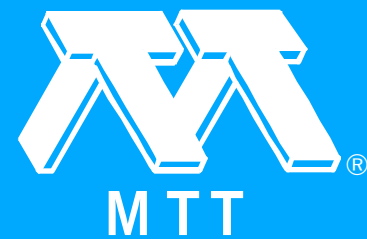


Abstracts

A Low-Pass Prototype Network Allowing the Placing of Integrated Poles at Real Frequencies

D.S.G. Chambers and J.D. Rhodes. "A Low-Pass Prototype Network Allowing the Placing of Integrated Poles at Real Frequencies." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 40-45.

This paper details a procedure by which a number of attenuation poles can be placed at differing frequencies, giving an asymmetric or symmetrical response, the only restriction being that the network must be physically symmetrical. If a number of poles are placed on one side of the passband, this technique can be used to greatly increase the selectivity of a filter on this side, while maintaining an equiripple passband response. There are four possible arrangements for these filters. They can have even or odd degree with an even or odd number of integrated poles. Only three of these are realizable in a symmetrical network and these possibilities are dealt with individually. An example is given in the case of an odd-degree filter with an odd number of integrated poles placed at two frequencies on opposite sides of the passband.



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Electronically Cold Microwave Artificial Resistors

R.L. Forward and T.C. Cisco. "Electronically Cold Microwave Artificial Resistors." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 45-50.

A large percentage of microwave field-effect transistors (FET's) are shown to act as a broad-band artificial resistor with a resistance of about 25 Ω when their drain is connected to their gate. The resistance appears between the gate-drain lead and the source lead. This resistance can be raised to 50 Ω with its reactive components eliminated over a reasonable bandwidth by using a matching transmission line of the proper impedance and a length near a quarter-wave at midband. An HFET- 1000 constructed in this configuration showed an impedance of $18 \pm 3 \Omega$ over an octave bandwidth, and when transformed with a 30- Ω quarter-wave transmission line produced a resistance of $51 \pm 1 \Omega$ from 8 to 13 GHz. A noise analysis shows that, at some frequencies, some FET's in this configuration will produce artificial resistors with an effective noise temperature as low as 67 K.





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Improving the Power-Added Efficiency of FET Amplifiers Operating with Varying-Envelope Signals

A.A.M. Saleh and D.C. Cox. "Improving the Power-Added Efficiency of FET Amplifiers Operating with Varying-Envelope Signals." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 51-56.

A technique is proposed for improving the power-added efficiency of linear, class-A FET power amplifiers operating with varying-envelope signals. It involves dynamically controlling the gate "dc" bias voltage with the envelope of the input RF signal. It is shown theoretically that this technique, which is referred to as "class A," results in a significant improvement in the power-added efficiency over standard class A, independently of the FET power gain. The efficiency is also better than that of standard class B if the FET gain is less than about 10 dB, which is the case normally encountered at higher microwave frequencies. The practical implementation of class A requires FET's with essentially linear drain-current-versus-gate-voltage transfer characteristics.

Click on title for a complete paper.



Abstracts

Design of Interdigitated Capacitors and Their Application to Gallium Arsenide Monolithic Filters

R. Esfandiari, D.W. Maki and M. Siracusa. "Design of Interdigitated Capacitors and Their Application to Gallium Arsenide Monolithic Filters." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 57-64.

Theoretical expressions for the interelectrode capacitance and conductor losses for an array of microstrip transmission lines are presented. The effect of finite conductor thickness is included in the analysis by introducing equations for the effective width of the transmission lines. Good agreement between theory and experiment is observed up to 18 GHz. Experimental results obtained from a lumped-element GaAs monolithic bandpass filter are in excellent agreement with theory. The filter has 1.5-dB insertion loss at 11.95 GHz and greater than 22-dB loss in the stopband. The filter measures 0.58x 1.3x0.203 mm.



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Optimized Waveguide E-Plane Metal Insert Filters for Millimeter-Wave Applications

R. Vahldieck, J. Bornemann, F. Arndt and D. Grauerholz. "Optimized Waveguide E-Plane Metal Insert Filters for Millimeter-Wave Applications." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 65-69.

A design theory is described for rectangular waveguide metal insert filters that includes both higher order mode interaction and finite thickness of the inserts. Optimized design data for three- to five-resonator type filters with several insert thicknesses suitable for metal stamping and etching techniques are given for midband frequencies of about 15, 33, 63, and 75 GHz. Measured passband insertion losses of prototypes for mid-band frequencies of 15, 33, and 76 GHz are 0.2, 0.6, and 0.7 dB, respectively.

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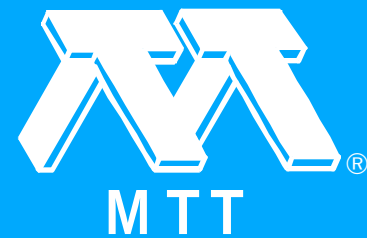


Abstracts

Capabilities of Multiapplicator Systems for Focussed Hyperthermia (Short Papers)

R. Knoechel. "Capabilities of Multiapplicator Systems for Focussed Hyperthermia (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 70-73.

Features of the randomly phased scheme and the constructive interference approach for focussed applicator systems are evaluated and compared from a practical point of view. A mathematical expression is given to estimate the depth location of a focal point that depends on the number of array elements. Constraints are indicated that limit the physical construction of such arrays and allow their application only for special purposes.



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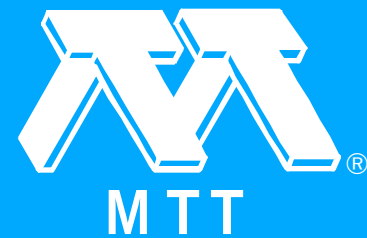


Abstracts

Field Theory of Planar Helix Traveling-Wave Tube (Short Papers)

D. Chadha, S. Aditya and R.K. Arora. "Field Theory of Planar Helix Traveling-Wave Tube (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 73-76.

A pair of unidirectionally conducting screens, conducting in different directions, constitute a planar helix. The planar helix is proposed as a slow-wave structure for application in a traveling-wave tube (TWT). Field theory is applied to analyze the behavior of the planar helix in the presence of a flat electron beams present between the two screens. Results indicate the presence of three modes, with one mode having a negative attenuation constant, as in the case of the usual helix-type TWT. Curves are shown for a typical proposed planar TWT. Also, the effect of beam current is indicated.



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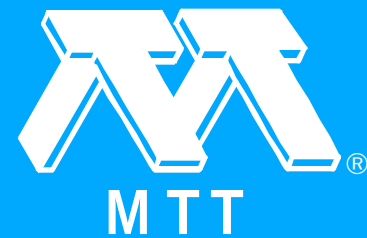


Abstracts

Choosing Line Lengths for Calibrating Network Analyzers (Short Papers)

C.A. Hoer. "Choosing Line Lengths for Calibrating Network Analyzers (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 76-78.

Equations, examples, and a table are given to help choose the best length for a precision transmission line which is used in some methods for calibrating a network analyzer. One line will cover a frequency range of about 10:1. Two lines will cover a range of about 65:1.



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Abstracts

Optical Injection Locking of BARITT Oscillators (Short Papers)

R. Heidemann and D. Jager. "Optical Injection Locking of BARITT Oscillators (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 78-79.

Optical injection locking of BARITT oscillators is investigated. Preliminary experimental results are presented for the first time. A simple first-order locking theory gives reasonable agreement with measurements.



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Abstracts

A Rigorous Technique for Measuring the Scattering Matrix of a Multiport Device with a Two-Port Network Analyzer (Comments)

H. Dropkin. "A Rigorous Technique for Measuring the Scattering Matrix of a Multiport Device with a Two-Port Network Analyzer (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 79-81.

The recent article by Tippet and Speciale uses the matrix formulation of the generalized scattering parameter renormalization transformation in the form.



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The Exact Noise Figure of Amplifiers with Parallel Feedback and Lossy Matching Circuit (Comments)

J. Engberg. "The Exact Noise Figure of Amplifiers with Parallel Feedback and Lossy Matching Circuit (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 81-81.

I found the short paper of K. B. Niclas "The Exact Noise Figure of Amplifiers with Parallel Feedback and Lossy Matching Circuits" very interesting, but, except for the approximated formulas, it contained only little new information, since my paper "Simultaneous Input Power Match and Noise Optimization using Feedback" included most of the formulas. In that paper, I have developed a general form of noise parameters of a three-port with combinations of parallel and series feedback (or imbedding) elements. These formulas include both the formula of Niclas and of Iversen. The formulas have been used in the lossless case to develop an amplifier with simultaneous noise and power input match.

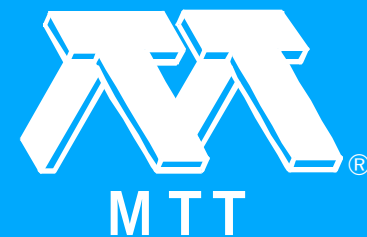
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Abstracts

Patent Abstracts (Jan. 1983 [T-MTT])

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Call for Papers - Electromagnetic Wave Interactions with Biological Systems (Jan. 1983 [T-MTT])

"Call for Papers - Electromagnetic Wave Interactions with Biological Systems (Jan. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.1 (Jan. 1983 [T-MTT] (Joint Special Issue on Monolithic Microwave IC's)): 86-86.



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Back Cover (Jan. 1983 [T-MTT])

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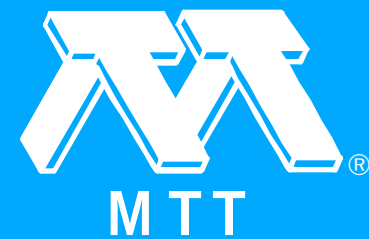
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Abstracts

Front Cover (Feb. 1983 [T-MTT])

"Front Cover (Feb. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): f1-f2.



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Foreword (Feb. 1983 [T-MTT])

V.G. Gelnovatch and H. Jacobs. "Foreword (Feb. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 89-90.

The millimeter wave community has had a roller coaster career over the last thirty years. The reasons are varied and have been adequately documented in great detail in the literature. The results have, however, been traumatic in that great efforts have been started, promises made, and finally, deliveries not met, followed by a drought in support till the next resurgence. Happily, this condition has changed since the early 1970's to a monotonically increasing support and interest, driven primarily by military requirements (see and fight on an obscured battlefield) and a still small but rapidly growing industrial/academia requirement. A barometer of this fact has been the increased publication rate, including special issues in this Journal plus the emergence of various specialist conferences. Today we stand on a threshold in the art, i.e., we must soon start delivering on our promises: Some other subtle issues also arise, specifically the question of industrial base. Picture, if you will, the hypothetical situation in which industry grows exponentially in the near future. Will there be an adequate industrial support base? Additionally, will second sources be available for system contractors? Obviously, the objective of this Special Issue is to present the latest efforts in the millimeter art, the previous comments being offered only as food for thought.

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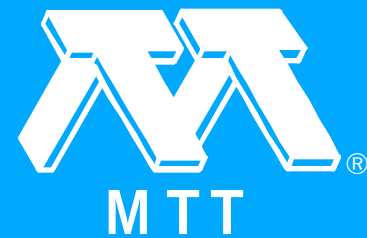


Abstracts

Millimeter-Wave Power-Combining Techniques

K. Chang and C. Sun. "Millimeter-Wave Power-Combining Techniques." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 91-107.

This paper summarizes different power-combining techniques and their performance, with particular emphasis on millimeter-wave developments. The tradeoffs of these techniques are discussed and future trends predicted.



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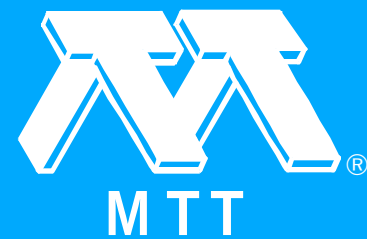


Abstracts

The Status of Printed Millimeter-Wave E-Plane Circuits

K. Solbach. "The Status of Printed Millimeter-Wave E-Plane Circuits." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 107-121.

The present state of the printed E-plane circuit technology for millimeter-wave integrated circuits is reviewed and trends for the future development in this field are discussed. the general transmission-line properties, types of waveguide housing, discontinuity, and filter problems are discussed in detail. Several circuit components for frequencies between 20 and 170 GHz, such as p-i-n diode attenuators and switches, mixers and detectors, couplers, oscillators, and nonreciprocal devices are examined. Integrated circuit components and subsystems which use these circuits as functional blocks are presented.



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Abstracts

50-GHz IC Components Using Alumina Substrates

Y. Tokumitsu, M. Ishizaki, M. Iwakuni and T. Saito. "50-GHz IC Components Using Alumina Substrates." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 121-128.

This paper discusses the feasibility of employing alumina substrates instead of fused quartz or sapphire substrates in millimeter-wave integrated circuits (IC's), an attractive prospect since alumina boasts considerable advantages over either of the other materials. Millimeter-wave 50-GHz components were developed on alumina substrates. These included passive components, a mixer, an ASK modulator, and an oscillator. Empirical results for both oscillator stabilization using a dielectric resonator and a new application of a GaAs FET in a millimeter-wave oscillator-doubler are presented. Examples of integrated systems using millimeter-wave IC'S are also presented. These systems include a compact Doppler radar front-end for an automobile ground-speed sensor, and a transmitter/receiver for digital radio equipment. All of them are fabricated on alumina substrates.



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Design of Dielectric Ridge Waveguides for Millimeter-Wave Integrated Circuits

T. Wang and S.E. Schwarz. "Design of Dielectric Ridge Waveguides for Millimeter-Wave Integrated Circuits." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 128-134.

All-dielectric ridge waveguides may be useful as elements of millimeter- and submillimeter-wave integrated circuits; A planar metallic V-coupler can be used to couple energy between the guide and small circuit elements such as diodes. Desirable characteristics in such a guide/coupler system are a) quasi-single mode propagation; b) low radiation loss in bendy c) low coupling loss between guide and devices and d) adequate physical strength. In this paper, we discuss the general problem of designing guides and couplers to obtain the desired characteristics. The principal method used is simulation in the range 2-7 GHz. We find that with good compromise designs, typical coupling loss between waveguide and a small device is about 1.4 dB, exclusive of dielectric loss and ohmic loss in the coupler.

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Abstracts

Computer-Aided Design of Millimeter-Wave E-Plane Filters (Feb. 1983 [T-MTT])

Y.-C. Shih, T. Itoh and L.Q. Bui. "Computer-Aided Design of Millimeter-Wave E-Plane Filters (Feb. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 135-142.

A computer-aided design (CAD) algorithm has been developed for a class of E-plane bandpass filters. The analysis portion of the algorithm is based on the residue-calculus technique and a generalized scattering parameter method. It is mathematically exact and numerically very efficient. Filters designed with this method have been fabricated and tested in Ku-band. Good agreement with design has been obtained.



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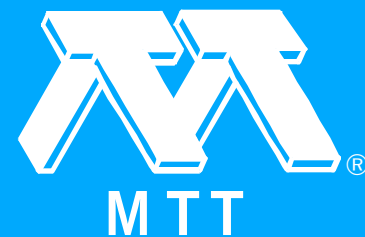


Abstracts

Integrated Fin-Line Components and Subsystems at 60 and 94 GHz

W. Menzel and H. Callsen. "Integrated Fin-Line Components and Subsystems at 60 and 94 GHz." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 142-146.

This paper describes fin-line receiver components for the frequency ranges around 60 and 94 GHz. In detail, the design and performance of balanced mixers, p-i-n-diode attenuators, and p-i-n-diode double throw switches will be presented. Next, the integration of such components (partly together with fin-line Gunn oscillators) will be demonstrated, showing a number of advantages concerning size, weight, losses, cost, and ruggedness.



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Abstracts

V-Band Low-Noise Integrated Circuit Receiver

K. Chang, K. Louie, A.J. Grote, R.S. Tahim, M.J. Mlinar, G.M. Hayashibara and C. Sun. "V-Band Low-Noise Integrated Circuit Receiver." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 146-154.

A compact low-noise V-band integrated circuit receiver has been developed for space communication systems. The receiver accepts an RF input of 60-63 GHz and generates an IF output of 3-6 GHz. A Gunn oscillator at 57 GHz is phase-locked to a low-frequency reference source to achieve high stability and low FM noise. The receiver has an overall single sideband noise figure of less than 10.5 dB and an RF to IF gain of 40 dB over a 3-GHz RF bandwidth. All RF circuits are fabricated in integrated circuits on a Duroid substrate.



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Subharmonic Planar Doped Barrier Mixer Conversion Loss Characteristics

S. Dixon, Jr. and R.J. Malik. "Subharmonic Planar Doped Barrier Mixer Conversion Loss Characteristics." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 155-158.

Planar doped barrier (PDB) diodes have been successfully used in a subharmonically pumped coplanar-stripline mixer circuit. A comparison is made in the conversion loss of the symmetric and asymmetric PDB diodes. A dramatic decrease in conversion loss is obtained when the PDB diode I-V curve is perfectly symmetric. A minimum conversion loss in the order of 5.0 dB is obtained at a signal frequency of 2.0 GHz.

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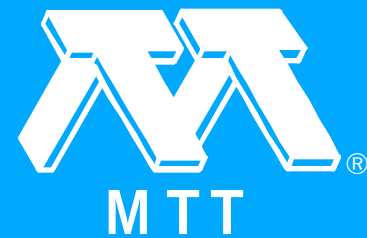


Abstracts

Diode Detector Characteristics for a 94-GHz Six-Port Application (Feb. 1983 [T-MTT])

R.A. Fong-Tom and H.M. Cronson. "Diode Detector Characteristics for a 94-GHz Six-Port Application (Feb. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 158-164.

The suitability of commercially available diodes as power detectors in a 94-GHz six-port is examined. Square law response, noise, variation of reflection coefficient with power, and temperature effects are studied. The results show that silicon Schottky diodes are the best available.



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A Quasi-Optical Polarization-Duplexed Balanced Mixer for Millimeter-Wave Applications

K.D. Stephan, N. Camilleri and T. Itoh. "A Quasi-Optical Polarization-Duplexed Balanced Mixer for Millimeter-Wave Applications." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 164-170.

An integrated planar antenna-mixer structure for use at millimeterwave frequencies is described. A simple but accurate theory of the slot-ring antenna is applied to several experimental devices. Mixer conversion loss of about 6.5 dB was obtained from an X-band model. Measured radiation patterns of structures designed for 65 GHz agree reasonably well with theory.

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Injection Locking Performance of a 41-GHz 10-W Power Combining Amplifier

D.W. Mooney and F.J. Bayuk. "Injection Locking Performance of a 41-GHz 10-W Power Combining Amplifier." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 171-177.

Due to the ever growing and tremendous demand for satellite communications channels, and the resultant spectrum crowding, there is an increasing interest in developing hardware appropriate for communication satellite use in the EHF frequency spectrum. Even with the advent of the space shuttle, reliability is still of paramount importance for hardware intended for satellite applications. While the traveling-wave tube (TWT) is presently the industry workhorse for satellite downlink transmitter use, their poor record of reliability becomes even worse as the operating frequency is increased from 4 GHz to 12 GHz, 30 GHz, 40 GHz, and beyond. For this reason and also the greater simplicity, particularly in the power supply requirements, attention is naturally directed toward a solid-state replacement for the TWT. This paper details the measured performance of a solid-state amplifier which delivers 10 W of RF output power at an operating frequency of 41 GHz. The development of this amplifier is a significant milestone toward building a space-qualified high-power solid-state transmitter for spacecraft use.

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Synchronization Effects in a Submillimeter Josephson Self-Oscillator

J.-C. Henaux, G. Vernet and R. Adde. "Synchronization Effects in a Submillimeter Josephson Self-Oscillator." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 177-183.

We present an experimental and theoretical study of injection locking in an oscillator in the presence of noise. The experiment is performed with a Josephson point-contact self-oscillator heterodyne receiver irradiated by a very weak ≈ 1 -THz signal. A general calculation of the oscillator response at low injection level is made based on the theoretical treatment of Stratonovitch. We show that the Josephson oscillator described by the RSJ model obeys the general locking equation in the presence of noise. We assume a simple evolution law of the oscillator spectrum as a function of detuning and calculate its response. The experimental results are compared with computer calculations and the implications are discussed.

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Abstracts

A High-Power W-Band (90-99 GHz) Solid-State Transmitter for High Duty Cycles and Wide Bandwidth

G.R. Thoren and M.J. Virostko. "A High-Power W-Band (90-99 GHz) Solid-State Transmitter for High Duty Cycles and Wide Bandwidth." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 183-188.

A high average power W-band solid-state transmitter using a 2-diode and a 4-diode IMPATT power combiner has achieved over 1.89 W and exceedingly versatile performance over a broad range of pulsewidths and duty cycles with a tunable bandwidth from 90 GHz to 99 GHz.



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Millimeter-Wave Power Combiner Using Quasi-Optical Techniques

L. Wandering and V. Nalbandian. "Millimeter-Wave Power Combiner Using Quasi-Optical Techniques." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 189-193.

A millimeter- or submillimeter-wave combiner using a quasi-optical open resonator to effectively combine the power output of several solid-state oscillators to a single-frequency is described. The combiner makes use of a symmetrical concave spherical resonator with dielectric wedge launchers as energy couplers. To demonstrate feasibility of this concept, experiments were carried out by using two InP Gunn oscillators at 60 GHz, and a combining efficiency of 54 percent has been achieved.

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Millimeter-Wave (W-Band) Quartz Image Guide Gunn Oscillator

Y.-W. Chang. "Millimeter-Wave (W-Band) Quartz Image Guide Gunn Oscillator." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 194-199.

Dielectric image-guide Gunn oscillator using fused quartz as the guide material has been investigated at frequencies around 94 GHz. Computer-controlled CO/sub 2/ laser cutting of quartz to the designed image-guide patterns has also been achieved. A resonant disk and pin bias circuit was used to tune the oscillator to an output power of 5 mW at the oscillation frequency of 94.2 GHz. An electronic frequency tuning of 350 MHz was measured with the oscillation characteristics similar to waveguide cavity oscillators. By varying the bias circuit disk and pin parameters, the Gunn-oscillator tuning characteristics have also been recorded for the future circuit performance optimization.

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Design of Dielectric Grating Antennas for Millimeter-Wave Applications

F.K. Schwering and S.-T. Peng. "Design of Dielectric Grating Antennas for Millimeter-Wave Applications." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 199-209.

At theoretical procedure well suited for generating design data on dielectric grating antennas for the millimeter-wave region is presented. The procedure utilizes the effective dielectric constant (EDC) method to determine the phase constant of the leaky modes supported by the antenna structure of finite lateral width. The radiation or leakage constant of these modes is obtained from the relatively simple boundary value problem of dielectric grating antennas of infinite width. For single-beam radiation, the practicably interesting case, the phase and leakage constants completely determine the field distribution in the antenna aperture, from which the directivity gain and radiation pattern are then calculated. The dependence of the antenna characteristics on the dimensions of the radiating structure is presented and discussed for $\epsilon = 12$, the dielectric constant of typical millimeter-wave materials, such as silicon and GaAs.

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Theory of Optically Controlled Millimeter-Wave Phase Shifters

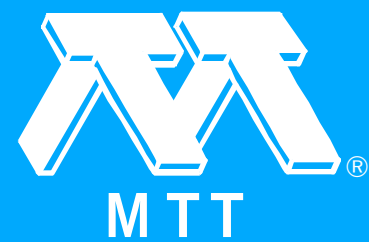
A.M. Vaucher, C.D. Striffler and C.H. Lee. "Theory of Optically Controlled Millimeter-Wave Phase Shifters." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 209-216.

In this paper we analyze the millimeter-wave propagation characteristics of a dielectric waveguide containing a plasma-dominated region. Such a device presents a new method for controlling millimeter-wave propagation in semiconductor waveguides via either optical or electronic means resulting in ultrafast switching and gating. We have calculated the phase shift and attenuation resulting from the presence of the plasma. Higher order modes, both TE and TM, as well as millimeter-wave frequency variation, are studied in both Si and GaAs dielectric waveguides. We have also formulated a surface plasma model that is a good approximation to the more elaborate volume plasma model. Phase shifts are predicted to be as high as $1400^\circ/\text{cm}$ for modes operating near cutoff. These modes suffer very little attenuation when the plasma region contains a sufficiently high carrier density.

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Precise Millimeter-Wave Measurements of Complex Refractive Index, Complex Dielectric Permittivity and Loss Tangent of GaAs, Si, SiO₂, Al₂O₃, BeO, Macor, and Glass

M.N. Afsar and K.J. Button. "Precise Millimeter-Wave Measurements of Complex Refractive Index, Complex Dielectric Permittivity and Loss Tangent of GaAs, Si, SiO₂, Al₂O₃, BeO, Macor, and Glass." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 217-223.

Highly accurate continuous spectra of the complex refractive index and complex dielectric permittivity are given in the millimeter range for a variety of potentially useful materials. The absorption coefficient is found to increase monotonically with increasing frequencies. Small amounts of glassy inclusions or water were found to increase losses at all frequencies, but impurities and radiation damage (except in semiconductors) have not yet proved to be detrimental to performance. Materials have been found for which the millimeter-wave losses can be tolerated when used as dielectric waveguide, high-power windows, and other applications. Nominal consideration must be given, however, to the conditions of preparation and the nature of contaminants. The measurements were made in a modular, polarizing, dispersive Fourier-transform spectrometer.

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Abstracts

Green's Function Approach for Obtaining S-Matrices of Multimode Planar Networks (Short Papers)

R. Chadha and K.C. Gupta. "Green's Function Approach for Obtaining S-Matrices of Multimode Planar Networks (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 224-227.

Evaluation of S-matrices for circuits using multimode microstrip-like lines is presented. Planar waveguide model for lines and two-dimensional analysis using Green's functions are used. As an example, a multimode S-matrix is computed for a microstrip right-angled bend.



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E-Plane W-Band Printed-Circuit Balanced Mixer (Short Papers)

P.J. Meier. "E-Plane W-Band Printed-Circuit Balanced Mixer (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 227-230.

A balanced W-band mixer has been developed which integrates a low-loss printed-probe hybrid with fin-line diode mounts on a single substrate. This E-plane approach features production economy, effective shielding, high (> 400) unloaded Q , light dielectric loading, and simple waveguide interfaces. With the LO fixed at 95 GHz, the measured conversion loss of the mixer is 7.8 ± 0.7 dB across the RF band of 92-98 GHz.

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A Cryogenic Millimeter-Wave Schottky-Diode Mixer (Short Papers)

E.L. Kollberg and H.H.C. Zirath. "A Cryogenic Millimeter-Wave Schottky-Diode Mixer (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 230-235.

We report theoretical calculations and measurements on cryogenic millimeter-wave Schottky-diode mixers. Measurements of the embedding impedances at the signal and image frequencies have been used for the theoretical predictions of the mixer performance, and an excellent agreement with measured performance was obtained. Measurements of embedding impedances for various waveguide structures are reported, and the choice of configuration for optimum single-sideband performance is discussed.

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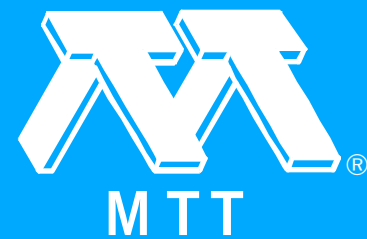


Abstracts

Hyperabrupt Junction Varactor Diodes for Millimeter-Wavelength Harmonic Generators (Short Papers)

K. Lundien, R.J. Mattauch, J. Archer and R. Malik. "Hyperabrupt Junction Varactor Diodes for Millimeter-Wavelength Harmonic Generators (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 235-238.

The design of a hyperabrupt Schottky-barrier varactor is considered with an exponentially retrograded doping profile assumed. Resistance and capacitance models are used to determine optimum doping profile characteristic length and breakdown voltage with respect to device dynamic cutoff frequency. Device fabrication is discussed and test results are presented indicating conversion efficiencies of approximately 15 percent upon doubling to the 200-GHz frequency range.



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Abstracts

A Limiter for High-Power Millimeter-Wave Systems (Short Papers)

A.L. Armstrong and Y. Anand. "A Limiter for High-Power Millimeter-Wave Systems (Short Papers)." 1983 *Transactions on Microwave Theory and Techniques* 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 238-241.

A high-power limiter for use in millimeter-wave systems has been designed and demonstrated. The RF control is provided by an array of p-i-n diodes fabricated into the surface of a high-resistivity silicon window. Orientation-dependent etching of the silicon is used to build diodes with parallel injection surfaces. The window is mounted into the waveguide using a metal membrane which simplifies construction and lowers cost.



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Patent Abstracts (Feb. 1983 [T-MTT])

"Patent Abstracts (Feb. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 242-246.



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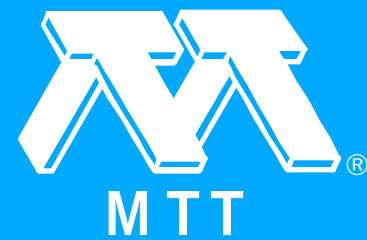
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American National Standard Metric Practice (Advertisement) (Feb.1983 [T-MTT])

"American National Standard Metric Practice (Advertisement) (Feb.1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.2 (Feb. 1983 [T-MTT] (Special Issue on Millimeter-Waves)): 247-247.



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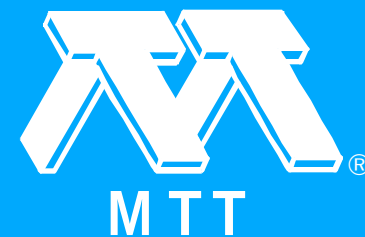
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Abstracts

A Fast Computational Technique for Accurate Permittivity Determination Using Transmission Line Methods

L.P. Ligthart. "A Fast Computational Technique for Accurate Permittivity Determination Using Transmission Line Methods." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 249-254.

A fast analytical method is given for determining permittivity characteristics at microwave frequencies. The experimental setup uses a single-moded cylindrical waveguide filled with dielectric and followed by a load or by a moving short. In this way, transmission-reflection and short-circuited line methods are compared. By including the uncertainties in length and in the reflection and transmission parameters, the permittivity uncertainty region is determined. It is shown that for optimum accuracy of the permittivity, specific lengths in combination with a moving short are needed.



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Nondestructive Measurement of a Dielectric Layer Using Surface Electromagnetic Waves

W. Ou, C.G. Gardner and S.A. Long. "Nondestructive Measurement of a Dielectric Layer Using Surface Electromagnetic Waves." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 255-261.

In this investigation, the possibility of nondestructively measuring the thickness and dielectric constant of a layer of dielectric material on a conducting substrate by surface electromagnetic waves (SEW) has been demonstrated. The theoretical approximate dispersion relations near cutoff were derived for both the TE and TM modes and found to be linear functions of frequency, the thickness and dielectric constant were then calculated as simple algebraic functions of the slope and intercept of the dispersion curve. An experimental apparatus utilizing a prism-coupler was constructed to excite surface electromagnetic waves in a dielectric layer whose characteristics were known. By suitable measurements of the frequency and the coupling angle of the source, the dispersion curve was determined experimentally and the resulting dielectric constant and thickness of the layer calculated.

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Determination of Loaded, Unloaded, and External Quality Factors of a Dielectric Resonator Coupled to a Microstrip Line

A.P.S. Khanna and Y. Garault. "Determination of Loaded, Unloaded, and External Quality Factors of a Dielectric Resonator Coupled to a Microstrip Line." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 261-264.

In the case of a dielectric resonator coupled to a microstrip line, the relations for the determination of unloaded, loaded, and external quality factors, in terms of directly measurable reflection or transmission coefficient at the resonant frequency, have been derived and represented on the corresponding vectorial and scalar planes. Construction of a linear frequency scale and a graphical method to accurately determine the unloaded Q from the loaded Q measurement presented.

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Abstracts

Large-Signal, Dynamic, Negative Conductance of Gunn Devices in Sharpless Flanges

M.R. Lakshminarayana and L.D. Partain. "Large-Signal, Dynamic, Negative Conductance of Gunn Devices in Sharpless Flanges." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 265-271.

A good agreement between actual, large-signal Gunn device operation and a first principles model has been achieved in terms of descriptive device parameters. An injection-locking technique was used to measure the variations of device conductance and capacitance with RF voltage amplitude. The equivalent circuits developed allow optimization of Gunn oscillator circuits.



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Hold-In Characteristics of an Extended Range Gunn Oscillator System

B.N. Biswas, S.K. Ray, K. Pramanik, M. Sadhu and D. Bandyopadhyay. "Hold-In Characteristics of an Extended Range Gunn Oscillator System." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 271-276.

This paper describes a new Gunn oscillator system having an additional arrangement for controlling the instantaneous frequency of the oscillator through an automatic frequency control circuit. By utilizing this new technique, based upon the principle of self tracking, the locking bandwidth of an injection-locked Gunn oscillator can be increased to a huge extent without affecting its stability. Experimental observations are found to be in good agreement with the conclusions of the analytical approach.

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Design and Performance of W-Band Broad-Band Integrated Circuit Mixers

R.S. Tahim, G.M. Hayashibara and K. Chang. "Design and Performance of W-Band Broad-Band Integrated Circuit Mixers." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 277-283.

Broad-band integrated circuit mixers using a crossbar suspended stripline configuration and a finline configuration were developed with GaAs beamlead diodes. For the crossbar suspended stripline balanced mixer, less than 7.5-dB conversion loss for 15-GHz instantaneous, IF bandwidth was achieved with the LO at 75 GHz and the RF swept from 76 to 91 GHz. With the LO at 90 GHz, a conversion loss of less than 7.8 dB was achieved over a 14-GHz instantaneous bandwidth as the RF is swept from 92 to 105 GHz. For the finline balanced mixer, a conversion loss of 8 to 12 dB over a 32-GHz instantaneous IF bandwidth was achieved as the RF is swept from 76 to 108 GHz. Integrated circuit building blocks, such as filters, broadside couplers, matching circuits, and various transitions, were also developed.

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An Ideal Six-Port Network Consisting of a Matched Reciprocal Lossless Five-Port and a Perfect Directional Coupler

E.R.B. Hansson and G.P. Riblet. "An Ideal Six-Port Network Consisting of a Matched Reciprocal Lossless Five-Port and a Perfect Directional Coupler." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 284-288.

A six-port consisting of a matched reciprocal lossless five-port in series with a perfect directional coupler is shown to have ideal six-port properties according to the theory developed by Engen. The q points are separated by 120° on a common circle. The matched five-port itself is shown to function as a four-way divider network and bears an interesting analogy with a matched nonreciprocal lossless three-port (circulator). This analogy is used to design several styles of matched symmetrical stripline five-ports for use in making six-port measurements.

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Microwave Circuit Models of Semiconductor Injection Lasers (Mar. 1983 [T-MTT])

R.S. Tucker and D.J. Pope. "Microwave Circuit Models of Semiconductor Injection Lasers (Mar. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 289-294.

Small-signal two-port circuit models of packaged commercial broad-stripe and buried-heterojunction AlGaAs laser diodes are presented. The models are based on the single-mode rate equations, and include the heterojunction I-V and space-charge characteristics. Also included are package and substrate parasitic. The models agree well with measured reflection coefficient and modulation frequency response data, and can be incorporated in standard microwave circuit analysis programs.



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Abstracts

Analysis and Modeling of "Two-Gap" Coaxial Line Rectangular Waveguide Junctions

A.G. Williamson. "Analysis and Modeling of "Two-Gap" Coaxial Line Rectangular Waveguide Junctions." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 295-302.

The analysis of "two-gap" coaxial line rectangular waveguide junctions is discussed. The cross-coupled junction, the 'coax-gap' mount are specifically considered. The theoretical expressions obtained yield results in excellent agreement with published experimental results. Equivalent circuits are presented for the two junctions applicable to the case where the TE/sub 10/ mode is the only propagating waveguide mode.



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Optimization of an Electrodynamic Basis for Determination of the Resonant Frequencies of Microwave Cavities Partially Filled with a Dielectric (Short Papers)

J. Krupka. "Optimization of an Electrodynamic Basis for Determination of the Resonant Frequencies of Microwave Cavities Partially Filled with a Dielectric (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 302-305.

In this paper, a method of optimization of an electrodynamic basis is presented for determination of resonant frequencies of the microwave cavities containing dielectric samples. It is shown that the use of the suitable basis, consisting of several functions only, ensures a high accuracy of calculation of these frequencies. The presented method is useful for solving the boundary problem for the elliptic partial differential equation if the considered region has a regular boundary and is filled with inhomogeneous medium.

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Abstracts

Propagation in Longitudinally Magnetized Compressible Plasma Between Two Parallel Planes (Short Papers)

H. Unz. "Propagation in Longitudinally Magnetized Compressible Plasma Between Two Parallel Planes (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 305-306.

The propagation of plasma waves in compressible, single fluid, macroscopic plasma, between two parallel, perfectly conducting planes, with longitudinal magnetostatic field parallel to the boundaries and in the direction of propagation is investigated for the different hybrid plasma wave modes of propagation.



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A Broad-Band Traveling-Wave Maser for the Range 40-46.5 GHz (Short Papers)

N.T. Cherpak and T.A. Smirnova. "A Broad-Band Traveling-Wave Maser for the Range 40-46.5 GHz (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 306-309.

A tunable traveling-wave maser (TWM) for the frequency range 40-46.5 GHz has been developed, which is characterized by an extended instantaneous bandwidth. Andalusite ($\text{Al}/\text{sub } 2/\text{SiO}/\text{sub } 5/$) doped with Fe^3 atoms is used as the active crystal. The slow-wave structure is a digit comb with broad-band matching particularly suitable for the millimeter range. The new type of isolator employed is based on textured hexagonal ferrite materials, namely $\text{BaNi}/\text{sub } 2/\text{Sc}/\text{sub } x/\text{Fe}/\text{sub } 16/-/\text{sub } x/\text{O}/\text{sub } 27/$. The net gain within the tuning band is 20-35 dB. The instantaneous bandwidth at a -3-dB level is 150-100 MHz, dependhsg on the net gain. The noise temperature at the input does not exceed 25° K .

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Abstracts

A Note Concerning Modes in Dielectric Waveguide Gratings for Filter Applications (Short Papers)

G.L. Matthaei. "A Note Concerning Modes in Dielectric Waveguide Gratings for Filter Applications (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 309-312.

Peng and Oliner, and others have shown that TM-to-TE or TE-to-TM mode conversions occur when a single, lowest order surface wave is incident obliquely onto a wide dielectric grating and that the lowest order converted modes of this sort can cause spurious stopbands which are especially troublesome because they are so close to the desired stopband. In this note it is observed that the spurious response situation is not as bad in the case of a grating cut into a dielectric waveguide (which can be thought of as having two, obliquely incident waves present). In this latter case, the fields have even or odd symmetry which eliminates part of the mode couplings including the lowest order TM-to-TE or TE-to-TM couplings. Experimental and theoretical results indicate that gratings can be made to be free from spurious responses or appreciable radiation over sizeable bands so that they can be useful in at least some kinds of dielectric waveguide filter structures.



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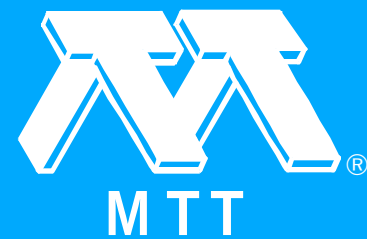


Abstracts

Temperature Stabilization of GaAs MESFET Oscillators Using Dielectric Resonators (Short Papers)

C. Tsironis and V. Pauker. "Temperature Stabilization of GaAs MESFET Oscillators Using Dielectric Resonators (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 312-314.

