

Microwave Digital Archive

IEEE Microwave Theory and Techniques Society

1992

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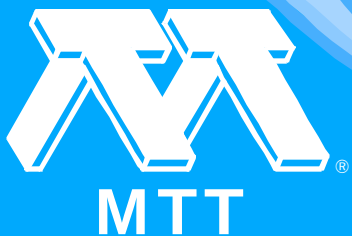
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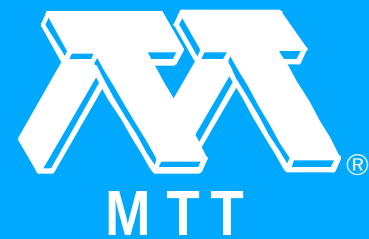
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Thank You and Enjoy!



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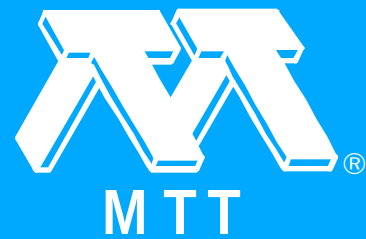
ACKNOWLEDGMENTS

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

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

ISBN: 0-7803-9906-4



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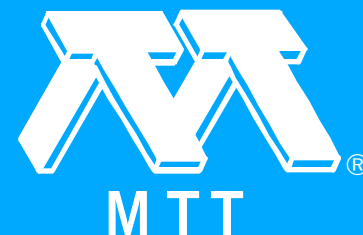
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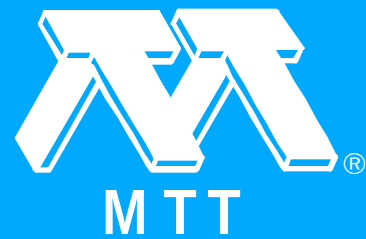
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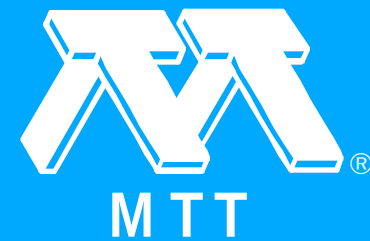
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INTRODUCTION

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

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

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

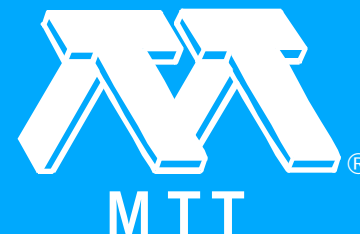


ACROBAT PREFERENCES

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



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

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

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

EXITING AN ARTICLE

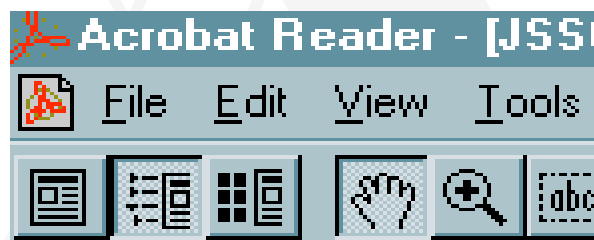
To exit an article after viewing, and return to the electronic guide, select File > Close from the menu bar. To switch between the article and the electronic guide or any other PDF file that is open, select “Window” and pick the open file you wish to return to.



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USING BOOKMARKS

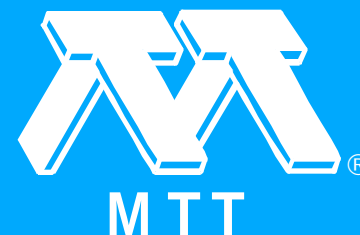
In addition to links, you can navigate through the Electronic Guide using Bookmarks. If they are not already visible, choose View > Bookmarks and Page from the menu bar or press the “Display Page and Bookmarks” button on the tool bar. A panel opens on the left side of the screen displaying Bookmarks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



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

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



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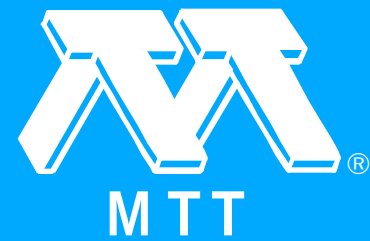
Articles may have text outside normal print-area defaults. We recommend selecting “Shrink to Fit” in the print menu (File > Print) to capture the complete image for your printout. This setting will become your new default.

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.

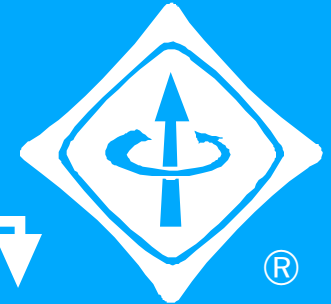
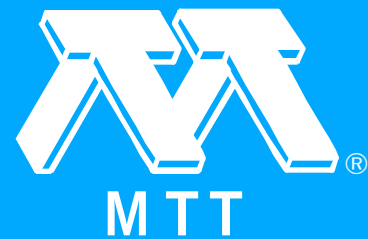
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Click to advance to the next page in the section.

Previous Page button

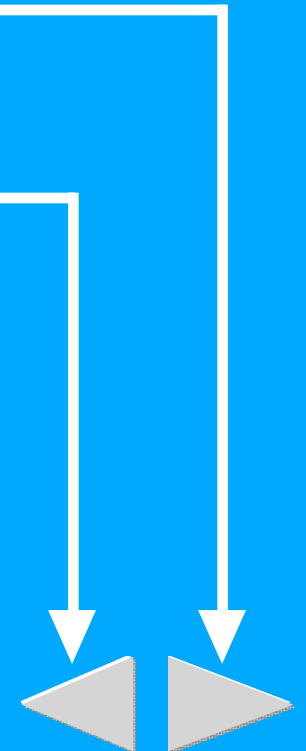
Click to go back to the previous page in the section. The first and last pages of a section show only one button.

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



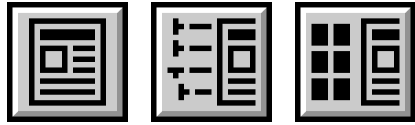
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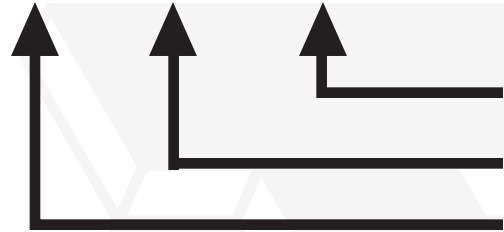


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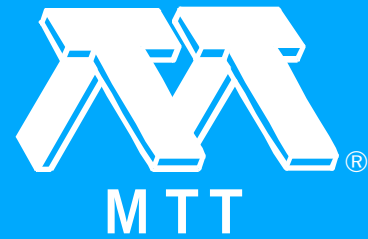
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Display Page



Zoom/Selection



Select Text
Zoom In (Magnify)
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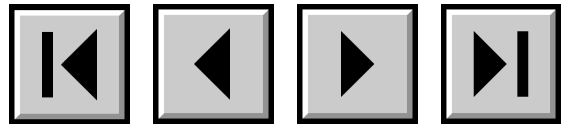
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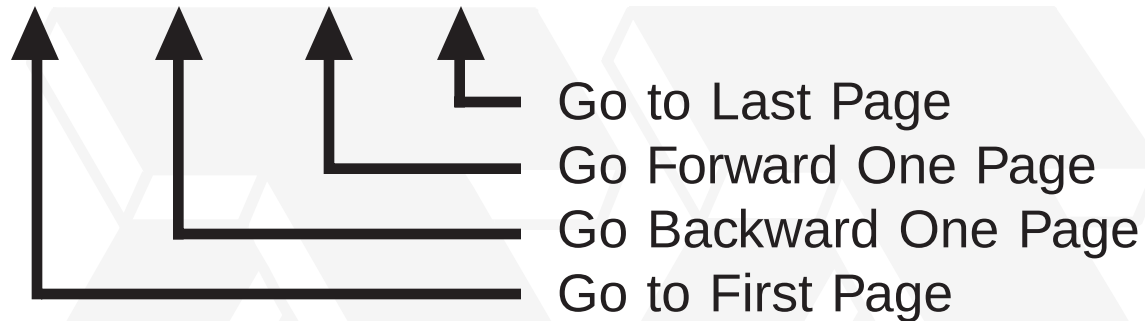


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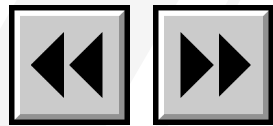


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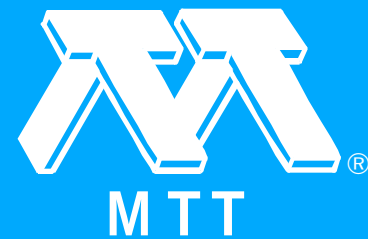


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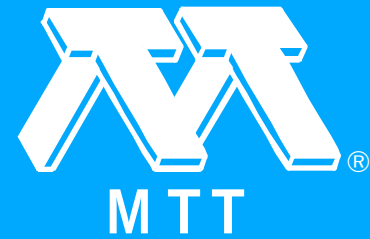


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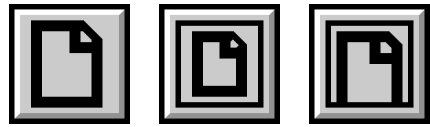
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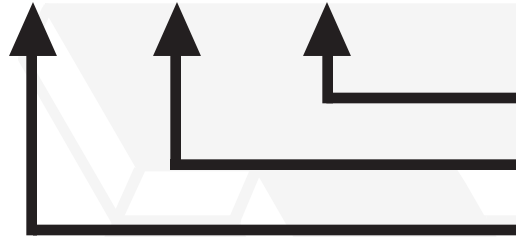
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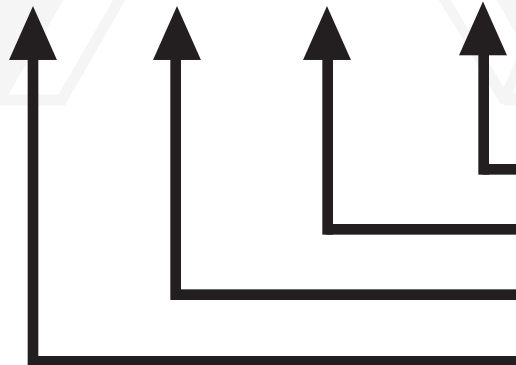
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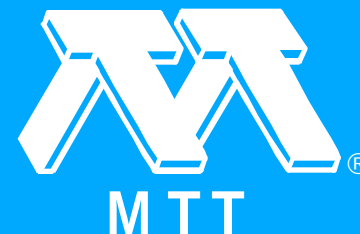
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SEARCHING

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

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

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



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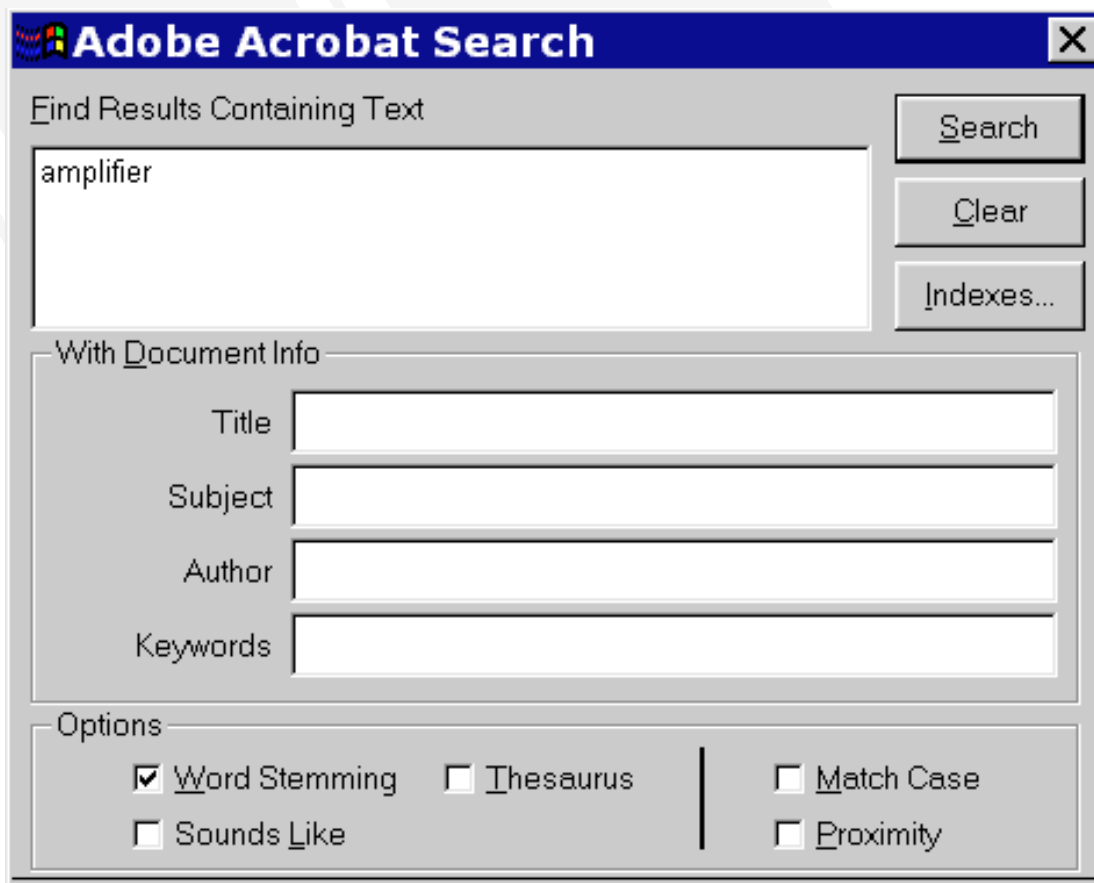
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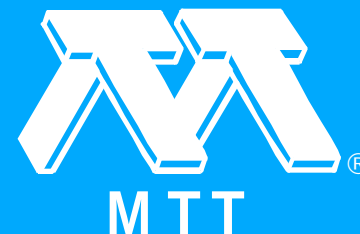
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If you are not finding files you think should show in the results list, Acrobat may not be attached to the correct index file. To check, press the “Indexes...” button for a list of available indexes. If this title is not listed, press the “Add...”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

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



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



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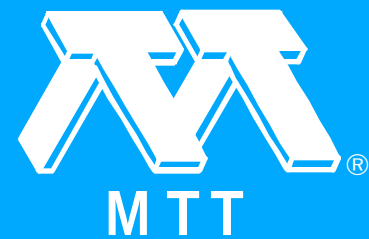


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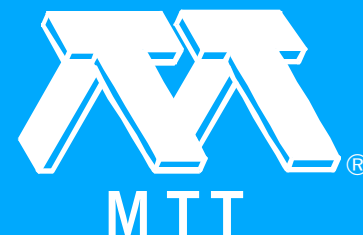
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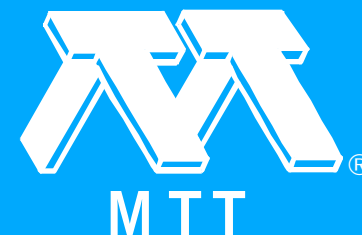
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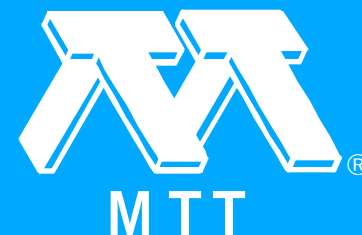
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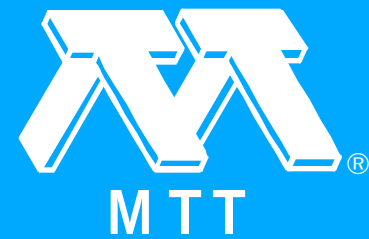
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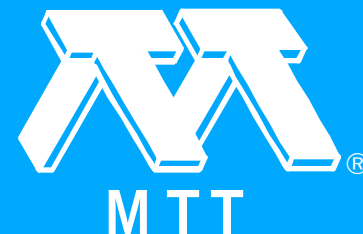
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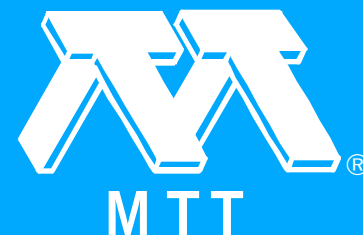
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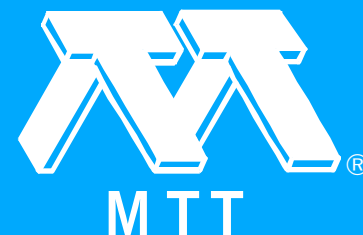
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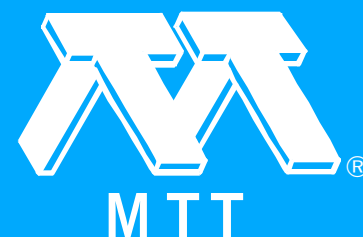
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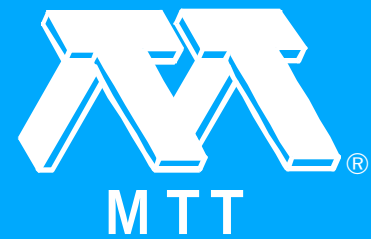
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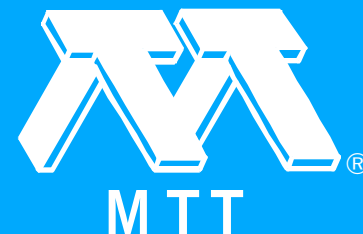
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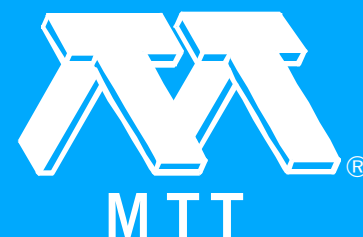
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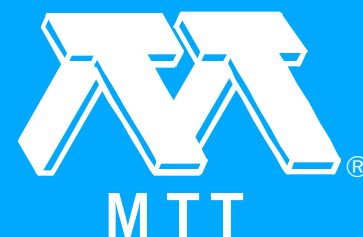
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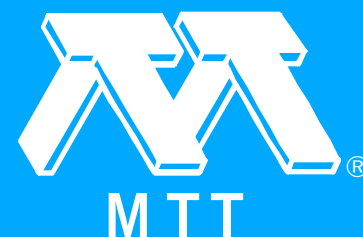
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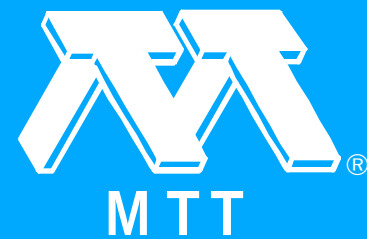
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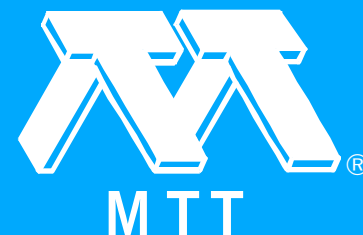
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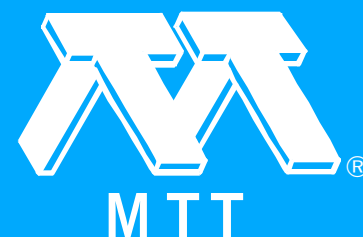
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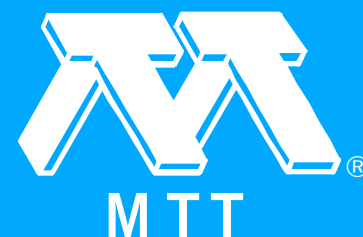
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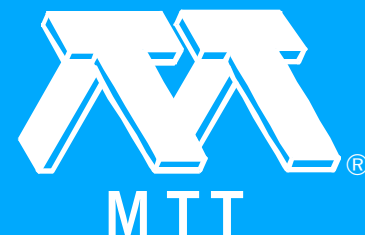
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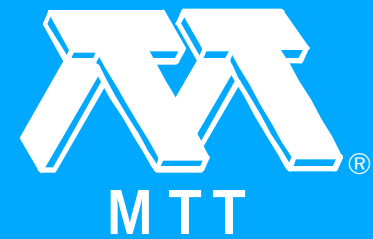
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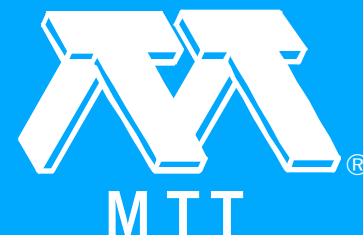
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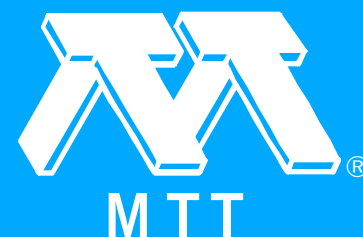
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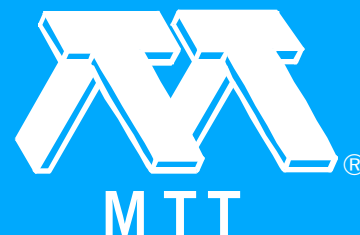
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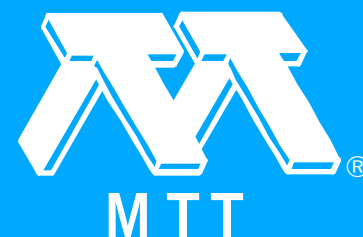
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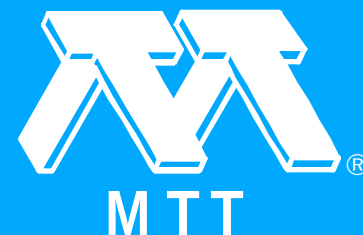
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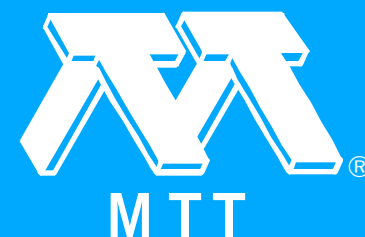
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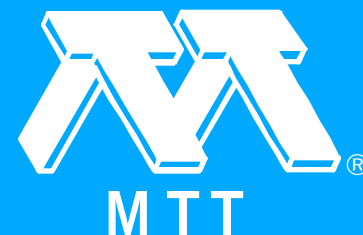
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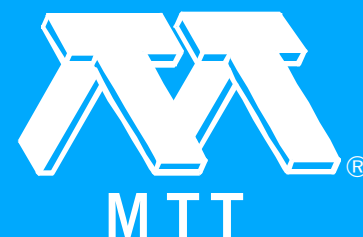
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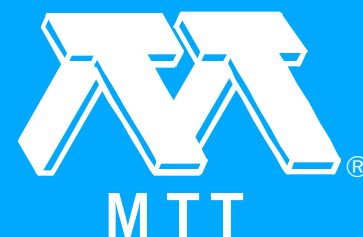
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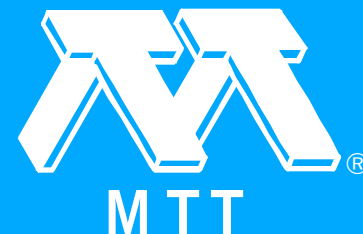
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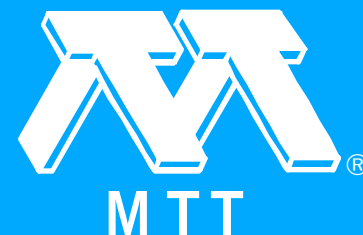
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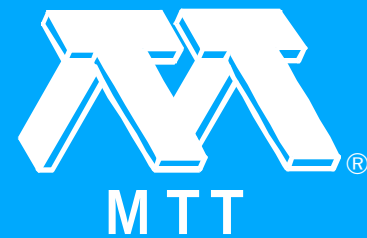
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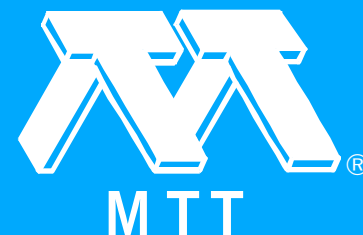
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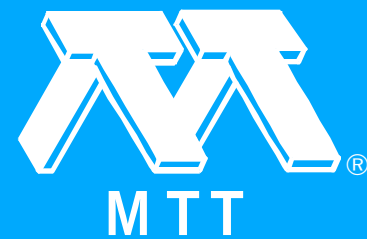
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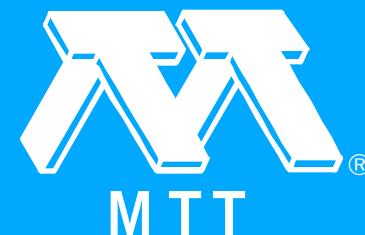
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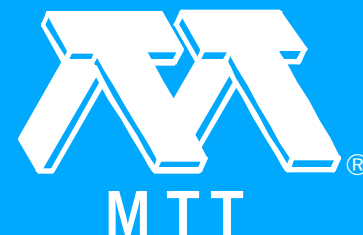
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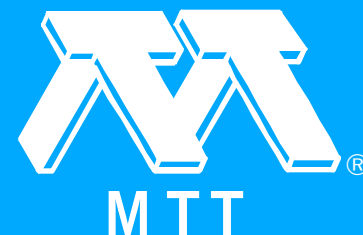
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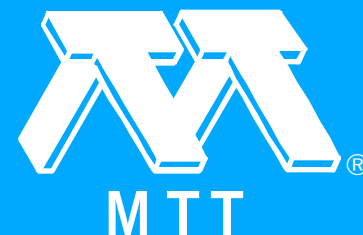
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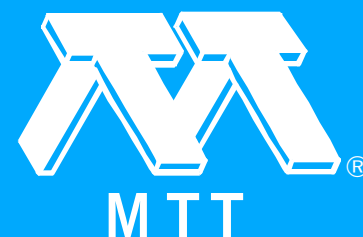
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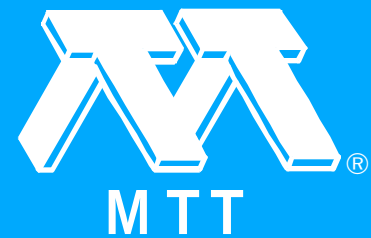
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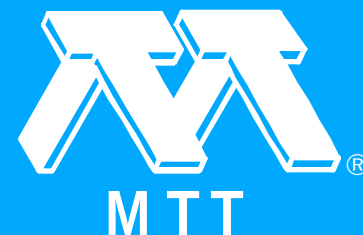
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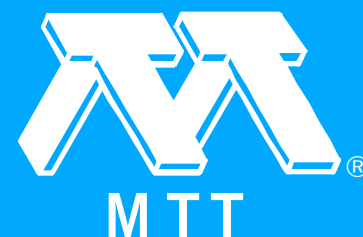
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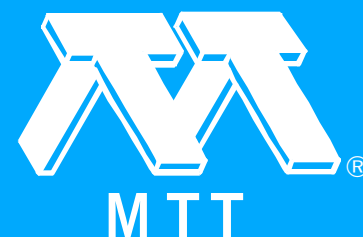
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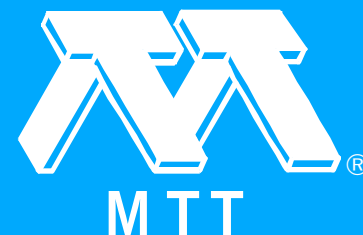
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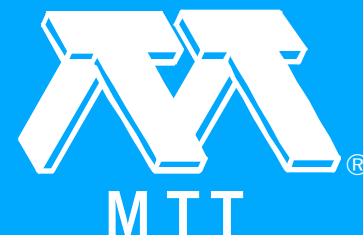
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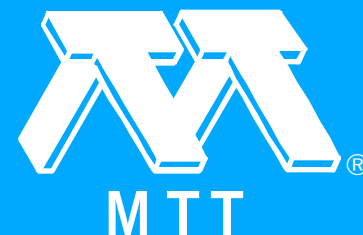
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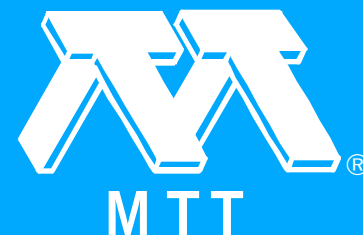
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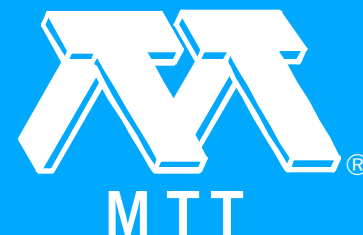


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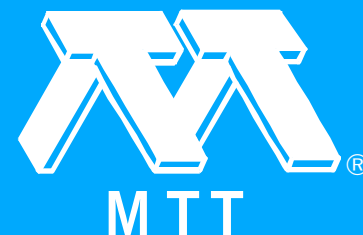
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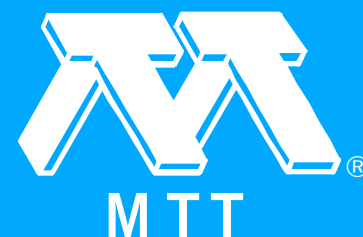
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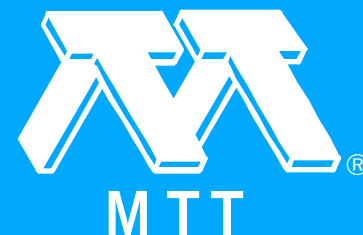
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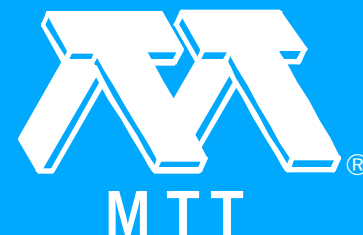
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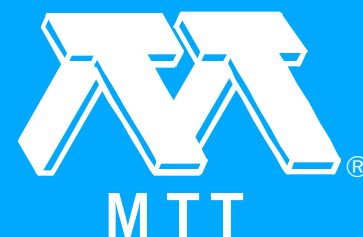
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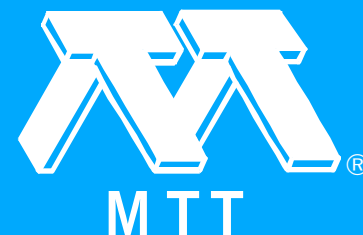
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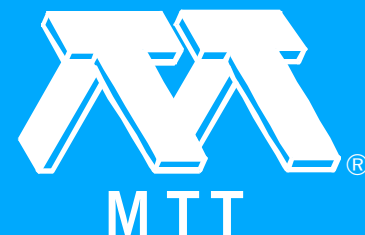
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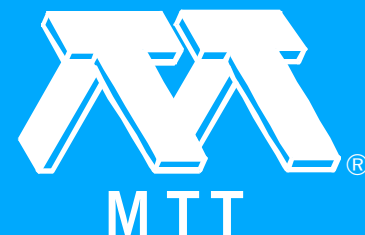
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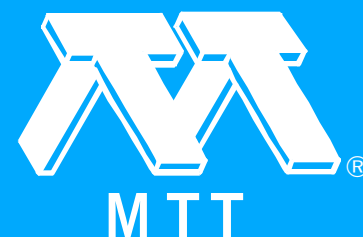
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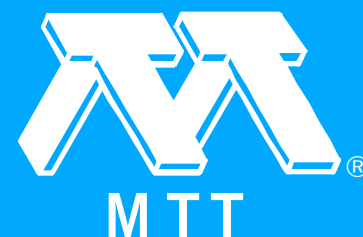
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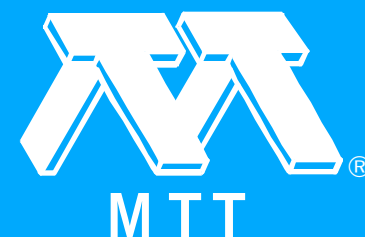
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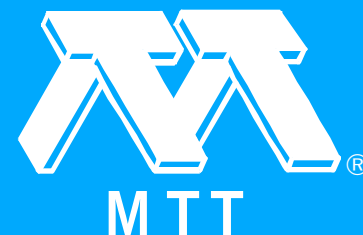
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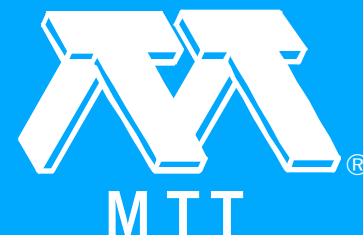
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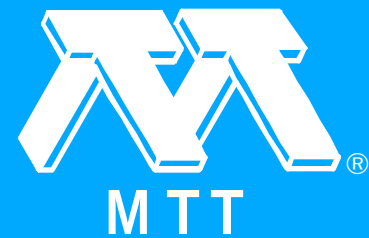
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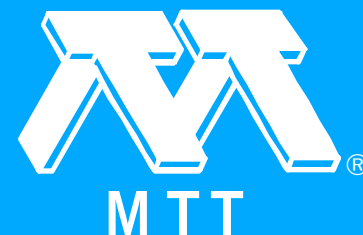
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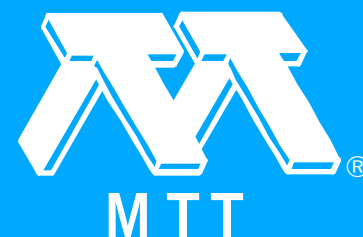
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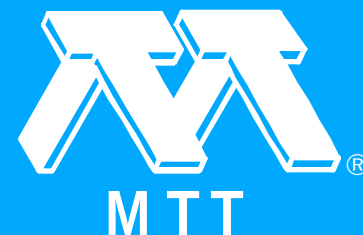
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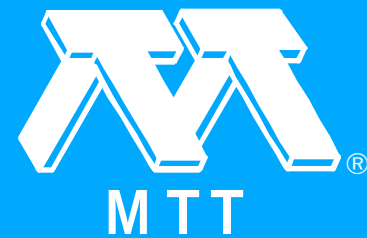
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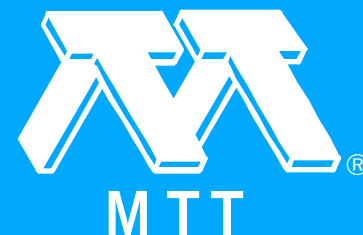
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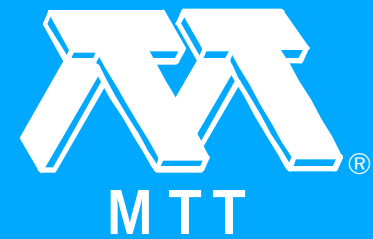
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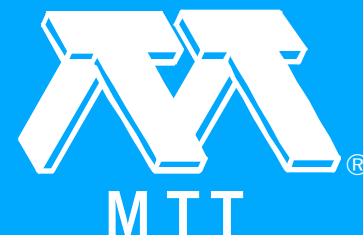
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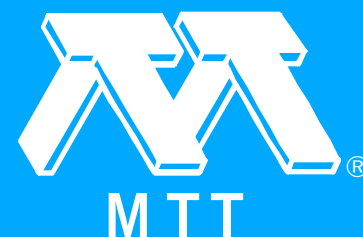
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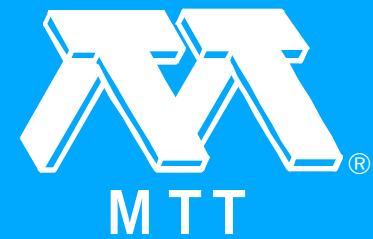
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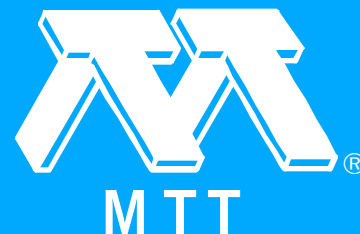


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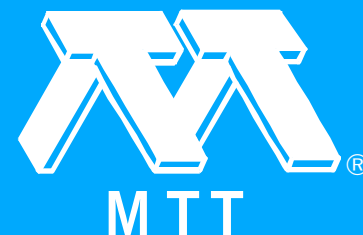
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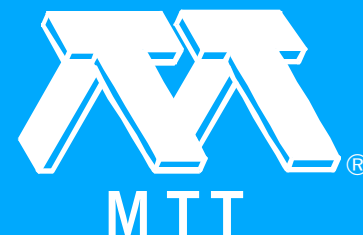
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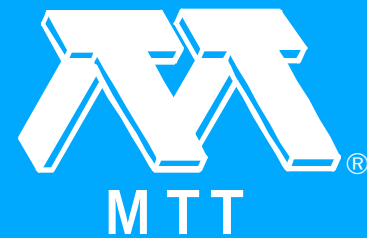
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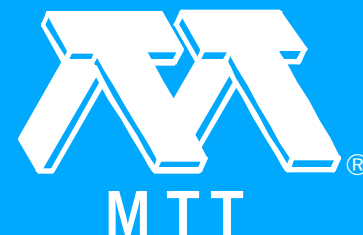
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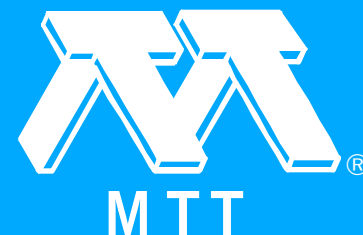
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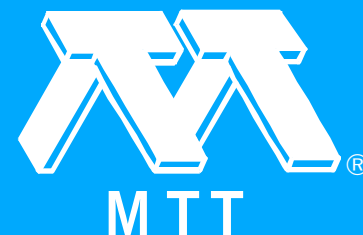
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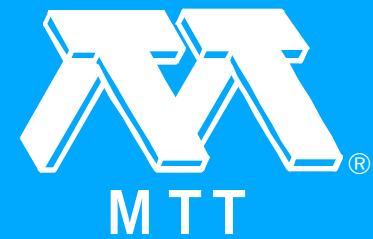
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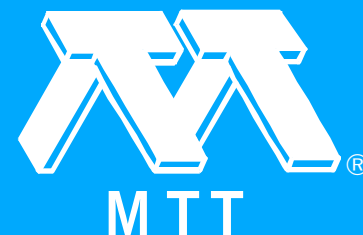
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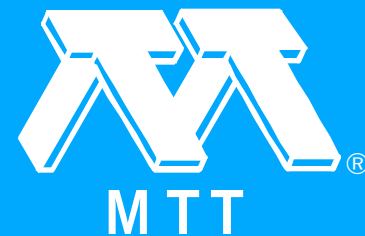
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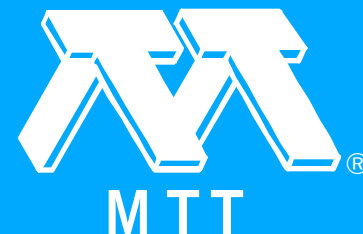
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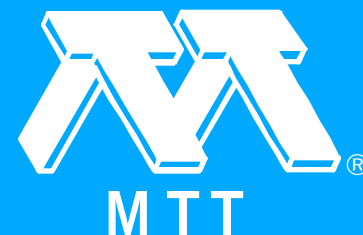
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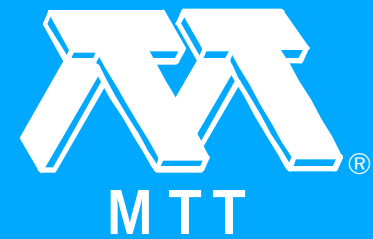
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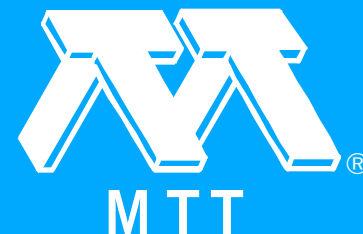
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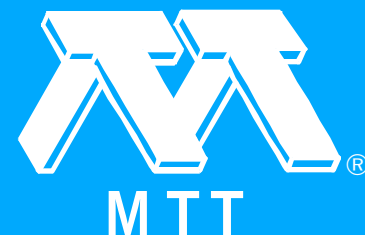
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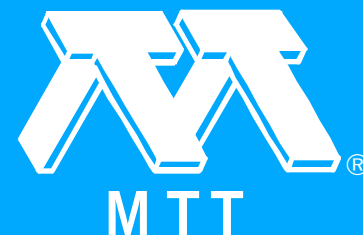
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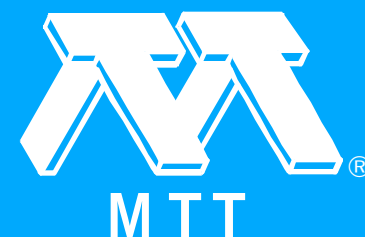
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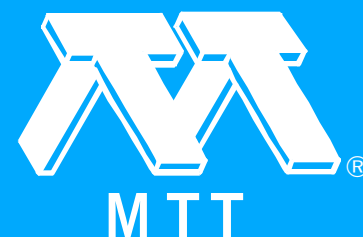
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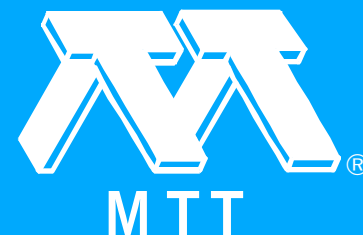
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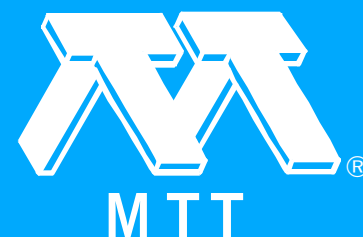
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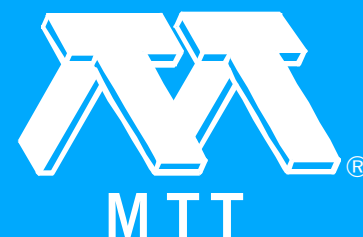
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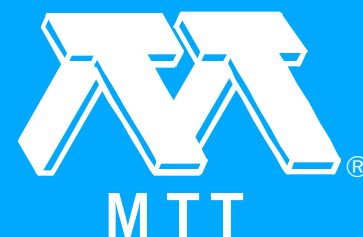
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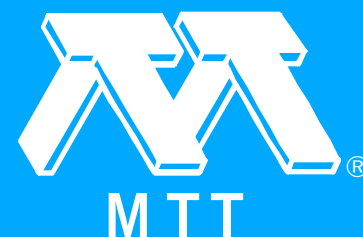
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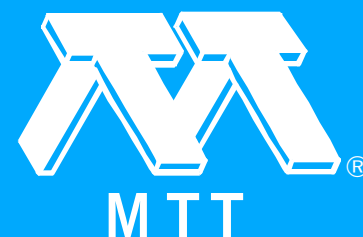
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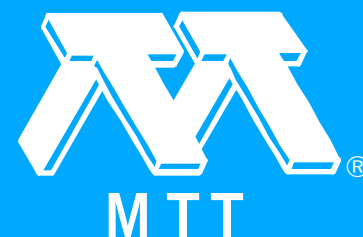
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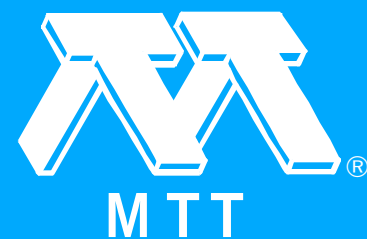
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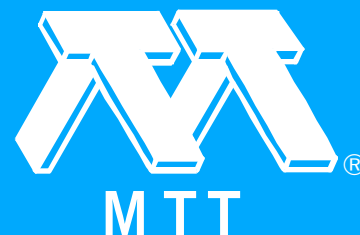
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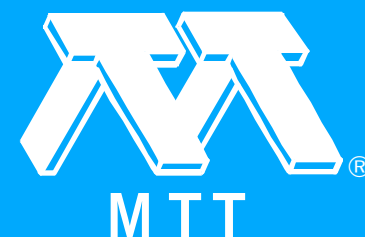
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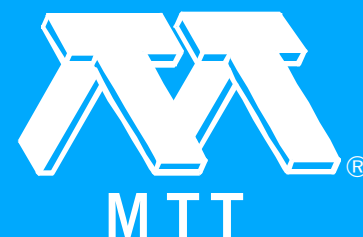
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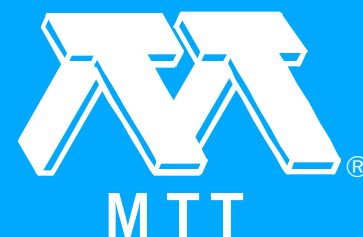
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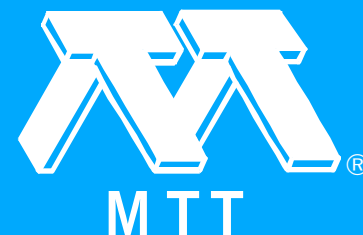
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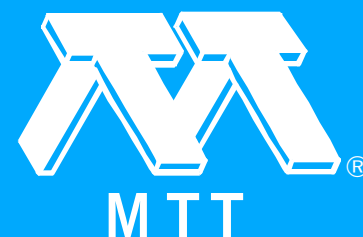
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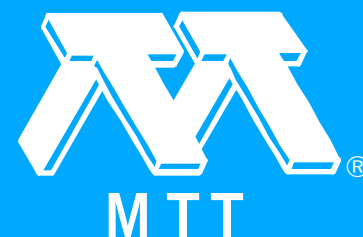
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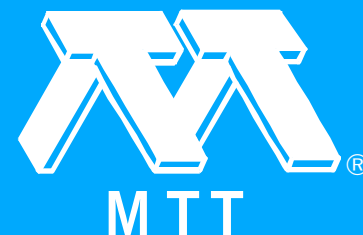
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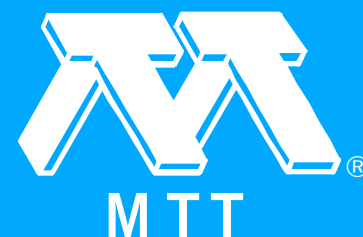
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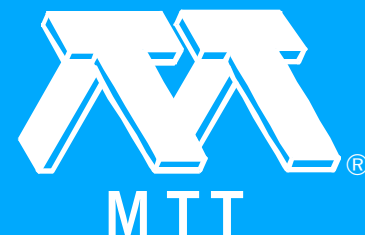
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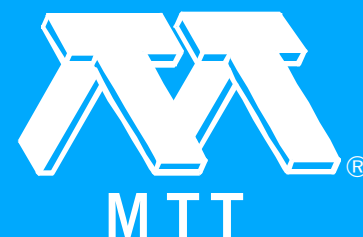
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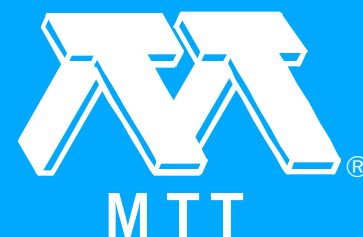
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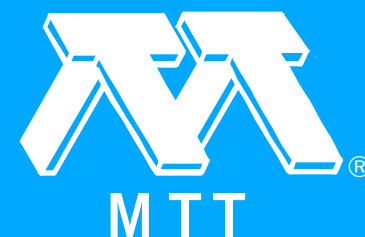
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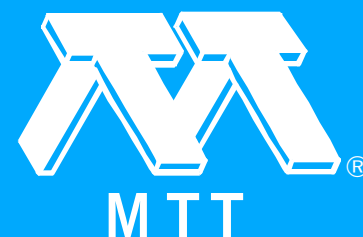
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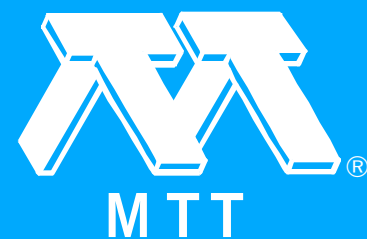
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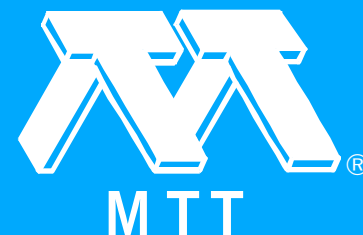
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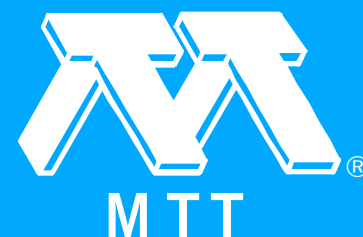
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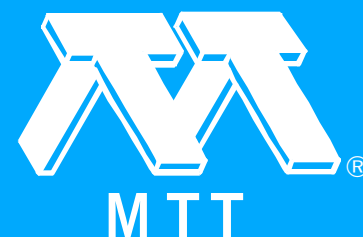
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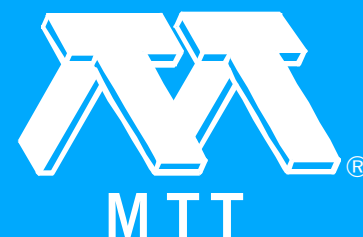
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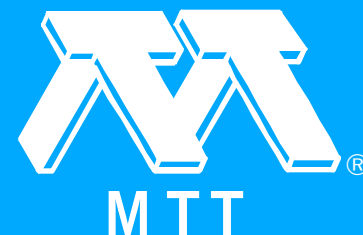
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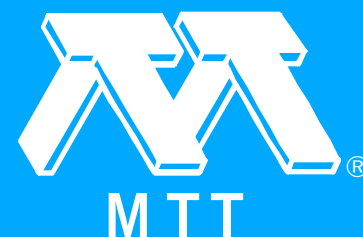
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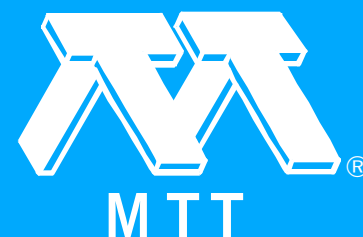
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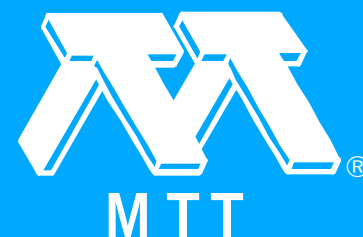
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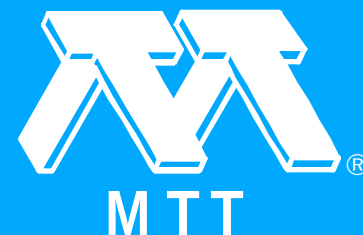
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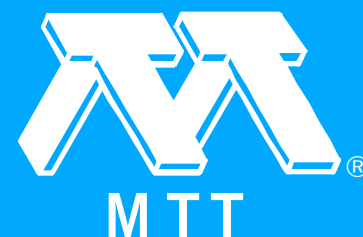
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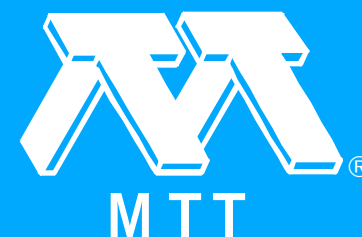
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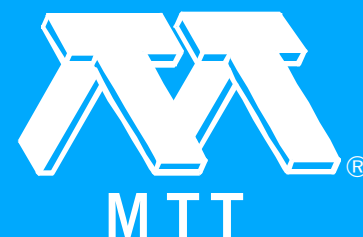
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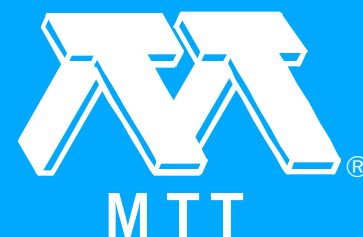
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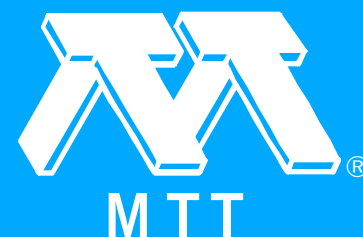
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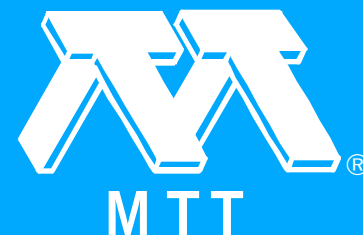
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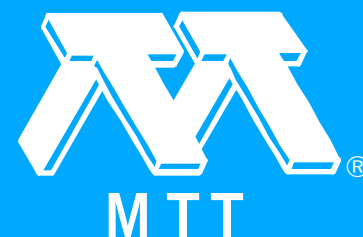
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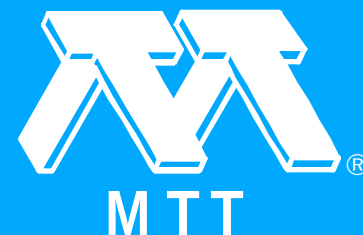
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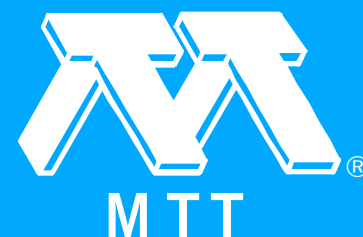
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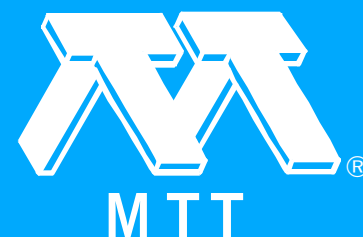
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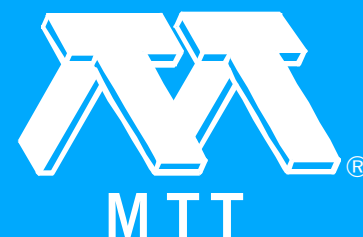
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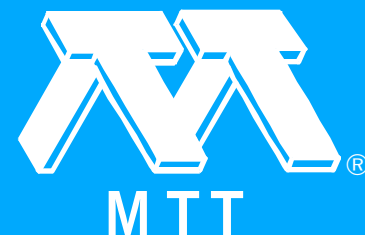
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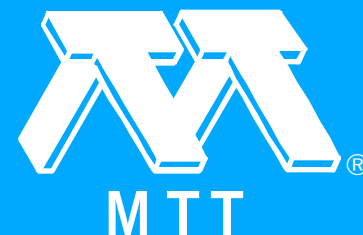
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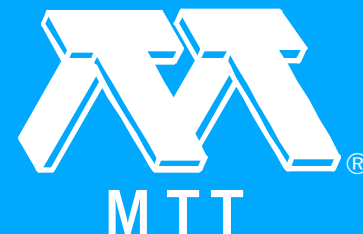
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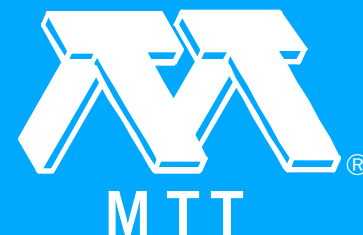
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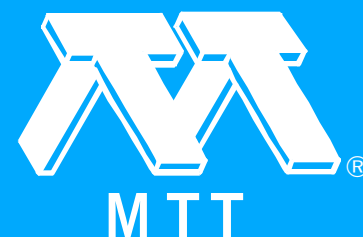
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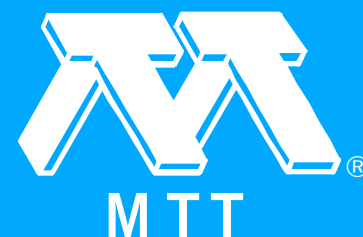
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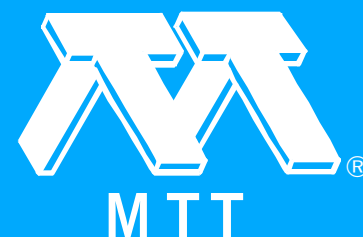
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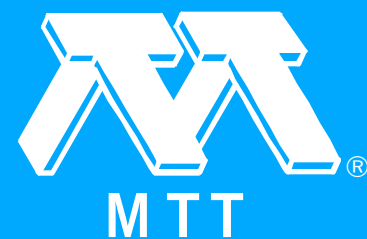
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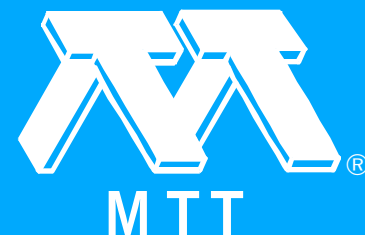
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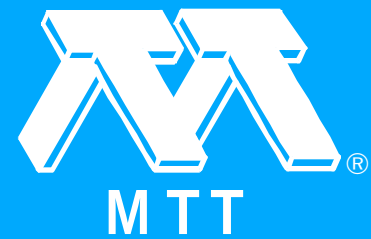
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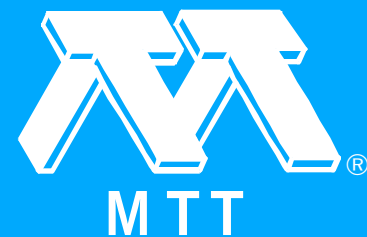
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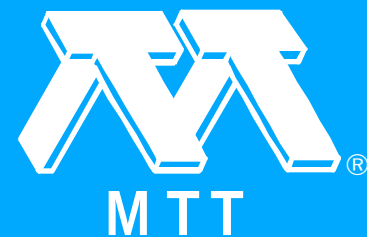
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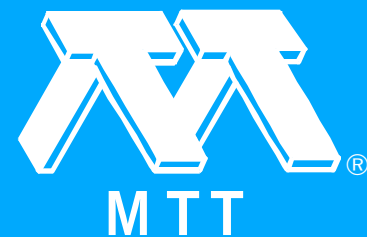
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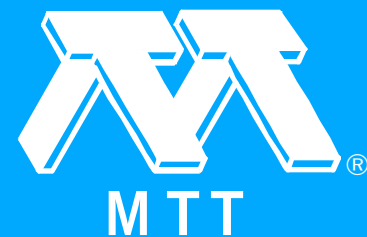
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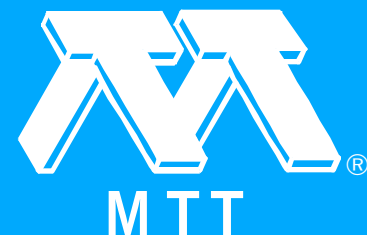
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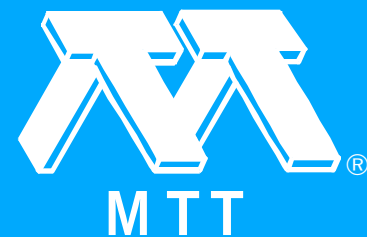
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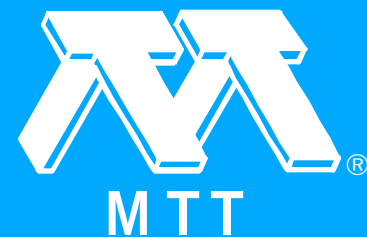
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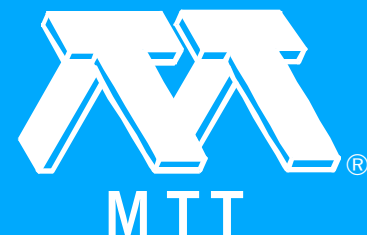
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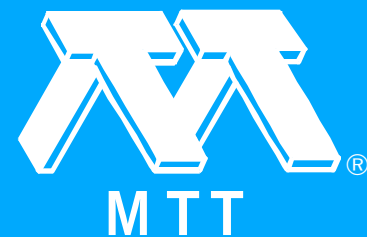
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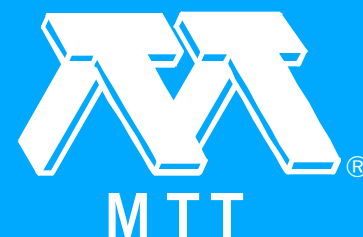
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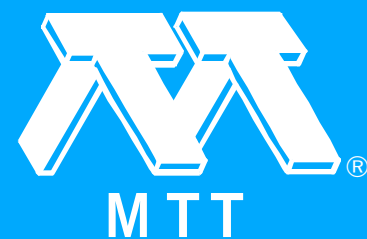
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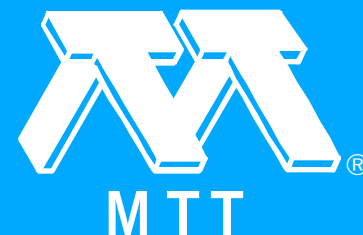
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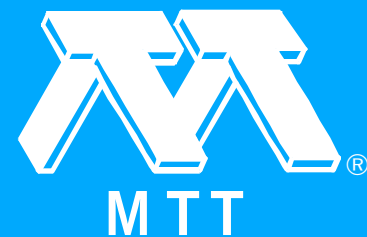
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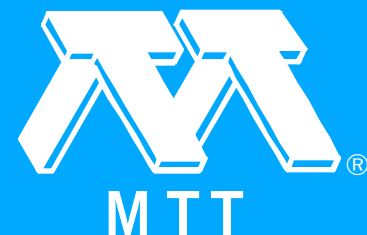
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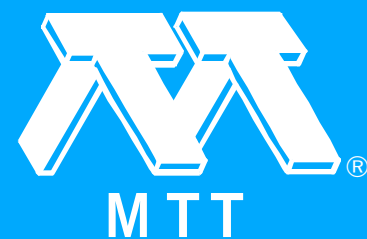
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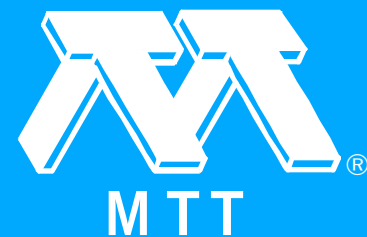
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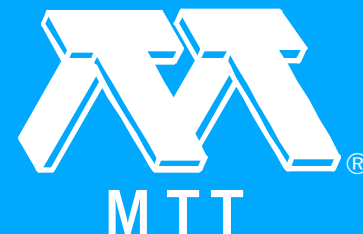
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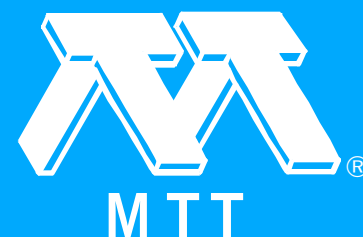
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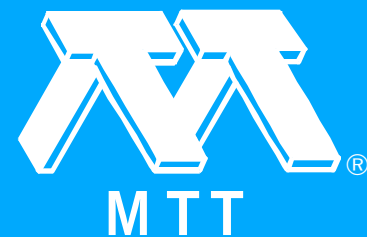
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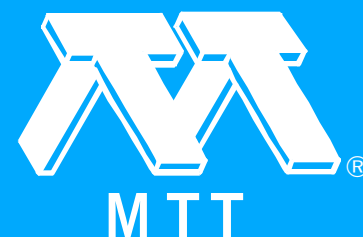
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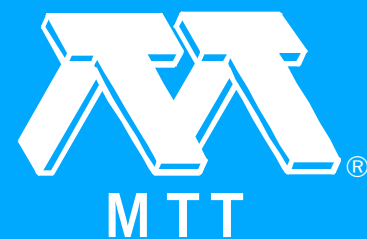
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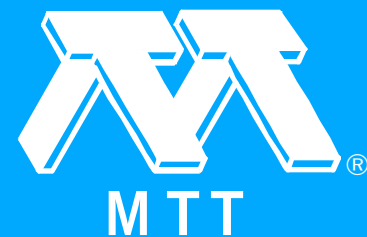
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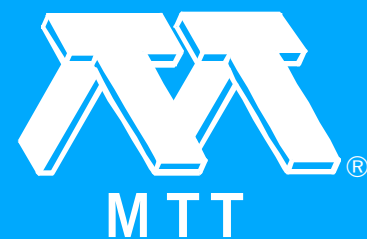
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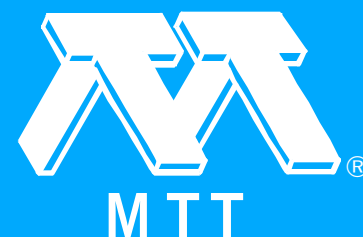
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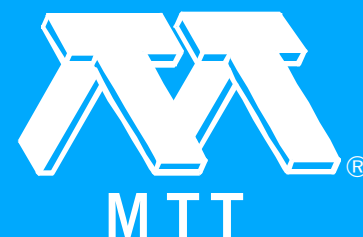
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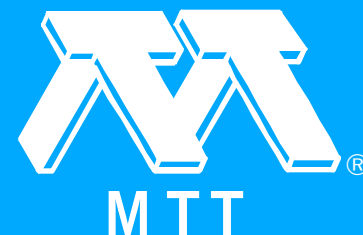
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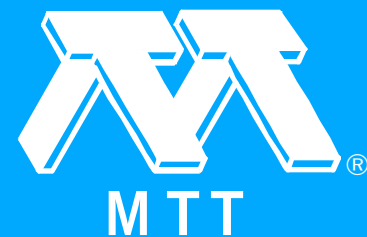
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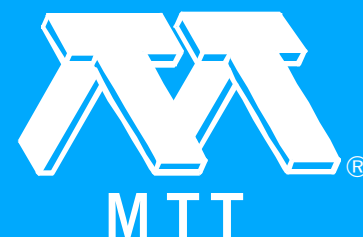
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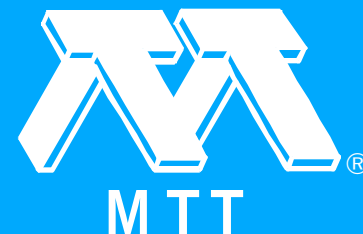
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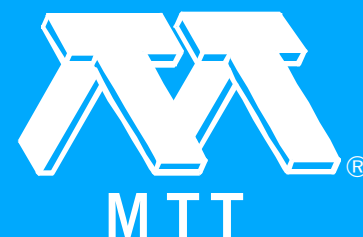
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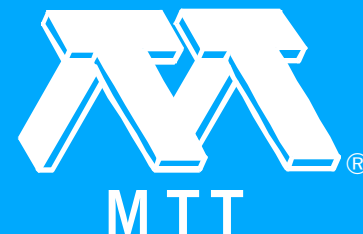
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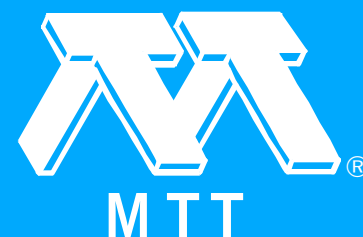
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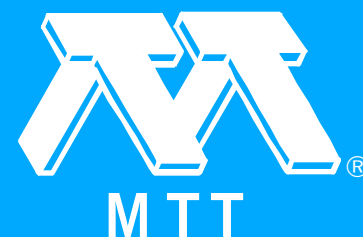
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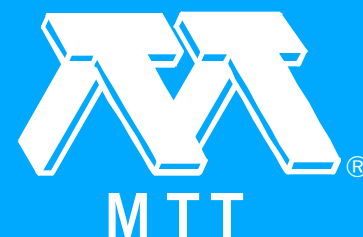
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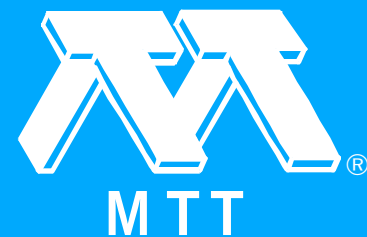
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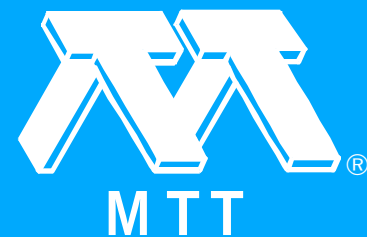
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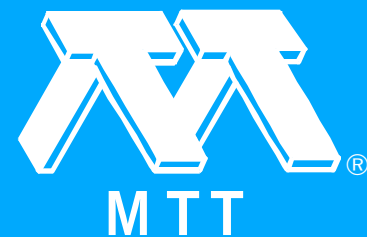
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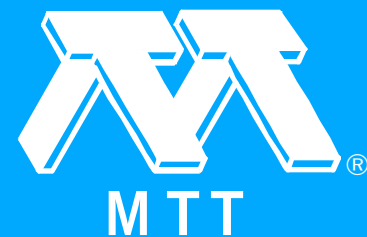
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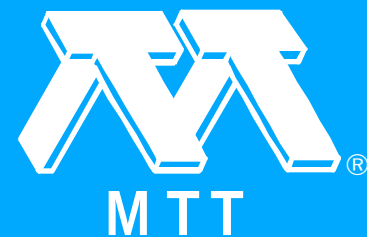
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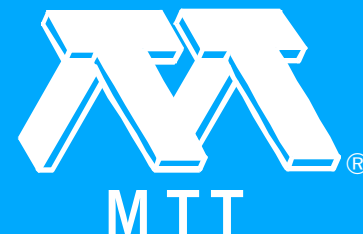
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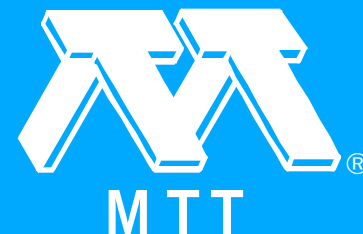
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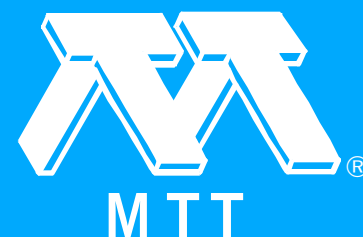
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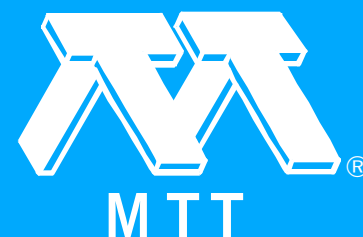
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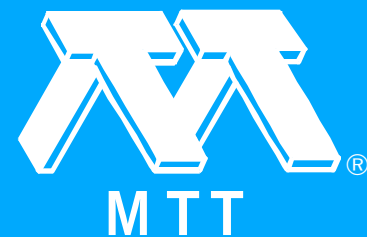
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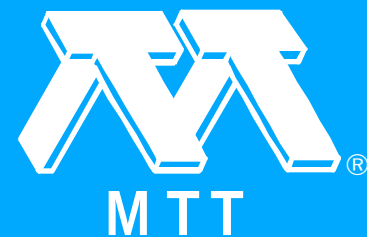
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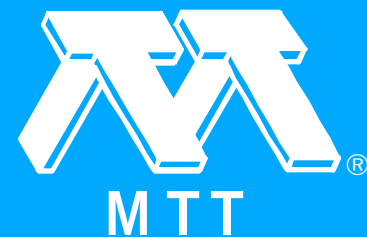
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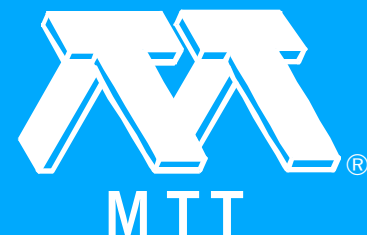
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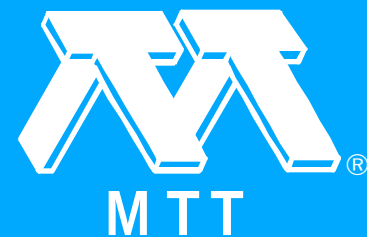
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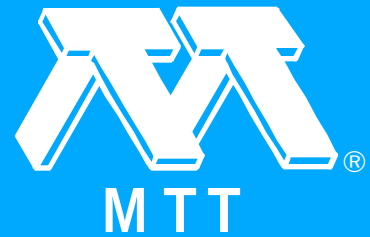