A simple model of the temperature stabilization of dielectric resonator FET oscillators (DRO's) is presented. Deduced from the oscillation condition, the model furnishes relations for oscillation power and frequency stability with temperature. A stack resonator with an appropriate linear resonance frequency/temperature characteristic has been developed and used to stabilize a DRO: frequency stability of ± 120 kHz over -20°C to 80°C ($\Delta f/f = \pm 0.1$ ppm/K) at 11.5 GHz has been achieved.



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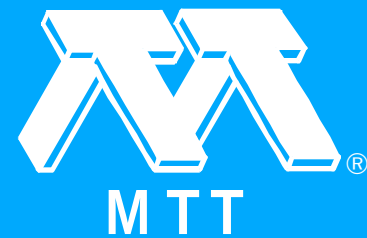


Abstracts

Dual Mode Dielectric Resonator Loaded Cavity Filters (Corrections)

S.J. Fiedziuszko. "Dual Mode Dielectric Resonator Loaded Cavity Filters (Corrections)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 315-315.

Due to typographical errors in the above referenced paper, the following corrections should be made.



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Abstracts

Waveguide Electrooptic Modulators (Corrections)

R.C. Alferness. "Waveguide Electrooptic Modulators (Corrections)." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 315-315.

The following corrections should be made to the above paper. In (3), n^2 should be n^3 .



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Patent Abstracts (Mar. 1983 [T-MTT])

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Call for Papers - Power and Low-Noise GaAs FET Circuits and Applications (Mar. 1983 [T-MTT])

"Call for Papers - Power and Low-Noise GaAs FET Circuits and Applications (Mar. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 319-319.



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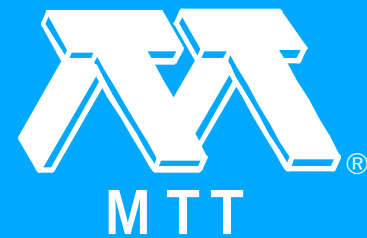
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Abstracts

Call for Papers - Electromagnetic Wave Interactions with Biological Systems (Mar. 1983 [T-MTT])

"Call for Papers - Electromagnetic Wave Interactions with Biological Systems (Mar. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.3 (Mar. 1983 [T-MTT]): 320-320.



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The Measurement of Complex Reflection Coefficient by Means of a Five-Port Reflectometer

S. Li and R.G. Bosisio. "The Measurement of Complex Reflection Coefficient by Means of a Five-Port Reflectometer." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 321-326.

A detailed analysis of the five-port reflectometer is presented in this paper. The possibility and application limitation of using a five-port to measure complex reflection coefficients is discussed and the related design consideration is derived. From the point of view of minimum measurement error, an optimized, multi-octave five-port circuit is suggested and realized by ordinary microwave integrated circuit technology. Some measurement results are reported to prove the above analysis and design consideration.

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Abstracts

Finite Element Analysis of Lossy Waveguides- Application to Microstrip Lines on Semiconductor Substrate

M. Aubourg, J.-P. Villotte, F. Godon and Y. Garault. "Finite Element Analysis of Lossy Waveguides-Application to Microstrip Lines on Semiconductor Substrate." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 326-331.

The development of Maxwell's equations is made considering the electromagnetic fields as vector distributions. With the aid of the finite element method, an analysis of lossy shielded inhomogenous waveguides of arbitrary shape is described. To solve the complex matrix system an iterative procedure is presented. The method is applied to study the propagation on MIS or Schottky contact microstrip lines.



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A Coordinate-Free Approach to Wave Reflection from a Uniaxially Anisotropic Medium

H.C. Chen. "A Coordinate-Free Approach to Wave Reflection from a Uniaxially Anisotropic Medium." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 331-336.

This paper presents a coordinate-free method of solving the problem of electromagnetic wave reflection from the surface of a uniaxially anisotropic medium. Based on the direct manipulation of vectors, dyadics, and their invariants, the method eliminates the use of coordinate systems. It facilitates solutions and provides results in a greater generality. The paper contains the following results in coordinate-free forms: a) the dispersion equations; b) the directions of field vectors; c) the Poynting vectors (ray vectors) and group velocities; d) the laws of reflection and refraction; and e) the transmission and reflection coefficients. The results are valid for the incident wave having any polarization, and the optic axis of the uniaxial medium being arbitrarily oriented with respect to the interface and the plane of incidence.

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Guided-Wave Experiments with Dielectric Waveguides Having Finite Periodic Corrugation

M. Tsuji, S. Matsumoto, H. Shigesawa and K. Takiyama. "Guided-Wave Experiments with Dielectric Waveguides Having Finite Periodic Corrugation." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 337-344.

A planar dielectric waveguide having finite periodic rectangular corrugation is investigated analytically and experimentally, in case of surface waves propagating at an angle to the corrugation. In analytical considerations, a finitely corrugated guide is regarded as consisting of many step discontinuities connected by a length of uniform slab waveguide, and its propagation characteristics in the Bragg interaction region are derived from a cascaded connection of the transmission matrix expressing a step discontinuity. Although the present method takes only surface wave modes into account and neglects the wave with continuous spectrum, the calculated results show an excellent agreement with experimental ones which are performed for art H-guide in the microwave region.

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Hybrid Modes in Circular Cylindrical Optical Fibers

K. Morishita. "Hybrid Modes in Circular Cylindrical Optical Fibers." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 344-350.

The classification of hybrid modes in circular cylindrical optical fibers is studied. It is shown that problems of the mode classifications, i.e., the crossover of the dispersion characteristics and the remarkable changes of the polarization states and the field configurations, are caused by the coupling of the HE-type and EH-type modes.

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



Abstracts

Empirical Expressions for Fin-Line Design

A.K. Sharma and W.J.R. Hoefer. "Empirical Expressions for Fin-Line Design." 1983
Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 350-356.

This paper presents empirical expressions in closed form for the design of unilateral and bilateral fin-lines. The guided wavelength and the characteristic impedance calculated with these expressions agree, typically, within ± 2 percent with values obtained using numerical techniques in the normalized frequency range $0.35 \leq b/\lambda \leq 0.7$, which is suitable for most practical applications.



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A Quasi-Optical Nulling Method for Material Birefringence Measurements at Near-Millimeter Wavelengths (Short Papers)

G.J. Simonis. "A Quasi-Optical Nulling Method for Material Birefringence Measurements at Near-Millimeter Wavelengths (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 356-358.

A quasi-optical technique for the measurement of birefringence is demonstrated at 245 GHz. The technique is applied to crystal quartz. The measured values are compared with values reported at nearby frequencies. The technique is used to determine the difference between the ordinary and extraordinary real indices of refraction directly, rather than by deducing the difference from separate measurements of the two indices. The technique is based on establishing a transmission null, thus providing appreciable sensitivity and precision for the measurement.

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Large Signal Design of GaAs FET Oscillators Using Input Dielectric Resonators (Short Papers)

A. Podcameni and L.A. Bermudez. "Large Signal Design of GaAs FET Oscillators Using Input Dielectric Resonators (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 358-361.

A dielectric resonator may be placed at the input of an active two-port device (FET or microwave transistor) yielding a stable frequency source. For this input configuration, a large signal design is presented. The method is simple, and power output prevision is also reached. The practical results obtained with an X-band medium-power oscillator are presented.

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



Abstracts

Coupling Between Microstrip Line and Image Guide Through Small Apertures in the Common Ground Plane (Short Papers)

J.-F. Miao and T. Itoh. "Coupling Between Microstrip Line and Image Guide Through Small Apertures in the Common Ground Plane (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 361-363.

A design theory is described for coupling between microstrip line and image guide through small coupling holes in a common ground plane. A five-slot Chebyshev coupler is designed based on coupling through a rectangular slot. The theoretical results are compared with experimental results.



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Some Pitfalls in Millimeter-Wave Noise Measurements Utilizing a Cross-Correlation Receiver (Comments)

H.J. Siweris, B. Schiek and K.M. Ludeke. "Some Pitfalls in Millimeter-Wave Noise Measurements Utilizing a Cross-Correlation Receiver (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 364-364.

In the above paper, 1 Sutherland and van der Ziel analyze some problems encountered during noise measurements at very low temperatures with a cross-correlation receiver. It is shown that, if a hybrid junction is used to split the noise signal from the device under test (DUT) into the two receiver channels, the correlation between the receiver input signals, which contains the useful information, vanishes if the remaining port of the hybrid is resistively terminated at a temperature equal to that of the DUT. The same effect occurs for a pure reactive termination, if the isolators used to decouple the receiver channels are also cooled down to the temperature of the DUT.

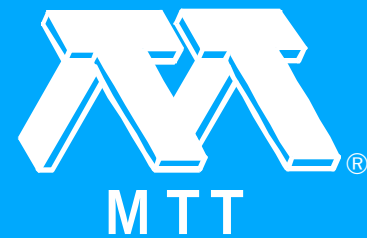


Abstracts

The Dynamical Behavior of a Single-Mode Optical Fiber Strain Gage (Comments)

P.A.A. Laura and J.L. Pombo. "The Dynamical Behavior of a Single-Mode Optical Fiber Strain Gage (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.4 (Apr. 1983 [T-MTT]): 364-366.

In the above paper, Martinelli presents a very interesting and useful comparison between the dynamical response of a single-mode fiber optic and resistive strain gages in the frequency range 25 -250 Hz. As shown by the author, the frequency spectrum of the phase change signal and the resistive strain gage signal are in very good agreement.



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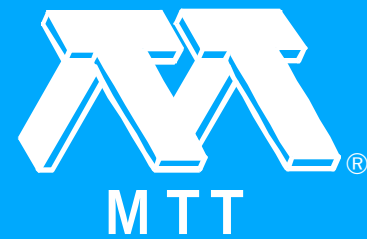
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IEEE Open Order Plan (Advertisement) (Apr. 1983 [T-MTT])

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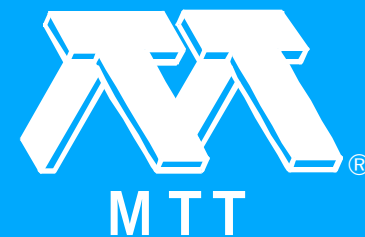
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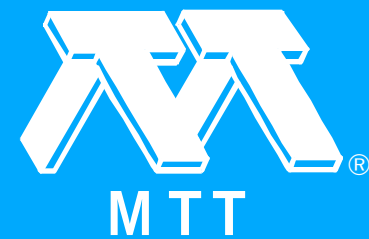
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Folded Fabry-Perot Quasi-Optical Ring Resonator Diplexer: Theory and Experiment

H.M. Pickett and A.E.T. Chiou. "Folded Fabry-Perot Quasi-Optical Ring Resonator Diplexer: Theory and Experiment." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 373-380.

Performance of folded Fabry-Perot quasi-optical ring resonator diplexers with different geometries of reflecting surfaces is investigated both theoretically and experimentally. Design of optimum surface geometry for minimum diffraction, together with the figure of merit indicating improvement in performance, are given.

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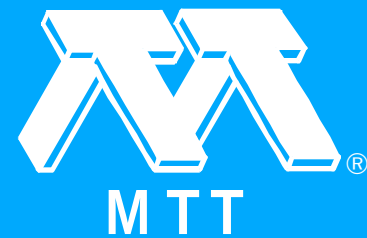


Abstracts

Numerical Analysis of Open-Ended Coaxial Lines

G.B. Gajda and S.S. Stuchly. "Numerical Analysis of Open-Ended Coaxial Lines." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 380-384.

Numerical methods are applied in the analysis of coaxial structures used as sensors for in vivo permittivity studies of biological substances. The methods used for the solution of the resulting static conductor-dielectric problems are the Finite Element Method (FEM) and the Method of Moments (MOM) applied to a pair of coupled integral equations. A linear model which relates the sample permittivity to the fringing field capacitance of the sensor is discussed and values of the model parameters are calculated for different types of sensors.



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Abstracts

A Numerical Calculation of the Capacitance for the Rectangular Coaxial Line with Offset Inner Conductor Having an Anisotropic Dielectric

H. Shibata, S. Minakawa and R. Terakado. "A Numerical Calculation of the Capacitance for the Rectangular Coaxial Line with Offset Inner Conductor Having an Anisotropic Dielectric." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 385-391.

The capacitances of the rectangular coaxial lines with an offset zero-thickness inner conductor having a sapphire dielectric are presented by using an expanded charge simulation method. In order to apply the method to an anisotropic region, we propose an electric potential formula for a two-dimensional system consisting of a line charge and an infinite plate conductor which are arbitrarily situated in the region. The potential formula is analytically derived by means of an affine transformation, a conformal mapping technique, and the method of images. The capacitance calculated using this method is in good agreement with those of other available methods.



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On the Complex Resonant Frequency of Open Dielectric Resonators

M. Tsuji, H. Shigesawa and K. Takiyama. "On the Complex Resonant Frequency of Open Dielectric Resonators." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 392-396.

An analytical method is presented for calculating accurately the complex resonant frequency of dielectric pillbox resonators. In this method, an approximated field of the resonator is expanded into a truncated series of solutions of the Helmholtz equation in the spherical coordinates, and the boundary condition on the resonator surface is treated in the least-squares sense. The resonant frequency and the intrinsic Q value due to radiation loss are obtained in the form of approximation converging to the exact values. Numerical results are compared with previously published calculations, which show that the present method is a relatively simple and effective one.

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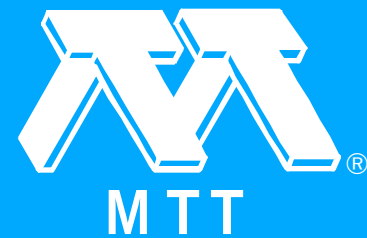


Abstracts

A Generalized Chebyshev Suspended Substrate Stripline Bandpass Filter

C.I. Mobbs and J.D. Rhodes. "A Generalized Chebyshev Suspended Substrate Stripline Bandpass Filter." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 397-402.

A design method for narrow-band suspended substrate strip-line filters having a true bandpass structure is presented. A generalized Chebyshev low-pass prototype is used, resulting in a convenient form of realization in suspended substrate stripline. A prototype device, designed with the aid of a computer program, is given as an example. Results from this device show that the method of realizing such a filter is viable for many applications and maybe suitable to replace more conventional types of microwave filter realized using TEM-mode resonators.



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Abstracts

Analysis of an Oval Symmetrically Located Inside a Rectangular Boundary by Conformal Mapping (Short Papers)

B.N. Das, K.V.S. Rao and A.K. Mallick. "Analysis of an Oval Symmetrically Located Inside a Rectangular Boundary by Conformal Mapping (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 403-406.

This paper describes the analysis of a transmission line having an oval-shaped center conductor symmetrically placed inside an outer conductor in the form of a rectangular waveguide. A conformal transformation is used to calculate the characteristic impedances of oval, elliptic, circular, and planar conductors. The impedance data of these structures are presented in the form of charts for different aspect ratios of the rectangular outer conductor. The charge distribution on the center conductor is also determined.



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Techniques for Correcting Scattering Parameter Data of an Imperfectly Terminated Multiport When Measured with a Two-Port Network Analyzer (Short Papers)

J.C. Rautio. "Techniques for Correcting Scattering Parameter Data of an Imperfectly Terminated Multiport When Measured with a Two-Port Network Analyzer (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 407-412.

Two techniques are described which correct scattering parameter data taken on an N-port device measured with N-2 imperfect terminations and a two-port network analyzer. The first technique rises a simple iterative algorithm and may be easily implemented in software. Each iteration reduces the error due to imperfect terminations typically by one decade. The second, more complicated, technique uses a general closed-form solution which requires specially developed Gamma-R parameters of which S-, Y-, and Z-parameters are particular cases. The closed-form solution is completely valid for any termination. The closed-form solution is the limit to which the iterative solution converges. The iterative technique has been implemented in software controlling an HP 8409 automated microwave network analyzer.

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Low-Noise, Low Power Dissipation GaAs Monolithic Broad-Band Amplifiers (Short Papers)

K. Honjo, T. Sugiura, T. Tsuji and T. Ozawa. "Low-Noise, Low Power Dissipation GaAs Monolithic Broad-Band Amplifiers (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 412-417.

Low-noise, low dc power dissipation GaAs monolithic amplifiers have been developed for use in VHF-UHF mobile radio systems. The developed amplifiers have two-stage construction, where gate width for the first stage is 1000 μm , and for the second stage is 500 μm . Using this circuit configuration, both noise figure and bandwidth have been improved. To maintain the uniformity for the ion-implanted active layers and to reduce gate-source resistance R_{gs} and gate-drain resistance R_{gd} , the "closely spaced electrode FET" was adopted. The FET enables low drain voltage operation, resulting in low dc power dissipation. The developed amplifier for the FET threshold voltage $V_{\text{T}} = -0.6 \text{ V}$ provides a 3-dB noise figure, less than 170-mW dc power dissipation, 9-MHz-3.9-GHz bandwidth with 16-dB gain. It can operate under a unipolar power source. When external choke inductors were introduced for the amplifier, 120-mW dc power dissipation has been achieved. It has also been demonstrated that the amplifier for $V_{\text{T}} = -0.6 \text{ V}$, which is inferior to the amplifier for $V_{\text{T}} = -2.7 \text{ V}$ regarding gain-bandwidth product and power efficiency under the same dc power dissipation, however, has an acceptable performance for use in the mobile radio systems.





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Permittivity Measurements of Lossy Liquids at Millimeter-Wave Frequencies (Short Papers)

L. Zanforlin. "Permittivity Measurements of Lossy Liquids at Millimeter-Wave Frequencies (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 417-419.

A measurement system is described which allows the determination of the complex permittivity of high-loss liquids at millimeter waves. Basically, the setup consists of a waveguide interferometer whose unknown arm embodies a liquid holder irradiated by an open-ended rectangular waveguide. The sample thickness is varied by means of a piston driven by a micrometer screw. The bridge output then is read as a function of the liquid thickness. Best fitting between experimental and computed data through a suitable model of the system enables the permittivity to be determined. The system can operate, with high sensitivity, over the whole frequency range of the dominant mode propagating in the waveguide setup employed. System performance is described through a set of experimental results obtained on ethanol, methanol, and pure water at 20° C and 70 GHz.

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Abstracts

The ZEPLS Program for Solving Characteristic Equations of Electromagnetic Structures (Comments)

W. Zieniutycz. "The ZEPLS Program for Solving Characteristic Equations of Electromagnetic Structures (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 420-420.

The ZEPLS routine prepared by P. Lampariello and R. Sorrentino in the above paper calculates the zeros of analytic function $f(z)$. Unfortunately, an additional difficulty is often introduced by the fact that the analytic function has polar singularities and that the poles are placed in the complex plane only by the zeros. In this case, the ZEPLS routine cannot be used successfully. On the other hand, the zeros and the poles create at that time the couples so that the regions with only one zero and one pole can be separated. The modification permits an adaptation the ZEPLS routine for such a case.



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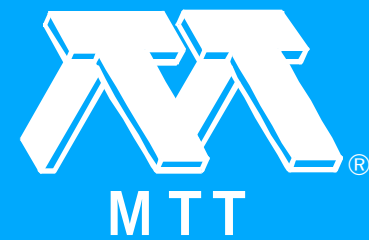
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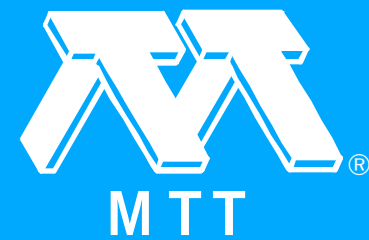
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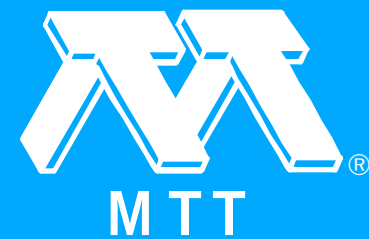
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"American National Standard Metric Practice (Advertisement) (May 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.5 (May 1983 [T-MTT]): 428-428.



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"Front Cover (Jun. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): f1-f2.



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Propagation Characteristics of Striplines with Multilayered Anisotropic Media

T. Kitazawa and Y. Hayashi. "Propagation Characteristics of Striplines with Multilayered Anisotropic Media." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 429-433.

Various types of striplines with anisotropic media are analyzed. The analytical approach used in this paper is based on the network analytical method of electromagnetic fields, and the formulation process is straightforward for complicated structures. Some numerical results are presented and comparison is made with the results available in the literature.

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Resonant Frequencies, Q-Factor, and Susceptance Slope Parameter of Waveguide Circulators Using Weakly Magnetized Open Resonators

J. Helszajn and J. Sharp. "Resonant Frequencies, Q-Factor, and Susceptance Slope Parameter of Waveguide Circulators Using Weakly Magnetized Open Resonators." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 434-441.

A useful quantity in the description of junction circulators is the difference between the split frequencies of the magnetized ferrite resonator. A knowledge of this quantity allows the loaded Q-factor of a junction using a weakly magnetized resonator to be determined. This paper derives an exact description of the former quantity in the case of the open quarter-wave long (partial-height) disk resonator used in the construction of commercial turnstile waveguide circulators. This is done by employing duality between a ferrite-filled circular waveguide having ideal electric wall boundary conditions and one having ideal magnetic wall boundaries. The effect of an image wall on the open flat face of the open resonator is considered separately. The paper includes some remarks about the susceptance slope parameters of disk and triangular open resonators.

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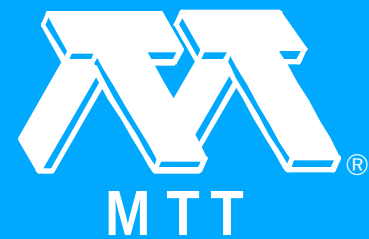
Estimation of Complex Permittivities of Three-Dimensional Inhomogeneous Biological Bodies

D.K. Ghodgaonkar, O.P. Gandhi and M.J. Hagmann. "Estimation of Complex Permittivities of Three-Dimensional Inhomogeneous Biological Bodies." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 442-446.

Complex permittivities are estimated for a 36-cell model which represents the chest portion of the block model of man by using moment-method formulation of the electric field integral equation. The errors in the calculated complex permittivities are lower with saline/water the surrounding medium, as compared to air, presumably on account of better matching of energy to the biological body. It has been shown that the rest of the human body has little effect on the estimation of complex permittivities because of the near-field nature of the illuminating sources. small number of buried cells can be handled for solving the inverse problem, but the problem becomes ill-posed and unsolvable for a larger number of buried cells.

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On Theory and Performance of Solid-State Microwave Distributed Amplifiers

K.B. Niclas, W.T. Wilser, T.R. Kritzer and R.R. Pereira. "On Theory and Performance of Solid-State Microwave Distributed Amplifiers." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 447-456.

The performance characteristics of n-link distributed amplifiers employing GaAs MESFET'S are studied. At first, formulas of tie symmetrical amplifier using lumped circuit elements are developed for the case of an idealized FET model. The theoretical analysis is then extended to distributed line elements and later to an S-parameter derived transistor model. In efforts to optimize amplifier performance, the restriction of circuit symmetry is subsequently removed and the performance characteristics of two concepts, that of equal characteristic impedances and that of equal line lengths, are proposed and compared. Based on this analysis and practical considerations, several three-link hybrid amplifiers utilizing the equal line lengths approach have been assembled and test results are reported. A gain of $G = 5.5 \pm 0.6$ dB was measured over the bandwidth of 2-20 GHz. Across this frequency band a maximum VSWR of 2.2:1 for the input and 2.5:1 for the output terminaf have been reafized, while a minimum output power at the l-dB compression points of 19.3 dBm was achieved from 2-18 GHz. Agreement between measured and computed small-signal gain as well as reverse isolation is excellent.

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Equivalent Representations of Lossy Nonuniform Transmission Lines

I. Endo, Y. Nemoto and R. Sato. "Equivalent Representations of Lossy Nonuniform Transmission Lines." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 457-462.

Equivalent transformations, which were recently derived for mixed lumped and distributed circuits, may be extended to circuits consisting of lumped reactance, resistors, and lossy transmission lines. It is shown that circuits consisting of a cascade connection of lumped element sections and lossy uniform transmission lines are equivalent to circuits consisting of a cascade connection of lossy nonuniform transmission lines, lumped elements, and ideal transformers. Furthermore, by considering the limiting case of these transformations, equivalent transformations for circuits consisting of a cascade connection of lumped reactance, resistors, and nonuniform transmission lines are obtained. Exact equivalent circuits of lossy even-order binomial form transmission lines are derived from these equivalent transformations.

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High-Frequency Doubler Operation of GaAs Field-Effect Transistors

C. Rauscher. "High-Frequency Doubler Operation of GaAs Field-Effect Transistors." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 462-473.

A comprehensive study of single-gate GaAs FET frequency doublers is presented. Special emphasis is placed on exploring high-frequency limitations, while yielding explanations for previously observed lower frequency phenomena as well. Extensive large-signal simulations demonstrate the underlying relationships between circuit performance characteristics and principal design parameter. Verifying experiments include straight frequency doubler and a self-oscillating doubler, both with output signal frequencies in Ku-band. The self-oscillating doubler appears especially attractive, yielding an overall dc-to-RF efficiency of 10 percent. The type of transistor employed in the numerical and experimental examples possesses a gate length of 0.5 μm and a gate width of 250 μm .

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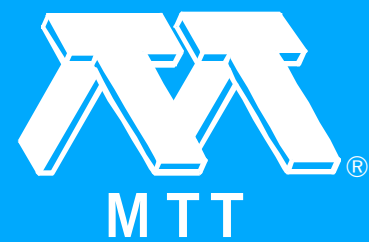
Design and Analysis of the Channel Waveguide Transformer

P.H. Siegel, D.W. Peterson and A.R. Kerr. "Design and Analysis of the Channel Waveguide Transformer." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 473-484.

The authors describe an easily fabricated H-plane transformer for use in rectangular waveguide carrying the dominant mode. An approximate theoretical analysis of the structure is presented, and computed results are compared with measurements on transformers at X-band. Design curves are given for transitions from full to one-half, one-third, and one-quarter height waveguide. The new transformers have been found particularly useful for millimeter-wave mixers and multipliers employing split-block construction. The structure can also be used as a transition from rectangular to channel waveguide.

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The Q-Factor of Coaxial Resonators Partially Loaded with High Dielectric Constant Microwave Ceramics (Short Papers)

S. Yamashita and M. Makimoto. "The Q-Factor of Coaxial Resonators Partially Loaded with High Dielectric Constant Microwave Ceramics (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 485-488.

The quality factor of partially loaded dielectric coaxial stepped impedance resonator (PDSIR) has been analyzed, including analysis of the dielectric constant ϵ_r and the dielectric loss $\tan \delta$ of the ceramics. The Q-factor of several resonators is also calculated and compared with the experimental results. This shows that the Q-factor degradation lessens even though the resonator length becomes small when the total length $L/t > 1/\sqrt{\epsilon_r}$ and becomes large when $L/t < 1/\sqrt{\epsilon_r}$.

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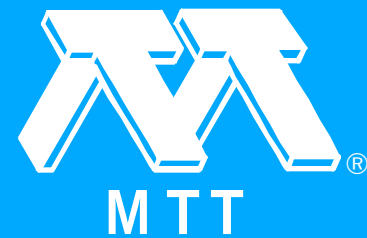


Abstracts

Microstrip Reactive Circuit Elements (Short Papers)

H.A. Atwater. "Microstrip Reactive Circuit Elements (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 488-491.

Quantitative design information is given for some planar distributed microwave circuit elements. A microstripline section is calculated as a parallel tuning element, and the radial-line stub and open- and short-circuited coupled microstrip stubs are treated. Typical applications showing measurements on circuits utilizing planar tuning elements are also presented.



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Abstracts

An Optimized L-Band Eight-Way Gysel Power Divider-Combiner (Short Papers)

F. Ardemagni. "An Optimized L-Band Eight-Way Gysel Power Divider-Combiner (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 491-495.

Theoretical analysis of a general n-way power divider-combiner in a Gysel configuration has been carried out to derive relationships among fundamental parameters. On the basis of its symmetries, an eight-way network has been described, analyzed, and optimized over a 25-percent bandwidth by the computer program COMPACT/sup tm/. Experimental data is reported and compared with theoretical predictions.



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Abstracts

An Analytical Investigation of Finline with Magnetized Ferrite Substrate (Short Papers)

Y. Hayashi and R. Mittra. "An Analytical Investigation of Finline with Magnetized Ferrite Substrate (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 495-498.

This paper presents an analysis of a unilateral finline printed on a magnetized ferrite substrate. The network analysis method is applied to derive the determinantal equation. Numerical results are presented.



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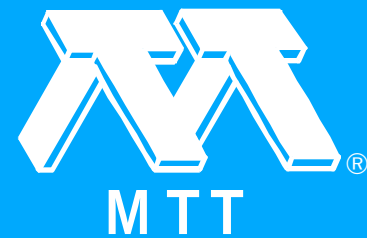


Abstracts

Propagation in Coupled Unilateral and Bilateral Finlines (Short Papers)

A.K. Sharma and W.J.R. Hoefer. "Propagation in Coupled Unilateral and Bilateral Finlines (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 498-502.

The propagation characteristics of coupled unilateral and bilateral finlines in the even and odd modes are evaluated with the hybrid-mode formulation in the spectral domain. The frequency-dependent guide wavelength is obtained from the solution of the characteristic equation. The characteristic impedance based on the power-voltage definition is also evaluated. Numerical results are presented to study the influence of various structural parameters on the characteristics of finlines.



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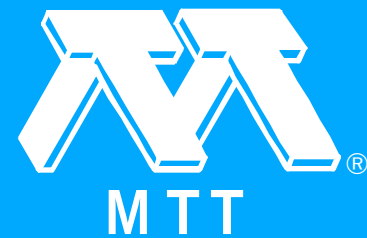


Abstracts

Integration Method of Measuring Q of the Microwave Resonators (Comments)

P.L. Overfelt and D.J. White. "Integration Method of Measuring Q of the Microwave Resonators (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 502-504.

The paper of this title suggested integrating the power transmitted through a resonator across some frequency band in the vicinity of resonance in order to determine the loaded $Q(Q_L)$; it pointed out some advantages over the common approach using the one-half power frequencies.



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Abstracts

A Quasi-Optical Polarization Duplexed Balanced Mixer for Millimeter-Wave Applications (Corrections)

K. Stephan, N. Camilleri and T. Itoh. "A Quasi-Optical Polarization Duplexed Balanced Mixer for Millimeter-Wave Applications (Corrections)." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 504-504.

In the above referenced paper, the following corrections should be made.



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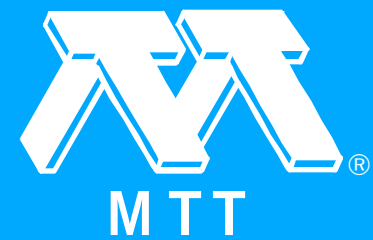
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Patent Abstracts (Jun. 1983 [T-MTT])

"Patent Abstracts (Jun. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.6 (Jun. 1983 [T-MTT]): 505-508.



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The Calibration and Performance of a Microstrip Six-Port Reflectometer

N.A. El-Deeb. "The Calibration and Performance of a Microstrip Six-Port Reflectometer." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 509-514.

The calibration and performance of a microstrip six-port reflectometer consisting of only one six-port coupler is discussed. The positions of the centers of the impedance-locating circles are determined from the calibration constants and their frequency behavior is illustrated. The results of measuring some terminations by the reflectometer and two HP network analyzers are compared within the frequency range from 0.5 GHz to 8 GHz. From this comparison the useful bandwidth of the reflectometer is found to be from 0.5 GHz to 5.5 GHz.

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A Moment Solution for Waveguide Junction Problems

H. Auda and R.F. Harrington. "A Moment Solution for Waveguide Junction Problems." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 515-520.

A moment procedure for solving waveguide junction problems is given using the generalized network formulation for aperture problems. As an illustration, the procedure is applied to a transverse planar junction between two uniform cylindrical waveguides. The generalized admittance network representation of the junction is first obtained. Its scattering matrix representation is then deduced from the former representation. A discussion shows that the conservation of complex power technique, which handles the same class of junctions, is, a specialization of the moment procedure.

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Dielectrically Loaded Corrugated Waveguide: Variational Analysis of a Nonstandard Eigenproblem

I.V. Lindell and A.H. Sihvola. "Dielectrically Loaded Corrugated Waveguide: Variational Analysis of a Nonstandard Eigenproblem." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 520-526.

Motivated by simple fabricability, the dielectrically loaded corrugated waveguide is analyzed applying the theory of nonstandard eigenvalues and variational principles recently presented by one of the authors. The eigenvalue parameter of this problem is the boundary susceptance of the corrugated surface, which choice is seen to lead to a simple functional. The functional is tested for the air-filled corrugated guide, and good accuracy for simple test functions is observed. Dispersion relation for the loaded corrugated guide is calculated together with the field pattern for quasi-balanced operation and estimates for the dielectric loss. The method presented here also appears to be applicable in other waveguide problems where inhomogeneous material is involved.

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A Proposal of a New Dielectric Resonator Construction for MIC's

Y. Shimoda, H. Tomimuro and K. Onuki. "A Proposal of a New Dielectric Resonator Construction for MIC's." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 527-532.

A compact and high-temperature-stable dielectric resonator having no shielding metal walls nor a conventional frequency tuning screw is described. This resonator consists of a high epsilon/sub r/ dielectric resonator element mounted on a low-loss dielectric mount, a dielectric disk with thin metal film fixed on the resonator element, and a microstrip line substrate on which to mount the constituents. The resonant frequency tuning is made by trimming the metal film on the disk. The TE/sub 01delta/ -mode resonant frequencies are analyzed through dielectric waveguide model application. Less than 1-percent analytical error is presented in comparison with the experimental data for a practical resonator. The frequency tuning limit by metal film trimming is about 7 percent. The unloaded Q value of 2700 at 8.8 GHz and a 4.4-ppm/deg frequency temperature coefficient are obtained.

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A Feasibility Study to Monitor Soil Moisture Content Using Microwave Signals

E. Bahar and J.D. Saylor. "A Feasibility Study to Monitor Soil Moisture Content Using Microwave Signals." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 533-541.

A buried leaky coaxial cable is used as a sensor to continuously monitor the average moisture content of irrigated soil at a desired depth. The two-phase feasibility study consists of an analytical and an experimental investigation. The modal equation in the cable is expressed in terms of the surface impedance at the inner conductor boundary and an effective surface impedance at the outer leaky conductor boundary. The effective surface impedance is related to the soil moisture content through its measured attenuation. The results of the experimental work conducted in the field are in good agreement with the analytical results. It is shown that the recorded phase difference between the test signal from the buried cable and the reference signal can be used to monitor the soil moisture content.





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Waves Guided by Conductive Strips Above a Periodically Perforated Ground Plane

B.J. Rubin and H.L. Bertoni. "Waves Guided by Conductive Strips Above a Periodically Perforated Ground Plane." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 541-549.

This paper considers the propagation of waves along an array of conductive strips situated above a periodically perforated conductive plane. Each conductor has zero thickness and finite sheet resistance, and the dielectric is homogeneous. The surface current density on the conductors is approximated by a finite number of current elements having rooftop spatial dependence. The transverse electric field is expressed in terms of the current, and the electric field boundary condition is satisfied in an integral sense over the conductors. This generates a matrix equation whose solution gives the dispersion curve relating the propagation constant to frequency, as well as the current distribution. The simulation results are used to obtain equivalent transmission-line parameters applicable to printed circuit boards found in high-performance computers. A characteristic impedance is defined and it is shown that, with proper interpretation, the uniform transmission-line equations for propagation constant and characteristic impedance apply to such computer packages. The coupling between adjacent strips is calculated, and the effect of finite resistivity discussed.

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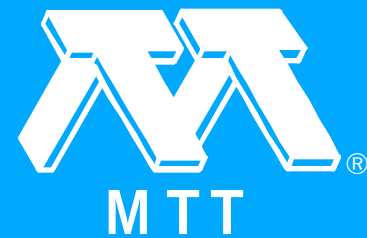


Abstracts

Substrate Optimization for Integrated Circuit Antennas (July 1983 [T-MTT])

N.G. Alexopoulos, P.B. Katehi and D.B. Rutledge. "Substrate Optimization for Integrated Circuit Antennas (July 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 550-557.

The reciprocity theorem and integral equation techniques are employed to determine the properties of integrated-circuit antennas. The effect of surface waves is considered for dipole and slot elements on substrates. The radiation and bandwidth of microstrip dipoles are optimized in terms of substrate thickness and permittivity.



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Design and Performance of Coplanar Waveguide Bandpass Filters

D.F. Williams and S.E. Schwarz. "Design and Performance of Coplanar Waveguide Bandpass Filters." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 558-566.

End-coupled resonator bandpass filters built in coplanar waveguide are investigated. The admittance inverter parameters of the coupling gaps between resonant sections are deduced from experiment, and bandpass filter design rules are developed. This allows easy filter synthesis from "prototype" low-pass designs. Measurements of single section resonator quality factors are used to predict filter insertion losses. Several examples of filters realized in coplanar waveguide are presented. Odd-mode coplanar waveguide filter elements that shortcircuit the even coplanar waveguide mode are investigated. Filter tuning, accomplished by adjusting the height of conducting planes above the resonant filter sections, is demonstrated.

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Analysis of Slow-Wave Coplanar Waveguide for Monolithic Integrated Circuits

Y. Fukuoka, Y.-C. Shih and T. Itoh. "Analysis of Slow-Wave Coplanar Waveguide for Monolithic Integrated Circuits." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 567-573.

The slow-wave characteristics of an MLS coplanar waveguide are analyzed using two different full-wave methods mode-matching and spectral-domain technique. The theoretical results obtained with them and the experimental values are in good agreement. Several important features of the MIS coplanar waveguide are presented along with some design criteria.

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Abstracts

The Electromagnetic Field of an Insulated Antenna in a Conducting or Dielectric Medium

R.W.P. King, B.S. Trembly and J.W. Strohbehn. "The Electromagnetic Field of an Insulated Antenna in a Conducting or Dielectric Medium." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 574-583.

Insulated antennas are useful for localized heating as in the hyperthermia treatment of tumors and the extraction of shale oil. The distribution of current in and the admittance of a center-driven dipole embedded in a general medium are reviewed. Formulas for the electric field generated by the currents in the dipole are derived for all points outside the antenna. Near the antenna, the field is elliptically polarized. Formulas for the polarization ellipses are derived and evaluated for antennas with electrical half-lengths $\beta L/h = \pi/4, \pi/2, \pi$, and $3\pi/2$, where $k_{\text{sub } L} = \beta_{\text{sub } L} + i\alpha_{\text{sub } L}$ is the wavenumber of the current, and this is different from the wavenumber of the ambient medium.



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Bragg Reflection Characteristics of Millimeter Waves in a Corrugated H-Guide (Short Papers)

C. Surawatpunya, M. Tsutsumi and N. Kumagai. "Bragg Reflection Characteristics of Millimeter Waves in a Corrugated H-Guide (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 584-588.

The Bragg reflection characteristics of millimeter waves in a H-guide having a corrugated dielectric slab are investigated by the perturbation method of multiple scales. Brillouin diagrams in the vicinity of the Bragg frequency of the TM-TM-, TE-TE-, and TM-TE-mode couplings are shown. Validity of the theoretical predictions are confirmed by experiments carried out in the 40-50-GHz region. Typical frequency response at the stopband resulting from TM-TM-mode coupling is stop bandwidth about 380 MHz, with return loss about 2.1 dB at the Bragg frequency 47.3 GHz.