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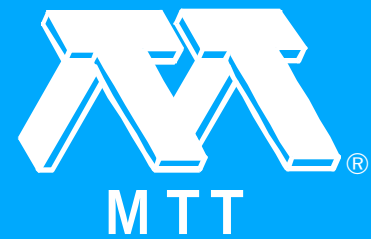
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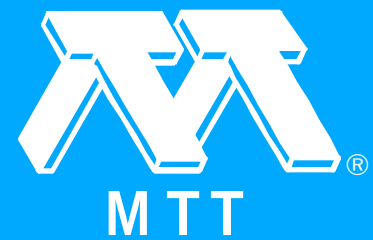
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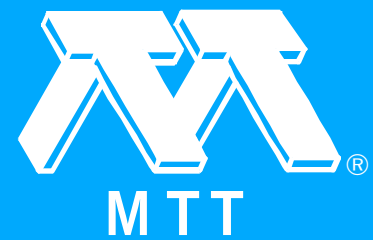
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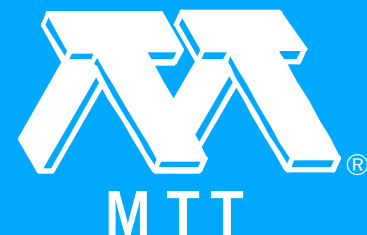
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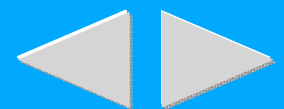
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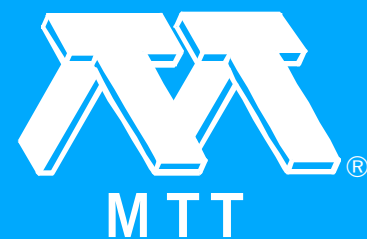
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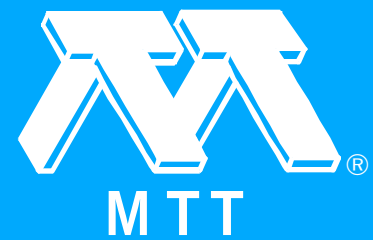
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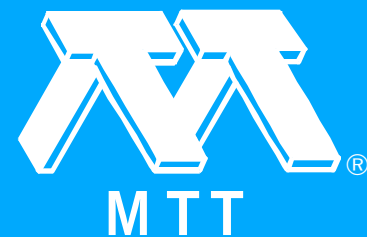
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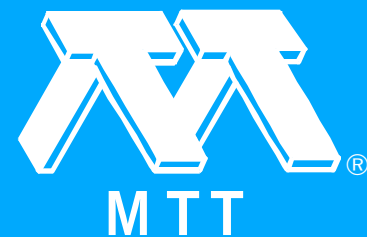
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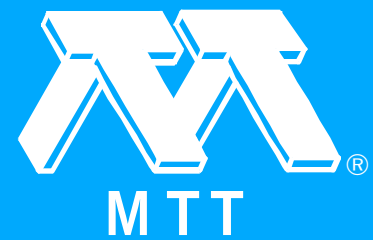
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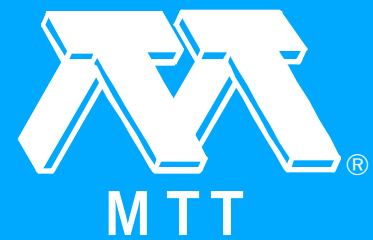
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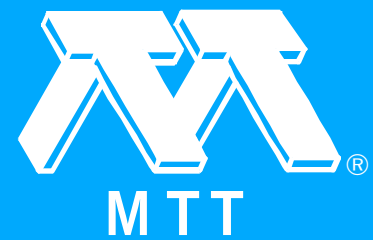
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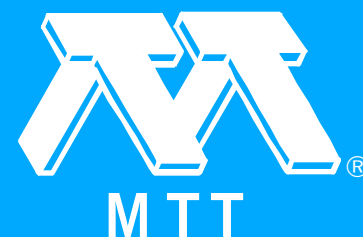
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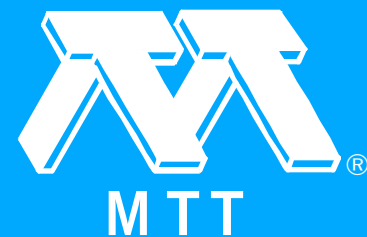
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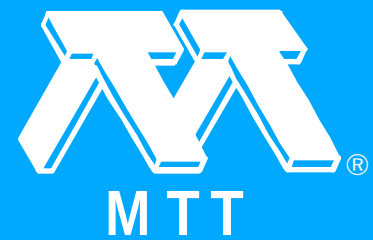
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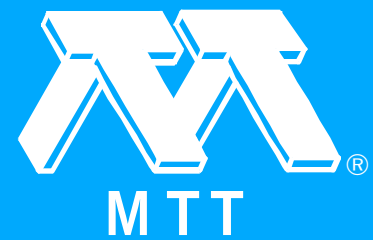
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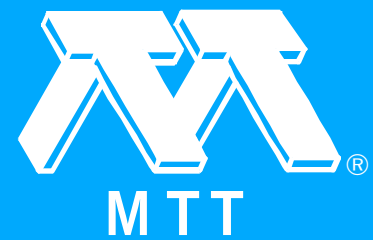
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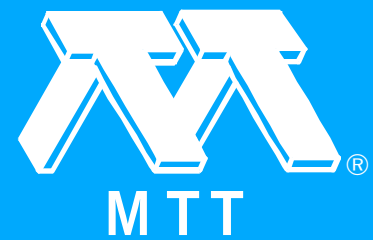
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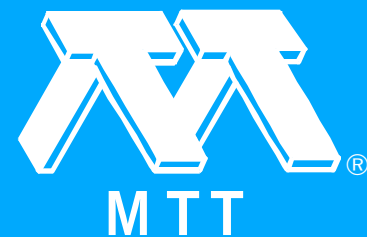
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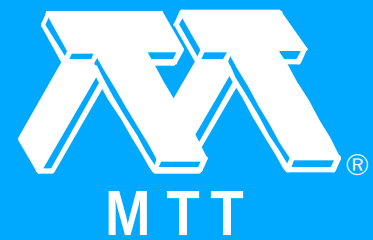
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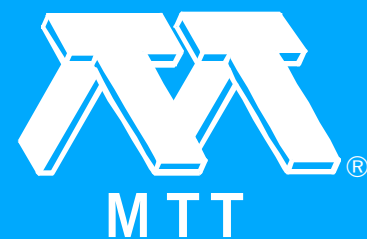
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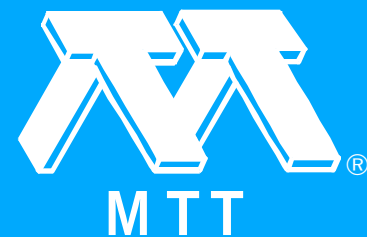
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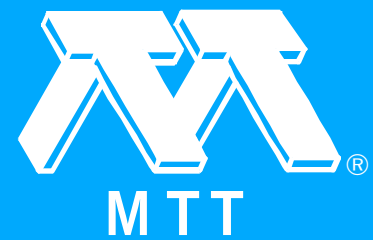
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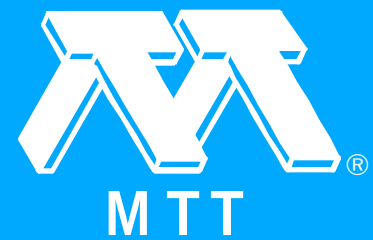
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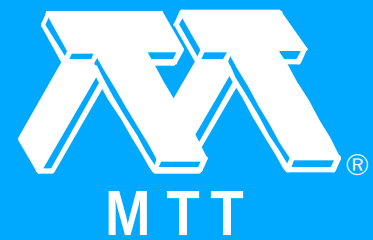
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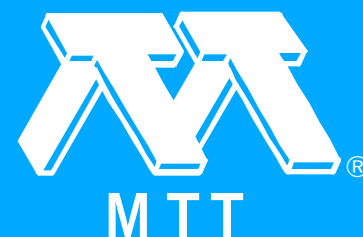
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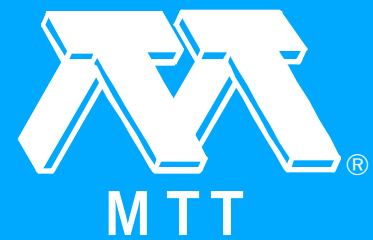
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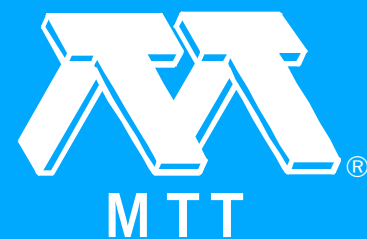
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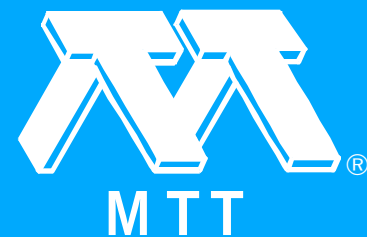
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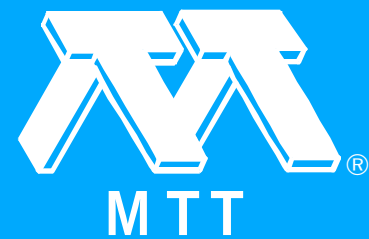
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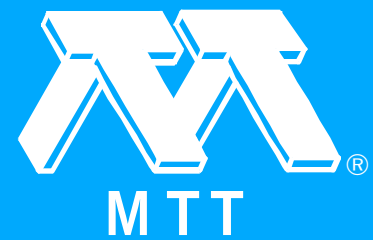
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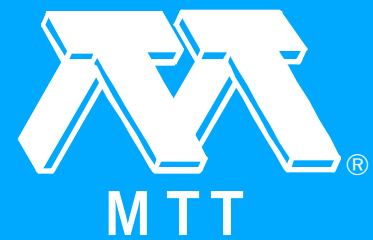
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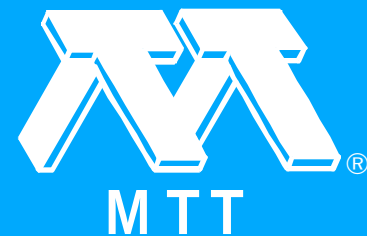
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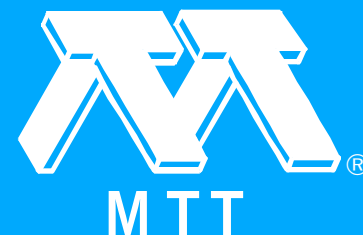
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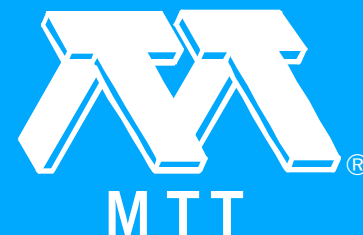


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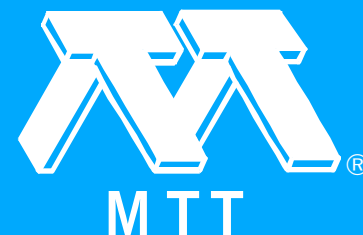
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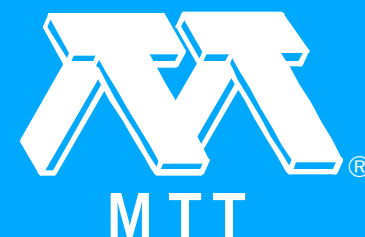
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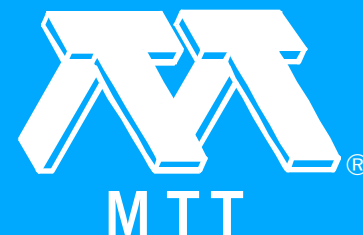
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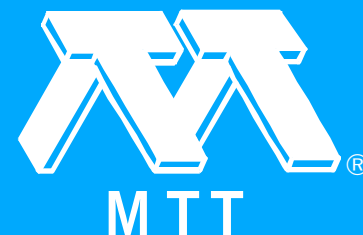
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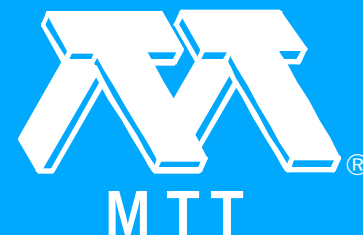
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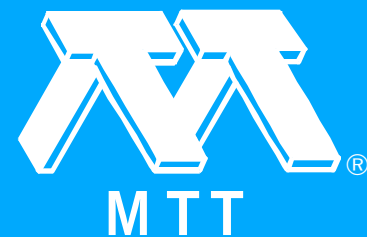
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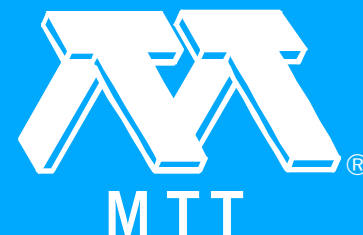
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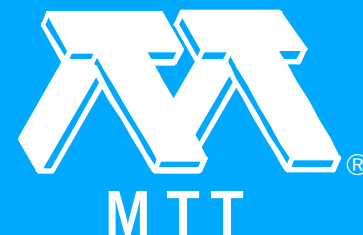
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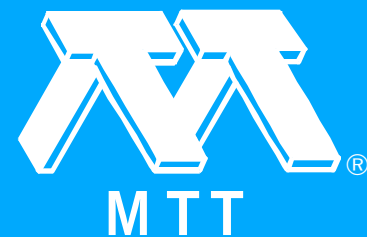
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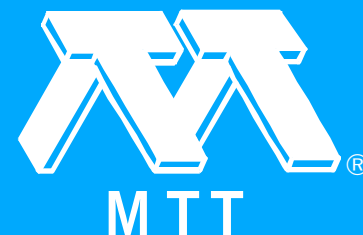
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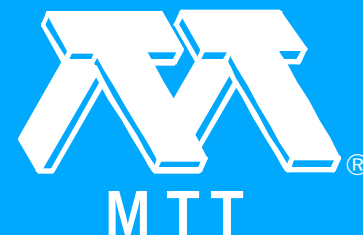
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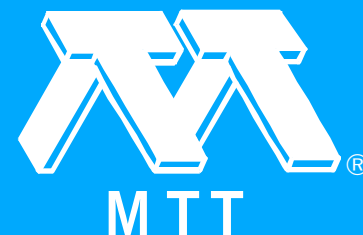
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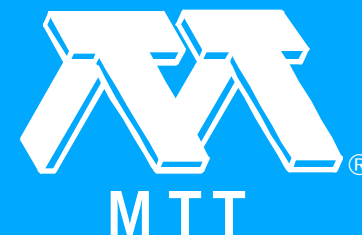
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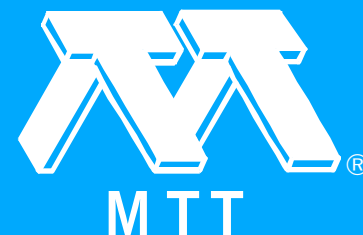
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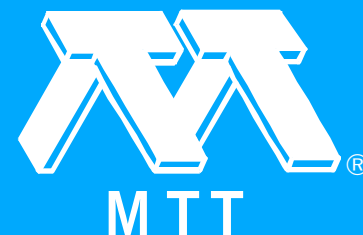
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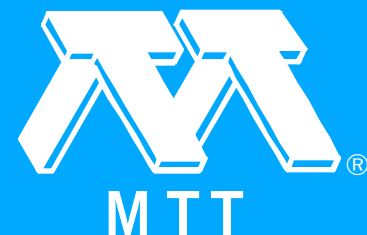
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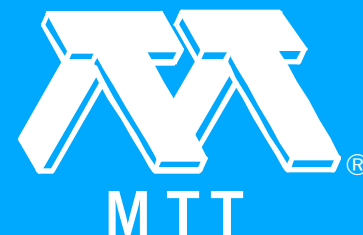


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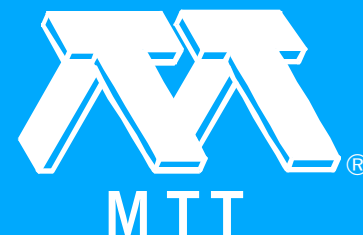
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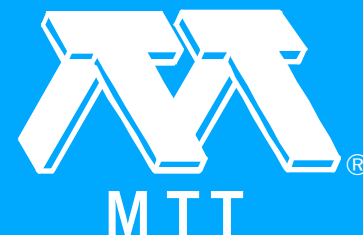


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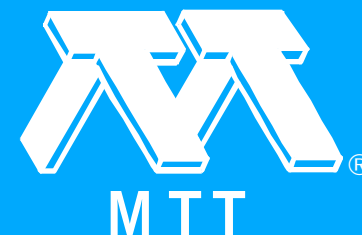
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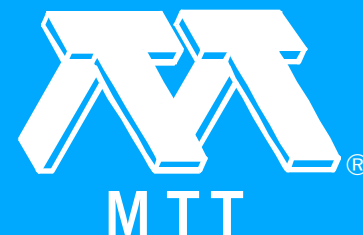
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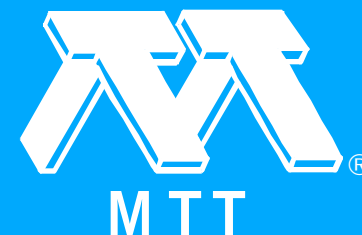
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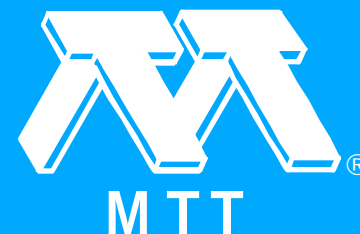
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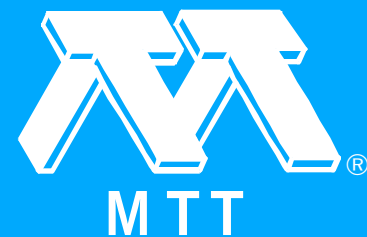
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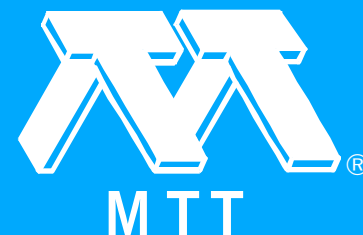
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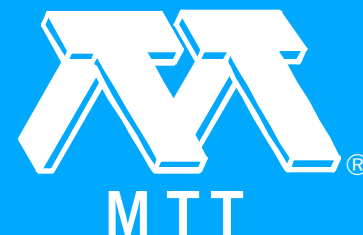


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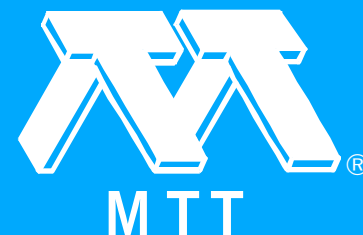
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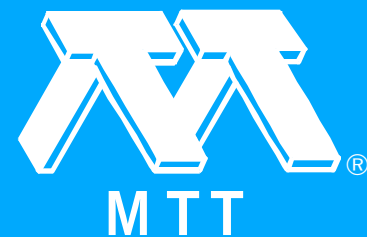
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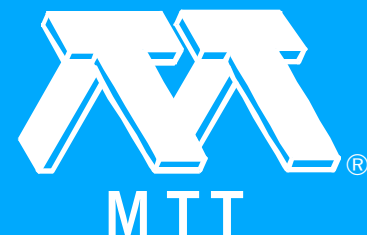
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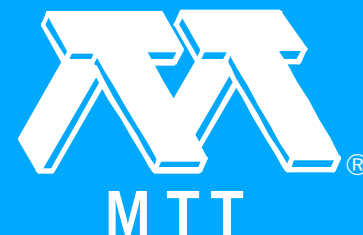
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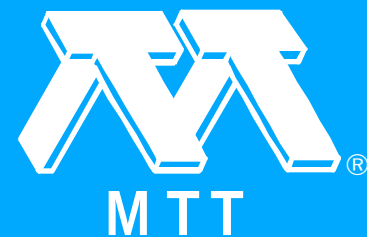
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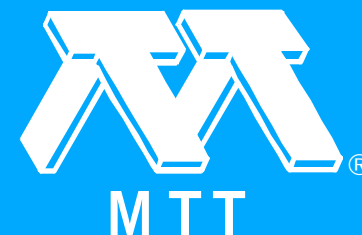
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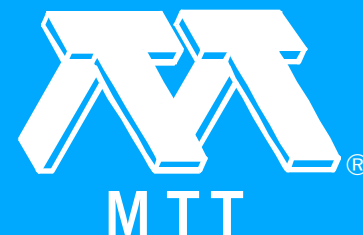
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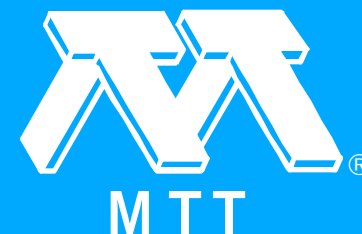
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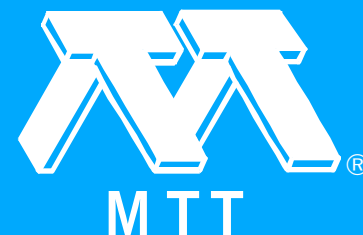
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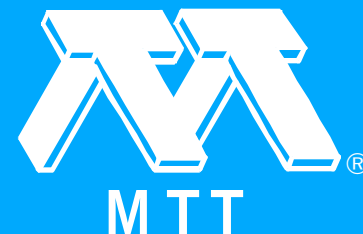
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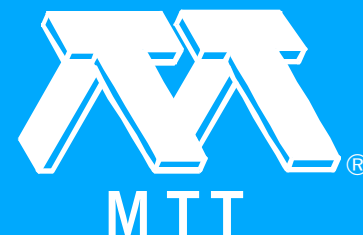
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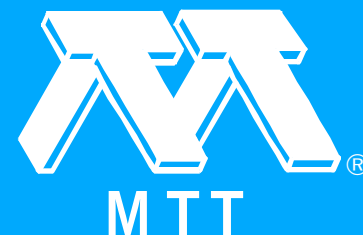
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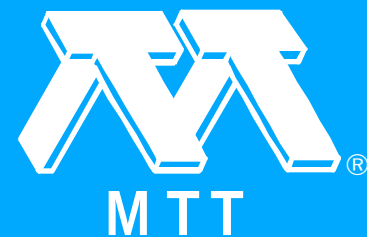
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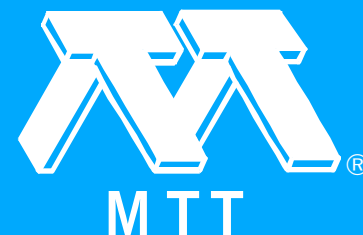
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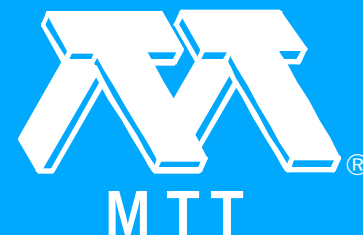
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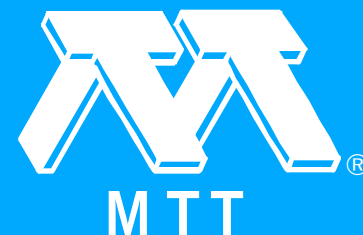
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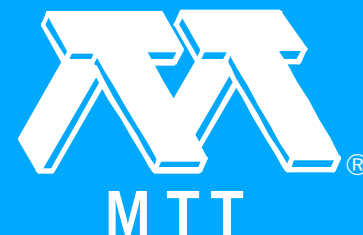
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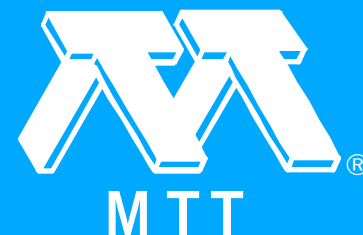
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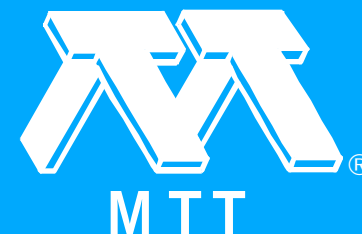
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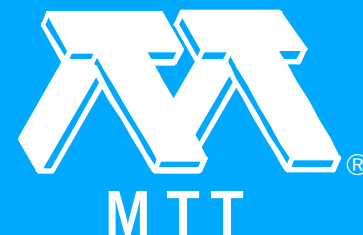
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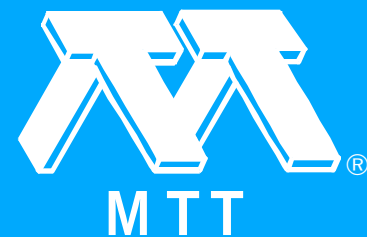
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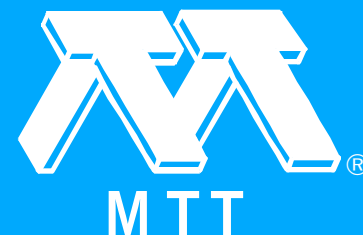
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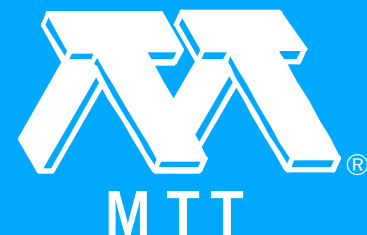
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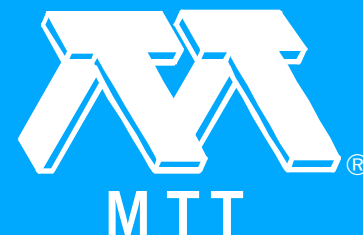
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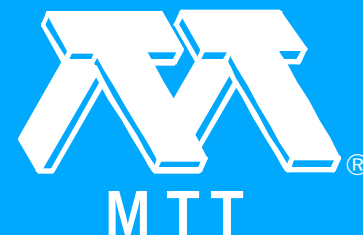
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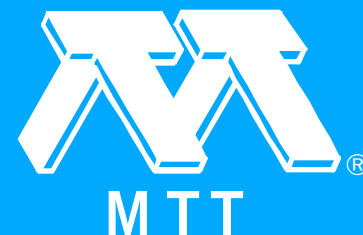
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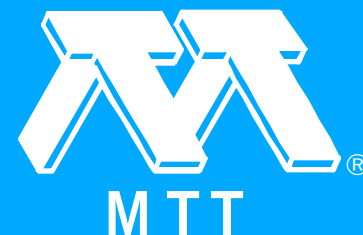
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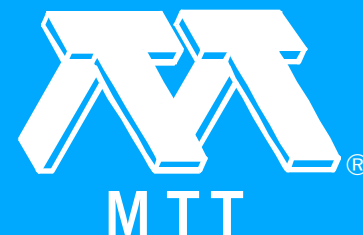
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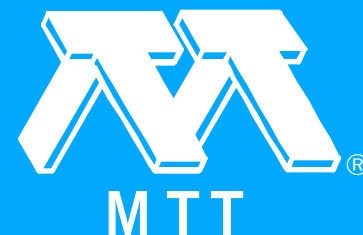
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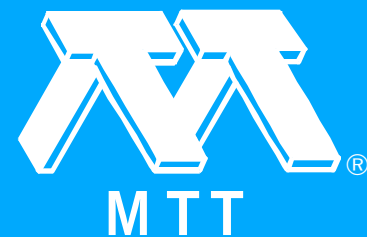
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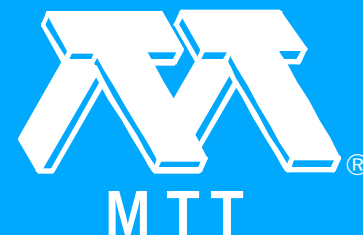
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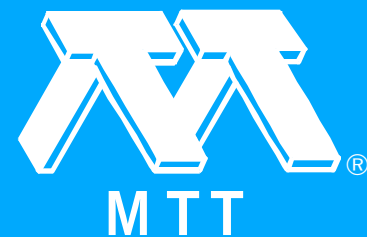
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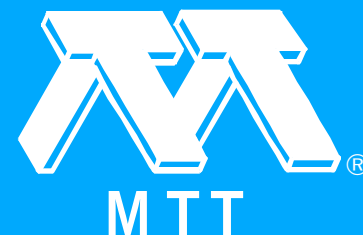
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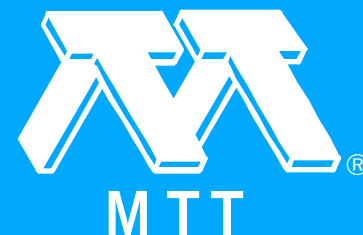
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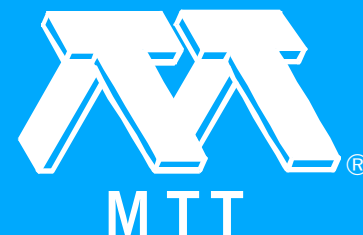
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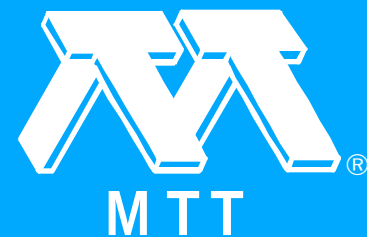
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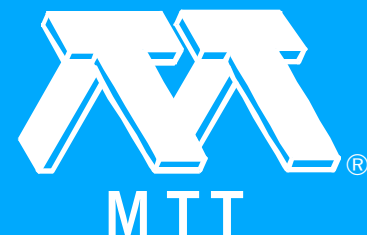
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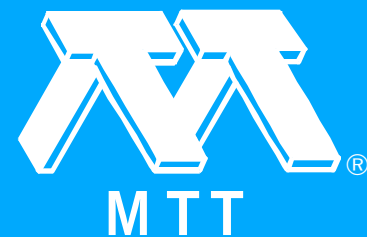
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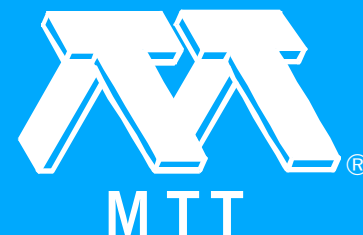
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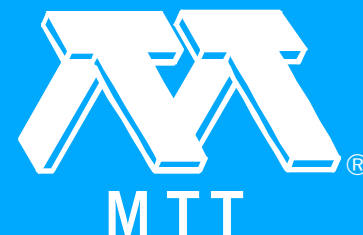
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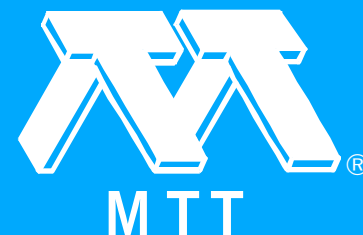
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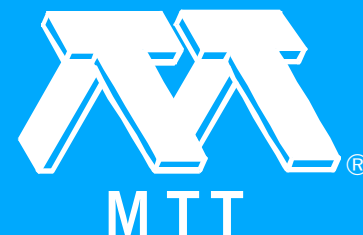
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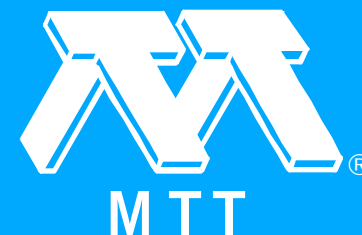
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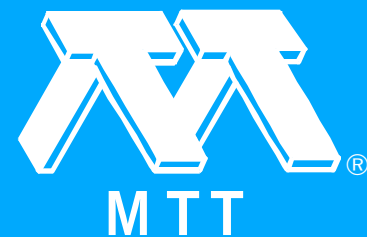
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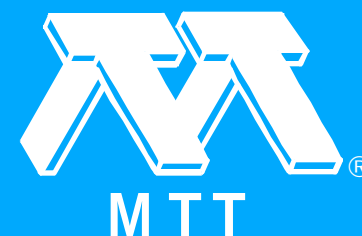
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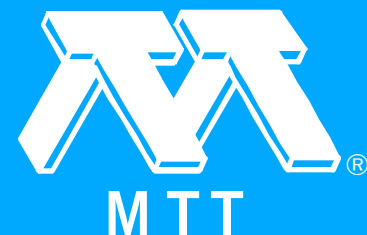
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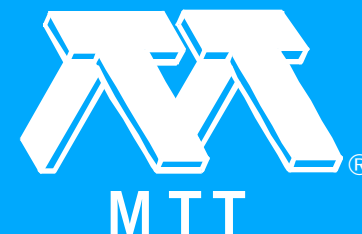
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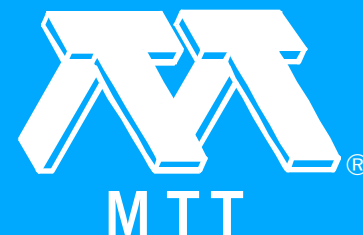
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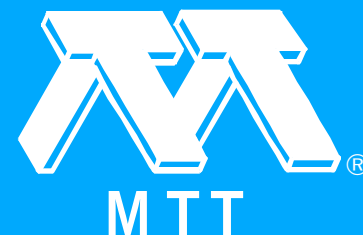
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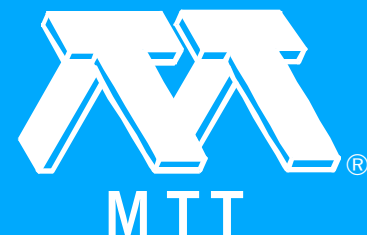
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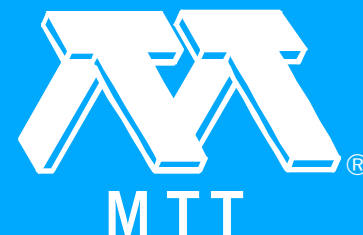
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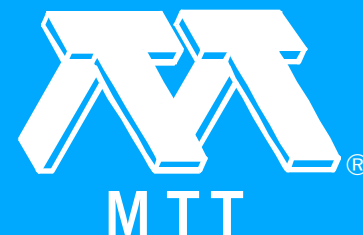
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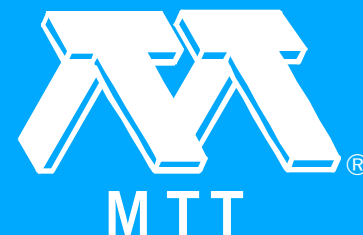
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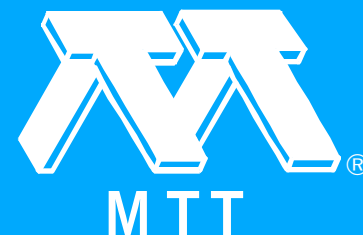
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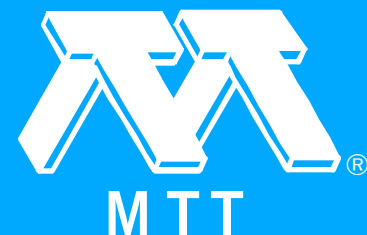
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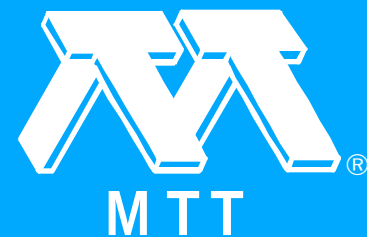
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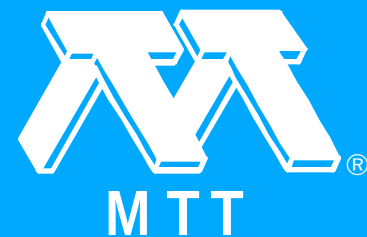
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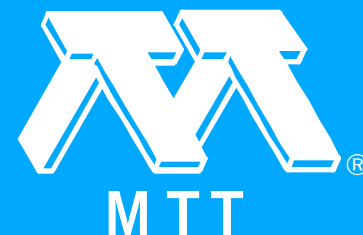
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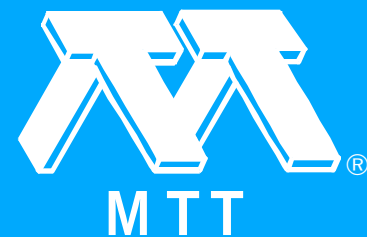
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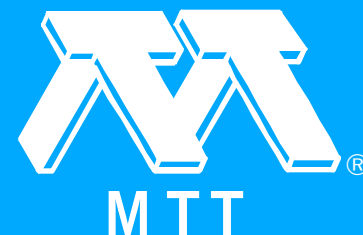
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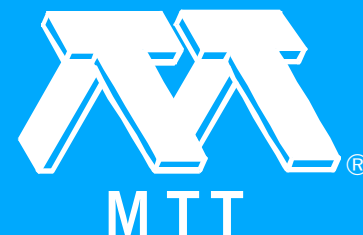
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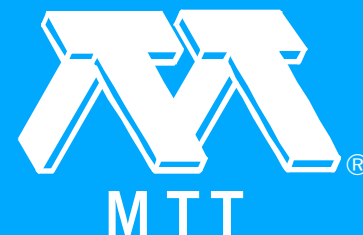
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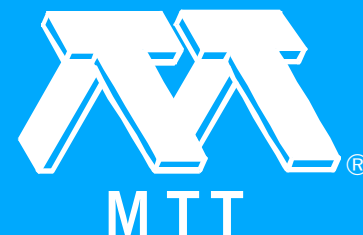
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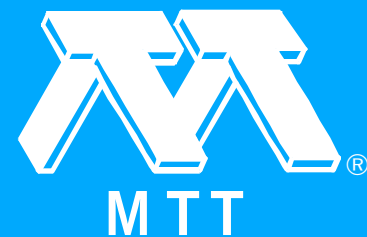
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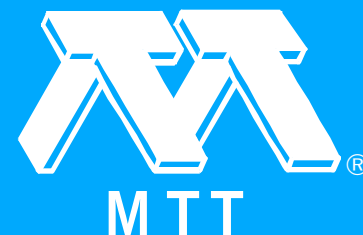
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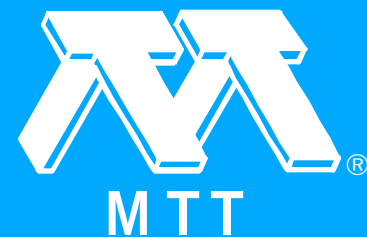
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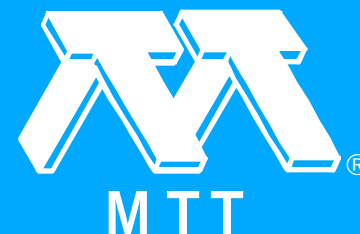
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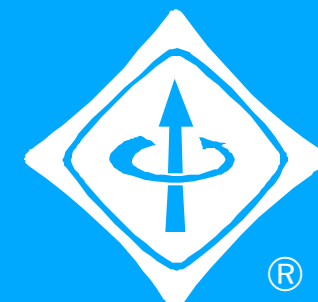
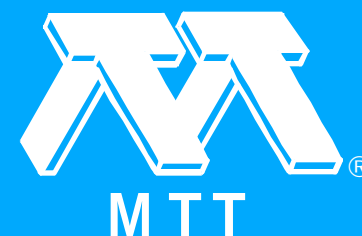
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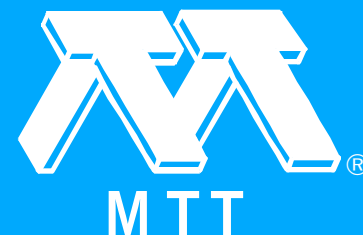
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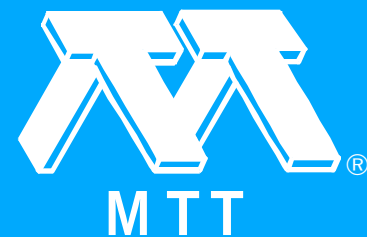
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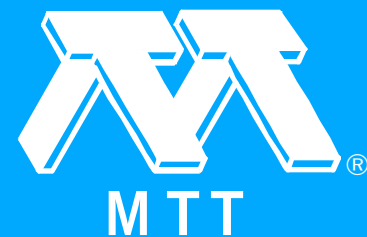
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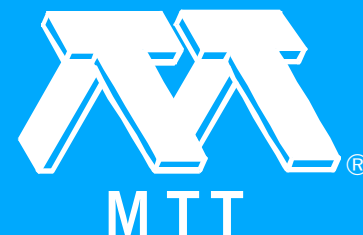
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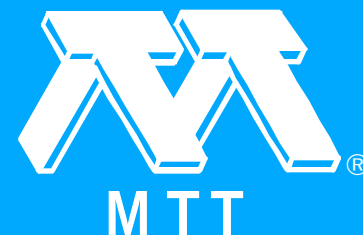
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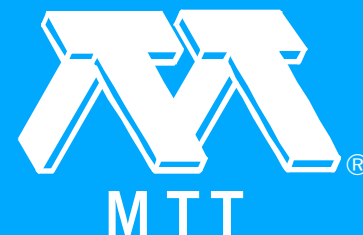
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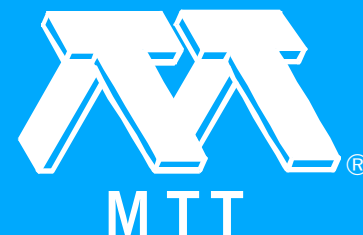
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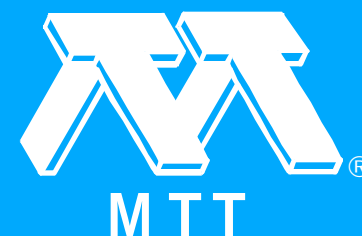
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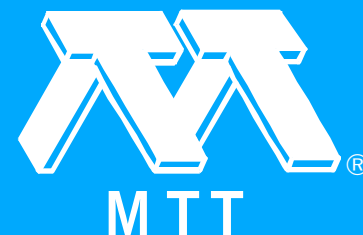
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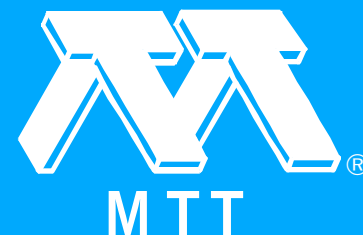
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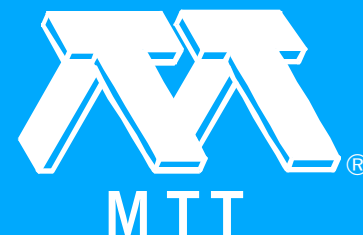
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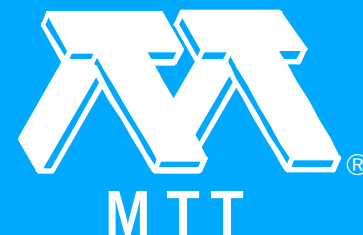
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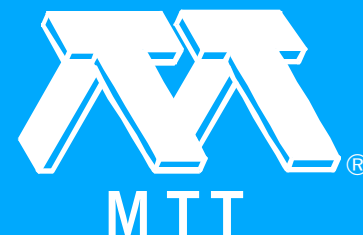
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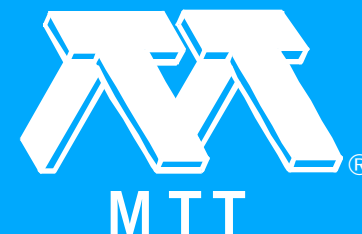
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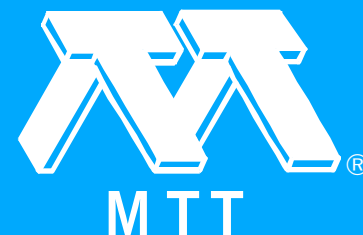
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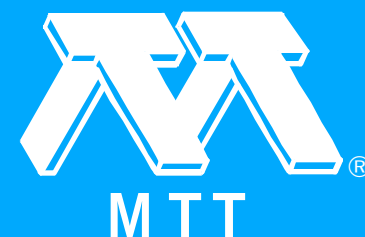


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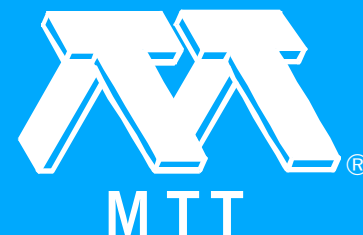
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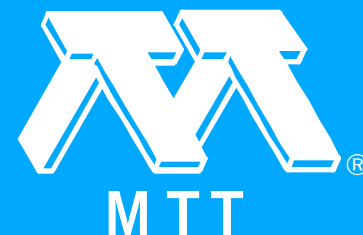
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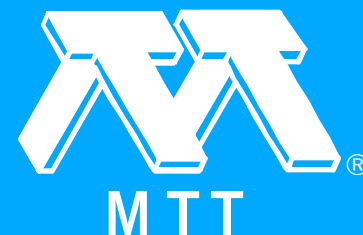
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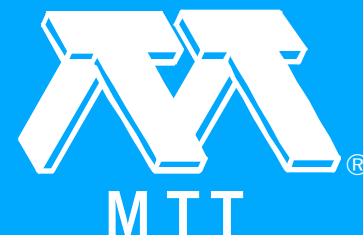
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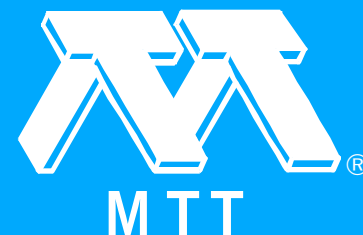
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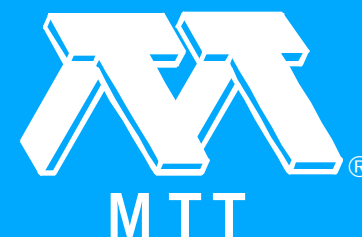
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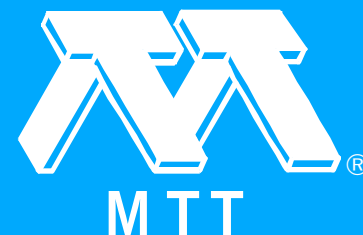
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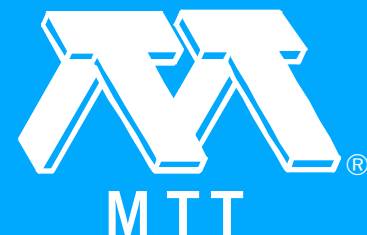
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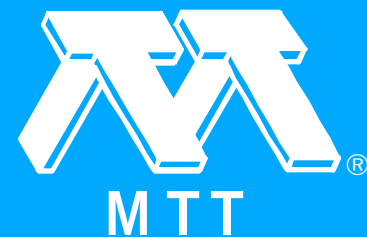
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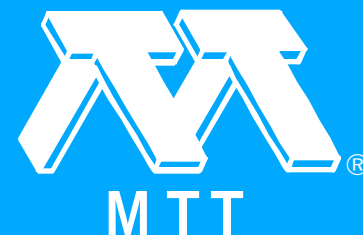
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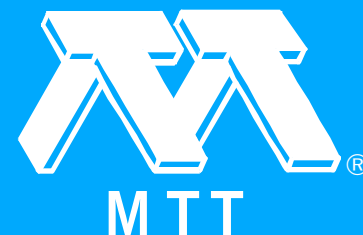
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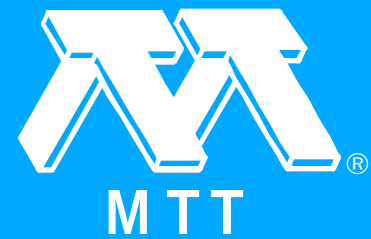
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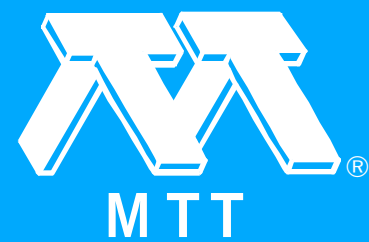
A 15 Element Focal Plane Array for 100 GHz

N.R. Erickson, P.F. Goldsmith, G. Novak, R.M. Grosslein, P.J. Viscuso, R.B. Erickson and C.R. Predmore. "A 15 Element Focal Plane Array for 100 GHz." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 1-11.

A focal plane imaging array receiver is described which covers the 86-115 GHz frequency range for radio astronomical observations. The 3 x 5 element array uses cryogenic Schottky diode mixers with integrated HEMT IF amplifiers. A cold quasioptical filter selects the desired sideband, and terminates the image at 20 K. Polarization interleaving is used to minimize the array size on the sky. LO power is provided by a frequency tripled YIG tuned oscillator. The average receiver noise temperature of the array pixels varies from 250-350 K SSB depending on the frequency. Only three mechanical tuners are used in the system and all functions are under computer control.

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V. Rizzoli, A. Lipparini, A. Costanzo, F. Matri, C. Cecchetti, A. Neri and D. Masotti. "State-of-the-Art Harmonic-Balance Simulation of Forced Nonlinear Microwave Circuits by the Piecewise Technique." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 12-28.

The paper discusses the theoretical foundations and the numerical performance of an advanced nonlinear circuit simulator based on the piecewise harmonic-balance (HB) technique. The program incorporates updated versions of several novel algorithmic concepts developed in the last few years. This results in computational capabilities well ahead of the state of the art of HB techniques as outlined even in recent review work. The exact computation of the Jacobian matrix for Newton-iteration based HB simulation, and the related conversion-matrix technique for fast mixer analysis, are formulated in the most general form available to date. Convergence problems at high drive levels are solved by a parametric formulation of the device models coupled with an advanced norm-reducing iteration. A physics-based approximation allows the HB equations to be effectively decoupled in many practical cases, thus bringing large-size jobs such as pulsed-RF analysis well within the reach of ordinary workstations. The exact Jacobian is used in conjunction with an exact formula for the gradient of the objective function, to implement an efficient broadband nonlinear circuit optimization capability. Finally, a number of examples are presented, in order to give the reader a feeling of the numerical performance that the program can provide at the workstation level.

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An Analysis of the Scalar Helmholtz Equation Using the Integral Equation Method

M. Tsuchimoto, A. Yoneta, T. Honma and K. Miya. "An Analysis of the Scalar Helmholtz Equation Using the Integral Equation Method." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 29-33.

The scalar Helmholtz equations are investigated by using the integral equation method (IEM). In the IEM analysis, the fundamental solution of the Laplace equation is used as a weighting function. Two IEM formulations are obtained one is a standard formulation and the other is obtained from an elimination of the unknown boundary value. The accuracy and computational time of the IEM are compared with those of the finite element method in two dimensional scalar Helmholtz problems. The analysis of a resonant cavity is reduced to a simple eigenvalue problem. Resonant frequencies of the IEM agree well with those of the finite difference method. Usefulness of the IEM is confirmed through the analyses of the scalar Helmholtz equations.

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Computation of Characteristic Impedance for Multiple Microstrip Transmission Lines Using a Vector Finite Element Method

G.W. Slade and K.J. Webb. "Computation of Characteristic Impedance for Multiple Microstrip Transmission Lines Using a Vector Finite Element Method." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 34-40.

The total characteristic impedance is computed from the field solution generated by a vector magnetic field finite element method for several microstrip geometries. By making use of the power orthogonality of the modes, characteristic impedances are computed. Additionally, the existence of negative modal characteristic impedances is verified for certain multiconductor striplines. Circuit parameters which are generated using this new method are verified by results from the spectral domain technique.

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Abstracts

Fast, Accurate and Simple Approximate Analytic Formulas for Calculating the Parameters of Supported Coplanar Waveguides for (M)MIC's

S.S. Bedair and I. Wolff. "Fast, Accurate and Simple Approximate Analytic Formulas for Calculating the Parameters of Supported Coplanar Waveguides for (M)MIC's." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 41-48.

Fast, accurate, and simple approximate analytic formulas are presented for calculating the quasi-static-TEM parameters of supported coplanar waveguide structures (SCPW's). These include, the open, covered as well as dielectric overplayed SCPW's. These formulas have been designed for use in (M)MIC's-CAD programs and are only valid when ever the supporting material is of lower permittivity. Comprehensive comparisons have been made by using a rigorous spectral domain hybrid mode analysis. Accuracy is found to be better than 1 percent for most of the operating range of physical dimensions and available dielectric materials ($\epsilon_r = 1$ to 20). Numerical results are also presented in order to investigate the properties of different SCPW structures.



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Entire-Domain Basis MOM Analysis of Coupled Microstrip Transmission Lines

J.S. Bagby, C.-H. Lee, Y. Yuan and D.P. Nyquist. "Entire-Domain Basis MOM Analysis of Coupled Microstrip Transmission Lines." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 49-57.

A full-wave spectral-domain integral equation formulation is used to analyze coupled open-boundary microstrip transmission lines. A general rigorous formulation is specialized to the case of two identical uniform lines and a method of moments (MOM) solution is implemented. In contrast with earlier subdomain basis MOM solutions, entire-domain basis functions which incorporate appropriate edge conditions for transverse and longitudinal current components are utilized. This allows close-form evaluation of relevant spatial integrals and results in improved accuracy using far fewer terms. Numerical results in the form of propagation constants and current distributions are presented for the dominant and first two higher-order coupled modes, and compare favorably to results of other techniques.

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Leaky Waves on Broadside-Coupled Microstrip

L. Carin and N.K. Das. "Leaky Waves on Broadside-Coupled Microstrip." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 58-66.

Broadside-coupled microstrip with and without conducting side walls are studied using a full-wave spectral-domain analysis. Special attention is directed towards possible leakage to the parallel plate mode and its potential effects in practical integrated circuits. It is asserted that for appropriate geometrical parameters, broadside-coupled microstrip can be leaky at all frequencies. Instructive comparisons between the modes on broadside-coupled microstrip with and without side walls are made by means of dispersion curves and field plots. From the comparison, approaches for reducing the low-frequency leakage are proposed.

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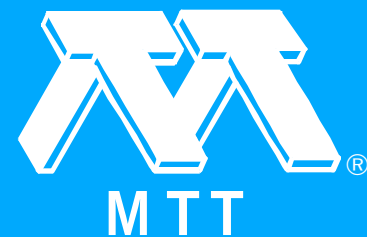


Abstracts

On the Design of Planar Microwave Components Using Multilayer Structures

W. Schwab and W. Menzel. "On the Design of Planar Microwave Components Using Multilayer Structures." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 67-72.

The design of planar microwave components using multilayer configurations with potentially arbitrary numbers of dielectric layers and metallization planes is described. Analysis and design are based on a combination of a spectral domain immittance matrix approach and standard CAD methods. To verify the design procedure, three examples--a microstrip-slot-line-microstrip transition, a stripline band-pass filter, and a microstrip coupler with lines on different sides of a common ground plane--are investigated theoretically and experimentally.



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Characterization of Shielded Coplanar Type Transmission Line Junction Discontinuities Incorporating the Finite Metallization Thickness Effect

C.-W. Kuo and T. Itoh. "Characterization of Shielded Coplanar Type Transmission Line Junction Discontinuities Incorporating the Finite Metallization Thickness Effect." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 73-80.

Frequency-dependent characteristics of shielded junction discontinuities between coplanar type transmission lines, coplanar waveguide (CPW) and finline, are analyzed by the mode-matching technique. Effect of finite metallization thickness is also incorporated in the analysis for the first time. Scattering parameters of finline step discontinuity are compared with existing data to confirm the accuracy of the approach. Numerical results for finline step discontinuity, shielded CPW step discontinuity and CPW-finline transition are presented.

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Broadband Vertical Interconnects Using Slot-Coupled Shielded Microstrip Lines

N.L. VandenBerg and L.P.B. Katehi. "Broadband Vertical Interconnects Using Slot-Coupled Shielded Microstrip Lines." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 81-88.

A full-wave space-domain integral equation analysis of aperture coupled shielded microstrip lines is presented based on the Equivalence Principle. The formulation includes the capability to model multi-layered substrates through the derivation of the associated dyadic Green's functions which represent the layers through impedance boundary conditions. The method of moments is used to solve for the line currents and slot voltage with even and odd mode excitations which are then interpreted through transmission line analysis to determine the two-port scattering parameters. A parametric study together with experimental data is presented which demonstrates the behavior of the coupler and the accuracy of the technique.

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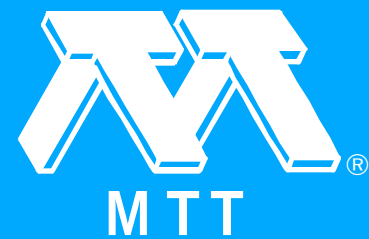
Solution of Dirichlet Problems by the Exodus Method

M.N.O. Sadiku and D.T. Hunt. "Solution of Dirichlet Problems by the Exodus Method." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 89-95.

The paper proposes the application of the Exodus method to Dirichlet problems in rectangular and axisymmetric solution regions. The stochastic technique is illustrated with specific practical applications to the solution of Laplace's equation. Although the method is probabilistic in its approach, it is not subject randomness as other Monte Carlo techniques because it does not involve the use of a pseudo-random generation subroutine. The method provides a more accurate solution in less amount of time compared with the fixed random walk. It is also found that the accuracy of the Exodus method is comparable to that of the finite difference method.

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Broad-Band Microwave Measurement of Water Using Transient Radiation

C.D. Capps, R.A. Falk, S.G. Ferrier and T.R. Majoch. "Broad-Band Microwave Measurement of Water Using Transient Radiation." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 96-101.

Previous workers have demonstrated the utility of optoelectronically pulsed antennas to make broad-band microwave measurements of the dielectric properties of relatively low loss materials. This work presents an extension of the analysis technique that allows measurements to be made on highly absorptive samples. Experimental results for water in the 10-70 GHz frequency range are presented, error sources analyzed, and results compared with measurements made with a different technique.

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Phase-Plane Approach to Nonlinear Propagation in Dielectric Slab Waveguide

T. Rozzi, F. Chiaraluce and L. Zappelli. "Phase-Plane Approach to Nonlinear Propagation in Dielectric Slab Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 102-111.

Considerable interest is currently being devoted to nonlinear propagation in dielectric slab waveguides for integrated optics and millimetric applications. Apart from a few specific analytical cases, much of the current work is numerically based, so that the qualitative features of the solutions are lost. In this contribution, we look at on the problem in the framework of a phase-plane approach, prior to seeking numerical solutions by, say, the Runge-Kutta method. As a result, qualitative aspects, such as "integrals of motion" in phase-plane do emerge from the analysis. Systematic consideration of these quantities narrows the range of possible solutions down whilst providing direct physical interpretation of the same. Particularly suggestive, in this respect, are the interpretations of the appearance of higher order modes and of the energy/boundary conditions constraints typical of the nonlinear problem. The approach is quite general and results will be shown in the TE and TM cases.

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Analysis of Microstrip Resonators of Arbitrary Shape

K.A. Michalski and D. Zheng. "Analysis of Microstrip Resonators of Arbitrary Shape." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 112-119.

A space-domain approach based on a mixed-potential integral equation formulation is developed for efficient computation of complex resonant frequencies of laterally open microstrip-patch resonators of arbitrary shape. The effects of the substrate--which may consist of any number of planar, possibly uniaxially anisotropic, dielectric layers--are rigorously incorporated in the formulation by means of the vector and scalar potential Green's functions. The current distribution on the conducting patch is approximated in terms of vector basis functions defined over triangular elements. Computed resonant frequencies, quality factors, modal currents, and far-field radiation patterns are presented for several microstrip resonators. For patches of simple, regular shapes, the results are in agreement with published data obtained by specialized techniques, which--unlike the method presented here--are not easily extendable to arbitrary shapes.

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Analysis and Realization of L-Band Dielectric Resonator Microwave Filters

V. Madrangeas, M. Aubourg, P. Guillon, S. Vigneron and B. Theron. "Analysis and Realization of L-Band Dielectric Resonator Microwave Filters." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 120-127.

The development of space communications necessitates that microwave devices used in satellite systems have good temperature and vibration characteristics, low weight and size. High power L-band dielectric resonator (DR) microwave filters which can solve these problems have been developed and are reported herein. The electromagnetic and electrical parameters of different microwave dielectric resonator structures have been computed by means of the two dimensional and three dimensional finite element method (FEM), which can be applied both for free and forced oscillation systems. In this paper, we propose, design and evaluate the response of a new type of filter using rectangular dielectric resonators excited in their TM/sub 110/ mode.

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On the Dyadic Green's Function for a Planar Multilayered Dielectric/Magnetic Media

S. Barkeshli and P.H. Pathak. "On the Dyadic Green's Function for a Planar Multilayered Dielectric/Magnetic Media." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 128-142.

A complete plane wave spectral eigenfunction expansion of the electric dyadic Green's function for a planar multilayered dielectric/magnetic media is given in terms of a pair of the ($\hat{z}$)-propagating solenoidal eigenfunctions, where ($\hat{z}$) is normal to the interface, and it is developed via a utilization of the Lorentz reciprocity theorem. This expansion also contains an explicit dyadic delta function term which is required for completeness at the source point. Some useful concepts such as the effective plane wave reflection and transmission coefficients are employed in the present spectral domain eigenfunction expansion. The salient features of this Green's function are also described along with a physical interpretation.

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Theoretical and Experimental Study of Measurement of Microwave Permittivity Using Open Ended Elliptical Coaxial Probes

Y. Xu, F.M. Ghannouchi and R.G. Bosisio. "Theoretical and Experimental Study of Measurement of Microwave Permittivity Using Open Ended Elliptical Coaxial Probes." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 143-150.

In this paper, a new kind of coaxial probe for measurement of microwave permittivity--open-ended elliptical aperture--is studied from theoretical and experimental view points. Calculated results are discussed and compared with experimental values. Wideband measurements of the dielectric constants of fluids are performed by rising this kind of needle type probe. Both theory and experiment show that open-ended elliptical coaxial probes can be successfully used in wideband dielectric constant measurements with the advantage of increased sensitivity, especially at low frequencies. Moreover, this kind of probe can easily be fitted into gels and living tissues: these features are very important in biological applications both for measurements and microwave radiation treatment.

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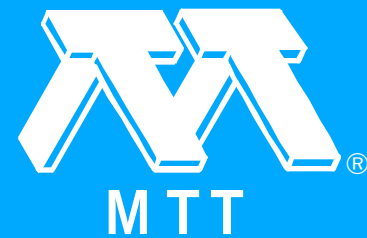


Abstracts

Observations on Resonant Cavity Perturbation by Dielectric Objects (Short Papers)

A.W. Kraszewski and S.O. Nelson. "Observations on Resonant Cavity Perturbation by Dielectric Objects (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 151-155.

Microwave resonators can be used as sensors for sorting dielectric objects. Differences in volume or mass can be distinguished among objects of irregular shape but of uniform dielectric properties. Moisture content, or other permittivity-dependent qualities can also be distinguished independent of mass or volume when objects are of uniform shape. Fundamental principles of the shape-independent and size-independent measurements are discussed, and experimental results are presented.



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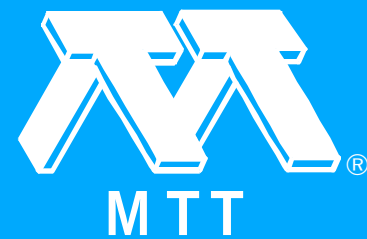


Abstracts

Efficient Computation of High-Frequency Two-Dimensional Effects in Multiconductor Printed Interconnects (Short Papers)

L. Carin. "Efficient Computation of High-Frequency Two-Dimensional Effects in Multiconductor Printed Interconnects (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 155-158.

The spectral domain technique with a Galerkin moment method solution is used to study high-frequency, two-dimensional effects such as dispersion and leakage in multiconductor printed interconnects. A simple asymptotic procedure is used to significantly improve the convergence of oscillatory spectral integrals involving distant expansion and testing functions. Examples are given for leaky waves on two multiconductor printed transmission line geometries.



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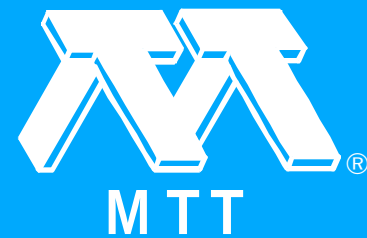


Abstracts

The Behavior of the Electromagnetic Field at Edges of Media with Finite Conductivity (Short Papers)

J. Geisel, K.-H. Muth and W. Heinrich. "The Behavior of the Electromagnetic Field at Edges of Media with Finite Conductivity (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 158-161.

The principal behavior of both electric and magnetic fields at the edges of media with finite conductivity is investigated. We find that, as in the case of ideal conductors, the normal electric field shows a singularity at the edge. The magnetic field components, however, remain bounded if the permeabilities of the neighboring media do not differ. Detailed results on typical geometries are given.



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Experimental Wide-Stopband Filters Utilizing Asymmetric Ferrite Junctions (Short Papers)

H. How, Y. Liu, S. Zhang, C. Vittoria, C. Carosella and V. Folen. "Experimental Wide-Stopband Filters Utilizing Asymmetric Ferrite Junctions (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 161-164.

Filters incorporating asymmetric stripline Y-junction circulators have been fabricated and tested over the frequency range of 0.05 to 18 GHz. The passband frequency was near 2 GHz. The insertion loss was ~2 dB and the stopband extended from 4.5 to 18 GHz with transmission ≤ -30 dB. The filter includes ferrite discs in which high order modes have been eliminated as calculated in an earlier paper.

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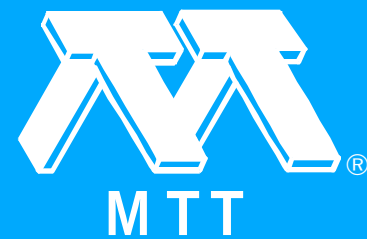


Abstracts

Some Observations on the Design and Performance of Distributed Amplifiers (Short Papers)

J.L.B. Walker. "Some Observations on the Design and Performance of Distributed Amplifiers (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 164-168.

This paper presents closed-form analytic expressions for the voltage and power distribution along the drain line of an ideal distributed amplifier.



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A Convergence Acceleration Procedure for Computing Slowly Converging Series (Short Papers)

S. Singh and R. Singh. "A Convergence Acceleration Procedure for Computing Slowly Converging Series (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 168-171.

The application of sloped theta-algorithm to the partial sums of a slowly converging series is shown to accelerate its convergence. The algorithm is applied to accelerate the convergence of series representing the free-space periodic Green's functions involving the zeroth-order Hankel function of the second kind, and its associated Fourier transform. Numerical results indicate that the algorithm converges faster than the Shanks' transform. It is also able to sum the series to machine precision in about 20 terms. A relative error measure is shown as a function of the number of terms of various combinations of source and observation points. The relative saving in computation time is also provided to show the benefit of using the algorithm.



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Abstracts

On the Use of Chebyshev-Toeplitz Algorithm in Accelerating the Numerical Convergence of Infinite Series (Short Papers)

S. Singh and R. Singh. "On the Use of Chebyshev-Toeplitz Algorithm in Accelerating the Numerical Convergence of Infinite Series (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 171-173.

It is shown here that a simple application of the Chebyshev-Toeplitz algorithm enhances the rate of convergence of slowly converging series. The algorithm is applied to series representing the periodic Green's functions involving a single infinite summation. The algorithm yields highly accurate results within relatively fewer terms. A quantitative comparison is shown with methods previously reported in the literature.



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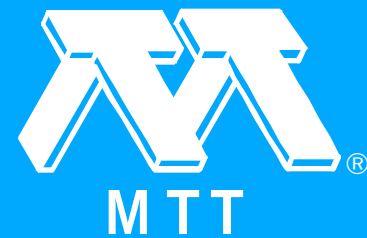


Abstracts

The Inverse Problem for Biaxial Materials (Corrections)

P.L.E. Uslenghi. "The Inverse Problem for Biaxial Materials (Corrections)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 174-174.

In the expression for $H_{\text{sub } x}$ of (15) in the above paper, the ratio μ_1/μ_3 must be replaced with μ_3/μ_1 . Consequently all derivations in the paper remain valid with the corrections indicated below.



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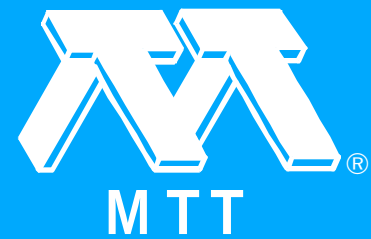


Abstracts

E-Plane Steps in Rectangular Waveguide (Corrections)

T. Rozzi and M. Mongiardo. "E-Plane Steps in Rectangular Waveguide (Corrections)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 174-174.

The above paper contains one error. Equation (1) should read as follows:



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Modes of Elliptical Waveguides: A Correction (Comments)

J.B. Davies. "Modes of Elliptical Waveguides: A Correction (Comments)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 174-174.

The object of this note is not to make any correction to the above paper, but rather to point out the existence of earlier, related work. Different errors in the Chu paper were reported 20 years ago in these same Transactions and this was soon followed by a paper which gave a routine and accurate scheme for the modal analysis of elliptical waveguide.

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Abstracts

Modes of Elliptical Waveguides: A Correction (Further Comments and Reply)

J.C. Wiltse, T.H. Gfroerer, D.A. Goldberg, L.J. Laslett and R.A. Rimmer. "Modes of Elliptical Waveguides: A Correction (Further Comments and Reply)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 175-175.

In the above paper, the authors discuss the TM/sub 01/ mode in elliptical waveguides and describe an error in the field configurations plotted in the early article by Chu and repeated in the book by Marcuvitz. The authors comment "that the error had apparently gone undetected for some five decades." This is not correct, and in fact, this and other errors in the Chu article have been discussed by numerous authors over a period of many years.



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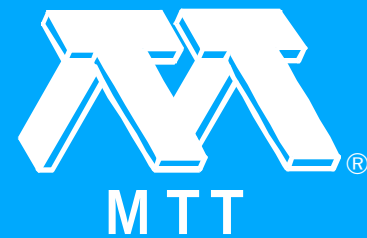


Abstracts

Full-Wave Analysis of Discontinuities in Planar Waveguides by the Method of Lines Using a Source Approach (Comments and Reply)

L. Chen and S.B. Worm. "Full-Wave Analysis of Discontinuities in Planar Waveguides by the Method of Lines Using a Source Approach (Comments and Reply)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 176-177.

I think there are some mistakes in the above paper. The method presented in that article is unavailable. Because (2) in the article should be:



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Abstracts

An Analytic Algorithm for Unbalanced Stripline Impedance (Comments and Reply)

R.E. Canright, Jr. and P. Robrish. "An Analytic Algorithm for Unbalanced Stripline Impedance (Comments and Reply)." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]).

This letter corroborates the results of recent research, promotes an alternative technique for calculating the impedance of unbalanced stripline, and highlights some older references that are often overlooked.



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Call for Papers - Electrical Performance of Electronic Packaging (Jan. 1992 [T-MTT])

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Call for Papers - 35th Midwest Symposium on Circuits and Systems (Jan. 1992 [T-MTT])

*"Call for Papers - 35th Midwest Symposium on Circuits and Systems (Jan. 1992 [T-MTT])."
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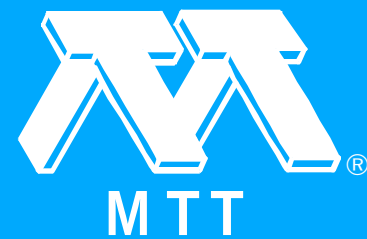
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Abstracts

Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Jan. 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Jan. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.1 (Jan. 1992 [T-MTT]): 182-182.



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Abstracts

Design and Performance of Wideband GaAs MMIC's for High-Speed Optical Communication Systems

Y. Imai, E. Sano and K. Asai. "Design and Performance of Wideband GaAs MMIC's for High-Speed Optical Communication Systems." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 185-190.

Advanced design techniques for GaAs wideband direct-coupled amplifiers are described. The amplifier achieved a 20-dB gain with a 3-dB bandwidth of 13 GHz and 5-7-dB noise figure. An equalizing amplifier module consisting of amplifier and variable attenuator MMIC's exhibited a high gain of 43 dB over a 10-GHz band with a controllable gain of 20-43 dB.



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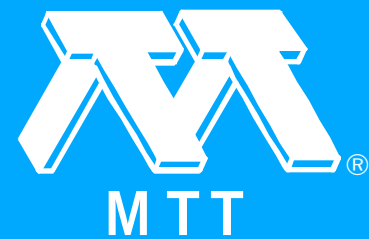


A K-Band Oscillator Locked to the First Water Resonance

A.N. Leontakianakos. "A K-Band Oscillator Locked to the First Water Resonance." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 191-195.

Locking a microwave oscillator to a rotational spectral line has the unique advantage that the frequency of oscillation is defined by the spectral line of the polar molecule involved and is thus immune to any drift caused by extraneous effects. In instruments and communication systems involving microwave sources, varying degrees of frequency stabilization are required. Frequency stabilization using the absorption line of a polar gas as the frequency reference standard obviates the need for external frequency reference sources. It thus provides a low cost alternative to phase locking the oscillator to a stable source. A Gunn diode oscillator has been locked to the rotational absorption line of water at 22 235.170 MHz. The water in vapor form was obtained from atmospheric air. The air was held in a vacuum chamber which was inserted in a Fabry-Perot open semiconfocal resonator. A sinusoidal electric field, the Stark field, was impressed upon the gas in the cavity which is coupled to the Gunn oscillator, thus modulating the water vapor absorption of microwave energy. The second harmonic of the Stark field was used to lock the Gunn oscillator. Working with the water spectral line (16/sub 16/-5/sub 23/) at 22 235 GHz, frequency stability of the order of ± 50 KHz was achieved.





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Composite Microbolometers with Tellurium Detector Elements

S.M. Wentworth and D.P. Neikirk. "Composite Microbolometers with Tellurium Detector Elements." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 196-201.

A composite microbolometer has been constructed for possible use as a broad band submillimeter radiation detector. Theory, fabrication, and measurement of these devices are discussed, and a finite element thermal model is introduced. Our devices utilize nichrome load elements which can be impedance-matched to a planar antenna. The load elements are thermally coupled to tellurium detectors. We achieved room temperature responsivities of 120 V/W, and noise equivalent powers (NEP) as low as 6.7×10^{-9} W/sqrt(Hz). Performance appears to be limited by 1/f noise in the Te detector.