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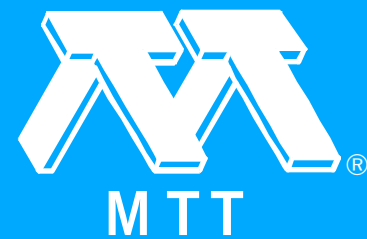


Abstracts

A Superconducting Tunnel Junction Receiver for 230 GHz (Short Papers)

E.C. Sutton. "A Superconducting Tunnel Junction Receiver for 230 GHz (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 589-592.

The performance of superconducting tunnel junctions as high-frequency receivers is discussed. Low-noise mixing in superconductor insulator-superconductor (SIS) quasi-particle tunnel junctions has been seen for frequencies up to 400 GHz. Such mixers have the significant advantage of small local-oscillator power requirements. A receiver has been constructed which has a single-sideband (SSB) receiver noise temperature of 305 K at 241 GHz.



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Design Parameters of Inhomogeneous Asymmetric Coupled Transmission Lines (Short Papers)

N.A. El-Deeb, E.A.F. Abdallah and M.B. Saleh. "Design Parameters of Inhomogeneous Asymmetric Coupled Transmission Lines (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 592-596.

The parameters of asymmetric coupled lines in an inhomogeneous medium (mode numbers and mode impedances) are derived in terms of self and mutual static capacitances of the system in the filled and empty structures. These capacitances are computed by using the network analog method. The effect of dispersion is accounted for by introducing an approximate dispersion model. A set of design curves for different geometric configurations are presented which can help in the design of couplers and filters. The obtained numerical results, taking into consideration the dispersion effect, were found to be in a good agreement with the only available published data.

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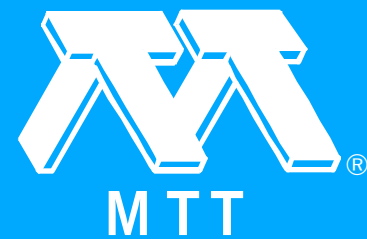


Abstracts

Microwave Characteristics of an Optically Controlled GaAs MESFET (Short Papers)

H. Mizuno. "Microwave Characteristics of an Optically Controlled GaAs MESFET (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 596-600.

This paper presents the results of an experimental investigation of microwave characteristics of a GaAs MESFET under optically direct-controlled conditions. The gain, drain current, and S-parameters were measured under various optical conditions in the frequency region from 3.0 GHz to 8.0 GHz, and it was found that they can be controlled by varying the incident light intensity in the same manner as when varying the gate bias voltage. As applications of this phenomenon, optical/microwave transformers and an optically switched amplifier were investigated.



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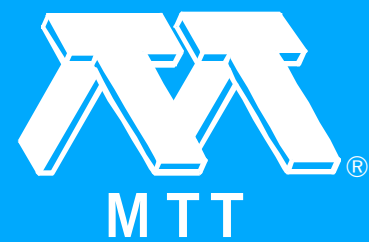
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Measured Temperature-Dependence of Attenuation Constant and Phase Velocity of a Superconducting PbAu/SiO/Pb Microstripline at 10 GHz and 30 GHz (Short Papers)

R. Popel. "Measured Temperature-Dependence of Attenuation Constant and Phase Velocity of a Superconducting PbAu/SiO/Pb Microstripline at 10 GHz and 30 GHz (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 600-604.

Measured results for the temperature dependence of the attenuation constant and phase velocity of a superconducting microstripline at 10 GHz and 30 GHz are presented here for the first time. At 9.1 GHz the attenuation constant of a PbAu/SiO/Pb microstripline with a dielectric height of 880 nm decreases from 1.6 dB/m to 0.04 dB/m going from 4.2 K to 2.0 K, while at 27.3 GHz a decrease from 2.6 dB/m to 0.09 dB/m going from 3.0 K to 1.7 K was measured. The calculated and measured temperature dependence of the phase velocity are in good agreement. The measured values for the attenuation constant together with the estimate of conductor losses from the Mattis-Bardeen theory, taking radiation losses and surface roughness into account, lead to an upper limit estimate for the loss factors of SiO.

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



Discriminator Theory (Comments)

J.R. Ashley, T.A. Barley and G.J. Rast, Jr.. "Discriminator Theory (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 605-606.

The error in our analysis detected by Knochel et al., and several other errors are acknowledged. The corrected analysis is abstracted and compared with the results by Knochel et al. Experimental verification is given for the new results. Some practical considerations regarding the implementation and use of the TEM resonator discriminator are given.

Abstracts

New View on an Anisotropic Medium in a Moving Line Charge Problem (Corrections)

M. Kobayashi. "New View on an Anisotropic Medium in a Moving Line Charge Problem (Corrections)." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 606-606.

In the above paper, the following corrections should be made.



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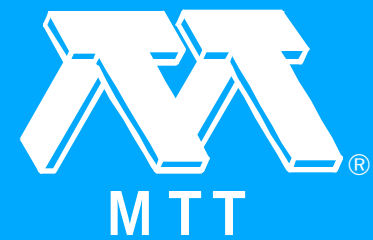
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Patent Abstracts (Jul. 1983 [T-MTT])

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Membership Application (Jul. 1983 [T-MTT])

"Membership Application (Jul. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.7 (Jul. 1983 [T-MTT]): 612-612.



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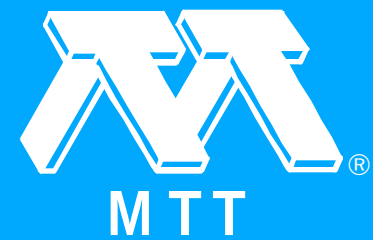
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Modulation Schemes in Low-Cost Microwave Field Sensors

P.A. Jefford and M.J. Howes. "Modulation Schemes in Low-Cost Microwave Field Sensors." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 613-624.

The use of modulation schemes in short-range microwave field sensors are discussed and in particular the ideas are applied to low-cost self-detecting doppler sensors based on a two-terminal negative resistance diode oscillator which acts as a load variation detector. FM-CW and pulse modulation techniques are described which can lead to improved performance in these sensors, and experimental results of bias modulation, varactor modulation, and pulsed operation of transferred-electron oscillators are presented. Modulation techniques can be applied in order to eliminate false alarms due to unwanted targets by enabling the doppler sensor to measure or discriminate target range, and the potential merits of different schemes based on frequency modulation with linear and sinusoidal modulation patterns are explored. A novel environmental profiling technique is proposed which exploits the response of frequency-modulated sensors to multiple stationary targets for use in a versatile short-range surveillance system employing digital processing techniques. The mechanism of pulsed operation in self-detecting sensors is described, and the effects of temperature variations in the active device, which result in frequency chirp, are considered. The technique of extracting the doppler signal from the pulsed bias current using a pulse cancellation circuit is demonstrated, and the effects of bias current changes during the pulse (due to temperature variations) on the use of this type of circuit are discussed.

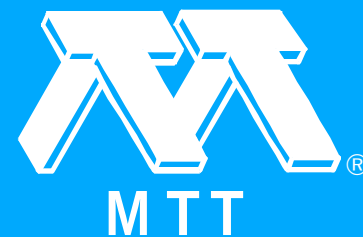


Abstracts

Measurement and Modeling of the Apparent Characteristic Impedance of Microstrip

W.J. Getsinger. "Measurement and Modeling of the Apparent Characteristic Impedance of Microstrip." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 624-632.

Voltage and current cannot be defined uniquely for microstrip except at zero frequency, and therefore microstrip has not been rigorously incorporated into circuit theory. However, in engineering practice, micro-strip exhibits an apparent characteristic impedance, denoted here by Z_A , that can be measured. Three methods of measuring Z_A were devised and used in measuring three impedance levels of microstrip. These methods are described and experimental results presented. The measurements of Z_A were found to be consistent with the power-current characteristic impedance definition of the approximate longitudinal-section electric (LSE) model of microstrip. Simple approximate formulas for representing Z_A are also discussed.



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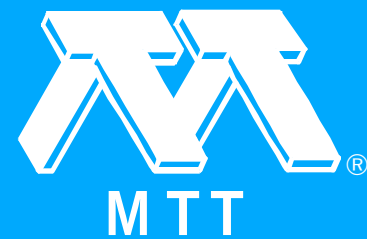


Abstracts

An Analytic Approach to Optimum Oscillator Design Using S-Parameters

R.J. Gilmore and F.J. Rosenbaum. "An Analytic Approach to Optimum Oscillator Design Using S-Parameters." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 633-639.

An analytic approach to the design of microwave FET oscillators for maximum power output into a given load is presented. By the use of FET S-parameters, characterized as a function of incident input powers, design information can be obtained for any standard topology. By means of this technique, an experimental 5.3-GHz oscillator has been demonstrated which delivers 245 mW at 35-percent efficiency into a 50- Ω load.



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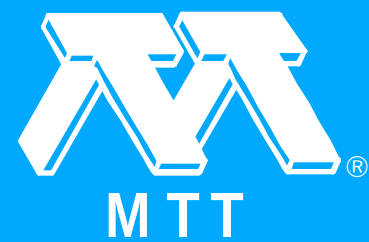
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An Iterative Extended Boundary Condition Method for Solving the Absorption Characteristics of Lossy Dielectric Objects of Large Aspect Ratios

A. Lakhtakia, M.F. Iskander and C.H. Durney. "An Iterative Extended Boundary Condition Method for Solving the Absorption Characteristics of Lossy Dielectric Objects of Large Aspect Ratios." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 640-647.

The recently developed iterative extended boundary condition method (IEBCM) has been used to compute the internal fields induced in homogeneous, axisymmetric, lossy dielectric objects of large aspect ratios when exposed to incident planewave radiation. Calculations were made for both the E- and k-polarization cases. The computed results for a prolate spheroidal model of an average man are found to be accurate for frequencies up to 300 MHz, while the use of the popular EBCM was found to be essentially restricted to frequencies less than 70 MHz for these models and exposure conditions. The applicability of the IEBCM to composite bodies has also been examined by studying the irradiation of a capped cylindrical object. This composite object was first partitioned into several overlapping spherical subregions, and, alternatively, into two spherical subregions overlapping with a central cylindrical subregion. Spherical harmonics were used to represent the internal fields in the spherical subregions, while cylindrical expansions were utilized in the cylindrical subregions. It is shown that the second partitioning scheme is more computationally efficient and thereby suggests that the basis functions used to represent the subregional fields should be compatible with the subregional geometry. The new IEBCM, therefore, is a very valuable procedure which provides the opportunity of using the mixed basis functions in the solution.

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Coupling Characteristics of Nonradiative Dielectric Waveguides

T. Yoneyama, N. Tozawa and S. Nishida. "Coupling Characteristics of Nonradiative Dielectric Waveguides." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 648-654.

An analytical method is presented for predicting coupling characteristics of dielectric strips in the nonradiative dielectric waveguide. Starting with an approximate but very accurate expression for the coupling coefficient between parallel dielectric strips, the scattering coefficients for nonuniform coupling structures are derived in simple closed-form expressions by taking the effect of the field deformation at the curved sections into account. The coupling coefficient of the nonradiative dielectric waveguide is found to be so large compared to those of other dielectric waveguides that complete power transfer can be attained with coupled polystyrene bends having a curvature radius as small as 20 mm at 50 GHz. The theory was verified experimentally for various coupling structures. As an application toward millimeter-wave integrated circuits, 0-dB couplers, quadrature hybrid couplers, and an in-phase power divider were constructed based on the present analysis. A comparison of theory and experimental data of these fabricated coupling circuits suggests that the effect of the nondegenerate modes in the straight and curved guides must be included in the analysis to further improve the theory.

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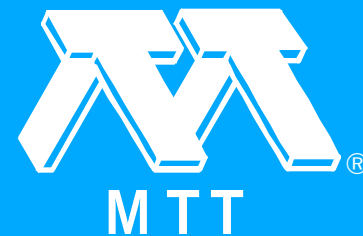


Abstracts

A Compact Septum Polarizer

N.C. Albertsen and P. Skov-Madsen. "A Compact Septum Polarizer." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 654-660.

A waveguide polarizer with resonant notches in a septum is investigated. The Wiener-Hopf techniques employed to derive theoretical design data and the results are compared to experiments for a single-notch and a double-notch design. It is concluded that the agreement is good and the design useful for narrowband applications.



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On Noise in Distributed Amplifiers at Microwave Frequencies

K.B. Niclas and B.A. Tucker. "On Noise in Distributed Amplifiers at Microwave Frequencies." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 661-668.

Formulas for the noise figure, and the minimum noise figure of a multi-link distributed amplifier have been developed. In addition, a relatively simple approximation formula has been devised that predicts the minimum noise figure of a practical amplifier design with good accuracy up to frequencies of 9 GHz. Finally, after the dependence of the noise characteristics on the circuit parameters is discussed, the noise figures of a 2--18-GHz three-link module are computed and compared with those measured on an actual amplifier. The measured data across the 2--18-GHz band compare favorably with the computed results. Measurements and theory agree that only small improvements in noise figure may be achieved, when noise matching the module's input impedance.

Abstracts

Scattering Matrix Description of Microwave Resonators (Short Papers)

B.A. Galwas. "Scattering Matrix Description of Microwave Resonators (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 669-671.

In this paper an analysis of the scattering matrix coefficients (reflectance and transmittances) of the microwave resonators is presented. Two general cases of resonator couplings are considered. One of them is a multiport with one port terminated by the resonator, the other is a resonator coupled, in various ways, to a number of transmission lines. The effect of external circuits on the Q and resonant frequency of the resonator has also been examined. Fundamental parameters for the commonly used microwave resonator couplings are shown in Table L



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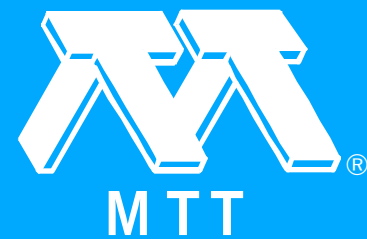


Abstracts

Performance of Microstrip Couplers on an Anisotropic Substrate with an Isotropic Superstrate (Short Papers)

N.G. Alexopoulos and S.A. Maas. "Performance of Microstrip Couplers on an Anisotropic Substrate with an Isotropic Superstrate (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 671-674.

The directivity of microstrip couplers on anisotropic substrates can be improved substantially by adding an isotropic superstrata layer above the microstrips. The necessary dimensions of the layer can be chosen so that fabrication is simple and noncritical.



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Optimum Design of 3-dB Branch-Line Couplers Using Microstrip Lines (Short Papers)

M. Muraguchi, T. Yukitake and Y. Naito. "Optimum Design of 3-dB Branch-Line Couplers Using Microstrip Lines (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 674-678.

A computer-aided design is described that makes it possible to reduce the internal impedance levels of branch-line couplers so that they may be physically constructed by microstrip lines, where the Fletcher-Powell search method has been used to optimize the design. Because microstrip lines are severely restricted in their usable impedance range, the 3-dB couplers presented here should be useful for numerous balanced-type components such as balanced mixers. The validity of the design has been experimentally verified in the microwave and millimeter-wave region.

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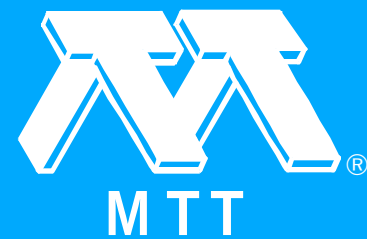


Abstracts

Characteristic Impedance of an Oval Located Symmetrically Between the Ground Planes of Finite Width (Short Papers)

K.V.S. Rao, B.N. Das and A.K. Mallick. "Characteristic Impedance of an Oval Located Symmetrically Between the Ground Planes of Finite Width (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 678-681.

A conformal transformation for the analysis of a transmission line with an oval-shaped center conductor symmetrically placed between two finite ground planes is developed. The formulation is used to calculate the characteristic impedances of oval, elliptic, circular, and planar conductors placed midway between the finite ground planes. The results on impedance are presented for various values of ground plane width to spacing ratios.



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Abstracts

Spectral Domain Analysis of Interacting Microstrip Resonant Structures (Short Papers)

A.K. Sharma and B. Bhat. "Spectral Domain Analysis of Interacting Microstrip Resonant Structures (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 681-685.

An analysis of the interacting microstrip resonant structures, namely, the half-wave coupled and the quarter-wave coupled rectangular microstrip resonators is performed with the hybrid-mode formulation of the spectral domain technique. The resonant frequencies in the even and odd resonance modes are evaluated from the numerical solution of the characteristic equation. Results agree within ± 1.5 percent of the experimental values.



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Abstracts

An Accurate Bivariate Formulation for Computer-Aided Design of Circuits Including Microstrip (Short Papers)

Y.L. Chua, J.B. Davies and D. Mirshekar-Syahkal. "An Accurate Bivariate Formulation for Computer-Aided Design of Circuits Including Microstrip (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 685-687.

An accurate and fast bivariate interpolation technique is used to compute the microstrip parameters at an arbitrary frequency and of any strip width. This technique allows computation of the effective dielectric constant, characteristic impedance, dielectric loss, and the conductor loss of microstrip in a time appropriate for computer-aided design application. By combining interpolation techniques with a highly accurate theory, computing is more accurate or faster than earlier theories, which achieve speed of computation by a priori approximations.



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Abstracts

A Technique for Measuring the Effective Dielectric Constant of a Microstrip Line (Short Papers)

S. Hubbell and D.J. Angelakos. "A Technique for Measuring the Effective Dielectric Constant of a Microstrip Line (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.8 (Aug. 1983 [T-MTT]): 687-688.

A method is discussed by which the effective dielectric constant of a transmission line of complex cross section is determined experimentally.



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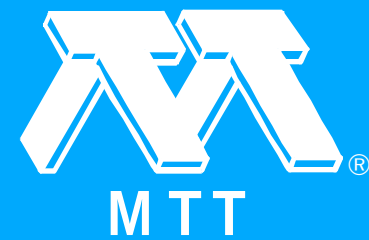
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Abstracts

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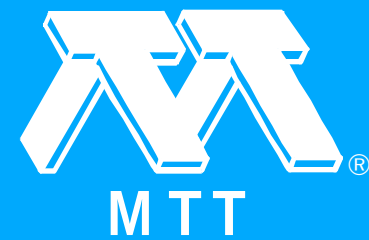
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Abstracts

IEEE Open Order Plan (Advertisement) (Aug. 1983 [T-MTT])

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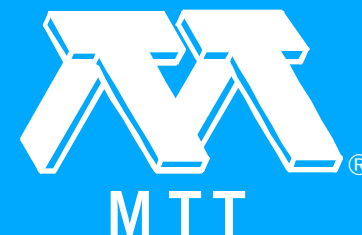
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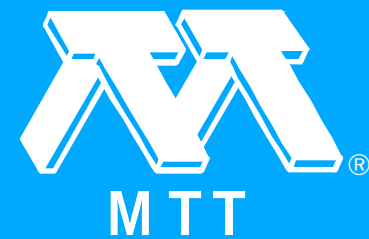
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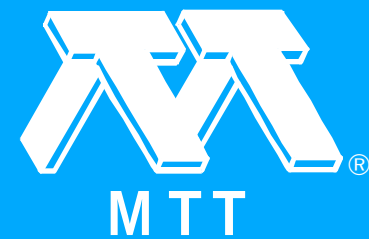
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Abstracts

Miniaturized Coaxial Resonator Partially Loaded with High-Dielectric-Constant Microwave Ceramics

S. Yamashita and M. Makimoto. "Miniaturized Coaxial Resonator Partially Loaded with High-Dielectric-Constant Microwave Ceramics." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 697-703.

A partially dielectric-filled stepped impedance resonator (PDSIR) is introduced as a class of a miniaturized coaxial resonator. The length of this resonator is less than that of a fully dielectric-filled quarter-wavelength resonator. The conditions for obtaining resonance with a high dielectric constant of $\epsilon_r = 35$ or 85 , sensitivity analysis, and temperature drift of the resonant frequency, are described. The spurious response, in which the characteristics are better than for a conventional quarter-wavelength resonator, is also analyzed.



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Electromagnetic-Wave Propagation in a Conducting Waveguide Loaded with a Tape Helix

H.S. Uhm. "Electromagnetic-Wave Propagation in a Conducting Waveguide Loaded with a Tape Helix." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 704-710.

Dispersion properties of the electromagnetic (EM) waves, propagating through a tape helix located inside a waveguide, are investigated. A complete dispersion relation for the eigenfrequency ω and the axial wavenumber κ is obtained, including influence of the outer conducting wall on the EM-wave propagation. It is shown that the limiting case where the outer conducting wall is very close to the helix, the helix mode is nearly a straight line in the (ω , κ) parameter space, and is independent of the width of the helix tape. Moreover, contrary to the conventional helix theory, the outer conducting wall completely eliminates the forbidden regions in the (ω , κ) parameter space.

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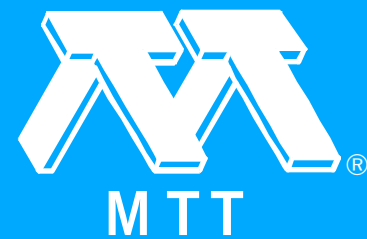


Abstracts

Mode-Specific Reflectometry in a Multimode Waveguide

D.S. Stone, K.L. Felch and S.T. Spang. "Mode-Specific Reflectometry in a Multimode Waveguide." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 710-718.

A technique for measuring the voltage-standing-wave ratio (VSWR) created by a mismatch for a specific mode in a multimode waveguide is described. A heavily loaded resonant cavity is used to launch the mode of interest and the variation in the cavity loaded Q is noted as the phase separation of the cavity and the mismatch is varied. The bandwidth of this technique is generally about 0.03 percent and VSWR as low as 1.05:1 may be measured accurately. Mode-specific VSWR measurements are of particular interest in analyzing the performance of multimode waveguide components, and in optimizing multimode networks. The measurement technique may be used, for example, in the design and optimization of transmission lines for electron cyclotron resonance heating systems in magnetic fusion devices.



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Abstracts

On the Problem of Applying Mode-Matching Techniques in Analyzing Conical Waveguide Discontinuities

G.L. James. "On the Problem of Applying Mode-Matching Techniques in Analyzing Conical Waveguide Discontinuities." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 718-723.

Mode-matching techniques in the past have been successfully used to analyze rectangular and circular waveguide problems involving transverse discontinuities. The extension of this method to conical waveguide discontinuities is shown to exhibit difficulties of convergence caused by the behavior of the cutoff conical modes. To illustrate the problem, the junction of a smooth-walled cylindrical waveguide with a corrugated conical horn is discussed in some detail.



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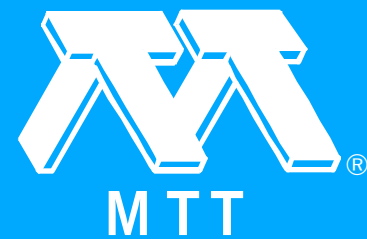


Abstracts

Numerical Steady-State Analysis of Nonlinear Microwave Circuits with Periodic Excitation

C. Camacho-Penalosa. "Numerical Steady-State Analysis of Nonlinear Microwave Circuits with Periodic Excitation." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 724-730.

A new method for determining the steady-state response of nonlinear microwave circuits with periodic excitation is proposed. The method minimizes time-domain calculations by introducing a criterion for selecting the variables to be considered as unknowns and for solving the resulting nonlinear system by a new and efficient algorithm. It has exhibited the capability for handling a large number of harmonics and nonlinearities. To illustrate the generality and usefulness of the method, a pumped diode and a MESFET frequency doubler are analyzed.



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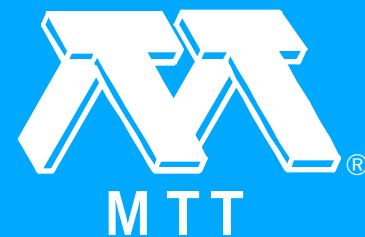


Abstracts

A 3M-Device Cavity-Type Power Combiner

M. Madihian and S. Mizushina. "A 3M-Device Cavity-Type Power Combiner." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 731-736.

This paper describes a new class of combiners which combine the powers from 3M ($M = 1, 2, \dots$) active devices by coupling them to both magnetic and electric fields inside a rectangular waveguide cavity. The structure employs coaxial lines and probes for magnetic and electric coupling, respectively. Up to 18 Gunn diodes have been combined with combining efficiencies higher than 96 percent at X-band. The operation of all combiners was stable and neither spurious oscillations nor jump phenomena were observed. An eigenfunction approach is used to analyze the operating principles of the combiner network systematically. A description is given to operate the circuit under optimum conditions.



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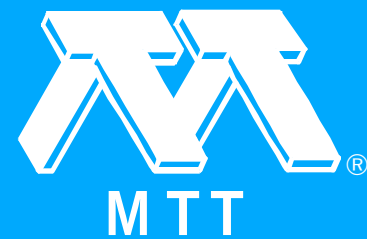


Abstracts

Transversely Anisotropic Optical Fibers: Variational Analysis of a Nonstandard Eigenproblem

I.V. Lindell and M.I. Oksanen. "Transversely Anisotropic Optical Fibers: Variational Analysis of a Nonstandard Eigenproblem." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 736-745.

The variational principle for nonstandard eigenvalue problems, recently reported by one of the authors, is applied for the study of guided-wave propagation in an anisotropic dielectric waveguide. A stationary functional is derived for the general dielectric waveguide with transverse anisotropy. The functional is tested for the well-known case of an isotropic step-index single-mode fiber. It is seen that for simple trial functions with only two parameters, a good accuracy is obtained. For two types of transversely anisotropic step-index fibers, relations between the propagation factor, anisotropy parameter, dielectric parameter, and frequency are calculated. The functional does not assume weak guidance condition nor perturbational anisotropy and, hence, is also applicable for other dielectric waveguides. In this application, only a modest computer or a programmable calculator is needed. Moreover, the spurious modes causing confusion in the finite-element method of calculation do not appear with the present method.



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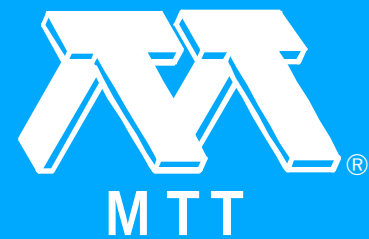
An Implantable Electric-Field Probe of Submillimeter Dimensions

T.E. Batchman and G. Gimpelson. "An Implantable Electric-Field Probe of Submillimeter Dimensions." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 745-751.

Many areas of biological research await the development of practical electric (E)-field probes with submillimeter dimensions for in situ measurements of RF electromagnetic fields. This paper reports on the design, fabrication, and testing of such a probe. The probe consists of a 0.6-mm dipole antenna zero-bias Schottky barrier diode and a unique highly resistive output lead structure. Experimental results indicate the probe does not perturb the field under investigation and is linear over a range of field strengths from less than 60 to over 1200 V/m. The probe has been designed so as to be independent of the media in which measurements are being made.

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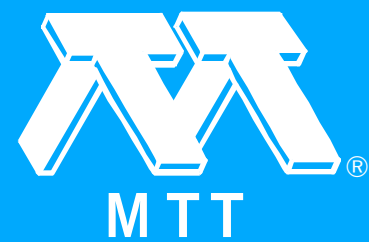
Passbands and Stopbands for an Electromagnetic Waveguide with a Periodically Varying Cross Section

A. Bostrom. "Passbands and Stopbands for an Electromagnetic Waveguide with a Periodically Varying Cross Section." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 752-756.

Electromagnetic waves in a rotationally symmetric and perfectly conducting waveguide with a periodically varying cross section are considered. Using the null field (T matrix) approach, a rather complicated determinantal condition for computing the axial wavenumber is derived. For a waveguide where the radius varies sinusoidally with the axial coordinate, the passbands and stopbands for the TE/sub 11/, TM/sub 11/, and TE/sub 12/ modes are numerically computed. When the axial wavenumbers of two modes differ by a multiple of the wavenumber of the wall corrugations, the result is a stopband in the following cases for two TE modes propagating in opposite directions, for a TE and a TM mode in the same direction, and sometimes for two TM modes in opposite directions.

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Microwave Automatic Impedance Measuring Schemes Using Three Fixed Probes

C.-L.J. Hu. "Microwave Automatic Impedance Measuring Schemes Using Three Fixed Probes." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 756-762.

Following a previous article reporting a general theory and a new approach using multiple probes to measure the complex impedance of an unknown microwave load, this article describes a simplified, but improved, design derived from that general theory. A simple analog dc signal processor was built according to this design and preliminary experiments were carried out to check the performance of the system. Real time oscilloscope displays showing the complex reflection coefficients of some standard loads and some time-varying loads were recorded. The performance of this system was checked against that of the standard traveling probe technique. The maximum disagreement between the two methods is about 5 percent in amplitude and 7° in phase. A special dc signal processor-the display rotator-was used in the system. The purpose, the design, and the performance of this rotator circuit are discussed in detail. Although the present experiments are restricted to fixed-frequency-automatic measurements, the system is seen to be easily generalized to step-frequency measurements as well. The latter can be used to record automatically the complex impedance spectrum of an unknown microwave load when the frequency is changed. Component imperfections that may affect the system accuracy and comparison of the present system with other automatic measuring systems are discussed.

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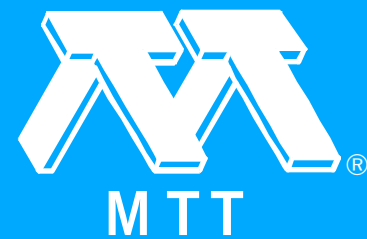


Abstracts

A General-Purpose Program for Nonlinear Microwave Circuit Design

V. Rizzoli, A. Lipparini and E. Marazzi. "A General-Purpose Program for Nonlinear Microwave Circuit Design." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 762-770.

The paper describes the basic philosophy and the general structure of a user-oriented program package capable of designing broad classes of nonlinear microwave subsystems. Some of the peculiar aspects of the nonlinear design problem and the computer solutions adopted are discussed in detail. The application to a practical medium-power oscillator shows that the program is numerically efficient and yields well-defined and accurate results. Furthermore it provides full coverage of several aspects of circuit performance that were previously treated by empirical approaches, such as detailed effects of higher harmonics, active device operating temperatures, and circuit regulations.



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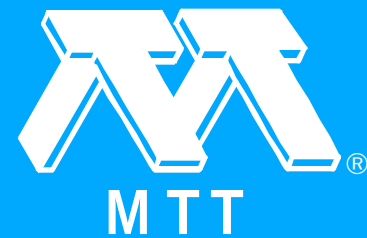


Abstracts

Higher Order Modes in Square Coaxial Lines (Short Papers)

L. Gruner. "Higher Order Modes in Square Coaxial Lines (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 770-772.

The cutoff frequencies of higher order modes in square coaxial lines are presented and compared with those of circular coaxial lines having the same mean circumference. It is noted that while the characteristics of the dominant TE/sub 10/ mode and the next TE/sub 11/ mode in the square line differ but little from those of their circular counterparts, the same conclusions do not hold in general for the remainder of the mode spectrum.



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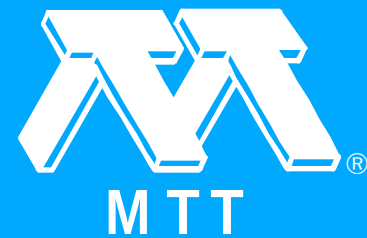


Abstracts

The Resonant Frequency of Rectangular Interdigital Filter Elements (Short Papers)

J.H. Cloete. "The Resonant Frequency of Rectangular Interdigital Filter Elements (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 772-774.

A procedure is given for the computation of the resonant frequency of loosely coupled interdigital resonators with rectangular cross section. The procedure is based on the use of Getsinger's fringing capacitance data. The accuracy of the method was verified experimentally and found to be approximately 1 percent for a 2-percent bandwidth interdigital linear-phase filter.



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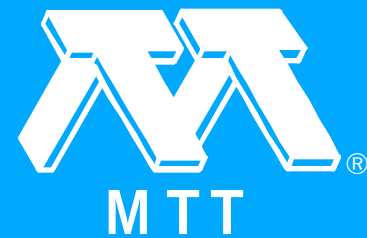


Abstracts

A Design Method for Noncommensurate Broad-Band Matching Networks (Short Papers)

D.A.E. Blomfield, A.G. Williamson and B. Egan. "A Design Method for Noncommensurate Broad-Band Matching Networks (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 774-776.

A simple design method for broad-band ladder network impedance transformers having noncommensurate section lengths and predictable passband response is presented. Limitations on section impedances imposed by constructional constraints are more easily met than with commensurate networks, and harmonically related passbands are largely avoided. An example is presented.



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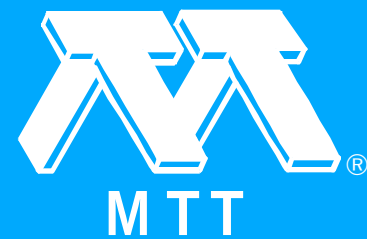


Abstracts

Design Consideration for High-Isolation Coaxial Broad-Band p-i-n Diode Switches and Limiters (Short Papers)

B.K. Sarkar. "Design Consideration for High-Isolation Coaxial Broad-Band p-i-n Diode Switches and Limiters (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 776-777.

Broad-band coaxial p-i-n diode switches and limiters are realized using a low-pass filter structure in which shunt capacitances are realized by the capacitances of reverse- or zero-biased p-i-n diodes. Usually, the design considerations are given only for insertion-loss state. No design guideline exists in the literature to optimize isolation for these type of switches and limiters. This paper shows that using low-pass filter structure with series inductance as the first element, higher isolation without increasing insertion loss can be achieved.



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On the Possible Use of Microwave-Active Imaging for Remote Thermal Sensing (Short Papers)

J.C. Bolomey, L. Jofre and G. Peronnet. "On the Possible Use of Microwave-Active Imaging for Remote Thermal Sensing (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 777-781.

Recent results have demonstrated the feasibility of quasi-real-time, active as well as harmless microwave imaging for biomedical purposes. Such a process allows tomographic reconstructions based on differences in the complex permittivity of tissues, the temperature dependence of which can be used for remote thermal sensing. A basic experiment conducted in water at 3-GHz yielded information on spatial resolution and temperature sensitivity. Discussion is devoted to potential capabilities and limitations of this remote-sensing approach in more complicated situations.



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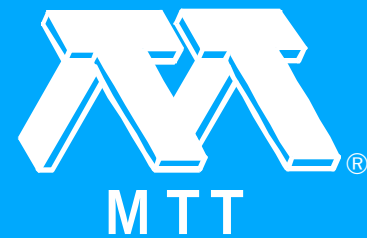


Abstracts

On the Transient Analysis of Circuits Containing Multiple Diodes (Short Papers)

P.A. Blakey and R.K. Froelich. "On the Transient Analysis of Circuits Containing Multiple Diodes (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 781-783.

Multiple-diode circuits are increasingly being used for power combining at microwave frequencies. This paper presents a method for the transient analysis of such circuits. The method exploits the cold-capacitance-particle-current decomposition of semiconductor diodes and is simpler, more efficient, and more accurate than previously proposed approaches to the problem.



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Abstracts

Heat Transfer in Surface-Cooled Objects Subject to Microwave Heating (Comments)

T.C. Guo, W.W. Guo, L.E. Larsen and J.H. Jacobi. "Heat Transfer in Surface-Cooled Objects Subject to Microwave Heating (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 783-785.

In the above paper, Foster et al. derived the following equation for the temperature T^* at the center of a spherical tissue.



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Hollow Image Guide and Overlayed Image Guide Coupler (Comments)

A. Prieto, E. Rubio, J. Rodriguez and J.L. Garcia. "Hollow Image Guide and Overlayed Image Guide Coupler (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 785-786.

The authors of the above paper failed to acknowledge several publications dedicated to the same subject. The so-called hollow image guide has already been studied by the E.D.C. method with the name of pi guide, as well as another dielectric structure named T guide. The same paper shows a good agreement between the theoretical and the experimental results which were measured by means of a movable electric field probe with the end of the dielectric waveguides finished in a short circuit.

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Abstracts

Variational Methods for Nonstandard Eigenvalue Problems in Waveguide and Resonator Analysis (Comments)

G.J. Gabriel. "Variational Methods for Nonstandard Eigenvalue Problems in Waveguide and Resonator Analysis (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 786-789.

In his recent work, Linden proposes variational methods for so-called nonstandard eigenvalue problems with sweeping generalities. To be sure, unorthodox formulations and solution of broad classes of problems ought to be encouraged, provided that they are consistent and that they are cogently demonstrated to offer significant improvement over existing knowledge.



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"Patent Abstracts (Sep. 1983, Part I [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]): 790-793.



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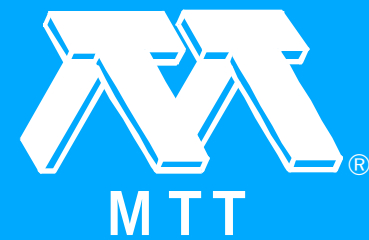
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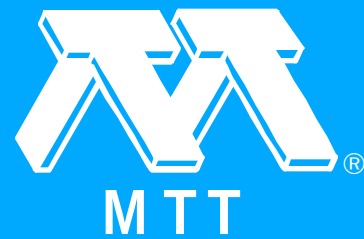
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American National Standard Metric Practice (Advertisement) (Sep. 1983, Part I [T-MTT])

"American National Standard Metric Practice (Advertisement) (Sep. 1983, Part I [T-MTT])."
1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part I [T-MTT]):
795-795.



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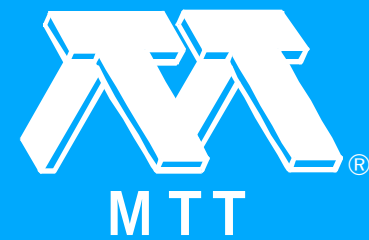
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*"IEEE Annual Combined Index (Advertisement) (Sep. 1983, Part I [T-MTT])." 1983
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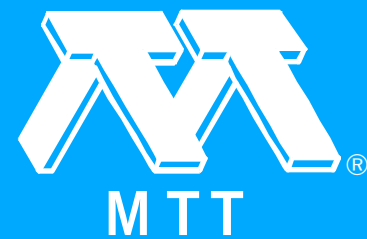


Abstracts

Editor's Preface (Sep. 1983, Part II [T-MTT])

P. Staecker. "Editor's Preface (Sep. 1983, Part II [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part II [T-MTT] (1952-1983 Cumulative Index)): 1-1.

Together with the 28-year MTT Transactions Index published in June 1981, this index of MTT-Symposia papers completes, at least for the present time, the task of presenting a complete bibliography of papers to what is known today as the Microwave Theory and Techniques Society. These indices are presented as a service to the members of MTT-S and will be updated and possibly combined in future years, allowing microwave practitioners easy access to their technical roots.



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The MTT Symposia (Sep. 1983, Part II [T-MTT])

T.S. Saad. "The MTT Symposia (Sep. 1983, Part II [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part II [T-MTT] (1952-1983 Cumulative Index)): 2-15.

The first Symposium sponsored and financed by, and designated as the Annual Meeting of the Professional Group on Microwave Theory and Techniques of the Institute of Radio Engineers, was held at the Western Union Auditorium in New York City on May 9 and 10, 1957. However, from the formation of the PGMTT in the spring of 1952 to that first official Symposium, several technical meetings sponsored in whole or in part by the PGMTT were held and they should be mentioned for the sake of completeness.



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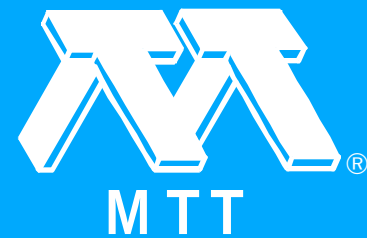
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"1952-1983 Cumulative Index - Guide to the Index (Sep. 1983, Part II [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part II [T-MTT] (1952-1983 Cumulative Index)): 16-16.