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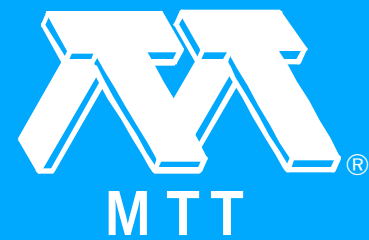


Abstracts

Analytical Modeling and Design Criteria for Traveling-Wave FET Amplifiers

S. D'Agostino, G. D'Inzeo and L. Tadini. "Analytical Modeling and Design Criteria for Traveling-Wave FET Amplifiers." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 202-208.

This paper describes the theoretical modeling and design of a traveling-wave FET. The device shows the capability of wide-bandwidth performance, high gain, and could be useful in power applications. The proposed analytical model considers the full modal effects of the three-coupled transmission lines and an accurate analysis of the FET model in the traveling-wave amplifier. Starting from electrode dimensions and active zone doping, such a model allows one to calculate the scattering parameters. Thus, it is possible to analyze the device as a six port network in a circuit analysis program.



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Fully Automated On-Wafer Noise Characterization of Gaas MESFET's and HEMT's

J.W. Archer and R.A. Batchelor. "Fully Automated On-Wafer Noise Characterization of Gaas MESFET's and HEMT's." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 209-216.

A technique is described which enables the rapid determination of all four noise parameters of a MESFET or HEMT at wafer level. The fully automated procedure, which has been implemented in the 2-18 GHz range, uses 16 accurately measured, very repeatable source impedance standards. The standards have been selected for optimum coverage of the input impedance plane to result in stable and rapidly convergent least-squares solutions for the minimum noise figure, optimum source impedance and noise resistance of practical devices. The resultant system is very stable and produces accurate noise parameters for a wide range of devices.

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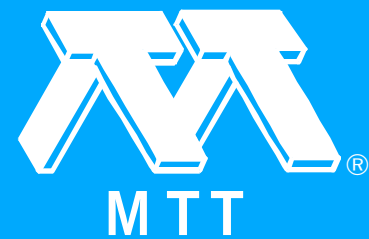
Efficient Spectral Domain Analysis of Generalized Multistrip Lines in Stratified Media Including Thin, Anisotropic, and Lossy Substrates

G. Cano, F. Medina and M. Horno. "Efficient Spectral Domain Analysis of Generalized Multistrip Lines in Stratified Media Including Thin, Anisotropic, and Lossy Substrates." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 217-227.

This paper deals with the full-wave analysis of multiconductor microstrip lines used in electrooptic modulators (EOM), MMIC or high speed VLSI applications. An arbitrary number of coupled coplanar strips are embedded in a stratified medium involving iso/anisotropic dielectric and/or semiconductor layers. The numerical aspects of the computation of the propagation constants using the spectral domain analysis (SDA) are stressed. An efficient scheme is used to accurately compute attenuation and propagation constants and current distributions with reasonable CPU times. Convergence problems due to the existence of very thin layers adjacent to the metallized interface has been explicitly considered. An algorithm to compute the modal characteristic impedances is provided regardless of the number and nature of substrate layers. A reciprocity related definition of modal impedances is used in this paper. The use of this definition ensures the symmetry of the multiport scattering matrix associated to the structure.

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Conical Cavity for Surface Resistance Measurements of High Temperature Superconductors

B. Mayer, A. Reccius and R. Knochel. "Conical Cavity for Surface Resistance Measurements of High Temperature Superconductors." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 228-236.

A new conically-shaped cavity is presented which intrinsically avoids mode-degeneration while maintaining the advantages of cylindrical resonators. The cavity is applied to surface resistance measurements of YBaCuO thin films on MgO substrates at 18 GHz. The lowest measured value was $4.5 \text{ m}\Omega \pm 2.1 \text{ m}\Omega$ for a 10 mm x 10 mm laser ablated film at 77 K. An error analysis is carried out which leads to an accuracy of $\pm 2.1 \text{ m}\Omega$ for samples with 9 mm diameter and an accuracy of $\pm 0.5 \text{ m}\Omega$ for samples with 20 mm diameter.

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Indirect Boundary Element Method Applied to Generalized Microstripline Analysis with Applications to Side-Proximity Effect in MMIC's

K. Li and Y. Fujii. "Indirect Boundary Element Method Applied to Generalized Microstripline Analysis with Applications to Side-Proximity Effect in MMIC's." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 237-244.

A novel analysis of the electrical properties of the microstrip-like structures with generalized configuration by means of the indirect boundary element method (BEM) is proposed. In this method, the basic boundary-integral equation is derived by choosing an appropriate fundamental solution and the numerical calculation is done by considering the root-singularity of boundary distribution on the strip conductor. As an application, the proximity effects in MMIC's are calculated. By curve-fitting, the numerical results are expressed in a polynomial suitable for CAD of MMIC's.

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A Planar-Lumped Model for Coupled Microstrip Lines and Discontinuities

A. Sabban and K.C. Gupta. "A Planar-Lumped Model for Coupled Microstrip Lines and Discontinuities." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 245-252.

This paper presents a convenient model for analyzing coupled microstrip line discontinuities. Similar to the planar waveguide model for single microstrip lines, a planar-lumped model is developed for coupled microstrip lines. Fields underneath the two strips and those fringing at the outer edge are modeled by two equivalent planar waveguides. Electric and magnetic field coupling in the gap region is modeled by a lumped network. The lumped network parameters are evaluated such that $[C]$ and $[L]$ matrices for the model are identical with those for coupled lines. The model is verified by comparing coupler characteristics with those obtained by the conventional coupled line analysis. Just as the planar model of a single microstrip has been used for characterizing microstrip discontinuities, the planar-lumped model developed here is used for coupled line discontinuities. Examples given here include a coupled microstrip section with chamfered right-angled bends to single microstrip lines, for which the results are in good agreement with experimental values.

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Analysis and Design of Lumped- and Lumped-Distributed-Element Directional Couplers for MIC and MMIC Applications

R.W. Vogel. "Analysis and Design of Lumped- and Lumped-Distributed-Element Directional Couplers for MIC and MMIC Applications." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 253-262.

An analysis of lumped- and lumped-distributed-element directional couplers is described. The assumed generality of the ring type four-port enables different types of directionality to be developed. The equations enabling an idealized design of co-, contra- and trans-directional couplers for arbitrary power division and transformation ratio are derived. A design procedure for three-branch, lumped-element directional couplers, which enables an impedance transformation between the input and output, ports is also included. Computer simulations of the performance of various couplers with lumped elements represented by realistic models are included in the paper.



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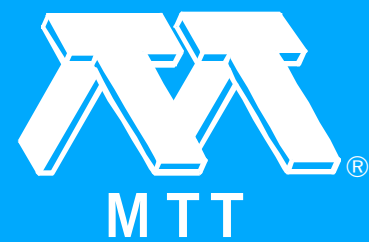
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Inductance and Resistance Computations for Three-Dimensional Multiconductor Interconnection Structures

R.-B. Wu, C.-N. Kuo and K.K. Chang. "Inductance and Resistance Computations for Three-Dimensional Multiconductor Interconnection Structures." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 263-271.

A computer-aided analysis system has been established to calculate the equivalent inductance and resistance matrices for three-dimensional multiconductor interconnection structures. Based on the theory of partial element equivalent circuit, the interconnection structures are first decomposed into many straight segments which are of circular or rectangular cross sections but can be in arbitrary orientation. The resistances and partial inductances between all these segments are calculated using analytical integration and quadrature formulae. They are finally assembled into the desired equivalent impedance matrix by general network theory. Illustrative examples include the analysis for nonuniformly coupled transmission lines and the calculation for skin-effect impedances of transmission lines and three-dimensional structures. The numerical results are in good agreement with the measurement data and the available results in the literature.

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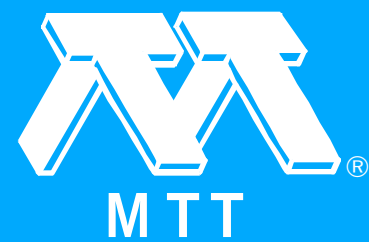
Analysis and Applications of "Microstrip-Loaded Inset Dielectric Waveguide" (Mig)

T. Rozzi, A. Morini and G. Gerini. "Analysis and Applications of "Microstrip-Loaded Inset Dielectric Waveguide" (Mig)." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 272-278.

We investigate analytically and experimentally the properties of mig (microstrip inset guide), highlighting its features with respect to microstrip and its applications to antenna circuitry. The method used in the analysis is the transverse resonance diffraction (TRD) method in the space domain. We discuss dispersion of the first three modes, field distribution, characteristic impedance and losses of the fundamental mode. Finally, we report the experimental antenna characteristics of an array of longitudinal strips, designed as a cascade of mig sections alternate to idg (inset dielectric guide) sections, showing good gain input match and pure polarization.

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Analysis of Dispersion and Series Gap Discontinuity in Shielded Suspended Striplines with Substrate Mounting Grooves

L.-K. Wu and H.-M. Chang. "Analysis of Dispersion and Series Gap Discontinuity in Shielded Suspended Striplines with Substrate Mounting Grooves." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 279-284.

Dispersion and series gap discontinuity of shielded suspended striplines (SSL's) on Duroid substrate ($\epsilon_r = 2.22$) are analyzed using the finite-difference time-domain method (FD-TD). Numerical accuracy of better than 0.15% is achieved when the FD-TD is used to calculate the effective dielectric constant (ϵ_{reff}) of an air-filled rectangular coaxial transmission line. Data obtained for the frequency-dependent ϵ_{reff} of uniform SSL's, and both scattering and equivalent circuit parameters of various series gap discontinuities, are then presented. In general, presence of sidewall mounting grooves causes a nearly frequency-independent small reduction in ϵ_{reff} . On the other hand, proximity effects of the housing are found to be more important. It is demonstrated that: 1) for a given housing, ϵ_{reff} decreases first with an increase in strip width before increasing again when strip is wider enough to interact strongly with the sidewalls and 2) reducing sidewall spacing causes an increase in ϵ_{reff} . For the gap discontinuity, coupling across the gap is stronger for wider strips and/or narrower gap width. Irregular transmission behavior is also found when strip is wide enough to interact strongly with the sidewalls.





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Computation of TM and TE Modes in Waveguides Based on a Surface Integral Formulation

M. Swaminathan, T.K. Sarkar and A.T. Adams. "Computation of TM and TE Modes in Waveguides Based on a Surface Integral Formulation." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 285-297.

The surface integral formulation has been used here for the computation of TM and TE modes propagating in dielectric loaded waveguides. This formulation makes use of the surface equivalence principle whereby the field at any point internal or external to the waveguide can be expressed in terms of equivalent surface currents. This procedure reduces the original problem into a set of integro-differential equations which is then reduced to a matrix equation using method of moments. The solution of this matrix equation provides the propagation characteristics of the waveguide and the equivalent surface currents existing on the waveguide walls. The equivalent surface currents can be used to compute the fields at all points, both inside and outside the waveguide. The surface integral method has been used to compute the propagation characteristics of waves propagating in dielectric loaded wave-guides. The computed results agree very well with analytical and published data. However, the use of the surface integral method on dielectric loaded waveguides sometimes leads to the existence of spurious modes. A method has been illustrated which can be used to remove these spurious modes.

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Study of a Fabry-Perot Cavity in the Microwave Frequency Range by the Boundary Element Method

H. Cam, S. Toutain, P. Gelin and G. Landrac. "Study of a Fabry-Perot Cavity in the Microwave Frequency Range by the Boundary Element Method." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 298-304.

In order to describe very closely the operation of a quasi-optical multidiode oscillator using a Fabry-Perot cavity, each component must be modeled. This paper presents the description of such a cavity by the Boundary Element Method (BEM). The difficulties of adapting classical models to this practical case are discussed in the first part of the paper and justify the use of a more complete and flexible method such as the three dimensional Boundary Element Method. Two levels of approach are succinctly described in the second part. The first one, which has been called zero order, is quite classical. The second one is the most original part of the study and has been called the Second Order Approach. The evolution of the computed results as a function of the number and the distribution of the meshes is given in the last part. They are compared to analytical results and measurements.

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Permittivity Measurements Using Open-Ended Sensors and Reference Liquid Calibration an Uncertainty Analysis

A. Nyshadham, C.L. Sibbald and S.S. Stuchly. "Permittivity Measurements Using Open-Ended Sensors and Reference Liquid Calibration an Uncertainty Analysis." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 305-314.

Results of the uncertainty analysis of the error-corrected permittivity measurements of materials using open-ended sensors are reported. Uncertainties in the permittivities of the reference liquids due to the uncertainties in the Cole-Cole parameters are discussed. The effect of the selection of these parameters of reference liquids, when used as calibration standards for error-corrected permittivity measurements, is highlighted. Measurements are performed on 15 and 30 ppt saline and the results are presented along with the measurement uncertainties resulting from uncertainties in Cole-Cole parameters of the reference liquids.

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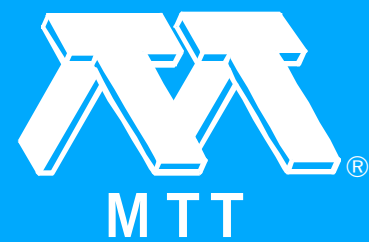
Tomographic Microwave Diversity Image Reconstruction Employing Unitary Compression

Z. Zhao and N.H. Farhat. "Tomographic Microwave Diversity Image Reconstruction Employing Unitary Compression." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 315-322.

Data compression through a unitary transform is utilized in tomographic microwave diversity image reconstruction in order to reduce the dimensionality and to extract the features in the data space. The unitary compression is derived by minimizing the mean-square error (MSE) and the unitary transform is made of eigenvectors of the data's covariance, regarded to be a Karhunen-Loeve transform. Tomographic microwave frequency-swept imaging was developed using a unique target-derived reference technique to access the three dimensional Fourier space of the scatterer and an image reconstruction algorithm based on the projection slice theorem. It is shown that: centimeter resolution of a complex object can be preserved even when half of the data set is compressed; and that the reconstructed image remains identifiable by a human observer even when 2/3 of the data set is compressed.

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Broadband Electronically Tunable Planar Active Radiating Elements and Spatial Power Combiners Using Notch Antennas

J.A. Navarro, Y.-H. Shu and K. Chang. "Broadband Electronically Tunable Planar Active Radiating Elements and Spatial Power Combiners Using Notch Antennas." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 323-328.

A Gunn device has been integrated with two types of active planar notch antennas. The first type uses a coplanar waveguide (CPW) resonator and a stepped-notch antenna with bias tuning to achieve a bandwidth of 275 MHz centered at 9.33 GHz with a power output of 14.2 ± 1.5 dBm. The second type uses a CPW resonator with a varactor for frequency tuning to achieve a bandwidth of over 1.3 GHz centered at 9.6 GHz with a power output of 14.5 ± 0.8 dBm. This is equivalent to over 14% electronic tuning bandwidth. Both configurations exhibit a very clean and stable output signal. A theoretical circuit model was developed to facilitate the design. The model agrees well with experimental results. Injection-locking experiments on the second configuration show a locking gain of 30 dB with a locking bandwidth of 30 MHz at 10.2 GHz. Power combining experiments of two varactor-tuned CPW active notch antenna elements in a broadside configuration have achieved well over 70% combining efficiency throughout the wide tuning range. The circuits have advantages of small size, low cost, and excellent performance.

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Unified Analytical Expressions for Calculating Resonant Frequencies, Transimpedances, and Equivalent Input Noise Current Densities of Tuned Optical Receiver Front Ends

Q.Z. Liu. "Unified Analytical Expressions for Calculating Resonant Frequencies, Transimpedances, and Equivalent Input Noise Current Densities of Tuned Optical Receiver Front Ends." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 329-337.

Unified analytical expressions have been derived for calculating the resonant frequencies, transimpedances and equivalent input noise current densities of the four most widely used tuned optical receiver front ends built with FET's and p-i-n diodes. A more accurate FET model has been used to improve the accuracy of the analysis. The Miller's capacitance has been taken into account, and its impact on the performances of the tuned front ends has been demonstrated. The accuracy of the expressions has been verified by Touchstone simulations. The agreement between the calculated and simulated performances of the front ends is very good. The expressions can be used to investigate the performances of different tuned front ends in a very simple way and provide a good starting point for further computer optimization of the front ends.





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Coupling Efficiency of Butt-Joined Isotropic and Anisotropic Single-Mode Slab Waveguides

S. Sawa, M. Geshiro, M. Hotta and H. Kanetake. "Coupling Efficiency of Butt-Joined Isotropic and Anisotropic Single-Mode Slab Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 338-345.

Studied is the effect of axial displacement and angular misalignment on power-coupling efficiency of a butt-joint between an isotropic and an anisotropic single-mode slab waveguide. The power-coupling coefficient is formulated by means of the boundary conditions at the interface of the butt-joint and the orthogonality relations between the modes in the outgoing waveguide. It is found from the numerical results that proper amounts of angular misalignment and axial displacement remarkably suppress transmission losses when the material coordinate system of the anisotropic waveguide is not aligned with its waveguide coordinate system in the plane defined by the propagation axis and the normal of waveguide surface.

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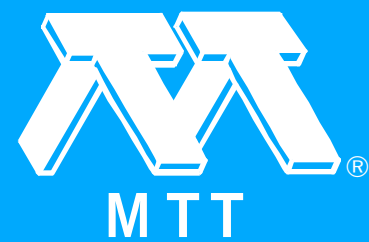
Modeling Three-Dimensional Discontinuities in Waveguides Using Nonorthogonal FDTD Algorithm

J.-F. Lee, R. Palandech and R. Mittra. "Modeling Three-Dimensional Discontinuities in Waveguides Using Nonorthogonal FDTD Algorithm." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 346-352.

In this paper, we present a generalization of the finite difference time domain (FDTD) algorithm adapted to nonorthogonal computational grids and apply it to the investigation of three dimensional discontinuity problems. The non-orthogonal FDTD uses a body-fitted grid for meshing up the computation domain and, consequently, is able to model the problem geometry with better accuracy than is possible with the staircasing approach conventionally employed in the FDTD algorithm. In addition to extending the FDTD algorithm to nonorthogonal grids, we also derive the stability conditions for the nonorthogonal FDTD algorithm in two and three dimensions. Numerical results including an H-plane waveguide junction, a circular waveguide with a circular iris, a circular wave-guide with a rectangular iris, and a microstrip bend discontinuity, are presented to validate the current nonorthogonal FDTD approach.

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Field Theoretic CAD of Open or Aperture Matched T-Junction Coupled Rectangular Waveguide Structures

T. Sieverding and F. Arndt. "Field Theoretic CAD of Open or Aperture Matched T-Junction Coupled Rectangular Waveguide Structures." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 353-362.

The rigorous computer-aided design of rectangular waveguide structures is described which are coupled by open or rectangular iris loaded E- or H-plane T-junctions. The design theory is based on the full wave mode-matching method for the key-building block T-junction element associated with the generalized S-matrix technique for composite structures. The waveguide structures may be arbitrarily composed of the T-junction and already known key-building block elements (such as the double step and the septum discontinuity) combined with homogeneous waveguide sections between them. The E- or H-plane T-junction effect, large apertures, finite iris or septum thicknesses and higher order mode interactions at all step discontinuities are rigorously taken into account. Typical design examples, like rectangular iris coupled T-junctions, narrow-stopband waveguide filters, high return loss E-plane T-junction diplexers, an elliptic function E-plane integrated metal insert filter and a simple orthomode transducer demonstrate the efficiency of the method. The theory is verified by measurements.

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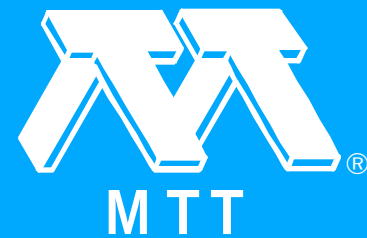


Abstracts

A Combined FEM/MoM Approach to Analyze the Plane Wave Diffraction by Arbitrary Gratings

S.D. Gedney, J.F. Lee and R. Mittra. "A Combined FEM/MoM Approach to Analyze the Plane Wave Diffraction by Arbitrary Gratings." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 363-370.

The diffraction of TE- and TM-polarized plane waves by planar gratings is numerically analyzed using a combined FEM/MoM algorithm based on the generalized network formulation. The interior region, treated using the FEM, is truncated to a single unit cell with the introduction of an exact periodic boundary condition, which is enforced as a natural boundary condition. By employing the finite element method to compute the fields within the periodic structure, gratings of arbitrary cross section and material composition can be efficiently modeled.



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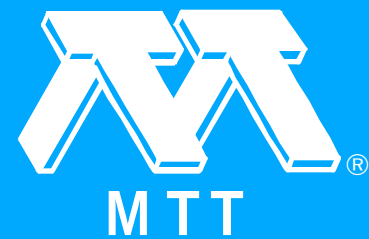
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Simple and Efficient Finite-Element Analysis of Microwave and Optical Waveguides

M. Koshiba and K. Inoue. "Simple and Efficient Finite-Element Analysis of Microwave and Optical Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 371-377.

A simple and efficient finite-element method for the analysis of microwave and optical waveguiding problems is formulated using three components of the electric or magnetic field. In order to eliminate spurious solutions, edge elements are introduced. In the edge element approach the nodal parameters are not limited to the magnetic field as in the conventional three-component formulation for the dielectric waveguiding problem. An eigenvalue equation derived here involves only the edge variables in the transversal plane and can provide a direct solution for the propagation constant. To show the validity and usefulness of this approach, computed results are illustrated for microstrip transmission lines and dielectric waveguides.

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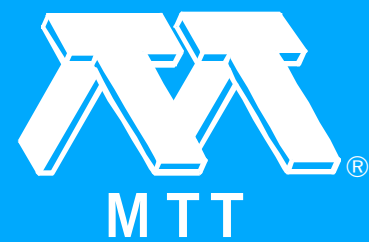
Equivalent Circuit Models for Computer Aided Design of Microstrip Rectangular Structures

F. Giannini, G. Bartolucci and M. Ruggieri. "Equivalent Circuit Models for Computer Aided Design of Microstrip Rectangular Structures." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 378-388.

A new modeling of microstrip rectangular structures in terms of equivalent circuits is here illustrated overcome many of the drawbacks and limitations of previously proposed approaches and the poor accuracy still introduced most of the presently available models. Through a successful electromagnetic approach, a lumped element modeling interacting and non-interacting step discontinuities have been created and tested. An alternative modeling is also proposed account for shunt connected double and single stubs in cross and tee junction with the main line respectively. The different models have also been tested on the same structure to demonstrate their congruency.

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Low Noise Cooled Microwave Amplifiers-- Simulation and Design

I.M. Angelov, I.K. Stoev, Z.G. Ivanov, B.N. Todorov, A.Y. Spasov, E.L. Kollberg, C.O. Lindstrom and B.L. Wendemo. "Low Noise Cooled Microwave Amplifiers--Simulation and Design." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 389-399.

The results of a study of cooled low noise field effect transistors and transistor amplifiers are presented. The investigations were made over a broad range of temperature and frequency. The temperature dependence of equivalent circuit elements in the transistor model is reported. This makes it possible to extrapolate with sufficient accuracy the S-parameters up to frequencies where direct measurements are difficult. Suspended microstrip lines have been used in the amplifier designs in order to minimize the losses and to improve the mechanical stability. The results of the theoretical studies are illustrated with a presentation of cooled amplifiers for the ranges 0.5-4 GHz, 3.7-4.1 GHz, 4.8-5.2 GHz, 19-23 GHz and 26-28 GHz, which are designed on the basis of the theoretically obtained parameters.

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Microstrip Line Filters Using Yttrium Iron Garnet Film (Short Papers)

M. Tsutsumi and S. Tamura. "Microstrip Line Filters Using Yttrium Iron Garnet Film (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 400-402.

The yttrium iron garnet (YIG) film microstrip line is fabricated by using 40 μm thick film of width of 20 mm and length of 10 mm with a microstrip of width 0.7 mm, and magnetized in a transverse direction to the wave propagation. Sharp notch characteristics of more than 30 db with few dB insertion loss are observed experimentally with a variable center frequency from 9 GHz to 11 GHz. Results were explained phenomenologically with the coupled mode theory.

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Variational Method for the Analysis of Lossless Bi-Isotropic (Nonreciprocal Chiral) Waveguides (Short Papers)

I.V. Lindell. "Variational Method for the Analysis of Lossless Bi-Isotropic (Nonreciprocal Chiral) Waveguides (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 402-405.

Equations are derived for the longitudinal fields of a propagating mode in the most general straight open waveguide structure made from the most general lossless linear material whose parameters are independent of its orientation. This material, also called bi-isotropic, has the important chiral medium as the reciprocal special case. Self-adjointness of the differential operator with respect to the hermitian inner product is confirmed. Applying the theory of nonstandard eigenvalue problems, a variational expression is derived for the solution of the waveguide problem. A procedure for its application is discussed.

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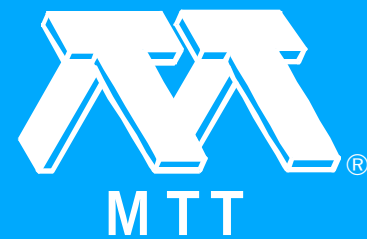


Abstracts

Analysis of Bilateral Fin-Lines on Anisotropic Substrates (Short Papers)

T.Q. Ho and B. Beker. "Analysis of Bilateral Fin-Lines on Anisotropic Substrates (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 405-409.

A full-wave analysis of the bilateral fin-line on anisotropic substrates is presented. The supporting medium is characterized simultaneously by both nondiagonal second rank $[\epsilon]$ and $[\mu]$ tensors. The dyadic Green's function is formed rigorously in the discrete Fourier transformed domain and is used to study the propagation characteristics of the fin-line. The Green's function elements are given explicitly in their closed forms along with the verification of the theory. New data describing the dispersion properties as functions of the coordinate misalignment are also generated for several substrate materials.



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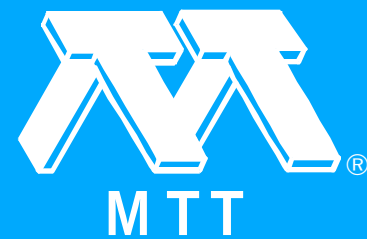


Abstracts

An Accurate Measurement Technique for Line Properties, Junction Effects, and Dielectric and Magnetic Parameters (Comments)

M.B. Steer, S.B. Goldberg and P.D. Franzon. "An Accurate Measurement Technique for Line Properties, Junction Effects, and Dielectric and Magnetic Parameters (Comments)." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 410-411.

In the above paper Enders develops an iterative technique so that "the characteristic impedance, the propagation constant, and the parameters of the connections with the measurement setup can be calculated if the coefficients of three different lengths of the line being investigated are measured. " The purpose of this letter is to point out that the characteristic impedance of the lines cannot be determined using the technique proposed.



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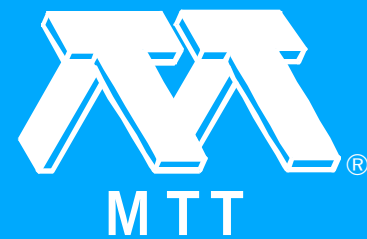
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Call for Papers - The Fifth IEEE Biennial Conference on Electromagnetic Field Computation (Feb. 1992 [T-MTT])

"Call for Papers - The Fifth IEEE Biennial Conference on Electromagnetic Field Computation (Feb. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 412-412.



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Call for Papers - 35th Midwest Symposium on Circuits and Systems (Feb. 1992 [T-MTT])

"Call for Papers - 35th Midwest Symposium on Circuits and Systems (Feb. 1992 [T-MTT])."
1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 413-413.



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Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Feb. 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Feb. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 414-414.



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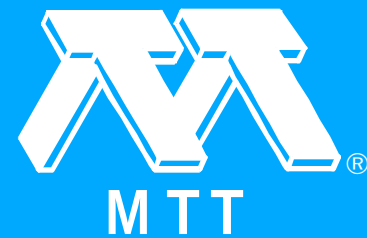
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Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers Workshop (Advertisement) (Feb. 1992 [T-MTT])

"Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers Workshop (Advertisement) (Feb. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 415-415.



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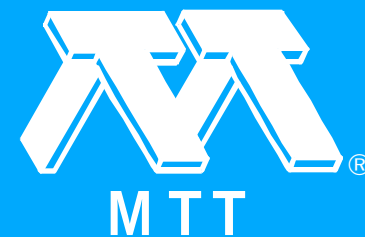
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Home Video Tutorials on Emerging Technologies (Advertisement) (Feb. 1992 [T-MTT])

"Home Video Tutorials on Emerging Technologies (Advertisement) (Feb. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 416-416.



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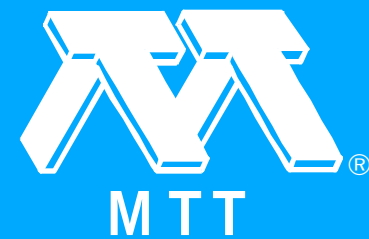
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"Back Cover (Feb. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): b1-b2.



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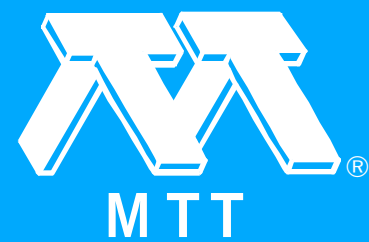
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High-performance W-Band Monolithic Pseudomorphic InGaAs HEMT LNA's and Design/Analysis Methodology

H. Wang, G.S. Dow, B.R. Allen, T.-N. Ton, K.L. Tan, K.W. Chang, T.-H. Chen, J. Berenz, T.S. Lin, P.-H. Liu, D.C. Streit, S.B. Bui, J.J. Raggio and P.D. Chow. "High-performance W-Band Monolithic Pseudomorphic InGaAs HEMT LNA's and Design/Analysis Methodology." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 417-428.

High-performance W-band monolithic one- and two-stage low noise amplifiers (LNA's) based on pseudo-morphic InGaAs/GaAs HEMT devices have been developed. The one-stage amplifier has a measured noise figure of 5.1 dB with an associated gain of 7 dB from 92 to 95 GHz, and the two-stage amplifier has a measured small signal gain of 13.3 dB at 94 GHz and 17 dB at 89 GHz with a noise figure of 5.5 dB from 91 to 95 GHz. An eight-stage LNA built by cascading four of these monolithic two-stage LNA chips demonstrates 49 dB gain and 6.5 dB noise figure at 94 GHz. A rigorous analysis procedure was incorporated in the design, including accurate active device modeling and full-wave EM analysis of passive structures. The first pass success of these LNA chip designs indicates the importance of a rigorous design/analysis methodology in the millimeter wave monolithic IC development.

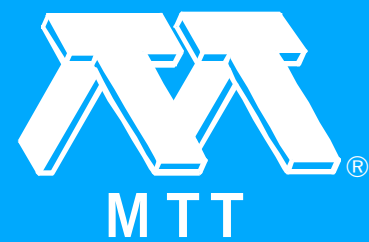


InGaAs Field-Effect Transistors with Submicron Gates for K-Band Applications

G.A. Johnson, V.J. Kapoor, D. Schmitz and H. Jurgensen. "InGaAs Field-Effect Transistors with Submicron Gates for K-Band Applications." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 429-433.

Depletion mode InGaAs microwave power MIS-FET's with 0.7 μm gate lengths and 0.2 mm gate widths have been fabricated using an epitaxial process. The devices employed a plasma deposited silicon dioxide gate insulator. The RF power performance at 18 GHz, 20 GHz, and 23 GHz is pre-sented. An output power density of 1.04 W/mm with a corresponding power gain and power-added efficiency of 3.7 dB and 40%, respectively, was obtained at 18 GHz. This is the highest output power density obtained for an InGaAs based transistor on InP at K-band. Record output power densities for an InGaAs MISFET were also obtained at 20 GHz and 23 GHz. The output power was demonstrated to be stable within 3% over 17 hours of continuous operation at 18 GHz.





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Theoretical Investigations of a Proposed Series Integration of Resonant Tunneling Diodes for Millimeter-Wave Power Generation

C.C. Yang and D.-S. Pan. "Theoretical Investigations of a Proposed Series Integration of Resonant Tunneling Diodes for Millimeter-Wave Power Generation." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 434-441.

Double-barrier quantum-well resonant tunneling diode (RTD) has great potential for power generation at millimeterwave frequencies. If a number of RTD's are integrated in series, the integrated device can greatly increase the total output power and help remove the problem of low-frequency spurious oscillations associated with a single RTD. The feasibility of such a proposed series integration scheme is investigated. The advanced monolithic nonlinear transmission line (NLTL) generating picosecond voltage shock waves can be used to initiate oscillation in such series-integrated RTD's to over-come the dc instability. The large-signal RF characteristics of the series-integrated RTD's are analyzed and simulated, including transit time effects in the depletion region. Using one of the available GaAs/AlAs RTD data, our computer simulation results show that a total cw output power of about 0.1 W with a dc-to-RF conversion efficiency of about 8% can be generated to a 5-ohm load at 100 GHz, if ten such RTD's are integrated in series.



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Intermodulation in Heterojunction Bipolar Transistors (Mar. 1992 [T-MTT])

S.A. Maas, B.L. Nelson and D.L. Tait. "Intermodulation in Heterojunction Bipolar Transistors (Mar. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 442-448.

This paper examines the modeling of small-signal intermodulation distortion (IM) in heterojunction bipolar transistors (HBT's). We show that IM current generated in the exponential junction is partially cancelled by IM current generated in the junction capacitance, and that this phenomenon is largely responsible for the unusually good IM performance of these devices. Thus, a nonlinear model of the HBT must characterize both nonlinearities accurately. Finally we propose a nonlinear HBT model suitable for IM calculations, show how to measure its parameters, and verify its accuracy experimentally.

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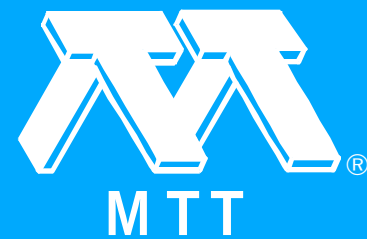


Abstracts

Large Signal Modeling of HBT's Including Self-Heating and Transit Time Effects

P.C. Grossman and J. Choma, Jr.. "Large Signal Modeling of HBT's Including Self-Heating and Transit Time Effects." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 449-464.

A physically based, large signal HBT model is presented to account for the time dependence of the base, collector, and emitter charging currents, as well as self heating effects. The model tracks device performance over eight decades of current. As such, the model can be used as the basis of SPICE modeling approximations, and to this end, examples are presented. A thesis for the divergence of high frequency large signal SPICE simulations from measured data is formulated, inclusive of a requisite empirical equation for the base-collector junction capacitance.



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An Analysis of the Large-Signal Characteristics of AlGaAs/GaAs Heterojunction Bipolar Transistors

M.Y. Frankel and D. Pavlidis. "An Analysis of the Large-Signal Characteristics of AlGaAs/GaAs Heterojunction Bipolar Transistors." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 465-474.

The large-signal characteristics of AlGaAs/GaAs heterojunction bipolar transistors are reported. A harmonic balance analysis technique is used for their analysis. This is based on equivalent circuit extractions using approximate physical equations for constraining the fitted solutions and for describing certain circuit element value bias trends. Class A and Class AB large signal behavior was measured and modeled satisfactorily. Power saturation is shown to occur due to the input signal entering the cutoff or the saturation region of the HBT operation. This is illustrated by time-dependent current/voltage waveforms and the power dependence of large-signal equivalent circuit elements. Depending on device bias and matching conditions the main sources of nonlinearities in device output may be caused by the nonlinearities in transconductance, input conductance, and base-collector capacitance.

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Abstracts

A 16 Element Quasi-Optical FET Oscillator Power Combining Array with External Injection Locking

J. Birkeland and T. Itoh. "A 16 Element Quasi-Optical FET Oscillator Power Combining Array with External Injection Locking." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 475-481.

In this paper we present analysis, design and experimental results of a 16 element planar oscillator array for quasi-optical power combining. Each element in the array consists of a single FET oscillator with an input port for injection of the locking signal, and an output port which is connected to a patch radiator. The array is synchronized using a 16 way power dividing network which distributes the locking signal to the oscillating elements. The array is constructed using a two-sided microstrip configuration, with the oscillators and feed network on one side of a ground plane, and the patch radiators on the opposite side. An effective radiated power (ERP) of 28.2 W CW with an isotropic conversion gain (G/sub iso/) of 9.9 dB was measured at 6 GHz. For an injected power of 10.3 dBm, a locking range of 453 MHz at a center frequency of 6.014 GHz was obtained; a bandwidth of 7.5%. Because of the simple nature of the individual oscillator elements, this approach is well suited to MMIC implementation.