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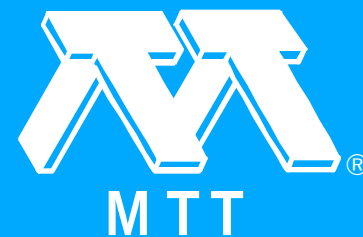
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"Index of Authors, Cumulative, 1952-1983 (Sep. 1983, Part II [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part II [T-MTT] (1952-1983 Cumulative Index)): 17-57.



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"Index of Subjects, Cumulative, 1952-1983 (Sep. 1983, Part II [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.9 (Sep. 1983, Part II [T-MTT] (1952-1983 Cumulative Index)): 58-138.



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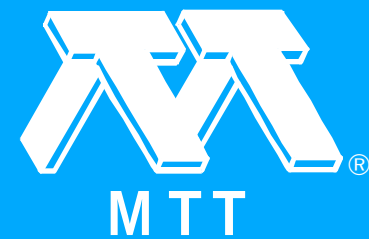
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Nonlinear Theory of Parametric Oscillator: Steady-State Operation and Fluctuation Analysis

R. Cazzola, G.P. Poncino, E. Bava, A. Godone and G.P. Bava. "Nonlinear Theory of Parametric Oscillator: Steady-State Operation and Fluctuation Analysis." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 797-805.

Parametric oscillators with a superconducting output cavity are of great interest as sources of very high frequency stability. In this paper, a careful analysis is performed for a parametric oscillator model based on an abrupt junction varactor with fixed-bias voltage and ideal shunt mode operation. Steady-state operation, transfer functions for amplitude and phase fluctuations, and additive noise contributions are examined. An overall estimation of system performance as regards to the phase instabilities shows that although the foreseen characteristics are less outstanding than expected from a previously reported analysis, this device compares favorably with the most important available sources based on atomic transitions or on superconducting cavity-stabilized oscillators.

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Single-Post Inductive Obstacle in Rectangular Waveguide

Y. Leviatan, P.G. Li, A.T. Adams and J. Perini. "Single-Post Inductive Obstacle in Rectangular Waveguide." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 806-812.

A rapidly converging moment solution for electromagnetic scattering by a single inductive post in a rectangular waveguide is obtained. The numerical results show good agreement with Marcuvitz's data as far as this data goes. Furthermore, Marcuvitz's curves are extended to cover data for large posts. This new data should allow one to design a simply constructed new type of narrow bandpass filter, namely, a filter consisting of large single posts. The successful use of this straightforward moment solution in solving the single-post problem suggests that this technique should prove useful in solving a variety of microwave discontinuities such as those involving thin or thick irises and posts of arbitrary shape.

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Optical Control of GaAs MESFET's

A.A.A. de Salles. "Optical Control of GaAs MESFET's." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 812-820.

Theoretical and experimental work for the performance of GaAs MESFET's under illumination from light of photon energy greater than the bandgap of the semiconductor is described. A simple model to estimate the effects of light on the dc and RF properties of MESFET'S is presented. Photoconductive and photovoltaic effects in the active channel and substrate are considered to predict the change in the dc equivalent circuit parameters of the FET, and from these the new Y- and S-parameters under illumination are calculated. Comparisons with the measured S-parameter's without and under illumination show very close agreement. Optical techniques can be used to control the gain of an FET amplifier and the frequency of an FET oscillator. Experimental results are presented showing that the gain of amplifiers can be varied up to around 20 dB and that the frequency of oscillators can be varied (tuning) around 10 percent when the optical absorbed power in the active region of the FET is varied by a few microwatts. When the laser beam is amplitude-modulated to a frequency close to the free-running FET oscillation frequency, optical injection locking can occur. An analytical expression to estimate the locking range is presented. This shows a fair agreement with the experiments. Some suggestions to improve the optical locking range are presented.

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Balance Quality Measurements on Baluns

O.M. Woodward and S.M. Perlow. "Balance Quality Measurements on Baluns." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 821-824.

Two different methods of measuring the balance quality of baluns are described. Section I describes the balance comparator, a mechanical test device requiring only a signal source, and receiver to perform the measurements on the test balun. Section II describes the use of a network analyzer, computer controlled to plot out all the graphical data on the balun measurements. Measurements on a balun having known balance characteristics show both methods obtain satisfactory balance data.

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A Study of the Filter Properties of Single and Parallel-Coupled Dielectric-Waveguide Gratings

G.L. Matthaei, D.C. Park, Y.M. Kim and D.L. Johnson. "A Study of the Filter Properties of Single and Parallel-Coupled Dielectric-Waveguide Gratings." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 825-835.

Our work with gratings in dielectric image guide shows that it is distinctly advantageous to place the grating notches on the sides of the guide, or on the top of the guide, depending on the mode used. Means are discussed for modeling gratings using an equal-line-length transmission-line equivalent circuit. Excellent agreement between computed and measured bandstop frequency responses of gratings are obtained. Design relations for gratings are presented, and equations for analysis and design of parallel-coupled grating structures are derived. It is shown that a simple bandpass filter can be made from properly designed parallel-coupled gratings with distributed loads at one end. It is also shown that by use of combinations of parallel-coupled and direct-coupled gratings, multiresonator filters with Chebyshev or other characteristics can be obtained. Experimental results in agreement with computed responses are demonstrated.

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Optimum Sectional Shape of Dominant Mode Waveguide

M. Suzuki and T. Hosono. "Optimum Sectional Shape of Dominant Mode Waveguide." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 836-841.

Approximating the cross section of a waveguide by a truncated Fourier series and using the finite element method (FEM), together with the quasi-Newton optimization method, the optimum cross section of the dominant mode waveguide which has minimum conductor loss is obtained. We take the attenuation constant at the cutoff frequency of the second higher mode as the index of good quality. This index simplifies the computation and gives a unique solution. The obtained optimum cross section is a kind of cigar shape. The Fourier series converges quite quickly, supporting the reliability of the numerical results. This optimum cross section gives 9.4-percent smaller conductor loss than, and the same frequency bandwidth as, the standard rectangular cross section. The theoretical results are confirmed by measurements.

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An Accurate Approximation of the Impedance of a Circular Cylinder Concentric with an External Square Tube (Short Papers)

H.J. Riblet. "An Accurate Approximation of the Impedance of a Circular Cylinder Concentric with an External Square Tube (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 841-844.

The problem of determining the characteristic impedance of a concentric coaxial transmission line having a circular inner conductor and a square outer conductor is reexamined. The Green's function for a rectangle is used to determine the geometrical capacitance of a series of structures ranging from 1-46 Ω with an error less than 10^{-5} . The method of analysis is illustrated in detail for the 1- Ω case. The results are presented in terms of the "outer shield factor" R_{eff} , which is defined as the ratio of the diameter of an outer circle, having the same capacitance as the outer square, to the side of the outer square. Values of this ratio are tabulated for impedances ranging from 1-46 Ω . These values are also plotted on a curve which can be read with an error of the order of 0.02 Ω for impedances greater than 3 Ω .

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Theoretical and Experimental Study of the Resonant Frequency of a Cylindrical Dielectric Resonator (Short Papers)

D. Maystre, P. Vincent and J.C. Mage. "Theoretical and Experimental Study of the Resonant Frequency of a Cylindrical Dielectric Resonator (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 844-848.

A rigorous modal method is described for calculating the resonant frequencies of a circular cylindrical dielectric rod placed between two perfectly conducting plates. Comparisons of the numerical results with those obtained from another rigorous theory developed at the same time by one of the authors show an accuracy better than 10^{-4} . Comparison with experimental data shows generally a very good agreement.

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Abstracts

Moment-Method Solutions and SAR Calculations for Inhomogeneous Models of Man with Large Number of Cells (Short Papers)

J.F. DeFord, O.P. Gandhi and M.J. Hagmann. "Moment-Method Solutions and SAR Calculations for Inhomogeneous Models of Man with Large Number of Cells (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 848-851.

This paper describes an iterative band approximation method (BAM) that is useful for solution of large matrix equations where the elements of the matrix decrease in magnitude with increasing distance from the diagonal. The method involves the inversion of a band about the diagonal which is used to obtain a first estimate of the solution. This estimate, along with the remaining elements in the matrix above and below the band, is used to iterate to the final solution. Due to the substantial reduction in the size of the matrix which is actually inverted, the method has been applied to the solution of full complex matrix equations involving up to 1698 unknowns. BAM is used to obtain distributions of EM energy absorption for man models with 180-1132 cells.



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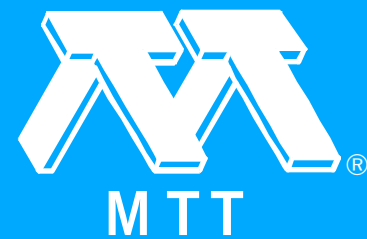


Abstracts

Capabilities of Multi-Applicator Systems for Focused Hyperthermia (Comments)

P.F. Turner. "Capabilities of Multi-Applicator Systems for Focused Hyperthermia (Comments)." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 851-852.

In the above paper, the author has incorrectly assumed that aperture size must be limited to a lateral dimension of not less than one wavelength in fat tissue in order to prevent excessive heating of superficial fat. The reference cited to support this conclusion did not make such a generalization, but rather provided an example which implied this restriction at a particular frequency and with a certain aperture size. In actually, however, focussed co-phased applicators are useful across a much broader range than Knoechel has suggested.



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Abstracts

Refraction at a Curved Dielectric Interface Geometrical Optics Solution (Comments) (Oct. 1983 [T-MTT])

J.D. Love and A.W. Snyder. "Refraction at a Curved Dielectric Interface Geometrical Optics Solution (Comments) (Oct. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 853-853.

In the above paper, Lee et al. consider the refraction of waves at a curved dielectric interface between media of uniform refractive index. They quote an earlier paper by us, and infer that our results are either inadequate or incorrect. We should like to have the opportunity to state that we have no reason to doubt the validity of our results, which, in any case were independently verified by Jones, and to point out how the erroneous conclusions of Lee et al. arise.



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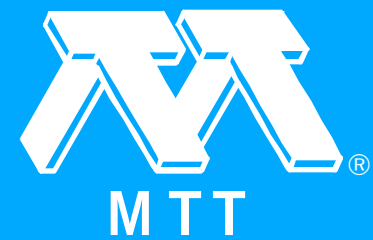
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"Patent Abstracts (Oct. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 854-856.



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"Asian Abstracts (Oct. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 856-869.



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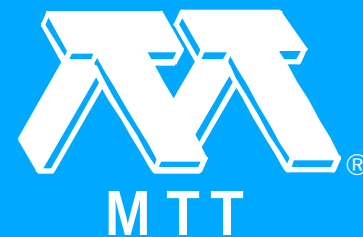
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IEEE Annual Combined Index (Advertisement) (Oct. 1983 [T-MTT])

"IEEE Annual Combined Index (Advertisement) (Oct. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 870-870.



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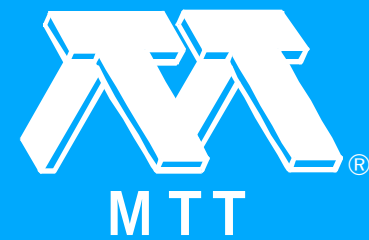
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Abstracts

IEEE on Microfilm (Advertisement) (Oct. 1983 [T-MTT])

"IEEE on Microfilm (Advertisement) (Oct. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 871-871.



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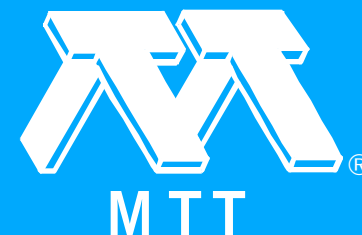
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Abstracts

IEEE Conference Records (Advertisement) (Oct. 1983 [T-MTT])

"IEEE Conference Records (Advertisement) (Oct. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.10 (Oct. 1983 [T-MTT]): 872-872.



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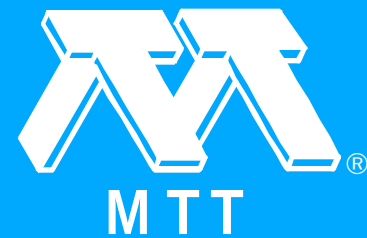


Abstracts

Submillimeter-Wave Receivers -- A Status Report

W.J. Wilson. "Submillimeter-Wave Receivers -- A Status Report." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 873-878.

A recent survey of U.S. and Western European research groups, working on heterodyne submillimeter receivers in the 300-1000-GHz frequency range, is presented. This survey provides a description of the technology that each research group is developing, and information on the state-of-the-art of submillimeter receivers and local oscillator sources. A brief description of submillimeter receiver components is also given.



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Fundamental and Harmonic Operation of Millimeter-Wave Gunn Diodes

W.H. Haydl. "Fundamental and Harmonic Operation of Millimeter-Wave Gunn Diodes." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 879-889.

Pulsed and CW measurements in the range 26-110 GHz were performed on gallium arsenide (GaAs) Gunn diodes having active lengths of 1.8-2.6 μm , bonded into commercially available packages. The diodes were operated in full-height waveguides in the V-(WR-15), E-(WR-12), and W-(WR-10) bands, using coaxial-bias circuits and a disc-post resonator to provide the required resonance at their fundamental frequency in the range from about 25-65 GHz.

Frequency and power measurements were performed up to 110 GHz on the fundamental, second, and third harmonics. The main emphasis of this experimental investigation has been the study of frequency changes caused by changes made in the various parameters of the disc, post, diode, diode package, and embedding waveguide sections.





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A Planar Electrooptic Beam Splitter with a Zig-Zag Electrode

C.L. Lee, J.S. Horng and C.H. Huang. "A Planar Electrooptic Beam Splitter with a Zig-Zag Electrode." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 890-897.

A new planar electrooptic beam splitter with a zig-zag electrode is proposed, studied, and demonstrated. The device is simple in its electrode configuration, hence, it is easier to be fabricated and has a potential to operate at higher speeds. Theoretical analyses on a single element of electrodes, as well as on the array structure, have been carried out, and experimental devices have been realized on LiNbO₃ to demonstrate its characteristics. The experimental results show that the device has a deflection power two times greater than that of a beam splitter with conventional electrodes. In addition, an analysis of the incident angle of the optical beam onto the device shows that the device can be used as a pure beam splitter, a beam deflector, or a combination of the two.

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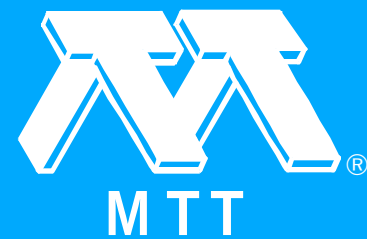


Abstracts

A New Stacked Two-Dimensional Spectral Iterative Technique (SIT) for Analyzing Microwave Power Deposition in Biological Media

R. Kastner and R. Mittra. "A New Stacked Two-Dimensional Spectral Iterative Technique (SIT) for Analyzing Microwave Power Deposition in Biological Media." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 898-904.

Conventional numerical methods for analyzing power deposition in biological media have been restricted to bodies which are relatively small electrically. A new, stacked-two-dimensional-spectral-iterative-technique (SIT), presented below, does not involve the generation and inversion of a matrix and is capable of analyzing larger bodies. It is based on modeling the body by a set of planar parallel slabs and utilizing the simple (convolution-type) relationship between a current distribution on any slab and the field due to this current. This invertible relationship is conveniently formulated in the transform domain in a strictly algebraic fashion. The interactions between the various slabs are also simple and algebraic in the spectral domain. The solution is generated in an iterative manner by applying these relationships sequentially over the slabs until convergence is achieved. Discussion on convergence and numerical examples are given.



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Experimental Properties of Three-Cavity Tunnel Diode RF Oscillators

I.E. Campisi and W.O. Hamilton. "Experimental Properties of Three-Cavity Tunnel Diode RF Oscillators." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 905-910.

The properties of an oscillator-frequency stabilization scheme involving a system of three resonators used in conjunction with a tunnel diode as an active element are discussed. A theoretical description of the behavior of the oscillator is given, together with a procedure which allows one to verify the validity of the theoretical model. It is found that as the oscillator is tuned over the operating frequency range, two sets of hysteretic frequency jumps are observed, the measured position of which should completely characterize the stabilization system's parameters. Results of the frequency stability measurements on a prototype of the three-cavity oscillator are also presented which experimentally agree with the predicted stabilization properties of the system.

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Abstracts

Numerical Analysis of Shielded Coplanar Waveguides

D.A. Rowe and B.Y. Lao. "Numerical Analysis of Shielded Coplanar Waveguides." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 911-915.

A numerical method is presented to calculate the impedance and the effective dielectric constant for a coplanar waveguide with a ground plane under a thin dielectric. Impedance and effective dielectric constant values are given as a function of geometry for GaAs and alumina substrates. An approximate analytical expression is given to generate the numerical value of the impedance with good accuracy. The results can be used in designing shielded coplanar waveguides. Measurements of a tapered 50- Ω test structure are presented.



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Theory and Measurement of Back Bias Voltage in IMPATT Diodes

L.H. Holway, Jr. and S.L.G. Chu. "Theory and Measurement of Back Bias Voltage in IMPATT Diodes." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 916-922.

The derivation of the back bias voltage is shown to require carrying the derivation of the Read equation to one order of approximation higher than that which is necessary to obtain the quasi-static result. A new term is shown to be needed in the expression for the back bias voltage which changes its sign to positive under conditions in which the older analyses indicate a negative back bias. Experimental measurements of V_{bb} as a function of V_{RF} were made using a network analyzer and are in agreement with the new analysis. At frequencies considerably below the range at which our measurements were made, a strong negative back bias voltage is caused by the saturation current.

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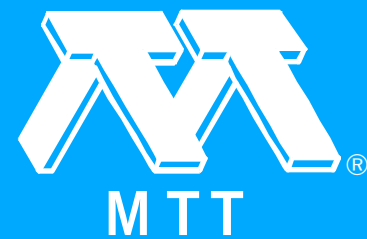


Abstracts

Scattering of Guided Modes Caused by an Arbitrarily Shaped Broken End in a Dielectric Slab Waveguide

E. Nishimura, N. Morita and N. Kumagai. "Scattering of Guided Modes Caused by an Arbitrarily Shaped Broken End in a Dielectric Slab Waveguide." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 923-930.

Electromagnetic scattering of guided modes in a dielectric slab waveguide caused by an arbitrarily shaped broken end is analyzed theoretically by using the integral equation method. By solving the integral equations iteratively, the tangential components of the electric and magnetic fields on the broken end surface are determined, from which the reflected mode power, the radiation wave power and field patterns, and the total scattered power are obtained. Numerical results are presented for the plane-perpendicular, plane-tilted, and arc-shaped end surfaces. Both TE and TM modes are assumed as an incident wave.



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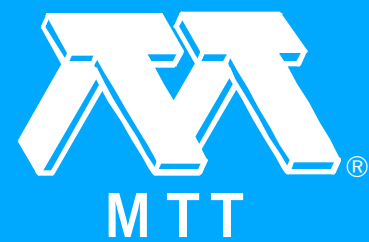
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Complex Gyrator Circuits of Planar Circulators Using Higher Order Modes in a Disk Resonator

J. Helszajn. "Complex Gyrator Circuits of Planar Circulators Using Higher Order Modes in a Disk Resonator." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 931-938.

The use of resonators or waveguides utilizing higher order modes is often an attractive solution to the design of millimeter microwave networks. This paper investigates the complex gyrator circuit of a planar junction circulator employing higher order solutions in a disk resonator. The first such solution displays many of the features of weakly magnetized junctions using the dominant mode in a disk resonator, but its loaded Q-factor is incompatible with the realization of quarter-wave coupled devices. Although the second one exhibits more useful equivalent circuits, it requires a relatively large magnetization, which is not altogether practical at millimeter frequencies. A circulator configuration that has a frequency response akin to that of a quarter-wave coupled one is one where the in-phase eigennetwork is degenerate with those of the demagnetized counter-rotating eigennetworks. The degeneracy between the in-phase limit, $TM_{2,0,-2}$ and the second-order counter-rotating limit, $TM_{1,1,-2}$ modes, in an oversized irregular hexagonal resonator, is used in this paper to construct such a device.

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Rectangular Waveguide with Two Double Ridges (Short Papers)

D. Dasgupta and P.K. Saha. "Rectangular Waveguide with Two Double Ridges (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 938-941.

An eigenvalue equation of a general structure having two arbitrary double ridges in a rectangular waveguide is derived. The cutoff wavelengths of two special cases with two symmetrically placed identical double ridges is computed numerically and their bandwidths are compared. The numerical solution of the eigenvector is also discussed and utilized in determining the gap impedance. As an example of the applications of such ridged waveguides, two varactor-tuned Gunn oscillators are briefly reported.

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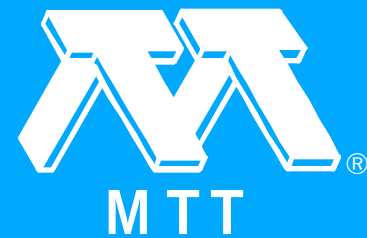


Abstracts

Mutual Impedance Computation Between Microstrip Antennas (Short Papers)

E.H. Newman, J.H. Richmond and B.W. Kwan. "Mutual Impedance Computation Between Microstrip Antennas (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 941-945.

A moment-method solution for the mutual coupling between rectangular microstrip antennas is presented. The grounded dielectric slab is accounted for exactly in the analysis.



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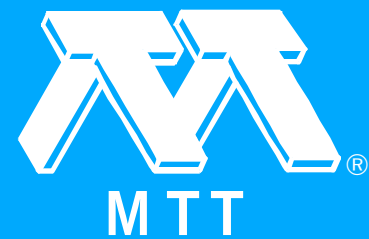
Analysis of the Hybrid Modes for an Eccentrically Cladded Fiber (Short Papers)

A.D. Lyras, J.A. Roumeliotis, J.D. Kanellopoulos and J.G. Fikioris. "Analysis of the Hybrid Modes for an Eccentrically Cladded Fiber (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 945-950.

This paper examines the hybrid-cladding modes of an eccentrically cladded three-layer dielectric fiber. The solutions are specialized to small eccentricities, and exact closed-form expressions for the normalized deviations of the cutoff wavenumbers from those of the concentric case are determined. Numerical results for various types of hybrid-cladding modes of the fiber are given. For certain values of the parameters, it is possible to enhance the operating bandwidth of the basic hybrid mode HE/sub 11/ over the conventional concentric fiber because its cutoff frequency can be shown to remain zero.

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An Accurate Determination of Dielectric Loss Effect in Monolithic Microwave Integrated Circuits Including Microstrip and Coupled Microstrip Lines (Short Papers)

D. Mirshekar-Syahkal. "An Accurate Determination of Dielectric Loss Effect in Monolithic Microwave Integrated Circuits Including Microstrip and Coupled Microstrip Lines (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 950-954.

For the first time, by a rigorous analysis, the performance of MIC planar transmission lines with lossy substrates can be studied accurately. The general structural shape chosen for the analysis includes infinitely thin metallic strips embedded within the layers of homogeneous dielectric substrates. The rigor of the analysis was guaranteed by the assumption of the propagation of an electromagnetic hybrid wave (i.e., TE+TM) along the planar transmission lines. An efficient computation was, however, achieved by implementing the spectral domain approach as the basis for the analysis. To test the analysis, phase constants, characteristic impedances, and attenuations, due to dielectric losses, were computed for microstrip and coupled microstrip lines. The results obtained were compared with those given previously by the spectral domain analysis in which dielectric losses were not included directly. The comparison showed an excellent agreement between the two theories for low-loss substrates. However, for lossy substrates the present method is more accurate.

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Mathematical Representation of Microwave Oscillator Characteristics by Use of the Rieke Diagram (Short Papers)

K. Fukumoto, M. Nakajima and J.-I. Ikenoue. "Mathematical Representation of Microwave Oscillator Characteristics by Use of the Rieke Diagram (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 954-959.

This paper shows that the characteristics of oscillators can be phenomenologically expressed by a polynomial function of frequency and amplitude, provided the output signal is nearly sinusoidal, especially at microwave frequency. A method is presented of determining the coefficients of the polynomial from several points on the Rieke diagram, with two examples being shown. The characteristics of oscillators can consequently be represented by several parameters, as in the case of electron tubes and transistors, so that the design of an oscillator circuit may become easier with the aid of an electronic computer.

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Abstracts

Single-Mode Fiber Design for Minimum Dispersion (Short Papers)

P.S.M. Pires and D.A. Rogers. "Single-Mode Fiber Design for Minimum Dispersion (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 959-962.

The value of the radius of the core of a single-mode step-index optical fiber for minimum dispersion is calculated with the normalized frequency in the range $1.0 \leq V \leq 2.5$, using the approximation for the eigenvalue U proposed by Miyagi and Nishida. This calculation is made by solving the total dispersion equation for the core radius when the wavelength assigned is assumed to be that necessary for minimum total dispersion. The computational procedure presented is simple enough to be accomplished on a programmable calculator or microcomputer. This work makes possible the characterization, with reasonable precision, of the ideal fiber that should be used with the available optical source.



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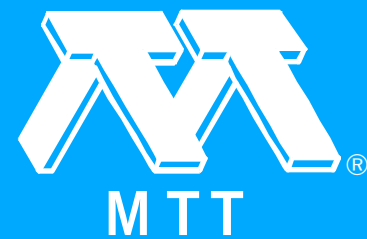


Abstracts

Noise Due to Pulse-to-Pulse Incoherence in Injection-Locked Pulsed Microwave Oscillators (Short Papers)

D. Anderson, M. Lisak and T. Lewin. "Noise Due to Pulse-to-Pulse Incoherence in Injection-Locked Pulsed Microwave Oscillators (Short Papers)." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 963-964.

It is demonstrated that partial pulse-to-pulse coherence in a pulsed oscillator system gives rise to no excess noise, which may be significantly reduced by injection locking.



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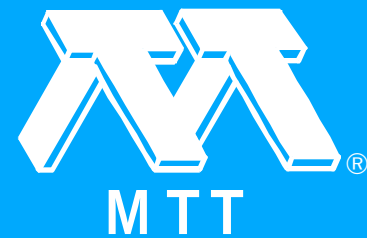
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Abstracts

Call for Papers - 1984 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium (Nov. 1983 [T-MTT])

"Call for Papers - 1984 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium (Nov. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.11 (Nov. 1983 [T-MTT]): 968-968.



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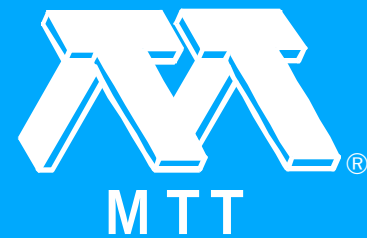


Abstracts

Editor's Overview (Dec. 1983 [T-MTT])

G.R. Thoren. "Editor's Overview (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 973-974.

Boston is a city that is rich in tradition. One modern tradition of Boston is to set new plateaus for the MTT-S International Microwave Symposium. The 1983 Symposium. broke all previous conference attendance records with a total attendance of 5168, The "Open Forum" session for technical papers was a resounding success. A new hardcover Symposium Digest was introduced. The technical quality of the Symposium is reflected in the articles that have been expanded for publication in this Special Issue of the Transactions on Microwave Theory and Techniques.



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The 1983 MTT-S International Microwave Symposium (Dec. 1983 [T-MTT])

H. Howe, Jr.. "The 1983 MTT-S International Microwave Symposium (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 975-984.

The 1983 MTT-S International Microwave Symposium and Workshops were jointly held with the 1983 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium during the week of May 31 to June 3, 1983 at the Sheraton-Boston Hotel in Boston, MA. In addition to the regular sessions of the two Symposia there were two panel discussions in the first evening and four workshops including the ARFTG meeting, which was held on Monday and Tuesday, June 6th and 7th the following week at a nearby location. A joint session of both Symposia was held on Wednesday morning, the opening day of the MTT-S International Microwave Symposium. To complement the Technical Program, there was a full range of social activities throughout the week including a lavish Awards Banquet held on Thursday evening June 2nd. A Commercial Exhibition by companies engaged in microwave activities was held in conjunction with the MTT Symposium. This year's exhibition turned out to be the largest in MTT-S history.



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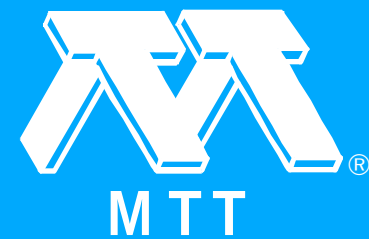
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Abstracts

Awards (Dec. 1983 [T-MTT])

"Awards (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 985-989.



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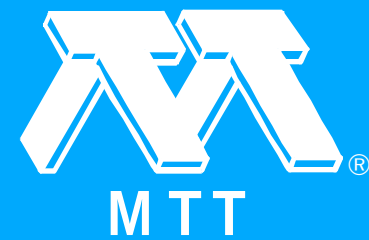
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Table of Contents, 1982 MTT Symposium Digest (Dec. 1983 [T-MTT])

"Table of Contents, 1982 MTT Symposium Digest (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 989-995.



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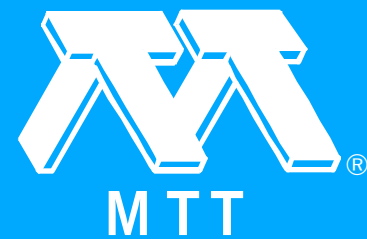


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Cryogenic All Solid-State Millimeter-Wave Receivers for Airborne Radiometry (Dec. 1983 [T-MTT])

B. Vowinkel, K. Gruener and W. Reinert. "Cryogenic All Solid-State Millimeter-Wave Receivers for Airborne Radiometry (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 996-1001.

Cryogenic receiver modules for 90 and 140 GHz have been developed that are part of an airborne imaging system. They consist of Schottky-barrier mixers followed by GaAs-FET IF amplifiers. The DSB receiver noise temperatures are 210 K for the 90-GW and 250 K for the 140-GHz system. The instantaneous bandwidth is 2.5 GHz for both front ends. Results of some flight tests are presented.



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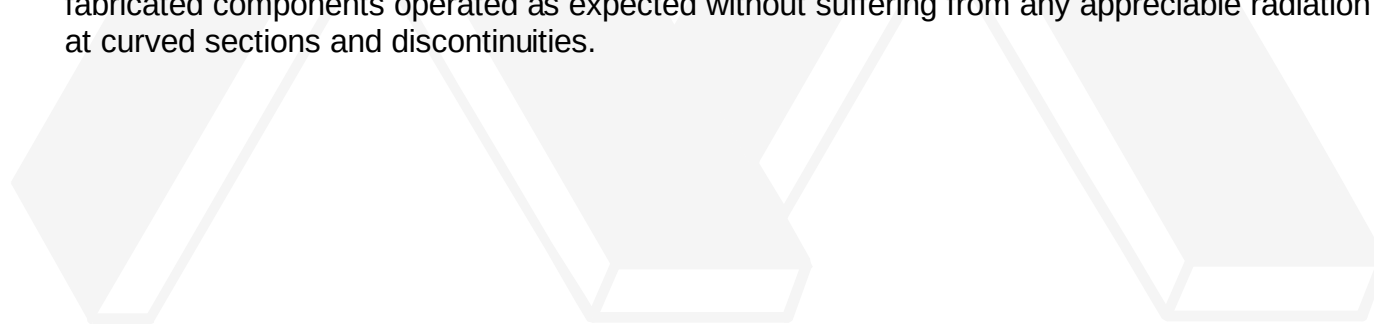
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Insulated Nonradiative Dielectric Waveguide for Millimeter-Wave Integrated Circuits (Dec. 1983 [T-MTT])

T. Yoneyama, S. Fujita and S. Nishida. "Insulated Nonradiative Dielectric Waveguide for Millimeter-Wave Integrated Circuits (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1002-1008.

An improved version of the nonradiative dielectric waveguide (NRD-guide), called an insulated nonradiative dielectric waveguide, is proposed for millimeter-wave integrated circuits. This dielectric waveguide can overcome some difficulties which arise when high dielectric material is used in the NRD-guide. Guide wavelengths and transmission losses were measured at 50 GHz and compared with theory. In addition, some basic circuit components such as bends, ring resonators, chip resonators, and T-junctions were fabricated on the basis of the insulated NRD-guide and tested to confirm their usefulness in millimeter-wave integrated circuits. The fabricated components operated as expected without suffering from any appreciable radiation at curved sections and discontinuities.



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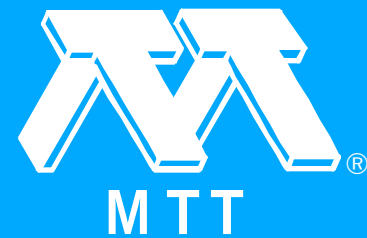


Abstracts

E-Plane Filters with Finite-Thickness Septa (Dec. 1983 [T-MTT])

Y.-C. Shih and T. Itoh. "E-Plane Filters with Finite-Thickness Septa (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1009-1013.

The effect of the metalization thickness of the septum is incorporated into an efficient computer-aided design (CAD) program for E-plane filters. The method is mathematically exact and numerically efficient. The results agree well with experimental data. The effect of the metal thickness on filter performance is demonstrated with a Ku-band filter.



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Slow-Wave Coplanar Waveguide on Periodically Doped Semiconductor Substrate (Dec. 1983 [T-MTT])

Y. Fukuoka and T. Itoh. "Slow-Wave Coplanar Waveguide on Periodically Doped Semiconductor Substrate (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1013-1017.

A metal-insulator-semiconductor (MIS) coplanar waveguide with periodically doped substrate is described. An efficient numerical method is introduced in order to obtain the propagation constants and the characteristic impedances of the constituent sections of each period. Using the results, the characteristic of the periodic MIS coplanar waveguide is analyzed by Floquet's theorem. The theoretical study shows reduction of attenuation and enhancement of the slow-wave factor at certain frequencies, compared to the uniform MIS coplanar waveguide. This structure is experimentally simulated and shows good agreement theory.

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Abstracts

Design of an Overlay Directional Coupler by a Full-Wave Analysis (Dec. 1983 [T-MTT])

L. Su, T. Itoh and J. Rivera. "Design of an Overlay Directional Coupler by a Full-Wave Analysis (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1017-1022.

A full-wave analysis based on the spectral-domain method is applied to coupled overlay microstrips, coupled inverted microstrips, and coupled microstrips. Exclusive numerical data including frequency characteristics are included. A 10-dB overlay coupler was built according to the design theory, and experimental results are reported.



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Abstracts

Evaluation of Modes in Dielectric Resonators Using a Surface Integral Equation Formulation (Dec. 1983 [T-MTT])

A.W. Glisson, D. Kajfez and J. James. "Evaluation of Modes in Dielectric Resonators Using a Surface Integral Equation Formulation (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1023-1029.

A moment method solution procedure for rotationally symmetric dielectric bodies has been applied to isolated cylindrical dielectric resonators, and the frequencies, as well as Q factors due to radiation, have been determined for several of the lowest modes, including those of hybrid type.



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Investigation of a Single-Sideband Mixer Anomaly (Dec. 1983 [T-MTT])

B.R. Hallford. "Investigation of a Single-Sideband Mixer Anomaly (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1030-1038.

Measurements on a 6-GHz single-sideband (SSB) balun-coupled mixer revealed a feedthrough of RF signals between the two mixer sections that caused the IF outputs to be unbalanced at the $\pm 90^\circ$ local oscillator (LO) phase differences when using a ring diode quad. Using a bridge diode quart in this same mixer eliminated this IF output unbalance. These measurements also give conclusive evidence that the balun-coupled mixer has a short-circuited image frequency voltage with the ring diode quad and an open-circuited image frequency voltage with the bridge diode quad. These two image frequency impedance conditions are independent of circuit terminating impedances and solely depend on the image frequency current path being completed or interrupted by the ring or bridge diode quads, respectively.

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Modes in Dielectric-Loaded Waveguides and Resonators

K.A. Zaki and A.E. Atia. "Modes in Dielectric-Loaded Waveguides and Resonators." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1039-1045.

Analysis of nonaxially symmetric modes in circular wave-guides partially filled with high-dielectric constant material is presented. A method for the accurate determination of resonant frequencies of any mode excited in dielectrically loaded waveguide cavities is described. The method is used to construct mode charts for dielectric resonators. Comparison of the resonant frequency calculations for several cases agrees closely with measurements.

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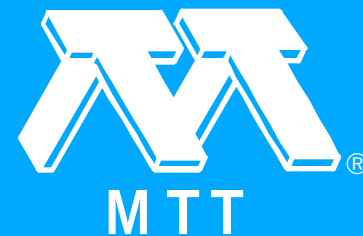


Abstracts

New Narrow-Band Dual-Mode Bandstop Waveguide Filters

J.-R. Qian and W.-C. Zhuang. "New Narrow-Band Dual-Mode Bandstop Waveguide Filters." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1045-1050.

A complementary relation between a dual-mode bandpass and bandstop waveguide filter is found. Then a new idea for constructing a bandstop filter is developed. Two trial samples of bandstop filters are constructed to demonstrate the principle.



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Generalized Analysis of Microstrip-Like Transmission Lines and Coplanar Strips with Anisotropic Substrates for MIC, Electrooptic Modulator, and SAW Application

S.K. Koul and B. Bhat. "Generalized Analysis of Microstrip-Like Transmission Lines and Coplanar Strips with Anisotropic Substrates for MIC, Electrooptic Modulator, and SAW Application." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1051-1059.

A unified variational expression is presented for the line capacitance of a general, multilayer anisotropic structure. The propagation characteristics of a variety of striplines, microstriplines, and coplanar strips, in isolated and coupled configurations, with anisotropic substrates having optical axis aligned along the axis of the substrate, are computed. The characteristics of these structures with anisotropic substrates having tilted optical axis are also studied. Using the formulas presented, the study of structures with anisotropic substrates having aligned or tilted optical axis, for various applications including MIC, electrooptic modulator, and SAW IDT, reduces to the determination of a single admittance parameter. This parameter can be obtained from the transmission-line equivalent circuit of the structure almost by inspection.





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Loop-Gap Resonator: A Lumped Mode Microwave Resonant Structure

M. Mehdizadeh, T.K. Ishii, J.S. Hyde and W. Froncisz. "Loop-Gap Resonator: A Lumped Mode Microwave Resonant Structure." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1059-1064.

Loop-gap resonators are newly developed microwave resonant structures with a field configuration that is intermediate between lumped and distributed. Typical characteristic dimensions are of the order of 1/10 of the resonant wavelength, and typical Q's are of the order of 1600-2000 in the frequency range of 1-4 GHz. Data are presented for Q's and frequencies for a series of resonators of various dimensions and compared with theory. Various coupling and frequency tuning techniques are discussed, and results of experiments are reported. Results of preliminary application of the stictire in microwave filters and oscillators are presented. Loop-gap resonators provide a useful design alternative, it is concluded, to dielectric and surface acoustic-wave resonators at low microwave frequencies.

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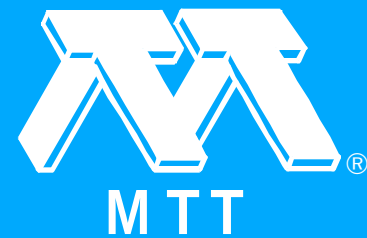


Abstracts

Foreword (Dec. 1983 [T-MTT])

H.J. Kuno. "Foreword (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1065-1065.

It is evident to those connected to microwave and millimeter-wave technology that monolithic integrated-circuits technology has become increasingly vital to the development of various systems operating at microwave and millimeter-wave frequencies. A great deal of active effort is currently directed towards integrated-circuits technology and rapid progress is being made.