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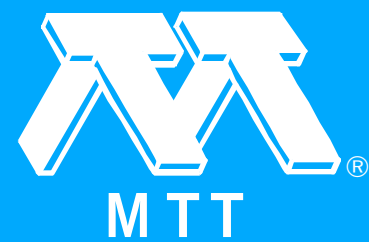
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A Multipole Analysis of a Dielectric Loaded Coaxial Rectangular Waveguide

M.Z. Mohamed and J.M. Jarem. "A Multipole Analysis of a Dielectric Loaded Coaxial Rectangular Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 482-494.

A multipole analysis of a coaxial rectangular wave-guide whose inner conductor is circular is made in order to determine the TE and TM modes of the system. The analysis is based on using multipole (dipole, quadruple, etc.) electric and magnetic current sources to generate field solutions in the waveguide. These solutions are used to match electromagnetic boundary condition in a homogeneous coaxial rectangular waveguide and determine the TE and TM eigenvalues of the waveguide system. The analysis is a generalization of a method first proposed by Mahmoud and Wait to study propagation along thin wires in a coal mine shaft. Eigenvalue results of the multipole method are compared with results of the Generalized Spectral Domain method, and are compared to eigen-value results of a ridged waveguide. Propagation in a coaxial rectangular waveguide is also studied when the coaxial rectangular waveguide is loaded with lossy inhomogeneous dielectric material. A variational formula is used to relate the TEM, TE and TM modes of an empty coaxial rectangular waveguide to the propagation in the loaded inhomogeneous dielectric waveguide. Propagation in a four wire anechoic chamber is given as an example of the application of the theory developed in the paper.

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Analysis of a Wide Resonant Strip in Waveguide

H.-C.B. Chu and K. Chang. "Analysis of a Wide Resonant Strip in Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 495-498.

An analysis has been developed to calculate the susceptance due to a wide resonant strip on the transverse plane of a rectangular waveguide. The theory is based upon a variational form for the susceptance, where the current distribution is determined by the moment method. Accurate results have been obtained for the wide strips as confirmed by the measurements.

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Analysis of Superconducting Microwave Structures: Application to Microstrip Lines

S.M. El-Ghazaly, R.B. Hammond and T. Itoh. "Analysis of Superconducting Microwave Structures: Application to Microstrip Lines." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 499-508.

An accurate analysis for the microwave and millimeter-wave transmission lines, which include high T_c superconductor materials, is presented. This analysis is based on blending a full electromagnetic wave model with London's equations and the two-fluid model. It is capable of fully characterizing the transmission lines, including obtaining the current distributions inside the superconducting material, the electromagnetic fields, the power handling capability and the quality factor. A simplified model based on the TM-mode solution is also presented. The solution is obtained using the finite-difference scheme. This approach is employed in investigating the superconducting microstrip structure. Results showing current distributions and quality factors are presented. Variations of the line characteristics with the strip width are also presented. The possibility of developing empirical relations for the current carrying capacity as functions of the critical current density and the critical magnetic flux density is also demonstrated.

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Pulse Propagation in Superconducting Coplanar Striplines

O.R. Baiocchi, K.-S. Kong and T. Itoh. "Pulse Propagation in Superconducting Coplanar Striplines." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 509-514.

The Phenomenological Loss Equivalence Method (PEM), the "enhanced" two-fluid model for thin-film super-conducting materials and the dynamical calculation of radiation losses in planar structures are used--in the context of a linear filter approach--to model attenuation and dispersion of ultrafast pulses in coplanar striplines. The numerical simulation of this modeling shows excellent agreement with experimental results available in the literature. Simple relationships between the peak attenuation and delay time of the propagation pulse, and penetration depth at absolute zero and conductivity at critical temperature may open the possibility of using pulse distortion to characterize thin-film, high-temperature super-conducting materials.

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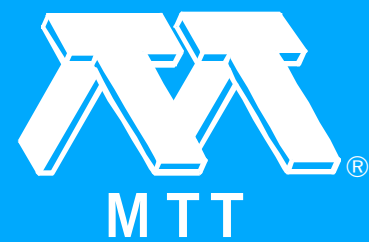
Microstripline-Slotline Transition Analysis Using the Spectral Domain Technique

Y.M.M. Antar, A.K. Bhattacharyya and A. Ittipiboon. "Microstripline-Slotline Transition Analysis Using the Spectral Domain Technique." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 515-523.

A spectral domain analysis of microstripline-slot-line transition is presented. The equivalent circuit of transition is obtained. Elements of the equivalent circuit are determined from the residue theorem. The reflection loss of the transition is determined using the present theory and is found to agree with the experimental data.

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On the Quasi-TEM and Full-Wave Approaches Applied to Coplanar Multistrip on Lossy Dielectric Layered Media

F.L. Mesa, G. Cano, F. Medina, R. Marques and M. Horno. "On the Quasi-TEM and Full-Wave Approaches Applied to Coplanar Multistrip on Lossy Dielectric Layered Media." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 524-531.

The characteristic parameters of coplanar multistrip lines embedded in multilayered lossless/lossy substrates are commonly computed by using either quasi-TEM or full-wave models: Several methods are provided in the literature to deal with this type of structure. In this paper a comparative study of quasi-TEM and rigorous solutions is carried out in order to establish criteria for the validity of the quasi-TEM approach. Reliable quasi-TEM and full-wave numerical data have been properly generated by applying an enhanced spectral domain analysis. We conclude that the quasi-TEM model yields satisfactory results for many MIC and MMIC practical cases. However, significant errors arise when high conductivity substrates are involved in MMIC applications. A discussion about the computation of the dynamic modal characteristic impedance is also reported, showing how the insertion of the modal orthogonality can save computational effort in a lossy multiport system.

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A Frequency-Dependent FDTD Method for Biological Applications

D.M. Sullivan. "A Frequency-Dependent FDTD Method for Biological Applications." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 532-539.

A frequency-dependent finite difference time domain (FD)² TD method to calculate the response of pulse in plasma or water has recently been described. This method is an advance over the traditional finite-difference time-domain (FDTD) method in that it allows for the frequency dependence of these two media. In this paper, the (FD)² TD method has been modified to obtain broad band frequency information in 3-D biological applications. The implementation of this method is described and its accuracy is verified by comparison with analytic solutions using the Bessel function expansion. The use of this method is illustrated by an example of the 3-D simulation of a hyperthermia treatment using two-applicators over a frequency range of 40 to 200 MHz.

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Improved Finite-Difference Formulation in Frequency Domain for Three-Dimensional Scattering Problems

K. Beilenhoff, W. Heinrich and H.L. Hartnagel. "Improved Finite-Difference Formulation in Frequency Domain for Three-Dimensional Scattering Problems." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 540-546.

The finite-difference method in the frequency domain is a powerful tool for analyzing arbitrarily shaped transmission-line discontinuities and junctions. In this paper, an improved formulation based on Maxwell's equations in integral form is presented. It corresponds to the Helmholtz equation and reduces the numerical efforts in solving the large linear equation system considerably. The method is verified by comparison to previous work on microstrip.



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Modeling of Discontinuities in General Coaxial Waveguide Structures by the FDTD-Method

J.V. Hese and D.D. Zutter. "Modeling of Discontinuities in General Coaxial Waveguide Structures by the FDTD-Method." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 547-556.

The finite difference time domain (FDTD)-method is applied to model generalized coaxial waveguide structures with discontinuities. The cross-section of the waveguide consists of a closed outer conductor and one or two inner conductors of arbitrary shape. The cross-section can have any number of dielectric materials with losses. The singular field-behavior near sharp edges is explicitly included in the finite-difference scheme. Any kind of discontinuity can be handled: changes in cross-section as well as changes of material parameters. From the time-domain data, frequency-domain data (S-parameters) are obtained using Fourier-transform techniques.

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A 100-Element Planar Schottky Diode Grid Mixer

J.B. Hacker, R.M. Weikle, II, M. Kim, M.P. De Lisio and D.B. Rutledge. "A 100-Element Planar Schottky Diode Grid Mixer." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 557-562.

In this work we present a Schottky diode grid mixer suitable for mixing or detecting quasi-optical signals. The mixer is a planar bow-tie grid structure periodically loaded with diodes. A simple transmission line model is used to predict the reflection coefficient of the grid to a normally incident plane wave. The grid mixer power handling and dynamic range scales as the number of devices in the grid. A 10 GHz 100-element grid mixer has shown an improvement in dynamic range of 16.3 to 19.8 dB over an equivalent single-diode mixer. The conversion loss and noise figure of the grid are equal to that of a conventional mixer. The quasi-optical coupling of the input signals makes the grid mixer suitable for millimeter-wave and submillimeter-wave applications by eliminating waveguide sidewall losses and machining difficulties. The planar property of the grid potentially allows thousands of devices to be integrated monolithically.

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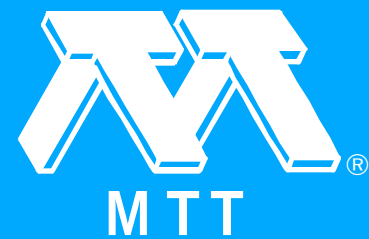
Ka-Band High Efficiency Power Amplifier MMIC with 0.30 μm MESFET for High Volume Applications (Short Papers)

J. Mondal, J. Geddes, D. Carlson, M. Vickberg, S. Bounnak and C. Anderson. "Ka-Band High Efficiency Power Amplifier MMIC with 0.30 μm MESFET for High Volume Applications (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 563-566.

A single-ended three-stage MESFET power amplifier designed for high-volume, low-cost applications shows an average of 15-21% power added efficiency in Ka-band with 100-150 mW of power output over 30-35 GHz. $\Delta < S_{21}$ with power saturation, an important parameter in phased array applications, is also reported. Efficiencies as high as 28% are measured on good wafers with high on-wafer repeatability under power drive.

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Criteria for the Onset of Oscillation in Microwave Circuits (Short Papers)

R.W. Jackson. "Criteria for the Onset of Oscillation in Microwave Circuits (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 566-569.

A commonly used criterion for oscillator startup is demonstrated not to be universally valid. In order to investigate startup conditions, the Nyquist stability criterion is written in terms of microwave quantities. It is shown that widely available microwave CAD can be used to create Nyquist stability plots. Since the Nyquist criterion gives only global stability information, a convenient graphical criterion is developed to determine whether an oscillation will start up near a particular resonance frequency.

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A General Approach for the S-Parameter Design of Oscillators with 1 and 2-Port Active Devices (Short Papers)

R.D. Martinez and R.C. Compton. "A General Approach for the S-Parameter Design of Oscillators with 1 and 2-Port Active Devices (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 569-574.

This paper introduces a circular function that serves as a basis for deciding if a circuit will contiguously oscillate. The circular function is derived from the signal flow graph of the circuit including the external load. Any node in the flow-graph can be split into two nodes, one of which contains incoming branches and the other containing outgoing branches. The circular function is then the transfer function between the two nodes, and it can be measured or simulated by looking at the reflection coefficient of a circulator inserted at the node that was originally split. Oscillations occur when the circular function is unity. Stability of these oscillations is determined by considering the behavior of the circular function as the circuit saturates. The circular function can be elegantly applied to 1-port oscillators that use negative resistance devices and to feedback oscillators containing transistors, and it reduces to previously published results for specific circuit topologies. To verify the practicality of this approach two 30 GHz HEMT oscillators were designed and tested.

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Parameter Extraction Technique for HBT Equivalent Circuit Using Cutoff Mode Measurement (Short Papers)

S. Lee and A. Gopinath. "Parameter Extraction Technique for HBT Equivalent Circuit Using Cutoff Mode Measurement (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 574-577.

We propose a new parameter extraction method based on the S-parameter measurements of the HBTs biased to cutoff. This method is applied to confirm the results for the RF probe pad and interconnection pattern parasitic obtained from the special test structures, and to determine some of the device capacitances of the HBT. The remaining device parameters are extracted by the S-parameter measurements of the devices biased to the active mode. The extraction technique gives good agreement between the equivalent circuit and the measured S-parameters of the HBT including probe pads and interconnections.

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Abstracts

An Analysis of a Coupled-Ring Rotary Joint Design (Short Papers)

E.D. Evans. "An Analysis of a Coupled-Ring Rotary Joint Design (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 577-581.

This paper describes a theoretical and experimental analysis of a coupled-ring rotary joint design. A rotary joint of this type is commonly used for mechanically scanned, multichannel radars. The main goal of the analysis is to develop a better understanding for the transfer of energy through the joint's highly coupled rings. We first consider the geometry of a typical single channel and then describe a coupled transmission line model for the coupled-ring network. Using the model, we determine the type of ring network needed for low channel loss and small rotational variations of this loss. A series of measurements on some test models support the predictions of the analysis.



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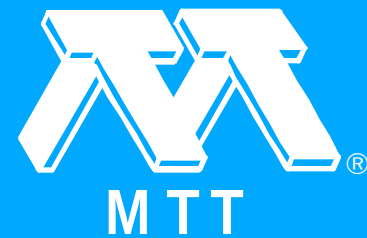


Abstracts

Computation of the Dispersion Characteristics of a Shielded Suspended Substrate Microstrip Line (Short Papers)

I.P. Polichronakis and S.S. Kouris. "Computation of the Dispersion Characteristics of a Shielded Suspended Substrate Microstrip Line (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 581-584.

The dispersion characteristics of a shielded suspended substrate microstrip line are calculated using five different sets of basis functions for the current distributions. Their comparison leads to the more suitable basis functions for the acquisition of fast and accurate results for frequencies up to 100 GHz.



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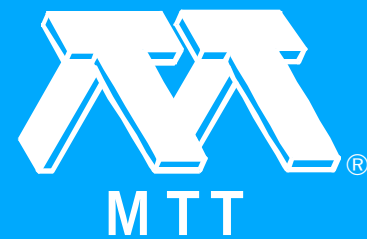


Abstracts

18-42 GHz Experimental Verification of Microstrip Coupler and Open End Capacitance Models (Short Papers)

A.J. Slobodnik, Jr., R.T. Webster and G.A. Roberts. "18-42 GHz Experimental Verification of Microstrip Coupler and Open End Capacitance Models (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 584-587.

A cavity resonance technique is used to experimentally verify microstrip coupler and open end capacitance models over the frequency range 18-42 GHz. In addition, these results are confirmed using an alternative version of the technique which directly determines open end discontinuity capacitance. In the second case knowledge of substrate dielectric constant is not required and the method also yields microstrip relative effective dielectric constant.



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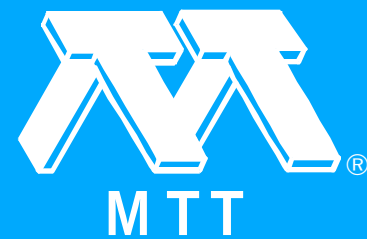


Abstracts

Scattering at an Offset Circular Hole in a Rectangular Waveguide (Short Papers)

C. Sabatier. "Scattering at an Offset Circular Hole in a Rectangular Waveguide (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 587-592.

A solution is given for the problem of scattering at an off-set circular to rectangular junction and at a thick diaphragm, with an offset circular aperture, in a rectangular waveguide. The method used, is mode matching for computing one discontinuity. The difficulty arising from the fact that the eigenmodes of the two waveguides are known in different coordinate systems is overcome by simple transformation for the evaluation of overlap integral between the eigenmodes of each waveguide. Experimental results validate this method.



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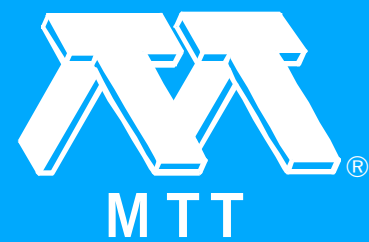


Moment Method Formulation of Thick Diaphragms in a Rectangular Waveguide (Short Papers)

A. Datta, B.N. Das and A. Chakraborty. "Moment Method Formulation of Thick Diaphragms in a Rectangular Waveguide (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 592-595.

The paper presents a method of determination of the electrical characteristics of two thick apertures in a rectangular wave-guide. The coupled integral equations resulting from the boundary condition of the magnetic field at the four interfaces are transformed into matrix equations using method of moments. The numerical data on reflection and transmission coefficients are evaluated. Comparison between theoretical and experimental results is presented.





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Complex Images of an Electric Dipole in Homogeneous and Layered Dielectrics Between Two Ground Planes (Short Papers)

J.J. Yang, Y.L. Chow, G.E. Howard and D.G. Fang. "Complex Images of an Electric Dipole in Homogeneous and Layered Dielectrics Between Two Ground Planes (Short Papers)." 1992 *Transactions on Microwave Theory and Techniques* 40.3 (Mar. 1992 [T-MTT]): 595-600.

In this paper, simple closed form expressions are derived for the vector and scalar potentials of a horizontal electric dipole in homogeneous and layered dielectrics between two ground planes. For the homogeneous dielectric case, an infinite number of dipole images due to the top and bottom ground planes are replaced by a few complex dipole images. For the layered dielectric case, the dipole images due to both the dielectric interfaces and the ground planes are replaced by a few complex dipole images. In addition, the wave guide modes of LSE and LSM types trapped by the two ground planes, and the surface wave modes of LSE and LSM type trapped by the dielectrics, both excited by the dipole, are included in the closed form expressions. The accuracy of the closed form expressions is confirmed by the numerical integration of spectral integrals.

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Abstracts

Comparison of Measured and Simulated Data in an Annular Phased Array Using an Inhomogeneous Phantom (Short Papers)

D.M. Sullivan, D. Buechler and F.A. Gibbs. "Comparison of Measured and Simulated Data in an Annular Phased Array Using an Inhomogeneous Phantom (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 600-604.

Computer simulation is being used to plan patient treatments for deep regional hyperthermia in the Sigma 60 applicator of the BSD-2000 Hyperthermia System. The method used is the finite-difference time-domain (FDTD) method. Like all simulation methods, confirmation of the accuracy via measured data is important. Until now, most such measurements in the Sigma 60 were done with homogeneous phantoms. A new phantom using both muscle and fat equivalent material has been constructed, presenting a more challenging simulation problem to the FDTD method. The description of the phantom and the results of comparisons between simulated and measured data are presented.



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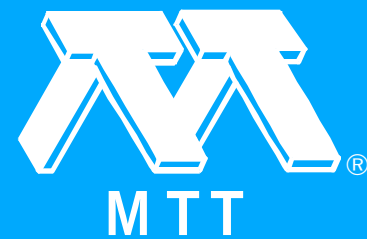


Abstracts

Alternative Field Representations and Integral Equations for Modeling Inhomogeneous Dielectrics (Short Papers)

J.L. Volakis. "Alternative Field Representations and Integral Equations for Modeling Inhomogeneous Dielectrics (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 604-608.

New volume and volume-surface integral equations are presented for modeling inhomogeneous dielectric regions. In particular, it is shown that materials with non-trivial permeability and permittivity can be modeled using a single unknown equivalent current or field component. The presented integral equations result in more efficient numerical implementations and should therefore be useful in a variety of electromagnetic applications.



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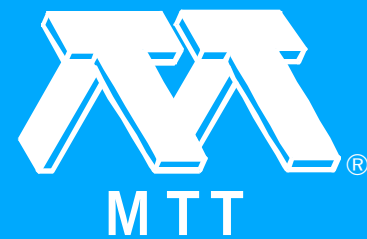
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Call for Papers - Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers Workshop (Mar. 1992 [T-MTT])

"Call for Papers - Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers Workshop (Mar. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 609-609.



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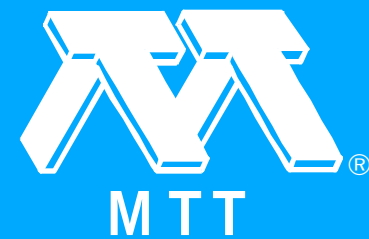
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Call for Papers - Special Issue on Quasi-Optical Techniques (Mar. 1992 [T-MTT])

"Call for Papers - Special Issue on Quasi-Optical Techniques (Mar. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 610-610.



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Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Mar. 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Mar. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 611-611.



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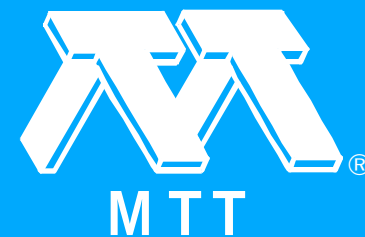
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Home Video Tutorials on Emerging Technologies (Advertisement) (Mar. 1992 [T-MTT])

"Home Video Tutorials on Emerging Technologies (Advertisement) (Mar. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.3 (Mar. 1992 [T-MTT]): 612-612.



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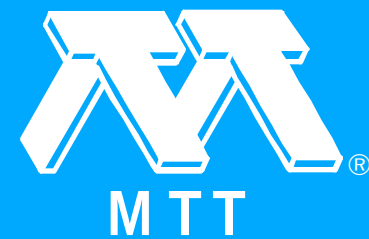
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Surface Wave Modes of Printed Circuits on Ferrite Substrates

H.-Y. Yang, J.A. Castaneda and N.G. Alexopoulos. "Surface Wave Modes of Printed Circuits on Ferrite Substrates." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 613-621.

Surface waves due to a current source on a grounded ferrite slab are investigated. Electromagnetic fields of the structure are in terms of a continuous plane wave spectrum. The spectrum of each field component is obtained numerically through the exponential-matrix method. The surface waves of the structure are extracted from the continuous spectrum by using the residue theorem and the method of steepest descent. Two types of surface waves are found and their properties are described. The surface wave modes found include dynamic surface wave modes which are closely related to the surface waves of a grounded dielectric slab, and magneto-static surface wave modes which are related to the solution of Laplace's equation for the magnetic potential.



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A Simple Technique for Calculating the Propagation Dispersion of Multiconductor Transmission Lines in Multilayer Dielectric Media

J.J. Yang, G.E. Howard and Y.L. Chow. "A Simple Technique for Calculating the Propagation Dispersion of Multiconductor Transmission Lines in Multilayer Dielectric Media." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 622-627.

A multiconductor transmission line in a multilayer dielectric medium is complicated and therefore is frequently analyzed by the simple quasi-TEM approach. Unlike the full wave eigenvalue approach, the quasi-TEM approach does not give the propagation dispersion characteristics of the line. This paper overcomes this problem by first obtaining the solution of each multiconductor mode from the quasi-TEM approach. Then these solutions are used as both basis and testing functions in a variational formulation of the full wave eigenvalue analysis. The result is high accuracy in the dispersive propagation constants of the multiconductor modes. By solving only for high frequency eigenvalues, not for the high frequency eigenvectors, the method is simpler and faster than the conventional full wave dispersion analyses.

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Abstracts

A Multipipe Model of General Strip Transmission Lines for Rapid Convergence of Integral Equation Singularities

G.E. Howard, J.J. Yang and Y.L. Chow. "A Multipipe Model of General Strip Transmission Lines for Rapid Convergence of Integral Equation Singularities." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 628-636.

An integral equation for solving thin conducting strip problems always involves three singularities, viz, two charge singularities at the strip edges and the Green's function singularity for close proximity of source and field points. This paper overcomes the singularity convergence problem using Gauss-Chebyshev quadrature for the edge charges, but more importantly by a multipipe model for the Green's function singularity. This model applies equally well to both two-dimensional (2-D) and three-dimensional (3-D) problems of metallic strips embedded in multilayer dielectric substrates. To reduce the scope, however, this paper analyzes only the quasi-TEM cases of 2-D thin strip transmission lines in multilayer dielectric substrates.



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Analysis of the Time Response of Multiconductor Transmission Lines with Frequency-Dependent Losses by the Method of Convolution-Characteristics

J.-F. Mao and Z.-F. Li. "Analysis of the Time Response of Multiconductor Transmission Lines with Frequency-Dependent Losses by the Method of Convolution-Characteristics." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 637-644.

A new method for analysis of the time response of multiconductor transmission lines with frequency-dependent losses is presented. This method can solve the time response of various kinds of transmission lines with arbitrary terminal networks. Particularly it can analyze nonuniform lines with frequency dependent losses, for which there is no existing effective method to analyze their time response so far. This method starts from the frequency-domain telegrapher's equations. After decoupling and inversely Fourier transforming, then a set of decoupled time-domain equations including convolutions are given. These equations can be solved with the characteristic method. The results obtained with this method are stable and accurate. Two examples are given to illustrate the application of this method to various multiconductor transmission lines.



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Analysis of a Microstrip Line Terminated with a Shorting Pin

W.-J. Tsay and J.T. Aberle. "Analysis of a Microstrip Line Terminated with a Shorting Pin." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 645-651.

A full-wave moment method solution to the problem of a semi-infinite microstrip line terminated with a shorting pin is presented. The electric current on the line is expanded in terms of longitudinal piecewise sinusoidal modes near the open end, with entire domain traveling-wave modes to represent incident and reflected waves away from the open end. Also, the electric current near the shorting pin is simulated by an attachment mode which insures continuity of the current between the pin and the line and models the rapidly-varying current on the line near the feed connection point. Results are given for the magnitude of the reflection coefficient and are compared with experimental data.

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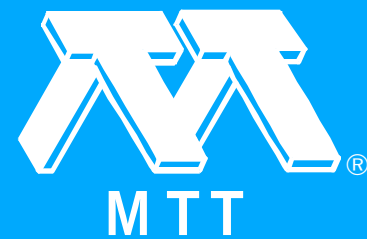


Abstracts

An Improved Iterative Technique for the Quasi-TEM Analysis of Generalized Planar Lines

E. Drake, F. Medina and M. Horno. "An Improved Iterative Technique for the Quasi-TEM Analysis of Generalized Planar Lines." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 652-658.

The Generalized Bioconjugate Gradient Method (GBGM) and FFT algorithms are used for the quasi-TEM analysis of generalized multistrip lines embedded in multilayered lossless/lossy, iso/anisotropic dielectric and/or magnetic media. Important computational improvement is achieved by including asymptotic extraction techniques in the determination of the spatial Green's function matrix. Comparisons with other iterative procedures are presented. Several practical structures are analyzed and numerical results are compared with previously published data.



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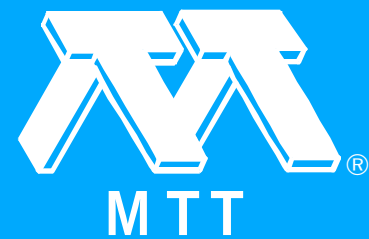
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Static Analysis of V Transmission Lines

J.E. Schutt-Aine. "Static Analysis of V Transmission Lines." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 659-664.

In this paper, the v-shaped transmission line is analyzed. The structure consists of a signal strip resting on a dielectric above a triangular reference. A static analysis is performed using the moment method to determine the quasi-TEM propagation parameters. The purpose of this study is to determine the basic electrical properties of the geometry and evaluate the differences from the microstrip configuration. Theoretical results are presented and, in the case of single lines measurements are performed and compare with theoretical predictions.

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Modal Analysis of Multi-Connected Waveguides

L. Carbonini. "Modal Analysis of Multi-Connected Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 665-671.

A general analysis for the modal characterization of multi-connected uniform, hollow, conducting waveguides is presented. It is relevant to waveguides with an "outer" conductor for which analytical Green's functions are known, "inner" conductors described by integral equations. The TEM modes space is analyzed, and singularities of the integral equations are studied for determining the higher order modes. The cases of parallel wires into rectangular waveguides and above a ground plane are worked in detail; experimental results about a complex multi-wire line are reported. Mixed coaxial and circular offset coaxial waveguides are also analyzed. Spurious solutions arise due to the structure of the integral equations for multi-connected waveguides; criteria to discard such modes are presented.

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A Linear-Operator Formalism for the Analysis of Inhomogeneous Biisotropic Planar Waveguides

C.R. Paiva and A.M. Barbosa. "A Linear-Operator Formalism for the Analysis of Inhomogeneous Biisotropic Planar Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 672-678.

Using the theory of linear operators, guided electromagnetic wave propagation in inhomogeneous (non-reciprocal) biisotropic planar structures is analyzed in terms of a 2×2 matrix differential operator. Based on the concept of adjoint waveguide, a new bi-orthogonality relation for the guided hybrid modes is derived. For the special case of reciprocal biisotropic media or chiral media, the linear-operator formalism leads to a self-adjoint problem. As an example of application, a general analysis of the radiation modes of a grounded chiroslabguide is also presented.

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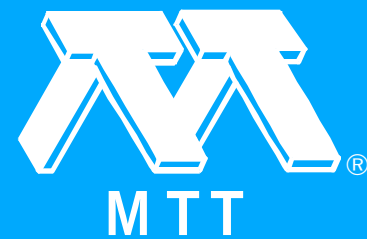


Abstracts

Modes and Attenuation Constants in Circular Hollow Waveguides with Small Core Diameters for the Infrared

Y. Kato and M. Miyagi. "Modes and Attenuation Constants in Circular Hollow Waveguides with Small Core Diameters for the Infrared." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 679-685.

The mode structures and attenuation constants in circular hollow waveguides are evaluated numerically based on the exact characteristic equations. Mode properties, which are strongly dependent on waveguide materials, and attenuation constants are discussed when the core diameter becomes small. Special modes are also analyzed in oversized metallic waveguides which approach very familiar modes in perfect-conducting cylindrical waveguides when the core diameter becomes small.



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Analysis of Discontinuities in an Asymmetric Dielectric Slab Waveguide by Combination of Finite and Boundary Elements

K. Hirayama and M. Koshiba. "Analysis of Discontinuities in an Asymmetric Dielectric Slab Waveguide by Combination of Finite and Boundary Elements." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 686-691.

An approach that combines the finite-element and boundary-element methods is extended to the analysis of discontinuities in an asymmetric slab waveguide. The discontinuity region is divided into three regions. One is a finite region with arbitrary inhomogeneities, and the others are semi-infinite and homogeneous regions. The finite-element and boundary-element methods are applied to the former and latter regions, respectively. For uniform waveguide regions connected to discontinuities, analytical solutions are used, in which all the eigenmodes, namely guided modes, substrate radiation modes, and substrate-cover radiation modes are taken into account. To show the validity and usefulness of this approach, computed results are given for three kinds of step-discontinuities with TE and TM mode incidence.

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A Variational Vector Finite Difference Analysis for Dielectric Waveguides

S.S. Patrick and K.J. Webb. "A Variational Vector Finite Difference Analysis for Dielectric Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 692-698.

A numerical technique based on the finite difference method is developed for the analysis of lossless dielectric waveguides. This method is a variational approach using all three components of the magnetic field vector, allowing for the enforcement of the divergence condition. The dispersion characteristics and field distributions for dielectric waveguides are accurately computed. Comparisons are made between the magnetic vectorial finite difference method and a finite element method incorporating the same functional.

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Iterative Solution of the Eigenvalue Problem for a Dielectric Waveguide

A.T. Galick, T. Kerkhoven and U. Ravaioli. "Iterative Solution of the Eigenvalue Problem for a Dielectric Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 699-705.

We present a numerical approach to the simulation of dielectric waveguides that is free of spurious modes and is based on the solution of an eigenvalue problem for the two transverse components of the magnetic field. We introduce a new discretization which has several computational advantages. In particular, by careful design of the discretization procedure we obtain systems of equations for the two components which are equivalent in the sense that a rotation over 90° corresponds to a suitable permutation of indices. The eigenvalue problem is solved iteratively by using an adapted version of the Chebyshev-Arnoldi algorithm. This approach takes full advantage of the sparsity of the matrix and circumvents the large memory requirements and the large computational complexity associated with dense methods. This allows us to employ meshes that are sufficiently fine to resolve higher modes without large discretization errors.

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Rigorous Analysis of Multiple Coupled Rib Waveguides

T. Rozzi, M.N. Husain and L. Zappelli. "Rigorous Analysis of Multiple Coupled Rib Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 706-715.

The general problem of multiple coupled rib wave-guides, where energy may be leaked from one guide to the other via the substrate and radiation mode, is of great practical and theoretical importance. Rigorous results including substrate and air modes coupling are hard to find for the general case of coupling of two or more different guides, due to the considerable complexity arising. In this contribution, we develop the analysis in terms of a cascade of the transverse steps, utilizing a variational solution with a single trial function and making explicit use of edge singularities at the dielectric corners in order to produce an effective and rigorous solution. Multiple coupled rib guides are then reduced to a cascade of interacting step discontinuities in the transverse direction, Where comparison is possible the numerical results obtained by the method are seen to be as accurate as those obtained by the FEM/FDM methods, but with a fraction of the computer time and memory involved.

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A Generalized Recursive Algorithm for Wave-Scattering Solutions in Two Dimensions

W.C. Chew, L. Gurel, Y.-M. Wang, G. Otto, R.L. Wagner and Q.H. Liu. "A Generalized Recursive Algorithm for Wave-Scattering Solutions in Two Dimensions." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 716-723.

A generalized recursive algorithm valid for both the Ez and Hz wave scattering of densely packed scatterers in two dimensions is derived. This is unlike previously derived re-cursive algorithms which have been found to be valid only for E/sub z/ polarized waves. In this generalized recursive algorithm, a scatterer is first divided into N subscatterers. The n-subscatterer solution is then used to solve the (n + n')-sub-scatterer solution. The computational complexity of such an algorithm is found to be of $O(N^2)$ in two dimensions, and meanwhile, providing a solution valid for all angles of incidence. This is better than the method of moments with Gaussian elimination which has an $O(N/\text{sub } 3/)$ complexity.

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Abstracts

Extending the Two-Dimensional FDTD Method to Hybrid Electromagnetic Systems with Active and Passive Lumped Elements

W. Sui, D.A. Christensen and C.H. Durney. "Extending the Two-Dimensional FDTD Method to Hybrid Electromagnetic Systems with Active and Passive Lumped Elements." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 724-730.

This paper extends the finite-difference time-domain (FDTD) method to include distributed electromagnetic systems with lumped elements (a hybrid system) and voltage and current sources. FDTD equations that include nonlinear elements like diodes and transistors are derived. Calculation of driving-point impedance is described. Comparison of FDTD calculated results with analytical results for several two-dimensional transmission-line configurations illustrate the accuracy of the method. FDTD results for a transistor model and a diode are compared with SPICE calculations. The extended FDTD method should prove useful in the design and analysis of complicated distributed systems with various active, passive, linear and nonlinear lumped electrical components.



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Synthesis Techniques for High Performance Octave Bandwidth 180° Analog Phase Shifters

S. Lucyszyn and I.D. Robertson. "Synthesis Techniques for High Performance Octave Bandwidth 180° Analog Phase Shifters." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 731-740.

Novel techniques for synthesizing 180° analog reflection type phase shifters, with ultra-low phase and amplitude error characteristics, over a very wide bandwidth, are presented. The novel approach of cascading stages, where the nonlinear performance of each stage compliments those of the others, results in a significant advance in the linearity performance of traditional reflection-type phase shifters. In this paper, it is shown by theoretical analysis that three conditions must be satisfied by the reflection terminations, in order to achieve the desired response. The theoretical conditions and subsequent design equations are given; Simulation results for a 2-stage Ku-band cascaded-match reflection-type phase shifter show that a very low maximum phase error and amplitude error of $\pm 2.4^\circ$ and ± 0.2 dB, respectively, can be achieved over a full octave bandwidth. Since the complexity of the overall topology is reduced to a minimum, the device appears insensitive to process variations and ideal for both hybrid and MMIC technologies.

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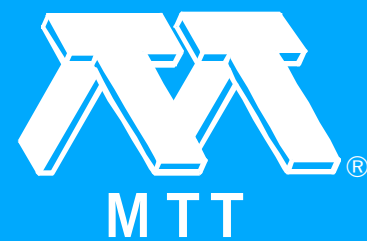


Abstracts

A Study of the Nonorthogonal FDTD Method Versus the Conventional FDTD Technique for Computing Resonant Frequencies of Cylindrical Cavities

P.H. Harms, J.-F. Lee and R. Mittra. "A Study of the Nonorthogonal FDTD Method Versus the Conventional FDTD Technique for Computing Resonant Frequencies of Cylindrical Cavities." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 741-746.

In this paper, the nonorthogonal finite difference time domain (FDTD) technique is used to compute the resonant frequencies of dielectric-filled cylindrical cavities. Because the method is based on the nonorthogonal coordinate system, it is not restricted to specific geometries, e.g., rectangular or axially symmetric geometries and is suitable for analyzing cavities of arbitrary shape. The advantages of this technique over the conventional FDTD algorithm with a staircase grid are readily shown in a convergence study, where the two methods are used to compute the dominant resonant frequency of a cylindrical cavity. The accuracy of the technique for calculating the resonant frequencies of the first few modes is demonstrated by comparing the results obtained via this technique with those derived by using two versions of the finite element method in the frequency domain.