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Profile Studies of Ion-Implanted MESFET's (Dec. 1983 [T-MTT])

J.M.M. Golio and R.J. Trew. "Profile Studies of Ion-Implanted MESFET's (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1066-1071.

A study of ion-implanted MESFET performance as a function of the implantation energy and fluency, and including the effects of deep-level trapping-state concentrations in the substrate, has been conducted. Carrier concentrations as a function of depth are determined through the use of LSS theory and a profiling model. An analytic device model, which computes both dc and RF characteristics, is then employed to predict MESFET performances. The study includes the effects of depth-dependent transport properties and has indicated a number of design rules for the fabrication of optimized ion-implanted devices.



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Low-Noise MESFET's for Ion-Implanted GaAs MMIC's

A.K. Gupta, D.P. Siu, K.T. Ip and W.C. Petersen. "Low-Noise MESFET's for Ion-Implanted GaAs MMIC's." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1072-1076.

Fabrication considerations for low-noise FET's in ion-implanted GaAs monolithic microwave integrated circuits (MMIC's) are presented. Processes that can deteriorate FET performance have been identified and some solutions proposed. Low-noise MMIC FET's fabricated along these lines show good microwave performance through 18 GHz, approaching the performance available from similar discrete FET's. 0.8- μm gate-length MMIC FET's with a noise figure of 2.9 dB and associated gain of 6.1 dB at 18 GHz have been fabricated. These devices are suitable for low-noise applications in ion-implanted GaAs MMIC's.

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A Ka-Band GaAs Monolithic Phase Shifter

V. Sokolov, J.J. Geddes, A. Contolatis, P.E. Bauhahn and C. Chao. "A Ka-Band GaAs Monolithic Phase Shifter." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1077-1083.

The design and performance of a GaAs monolithic 1800 one-bit switched line phase shifter test circuit for Ka-band operation is presented. A self-aligned gate (SAG) fabrication technique is also described that reduces resistive parasitic in the switching FET's. Over the 27.5-30 GHz band, typical measured differential insertion phase is within 10-20° of the ideal time delay characteristic. Over the same band, the insertion loss for the SAG phase shifter is about 2.5-3 dB per bit. The SAG fabrication technique holds promise in reducing phase shifter insertion loss to about 1.5 dB/bit for 30-GHz operation.

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12-GHz-Band Low-Noise GaAs Monolithic Amplifiers

T. Sugiura, H. Itoh, T. Tsuji and K. Honjo. "12-GHz-Band Low-Noise GaAs Monolithic Amplifiers." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1083-1088.

One- and two-stage 12-GHz-band low-noise GaAs monolithic amplifiers have been developed for use in direct broadcasting satellite (DBS) receivers. The one-stage amplifier provides a less than 2.5-dB noise figure with more than 9.5-dB associated gain in the 11.7-12.7-GHz band. In the same frequency band, the two-stage amplifier has a less than 2.8-dB noise figure with more than 16-dB associated gain. A 0.5- μ m gate closely spaced electrode FET with an ion-implanted active layer is employed in the amplifier in order to achieve a low-noise figure without reducing reproducibility. The chip size is 1 mm x 0.9 mm for the one-stage amplifier, and 1.5 mm x 0.9 mm for the two-stage amplifier.

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GaAs Monolithic MIC's for Direct Broadcast Satellite Receivers (Dec. 1983 [T-MTT])

S. Hori, K. Kamei, K. Shibata, M. Tatematsu, K. Mishima and S. Okano. "GaAs Monolithic MIC's for Direct Broadcast Satellite Receivers (Dec. 1983 [T-MTT])." 1983 Transactions on Microwave Theory and Techniques 31.12 (Dec. 1983 [T-MTT] (1983 Symposium Issue)): 1089-1096.

A 12-GHz low-noise amplifier (LNA), a 1-GHz IF amplifier (IFA), and an 11-GHz dielectric resonator oscillator (DRO) have been developed for DBS home receiver applications by using GaAs monolithic microwave integrated circuit (MMIC) technology. Each MMIC chip contains FET's as active elements and self-biasing source resistors and bypass capacitors for a single power supply operation. It also contains dc-block and RF-bypass capacitors. The three-stage LNA exhibits a 3.4-dB noise figure and a 19.5-dB gain over 11.7-12.2 GHz. The negative-feedback-type three-stage IFA shows a 3.9-dB noise figure and a 23-dB gain over 0.5-1.5 GHz. The DRO gives 10.mW output power at 10.67 GHz, with a frequency stability of 1.5 MHz over a temperature range from -40-80°C. A direct broadcast satellite (DBS) receiver incorporating these MMIC's exhibits an overall noise figure of ≤ 4.0 dB for frequencies from 11.7-12.2 GHz.



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Patent Abstracts (Dec. 1983 [T-MTT])

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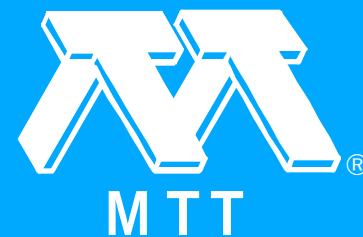
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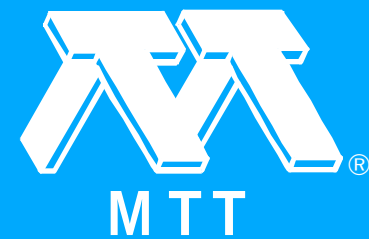
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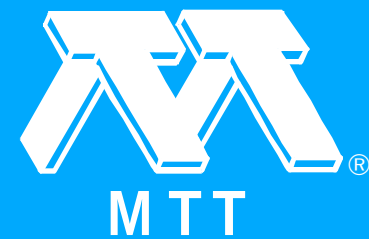
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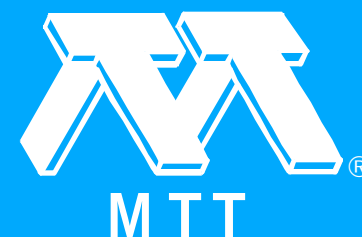
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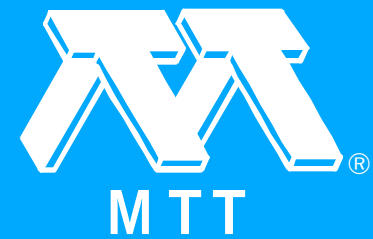
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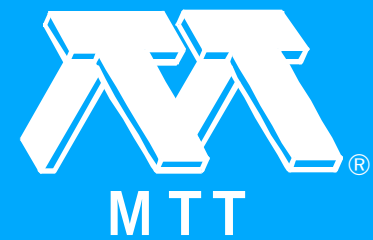
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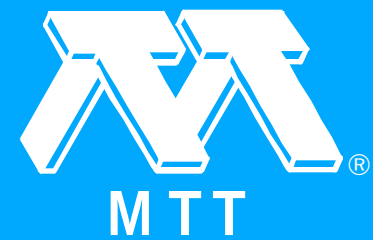
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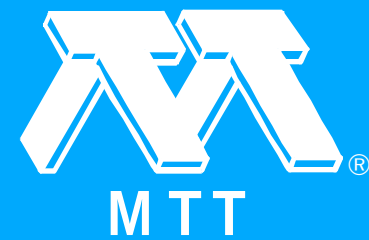
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Broadband Monolithic Low-Noise Feedback Amplifiers (1983 [MWSYM])

P.N. Rigby, J.R. Suffolk and R.S. Pengelly. "Broadband Monolithic Low-Noise Feedback Amplifiers (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 41-45.

A 0.6 to 6 GHz monolithic GaAs FET low-noise feedback amplifier has been developed. This amplifier chip has a gain of 6 dB and a noise figure of around 4 dB over the bandwidth. Gains of 8 dB have been achieved at $\frac{1}{2}I_{\text{sub dss}}$ with 1 dB gain compression points of 21 dBm over the band. This paper discusses the design of such amplifiers using as an example a 1 to 10 GHz two stage monolithic amplifier chip presently under development which is capable of being cascaded up to total gains of 50 dB or so with ± 1.5 dB ripple.

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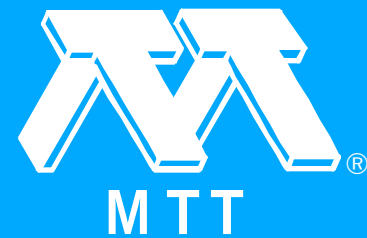


Abstracts

2-6 GHz Monolithic Microwave Amplifier (1983 [MWSYM])

W.O. Camp, Jr., S. Tiwari and D. Parsons. "2-6 GHz Monolithic Microwave Amplifier (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 46-49.

The design and results of a GaAs monolithic feedback amplifier are presented. The features stressed are its small size (0.76 mm square) and simple 5 mask process in order that the lowest possible cost per dB of gain may be achieved. Refinements to the CAD model, particularly with respect to inductors, are also presented.



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Wideband High Gain Small Size Monolithic GaAs FET Amplifiers (1983 [MWSYM])

V. Pauker and M. Binet. "Wideband High Gain Small Size Monolithic GaAs FET Amplifiers (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 50-53.

A series of two to four stage monolithic amplifiers operating with a gain of 15 to 42 dB and covering the 0.1 to 2 till 4 GHz frequency band has been realized. A high density of integration has been achieved (active area of 0.2 mm²) as no decoupling capacitors nor inductance have been used.

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12GHz-Band Low-Noise GaAs Monolithic Amplifiers (1983 [MWSYM])

H. Itoh, T. Sugiura, T. Tsuji, K. Honjo and Y. Takayama. "12GHz-Band Low-Noise GaAs Monolithic Amplifiers (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 54-58.

One- and two-stage 12GHz-band low-noise GaAs monolithic amplifiers have been developed for use in direct broadcasting satellite receivers. The one-stage amplifier provides a less than 2.5dB noise figure with more than 9.5db associated gain in the 11.7 to 12.7GHz band. In the same frequency band, the two-stage amplifier has a less than 2.8dB noise figure with more than 16dB associated gain. A 0.5 μ m gate closely-spaced electrode FET with an ion implanted active layer is employed in the amplifier in order to achieve a low noise figure without reducing reproducibility. Chip size is 1 mm x 0.9 mm for the one-stage amplifier and 1.5 mm x 0.9 mm for the two-stage amplifier.



GaAs Monolithic MICs for Direct Broadcast Satellite Receivers (1983 [MWSYM])

S. Hori, K. Kamei, K. Shibata, M. Tatematsu, K. Mishima and S. Okano. "GaAs Monolithic MICs for Direct Broadcast Satellite Receivers (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 59-64.

A 12-GHz low-noise amplifier (LNA), a 1-GHz IF amplifier (IFA) and an 11-GHz dielectric resonator oscillator (DRO) have been developed for DBS home receiver applications by using GaAs MMIC (monolithic MIC) technology. Each MMIC chip contains FETs as active elements and self-biasing source resistors and bypass capacitors for single power supply operation. It also contains DC-block and RF-bypass capacitors. The three-stage LNA exhibits 3.4-dB noise figure and 19.5-dB gain over 11.7 GHz-12.2 GHz. The negative-feedback type three-stage IFA shows 3.9-dB noise figure and 23-dB gain over 0.5 GHz-1.5 GHz. The DRO gives 10-mW output power at 10.67 GHz with a frequency stability of 1.5 MHz over a temperature range from -40 to 80 °C. A DBS receiver incorporating these MMICS exhibits an overall noise figure of ≤ 4.0 dB for frequencies from 11.7 to 12.2 GHz.

Miniaturisation of a Band-X Monolithic GaAs Amplifier (1983 [MWSYM])

P. Dueme, M. Le Brun, P.R. Jay and C. Rumelhard. "Miniaturisation of a Band-X Monolithic GaAs Amplifier (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 65-68.

Reducing the area occupied by microwave monolithic integrated circuits is a necessity to decrease the cost of these circuits. A reduction in area can be obtained with circuit configurations comprising a minimum of inductances and by using spiral inductors. When a circuit is compacted, the coupling between radiating elements such as the inductances has also to be taken into account. An amplifier working from 2 to 10GHz with a measured gain of $5.8 \pm 0.4\text{dB}$ is presented. The efforts to reduce the area have led to a surface of 0.16mm^2 and therefore an integration density of 36dB/mm^2 .





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GaAs Monolithic Lumped Element Multistage Microwave Amplifier (1983 [MWSYM])

K.P. Weller, G.D. Robinson, A. Benavides and R.D. Fairman. "GaAs Monolithic Lumped Element Multistage Microwave Amplifier (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 69-73.

This paper reports on the successful development of a four stage, directly cascaded GaAs FET monolithic preamplifier chip realized using truly lumped elements for both RF and DC circuitry. The chip is designed to be entirely self-biased and contains all required DC circuitry on-chip for operation from a single drain supply. The design is based on a nominal 1 micron gate length interdigital FET geometry of planar construction. The device is fabricated using a selective ion implantation process. The finished die dimensions are 0.060 by 0.110 inch with a thickness of 0.015 inch. The chip provides a gain of over 20 dB in a 2 GHz band centered near 7 GHz. The noise figure achieved is 6 dB, the output power at 1 dB gain compression is typically +8 dBm, and the third order intermodulation intercept point is approximately +20 dBm.

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



Abstracts

Session B -- Filters and Passive Networks I

"Session B -- Filters and Passive Networks I." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 75-75.



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Abstracts

A 12-Channel Contiguous Band Multiplexer at Ku-Band

M.H. Chen. "A 12-Channel Contiguous Band Multiplexer at Ku-Band." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 77-79.

A 12-Channel contiguous band Multiplexer at Ku-band has been developed, The multiplexer has 0.01 fractional channel bandwidths with A 10 percent guard band. This development should provide system engineers confidence to use contiguous band multiplexer more often.



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Asymmetric Canonical Dielectric Resonator Filters

S.J. Fiedziuszko. "Asymmetric Canonical Dielectric Resonator Filters." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 80-82.

Miniature, high performance asymmetric canonical filters utilizing dual-mode dielectric resonators are discussed. Filter synthesis is accomplished by proper rotations of the canonical coupling matrix. As an example, performance of realized 6-pole asymmetric canonical (6-4) and 8-pole self-equalized (8-4-2) filters are presented.

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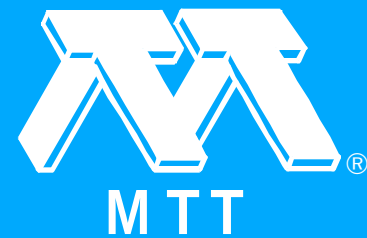


Abstracts

Triple-Mode True Elliptic Function Filter Realization for Satellite Transponders

W.-C. Tang and S.K. Chaudhuri. "Triple-Mode True Elliptic Function Filter Realization for Satellite Transponders." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 83-85.

A six-pole, triple mode filter with true elliptic-function response has been synthesized and experimentally realized, This was done by using a new intercavity iris structure that can control three intercavity mode couplings simultaneously.



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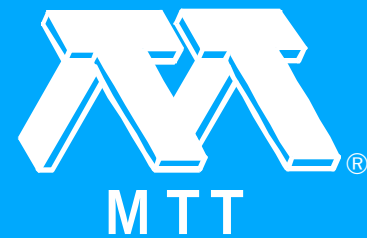


Abstracts

A Contiguous-Band Multiplexer Design

R.G. Egri, A.E. Williams and A.E. Atia. "A Contiguous-Band Multiplexer Design." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 86-88.

A general contiguous-band multiplexer design procedure is described whereby the total network, including both the filters and manifold, is accurately modeled. All parameters, such as line lengths and filter coupling values, are optimized on a digital computer. Excellent agreement between theory and experiment is shown for a five-channel, 11-GRs multiplexer.



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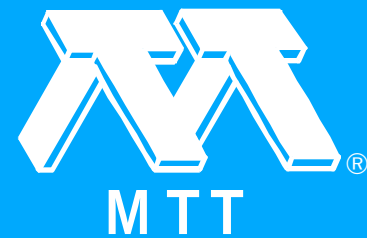


Abstracts

A New Narrow Dual-Mode Bandstop Waveguide Filter

Q. Jing-ren and Z. Wei-chen. "A New Narrow Dual-Mode Bandstop Waveguide Filter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 89-91.

A complementary relation between a dual mode bandpass and bandstop waveguide filter is found. Then a new idea for constructing bandstop filter is developed. Two trial samples of bandstop filters are constructed to demonstrate the principle.



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Strip-Line Resonator Filters Having Multi-Coupled Sections

M. Makimoto and S. Yamashita. "Strip-Line Resonator Filters Having Multi-Coupled Sections." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 92-94.

The design criteria for microwave filters with multi-coupled strip-line have been developed. One of the advantages of this method is that it provides a line-spacing which is five times wider than with the conventional method. Higher production yield is therefore obtainable in designing wideband or millimeter-wave filters with the use of thin dielectric substrate.

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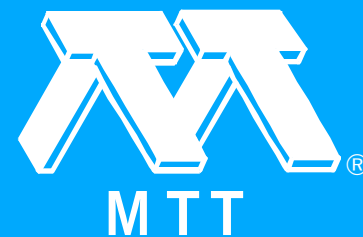


Abstracts

Lumped Mode Microwave Resonant Structures

M. Mehdizadeh, T.K. Ishii, J.S. Hyde and W. Froncisz. "Lumped Mode Microwave Resonant Structures." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 95-97.

A new class of electrically small microwave resonators working in lumped mode is described for filter and oscillator applications. These resonators are tunable over a wide range and have a Q of about 2000. Tuning, coupling, and applications of these resonant structures are discussed.



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Millimeter Wave Printed Circuit Spurline Filters

C. Nguyen, C. Hsieh and D.W. Ball. "Millimeter Wave Printed Circuit Spurline Filters." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 98-100.

This paper provides a new equivalent circuit model for a spurline filter section in an inhomogeneous coupled-line medium whose even and odd mode phase velocities are unequal. This equivalent circuit permits the exact filter synthesis to be performed easily. Millimeter-wave filters at 26 to 40 GHz and 75 to 110 GHz have been fabricated using the model, and experimental results are included which validate the equivalent circuit model.

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Abstracts

Session C -- Near Millimeter Wave Techniques

"Session C -- Near Millimeter Wave Techniques." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 101-101.



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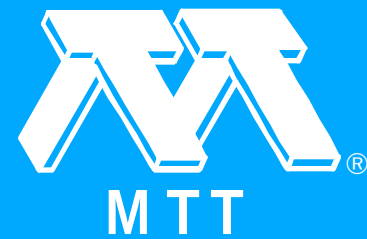


Abstracts

Ultrafast Optoelectronic Devices for Millimeter-Waves

C.H. Lee, A.M. Vaucher, M.G. Li and C.D. Striffler. "Ultrafast Optoelectronic Devices for Millimeter-Waves." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 103-105.

We discuss a new class of devices in which the propagation parameters of millimeter-waves are controlled by a laser induced electron-hole plasma in a semiconductor waveguide. The performance of high speed (better than one nanosecond), efficient millimeter-wave phase shifters, modulators, switches, and gating devices are reported.



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Performance of Metal Meshes as a Function of Incidence Angle

H.M. Pickett, J. Farhoomand and A.E. Chiou. "Performance of Metal Meshes as a Function of Incidence Angle." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 106-107.

An inductive mesh was measured for transmission as a function of frequency, incidence angle and polarization. The experimental data agreed well with Chen's waveguide theory for meshes as long as an adequate number of modes were included in the calculation.

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Abstracts

A Submillimeter Wave Quasi-Optical Frequency Doubler

M.A. Frerking, H.M. Pickett and J. Farhoomand. "A Submillimeter Wave Quasi-Optical Frequency Doubler." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 108-109.

A 600 GHz source has been developed as the local oscillator for a submillimeter heterodyne radiometer. A quasi-optical Fabry-Perot interferometer is used to diplex the input and output frequencies while waveguide is used for the diode circuit.



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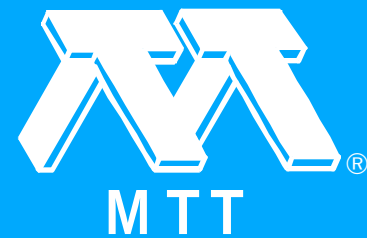


Abstracts

A Broad-Band Low-Noise 205 GHz Radiometer for a Satellite Receiver

M.A. Frerking, J.C. Hardy and W.J. Wilson. "A Broad-Band Low-Noise 205 GHz Radiometer for a Satellite Receiver." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 110-112.

A low-noise room temperature 205 GHz heterodyne radiometer has been designed and built for the Upper Atmosphere Research Satellite Microwave Limb Sounder instrument. The radiometer design features a low loss quasi-optical broad-band signal/LO coupler, a solid state local oscillator and a single-ended fundamental mixer.



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Surface-Wave Losses of Coplanar Transmission Lines

D.P. Kasilingam and D.B. Rutledge. "Surface-Wave Losses of Coplanar Transmission Lines." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 113-116.

Coplanar transmission lines lose energy to surface waves when the propagation constant of the surface-wave mode exceeds that of the transmission line. This happens when the substrate thickness is an appreciable fraction of a wavelength. The losses should become important in integrated circuits at near-millimeter wavelengths because it is hard to make the substrate thickness small compared to a wavelength. In this paper we have developed a theory based on reciprocity for predicting these losses. We also utilized the quasi-static approximation method to derive expressions for propagation constants and line impedances. Experimental measurements were made for the surface-wave losses in the two strip line, the two slot line and the three wire line, and the results obtained were consistent with the theory.

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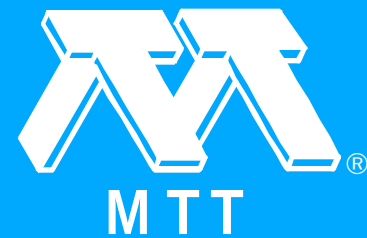


Abstracts

Effective Cross-Sections for Dielectric Waveguides in Substrate Environments

E.F. Kuester. "Effective Cross-Sections for Dielectric Waveguides in Substrate Environments." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 117-118.

The use of an effective cross-section for determining the propagation constants of modes of dielectric waveguides embedded in substrates is illustrated. The resulting expressions are simple, and involve knowledge only of the TM-mode eigenvalues for a similarly shaped hollow waveguide.



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Abstracts

Analysis of Multiple Dielectric Wave Guide Systems with Extended Point-Matching Method

E. Yamashita, Y. Nishino and K. Atsuki. "Analysis of Multiple Dielectric Wave Guide Systems with Extended Point-Matching Method." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 119-121.

Quaternary dielectric waveguide systems, which could be applied to optical fibers and dielectric image lines, are analyzed with an extended point-matching method. Theoretical results are confirmed with microwave experiments.



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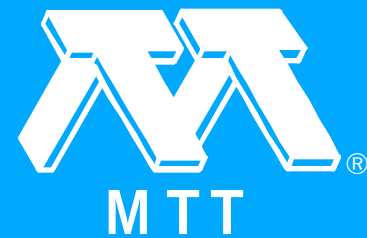


Abstracts

Image Formation in Circular Waveguides and Optical Fibers

A.R. Mahnad and E.F. Kuester. "Image Formation in Circular Waveguides and Optical Fibers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 122-124.

The formation of images of Gaussian beams at certain distances along a circular metallic waveguide or optical fiber is studied. The phenomenon of Fourier imaging in which an essentially exact replica of the input beam is produced, occurs here as it does for slab waveguides. The Fresnel images produced in the circular guides, however, are not replicas, but are related to a certain transform of the original beam shape.



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Abstracts

Session D -- Millimeter Wave Solid State Devices

"Session D -- Millimeter Wave Solid State Devices." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 125-125.



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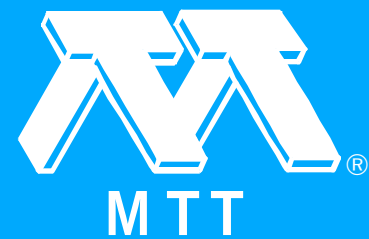
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A Comparison of the Performance of Millimetre-Wave Semiconductor Oscillator Devices and Circuits

D.C. Smith, T.J. Simmons and M.R.B. Jones. "A Comparison of the Performance of Millimetre-Wave Semiconductor Oscillator Devices and Circuits." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 127-129.

A comparison of the commonly used millimetre-wave semiconductor devices is made; the Si IMPATT, GaAs TED and InP TED. The comparison is made on the basis of the primary characteristics of output power and efficiency as well as the secondary effects of amplitude and frequency stability, including a.m. and f.m. noise. A review of the waveguide circuit techniques employed with these devices is presented, emphasizing the size limitation and susceptibility to severe environmental loadings. A miniature microstrip oscillator structure employing an InP TED as the active element is described. This source has produced 32 mW at 81 GHz in microstrip and highlights the potential suitability for rugged, integrated transmitter/receiver subsystems operating at millimetre wave frequencies.





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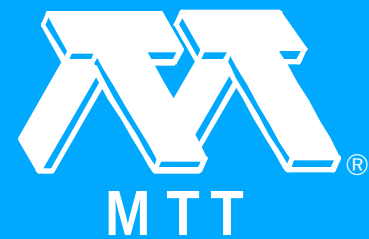
Unbiased, Sub-Harmonic Mixers for Millimeter Wave Spectrum Analyzers

R.J. Matreci and F.K. David. "Unbiased, Sub-Harmonic Mixers for Millimeter Wave Spectrum Analyzers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 130-132.

Even harmonic mixers with vastly improved sensitivity and flatness are described for the 18 to 60 GHz bands. Using GaAs antiparallel-pair diodes, conversion loss of 19, 21 and 23 dB is achieved for the 6th, 8th and 10th harmonic respectively of the analyzer's local oscillator.

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MM-Wave Frequency Discriminator Aids Reduction of Oscillator Chirp

H. Barth. "MM-Wave Frequency Discriminator Aids Reduction of Oscillator Chirp." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 133-135.

A 60 GHz frequency discriminator was developed to analyze the transient frequency behaviour and chirp of pulsed Gunn and IMPATT oscillators. The bandwidth and resolution of the discriminator amount to 7 GHz and about 5 $\mu\text{V}/(\text{mW.MHz})$. To watch centerfrequency and chirp simultaneously while shaping the bias pulse simplifies the tuning procedure of pulsed oscillators significantly. In this manner the chirp of a 5W / 100nsec IMPATT oscillator was tuned to below ± 20 MHz.

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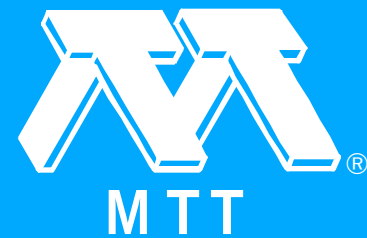


Abstracts

Ka-Band GaAs Power FETs

Y.-H. Yun, G.C. Taylor, D.S. Bechtle, S.T. Jolly, S.G. Liu and R.L. Camisa. "Ka-Band GaAs Power FETs." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 136-138.

Ka-band results using submicrometer gate length, air-bridged, soldered flip-chip GaAs power FETs in finline, ridge-waveguide circuits are reported. Conventional photolithography was used to fabricate FETs with submicrometer gate lengths by using the undercut associated with chemical etching. At 35 GHz an output power of 91 mW at 3 dB gain and 4.5% efficiency was measured.



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Abstracts

Millimeter Wave IMPATT Microstrip Oscillators

P. Yen, D. English, C. Ito and K. Chang. "Millimeter Wave IMPATT Microstrip Oscillators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 139-141.

Low cost, rugged, light weight microstrip IMPATT oscillators with a very simple structure have been developed. A Q-band (45 GHz) oscillator provides a CW output power of 200 mW. A W-band (94 GHz) oscillator provides 25 mW of CW output power and a pulsed output power of 3 watts.



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A Ka-Band PIN-Diode Switch with Extremely Large On-Off Ratio

R.D. Weglein, D.Y. Kim, R.E. Johnson and L.D. Darlington. "A Ka-Band PIN-Diode Switch with Extremely Large On-Off Ratio." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 142-144.

The performance of a Ka-Band PIN-diode switch, configured in double-ridged WR-28 waveguide and composed of up to six contiguous, self-contained modules is described. The large isolation, greater than 70 dB in the OFF state, while maintaining 1 dB minimum insertion loss in the ON state, is obtained through the application of the traveling-wave concept. The switch at present exhibits in excess of 10% bandwidth near 35 GHz in both states. Switching times of the silicon mesa diodes, measured on several completed assemblies, is 10-15 nanoseconds from OFF to ON state and less than five nanoseconds in the reverse sequence. These results are compared with predictions based on a cascaded circuit model using measured diode, parasitic and transmission line elements. The empirical relationship of peak power and switching times in PIN-diodes are used to predict the performance of a fully developed K/sub a/-Band PIN-diode switch.

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Abstracts

A 60 GHz GaAs FET Amplifier

E.T. Watkins, J.M. Schellenberg, L.H. Hackett, H. Yamasaki and M. Feng. "A 60 GHz GaAs FET Amplifier." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 145-147.

Using a $1/4\ \mu\text{m}$ gate structure, a new millimeter wave FET device has been developed. This device, in a waveguide/MIC amplifier circuit, has demonstrated gains of $5.0 \pm 0.5\ \text{dB}$ from 55 to 62 GHz with a minimum noise figure of 7.1 dB at 60 GHz.



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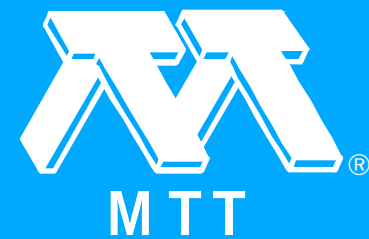
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Abstracts

Session E -- Filters and Passive Networks II

"Session E -- Filters and Passive Networks II." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 149-149.



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Abstracts

Broadband Waveguide Filters with Wide Stopbands Using a Stepped-Wall Evanescent Mode Approach

R.V. Snyder. "Broadband Waveguide Filters with Wide Stopbands Using a Stepped-Wall Evanescent Mode Approach." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 151-153.

Utilizing more than one below cut-off cross section, evanescent mode series coupled bandpass filters are described which achieve wide passbands and stopbands with practical mechanical dimensions. Performance is comparable to the conventional approach. The new design is applicable for center frequencies to above 40 GHz.



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Abstracts

Circuit Duals on Planar Transmission Media

W.J. Getsinger. "Circuit Duals on Planar Transmission Media." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 154-156.

Lumped element and multiconductor transmission line configurations in a plane have dual circuit representations, as shown by coplanar and twinstrip transmission lines. Duality relations and circuits having possible applications to MIC and MMIC are given.



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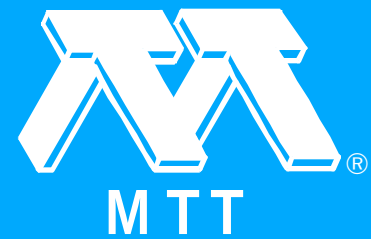


Abstracts

E-Plane Filters with Finite-Thickness Septa (1983 [MWSYM])

Y.C. Shih and T. Itoh. "E-Plane Filters with Finite-Thickness Septa (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 157-159.

The effect of metalization thickness of the septum is incorporated into an efficient CAD program for E-plane filters. The method is mathematically exact and numerically efficient. The results agree well with experimental data.



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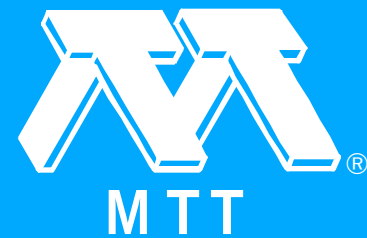


Abstracts

Filter Realizations with Fin-Lines

A.S. Omar, H. El Hennawy and K. Schunemann. "Filter Realizations with Fin-Lines." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 160-162.

The potentials of various circuits are compared for realizing fin-line bandpass filters. These include conductive strip, notch, post coupled resonators and sections of bilateral embedded into a unilateral fin-line. Some results on bandstop filters are also presented.



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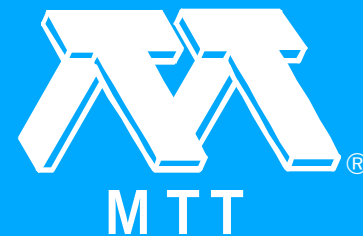


Abstracts

An 18 GHz 8-Way Radial Combiner

I. Stones, J. Goel and G. Oransky. "An 18 GHz 8-Way Radial Combiner." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 163-165.

This paper describes a 16 to 20 GHz 8-way radial microstrip combiner with transitions to WR42 waveguide. It demonstrates greater than 20% bandwidth and insertion loss of only 0.8 dB. Excellent phase and amplitude balance has been achieved.



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Abstracts

A Matched Turnstile Type 4-Way Divider/Combiner

R.L. Eisenhart, N.W. Nevils, J.J. Gulick and R.C. Monzello. "A Matched Turnstile Type 4-Way Divider/Combiner." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 166-168.

Two-port Z-parameter characterization techniques have been applied in a novel way to a 6-port turnstile type waveguide junction, resulting in a matched 4-way power divider/combiner. The circuit is new with many interesting characteristics and has application in high power or millimeter wave power combining where waveguide is best used.



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Analysis and Design of a Folded Branch Line Coupler

J.P. Starski, H.B. Lunden and V.K. Tripathi. "Analysis and Design of a Folded Branch Line Coupler." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 169-171.

The scattering parameters of branch line hybrids with coupled lines are derived in terms of the even- and odd-mode admittances and the lengths of the lines. These are used to formulate closed form design formulas. The result gives very compact structures at lower frequencies. At higher frequencies the coupling between the lines due to the limited spacing can be compensated.

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The Channel Waveguide Transformer: An Easily Fabricated H-Plane Transition for the Rectangular TE-10 Mode

P.H. Siegel, D.W. Peterson and A.R. Kerr. "The Channel Waveguide Transformer: An Easily Fabricated H-Plane Transition for the Rectangular TE-10 Mode." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 172-174.

The authors describe an easily fabricated H-plane transformer for use in rectangular waveguide carrying the dominant mode. An approximate theoretical analysis of the structure is presented, and computed results are compared with measurements on transformers at X-band. Design curves are given for transitions from full to one-half and one-quarter height waveguide. The new transformers have been found particularly useful for millimeter-wave mixers and multipliers with split-block construction. The structure can also be used as a transition from rectangular to channel waveguide.

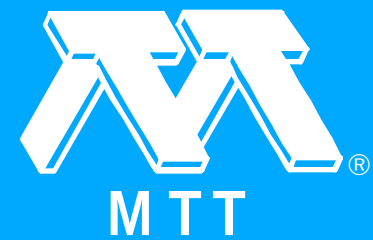
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Abstracts

Session F -- Microwave Biological Effects

"Session F -- Microwave Biological Effects." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 175-175.



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A 5.8 GHz Ophthalmic Microwave Applicator for Treatment of Choroidal Melanoma

P.T. Finger, S. Packer, P. Svitra, R.W. Paglione, D.M. Albert and J. Chess. "A 5.8 GHz Ophthalmic Microwave Applicator for Treatment of Choroidal Melanoma." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 177-179.

We report on the use of a 5.8 GHz microwave applicator to treat choroidal melanoma (Greene) in rabbits. The physical requirements needed to treat these intraocular tumors are quite different from those encountered elsewhere in the body. From a trans-scleral approach the penetration needed is minimal (5-10 mm.). The fibrous sclera is the only structure between the heat source and the tumor. The sclera has a relatively low water content when compared to tumor. This fact in addition to the frequency dependent interactions of tissue and electromagnetic radiation, results in an advantage to the use of the 5.8 GHz microwave device in treating intraocular malignancies.

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Microwave Thermotherapy for the Treatment of Human Brain Cancer

A. Winter, J. Laing, R. Paglione, F. Sterzer and P. Engler. "Microwave Thermotherapy for the Treatment of Human Brain Cancer." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 180-182.

Microwave apparatus for thermotherapy of human brain cancer is described. Key components of this apparatus are coaxial applicators that fit into 16-gauge tubes or needles (ID=1.32 mm) and can be inserted into the brain with minimum damage to healthy tissues. The case history of a patient treated with this apparatus is presented in some detail.

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A Multi-Element Microstrip Antenna for Local Hyperthermia

E. Tanabe, A. McEuen, C.S. Norris, P. Fessenden and T.V. Samulski. "A Multi-Element Microstrip Antenna for Local Hyperthermia." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 183-185.

A multi-element microstrip antenna applicator designed for microwave local hyperthermia is described. Design criteria for such a microstrip antenna array are presented. Various antennas were built and compared. Experimental measurements of heating patterns show the multiple microstrip spiral antenna provides controlled heating over a large area.

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Present Results and Trends in Microwave Thermography

Y. Leroy, M. Chive, A. Mamouni, M. Hochedez-Robillard and J.C. van de Velde. "Present Results and Trends in Microwave Thermography." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 186-188.

We summarize the data obtained on Microwave Thermography, an application of Radiometry devoted to the reception of thermal noise leading to information about the temperature in living tissues. We describe the processes experimented until now and explain their domain of application in biomedical engineering. Experiments on animals and clinical evaluations are at present being continued. Research is also carried out in the laboratory in order to improve the characteristics of this technique: elaboration of algorithms for thermal Pattern Recognition (or interpretation of the radiometric data), achievement of a multiprobe scanning microwave thermograph, and the study of the possibilities offered by Correlation microwave Thermography.

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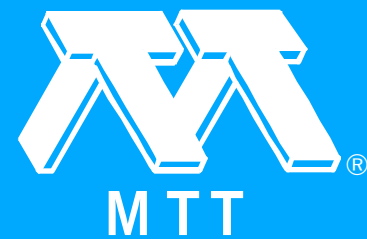


Abstracts

The Effect of Antenna Match on Microwave Radiometric Thermal Patterns

K.L. Carr, R.J. Bielawa, J.F. Regan, A.M. El-Mahdi and J. Shaeffer. "The Effect of Antenna Match on Microwave Radiometric Thermal Patterns." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 189-191.

Microwave thermographic profiles of the breast region of healthy female volunteers were obtained using a 4.7 GHz radiometer. Apparent temperature elevations of about 0.4°C were seen in the areolar (nipple) region compared to the other areas of the breast. At least half of this apparent areolar temperature elevation may be attributed to improved antenna match at that site. The importance of antenna match in the proper evaluation of microwave thermographic studies is emphasized.



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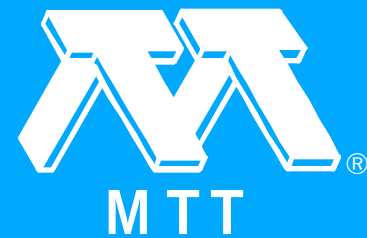


Abstracts

A Ferrimagnetic Resonance Sensor for Remote Wireless Temperature Measurements in Organic Tissue

P. Roschmann and K.M. Ludeke. "A Ferrimagnetic Resonance Sensor for Remote Wireless Temperature Measurements in Organic Tissue." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 192-194.

FMR-sensors are used in a new system for remote medical thermometry. A new integrated torus shaped permanent-magnet-YIG-sphere sensor configuration led to considerable size reduction and generally improved thermometric properties as compared to earlier designs.



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Non-Perturbed Photoluminescent Thermometry (PLT) Suitable for Microwave Hyperthermia in Cancer Patients

P.N. Shrivastava and T.V. Samulski. "Non-Perturbed Photoluminescent Thermometry (PLT) Suitable for Microwave Hyperthermia in Cancer Patients." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 195-197.

A new concept of Photoluminescent Thermometry (PLT) for non-perturbing measurement of temperature in the presence of electromagnetic fields is presented. PL spectroscopic studies demonstrate CaS(Eu,Sn) phosphors to have optimum properties for a hyperthermia probe. Several PLT probes have been constructed and tested to demonstrate that real-time temperature as measured with these probes remain unperturbed in microwave fields at power densities $>325 \text{ mW/cm}^2$. Temperature resolution of 0.1 degree C has been achieved in the range of 37-47 degrees C and the calibration stability over periods of months is found excellent for use invivo during hyperthermia treatment.

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Microwave Thermotherapy of Recurrent Chest-Wall Carcinoma

E. Friedenthal, J. Mendecki, C. Botstein, F. Sterzer and R. Paglione. "Microwave Thermotherapy of Recurrent Chest-Wall Carcinoma." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 198-200.

During the past four years, 42 patients with chest-wall recurrence of breast carcinoma were treated with microwave thermotherapy and ionizing radiation. Complete or subtotal tumor regression and healing of lesions was achieved in about 70% of the patients.

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Abstracts

Session G -- Open Forum Session I

"Session G -- Open Forum Session I." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 201-201.



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Abstracts

Theory of the Varactor Frequency Halver

R.G. Harrison. "Theory of the Varactor Frequency Halver." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 203-205.

A basic theory for broadband balanced frequency-halving circuits is presented. The analysis is applicable to both Schottky-barrier and reverse-biased abrupt-junction varactors and is based on the solution of exact nonlinear differential equations. An approximate algebraic method yields the global steady-state amplitude and phase solutions, while numerical integration gives transient solutions under specific conditions. These circuits are useful in bandwidth-compression, frequency-translation, PSK carrier-recovery and for stabilizing RF sources to LF references.



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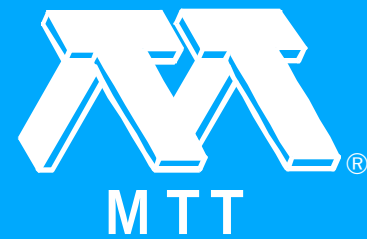


Abstracts

Statistical Analysis of Microwave Balanced Amplifiers

G.V. Petrov. "Statistical Analysis of Microwave Balanced Amplifiers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 206-208.

Statistical analysis of microwave balanced amplifiers using Monte Carlo method is presented. Yield of balanced amplifiers using tuning of matching networks is defined.



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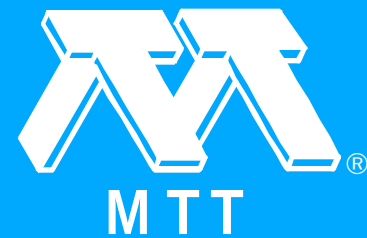


Abstracts

A Lossless Radially Symmetric TEM-Line IMPATT-Diode Power Combiner

R. Actis and D.F. Peterson. "A Lossless Radially Symmetric TEM-Line IMPATT-Diode Power Combiner." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 209-211.

Verification of a new approach to circuit-level power combining of negative resistance devices is presented. Lossless combining networks and band-limited IMPATT-diodes are utilized to provide stable combiner designs of improved bandwidth without resistive stabilization.



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Equivalent Circuit of a Kurokawa-Type Waveguide Power Combiner

P.J. Allen and P.J. Khan. "Equivalent Circuit of a Kurokawa-Type Waveguide Power Combiner." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 212-214.

An analysis is carried out for a two-post Kurokawa-type waveguide power combiner structure, using an image theory approach, which models not only the two individual components but also the cross-coupling between the two adjacent posts. Comparison with experimental measurements shows that the basic theory as applied to the single-post case remains accurate for the practical case of the post close to the waveguide sidewall.

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The Switch on Characteristics and Noise of Pulsed Read IMPATTs in Ku Band

D.M. Brookbanks and B.J. Buck. "The Switch on Characteristics and Noise of Pulsed Read IMPATTs in Ku Band." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 215-217.

The switch on characteristics and interline noise of free running, phase primed and phase locked pulsed Read Impatts have been studied in detail. The results obtained have been compared with high efficiency transferred electron devices operating in the same frequency range and very significant differences noted. Although the majority of the work has centred upon the study of high power high efficiency single drift devices some results are presented for double drift devices. The rapid switch on characteristics show that the Read Impatt is ideally suited to short pulse fast rise time applications over broad temperature ranges. These characteristics of the device are explained by existing theoretical device models, and it is shown that in the phase primed mode the residual interline noise is dominated by a small random pulse to pulse starting phase error.

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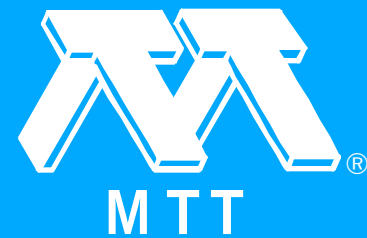


Abstracts

Constant Voltage Biasing of IMPATT Injection-Locked Oscillators

J.L. Chan. "Constant Voltage Biasing of IMPATT Injection-Locked Oscillators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 218-220.

It is shown by analysis and experimental data that constant voltage biasing is practical with IMPATT oscillators. Constant-voltage biasing offers a lesser possibility of a thermal runaway, as compared to the conventional constant-current biasing. The price for this thermal advantage is a degradation of output power with elevating ambient temperature.



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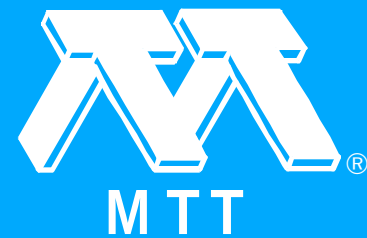


Abstracts

A Theory for the Prediction of GaAs FET Load-Pull Power Contours

S.C. Cripps. "A Theory for the Prediction of GaAs FET Load-Pull Power Contours." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 221-223.

A theory is presented which is capable of predicting the power load-pull contours of a GaAs FET in a convenient mathematical formulation. Although based on some initial simplifying assumptions, the predicted contours are shown to be in good agreement with experimental measurements.



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Computer-Corrected Load-Pull Characterisation of Power MESFET's

P.D. Bradley and R.S. Tucker. "Computer-Corrected Load-Pull Characterisation of Power MESFET's." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 224-226.

A versatile system for the load-pull characterisation of power MESFET's is described. Computer-aided vector error correction techniques are used at the input and output of the transistor to provide accurate large-signal measurements of reflection coefficient and RF power.

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Abstracts

Field Distributions in the Trapped Image Guide

W.B. Zhou and T. Itoh. "Field Distributions in the Trapped Image Guide." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 227-229.

An efficient analytical method based on Weber-Schafheitlin integral is presented for accurate field calculation in the trapped image guide. Several numerical results of the field distributions are presented and compared with measured data at Ku-band.



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Abstracts

Analysis of a Wire in a Rectangular Cavity

H. Rahman and J. Perini. "Analysis of a Wire in a Rectangular Cavity." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 230-232.

An efficient method of analyzing a loaded wire enclosed within a rectangular cavity is developed. The wire and the cavity interior are excited by electromagnetic sources exterior to the cavity. The formulation of the problem makes use of the theory of Fourier series expansion to approximate the waveform of unknown currents excited on the wire. This method bypasses the dyadic Green's function approach thereby leading to a solution which is computationally easier to handle.



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Convergence of Numerical Solutions of Step-Type Waveguide Discontinuity Problems by Modal Analysis

Y.C. Shih and K.G. Gray. "Convergence of Numerical Solutions of Step-Type Waveguide Discontinuity Problems by Modal Analysis." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 233-235.

Convergence of modal analysis solutions of step-type waveguide discontinuity problems is studied. The convergence rate depends on the ratio between the number of modal terms retained in different regions. Guidelines for accurate and efficient computations are indicated.



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Simplified Analysis of Stripline, Microstripline and Coplanar Strips, with Anisotropic Substrates for MIC and SAW Applications

S.K. Koul and B. Bhat. "Simplified Analysis of Stripline, Microstripline and Coplanar Strips, with Anisotropic Substrates for MIC and SAW Applications." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 236-238.

A unified variational expression is derived for the line capacitance of a general, multilayer anisotropic structure. The propagation parameters of a variety of striplines, microstriplines and coplanar strips with anisotropic substrates, in isolated and coupled configurations, can be obtained by simply determining the admittance parameter.



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A New Method for Solving Potential Problems which Contain Straight or Curved Strip Conductors

S. Murashima and H. Nieda. "A New Method for Solving Potential Problems which Contain Straight or Curved Strip Conductors." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 239-241.

A new method for analyzing micro strip transmission lines is presented. This method uses the superposition of Green's function on a Riemann surface and developed from research into the Charge Simulation Method. By using this method, we can accurately calculate the potential field around straight or curved strip conductors which are essential in microwave transmission lines.



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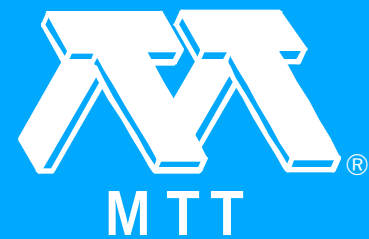
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Tapered Microstrip Transmission Lines

P. Pramanick and B. Bhat. "Tapered Microstrip Transmission Lines." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 242-244.

Lossless nonuniform microstrip tapers are useful for the design of matching networks, filters, etc. In this paper these tapers have been analysed. Reflection coefficient and complex impedance results are presented for exponential, parabolic and cosine squared tapers. The paper also presents typical design data for such tapers on 0.635 mm. thick alumina substrate.

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Abstracts

A New Transmission Line Approach for Designing Spiral Microstrip Inductors for Microwave Integrated Circuits

D. Cahana. "A New Transmission Line Approach for Designing Spiral Microstrip Inductors for Microwave Integrated Circuits." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 245-247.

Spiral microstrip inductors with up to two full turns have been modeled by using parallel coupled and single transmission lines. With this method, the electrical characteristics of these inductors, which may be fabricated as elements of MIC and MMIC circuits, can be designed for reactance up to 200 ohms with a maximum error of 15 percent for frequencies up to the K/sub u/ band.



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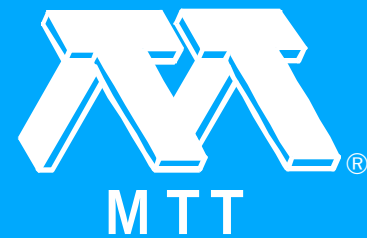


Abstracts

Cascading (CAS) and its Inverse (SAC) Matrix Operation

H.E. Stinehelfer, Sr. and H.E. Stinehelfer, Jr.. "Cascading (CAS) and its Inverse (SAC) Matrix Operation." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 248-250.

The cascading of S-parameters from test areas is described and includes the inverse cascading option "SAC" (CAS backwards). The "SAC" option inverts the matrix before multiplication causing the matrix to be de-embedded from the second matrix.



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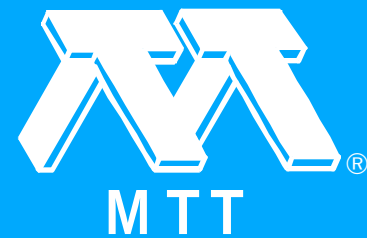


Abstracts

A Complete and Unambiguous Solution to the Super-TSD Multiport-Calibration Problem

J.W. Helton and R.A. Speciale. "A Complete and Unambiguous Solution to the Super-TSD Multiport-Calibration Problem." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 251-252.

A rigorous and complete mathematical analysis of the projective matrix transformation has led to a self-consistent and unambiguous solution to the Super-TSD multiport-calibration problem. Contrary to the conclusions of earlier analyses, the new procedure requires, in general, more than three n-port calibration-standards and determines the chain-scattering matrix (T-matrix) of the 2n-port Super-TSD virtual error-network up to an arbitrary scalar factor.



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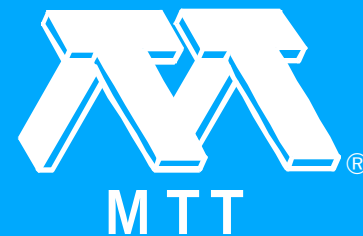


Abstracts

Magnetostatic Volume Waves

I.J. Weinberg and J.C. Sethares. "Magnetostatic Volume Waves." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 253-255.

The dispersion relation, radiation impedance and insertion loss by two terminal and microstrip models for forward and backward volume waves including a gap between YIG and transducer are obtained for the first time.



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A Magnetostriction Insensitive Dual-Mode Phase Shifter

H. Asao, M. Matsunaga and F. Takeda. "A Magnetostriction Insensitive Dual-Mode Phase Shifter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 256-258.

This paper describes a magnetostriction insensitive dual-mode phase shifter. In this phase shifter, nonreciprocal insertion phase is reduced to one tenth of conventional one by connecting two phase shifters magnetized in opposite direction.

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An Oblique Incidence Ion Implanted MSFVW RAF with Linear Group Delay

K.W. Reed, J.M. Owens, R.L. Carter and C.V. Smith. "An Oblique Incidence Ion Implanted MSFVW RAF with Linear Group Delay." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 259-261.

Ion implanted bars have been used in a MSFVW oblique incidence reflective array linear delay filter at 3 GHz. Theory and synthesis techniques are presented based on a four layer complex dispersion relation and the impulse reflection model.

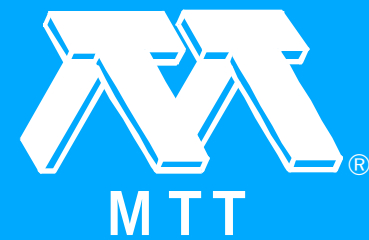
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Abstracts

Session H -- GaAs FET Amplifiers and Oscillators

"Session H -- GaAs FET Amplifiers and Oscillators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 263-263.



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X and Ku Band High Efficiency Power GaAs FETs

A. Saito, Y. Kojima, K. Suzuki, Y. Kaneko and S. Aihara. "X and Ku Band High Efficiency Power GaAs FETs." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 265-267.

New structural, high productive power GaAs FETs have been developed, achieving power added efficiency ranging from 30 % to 40 % with 1.5 W power output between 10 to 15.2 GHz on mass production basis. Internally matched devices with two chips have exhibited the supreme performance of 3 W power output with as high as 40 % power added efficiency at 15.2 GHz. These devices have structural features on the 0.5 μm deep recessed gate utilizing photoresist-free gate formation and the sidewall metallization combined with PHS and via hole structure.





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K-Band Via-Hole Grounding pi-Gate FET With Monolithic On-Chip Matching Network

P. Saunier and S. Nelson. "K-Band Via-Hole Grounding pi-Gate FET With Monolithic On-Chip Matching Network." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 268-269.

A 1650 μm gate width GaAs FET with monolithic partial on-chip matching network of the input for broadband operation had 630 mW output power with 4 dB gain from 17 to 20.5 GHz. The pi-gate design includes 13 reactive-ion-etched source vias on a 50 μm substrate with a plated heat sink.

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Design and Performance of K-Band Power GaAs FETs on Matched Carriers

L. Rosenheck, S. Dow, C. Berglund and M. Stevens. "Design and Performance of K-Band Power GaAs FETs on Matched Carriers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 270-272.

Experimental relationships between the gain of K-band GaAs power FETs and the device geometries. Output powers as high as 1100mW with 4.3dB associated gain at 20.2 GHz have been measured. Matched carrier performance on both fused silica and sapphire is described.

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An 8.0 Watt K-Band FET Amplifier for Satellite Downlink

J. Goel, G. Oransky, P. O'Sullivan, S. Yuan, B. Hewitt and P. White. "An 8.0 Watt K-Band FET Amplifier for Satellite Downlink." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 273-275.

An 8.2 Watt FET amplifier with 38.6 ± 0.5 dB gain over 17.7 to 19.1 GHz frequency band has been developed. This amplifier combines the outputs of eight multistage amplifier modules utilizing a radial combiner. This state-of-the-art uower leve has been achieved with a noise fiaure of less than 8.0 dB and AM/PM of less than $2^\circ/\text{dB}$. The third order intermodulation products at 1 dB qain compression were 20 dBc and variation in group delay over the frequency band was less than $\pm.25$ nSec.

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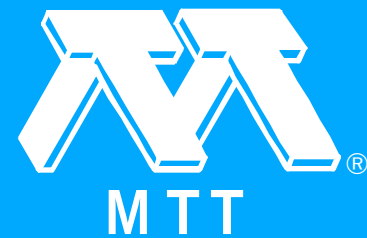


Abstracts

A 6-GHz 80-W GaAs FET Amplifier with TM-Mode Cavity Power Combiner

N. Okubo, Y. Kaneko, T. Saito and Y. Tokumitsu. "A 6-GHz 80-W GaAs FET Amplifier with TM-Mode Cavity Power Combiner." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 276-278.

A novel 8-way divider/combiner using TM₀₁₀- and TM₀₂₀-mode cavities was developed, with an insertion loss of 0.2 dB and a bandwidth of 600 MHz at 6 GHz. An 80-W broadband GaAs FET amplifier with combining efficiency of 85 percent was successfully demonstrated using this power divider/combiner.



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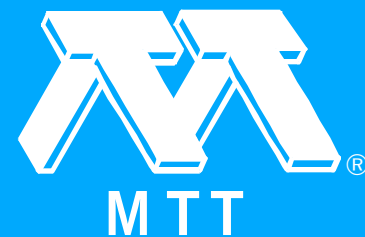


Abstracts

GaAs MESFET Oscillator Design Using Large-Signal S-Parameters

R.J. Gilmore and F.J. Rosenbaum. "GaAs MESFET Oscillator Design Using Large-Signal S-Parameters." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 279-281.

A novel analytical technique is presented which uniquely determines the embedding network required for a MESFET oscillator to deliver specified power to an arbitrary load. An experimental 5.3 GHz oscillator provided 24 dBm with 35% efficiency.



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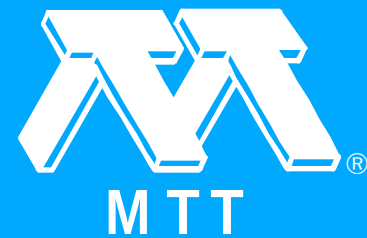


Abstracts

Near-Carrier Noise in FET Oscillators

R.A. Pucel and J. Curtis. "Near-Carrier Noise in FET Oscillators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 282-284.

An exhaustive study is presented of the relation of near-carrier FM noise of FET oscillators to baseband noise, gate technology, surface passivation, channel formation, and traps. FM noise performance of an FET oscillator will be presented which is over 20 dB better than heretofore reported.



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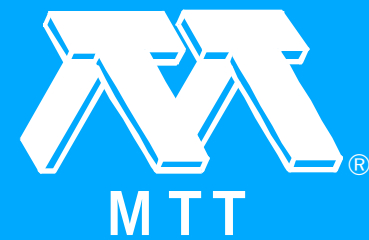
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Abstracts

Session I -- Millimeter Wave Integrated Circuits

"Session I -- Millimeter Wave Integrated Circuits." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 285-285.



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Dielectric Guide W-Band (75-110GHz) Receiver with Partially Integrated Oscillator

T.H. Oxley, J. Ondria, P.L. Lowbridge, N. Williams, R.A. Gelsthorpe and S. Gibbs. "Dielectric Guide W-Band (75-110GHz) Receiver with Partially Integrated Oscillator." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 287-289.

This paper discusses the design, construction, and performance aspects of a W-Band (75-110 GHz) dielectric guide receiver, incorporating a partially integrated local oscillator. Machined alumina and thick film dielectric guide fabrication techniques are considered.

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



Abstracts

W-Band Low Noise Integrated Circuit Crossbar and Finline Mixers with Over 20 GHz Instantaneous RF Bandwidth

R.S. Tahim, T. Pham and K. Chang. "W-Band Low Noise Integrated Circuit Crossbar and Finline Mixers with Over 20 GHz Instantaneous RF Bandwidth." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 290-292.

W-band integrated circuit mixers with state-of-the-art performance over wide IF and RF bandwidths have been developed. A conversion loss of less than 7.2 dB over 20 GHz instantaneous RF bandwidth has been achieved in a crossbar stripline structure and less than 7.6 dB over 28 GHz in a finline structure. Commercially available beamlead diodes are used in both structures. Major features include mechanical ruggedness, light weight, small size, and ease of low cost manufacturing. Areas of application include advanced electronic warfare, surveillance, and communication systems.



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Abstracts

Direct Experimental Confirmation of New Leakage Effects on Open Dielectric Strip Waveguides

H. Shigesawa, M. Tsuji, J.S. Myung, S.T. Peng and A.A. Oliner. "Direct Experimental Confirmation of New Leakage Effects on Open Dielectric Strip Waveguides." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 293-295.

Certain open dielectric strip waveguides for millimeter waves and for integrated optics leak under appropriate circumstances. This leakage was predicted theoretically and indicated experimentally in indirect fashion. Here, direct measurements are presented which verify not only the leakage but also the resonance effect associated with it.



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Wave-Guiding Characteristics of Partially Corrugated Dielectric Waveguides

M. Tsuji, H. Shigesawa and K. Takiyama. "Wave-Guiding Characteristics of Partially Corrugated Dielectric Waveguides." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 296-298.

The behavior due to a finite length of periodically corrugated dielectric waveguide is analyzed under the conditions that the TE and TM modes must couple to each other. Excellent agreements between calculated and experimental results are shown not only for the reflected and transmitted powers, but also for the dispersion curves.

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



Abstracts

Some Dielectric-Waveguide Filter Structures

G.L. Matthaei, D.C. Park, Y.M. Kim and D.L. Johnson. "Some Dielectric-Waveguide Filter Structures." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 299-301.

Band-stop and band-pass filters utilizing dielectric-waveguide (DW) gratings are discussed and theoretical and measured responses are presented. The simplest band-pass filter of this class consists of two, parallel-coupled gratings with distributed loss added at their far ends. It is shown that using combinations of parallel-coupled and direct-coupled gratings Chebyshev or other pass-band characteristics can be obtained.



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Insulated Nonradiative Dielectric Waveguide for Millimeter-Wave Integrated Circuits (1983 [MWSYM])

T. Yoneyama, S. Fujita and S. Nishida. "Insulated Nonradiative Dielectric Waveguide for Millimeter-Wave Integrated Circuits (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 302-304.

An improved version of the nonradiative dielectric waveguide (NRD-guide), called an insulated nonradiative dielectric waveguide, is proposed for millimeter wave integrated circuits. This dielectric waveguide can overcome some difficulties which arise when high dielectric material is used in the NRD-guide. Guide wavelengths and transmission losses were measured at 50 GHz and compared with theory.

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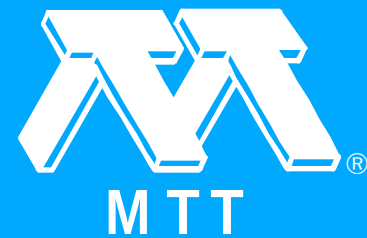


Abstracts

Suspended H-Waveguide and its Millimeter Wave Applications

T.N. Trinh and R. Mittra. "Suspended H-Waveguide and its Millimeter Wave Applications." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 305-308.

The propagation and loss characteristics of the suspended H-waveguide, a new dielectric waveguide structure for millimeter-wave applications, are described. Both the mode-matching and the effective dielectric constant techniques are investigated. Some novel applications of the suspended H-waveguide are also presented.



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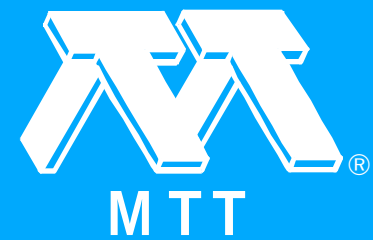
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Abstracts

Session J -- Acoustics and Ferrites

"Session J -- Acoustics and Ferrites." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 309-309.



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Abstracts

The Role of SAW Oscillators in Military Radar Systems

P. Pedi, J. Loan and E. McManus. "The Role of SAW Oscillators in Military Radar Systems." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 311-313.

Surface Acoustic Wave (SAW) oscillators are beginning to find growing applications for military radar systems. This paper deals with the capability of SAW oscillators and the impact on system performance relative to meeting missile and radar requirements.



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Abstracts

A Review of Surface Acoustic Wave Devices and Their Current Applications

R.C. Rosenfeld and R.M. Hays, Jr.. "A Review of Surface Acoustic Wave Devices and Their Current Applications." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 314-314.

Millions of SAW bandpass filters are produced each year for TV IF application. Recently SAW resonators for oscillators at 680 MHz and other frequencies in CATV set-top convertors have reached volumes of tens of thousands per month. New applications for filters, resonators, and coded devices in security and identification systems are nearing high- volume production. Military applications have increased steadily over the last decade with some production programs requiring thousands of SAW components per year. Clearly, in recent years the use of SAW filters has increased dramatically. This paper reviews the present state-of-the-art performance of production SAW devices and their commercial and military applications.



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New SAW Oscillators for Land Mobile Telephone Radio Unit

S. Urabe, S. Saito and N. Kanmuri. "New SAW Oscillators for Land Mobile Telephone Radio Unit." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 315-317.

New SAW frequency variable oscillators for a mobile radio unit are presented. A 145-MHz SAW-resonator -oscillator has been developed for the FM modulator. An 800-MHz SAW delay-line oscillator without an external phase shifter is proposed for the frequency synthesizer.

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A Tunable Magnetostatic Volume Wave Oscillator

J.P. Castera, P. Hartemann, J.M. Dupont, Y. Le Tron, A. Bert and A. Trillaud. "A Tunable Magnetostatic Volume Wave Oscillator." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 318-322.

A 3.4 GHz to 7.0 GHz tunable oscillator using a magnetostatic volume wave resonator as the frequency selective element and GaAs FET chips for gain in the feedback loop has been achieved and tested. Oscillator circuit has been designed using the theoretical model of a GaAs FET and the equivalent circuit of the resonator. This oscillator delivers a + 7 dBm output signal at 7 GHz with a low FM noise of - 90 dBc/Hz, 10kHz removed from the carrier.

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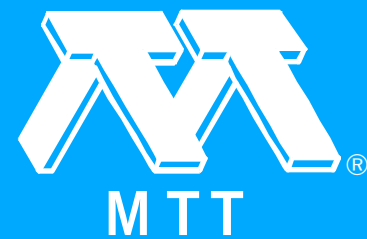


Abstracts

A Hybrid GaAs MIC Oscillator Using a Magnetostatic Wave Resonator

J.M. Owens, R.L. Carter and Y.W. Sam. "A Hybrid GaAs MIC Oscillator Using a Magnetostatic Wave Resonator." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 323-325.

A Magnetostatic Surface Wave resonator and GaAs Field Effect transistor amplifier have been fabricated in an integrated format on a common MIC substrate operating at 3 GHz. The resultant oscillator had an output of -30 dB and phase noise of -92 dBc/Hz at 20 kHz offset.



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A Multi-Octave Frequency Selective Limiter

S.N. Stitzer and H. Goldie. "A Multi-Octave Frequency Selective Limiter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 326-328.

A frequency selective limiter operating over more than 2 octaves bandwidth has been developed. The design uses single crystal ephaxial YIG films. Limiting threshold and leakage are about 1 milliwatt. Dynamic range approaches 20 dB. Selectivhy bandwidth for 3 dB weak signal compression is about ± 20 MHz at 100 mW input. An analytical method gives accurate predictions of limiting behavior when linear loss terms are included.

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YIG-Filter Recovery After Exposure to High Power and X-Band Frequency-Stepped YIG Filter

E. Schloemann and R.E. Blight. "YIG-Filter Recovery After Exposure to High Power and X-Band Frequency-Stepped YIG Filter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 329-331.

The physical processes that determine the recovery of YIG filters after exposure to high-power signals are investigated. Results include predictions concerning nonthermal detuning due to spin-wave instability and concerning delayed emission after termination of the incident pulse. A novel YIG filter is described in which resonators can be detuned some 300 MHz in a 50 nanosecond time interval. When detuning is synchronized with a transmitter pulse the component can perform as a T.R. switch in addition to its normal selective function. A substantial amount of the incident rf power is reflected, providing a measure of protection for the filter and following receiver components.

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Low Loss Electronically Controlled EHF Variable Power Dividers

D.S. Besse and T.E. Sharon. "Low Loss Electronically Controlled EHF Variable Power Dividers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 332-334.

The development of an EHF variable power divider (VFD) using 90° phase shifters and fixed 3 dB couplers is described. The accurate characterization of individual components of the VFD's leading to the construction of a device capable of over 34 dB cancellation is discussed.

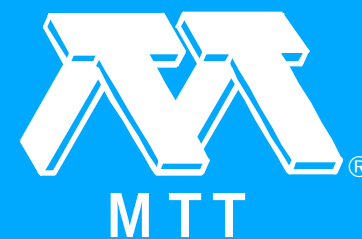
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Abstracts

Session K -- Systems Applications of GaAs FETs

"Session K -- Systems Applications of GaAs FETs." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 335-335.



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Abstracts

N-Bit L-Band Phase Shifters for Phased Arrays

J.K. Smith. "N-Bit L-Band Phase Shifters for Phased Arrays." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 337-339.

Phase shifters required for electronic beamsteering in phased arrays are typically built with a small number of discrete bits. At the lower microwave radar frequencies, a large number of bits is desired to both reduce sidelobes and perform adaptive beamforming. Continuously variable phase shifters with infinite resolution have been built at L-band (1.3 GHz). Two phase shifters are reported on: a 360° unit which is a hybrid of all GaAs components, and a fully monolithic 90° shifter made in silicon-on-sapphire.



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GaAs FET Linear Power Amplifiers for 16 QAM Signals at 6 and 11 GHz

A. Barzaghi, F. Oggionni and G. Pratesi. "GaAs FET Linear Power Amplifiers for 16 QAM Signals at 6 and 11 GHz." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 340-342.

This paper describes design and realisation criteria for linear power amplifiers used in novel 16 QAM radio link systems. The 6.4-7.1 GHz amplifiers use 6 cascaded stages and perform a .9 W mean output power with a 42 dB linear gain and -37 dBc 3rd order IM. The 10.7-11.7 GHz version uses 8 cascaded stages to perform a .5 W mean output power with the same distortion value.

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Sources of Non-Linearity in GaAs MESFET Frequency Multipliers

E. Camargo, R. Soares, R.A. Perichon and M. Goloubkoff. "Sources of Non-Linearity in GaAs MESFET Frequency Multipliers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 343-345.

Transconductance and output conductance non-linearities of a single gate GaAs MESFET are used to define promising multiplier bias levels and harmonic loads. The model enables design of 25 mW 4-8 GHz doubler with 6 dB gain, 20 mW 4-12 GHz tripler with 3 dB gain and 2 mW 4-16 GHz quadruple with 2 dB gain.



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A Frequency Translator Using Dual-Gate GaAs FETs

S.R. Mazumder, T.L. Tsai and W.C. Tsai. "A Frequency Translator Using Dual-Gate GaAs FETs." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 346-348.

An active 11.5 GHz frequency translator using four dual-gate FETs has been developed. Carrier and spurious sideband suppression of more than 20 dB has been achieved for translation frequency of up to 1 MHz. The same circuit can also be used as a high speed QPSK modulator with phase transition time of about 1 nanosecond.

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A 16 GHz GaAs FET Frequency Divider

C. Rauscher. "A 16 GHz GaAs FET Frequency Divider." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 349-351.

A GaAs FET regenerative frequency divider operating at K/sub u/-band is described, employing a 0.5 μm gate length device biased in the vicinity of pinch-off so as to provide both the gain and the nonlinear properties required for achieving frequency division. The study includes measured circuit responses as functions of drive level for single-tone CW, single-tone pulsed, and two-tone CW excitations.

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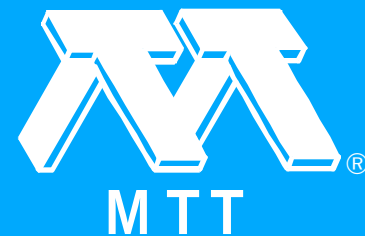


Abstracts

A Dual-Gate Ga As F.E.T. Analog Frequency Divider

D. Kaminsky, P. Goussu, R. Funck and A.G. Bert. "A Dual-Gate Ga As F.E.T. Analog Frequency Divider." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 352-354.

Theoretical and experimental performances of a dual-gate GaAs F.E.T. analog frequency divider are presented. The preliminary results show the feasibility of such a divider, obtaining a half-frequency conversion gain of 4 dB within an operating bandwidth of 20% with less than 10 mWatts input power level.



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Wideband Agile Transversal Filter

C. Ryan, C. Weitzel, D. Gottman and J. Frary. "Wideband Agile Transversal Filter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 355-357.

The development of a Wideband Agile Transversal Filter is made possible by the use of dual gate GaAs FET transistor arrays. The transversal filter design has a bandwidth of greater than 2.0 GHz and the filter transfer function can be changed in less than 10 nanoseconds. The design has been configured in a four section block that can be cascaded to obtain multiple delay functions and thus very complex filter transfer functions.

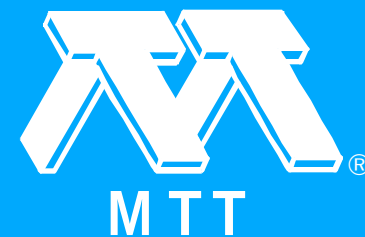
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Abstracts

Session L -- Microwave Measurements (1983 [MWSYM])

"Session L -- Microwave Measurements (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 359-359.



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Comparison of Single Diode vs. Dual Diode Detectors for Microwave Power Detection

S. Wetenkamp. "Comparison of Single Diode vs. Dual Diode Detectors for Microwave Power Detection." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 361-363.

In this article we review basic diode detection as it pertains to microwave power measurements. The detected voltage as a function of input voltage is derived for the single diode detector, and several of the limitations and drawbacks are explored. The concept of a balanced detector is then explored and its advantages examined. A family of curves is given showing the worst case errors due to harmonics for both the single diode and the balanced detector.

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Conversion Loss and Noise Temperature of Mixers from Noise Measurements

R. Trambarulo and H.S. Berger. "Conversion Loss and Noise Temperature of Mixers from Noise Measurements." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 364-365.

Dual-sideband conversion loss and noise temperature of a mixer can be determined from noise measurements alone from the variation of receiver noise temperature with changes in IF noise temperature. Results are presented for a 100 GHz subharmonically pumped mixer.

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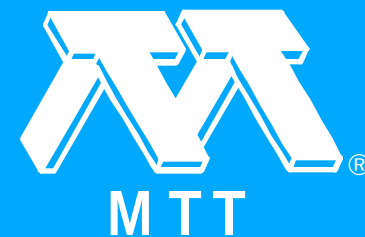


Abstracts

A New Measurement Method of the Noise Parameters of Two-Port Devices

N. Fanelli. "A New Measurement Method of the Noise Parameters of Two-Port Devices." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 366-368.

A new procedure, based on the representation of the noise properties of linear two-ports with uncorrelated noise waves, allows the experimental evaluation of the four noise parameters using only a sliding short as tunable element. Experimental set-up and results obtained from measurements of FET devices are discussed.



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A Unified Analysis of Transmission Line Discriminators for F. M. Noise Measurements

R.S. Brozovich. "A Unified Analysis of Transmission Line Discriminators for F. M. Noise Measurements." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 369-371.

The transmission line discriminator is a well known system for measuring phase noise of an oscillator. Using several forms of these circuits, (particularly those patented by Ashley et al.) as a basis, we derive equations for the mixer I.F. output voltage, use these to determine the sensitivity of the discriminator and system threshold. This is related to a minimum detectable frequency deviation. Combining these theoretical equations and computer simulations with experimental results, we provide a unified analysis of frequency discriminators which goes well beyond any analysis available in current literature.

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Abstracts

An E-Plane Coupled Matched Waveguide 5-Port for Making 6-Port Measurements Over a Full Waveguide Band

G.P. Riblet. "An E-Plane Coupled Matched Waveguide 5-Port for Making 6-Port Measurements Over a Full Waveguide Band." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 372-374.

Recently, it has been shown that an ideal 6-port network consists of a perfect directional coupler and a matched reciprocal five port. In this paper an E-plane coupled waveguide five port which is well matched over an entire waveguide band will be described and its use for making 6-port measurements demonstrated over the Ku band 12.5 - 18.0 GHz.



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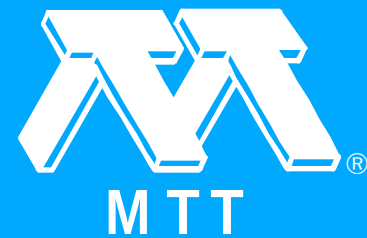


Abstracts

Development of Broadband Coaxial Components for a 0.01 to 40 GHz Measurement System

W. Oldfield. "Development of Broadband Coaxial Components for a 0.01 to 40 GHz Measurement System." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 375-377.

Broadband millimeter coaxial components, including a new connector are used to configure an accurate automated scalar network analyzer system with continuous coverage from 10 MHz to 40 GHz.



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Video Impedance Properties of Pulsed X-Band GaAs IMPATT Diodes

C. Horvitz, R. Laton, L. Olsen and D. Porterfield. "Video Impedance Properties of Pulsed X-Band GaAs IMPATT Diodes." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 378-380.

A pulsed impedance measurement system was developed to characterize the bias circuit of GaAs IMPATT diodes. Actual bias circuit data was obtained and used analytically to describe the interaction between Impatt diode bias input and modulator impedances.

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

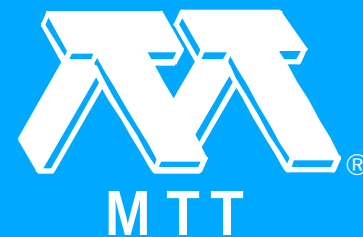


Abstracts

Automated Measurement System for Characterizing Power Amplifier Performance

E.R. Carlson. "Automated Measurement System for Characterizing Power Amplifier Performance." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 381-383.

An automated test system is described which measures the transfer characteristics, frequency response, linearity, and dc characteristics of microwave power amplifiers. The system performs, in real time, a 24-carrier C/IM measurement at fixed amplifier output for linearity tuning.



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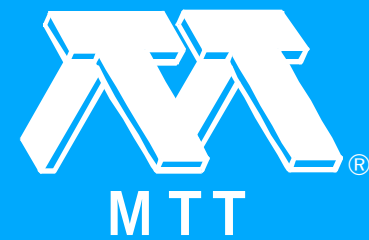
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Abstracts

Session M -- New Effects in Guided Wave Structures

"Session M -- New Effects in Guided Wave Structures." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 385-385.



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Solution of Fin-Line Discontinuities through the Identification of its First Four Higher Order Modes

M. Helard, J. Citerne, O. Picon and V.F. Hanna. "Solution of Fin-Line Discontinuities through the Identification of its First Four Higher Order Modes." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 387-389.

The dominant and the first four higher order modes in a unilateral fin-line are accurately described from a thorough Spectral Domain Approach. Then, coupling coefficients between eigenmodes at a discontinuity that have to be introduced into the scattering matrix formulation, are directly computed in the Spectral Domain. Finally, fin-line discontinuities often used for impedance transformation are investigated and comparison with measurements in K/sub a/ band are given.

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Leaky Modes of Symmetrical Groove Guide

A.A. Oliner and P. Lampariello. "Leaky Modes of Symmetrical Groove Guide." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 390-392.

Both the odd and even higher modes of groove guide, a low-loss waveguide proposed some years ago for millimeter wavelengths and of interest again today, are investigated quantitatively. We verified an early prediction that all the odd higher modes leak, and we find that all even higher modes do also. The leakage is obtained quantitatively by deriving accurate transverse equivalent networks, all of whose elements are in closed form. The implications for new leaky-wave antennas are also indicated.

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



Abstracts

Mode Propagation in Laterally Bounded Conductor-Backed Coplanar Waveguides

G. Leuzzi, A. Silbermann and R. Sorrentino. "Mode Propagation in Laterally Bounded Conductor-Backed Coplanar Waveguides." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 393-395.