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New Results for Coaxial Re-Entrant Cavity with Partially Dielectric Filled Gap

W. Xi, W.R. Tinga, W.A.G. Voss and B.Q. Tian. "New Results for Coaxial Re-Entrant Cavity with Partially Dielectric Filled Gap." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 747-753.

Resonant frequencies, Q-factor and electromagnetic field intensity are presented for a set of varied parameters of a coaxial reentrant cavity with a gap partially filled with a dielectric. The cavity is analyzed using the mode matching technique. The numerical results are found to be in good agreement with experimental data. Based on the numerical results, a scheme for mode identification is proposed and the mode transition is discussed. Furthermore, the equivalent gap capacitances are obtained and compared with the results from an existing formula which has been modified for the dielectric loaded gap,

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Abstracts

A General Approach to Network Analyzer Calibration

K.J. Silvonon. "A General Approach to Network Analyzer Calibration." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 754-759.

A new general-purpose algorithm for network analyzer and test fixture calibration is presented. The TCX algorithm is able to handle most of the existing calibration methods including symmetrical test fixtures. Any combination of one-port or two-port standards can be used. There is a possibility of partial self-calibration, if one of the standards is a two-port network or a through connection. The algorithm is applied to get simple equations covering the TSD, LDX (LRL), LAX, and LMX methods (X being an unknown one-port or symmetrical two-port network). A transmission path is allowed between the ports of standard X. In the TSD method the delay line can be replaced with an attenuation network or with a matched load; also the "through" line can have an unknown delay and attenuation. A new method of root choice for LRL and similar methods in conjunction with test fixtures is described. The method of least-squares-fit can be applied, when redundant data are available. It gives an essential improvement of accuracy in the simulation of a symmetrical test fixture.



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Muscle-Equivalent Phantom Materials for 10-100 MHz (Short Papers)

M.J. Hagmann, R.L. Levin, L. Calloway, A.J. Osborn and K.R. Foster. "Muscle-Equivalent Phantom Materials for 10-100 MHz (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 760-762.

New tissue-simulating materials are described which are aqueous solutions. Glycine is used to obtain the large permittivity of muscle at frequencies below 100 MHz. The lack of suspended solids simplifies preparation, and ensures the dielectric properties are homogeneous, stable and reproducible. The solutions are transparent, facilitating placement of probes for measuring temperature or electric field. The optical clarity of the phantom mixtures may also be desirable in a quick assessment of RF applicators by the use of liquid crystalline display sheets. Long-term stable gelling, with no measurable change in dielectric properties, can be obtained with 1 to 2 percent of agarose or carrageenan.

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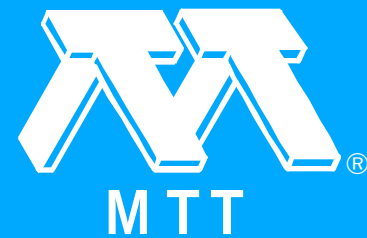


Abstracts

Microstrip Resonators on Anisotropic Substrates (Short Papers)

T.Q. Ho, B. Beker, Y.C. Shih and Y. Chen. "Microstrip Resonators on Anisotropic Substrates (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 762-765.

The spectral domain method is applied to study shielded microstrip resonators printed on anisotropic substrates. A Green's function that takes into account the dielectric anisotropy effects is derived through a fourth order formulation. Galerkin's method is then applied to form the characteristic equation from which the resonant frequency of the microstrip resonator is numerically obtained. Results for a microstrip resonator situated on an isotropic substrate are used to validate the theory.



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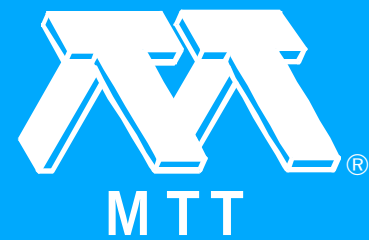


Abstracts

Analysis of a Coupled Slotline on a Double-Layered Substrate Containing a Magnetized Ferrite (Short Papers)

M. Geshiro and T. Itoh. "Analysis of a Coupled Slotline on a Double-Layered Substrate Containing a Magnetized Ferrite (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 765-768.

Nonreciprocity in the propagation characteristics of the even and odd modes in magnetized-ferrite-loaded double-layered coupled slotlines is studied. The analysis is based on Galerkin's method applied in the Fourier transform domain. Numerical results are presented for various values of structural parameters. As a result, it is found that the waveguide structures studied have sufficient nonreciprocity in propagation constants for isolators and four port circulators.



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Abstracts

Analysis of Multilayer Microstrip Lines by a Conformal Mapping Method (Short Papers)

J. Svacina. "Analysis of Multilayer Microstrip Lines by a Conformal Mapping Method (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 769-772.

The article contains an investigation of multilayer microstrip transmission lines. The conformal mapping method is used to obtain simple analytical relations for the filling factors and the effective permittivity of two fundamental types of three-layer microstrips. Numerical results obtained by the present method are compared with available data from other authors.



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Analysis of a New Configuration of Coplanar Stripline (Short Papers)

J.S. McLean and T. Itoh. "Analysis of a New Configuration of Coplanar Stripline (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 772-774.

A new configuration of coplanar stripline is presented and analyzed. This configuration is derived by augmenting coplanar strip-line with electrically wide lateral ground planes on either side of the balanced pair of signal lines. The ground planes should reduce line-to-line coupling in complex circuits and eliminate the TEO parasitic dielectric slab waveguide mode. Also, the spacing from signal lines to ground planes may be adjusted to change the characteristic impedance. Spectral domain analysis is used to calculate the dispersion characteristics of this transmission line. Furthermore, analytical expressions for quasi-static values of the propagation constant and characteristic impedance of the line are presented. This configuration of CPS should be useful for balanced high impedance lines in MMIC and high speed digital circuits.



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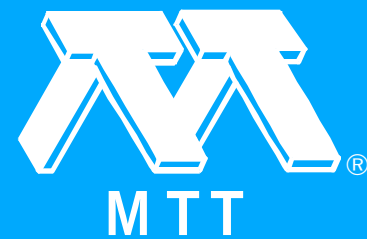


Abstracts

A Dispersive Boundary Condition for Microstrip Component Analysis Using the FD-TD Method (Short Papers)

Z. Bi, K. Wu, C. Wu and J. Litva. "A Dispersive Boundary Condition for Microstrip Component Analysis Using the FD-TD Method (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 774-777.

A dispersive absorbing boundary condition (DBC) is presented, which allows the dispersion characteristics of waves to be used as a criterion for designing absorbing boundary conditions. Its absorbing quality is superior to that of the presently used Mur's first order boundary condition for microstrip component analysis, and, as well, its implementation is much simpler when compared to that of the "super boundary condition" treatment. Due to the significant performance improvement of the new boundary condition, the memory requirement can be reduced greatly when applying this boundary condition to microstrip component analysis.



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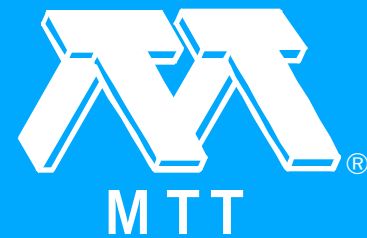


Abstracts

New Broadband Rectangular Waveguide with L-Shaped Septa (Short Papers)

P.K. Saha and D. Guha. "New Broadband Rectangular Waveguide with L-Shaped Septa (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 777-781.

Rectangular waveguides with double L-shaped septa- variants of Double T-Septa Guides (DTSG) -have been analyzed theoretically and are proposed as new broadband waveguides. Results indicate that significant improvement in cutoff wavelength and bandwidth in particular should be available with L-shaped septa in antisymmetric configuration.



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Matrix Theory Approach to Complex Waves (Short Papers)

M. Mrozowski and J. Mazur. "Matrix Theory Approach to Complex Waves (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 781-785.

Complex waves in shielded lossless inhomogeneous isotropic guides are investigated. A critical appraisal of the existing theory of complex waves is given and new approach is proposed. A mathematical condition for the existence of complex waves is derived using the properties of a generalized symmetric matrix eigenvalue problem. It is shown that complex waves may exist in slightly perturbed homogeneous guides as a result of the coupling of a pair of degenerate or nearly degenerate modes.

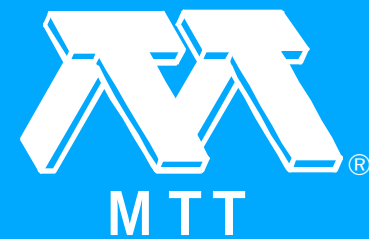
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Abstracts

Call for Papers - Symposium on Adaptive Antenna Systems (Apr. 1992 [T-MTT])

"Call for Papers - Symposium on Adaptive Antenna Systems (Apr. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.4 (Apr. 1992 [T-MTT]): 786-786.



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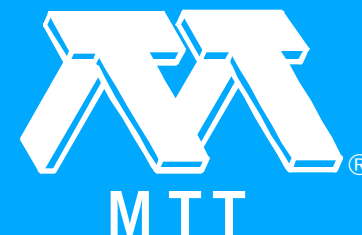
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Call for Papers - Quasi-Optical Techniques (Apr. 1992 [T-MTT])

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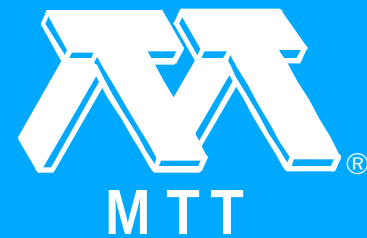
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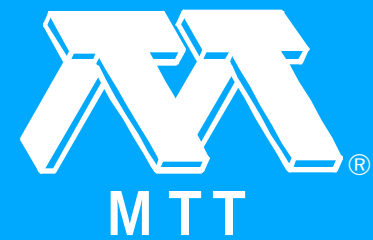
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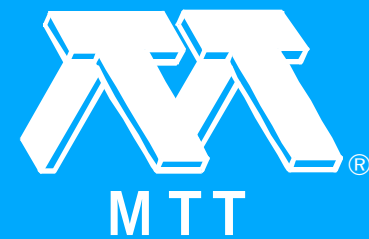
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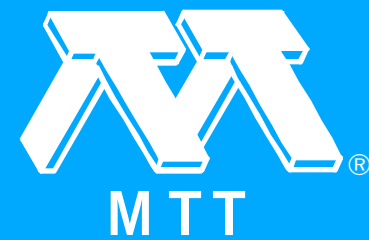
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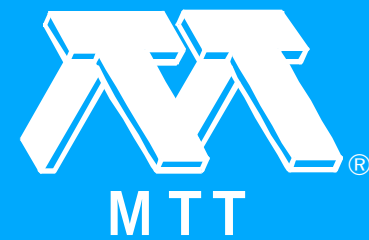
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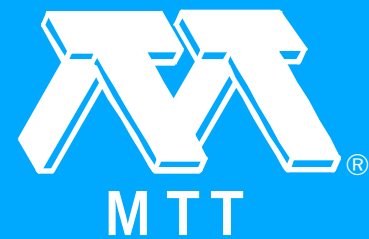
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Guest Editors' Overview (May 1992 [T-MTT])

G.M. Rebeiz and M.A. Frerking. "Guest Editors' Overview (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 793-794.

The terahertz frequency band spanning the spectral range from 100 GHz to 10 THz is one of the last major windows in the electromagnetic spectrum to be explored. The primary applications for terahertz technology has been basic scientific research including astrophysics, atmospheric physics, plasma diagnostics, and laboratory spectroscopy. The rotational emission lines of the simpler molecules occur in this band. Measurements of these spectra allow the determination of abundances, distributions, and kinematic properties of the medium in which the molecules are located. More recently radar and communications systems are employing this spectral range to combine the frequency resolution and agility available in the microwave regime with the high spatial resolution using modest apertures typical of optical technology. Because the earth's atmosphere is opaque except for a few discrete windows in this frequency range, much of the technology development is being directed toward space qualifiable components. Achieving the full potential of the terahertz region has been limited by the lack of suitable technology. The design of high performance receivers and transmitters present a major challenge to the scientific and technical community.

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The Diagonal Horn as a Sub-Millimeter Wave Antenna

J.F. Johansson and N.D. Whyborn. "The Diagonal Horn as a Sub-Millimeter Wave Antenna." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 795-800.

The far-field radiation pattern of a diagonal horn has been calculated by aperture integration. The radiation patterns for a 4 x 4 diagonal horn array, measured at 100 GHz, agree very well with the theoretical predictions. The aperture electric field was also expanded into Gauss-Hermite modes. The results indicate that the fraction of the power radiated into the fundamental Gaussian mode is about 84%. About 10% of the power is radiated in the cross-polarized component.



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High-gain Step-profiled Integrated Diagonal Horn-Antennas

G.V. Eleftheriades and G.M. Rebeiz. "High-gain Step-profiled Integrated Diagonal Horn-Antennas." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 801-805.

Dipole excited integrated horn antennas are well established by now. Their main limitation stems from their large flare angle of 70° which is inherent in the anisotropic etching process of (100) silicon wafers. The large flare-angle does not allow for integrated horns with gains higher than 13 dB and for 10-dB beamwidths less than 90° . In this paper, a new step-profiled horn is proposed which reduces the effective flare angle of the horn and allows for gains in the region of 17 dB to 20 dB to be achieved. The symmetry of the horn's radiation pattern is enhanced by positioning the exciting dipole along the diagonal of the horn cavity. A specific design example is shown with a gain of 18.4 dB and a 10-dB beamwidth of 37° in the E, H and 45° planes. The coupling efficiency of this horn to a Gaussian beam is calculated to be 83%. An equivalent smooth envelope-horn (see text) was built at 12.1 GHz and the measured patterns agree well with theory. The integrated step-profiled horn is well suited for millimeter wave and Terahertz focal plane imaging arrays requiring a large number of elements.

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Lens-Coupled Imaging Arrays for the Millimeter- and Submillimeter-Wave Regions

K. Uehara, K. Miyashita, K.-I. Natsume, K. Hatakeyama and K. Mizuno. "Lens-Coupled Imaging Arrays for the Millimeter- and Submillimeter-Wave Regions." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 806-811.

We have been developing four kinds of lens-coupled antenna imaging arrays for operation at millimeter- and submillimeter-wave frequencies. The comparison between dipole antennas, Yagi-Uda's, trap-loaded antennas, and microstrip patches will be discussed from the viewpoint of the matching with the detectors and optical systems. The radiation patterns and input impedance of each antenna have been calculated and measured to attain the optimum matching using model experiments. The trap-loaded antenna arrays have been successfully applied to plasma diagnostics at the Tsukuba GAMMA 10 tandem mirror.

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A Low Noise 230 GHz Heterodyne Receiver Employing $.25 \mu\text{m}/\text{sup } 2/\text{Area Nb}/\text{AlO}/\text{sub } x/\text{Nb}$ Tunnel Junctions

J.W. Kooi, M. Chan, T.G. Phillips, B. Bumble and H.G. LeDuc. "A Low Noise 230 GHz Heterodyne Receiver Employing $.25 \mu\text{m}/\text{sup } 2/\text{Area Nb}/\text{AlO}/\text{sub } x/\text{Nb}$ Tunnel Junctions." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 812-815.

We report recent results for a full height rectangular waveguide mixer with an integrated IF matching network. Two $.25 \mu\text{m}/\text{sub } 2/\text{Nb}/\text{AlO}/\text{sub } x/\text{Nb}$ superconducting insulating superconducting (SIS) tunnel junctions with a current density of $\sim 8500 \text{ A}/\text{cm}^2$ and ωRC of ~ 2.5 at 230 GHz have been tested. One of these quasiparticle tunnel junctions is currently being used at the Caltech Submillimeter Observatory in Hawaii. Detailed measurements of the receiver noise have been made from 200-290 GHz for both junctions at 4.2K. The lowest receiver noise temperatures were recorded at 239 GHz, measuring 48K DSB at 4.2K and 40K DSB at 2.1K. The 230 GHz receiver incorporates a one octave wide integrated low pass filter and matching network which transforms the pumped IF junction impedance to 50 Ω over a wide range of impedances.



Abstracts

Nb/Al-Al/sub 2/O/sub 3/Nb Junctions with Inductive Tuning Elements for a Very Low Noise 205-250 GHz Heterodyne Receiver

A.W. Lichtenberger, D.M. Lea, R.J. Mattauch and F.L. Lloyd. "Nb/Al-Al/sub 2/O/sub 3/Nb Junctions with Inductive Tuning Elements for a Very Low Noise 205-250 GHz Heterodyne Receiver." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 816-819.

The superconductor-insulator-superconductor (SIS) junction is the most sensitive nonlinear element for millimeter-wave heterodyne detection. We have developed a Nb/Al-Al/sub 2/O/sub 3/Nb junction fabrication process which allows the use of planar tuning circuits integrated with the junctions. These tuning elements permit the use of junctions with relatively large areas and small current densities with excellent results. Recent measurements have yielded a double sideband receiver noise temperature less than 50K from 205 to 240 GHz and 44K at 230 GHz. We are also extending our Nb/Al-Al/sub 2/O/sub 3/Nb trilayer technology to the fabrication of sub-square-micron area planar junctions for submillimeter wavelengths.



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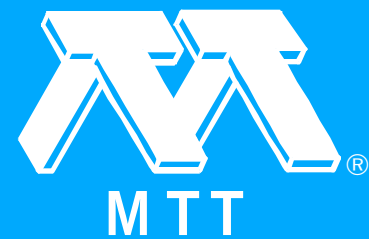
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Josephson Effect Gain and Noise in SIS Mixers

M.J. Wengler, N.B. Dubash, G. Pance and R.E. Miller. "Josephson Effect Gain and Noise in SIS Mixers." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 820-826.

Superconducting tunnel diode (SIS) mixers are used for radio astronomy from 100 to 500 GHz. They are being considered for NASA spaceborne astronomy at frequencies near 1000 GHz. We report measurements of gain and noise in SIS mixers at 230 and 492 GHz. We measure relatively high gain and noise associated with Josephson currents that have not been previously reported. These measurements show that Josephson currents are increasingly important as operating frequencies are raised. We discuss the techniques we use to make these measurements. Measurements made with hot and cold black-bodies are shown to be inaccurate at high frequencies. The problem is that SIS mixers do not always respond linearly to the signal power incident on them. This is particularly important when 1) very broad band mixers are used and 2) Josephson effect currents are important. Both of these circumstances are present in the quasioptical SIS mixers favored for 500 GHz and higher. We use monochromatic signals to measure gain and noise to get around these problems.

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On the Development of a High Efficiency 750 GHz Frequency Tripler for THz Heterodyne Systems

A. Rydberg, B.N. Lyons and S.U. Lidholm. "On the Development of a High Efficiency 750 GHz Frequency Tripler for THz Heterodyne Systems." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 827-830.

The development of a 750 GHz Schottky varactor diode frequency tripler having a measured output power and efficiency of more than 120 μ W and 0.8% at a frequency of 803 GHz is described. The output powers and efficiencies are the highest reported for this frequency. The 750 GHz tripler mount is analyzed and optimized using a scaled model of the mount. Measurements of the embedding impedance seen by the device, using the model, are compared with theoretical values.

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Current Saturation in Submillimeter Wave Varactors

E.L. Kollberg, T.J. Tolmunen, M.A. Frerking and J.R. East. "Current Saturation in Submillimeter Wave Varactors." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 831-838.

In semiconductor devices the speed of electrons cannot exceed certain limits. This phenomenon will affect varactor multipliers as well as other high frequency devices where the RF current through the active part of the device is primarily displacement current. Hence, we expect at some point "saturation" of the varactor output power. We will, in this paper, discuss this phenomenon in some detail and show that it severely deteriorates the multiplier performance at higher frequencies. Single barrier varactors (SBV) should have an advantage over GaAs Schottky diode varactors because they can be fabricated on InAs and stacked in a series array, allowing for lower current densities and higher power handling.

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Modeling of Planar Varactor Frequency Multiplier Devices with Blocking Barriers

U. Lieneweg, T.J. Tolmunen, M.A. Frerking and J. Maserjian. "Modeling of Planar Varactor Frequency Multiplier Devices with Blocking Barriers." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 839-845.

Models for optimization of planar frequency triplers with symmetrical C -- V curves are presented. Role and limitation of various blocking barriers (oxide, Mott, heterojunction) are discussed. Devices with undoped drift regions (BIN) have moderate efficiency but a broad range of power operation, whereas devices with doped drift regions (BNN) have high efficiency in a narrow power window. In particular, an upper power limit of the BNN is caused by electron velocity saturation. Implementations in SiO/sub 2/Si and AIAs/GaAs and means for increasing the power of BNN structures are considered.

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Abstracts

A Quasioptically Stabilized Resonant-Tunneling-Diode Oscillator for the Millimeter- and Submillimeter-Wave Regions

E.R. Brown, C.D. Parker, K.M. Molvar and K.D. Stephan. "A Quasioptically Stabilized Resonant-Tunneling-Diode Oscillator for the Millimeter- and Submillimeter-Wave Regions." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 846-850.

A semiconfocal open-cavity resonator has been used to stabilize a resonant-tunneling-diode waveguide oscillator at frequencies near 100 GHz. The high quality factor of the open cavity resulted in a linewidth of approximately 10 kHz at 10 dB below the peak, which is about 100 times narrower than the linewidth of an unstabilized waveguide oscillator. This technique is well suited for resonant-tunneling-diode oscillators in the submillimeter-wave region.



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Abstracts

A Periodic Second Harmonic Spatial Power Combining Oscillator (May 1992 [T-MTT])

A. Mortazawi, H.D. Foltz and T. Itoh. "A Periodic Second Harmonic Spatial Power Combining Oscillator (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 851-856.

In this paper we present a periodic second harmonic spatial power combining oscillator. The power combining is achieved by phase locking the oscillators at the fundamental frequency and combining the second harmonic power in space through an array of microstrip patch antennas. The effect of moding and multiple device-circuit interaction is investigated. This circuit is planar, and therefore simplifies the design of monolithic circuits. In this work, X-band Gunn diodes are used for the purpose of demonstration.



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Millimeter and Submillimeter Wave Quasi-Optical Oscillator with Multi-Elements (May 1992 ([T-MTT]))

H. Kondo, M. Hieda, M. Nakayama, T. Tanaka, K. Osakabe and K. Mizuno. "Millimeter and Submillimeter Wave Quasi-Optical Oscillator with Multi-Elements (May 1992 ([T-MTT]))." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 857-863.

Multi-element oscillators with a quasi-optical resonator are reported. The resonator consists of a Fabry-Perot cavity with a grooved mirror (grating) and a concave mirror. It is possible to mount solid-state devices (Gunn diode, GaAsMESFET, etc.) in the grooved mirror. The oscillator has capability for power-combining of solid-state sources in the millimeter and submillimeter wave regions.

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Power Gain in Feedback Amplifiers, A Classic Revisited

M.S. Gupta. "Power Gain in Feedback Amplifiers, A Classic Revisited." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 864-879.

This paper is a tutorial review of a classic paper of the same title authored by Samuel J. Mason, and published in 1954. That paper was the first to define a unilateral power gain for a linear two-port, and to prove that this gain is invariant with respect to linear lossless reciprocal four-port embeddings, thereby making it useful as a figure of merit intrinsic to the device. The significance of the paper stems from the fact that (a) it introduced a new fundamental parameter that is now used to evaluate all three-terminal active devices, (b) it initiated work on a new line of inquiry, which has led to the discovery of many other invariants that describe the essential constraints on the behavior of networks, and (c) its results form the foundation for many of the basic ideas currently in use, including those of the cutoff frequency of transistors, activity of devices, stability of amplifiers, and device invariants. The present article brings that original paper up-to-date, presents a tutorial exposition of its contents in a modern form, and points out its significance and applications in microwave engineering. The subsequent advances in the subject area of the paper are also summarized so that the original paper can be placed within a broader context, and understood with a more general perspective.

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Series Impedance of GaAs Planar Schottky Diodes Operated to 500 GHz

K. Bhaumik, B. Gelmont, R.J. Mattauch and M. Shur. "Series Impedance of GaAs Planar Schottky Diodes Operated to 500 GHz." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 880-885.

This paper discusses the impact of ohmic contacts on the series impedance of a GaAs cylindrical planar Schottky diode. The expression for the high-frequency impedance of an annular ohmic contact is developed using a novel transmission line model. This formulation is used to ascertain the contribution of the ohmic contact impedance to the overall device series impedance at both dc and 500 GHz. Diode impedance characterization indicates that the ohmic contact impedance makes a small contribution to the series impedance in comparison to that of the other components, both at dc and submillimeter wave-lengths. Hence, the dimensions of the contact pads can be scaled down significantly without any appreciable increase in series impedance but with a decrease in the parasitic pad-to-pad capacitance. Finally, this modeling establishes theoretical guide-lines regarding the allowable limits for specific contact resistance in small geometry diodes, so that device Z-V characteristics are not significantly altered as a result of the ohmic contact impedance.

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Analysis of the High Frequency Series Impedance of GaAs Schottky Diodes by a Finite Difference Technique

U.V. Bhapkar and T.W. Crowe. "Analysis of the High Frequency Series Impedance of GaAs Schottky Diodes by a Finite Difference Technique." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 886-894.

This paper describes a method to investigate the high frequency series impedance of GaAs Schottky barrier diodes. The analysis uses the finite difference technique to calculate the electromagnetic field within the diode chip based on a solution of Maxwell's equations, and includes high-frequency effects, such as the skin effect, charge carrier inertia, and dielectric relaxation. These effects are shown to greatly increase the series impedance at high frequencies. The finite difference technique is accurate for diode structures that incorporate an epitaxial layer of different doping than the substrate and a non-ideal ohmic contact on the bottom of the chip. An important feature of this analysis is an impedance calculation based on power considerations, rather than the electrostatic potential. The analysis is used to investigate the series impedance as a function of epilayer doping density, anode diameter, chip thickness and ohmic contact resistivity. It is shown that a proposed membrane diode, whose thickness is less than one skin depth, will have a series impedance 30 percent less than that of a comparable standard diode, provided that the ohmic contact has a specific contact resistivity of $10^{-8} \Omega/\text{cm}^2$ or less.

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A Theoretical and Experimental Study of the Noise Behavior of Subharmonically Injection Locked Local Oscillators

X. Zhang, X. Zhou and A.S. Daryoush. "A Theoretical and Experimental Study of the Noise Behavior of Subharmonically Injection Locked Local Oscillators." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 895-902.

A method for the noise characterization of optically controlled subharmonically injection locked oscillator; is presented. Based on a nonlinear model of synchronized oscillators, this method is used to formulate a general expression for phase noise calculation, so that FM noise degradation of a subharmonically synchronized LO at large-signal levels can be predicted easily and accurately. The theoretical analysis shows that 1) the n th-order subharmonic injection locking oscillator is primarily locked by the n th harmonic output of an injected signal, which is generated by the nonlinearity of the active device; 2) the minimum FM noise degradation factor of the n th order subharmonically locked oscillator is $n/2$ when the injection power is sufficiently strong; 3) a subharmonic injection locking LO with low injection power, good, FM noise degradation and large locking range can be designed by determining the optimum injection power level, by selecting the optimal nonlinear multiplication factor, and by decreasing the intrinsic noise level of the active device. The experimental results of the FM noise measurement of an oscillator confirmed the accuracy of the analysis.





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Transmission and Attenuation of Vector Modes in Uniformly Bent Circular Hollow Waveguides for the Infrared

S.-I. Abe and M. Miyagi. "Transmission and Attenuation of Vector Modes in Uniformly Bent Circular Hollow Waveguides for the Infrared." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 903-909.

Electric field distributions and attenuation constants of the eigenmodes in uniformly bent circular hollow waveguides have been evaluated based on a vector wave equation deduced from Maxwell's equations. A diagram representation of the parameter describing mode properties has been newly introduced. It is numerically shown that vector modes gradually approach linearly polarized modes when the bending radius becomes small. A relation between attenuation constants in sharply bent circular and slab hollow waveguides is also discussed where the electric fields concentrate near the outer edge of the core.

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Improvements in Fiber-Optic Transmission of Multi-Carrier TV Signals

T. Berceli, I. Frigyes, P. Gottwald, P.R. Herczfeld and F. Mernyei. "Improvements in Fiber-Optic Transmission of Multi-Carrier TV Signals." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 910-915.

In broadband networks, there is an increasing need for the transmission of more and more television channels with a higher quality. For this purpose the optical transmission proved to be one of the best solutions. However, when the number of TV channels is high, a significant harmonic and intermodulation distortion will arise. These distortions can be reduced by improving the modulation linearity of the laser or by applying a more appropriate modulation method. In this paper both solutions will be discussed and evaluated in detail. The linearity has been significantly improved by applying an active matching technique. The improvement achieved via the new driving circuit over the conventional one is 15 dB considering the third harmonic distortion. The sensitivity of QPSK TV transmission to disturbing interferences has been investigated. A new so called "group modulation" method offers a better approach for optical multi-carrier TV transmission.

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Analysis of Coupled Inset Dielectric Guides Under LSE and LSM Polarization

S.R. Pennock, D.M. Boskovic and T. Rozzi. "Analysis of Coupled Inset Dielectric Guides Under LSE and LSM Polarization." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 916-924.

The inset dielectric guide (IDG) represents an easy- to-fabricate alternative to image line that is also less sensitive to loss by radiation at discontinuities. Two IDG's geometries were analyzed. the so-called deep and shallow IDG structures, operating-in the LSE and LSM polarization, respectively. The propagation constants of single and coupled symmetrical IDG's have been calculated as well as the coupling coefficients of coupled guides. The Transverse Resonance Diffraction (TRD) method with variational formulation was used. Measured values show very good agreement with predicted values for the propagation constants of coupled deep slot IDG's. This information is a prerequisite for the design of directional couplers in IDG.

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Finite Elements for Microwave Device Simulation: Application to Microwave Dielectric Resonator Filters

J.-P. Cousty, S. Verdeyme, M. Aubourg and P. Guillon. "Finite Elements for Microwave Device Simulation: Application to Microwave Dielectric Resonator Filters." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 925-932.

The two dimensional (2-D) and three dimensional (3-D) finite element method (FEM) are applied to compute the exact scattering parameters (taking into account the transmission lines) of dielectric resonator (DR's) filters. These filters are acting both on TM or hybrid modes. A sensitivity analysis is also performed to predict the influence of the geometrical parameters on the devices responses. Examples of one, two and three DR filters are given. Experimental results are in good agreement with theoretical ones.

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Magnetostatic Wave Resonators Using Microstrip Disk

M. Tsutsumi and T. Umegaki. "Magnetostatic Wave Resonators Using Microstrip Disk." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 933-937.

We propose a magnetostatic wave resonator using yttrium iron garnet film with a microstrip disk. Assuming a magnetic wall at the edge of the disk, a dispersion relation is derived and solved numerically to obtain the resonant frequency. Resonant mode charts are given for various parameters of resonator. The quality factor is also given as a function of the resonator dimensions. Resonant characteristics are confirmed experimentally using 40 μ m and 13.5 μ m thick YIG films with 5 mm diameter strip disk at S band.



Abstracts

A Universal Model for Lossy and Dispersive Transmission Lines for Time Domain CAD of Circuits

J.I. Alonso, J. Borja and F. Perez. "A Universal Model for Lossy and Dispersive Transmission Lines for Time Domain CAD of Circuits." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 938-947.

In this paper, the Branin's method of characteristics has been extended to obtain a universal equivalent model for lossy and dispersive transmission lines. Existing CAD software packages, such as SPICE, can be used for this implementation. The starting point for obtaining the model are the analog filters that approximate the characteristic impedance $Z_{0}(s)$ and the propagation function $F(s) = \exp(-\gamma l)$ of the transmission line. The circuits are synthesized using conventional network synthesis techniques. An examination of the validity of the model is carried out analyzing an example of RLCG lines driven by bipolar logic gates and the distortion of a Gaussian dc pulse as it propagates along a microstrip line.



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Analysis of the Time Response of Nonuniform Multiconductor Transmission Lines with a Method of Equivalent Cascaded Network Chain

J.-F. Mao and Z.-F. Li. "Analysis of the Time Response of Nonuniform Multiconductor Transmission Lines with a Method of Equivalent Cascaded Network Chain." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 948-954.

In this paper nonuniform multiconductor transmission lines are considered to be equivalent to a cascaded chain of many multiport subnetworks which are made of short sections of uniform lines. The ABCD matrices of the subnetworks can be obtained by the matrix series expansions of their analytic expressions. As long as the number of the subnetworks is large enough to reflect the line nonuniformity fully, the expansions will converge so fast that a few of low-order series terms will be good approximations. After the overall ABCD matrix of the cascaded network chain is evaluated from that of each subnetwork, the time of response of transmission lines can be analyzed. The lines may have frequency-dependent parameters and arbitrary nonlinear terminals. Furthermore, transmission systems with branches uniform and nonuniform transmission lines can be studied with this method conveniently. The analysis accuracy and efficiency are discussed in detail.

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Harmonical Characterization of a Microstrip Bend via the Finite Difference Time Domain Method

N. Feix, M. Lalande and B. Jecko. "Harmonical Characterization of a Microstrip Bend via the Finite Difference Time Domain Method." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 955-961.

A 90° Microstrip bend is characterized using a Time-Frequency method based on the Finite Difference Time Domain (FDTD) method. Time evolution of the currents generated by FDTD are Fourier transformed to lead to S-parameters and radiated powers characteristic of the microstrip bend. The method for calculating both radiation and surface wave losses is developed in this paper for microstrip structures. Then, the results of the 90° microstrip bend are compared with the results of the mitred microstrip bend.





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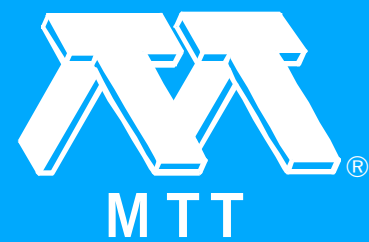
Millimeter-Wave Double-Dipole Antennas for High-Gain Integrated Reflector Illumination

D.F. Filipovic, W.Y. Ali-Ahmad and G.M. Rebeiz. "Millimeter-Wave Double-Dipole Antennas for High-Gain Integrated Reflector Illumination." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 962-967.

A double-dipole antenna backed by a ground plane has been fabricated for submillimeter wavelengths. The double-dipole antenna is integrated on a thin dielectric membrane with a planar detector at its center. Measured feed patterns at 246 GHz agree well with theory and demonstrate a rotationally symmetric pattern with high coupling efficiency to Gaussian beams. The input impedance is around 50 Ω , and will match well to a Schottky diode or SIS detector. The double-dipole antenna served as the feed for a small machined parabolic reflector. The integrated reflector had a measured gain of 37 dB at 119 μm . This makes the double-dipole antenna ideally suited as a feed for high resolution tracking or for long focal length casagrain antenna systems.

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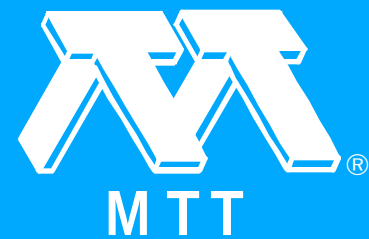
A Millimeter-Wave Integrated-Circuit Antenna Based on the Fresnel Zone Plate (May 1992 [T-MTT])

M.A. Gouker and G.S. Smith. "A Millimeter-Wave Integrated-Circuit Antenna Based on the Fresnel Zone Plate (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 968-977.

A new type of millimeter-wave integrated-circuit antenna is investigated. The antenna is based on a quasi-optical design and consists of a Fresnel zone plate on one side of a dielectric substrate and a resonant strip dipole antenna at the focus of the zone plate on the opposite side of the substrate. The unique feature of this design is that all of the components are made using simple integrated-circuit fabrication techniques: thin film metal depositions on planar dielectric substrates. Another unusual feature of this design is the short focal length of the zone plate; the focal length/diameter (f/d) for the zone plates studied ranges from 0.1 to 0.5. The antennas described are for a frequency of 230 GHz ($\lambda_{\text{sub } 0} = 1.3 \text{ mm}$); however, the design is easily scaled to other millimeter-wave or submillimeter-wave frequencies. Measured results are reported for four different focal length zone plates. Moderate gains, above 20 dB, are obtained. A theory is developed which predicts the on-axis gain, beamwidth, and side lobe levels. Design graphs are given to aid in the selection of the geometrical parameters to achieve a desired gain from the integrated-circuit zone-plate antenna.