The propagation characteristics and field distributions in conductor-backed coplanar waveguide are investigated using a full-wave technique. The influence of the lateral boundaries of the structure is illustrated in detail. With respect to the unbounded structure additional modes can propagated even in the low-frequency range.



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Abstracts

Analysis of M.I.S. or Schottky Contact Coplanar Lines Using the F.E.M. and the S.D.A.

M. Aubourg, P. Villotte, F. Godon, Y. Garault, P. Kennis, P. Pribetich, C. Seguinot and P. Gelin. "Analysis of M.I.S. or Schottky Contact Coplanar Lines Using the F.E.M. and the S.D.A.." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 396-398.

The finite element method and the spectral domain approach are used to optimize M.I.S. and Schottky contact coplanar waveguides because the range domain of the slow wave mode depends stronger the geometrical size.



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Slow-Wave Coplanar Waveguide on Periodically Doped Semiconductor Substrate (1983 [MWSYM])

Y. Fukuoka and T. Itoh. "Slow-Wave Coplanar Waveguide on Periodically Doped Semiconductor Substrate (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 399-401.

A metal-insulator-semiconductor (MIS) coplanar waveguide with periodically doped substrate is described. Reduction of attenuation and enhancement of the slow-wave factor are observed, compared to the uniform MIS coplanar waveguide. The structure is experimentally simulated and shows good agreement with theory.



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Abstracts

Slow Wave Propagation in Generalized Cylindrical Waveguides Loaded with a Semiconductor

C.M. Krowne. "Slow Wave Propagation in Generalized Cylindrical Waveguides Loaded with a Semiconductor." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 402-404.

For a parallel-plate waveguide and a microstrip line loaded with a semiconductor slab of resistive or active character the complex propagation constant γ is determined. γ is found for higher order branches for microwave and millimeter-wave frequencies between 10 and 140 GHz, representing a very comprehensive study of phase velocity slowing. An assessment of slowing in generalized cylindrical waveguide structures at millimeter-wave frequencies is obtained from this study.



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Abstracts

Smith-Purcell Radiation from a Charge Moving Above a Penetrable Grating

S.L. Chuang and J.A. Kong. "Smith-Purcell Radiation from a Charge Moving Above a Penetrable Grating." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 405-406.

Taking into account the penetrable property of metallic gratings, the Smith-Purcell radiation problem is solved and it is shown that when the surface plasmon mode is excited, maximum radiation occurs.



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Abstracts

Session N -- Open Forum Session II

"Session N -- Open Forum Session II." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 407-407.



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Abstracts

Evaluation of Modes in Dielectric Resonators Using a Surface Integral Equation Formulation (1983 [MWSYM])

D. Kajfez, A.W. Glisson and J. James. "Evaluation of Modes in Dielectric Resonators Using a Surface Integral Equation Formulation (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 409-411.

A moment method solution procedure for rotationally symmetric dielectric bodies has been applied to isolated cylindrical dielectric resonators, and the frequencies as well as Q factors due to radiation have been determined for several of the lowest modes including those of hybrid type including those of hybrid type.



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Passive Components in Inverted Microstrip and Suspended Microstrip Configurations

S.K. Koul, B. Bhat and M.C. Krishnaswamy. "Passive Components in Inverted Microstrip and Suspended Microstrip Configurations." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 412-414.

This paper reports the development and performance characteristics of a number of passive components in the inverted microstrip and the suspended microstrip configurations. These devices are fabricated at frequencies up to X-band. However, using proper scaling, devices at millimeter wave frequencies should be possible in these two configurations.

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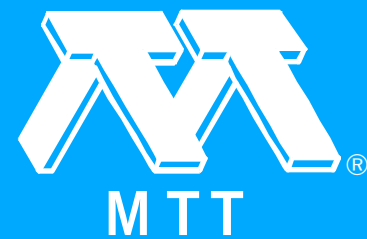


Abstracts

Integrated Approach to Microwave Postproduction Tuning

J.W. Bandler and A.E. Salama. "Integrated Approach to Microwave Postproduction Tuning." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 415-417.

We present a new, integrated, theoretically justifiable approach to postproduction tuning. The approach addresses the determination of a set of sampling points at which measurements should be made, the specification of the circuit response of interest, the determination of the parameters to be tuned and the tuning algorithm itself. It utilizes a highly effective nonlinear programming notation which can be applied to any circuit design problem. We present its application in tuning a matching amplifier circuit, utilizing highly efficient optimization algorithms, which are available as documented computer program packages.



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Automatic Measurement of Filter Coupling Parameters

A.E. Williams, R.G. Egri and R.R. Johnson. "Automatic Measurement of Filter Coupling Parameters." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 418-420.

The coupling parameters of a system of high Q coupled cavities, such as a filter, can be determined by measuring the 0° , $\pm 90^\circ$, and $\pm 180^\circ$ phases of the input reflection coefficient. This paper describes a technique to measure these coupling parameters auto-matically by using an HP-9845B desk-top computer to control a frequency synthesizer, a network analyzer, and a frequency counter.

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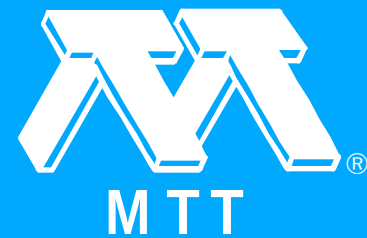


Abstracts

Resonant Frequencies of Dielectric Loaded Waveguide Cavities

K.A. Zaki and A.E. Atia. "Resonant Frequencies of Dielectric Loaded Waveguide Cavities." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 421-423.

An accurate method for the computation of the resonant frequencies of dielectrically loaded circular cylindrical waveguide cavities is described. The method is suitable for the calculation of any resonant mode with high accuracy. Comparison of the calculation of the resonant frequencies of several cases agreed closely with measurements.



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Modal Analysis of a Coaxial-Line Waveguide Junction

M.E. Bialkowski and P.J. Khan. "Modal Analysis of a Coaxial-Line Waveguide Junction." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 424-426.

A modal approach is described for analysis of the junction between a coaxial line and a guiding structure having conducting planes on upper and lower surfaces. The expressions are verified by comparison with experimental measurement for the special case of a rectangular waveguide.

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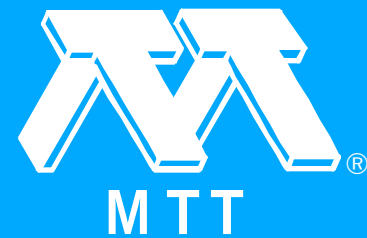


Abstracts

Design of an Overlay Directional Coupler by a Full-Wave Analysis (1983 [MWSYM])

L. Su, T. Itoh and J. Rivera. "Design of an Overlay Directional Coupler by a Full-Wave Analysis (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 427-429.

A full-wave analysis based on the spectral domain method is used for designing an overlay coupler. Calculated and measured results are presented.



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Rectangular Cavity High Harmonic Gyrotron Amplifier

A.M. Ferendeci. "Rectangular Cavity High Harmonic Gyrotron Amplifier." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 430-431.

A gyrotron amplifier operating at the higher harmonics of the cyclotron frequency using a slotted rectangular waveguide is described. Axial grooves on the upper wall of the cavity allows strong interaction of the electrons with the electromagnetic fields. Pi and 2 pi modes of the cavity are analyzed for mode competition and optimum interaction.

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An Eight - Phase Broadband Serrodyne Modulator

M. Topi. "An Eight - Phase Broadband Serrodyne Modulator." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 432-434.

The design of a 6 to 18 GHz serrodyne modulator is described. It consists of a P-I-N diodes based all passive eight step phase shifter. The device is digitally controlled. Experimental data and a comparison with a conventional serrodyne TWT are presented.

Click on title for a complete paper.



Abstracts

A Broadband 16 Port Modeformer System Using Computer Aided Design

G.R. Branner, E.A. Cota and T.J. Minasi. "A Broadband 16 Port Modeformer System Using Computer Aided Design." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 435-437.

A 16-port broadband modeformer system has been developed to operate between C and Ku bands. The design approach is novel in that a unique computer modeling technique was developed and employed for design, optimization and integration of the system. The program employs exact analytical models for all components in the system such as 4-section tandem connected 90° hybrids, 180° hybrids, multisection phase shifters and line lengths. The overall system computer model employs special techniques to handle large (200 by 200) complex matrices. Measured data is presented which illustrates the accuracy with which the composite computer model predicts the actual hardware system performance.



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Millimeter Wavelength Solid State Oscillator AM and FM Noise

J.R. Ashley, F.M. Palka, P.E. Pages and J.C. Rolfs. "Millimeter Wavelength Solid State Oscillator AM and FM Noise." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 438-439.

A comparison of difficulty for AM and FM noise measurements at millimeter and centimeter wavelengths explains why few FM noise measurements and even fewer AM noise measurements have been reported. The AM noise measurement should be made to prove that AM noise can be neglected and to learn about the oscillator diode noise measure, M. Since millimeter wavelength solid state oscillators are relatively noisy, we show that a simple transmission line discriminator is adequate for measuring both AM and FM noise. Data will be presented for several oscillators in the most used portions of the millimeter wave bands.

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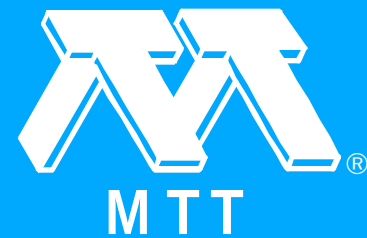


Abstracts

Design and Performance of Dual-Gate GaAs MESFET Up-Converter

A.A. de Salles. "Design and Performance of Dual-Gate GaAs MESFET Up-Converter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 440-442.

Design procedure and experimental results for a GaAs MESFET Up-Converter using a dual gate device are presented. DC and S parameter measurements are used to estimate the appropriate biasing and matching conditions. High conversion gain (~8dB) and moderate noise performance (~7dB) were obtained.



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Modelling and Evaluation of Dual Gate MESFETs as Low-Noise, Self-Oscillating and Image-Rejection Mixers

C. Tsironis, R. Stahlmann and R. Meierer. "Modelling and Evaluation of Dual Gate MESFETs as Low-Noise, Self-Oscillating and Image-Rejection Mixers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 443-445.

The three principal modes of non linear operation of DGFET mixers are described and modelled in order to understand the mixing mechanism and optimize critical circuit and device parameters. Theoretical results are compared with experiments on a 12 GHz TV reception mixer with 8 dB conversion gain and 800 MHz bandwidth.



Abstracts

Spurious Product Zone Chart: A Practical Approach to Frequency Conversion Synthesis

A.D. Vincze. "Spurious Product Zone Chart: A Practical Approach to Frequency Conversion Synthesis." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 446-448.

Mixer charts and computerized spurious product search are commonly utilized techniques for determining the spurious/intermodulation spectrum of communication systems or equipment utilizing frequency conversion. Both methods require intuition, a trial-and-error approach, and lack the adaptability to illustrate computer graphics. The spurious product zone charting method provides a clear, quick, and concise mathematical/graphical presentation of spurious/intermodulation (IM) products resulting from conversion processes. It adapts easily to computer aided design graphic displays or to small calculators with alphanumeric readouts.



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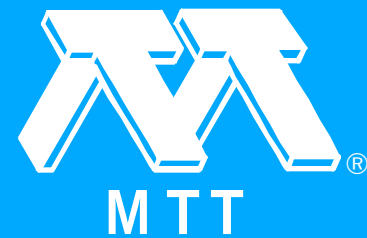


Abstracts

Investigation of a Single-Sideband Mixer Anomaly (1983 [MWSYM])

B.R. Hallford. "Investigation of a Single-Sideband Mixer Anomaly (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 449-451.

Investigations into a higher than expected conversion loss phenomena in a single-sideband (SSB) balun-coupled mixer revealed an unusual feedthrough mechanism. The tests also showed the image frequency voltage to be short-circuited with a ring diode quad and open-circuited with a bridge diode quad.



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Detection of VX2 Carcinoma in Rabbits by Passive Microwave Radiometry

J. Shaeffer, P.E. Parker, A.M. El-Mahdi and K.L. Carr. "Detection of VX2 Carcinoma in Rabbits by Passive Microwave Radiometry." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 452-454.

VX2 cancers were grown at various anatomic sites in the New Zealand rabbit. Thermometric detection of these tumors was attempted by microwave radiometry as well as by contact thermometry using thermocouple and thermistor probes. Tumors, irrespective of site, could not be reliably detected by surface thermometry. Tumors growing subcutaneously in the ear could be detected early (diameter = 5mm) by microwave radiometry. Detection by microwave radiometry of tumors grown subcutaneously or intramuscularly in the hind limb was much less reliable. Blood flow rates in the tumor and surrounding tissues could not explain these site-related differences in tumor detectability by microwave radiometry.

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Abstracts

Effect of 330 MHz Radiofrequency Radiation of the Human Erythrocyte Ghosts (Abstract Only)

V.L. Shnyrov, G.G. Zhadan and I.G. Akoev. "Effect of 330 MHz Radiofrequency Radiation of the Human Erythrocyte Ghosts (Abstract Only)." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 455-455.

Differential scanning microcalorimetry and infrared spectroscopy showed that radio-frequency irradiation of erythrocyte ghost suspension leads to irreversible changes in their heat capacity, apparently affecting the band 3 protein.



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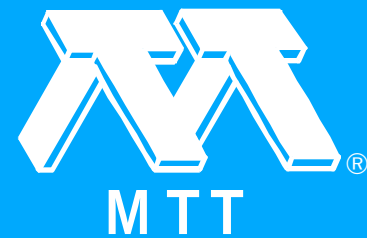


Abstracts

The Performance of Inductive Shortwave Diathermy Applicators

G. Kantor and C.Y. Moon. "The Performance of Inductive Shortwave Diathermy Applicators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 456-458.

Test methods were developed for evaluating the heating effectiveness and radiation safety of two different inductive shortwave diathermy applicators. Heating pattern characteristics, absorbed dose rates and leakage were determined.



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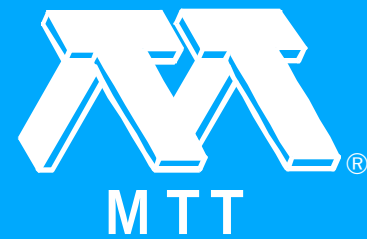


Abstracts

The Design of Low-Noise Broad-Band Microwave FET Amplifiers

Y.-S. Wu and H.J. Carlin. "The Design of Low-Noise Broad-Band Microwave FET Amplifiers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 459-461.

A computer-aided design procedure applicable to low-noise and broad-band MMIC FET amplifiers is presented. The method takes into account the nonunilateral behavior of the FET, losses in the matching networks and complex termination mismatch.



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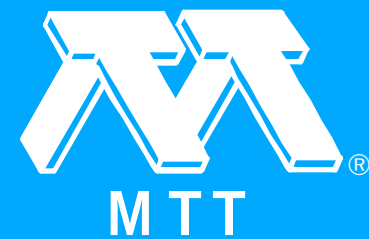
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Abstracts

Session O -- Microwave Systems

"Session O -- Microwave Systems." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 463-463.



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Microwave Technology-Key to AWACS

W.A. Skillman. "Microwave Technology-Key to AWACS." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 465-465.

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Abstracts

Wideband ESM Receiver Utilizing Integrated Acousto-Optic Technology

A. Grasso and D. Mergerian. "Wideband ESM Receiver Utilizing Integrated Acousto-Optic Technology." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 466-468.

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A High-Resolution Total-Power Radiometer Using SAW Compressive Receivers

R.D. Towns, J.J. Chambers, R.F. Humphries and C.I. Smith. "A High-Resolution Total-Power Radiometer Using SAW Compressive Receivers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 469-471.

A total-power radiometer is being developed to measure parameters of the atmosphere from a Spacelab platform. Channelization for the high-resolution data is implemented by SAW compressive receivers. Two resolution levels are obtained from the same SAW device: twenty-five 2-MHz channels are defined across a 50-MHz instantaneous bandwidth; thirty 100-KHz channels are taken from a 3-MHz window in the center of the larger band. This paper describes the realization of the radiometer using RAC devices. A description is also included of a prototype compressive receiver that has been delivered to the experimenters for the generation of performance data.

Click on title for a complete paper.



Abstracts

A Doppler Radar Sensor in Integrated Fin-Line Technique

L. Szabo and E. Jensen. "A Doppler Radar Sensor in Integrated Fin-Line Technique." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 472-474.

An experimental 35 GHz FSK-CW Radar Sensor is described. A low cost integrated FIN-line structure performs a fast switching VCO, hybrid junction, reflection type modulator and down converter. A single oscillator with a high Q varactor acts as both, transmitter source and receiver local oscillator. The integrated front end with IF preamplifier has a size of $5,0 \times 5,5 \times 1,8 \text{ cm}^3$. Its features are low cost, small size, a minimum number of components for a minimum range of 70 m with 1 m^2 effective radar cross section targets.



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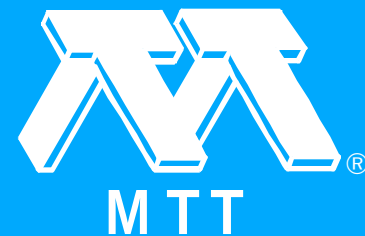


Abstracts

The Heterodyne VCO

R.G. Winch. "The Heterodyne VCO." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 475-476.

Using synchronously controlled varactor tunable oscillators into both the RF and LO ports of a mixer produces a resulting VCO output which is extremely linear and wideband. A deviation from best straight line of $\pm 25\text{MHz}$ has been achieved over a frequency range of 2-8GHz, tunable in only 4.77V. This high modulation sensitivity is accompanied by a fast set-on time of $< 20\text{ns}$.



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A Lightweight Active Antenna Array Using Miniature Beryllia Amplifiers

H.C. Johnson, M. Oz, R.E. Marx, J. Rosen and E. Mykietyn. "A Lightweight Active Antenna Array Using Miniature Beryllia Amplifiers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 477-478.

A planar active antenna array design combines miniature beryllia amplifiers using batch process techniques with an open-celled microstrip antenna. A thin, very light active antenna subarray using these technologies has been developed and tested.



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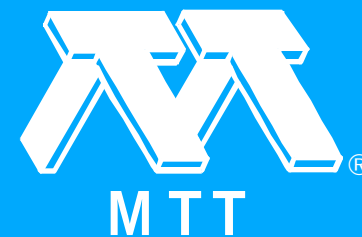
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Abstracts

Session P -- IMPATT Diode Power Combiners

"Session P -- IMPATT Diode Power Combiners." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 479-479.



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3W, Q Band Solid State Amplifier

G. Jerinic, J. Fines and M. Schindler. "3W, Q Band Solid State Amplifier." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 481-483.

The design of Q band IMPATT diode cavity combiners is discussed. The design is based on a three-step closed form algorithm. The first step is the characterization of the passive circuit (cavity and diode package) using an automatic network analyzer. In the second step, a computer program is used to generate diode device lines. The third step is the load line synthesis for predictable operation as either an injection-locked oscillator or a stable negative resistance amplifier. These procedures were used to design a three-diode, two-stage amplifier using 2-watt, 44-GHz GaAs IMPATT diodes. An output power of 3 watts with 11 dB gain was achieved.



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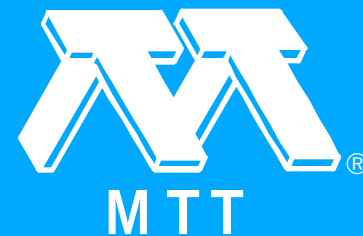


Abstracts

A 16.5 Watt, 20 GHz IMPATT Diode Power Combiner

J. McClymonds. "A 16.5 Watt, 20 GHz IMPATT Diode Power Combiner." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 484-486.

Progress in the development of a 20 watt, 20 GHz power combiner with 5 percent bandwidth will be discussed. Six Raytheon high power GaAs double-drift diodes are used. Each diode has four mesas which are TC bonded to the heat-sink to achieve very low thermal resistance. A set of characterization data for the diodes and the combiner will be presented to demonstrate Raytheon's method for designing power combiners with large bandwidth.



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20 GHz High Power IMPATT Transmitter

Y.C. Ngan, J. Chan and C. Sun. "20 GHz High Power IMPATT Transmitter." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 487-488.

The development of a 20 GHz proof-of-concept (POC) high power solid state transmitter sponsored by NASA Lewis Research Center and USAF Space Division is described. The transmitter utilizes GaAs IMPATT diodes for high power output and high efficiency, and operates in the constant-voltage injection-locked mode to achieve high dc-to-rf conversion efficiency. The transmitter is a three-stage design consisting of a single-diode driver, a dual-cliode intermediate driver, and a twelve-diode rectangular waveguide power combiner in the output stage to achieve 29 dB gain and 16 W power output.



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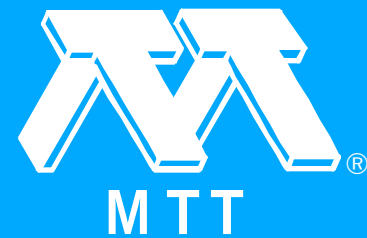


Abstracts

The Effect of Dissimilar IMPATT Diodes on Power Combining Efficiency

L. Wagner, R. Laton and R. Wallace. "The Effect of Dissimilar IMPATT Diodes on Power Combining Efficiency." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 489-491.

Experimental results are presented which demonstrate that IMPATT diode preselection by growth wafer is unnecessary in order to achieve good power combining efficiency. With the possible exception of junction capacitance, tight tolerances ($<\pm 10\%$) on DC or RF characteristics are also found to be unnecessary.



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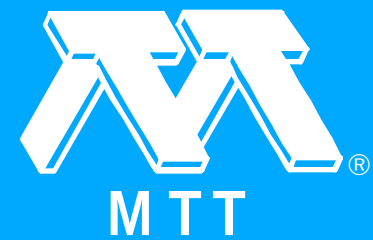
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Abstracts

Session Q -- Microwave Measurements for MIC

"Session Q -- Microwave Measurements for MIC." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 493-493.



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Abstracts

Measurement and Computer-Aided Modeling of Microstrip Discontinuities by an Improved Resonator Method

M. Kirschning, R.H. Jansen and N.H.L. Koster. "Measurement and Computer-Aided Modeling of Microstrip Discontinuities by an Improved Resonator Method." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 495-497.

The broad-band characterization of microstrip discontinuities by an improved resonator technique is described. This technique involves hitherto unknown expressions accounting for nonsymmetrical gap coupling and employs an efficient error function for the computer-aided modeling of microstrip n-ports. It is applied to derive new analytical results for microstrip corners and chamfered right-angle bends.



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Abstracts

The Calibration of a Universal Test Fixture

R.D. Pollard and R.Q. Lane. "The Calibration of a Universal Test Fixture." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 498-500.

A broadband, universal transistor test fixture uses exchangeable inserts to accommodate most transistor types. The calibration of the fixture and its inserts by a reliable, accurate and easy to use scheme is described.



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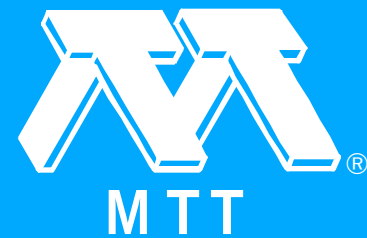


Abstracts

Direct Measurement of the Nonlinear M.I.C. Oscillator Characteristics Using Injection Locking Polar Diagram

A.P.S. Khanna and J. Obregon. "Direct Measurement of the Nonlinear M.I.C. Oscillator Characteristics Using Injection Locking Polar Diagram." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 501-503.

Direct measurement of principal characteristics of a negative resistance nonlinear M.I.C. Oscillator using a network analyser is presented. Theoretical considerations and experimental results are shown for the injection locking polar diagram obtained by placing the oscillator directly at the unknown port without the use of a circulator.



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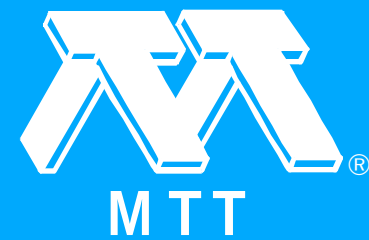
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Abstracts

Session R -- Semiconductor Control

"Session R -- Semiconductor Control." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 505-505.



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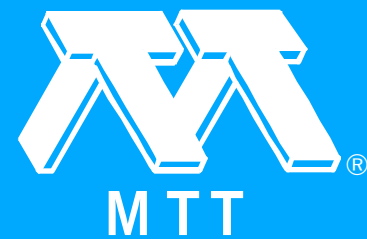


Abstracts

New GaAs PIN Diodes with Lower Dissipation Loss, Faster Switching Speed at Lower Drive Power

C. Barratt, A. Christou, N. Jansen, R.E. Neidert, M.L. Ruess, Jr. and C.W. Young. "New GaAs PIN Diodes with Lower Dissipation Loss, Faster Switching Speed at Lower Drive Power." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 507-509.

GaAs PIN diode material with low forward resistance and high Q reverse bias capacitance has been successfully grown for the first time. Static performance data for shunt mounted chips in a microstrip SPST switch show improved insertion loss for the 2-40 GHz range. Dynamic data show switching speed and switch drive power advantages of GaAs over Si for both carrier injection and sweep-out modes of operation.



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Abstracts

Broadband Reflection-Type Phase Modulators

C. Schieblich, U. Goebel and V. Beres. "Broadband Reflection-Type Phase Modulators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 510-512.

A phase modulator circuit is described showing improved broadband capability. A phase error less than 2° can be achieved over more than 25% bandwidth. Circuit realizations in microstrip, fin-line and waveguide technique are also presented.



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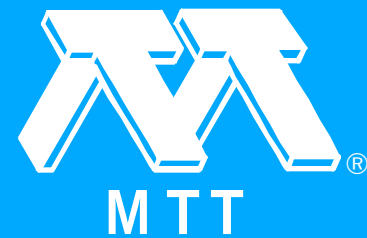


Abstracts

An E-Plane Broadband Bi-Phase Balanced Modulator for Ka-Band

W. Thorpe. "An E-Plane Broadband Bi-Phase Balanced Modulator for Ka-Band." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 513-515.

A bi-phase p.s.k. modulator for use in 29 GHz Radio equipment has been developed that gives state of the art performance (3 dB insertion loss across 7% bandwidth and 70/100 Mbit/s data rate using beam lead PIN diodes as the switching elements). The circuit maintains the full instantaneous bandwidth without requiring any tuning or alignment during or after manufacture.



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Abstracts

Paper Withdrawn (1983 [MWSYM])

"Paper Withdrawn (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 516-518.



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Abstracts

Session S -- Microwave Integrated Circuits

"Session S -- Microwave Integrated Circuits." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 519-519.



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Parameter Insensitive Matching Circuits for Low Cost Integrated Circuits

A.N. Riddle and R.J. Trew. "Parameter Insensitive Matching Circuits for Low Cost Integrated Circuits." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 521-523.

A new theory for increasing the tolerance of matching networks to load variations is presented. This theory is based on matching the angles of the changes in $S_{11}(f)$ due to frequency and load variations, and its use can double allowed device tolerances in many cases. As a byproduct, this theory also shows why Chebyshev matching filters have poor tolerances. Examples are given showing as much as an order of magnitude improvement in circuit tolerances.

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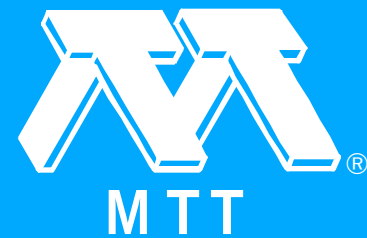


Abstracts

A Contour Formula for Compensated Microstrip Steps and Open Ends

W.J.R. Hoefer. "A Contour Formula for Compensated Microstrip Steps and Open Ends." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 524-526.

A formula for the contour of compensated microstrip steps and open ends is derived. Suitable for automated mask design, the expression generates an exponential transition minimizing the parasitic shunt capacitance and series inductance of microstrip step discontinuities.



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Dielectric Resonator HE/₁₁ Mode Coupling to a Shielded Microstrip Line.

A.P.S. Khanna, Y. Garault and M. Guedira. "Dielectric Resonator HE/₁₁ Mode Coupling to a Shielded Microstrip Line.." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 527-529.

A configuration is presented to effectively couple a dielectric resonator to a microstrip line using the HE/₁₁ mode. For this mode, the resonator acts as a magnetic dipole perpendicular to the resonator axis. The f/Q product is improved by about 50 % compared to TE/₀₁ mode.

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Miniature Beryllia Circuits for Ku-Band Power Amplifiers

F. Sechi, R. Brown, P. Jozwiak, G. Rolland, J. Brown and E. Mykietyn. "Miniature Beryllia Circuits for Ku-Band Power Amplifiers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 530-532.

Ku-band power amplifiers have been developed using miniature circuits fabricated on glazed beryllium oxide. This new technology is particularly well suited for miniature, light-weight, high performance GaAs power amplifiers. Experimental results illustrate the basic viability of this approach: the performances obtained from 1/2-W and 1-W amplifiers operating at Ku-band are already better than those obtained by more standard technologies. A cascode amplifier, also built on BeO has shown exceptionally broadband performance.

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An Overload Protected Low-Noise X-Band FET Amplifier

E.C. Niehenke and T.E. Steigerwald. "An Overload Protected Low-Noise X-Band FET Amplifier." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 533-535.

Design and performance of a 40 dB gain X-band low-noise FET amplifier with integral overload protection is presented. Noise figures as low as 2 dB have been achieved using packaged transistors, including a multidiode overload protector that protects the FET's for input pulse powers to 1 kW. Performance is achieved by the use of new embedment circuits for super-low-noise packaged FET and pin diodes in aluminum-clad soft microstrip.

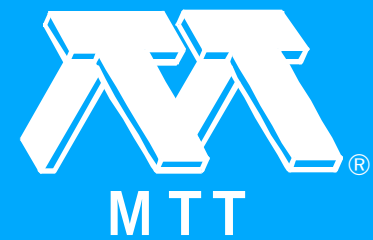
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Abstracts

Session T -- Microwave Communications Systems

"Session T -- Microwave Communications Systems." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 537-537.



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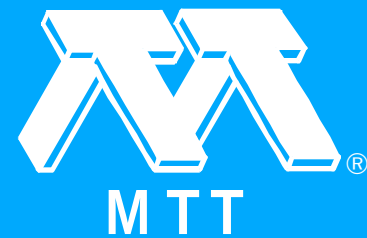


Abstracts

A Bipolar Oscillator for the 6 GHz Communications Band

K.R. Varian. "A Bipolar Oscillator for the 6 GHz Communications Band." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 539-540.

A Si bipolar transistor, cavity stabilized, oscillator is described that exhibits phase noise that is greater than 83dB below a reference 100KHz tone 300KHz from the carrier in a 3.1KHz bandwidth, less than 2 watts power consumption at 25°C, a typical frequency stability of $\pm 0.00035\%$ over the -20 to 70°C, and utilizing packaged devices.



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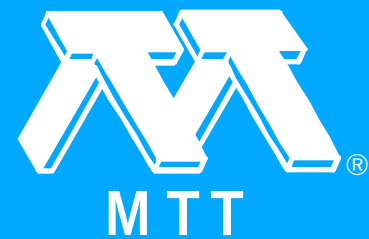


Abstracts

Cavity Stabilised Oscillators for Advanced Analog and Digital Radio Links

G. Corbetta, D. Arosio and A. Marconcin. "Cavity Stabilised Oscillators for Advanced Analog and Digital Radio Links." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 541-543.

This paper describes design and realisation criteria for a complete new line of cavity stabilised oscillators operating in the 2 to 15 GHz frequency ranges. Oscillators, using bipolar transistors and GaAs FET's, are characterised by: a 0 to 45° C frequency stability of 40 ppm in the tunable and of 20-30 ppm in the single frequency version, an RF-to-power supply efficiency of 5 to 10% and direct frequency modulation by order wire.



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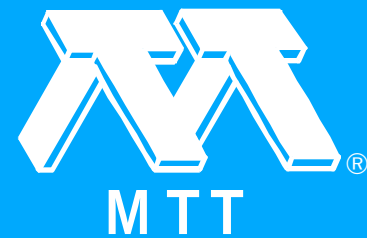


Abstracts

Highly Linear Solid-State Power Amplifiers for Single Sideband via Satellite Applications

R.G. Gels, R.D. Standley, D.L. Wilson and R. Trambarulo. "Highly Linear Solid-State Power Amplifiers for Single Sideband via Satellite Applications." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 544-546.

Highly linear FET amplifiers have been built to supplant conventional traveling wave tubes for application to C-band satellites serving spectrum efficient single sideband transmission. Detailed experimental results on various amplifier configurations are given.



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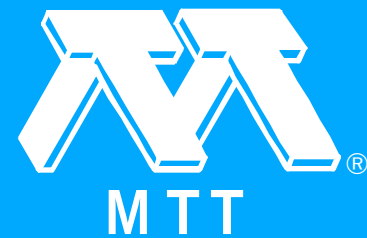


Abstracts

Direct Microwave Modulation and Demodulation

Z. Kuan-Jie and L. Fu-Hua. "Direct Microwave Modulation and Demodulation." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 547-549.

Direct modulation and demodulation techniques realized at microwave frequency are proposed. Using microwave integrated technology, a linear FM oscillator and two types of discriminator for relay communication and linear amplitude modulator for UHF TV broadcasting are developed.



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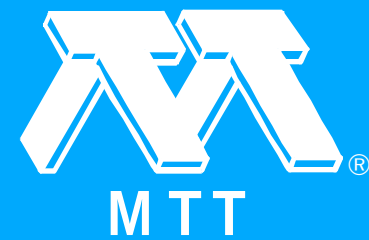
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Abstracts

Session U -- Low Noise Receiver Technology

"Session U -- Low Noise Receiver Technology." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 551-551.



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Current Status of Receiver Low-Noise Technology (Abstract Only)

J.J. Whelehan, Jr.. "Current Status of Receiver Low-Noise Technology (Abstract Only)." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 553-553.

Significant advances have been made in the capability of both microwave and millimeter wave receivers over the past few years. An integral part of this ever-changing technology, which is being developed to meet the challenge of expanding system requirements, is the rapid advancement of low-noise receivers. The state-of-the-art of Receiver Low-Noise Technology for both the microwave and millimeter wave regions will be presented. The techniques of optimum coupling of semiconductor devices with low-noise embedding circuits for various receiver components (for example, paramps, FET's, mixers, etc.) will be explored. The choice of transmission lines, particularly in the millimeter wave region, will be presented. Performance criteria in evaluating low-noise systems for various receiver configurations, as well as future trends in millimeter receivers, will also be given.

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Abstracts

Image-Optimized, Frequency-Scalable Mixers for Millimeter-Wave Applications

D.F. Peterson and D.H. Steinbrecher. "Image-Optimized, Frequency-Scalable Mixers for Millimeter-Wave Applications." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 554-556.

A unique IF measurement procedure for evaluating mixer performance and identifying optimum circuit boundary conditions is presented. The technique is applied to a scalable mm-wave single-sideband (image-sum enhanced) mixer design which provides 3.5 to 5 dB typical conversion loss from conventional, packaged devices.



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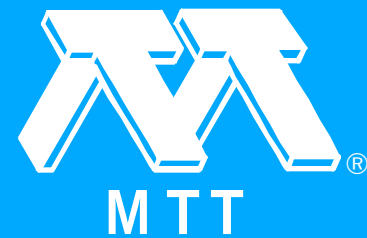


Abstracts

Experimental Investigation of Subharmonically Pumped Balanced Mixer Performance

R.G. Hicks and P.J. Khan. "Experimental Investigation of Subharmonically Pumped Balanced Mixer Performance." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 557-559.

An experimental study is reported on a subharmonically pumped balanced mixer which permits variation in the degree of imbalance between the two circuit halves. Results show good agreement with theory and indicate the importance of some degree of flexibility in each half of the circuit in order to achieve low conversion loss with these mixers.



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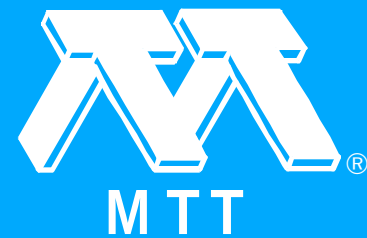


Abstracts

Low-Noise 50-58 GHz Mixers for Spacecraft Radiometers

W.J. Wilson and A.L. Riley. "Low-Noise 50-58 GHz Mixers for Spacecraft Radiometers." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 560-561.

Reliable low-noise millimeter-wave mixers have been designed and built for the TIROS satellite microwave sounder radiometers. This mixer design features a balanced microstrip circuit using packaged diodes and fixed-tuned backshorts. System noise figures of less than 5 dB (DSB) were achieved in the 50-58 GHz frequency range.



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Abstracts

Impact of Receiver Noise on Microwave and Millimeter Wave Communications Link Performance (Abstract Only)

H.C. Okean. "Impact of Receiver Noise on Microwave and Millimeter Wave Communications Link Performance (Abstract Only)." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 562-562.

The measure of quality of the back to back performance of a microwave or millimeter wave communications link is not the least of which is noise introduced in the receiver prior to demodulation. This paper will characterize the impact of receiver front-end noise temperature on predetection carrier-to-noise ratio, as well as the critical effect of down converter LO noise on the demodulation process itself for a variety of modulation formats.



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Noise Performance of Microwave HEMT

K. Joshin, T. Mimura, M. Niori, Y. Yamashita, K. Kosemura and J. Saito. "Noise Performance of Microwave HEMT." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 563-565.

Low noise HEMTs (High Electron Mobility Transistors) with 0.5 μ m gate have been made using direct electron beam lithography. At 12 GHz a noise figure of 1.4 dB with an associated gain of 11 dB has been obtained at room temperature. Noise figure has been reduced to 0.35 dB by decreasing ambient temperature to 100K.

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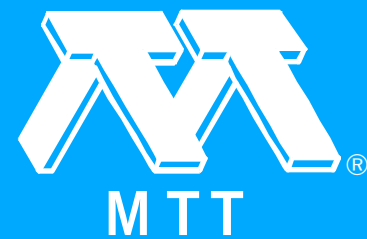


Abstracts

Cryogenic All Solid-State Millimeter-Wave Receivers for Airborne Radiometry (1983 [MWSYM])

B. Vowinkel, K. Gruner, H. Suss and W. Reinert. "Cryogenic All Solid-State Millimeter-Wave Receivers for Airborne Radiometry (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 566-568.

Cryogenic receiver modules for 90 and 140 GHz have been developed that are part of an airborne imaging system. They consist of Schottky-barrier mixers followed by GaAs-FET IF amplifiers. The DSB receiver noise temperatures are 210 K for the 90 GHz and 250 K for the 140 GHz system. The instantaneous bandwidth is 2.5 GHz for both front-ends. Results of some flight tests are presented.



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Session V -- Field Theory (1983 [MWSYM])

"Session V -- Field Theory (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 569-569.



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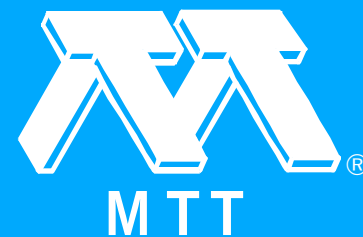


Abstracts

New Perspectives on the Green's Function for Quasi-TEM Planar Structures

H. Lee and V.K. Tripathi. "New Perspectives on the Green's Function for Quasi-TEM Planar Structures." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 571-573.

The quasi-static spectral Green's function for various planar structures is decomposed into a fundamental part corresponding to a homogeneous medium and the remainder. This is used to help formulate the quasi-TEM analysis of the coplanar strips whose spectral Green's function is singular and to devise efficient numerical techniques to solve for the quasi-TEM parameters of single and multiple coupled microstrip lines and coplanar strips.



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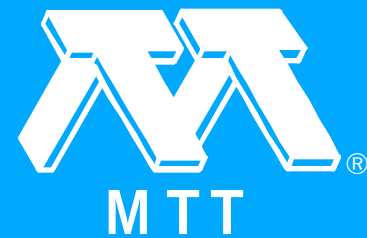


Abstracts

Planar Circuit Equation and its Practical Application to Planar-Type Transmission-Line Circuit

H. Jui-Pang and T. Anada. "Planar Circuit Equation and its Practical Application to Planar-Type Transmission-Line Circuit." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 574-576.

This paper presents general circuit equation of planar circuit basing on the field theory and systematic method of analysis basing on the conventional circuit theory. As an example of the application, planar-type transmission-line circuits are analyzed.



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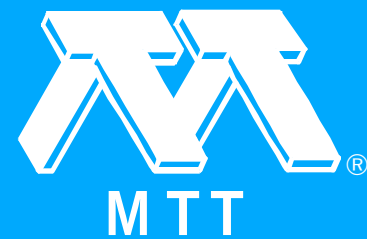
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Asymptotic Evaluation of Resonant Frequencies for Two Coupled Circular Microstrip Disk Resonators

T.M. Habashy and J.A. Kong. "Asymptotic Evaluation of Resonant Frequencies for Two Coupled Circular Microstrip Disk Resonators." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 577-579.

For two coupled circular microstrip disk resonators in the limit of small substrate thickness, a matched asymptotic expansion approach is used to derive asymptotic formulae for the resonant frequencies. The mode coupling effects are clearly demonstrated.



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Modal Analysis of a Leaky Feeder Cable Modeled by a Sheath Helix with a Conducting Core

C.V. Valerio and R. Bansal. "Modal Analysis of a Leaky Feeder Cable Modeled by a Sheath Helix with a Conducting Core." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 580-582.

Modes of a leaky feeder cable in tunnels and buried in earth are investigated by modeling the cable as a sheath helix with a conducting core. The numerical results are compared with previous work and used to plot dispersion diagrams.



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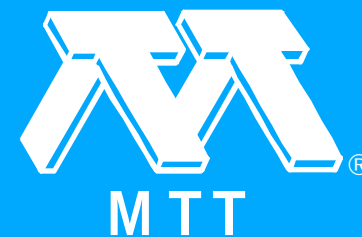
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Abstracts

MTT-S International Symposia Future Locations (1983 [MWSYM])

"MTT-S International Symposia Future Locations (1983 [MWSYM])." 1983 MTT-S International Microwave Symposium Digest 83.1 (1983 [MWSYM]): 582-582.



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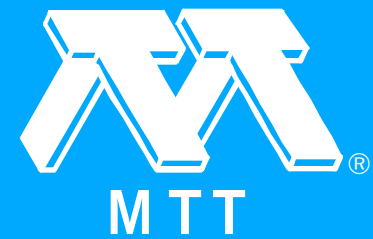
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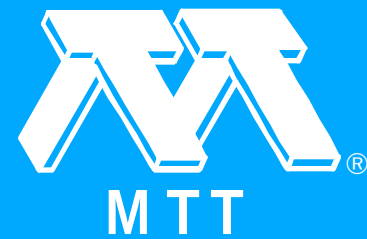
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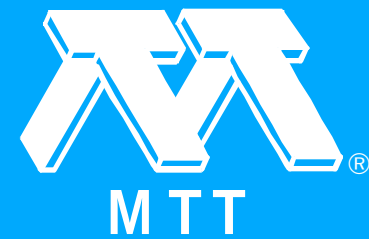
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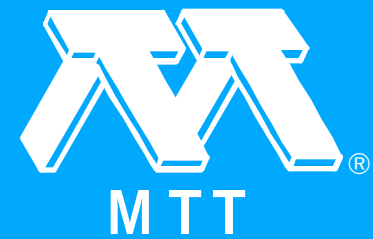
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Abstracts

Technical Program, Overview (1983 [MCS])

J.G. Oakes. "Technical Program, Overview (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): fm5-fm5.

Welcome to the 1983 IEEE Microwave and Millimeter Wave Monolithic Circuits Symposium. This year's program covers a wide range of circuits which have been realized monolithically in GaAs as well as a session on new devices and processing approaches. The interest in monolithic GaAs integrated circuits continues to increase and the 23 papers to be presented were chosen from over 50 submissions. Nearly half the papers accepted are by overseas authors.



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Abstracts

High Quality X-Band Monolithic Diode Mixer

A.W. Jacomb-Hood, J.R. Smith and L.G. Hipwood. "High Quality X-Band Monolithic Diode Mixer." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 1-4.

A mixer analysis program has been used to design a single balanced MMIC diode mixer. The predicted conversion loss is better than 6 dB over 2 GHz B.W. at X-band and the input VSWR is better than 2:1. An inter-mesa airbridge technique has been developed to provide low parasitic connections to the diode. Also 0.6 dB insertion loss Lange couplers have been demonstrated and via holes have been successfully etched through 200 μ of GaAs.



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Wideband GaAs Four Quadrant Multiplier

C. Ryan, D. Hartman, J.M. Frary and C.E. Weitzel. "Wideband GaAs Four Quadrant Multiplier." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 5-11.

A four quadrant multiplier has a variety of high frequency, signal processing applications (phase detection, modulation, and frequency conversion). This paper describes work undertaken to design, model, fabricate, and test a GaAs monolithic four quadrant multiplier which utilizes dual-gate FETs. The multiplier was fabricated using n-type expitaxial GaAs on a high resistivity substrate.

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



A GaAs High-Speed Counter Using Current Mode Logic

K. Suyama, H. Suzuki, Y. Nemoto, S.I Yamamura and M. Fukuta. "A GaAs High-Speed Counter Using Current Mode Logic." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 12-16.

A single-clocked divide-by-four counter with maximum operating frequency of 3.4 GHz has been developed. The circuit was fabricated using a tungsten-silicide gate self-alignment technique with full ion implantation. The basic building block of the counter current mode logic (CML) master-slave flip-flop similar to Si ECL.



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AlGaAs/GaAs Heterojunction Ballistic Bipolar Transistors (BBT) for EHF Amplifiers

E.J. Zhu, W.H. Ku and C.E.C. Wood. "AlGaAs/GaAs Heterojunction Ballistic Bipolar Transistors (BBT) for EHF Amplifiers." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 17-21.

This paper presents the theory and design of AlGaAs/GaAs heterojunction Ballistic Bipolar Transistors (BBTs) which utilize heterojunction injection and ballistic electron motion in GaAs. Key factors for the successful realization of this new 3-terminal EHF solid-state device are identified and discussed. We present for the first time an ideal emitter junction structure with suitable Al concentration and doping profile as well as an "inverted" heterojunction bipolar device structure. The proposed inverted BBT structure has the advantages of reducing both the base current and the important emitter-base capacitances. The performance of this new device makes it an attractive candidate for the first realizable 3-terminal solid-state device capable of amplification in the EHF frequency range (60 GHz and above) as well as GaAs gigabit logic building block. It is believed that BBT represents a new 3-terminal device of tremendous promise for both analog and digital MMIC and M³IC applications.

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Profile Studies of Ion-Implanted MESFETs (1983 [MCS])

J.M. Golio and R.J. Trew. "Profile Studies of Ion-Implanted MESFETs (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 22-26.

A study of ion-implanted MESFET performance as a function of the implantation energy and fluency and including the effects of deep-level trap concentrations in the substrate has been conducted. Carrier concentrations as a function of depth are determined through the use of LSS theory and a profiling model. An analytic device model, which computes both DC and RF characteristics, is then employed to predict MESFET performances. The study includes the effects of depth dependent transport properties and has indicated a number of design rules for the fabrication of optimized ion-implanted devices.

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Low Noise MESFETs for Ion Implanted GaAs MMICs

A.K. Gupta, D.P. Siu, K.T. Ip and W.C. Petersen. "Low Noise MESFETs for Ion Implanted GaAs MMICs." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 27-30.

Fabrication considerations for low noise FETs in ion implanted GaAs MMICS are presented. Processes that can deteriorate FET performance have been identified and some solutions proposed. Low noise MMIC FETs fabricated along these lines show good microwave performance through 18 GHz, approaching the performance available from similar discrete FETs. 0.8 μm gate length MMIC FETs with a noise figure of 2.9 dB and associated gain of 6.1 dB at 18 GHz have been fabricated. These devices are suitable for low noise applications in ion implanted GaAs MMICS.

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Abstracts

Transient Capless Annealing of Ion-Implanted PBN LEC GaAs for Monolithic Microwave Integrated Circuits

R.C. Clarke, G.W. Eldridge, S.K. Wang and W.F. Valek. "Transient Capless Annealing of Ion-Implanted PBN LEC GaAs for Monolithic Microwave Integrated Circuits." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 31-35.

A method for high-temperature, capless activation of implanted gallium arsenide has been devised based on the recent availability of high-purity semi-insulating PBN LEC gallium arsenide both as implant host and stabilizing medium.



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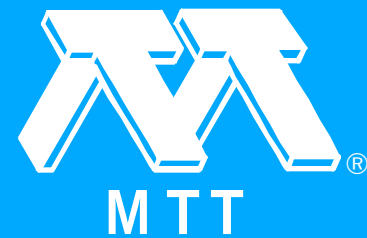


Abstracts

A New Via Hole Structure for Power GaAs MESFET's and MMIC

L. Songfa and L. Qingxiang. "A New Via Hole Structure for Power GaAs MESFET's and MMIC." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 36-36.

A New Via Hole Structure made by the laser beam technique has been developed. A 1.2mm gate width GaAs power MESFET and an experimental MMIC were fabricated with this method, thus the availability of this new via hole structure has been verified.



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A Two-Stage Monolithic Buffer Amplifier for 20 GHz Satellite Communication

W.C. Petersen and A.K. Gupta. "A Two-Stage Monolithic Buffer Amplifier for 20 GHz Satellite Communication." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 37-39.

Design, fabrication, and test results of a two-stage GaAs monolithic buffer amplifier for 20 GHz satellite communication are described in this paper. A gain of 13 ± 0.75 dB from 17.7 to 20.2 GHz was obtained from the 1.5 x 1.5 millimeter chip, which includes all necessary bias and dc blocking circuitry.





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A GaAs Monolithic Phase Shifter for 30 GHz Application

V. Sokolov, P. Bauhahn, J. Geddes, T. Contolatis and C. Chao. "A GaAs Monolithic Phase Shifter for 30 GHz Application." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 40-44.

The design and performance of a GaAs monolithic 180° one-bit phase shifter test circuit for Ka-band operation is presented. Over the 27.5 to 30 GHz band the measured differential phase shift is within 10° of the ideal characteristic and the insertion loss is between 4 and 6 dB. The switching FETs are fabricated by ion implantation into LEC material using a power FET implant schedule. I-V characteristics are also presented for a self-aligned gate FET whose channel resistance is reduced by more than a factor of two relative to the power FET. This latter fabrication technique holds promise in reducing phase shifter insertion loss for mm-wave applications.

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Monolithic Frequency Doublers

A. Chu, W.E. Courtney, L.J. Mahoney, R.A. Murphy and R.W. McLelland. "Monolithic Frequency Doublers." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 45-49.

Monolithic frequency doublers have been fabricated and tested. Planar Schottky barrier varactor diodes, RF matching circuits and bias lines are integrated on a 4 mm by 8 mm GaAs substrate, demonstrating the feasibility of monolithic frequency multipliers for the first time. Output powers greater than 20 mW are obtained from 25.6 to 27.4 GHz. In this frequency range maximum output powers are ~43 mW with conversion efficiencies of ~20%. Maximum efficiencies of 24% are obtained at a reduced output power of 25 mW.

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94 GHz Monolithic GaAs Balanced Mixers

C. Chao, A. Contolatis, S. Jamison and C. Butter. "94 GHz Monolithic GaAs Balanced Mixers." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 50-53.

A millimeter wave monolithic GaAs balanced mixer integrated circuit using a pair of planar Schottky barrier diodes with RF matching elements on a semi-insulating GaAs substrate has been developed for 94 GHz receiver applications. The GaAs chip is used as a suspended stripline in a WR-10 waveguide circuit. A double sideband noise figure of 6.3 dB has been achieved with a local oscillator power of 8 dBm. This includes a contribution of a 1.5dB noise figure due to the IF preamplifier (5-500MHz).

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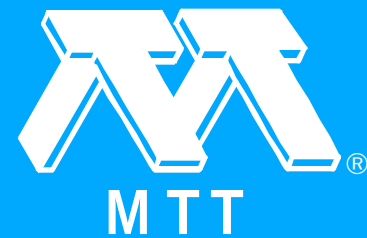


Abstracts

A New, Specifically Monolithic Approach to Microwave Power Amplifiers

D. Pavlidis, Y. Archambault, N. Efthimerou, D. Kaminsky, A. Bert and J. Magarshack. "A New, Specifically Monolithic Approach to Microwave Power Amplifiers." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 54-58.

A new principle was used to build a GaAs MMIC. X-band Power Amplifier based on a modular tree design where the number of modules increase at each amplifying stage. First experimental data show 10 dB gain at the centre of the operation band (8 - 9 GHz).



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Monolithic Broadband Power Amplifier at X-Band

A. Platzker, M.S. Durschlag and J. Vorhaus. "Monolithic Broadband Power Amplifier at X-Band." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 59-61.

Single-ended broadband power amplifier for X-band operation was designed and fabricated on GaAs with chip dimensions of 4.3 x 2.1 x 0.1 mm. The amplifier exhibited over 2 GHz of 1 db small signal bandwidth with more than 1.6 W at 9 db gain at mid-band CW operation with 20% power added efficiency. The recently developed, potentially high yielding, Ta/sub 2/O/sub 5/ capacitor technology enabled the small chip size.

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Wideband 3W Amplifier Employing Cluster Matching

*R.G. Freitag, J.E. Degenford, D.C. Boire, M.C. Driver, R.A. Wickstrom and C.D. Chang.
"Wideband 3W Amplifier Employing Cluster Matching." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 62-66.*

High power, broadband monolithic amplifiers have inherent performance limitations and require specialized fabrication and design techniques to ensure optimal performance and high yield. The "cell cluster matching" design approach is presented as a solution to this power-bandwidth problem along with a detailed discussion of the high yield fabrication techniques used to implement it. In particular, a 3 W 8-12 GHz amplifier, employing the cluster matching technique, is discussed and some initial test results are presented.

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2-20 GHz GaAs Traveling-Wave Power Amplifier (1983 [MCS])

Y. Ayasli, L.D. Reynolds, R.L. Mozzi, J.L. Vorhaus and L.K. Hanes. "2-20 GHz GaAs Traveling-Wave Power Amplifier (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 67-70.

A novel single-stage monolithic GaAs traveling-wave power amplifier with 250-mW power output in the 2-20 GHz frequency range is described. Design considerations power amplification are discussed.

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Broadband Monolithic Low-Noise Feedback Amplifiers (1983 [MCS])

P.N. Rigby, J.R. Suffolk and R.S. Pengelly. "Broadband Monolithic Low-Noise Feedback Amplifiers (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 71-75.

A 0.6 to 6 GHz monolithic GaAs FET low-noise feedback amplifier has been developed. This amplifier chip has a gain of 6 dB and a noise figure of around 4 dB over the bandwidth. Gains of dB have been achieved at $\frac{1}{2}$ dB/sub dss/ with 1 dB gain compression points 21 dBm over the band. This paper discusses the design of such amplifiers using as an example a 1 to 10 GHz two stage monolithic amplifier chip presently under development which is capable of being cascaded up to total gains of 50 dB or so with ± 1.5 dB ripple.

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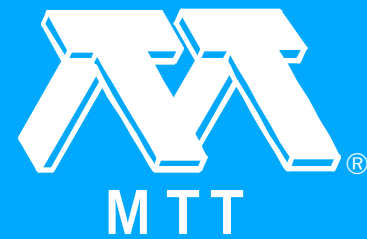


Abstracts

2-6 GHz Monolithic Microwave Amplifier (1983 [MCS])

W.O. Camp, Jr., S. Tiwari and D. Parsons. "2-6 GHz Monolithic Microwave Amplifier (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 76-80.

The design and results of a GaAs monolithic feedback amplifier are presented. The features stressed are its small size (0.76 mm square) and simple 5 mask process in order that the lowest possible cost per dB of gain may be achieved. Refinements to the CAD model, particularly with respect to inductors, are also presented.



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Wideband High Gain Small Size Monolithic GaAs FET Amplifiers (1983 [MCS])

V. Pauker and M. Binet. "Wideband High Gain Small Size Monolithic GaAs FET Amplifiers (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 81-84.

A series of two to four stage monolithic amplifiers operating with a gain of 15 to 42 dB and covering the 0.1 to 2 till 4 GHz frequency band has been realized. A high density of integration has been achieved (active area of 0.2 mm²) as no decoupling capacitors nor inductances have been used.

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12GHz-Band Low-Noise GaAs Monolithic Amplifiers (1983 [MCS])

H. Itoh, T. Sugiura, T. Tsuji, K. Honjo and Y. Takayama. "12GHz-Band Low-Noise GaAs Monolithic Amplifiers (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 85-89.

One- and two-stage 12GHz-band low-noise GaAs monolithic amplifiers have been developed for use in direct broadcasting satellite receivers. The one-stage amplifier provides a less than 2.5dB noise figure with more than 9.5dB associated gain in the 11.7 to 12.7GHz band. In the same frequency band, the two-stage amplifier has a less than 2.8dB noise figure with more than 16dB associated gain. A 0.5 μm gate closely-spaced electrode FET with an ion implanted active layer is employed in the amplifier in order to achieve a low noise figure without reducing reproducibility. Chip size is 1 mm x 0.9 mm for the one-stage amplifier and 1.5 mm x mm for the two-stage amplifier.

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GaAs Monolithic MICs for Direct Broadcast Satellite Receivers (1983 [MCS])

S. Hori, K. Kamei, K. Shibata, M. Tatematsu, K. Mishima and S. Okano. "GaAs Monolithic MICs for Direct Broadcast Satellite Receivers (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 90-95.

A 12-GHz low-noise amplifier (LNA), a 1-GHz IF amplifier (IFA) and an 11-GHz dielectric resonator oscillator (DRO) have been developed for DBS home receiver applications by using GaAs MMIC (monolithic MIC) technology. Each MMIC chip contains FETs as active elements and self-biasing source resistors and bypass capacitors for single power supply operation. It also contains DC-block and RF-bypass capacitors. The three-stage LNA exhibits 3.4-dB noise figure and 19.5-dB gain over 11.7 GHz-12.2 GHz. The negative-feedback type three-stage IFA shows 3.9-dB noise figure and 23-dB gain over 0.5 GHz-1.5 GHz. The DRO gives 10-mW output power at 10.67 GHz with a frequency stability of 1.5 MHz over a temperature range from -40 to 80 °C. A DBS receiver incorporating these MMICs exhibits an overall noise figure of ≤ 4.0 dB for frequencies from 11.7 to 12.2 GHz.



Miniaturisation of a Band-X Monolithic GaAs Amplifier (1983 [MCS])

P. Dueme, M. Le Brun, P.R. Jay and C. Rumelhard. "Miniaturisation of a Band-X Monolithic GaAs Amplifier (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 96-99.

Reducing the area occupied by microwave monolithic integrated circuits is a necessity to decrease the cost of these circuits. A reduction in area can be obtained with circuit configurations comprising a minimum of inductances and by using spiral inductors. When a circuit is compacted, the coupling between radiating elements such as the inductances has also to be taken into account. An amplifier working from 2 to 10GHz with a measured gain of $5.8 \pm 0.4\text{dB}$ is presented. The efforts to reduce the area have led to a surface of 0.16mm^2 and therefore an integration density of 36dB/mm^2 .





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GaAs Monolithic Lumped Element Multistage Microwave Amplifier (1983 [MCS])

K.P. Weller, G.D. Robinson, A. Benavides and R.D. Fairman. "GaAs Monolithic Lumped Element Multistage Microwave Amplifier (1983 [MCS])." 1983 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 83.1 (1983 [MCS]): 100-104.

This paper reports on the successful development of a four stage, directly cascaded GaAs FET monolithic preamplifier chip realized using truly lumped elements for both RF and DC circuitry. The chip is designed to be entirely self-biased and contains all required DC circuitry on-chip for operation from a single drain supply. The design is based on a nominal 1 micron gate length interdigital FET geometry of planar construction. The device is fabricated using a selective ion implantation process. The finished die dimensions are 0.060 by 0.110 inch with a thickness of 0.015 inch. The chip provides a gain of over 20 dB in a 2 GHz band centered near 7 GHz. The noise figure achieved is 6 dB, the output power at 1 dB gain compression is typically +8 dBm, and the third order intermodulation intercept point is approximately +20 dBm.

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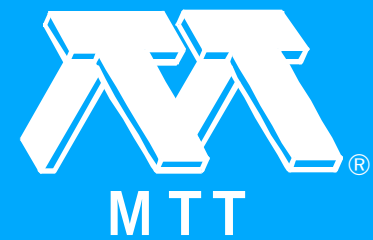
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Technical Program, Overview (1984 [MCS])

W.R. Wisseman. "Technical Program, Overview (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): v-v.



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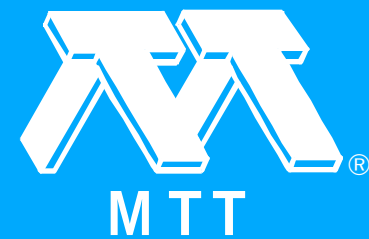
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Welcome (1984 [MCS])

"Welcome (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): vi-vi.



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"Table of Contents (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): vii-viii.



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A Microwave Phase and Gain Controller with Segmented-Dual-Gate MESFETs in GaAs MMICs

Y.C. Hwang, Y.K. Chen, R.J. Naster and D. Temme. "A Microwave Phase and Gain Controller with Segmented-Dual-Gate MESFETs in GaAs MMICs." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 1-5.

A novel segmented-dual-gate MESFET device which provides precise gain control over broad microwave bandwidth by using prescribed gate-width-ratio is presented. The digitally-controlled precision microwave gain scaler has potential application as an ultra-wide band microwave attenuator or active microwave phase shifter. The design and test results of GaAs MMIC active attenuator and hybrid phase shifter are described.

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



Abstracts

An Analog X-Band Phase Shifter

O.E. Dawson, A.L. Conti, S.H. Lee, G.F. Shade and L.E. Dickens. "An Analog X-Band Phase Shifter." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 6-10.

A hybrid-coupled phase shifter has been fabricated monolithically using reverse-biased Schottky varactor diodes to continuously vary phase with an analog control voltage. A phase shift of 105° is obtained at X-Band, and with design improvements a phase shift of 180° over the full 8-12.4 GHz is expected. Phase shift variation with power level is reduced by using back-to-back varactors on the direct and coupled ports of the coupler. A six-to-one reduction in size compared to a four-bit switched-line phase shifter (also at X-Band) results from this approach.



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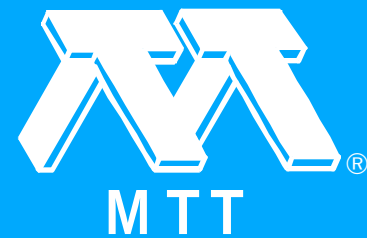


Abstracts

Wideband S-C Band Monolithic Phase Shifter

Y. Ayasli, S.W. Miller, R.L. Mozzi and L.K. Hanes. "Wideband S-C Band Monolithic Phase Shifter." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 11-13.

A wideband monolithic phase shifter operating in the 2-8 GHz frequency range is reported. Six GaAs FETs per bit are used as switch elements in a bridge configuration which alternatively becomes a highpass or a low-pass section. Their low impedance state is modeled as a resistor, the high impedance state as a combination of capacitors and resistors. In the design approach, the high impedance state equivalent shunt capacitor is not resonated. Instead, these capacitors become part of the resulting high-pass, low-pass sections. In this way the maximum theoretical bandwidth that a high-pass, low-pass section can provide is achieved despite the nonideal switching elements.



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Monolithic Gallium Arsenide I-Q Demodulator

V.P. O'Neil, C. Ryan and C. Weitzel. "Monolithic Gallium Arsenide I-Q Demodulator." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 14-18.

The monolithic gallium arsenide demodulator described herein demodulates the in-phase (I) and quadrature (Q) components of two signal channels on carriers identical in frequency but in quadrature phase relationships. The present demodulator is shown to be closely matched because of close matching of component parameters achieved by fabricating the entire demodulator on a single gallium arsenide chip. The demodulator can be developed to, replace diode ring demodulators to obtain the following advantages.

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



GaAs Monolithic MIC Mixer-IF Amplifiers for Direct Broadcast Satellite Receivers

S. Watanabe, J. Ozaki, M. Miyauchi, M. Tatematsu, S. Hori and K. Kamei. "GaAs Monolithic MIC Mixer-IF Amplifiers for Direct Broadcast Satellite Receivers." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 19-23.

An MMIC mixer-IF amplifier (MIX-IFA) and a band-pass filter (BPF) have been developed for DBS receiver applications. The MIX-IFA chip with a size of $2.0 \times 2.25 \text{ mm}^2$ contains a balanced-type diode mixer using a newly designed 3-dB hybrid circuit and a resistive feedback-type single-stage IF amplifier. The MIX-IFA shows a noise figure of $\leq 72 \text{ dB}$ and a conversion gain of 1.5 dB for signal frequencies from 11.7 to 12.2 GHz with a minimum noise figure of 9 dB and a maximum conversion gain of 3.5 dB. All the circuit elements such as Schottky diodes, FET and resistors are fabricated in a planar structure by using selective ion-implantation technology for realizing good uniformity and reproducibility. The BPF chip designed from modification of high-pass filter exhibits an insertion loss of $\leq 1 \text{ dB}$ for signals and an attenuation of $\geq 10 \text{ dB}$ for images. With the previously developed LNA, IFA and local oscillator, all MMIC components for DBS receiver are prepared.





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Si-Monolithic Microwave Prescaler IC

S. Watanabe, S. Shinozaki, N. Kusama, S.-I. Miyazaki and T.-a. Nakata. "Si-Monolithic Microwave Prescaler IC." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 24-28.

This paper describes a Si Monolithic microwave Prescaler IC with a toggle frequency of 3.9 GHz. To optimize circuit parameters and to determine the dominant transistor parameters, precise computer simulation has been used. An improved IC manufacturing process was developed to achieve the desired parameters and to obtain a transistor cut-off frequency of 10 GHz.

Click on title for a complete paper.



On-Chip Pulse Transmission in Very High Speed LSI/VLSIs

H. Hasegawa and S. Seki. "On-Chip Pulse Transmission in Very High Speed LSI/VLSIs." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 29-33.

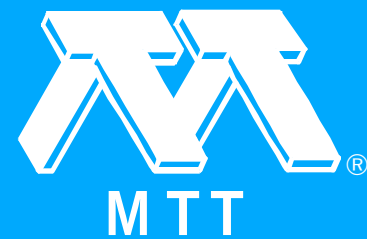
Using single and coupled metal-insulator-semiconductor (MIS) microstrip line models for interconnection, on-chip pulse delay and crosstalk in very high-speed LSI/VLSIs, are analyzed. The result shows (1) inapplicability of lumped capacitance approximation for interconnection in very high-speed LSI/VLSIs ($t_{pd} < 100$ ps), (2) superiority of semi-insulating substrates over semi-conducting substrates, (3) importance of driving capability of device to achieve high speeds at LSI/VLSI level and (4) importance of crosstalk in interconnection design.

Abstracts

Transformer Coupled High-Density Circuit Technique for MMIC

D. Ferguson, P. Bauhahn, J. Keuper, R. Lokken, J. Culp, C. Chao and A. Podell. "Transformer Coupled High-Density Circuit Technique for MMIC." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 34-36.

A circuit technique that employs a transformer wrapped around an active device to increase circuit density has been demonstrated with key building blocks for sensor systems. This technique is completely compatible with planar fabrication processes used in the fabrication of high-density and high-yield circuits. Measured results from a wraparound transformer-FET combination are compared with a similar circuit that incorporates octagonal transformers. The wraparound technique has been successfully implemented in the design of a transmitter and an image reject mixer. Test results from these circuits are presented.



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A Manufacturable GaAs MMIC Amplifier with 10 GHz Bandwidth

S. Moghe, T. Andrade, H. Sun and C. Huang. "A Manufacturable GaAs MMIC Amplifier with 10 GHz Bandwidth." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 37-40.

A two stage feedback amplifier has been developed for the 2 to 12 GHz band. The measured gain is 10 ± 1 dB with 2.5:1 input and 1.7:1 output VSWR. The chip size is less than 0.5×1.0 mm² and it includes complete RF and bias circuitry. The amplifier also has AGC capability with more than 25 dB of gain control.

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A Miniature 2-18 GHz Monolithic GaAs Distributed Amplifier

W. Kennan, T. Andrade and C. Huang. "A Miniature 2-18 GHz Monolithic GaAs Distributed Amplifier." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 41-44.

A 2-18 GHz monolithic GaAs distributed amplifier has been developed with over 6dB gain $\pm$ 0.5 dB gain ripple, less than 2.0 input and output VSWR less than 7.5 dB noise figure, and greater than 17 dBm power output capability. The amplifier is designed with dual-gate GaAs FET's and measures .75 mm by .85 mm (.64 mm²). The small size insures high circuit yield and makes the part cost effective for general applications.

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A Monolithic Multi-Stage 6-18 GHz Feedback Amplifier

A.M. Pavio, S.D. McCarter and P. Saunier. "A Monolithic Multi-Stage 6-18 GHz Feedback Amplifier." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 45-48.

A design approach and circuit modeling method, which includes parasitic effects, will be presented for a two-stage monolithic feedback amplifier with enhanced high frequency performance. Using the proposed approach, a 6-18 GHz amplifier has been demonstrated with low input/output VSWR, respectable noise figure (6 dB) and a minimum gain of 8 dB.

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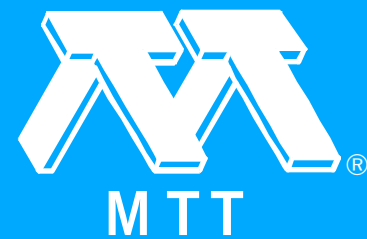


Abstracts

An 8-18 GHz Monolithic Two-Stage Low Noise Amplifier

L.C.T. Liu, D.W. Maki, C. Storment, M. Sokolich and W. Klatskin. "An 8-18 GHz Monolithic Two-Stage Low Noise Amplifier." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 49-51.

A wideband monolithic low noise amplifier which covers the frequency band from 8 to 18 GHz has been designed and fabricated. The amplifier has a noise figure less than 4.3 dB and an associated gain of 8.5 dB across the entire band. A revised version of the amplifier which has a design goal of sub-four dB noise figure and an associated gain of 12 dB has been processed. Measured data will be presented at the conference.



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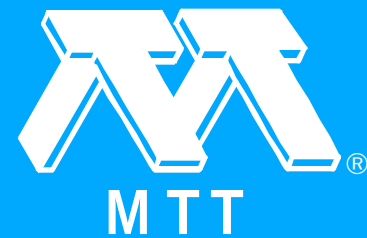


Abstracts

Capacitively Coupled Traveling-Wave Power Amplifier (1984 [MCS])

Y. Ayasli, S.W. Miller, R. Mozzi and L.K. Hanes. "Capacitively Coupled Traveling-Wave Power Amplifier (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 52-54.

A new circuit concept which significantly improves the power-handling capability of a traveling-wave amplifier by coupling the active devices to the input gate line through discrete series capacitors is described. The approach is applied to a 2-8 GHz monolithic amplifier design.



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A GaAs Monolithic 6-18 GHz Medium Power Amplifier

C.D. Palmer, P. Saunier and R.E. Williams. "A GaAs Monolithic 6-18 GHz Medium Power Amplifier." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 55-57.

A monolithic two-stage medium power amplifier, fabricated on GaAs and designed to cover the 6-18 GHz frequency band, is described. Amplifier circuit topology, process sequence, and measured performance results are presented. Chips from several epitaxial and ion implanted slices have demonstrated good output power and gain performance across the 7.0-17.0 GHz band, achieving an average of 27.3 dBm (540 mW or 0.45 watts per millimeter of gate width) at 18.8 percent power-added efficiency, with an average gain of 10.6 dB, at 1 dB gain compression.

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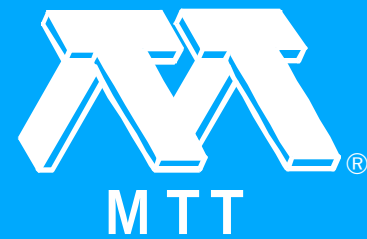


Abstracts

A Family of Four Monolithic VCO MIC's Covering 2-18 GHz

B.N. Scott, M. Wurtele and B.B. Cregger. "A Family of Four Monolithic VCO MIC's Covering 2-18 GHz." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 58-61.

Four GaAs monolithic voltage controlled oscillator chips were designed and fabricated which cover the 2-4 GHz, 4-7 GHz, 7-12 GHz, and 12-18 GHz bands. Minimum output power of the four bands was +12 dBm in the 12-18 GHz band with a maximum output power of +20 dBm in the 7-12 GHz band. Typical power flatness was ± 5 dBm in any band. The monolithic chips include a FET, two varactors, gate and source inductors, bypass capacitors, and bias resistors. The paper will discuss design considerations and performance.



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A 69 GHz Monolithic FET Oscillator (1984 [MCS])

D.W. Maki, J.M. Schellenberg, H. Yamasaki and L.C.T. Liu. "A 69 GHz Monolithic FET Oscillator (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 62-66.

A monolithic oscillator was fabricated using conventional planar FET technology. The active device used was a 0.35x60 micron FET fabricated on an active layer formed by ion implantation into an undoped VPE buffer layer. Frequency stability is achieved using either an on-chip microstrip resonant circuit or by adding a 30 mil diameter dielectric resonator directly onto the 50 mil square GaAs chip. With no external tuning the oscillator delivered 0.45 milliwatts at 64 GHz. By using an external E-H waveguide tuner, 0.7 milliwatts of power at 65.7 GHz was achieved. The oscillator was tunable from 55 to 75 GHz by adjusting the source-gate tuning inductor and the drain tuning.

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Abstracts

A W-Band Monolithic GaAs Crossbar Mixer

L.T. Yuan. "A W-Band Monolithic GaAs Crossbar Mixer." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 67-69.

A fully monolithic crossbar mixer has been designed and fabricated for operation at W-band (75 to 110 GHz). A typical conversion loss of 9 dB with a variation of less than ± 0.5 dB has been measured, and a minimum conversion loss of 7.5 dB has been measured at 76 GHz.



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94 GHz Planar GaAs Monolithic Balanced Mixer (1984 [MCS])

P. Bauhahn, T. Contolatis, J. Abrokwhah, C. Chao and C. Seashore. "94 GHz Planar GaAs Monolithic Balanced Mixer (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 70-73.

A 94 GHz GaAs monolithic balanced mixer in a Planar microstrip integrated circuit configuration has been demonstrated. A double sideband noise figure of 5.6 dB has been achieved at 94.5 GHz. This includes a 1.5 dB noise contribution of the IF preamplifier. The chip size is 0.076 x .034 inch with integral beam leads.

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GaAs Monolithic Frequency Doublers with Series Connected Varactor Diodes (1984 [MCS])

A. Chu, W.E. Courtney, L.J. Mahoney, R.W. McClelland and H.A. Atwater. "GaAs Monolithic Frequency Doublers with Series Connected Varactor Diodes (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 74-77.

GaAs monolithic frequency doublers using series connected varactor diodes have been fabricated for the first time. Output powers of 150 mW at 36.9 GHz with 24% efficiency and 300 mW at 24.8 GHz with 18% efficiency have been obtained. Peak efficiencies of 35% at output power levels near 100 mW have been achieved at both frequencies. Both K-band and Ka-band frequency doublers are derived from a lower power, single-diode design by series connection of two diodes and scaling to achieve different power and frequency specifications. Their fabrication was accomplished using the same process sequence.

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Calibration Methods for Microwave Wafer Probing

E.W. Strid and K. Gleason. "Calibration Methods for Microwave Wafer Probing." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 78-82.

A new level of accuracy in the measurement of microwave parasitic has been achieved, due to the combined development of microwave wafer probes and on-wafer impedance standards. Repeatable losses and reflections in the probes can be readily removed from measured data, but radiation losses and crosstalk cannot be corrected and must be minimized. Oneport and twoport on-wafer standards for several probe footprints are shown, and their performance verified.

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Low Noise High Electron Mobility Transistors (1984 [MCS])

J.J. Berenz, K. Nakano and K.P. Weller. "Low Noise High Electron Mobility Transistors (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 83-87.

Sub-half-micron gate length High Electron Mobility Transistors (HEMT) were fabricated by direct-write electron beam lithography for low noise EHF amplifiers. Modulation-doped epitaxial structures were grown by molecular beam epitaxy having 8,000 cm²/ V-sec room temperature and 77,600 cm²/ V-sec liquid nitrogen Hall mobility for 10/sup 12/ electrons/cm². Gate lengths as narrow as 0.28 micron were defined in a recess etched through the n/sup +/ GaAs contact layer. The dc transconductance of 0.4 micron gate length depletion mode devices exceeded 260 mS/mm. Preliminary measurement of noise figure and associated gain made at room temperature yielded 2.7 dB noise figure and 5.9 dB associated gain at 34 GHz for devices having 0.37 micron gate length. Enhancement mode devices were also fabricated having 240 mS/mm dc transconductance. These devices yielded 1.5 dB noise figure and 10.5 dB associated gain at 18 GHz for 0.35 micron gate length. These results are comparable to the best quarter-micron gate length GaAs MESFET noise figures yet reported.

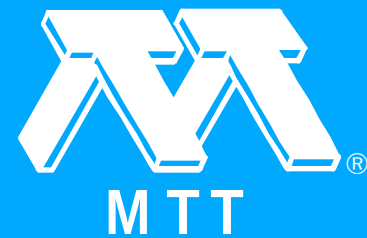


Abstracts

High Efficiency GaAs MBE Power FETs for Ka-Band (1984 [MCS])

J. Geddes, V. Sokolov, T. Contolatis, J. Abrokwah and W. Larson. "High Efficiency GaAs MBE Power FETs for Ka-Band (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 87-90.

Submicron gate length, 300 micron gate width GaAs FETs were fabricated on MBE material using direct write e-beam lithography. Evaluation of the devices in a Ka-band test fixture with fin line transitions resulted in an amplifier output power of 110 mw with 11 percent power added efficiency at 30 GHz. At 2.9 dB gain the power per unit gate width is .46 W/mm referenced to the device. This is the highest power output per unit gate width reported to date for a GaAs FET at Ka-band.



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Highly Accurate Design of Spiral Inductors for MMIC's with Small Size and High Cut-Off Frequency Characteristics (1984 [MCS])

M. Parisot, Y. Archambault, D. Pavlidis and J. Magarshack. "Highly Accurate Design of Spiral Inductors for MMIC's with Small Size and High Cut-Off Frequency Characteristics (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): 91-95.

High precision experimental and theoretical procedures are presented for obtaining very compact inductors (diameter 80 to 200 μm) with values up to 5 nH and cut-off frequencies ranging from 20 to 100 GHz for $L < 2$ nH. The maximum phase and amplitude measurement error is of the order to ± 2 degrees and 1% respectively with typical measurement reproducibility of 0.1%. A new lumped element theory is presented predicting the electrical characteristics of spiral inductors with a maximum error of only 5%.

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Abstracts

Back Cover (1984 [MCS])

"Back Cover (1984 [MCS])." 1984 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 84.1 (1984 [MCS]): b1-b1.



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