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Fast Rigorous Analysis of Shielded Planar Filters

C.J. Railton and S.A. Meade. "Fast Rigorous Analysis of Shielded Planar Filters." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 978-985.

Much interest has been shown by industry and in the literature regarding the analysis of complex planar components such as are found in modern (M)MIC's. Many of the published results have, however, required the use of a large computer. In this contribution a technique is described whereby rigorous analyses of moderately complex planar circuits may be obtained on a relatively small desktop computer. Results obtained using a personal computer are presented for several planar filter geometries. These are in good agreement with published results which use more computationally expensive techniques.

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The Incorporation of Static Field Solutions Into the Finite Difference Time Domain Algorithm

D.B. Shorthouse and C.J. Railton. "The Incorporation of Static Field Solutions Into the Finite Difference Time Domain Algorithm." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 986-994.

This paper demonstrates how the accuracy, speed and flexibility of FDTD analysis may be improved for the modelling of MMIC structures. Correction factors, obtained from the known behavior of static fields close to discontinuities, may be incorporated into the algorithm for application in the regions of high field variation where errors would otherwise occur. Application is made to both enclosed and open microstrip structures.

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Lower and Upper Bounds of Cutoff Frequencies in Metallic Waveguides

L. Gruner. "Lower and Upper Bounds of Cutoff Frequencies in Metallic Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 995-999.

It is shown how the upper and lower bounds of the cutoff frequencies of TE and TM modes in many waveguides bounded by metallic lossless walls and which maybe hollow or comprise one or more inner conductors, can be computed using two independent methods. The methods are applicable whenever the cross-section of the waveguide can be split up into several regions bounded by lines having a fixed coordinate and includes several cases of practical interest. The theory is illustrated with reference to a rectangular coaxial line.





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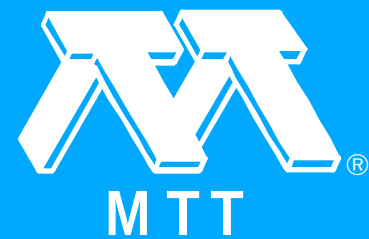
Accurate Full-Band Equivalent Circuits of Inductive Posts In Rectangular Waveguide

T. Rozzi, F. Moglie, A. Morini, W. Gulloch and M. Politi. "Accurate Full-Band Equivalent Circuits of Inductive Posts In Rectangular Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1000-1009.

Inductive posts of finite dimensions are currently employed for the precise realization of millimeter wave filters in waveguide. Although this structure constitutes a classical problem, no true wideband equivalent circuit seems to be available, that is, with elements dependent only on post geometry and, at the same time, capable of describing higher order mode interaction. The availability of such an equivalent circuit is a prerequisite for efficient CAD. We develop a rigorous wide-band model, inclusive of near neighbor interaction, suitable for accurate filter synthesis and CAD by means of a desk-top computer. Three actual applications to the design of multipost filters are presented with practical results in excellent agreement with computer predictions. Computation times are such that the analysis can be effected in real time.

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Modified Concentric Loop for Focused Electromagnetic Heating of Limbs and Torsos (Short Papers)

K.A. Nabulsi and J.R. Wait. "Modified Concentric Loop for Focused Electromagnetic Heating of Limbs and Torsos (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1010-1012.

An idealized two dimensional model of modified concentric loop for focused electromagnetic heating of limbs and torsos is considered. In contrast to the uniform current excitation, the present scheme has two current nulls diametrically opposite to one another. In this case, the circumferential electric field does not vanish on the axis which overcomes the principal criticism of the uniform loop.

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Bias-Dependence of the Intrinsic Element Values of InGaAs /InAlAs /InP Inverted Heterojunction Bipolar Transistor (Short Papers)

B. Meskoob, S. Prasad, M. Vai, J.C. Vlcek, H. Sato and C.G. Fonstad. "Bias-Dependence of the Intrinsic Element Values of InGaAs /InAlAs /InP Inverted Heterojunction Bipolar Transistor (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1012-1014.

The small-signal S parameters of an inverted In-GaAs/ InAlAs/InP heterojunction bipolar transistor are measured at 39 bias points covering the entire useful bias region. Small-signal model fitting is performed at each bias point. The results of the small-signal model fitting show that in this device it is sufficient to take five intrinsic elements of the model to be bias dependent. The methodology and the results of the simulations are presented here.

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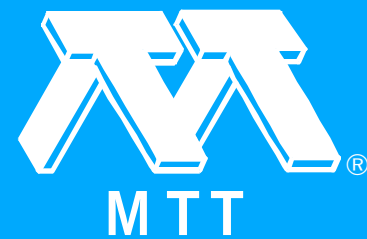


Abstracts

On the Representational Nonuniqueness of Uniform Waveguide Eigenvalue Formulas (Short Papers)

P.L. Overfelt. "On the Representational Nonuniqueness of Uniform Waveguide Eigenvalue Formulas (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1014-1018.

In the following, we find that for uniform perfectly conducting waveguides characterized by rectilinear boundaries and exact eigenvalue formulas, such formulas are not representationally unique. They are specific examples of general homogeneous polynomials of degree p in q variables, known as q -ary, p -ic forms. Using the concepts of equivalence and congruence, we find that an infinite number of eigenvalue formulas (that are members of an equivalence or congruence class) may be associated with a given waveguide cross section.



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Effects of Misalignment on Propagation Characteristics of Transmission Lines Printed on Anisotropic Substrates (Short Papers)

T.Q. Ho and B. Beker. "Effects of Misalignment on Propagation Characteristics of Transmission Lines Printed on Anisotropic Substrates (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1018-1021.

The spectral-domain method is applied to study the propagation characteristics of grounded transmission lines on biaxial substrates whose axes are misaligned with those of the line. The three structures under investigation are the grounded slotline, microstrip, and the edge coupled line. The formulation derives an expression for the Green's function that is valid for substrates which are simultaneously characterized by both their permittivity and permeability tensors. The off-diagonal elements of the permittivity tensor, present due to the misalignment of the axes, are used to examine the dispersion properties of these transmission lines with numerous case-studies presented for different angles of rotation.

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Analysis of an Infinite Array of Rectangular Anisotropic Dielectric Waveguides Using the Finite-Difference Method (Short Papers)

C.L. da Silva Souza Sobrinho and A.J. Giarola. "Analysis of an Infinite Array of Rectangular Anisotropic Dielectric Waveguides Using the Finite-Difference Method (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1021-1025.

The finite-difference method is used in the analysis of the propagation characteristics of an infinite array of rectangular dielectric waveguides. Particular attention is devoted to the mode coupling analysis and a comparison with results from an integral equation method is presented. The wave equation is solved in terms of the transverse components of the magnetic field, resulting in an eigenvalue problem with the elimination of spurious modes. The formulation is general and may be applied to the solution of other problems, including those with anisotropic dielectrics and with a continuous variation of the index of refraction profile in the waveguide cross section.

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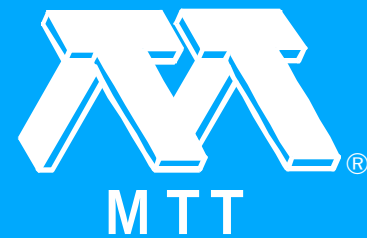


Abstracts

Analysis of Coupling in Image Guide Technology (Short Papers)

D.L. Paul, M. Habibi, J. Castrillo, P. Gelin and S. Toutain. "Analysis of Coupling in Image Guide Technology (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1025-1028.

Coupling for symmetrical and asymmetrical structures in image guide technology is described. Starting from Trinh and Mittra's analysis, we propose some improvements for treating strong coupling between an image guide and a ring resonator of any radius of curvature, by taking into account the field displacement effect, and for a nonsymmetric coupler, the difference between the propagation constants of the straight and curved image guides. A comparison between this analysis and Trinh and Mittra's experiments has been made.



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Abstracts

Microwave Reflection at an Active Surface Imbedded with Fast-Ion Conductors (Short Papers)

P.S. Neelakanta, J. Abello and C. Gu. "Microwave Reflection at an Active Surface Imbedded with Fast-Ion Conductors (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1028-1030.

The microwave reflection characteristics at a surface of a composite medium comprised of thermally controllable, solid-electrolyte based active-zones are studied. These zones are energized (heated) reconfigurably so as to alter their electric conductivity, and hence their reflection/transmission characteristics. Experimental studies at X-band frequencies on a test active surface formed by a two dimensional array of AgI pellets (fast-ion conductors) imbedded in a dielectric medium are presented. Suitability of the proposed composite-medium for broadband applications is indicated.



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Abstracts

Degradation of Power Combining Efficiency Due to Variability Among Signal Sources (Short Papers)

M.S. Gupta. "Degradation of Power Combining Efficiency Due to Variability Among Signal Sources (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1031-1034.

The power combining efficiency of a symmetric n-way power combiner depends on the degree of impedance among its input signals. This paper establishes the worst-case efficiency for a combiner when its input signal amplitudes and phases are uncertain, but constrained to given ranges. This result is then used to deduce the permissible tolerance in the uniformity of components used in power combiner construction, given the maximum acceptable efficiency degradation.



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Abstracts

Electromagnetic Field Plot of an Inductive Window by the Moment Method (Corrections)

J.R. Natzke, M.R. Wolski and T.K. Ishii. "Electromagnetic Field Plot of an Inductive Window by the Moment Method (Corrections)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1035-1035.

The above paper contains three errors. Equation (5) should read:



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Whispering Gallery Dielectric Resonator Modes for W-Band Devices (Comments)

M.J. Niman. "Whispering Gallery Dielectric Resonator Modes for W-Band Devices (Comments)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1035-1038.

The above paper is a valuable contribution to a field which has little coverage in the literature. Working through the results however, it is felt that a discrepancy exists which may mislead other workers in this subject. In this regard, Section II-D and Fig. 6 which discuss a measurement in the 75-110 GHz band, raise most concern. In the paper the resonances on the plot (reproduced in Fig. 1) are attributed to whispering gallery (WG) modes $WGE_{\text{sub } 60-10,0,0/}$

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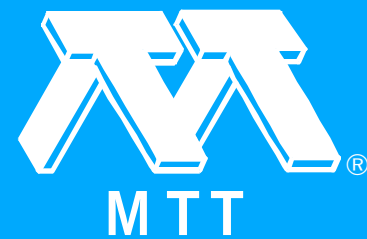


Abstracts

A Novel Method for Modeling Coupling Between Several Microstrip Lines in MIC's and MMIC's (Comments)

E. Costamagna. "A Novel Method for Modeling Coupling Between Several Microstrip Lines in MIC's and MMIC's (Comments)." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1038-1039.

In the above paper, the capabilities of a described four-port generalized coupling model (GCM) in analysing multiple coupled microstrip line circuits are deeply explored. The model is used to describe coupling between nonadjacent lines as well as adjacent ones, and interesting results are shown.



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Abstracts

Call for Papers - Symposium on Adaptive Antenna Systems (May 1992 [T-MTT])

"Call for Papers - Symposium on Adaptive Antenna Systems (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1040-1040.



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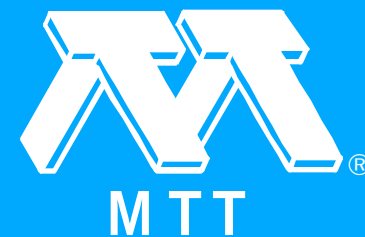
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Abstracts

Call for Papers - Quasi-Optical Techniques (May 1992 [T-MTT])

"Call for Papers - Quasi-Optical Techniques (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1041-1041.



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Abstracts

Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (May 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1042-1042.



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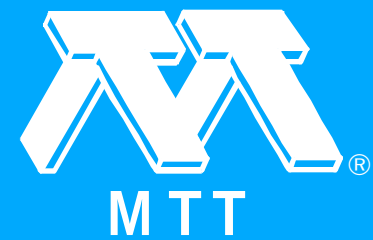
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Abstracts

Information for Authors (May 1992 [T-MTT])

"Information for Authors (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1043-1043.



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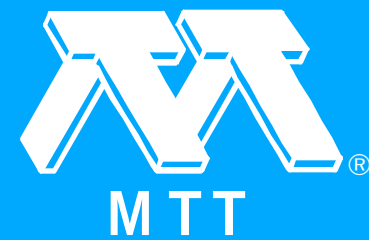
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Abstracts

IEEE Home Video Tutorials (Advertisement) (May 1992 [T-MTT])

"IEEE Home Video Tutorials (Advertisement) (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 1044-1044.



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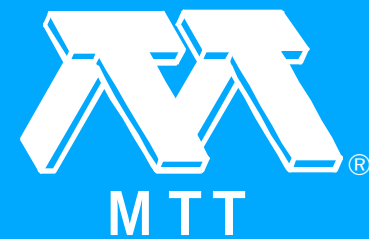
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Back Cover (May 1992 [T-MTT])

"Back Cover (May 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): b1-b2.



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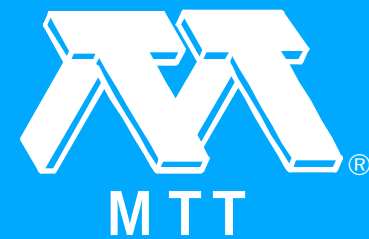
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Front Cover (Jun. 1992 [T-MTT])

"Front Cover (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): f1-f2.



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Guest Editors' Overview (Jun. 1992 [T-MTT])

R.M. Dickinson and W.C. Brown. "Guest Editors' Overview (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1045-1046.

ISY 92, The International Space Year 1992, is a global event that marks the 35th anniversary of the International Geophysical Year which ushered in the Space Age. It is also the 500th anniversary of the discovery of America by Columbus. The planning for ISY 92 was initiated in the summer of 1987 by an assembly of Pacific Rim Countries that met in Hawaii, but the participation has since expanded to include all the Earth's nations that are involved in major space activities. At that time, Dr. Russell Drew, past President of the IEEE, chaired a working group composed of Professional Societies.

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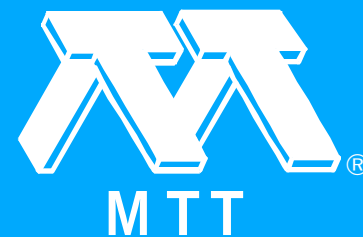


Abstracts

Design Concepts of a 1-MW CW X-Band Transmit/Receive System for Planetary Radar

A.J. Freiley, B.L. Conroy, D.J. Hoppe and A.M. Bhanji. "Design Concepts of a 1-MW CW X-Band Transmit/ Receive System for Planetary Radar." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1047-1055.

The conceptual design of the 1-MW X-Band Transmit System for the Goldstone Solar System Radar represents the next step in the quest to expand planetary radar explorations. The radar transmitter requirements are summarized. The characteristics and expected performance of the major elements are discussed, including the klystrons, power amplifiers, microwave transmission lines, feed systems, beam power supply, heat exchanger, phase stable exciter, and the monitor/control system. An assessment of the technology development needed to meet the system requirements is given, and possible areas of difficulty are outlined.



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Abstracts

250-kW CW Klystron Amplifier for Planetary Radar

R.A. Cormier and A. Mizuhara. "250-kW CW Klystron Amplifier for Planetary Radar." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1056-1062.

Jet Propulsion Laboratory contracted with Varian Associates to design, build, and deliver replacements for VA-949J klystrons in the X-band planetary radar transmitter on the Goldstone, CA, 70-meter antenna. Output power was to be increased from 200 kW to 250 kW CW per klystron, and full dc beam power was to be dissipated in the collector (it is not possible to operate the VA-9496J without RF drive because of limited collector dissipation capability). Replacements were to be made with a minimum of transmitter modifications. Two model VKX-7864A klystrons were subsequently built and delivered. This report describes the design of these klystrons and the results of their performance testing. The planetary radar transmitter is now operating with these two klystrons.



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Development of the ERS-1 Active Radar Calibration Unit

H.D. Jackson and A. Woode. "Development of the ERS-1 Active Radar Calibration Unit." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1063-1069.

This paper describes the development of a microwave Active Radar Calibration Unit (ARC) used as a ground calibration reference standard for the European Remote Sensing Satellite ERS-1 imaging Synthetic Aperture Radar. Three such units are placed across the radar swath giving, point target returns with a known signal strength and are used to calibrate the radar image. The units have been designed for maximum stability with temperature (<0.1 dB over the temperature range of -15°C to $+35^{\circ}\text{C}$); for absolute calibration the ARC is referenced to a flat plate using a novel technique of multiple transmission in its self calibration mode, achieving an absolute calibration error of <0.14 dB.



Abstracts

Satellite Radar Altimetry

C.H. Davis. "Satellite Radar Altimetry." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1070-1076.

A brief review of the historical development and principles of satellite radar altimetry is presented, with special emphasis placed on the unique capability of the microwave altimeter to provide valuable information for global geoscientific studies. Altimeter data over the ocean is used to monitor mean sea levels, waveheights, windspeeds, and surface topographical features. Over the ice sheets, the altimeter data is used to produce surface elevation maps, while repeated measurements are used to monitor volume changes. The success of earlier altimeter missions has promoted the development of future missions that will provide more accurate data sets. These will continue the study of Earth's systems well into the 21st century.



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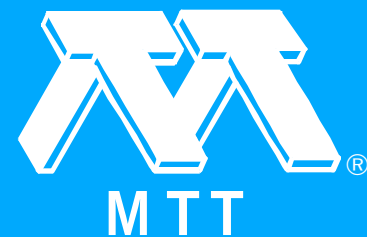


Abstracts

Rings of Earth

R.M. Goldstein and L.W. Randolph. "Rings of Earth." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1077-1080.

We have used the planetary radar at the Jet Propulsion Laboratory's Goldstone Tracking Station to monitor small particles of orbital debris. This radar can detect metallic objects as small as 1.8 mm in diameter at an altitude of 600 km. The results of our first set of observations show a flux (at 600 km) of 6.4 objects per sq km per day, of equivalent size of 1.8 mm or larger. Forty percent of the observed particles appear to be concentrated into one or two orbits. An orbital ring with the same inclination as the radar (35.1°), is suggested. However, an orbital band with the much higher inclination of 66° is also a possibility. Neither explanation is without difficulty.



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A Space-Based Microwave Radar Concept

D. Chakraborty. "A Space-Based Microwave Radar Concept." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1081-1089.

A Space-Based Microwave Radar (SBR) Concept is defined using a tether trans/receive antenna supported between two gravity gradient low earth-orbiting satellites. A cluster of four tether antennas each of 6 km maximum length and 1.5 km separation between tethers constitutes a radar. A system of 8 to 11 such clusters constitutes the overall radar scheme which will cover approximately one third of the earth surface for detecting sea-based targets. Issues identified are the array structure, coherence of tethered arrays, grating lobe energy clamping, clutter effects, communications, system requirements and the overall radar system concept including stability considerations. This paper presents the base-line definition of an alternate space-based radar scheme. A significant amount of R&D efforts will be required to derive practical solutions of the proposed scheme.

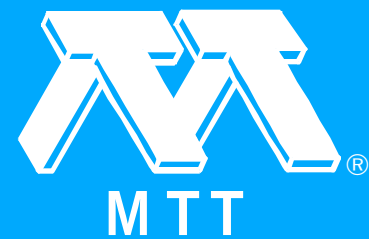


Abstracts

The Millimeter Wave Atmospheric Sounder (MAS): A Shuttle-Based Remote Sensing Experiment

C.L. Croskey, N. Kampfer, R.M. Belivacqua, G.K. Hartmann, K.F. Kunzi, P.R. Schwartz, J.J. Olivero, S.E. Puliafito, C. Aellig, G. Umlauf, W.B. Waltman and W. Degenhardt. "The Millimeter Wave Atmospheric Sounder (MAS): A Shuttle-Based Remote Sensing Experiment." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1090-1100.

The Millimeter Wave Atmospheric Sounder (MAS) will be launched by the Space Shuttle in the spring of 1992 as part of the ATLAS 1 (ATmospheric Laboratory for Application and Science) mission. Using passive limb-scanning millimeter wave radiometry, it will sense the thermal emission produced by ozone at 184 GHz, water vapor at 183 GHz, chlorine monoxide at 204 GHz, and oxygen (for retrieval of temperature and pressure) at 60 GHz. From these observations, concentration profiles of these gases throughout the middle atmosphere will be made. This paper describes the fundamentals of the measurements, the design of the radiometers, and the approaches used for the data analysis.



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Search for Sulfur (H_2S) on Jupiter at Millimeter Wavelengths

J. Joiner, P.G. Steffes and K.S. Noll. "Search for Sulfur (H_2S) on Jupiter at Millimeter Wavelengths." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1101-1109.

We have observed Jupiter at two wavelengths near 1.4 mm in an attempt to detect gaseous hydrogen sulfide (H_2S) or place new upper limits on its abundance in Jupiter's atmosphere. Although we were not successful in detecting H_2S , we report the first brightness temperature observations of Jupiter at 1.4 mm with a spectral resolution of approximately 1 GHz using Mars as the calibration standard. We also discuss the methodology and results of a laboratory experiment in which we measured H_2S absorption at 1.4 mm in a simulated Jovian atmosphere (predominantly H_2 and He). We apply the results of our laboratory measurements to a radiative transfer model which we use to interpret our observations of Jupiter.

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Microwave SAW Bandpass Filters for Spacecraft Applications

H. Shinonaga and Y. Ito. "Microwave SAW Bandpass Filters for Spacecraft Applications." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1110-1116.

Surface acoustic wave (SAW) bandpass filters are small in size, light in weight, and reliable, and can be designed to possess very sharp frequency selectivity and/or a linear phase response. When such stringent filter characteristics were required, not a few satellites used SAW bandpass filters in their transponders in spite of their relatively large insertion losses. These on-board SAW bandpass filters were limited to be operation in the IF (lower than 400 MHz) frequency range. This paper describes microwave SAW bandpass filters for spacecraft applications. Two SAW bandpass filters were designed and fabricated in the 1.5 GHz band using temperature-stable ST-cut quartz substrates. The SAW bandpass filters were then assembled in a SAW filter bank. One unique feature of the SAW filter bank is that a broader band is available merely by adding the outputs of SAW bandpass filters adjacent in the frequency domain. Measured electrical responses as well as results of a transmission experiment show satisfactory performance. Finally, effects of the temperature and aging stability characteristics are investigated based on the measured and calculated responses.



Abstracts

Computer-Aided Design of Beam Forming Networks for Modern Satellite Antennas

F. Alessandri, M. Mongiardo and R. Sorrentino. "Computer-Aided Design of Beam Forming Networks for Modern Satellite Antennas." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1117-1127.

Multicontoured and reconfigurable beam spacecraft antennas rely on sophisticated beam forming networks (BFN). Accurate and efficient CAD tools are required to meet the stringent requirements on the power (division, while avoiding any tuning or trimming of the BFN. This paper presents advanced field theoretical techniques for the analysis and optimization of microwave beam forming networks realized in both waveguide and square coaxial cable technologies. Such advances consist in new segmentation techniques of the microwave components associated with efficient mode-matching formulations for the modeling of isolated as well as coupled discontinuities. The achieved numerical efficiency, allows sophisticated synthesis procedures, based on repeated full-wave analysis in wide frequency bands, to be performed on small machines such as a 386 PC. The design tools developed have been widely validated through a comprehensive test campaign.



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Modeling of Planar Quasi-Tem Superconducting Transmission Lines

D. Antsos, W. Chew, A.L. Riley, B.D. Hunt, M.C. Foote, L.J. Bajuk, D.L. Rascoe and T.W. Cooley. "Modeling of Planar Quasi-Tem Superconducting Transmission Lines." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1128-1132.

Design oriented modeling of high-temperature superconducting thin-film microwave circuits is difficult when film thickness is of the order of the penetration depth of the fields. Involved formulas for loss, phase velocity and characteristic impedance can be derived from the Bardeen-Cooper-Schrieffer (BCS) theory of superconductivity. The parameters required by these formulas do not correspond to "readily measurable" observable that depend on the manufacturing process of the superconductor. In this paper an application of the phenomenological loss equivalence method in modeling the microwave behavior of planar quasi-TEM superconducting transmission lines is presented. Measured and modeled S-parameters of an existing superconducting coplanar waveguide lowpass filter agree to within 0.3 dB in magnitude and 0.5 radians in phase. Extracted values for penetration depth and real part of the conductivity of the superconducting film are within 10% of the findings of other researchers.

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Innovations in Microwave Filters and Multiplexing Networks for Communications Satellite Systems

C. Kudsia, R. Cameron and W.-C. Tang. "Innovations in Microwave Filters and Multiplexing Networks for Communications Satellite Systems." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1133-1149.

The advent of commercial satellite communications in the late 1960s provided a challenge to the microwave industry. It demanded technological advances to reduce the mass and volume of the communications payload and, at the same time, more efficient delivery of higher effective isotropic radiated power (EIRP) to the ground stations. One of the areas most dramatically impacted has been that of microwave filters and multiplexing networks. The past two decades have seen an order of magnitude improvement in the mass and volume of microwave filters. In the area of frequency combining or multiplexing, it is now possible to design and implement microwave multiplexing networks with arbitrary frequency spacing and channel bandwidths with an accuracy that was once reserved for individual microwave filters. This has allowed implementation of single mode transmit antennas. Such an antenna design provides maximum gain over a given coverage area and hence a maximum of EIRP. The net effect of these innovations has been the lowering of cost of a satellite channel. This paper describes the evolution of microwave filters and multiplexer for space application. The many advances are described within the context of the design of the overall communications subsystem. Extra emphasis is placed on the multipaction and passive intermodulation (PIM) considerations in (designing high power multiplexer. The impact of microwave filter technology in the channel characterization of satellite systems is described. The future directions of research and development are briefly discussed.

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Abstracts

Overview of Microwave Components Activities at the European Space Agency

R. Coirault, S.J. Feltham, G. Gatti, M. Guglielmi and D. Perring. "Overview of Microwave Components Activities at the European Space Agency." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1150-1158.

A review of some of the activities of the European Space Agency in the area of Microwave Devices and Components for Space Application is presented. The activities discussed are in the areas of Solid State Devices and Technology, Traveling Wave Amplifiers, Microwave Filters and Time References. Each area is discussed in detail illustrating the achievements of on-going research and development programs involving European Industries and Research Centers. The growing importance of Microwave Technology for space applications is discussed and the future challenges outlined indicating how the European Space Industry is preparing for the future through the many R&D activities sponsored by the European Space Agency.



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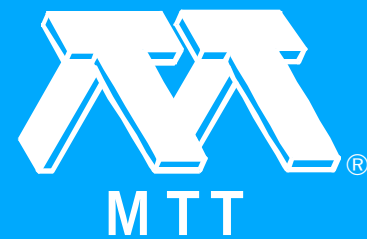


Abstracts

The ACTS Multibeam Antenna

F.A. Regier. "The ACTS Multibeam Antenna." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1159-1164.

The Advanced Communications Technology Satellite (ACTS) to be launched in 1993 introduces several new technologies including a multibeam antenna (MBA) operating at Ka-band. The satellite is introduced briefly, and then the MBA, consisting of electrically similar 30 GHz receive and 20 GHz transmit offset Cassegrain systems--both utilizing orthogonal linear polarizations, is described. Dual polarization is achieved by using one feed assembly for each polarization in conjunction with nested front and back subreflectors, the gridded front subreflector acting as a window for one polarization and a reflector for the other. The antennas produce spot beams with approximately 0.3 degree beamwidth and gains of approximately 50 dBi. High surface accuracy and high edge taper produce low sidelobe levels and high cross-polarization isolation. A brief description is given of several Ku-band components fabricated for ACTS. These include multiflare antenna feedhorns, beam-forming networks utilizing latching ferrite waveguide switches, a 30 GHz HEMT low-noise amplifier and a 20 GHz TWT power amplifier.



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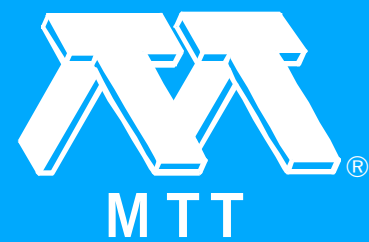
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Miniaturized Reverse Modulation Loop of a CQPSK 120-Mbit/s Modem for Spacecraft Applications

K.H.R. Kirmse, R.K. Gupta, F.T. Assal and R.T. Kroll. "Miniaturized Reverse Modulation Loop of a CQPSK 120-Mbit/s Modem for Spacecraft Applications." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1165-1170.

The design and performance of a miniaturized reverse modulation loop (RML) for a 120-Mbit/s coherent quadrature phase shift keying (CQPSK) modem for on-board satellite applications are presented. Analysis of time delays within the RML circuit indicates that any differential time-delay errors can adversely affect the associated BER and should be minimized. The RML circuit, consisting of a modulator, demodulator, and comparator circuit, has been fabricated using quasi-monolithic techniques with dimensions of 1.65 x 4 cm. The relative phase for all four states of the modulator is in close agreement with design values of $90^\circ \pm 1^\circ$ over a 200-MHz bandwidth at 3.95 GHz. The demodulator and comparator circuits of the RML have successfully recovered a 120-Mbit/s bit stream. The RML circuit is capable of recovering higher bit rates because of relatively uniform amplitude and phase performance over the 3.7- to 4.2-GHz communications satellite band.





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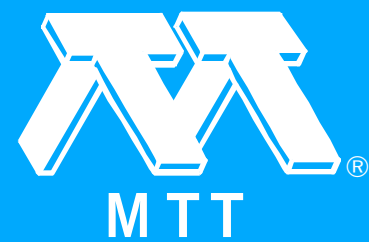
Microwave Systems Applications in Deep Space Telecommunications and Navigation: Space Exploration Initiative Architectures

J.R. Hall, R.C. Hastrup and D.J. Bell. "Microwave Systems Applications in Deep Space Telecommunications and Navigation: Space Exploration Initiative Architectures." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1171-1178.

The United States Space Exploration Initiative (SEI) calls for the charting of a new and evolving manned course to the Moon, Mars, and beyond. The fundamental SEI support objectives are to provide the mission with means to monitor and control mission elements, acquire engineering, science, and navigation data, compute state vectors and navigate, and move these data efficiently and automatically between mission nodes for timely analysis and decision-making. Microwave links provide the means to communicate between system nodes, and the essential radio metrics to navigate; later, these likely will be augmented with optical links. Although these objectives do not depart, fundamentally, from those evolved over the past 30 years in supporting deep space robotic exploration, there are several new challenges. This paper first familiarizes the reader with the general mission telecommunications and navigation support requirements and resulting architectures for SEI mission support, and then discusses the implications of these on the role of microwave technology in these architectures, particularly for Mars exploration support. Effective use of microwave technology is enabling, and obviously the sine qua non of the mission support architecture.

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Microwave Electrothermal Propulsion for Space

J.L. Power. "Microwave Electrothermal Propulsion for Space." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1179-1191.

The microwave electrothermal thruster (MET) is an attractive concept for medium or high power spacecraft propulsion. The heart of the concept lies in heating a propellant gas by passing it through a microwave plasma discharge. As described in the paper, the plasma is created in a resonant cavity by tuning either the TM(011) or the TM(012) mode for impedance-matched operation, using two internal tuning mechanisms. The MET concept is electrodeless, synergistically combines high pressure and high power capability, provides external control over the energy-conversion discharge, and operates on hydrogen propellant. Upwards of 95% efficiency has been reported in absorbing the applied microwave power in the plasma discharge. By employing a magnetic nozzle with the MET, substantial performance and life gains are expected due to reduced wall heating and losses, improved recovery of propellant internal energy, and discharge stabilization. Calculations of potential MET performance predict that 2000 sec. specific impulse at 6000 K average discharge chamber temperature and 1.0 MPa (10 atm.) pressure are reasonable goals with hydrogen propellant. Apparatus is described for testing the resonant-cavity MET to power levels of 30 kW at 915 MHz on nitrogen, helium, and hydrogen. It includes a superconducting magnet, providing field strengths to 5.7 T, to implement a magnetic nozzle. The low-ripple operation of the microwave generator has been verified, as has a procedure for starting the microwave discharge and raising the power applied to the cavity via a phase shifter-tuner. Impedance-matched resonant operation of the microwave cavity has been achieved.

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Abstracts

An X-Band Spacecraft Transponder for Deep Space Applications--Design Concepts and Breadboard Performance

N.R. Mysoor, J.D. Perret and A.W. Kermode. "An X-Band Spacecraft Transponder for Deep Space Applications--Design Concepts and Breadboard Performance." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1192-1198.

This article summarizes the design concepts and measured performance characteristics of an X-band bread-board deep-space transponder (DST) for future spacecraft applications, with the first use scheduled for the Cassini missions in 1997 and 1996, respectively. The DST consists of a double-conversion, superheterodyne, automatic phase tracking receiver, and an X-band exciter to drive redundant downlink power amplifiers. The receiver acquires and coherently phase tracks the modulated or unmodulated X-band uplink carrier signal. The exciter phase modulates the X-band downlink signal with composite telemetry and ranging signals. The measured tracking threshold, automatic gain control (AGC), static phase error, and phase jitter characteristics of the breadboard DST are in good agreement with the expected performance. The measured results show a receiver tracking threshold of -158 dBm and a dynamic signal range of 88 dB.



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Doppler Tracking of Planetary Spacecraft

P.W. Kinman. "Doppler Tracking of Planetary Spacecraft." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1199-1204.

This article concerns the measurement of Doppler shift on microwave links that connect planetary spacecraft with the Deep Space Network. Such measurements are made by tracking the Doppler effect with phase-locked loop receivers. A description of equipment and techniques as well as a summary of the appropriate mathematical models are given. The two-way Doppler shift is measured by transmitting a highly-stable microwave (uplink) carrier from a ground station, having the spacecraft coherently transpond this carrier, and using a phase-locked loop receiver at the ground station to track the returned (downlink) carrier. The largest sources of measurement error are usually plasma noise and thermal noise. The plasma noise, which may originate in the ionosphere or the solar corona, is discussed; and a technique to partially calibrate its effect, involving the use of two simultaneous downlink carriers that are coherently related, is described. Range measurements employing Doppler rate-aiding are also described.

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Performance Capabilities of HBT Devices and Circuits for Satellite Communication

K. Fricke, G. Gatti, H.L. Hartnagel, V. Krozer and J. Wurfl. "Performance Capabilities of HBT Devices and Circuits for Satellite Communication." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1205-1214.

We have investigated the HBT performance with emphasis on its possible utilization in satellite power amplifiers. After recalling the requirements of satellite power amplifiers the suitability of HBT is discussed in depth including the output power capabilities, the realizable power-added efficiency and linearity, reliability considerations and circuit aspects. Models and simulation tools of HBT in power amplifiers are discussed and the results obtained so far are quoted. A comparison of realized HBT and various FET devices and circuits demonstrates that the HBT is a promising device for applications in satellite power amplifiers. The HBT will be a preferable device for microwave power amplification if the problems concerning the reliability can be solved and further investigations will be performed to obtain larger devices with higher rated output power.

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38-GHz-band High-power MMIC Amplifier Module for Satellites On-Board Use

M. Shigaki, S. Koike, K. Nogatomo, K. Kobayashi, H. Takahashi, T. Nakatani, N. Tanibe and Y. Suzuki. "38-GHz-band High-power MMIC Amplifier Module for Satellites On-Board Use." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1215-1222.

This paper presents the design and development results of 38-GHz high-power MMIC amplifier modules for use in the solid state power amplifier (SSPA) to be carried aboard Engineering Test Satellite VI in 1993. This amplifier will be used in millimeter-wave intersatellite communication experiments. For the development of this amplifier, we designed high-power, highly reliable FET's with 0.25 μm -long gates. The FET large-signal impedance was accurately measured using an improved load-pull method and MMIC transformers. The measurements were used to design two types of MMIC 's: one composed of two FET cells with 600 μm wide gates, and the other of four FET cells with 400 μm wide gates. We also developed a two-stage amplifier package consisting of two of these MMIC's that can be used at 38 GHz. We obtained a P_o (1 dB) of 25 dBm and a gain of 11 dB. A 38-GHz test conducted during chip screening achieves a high production yield without circuits adjustment.

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Traveling-Wave Amplifiers with Prescribed Frequency Response

W.D. Palmer and W.T. Joines. "Traveling-Wave Amplifiers with Prescribed Frequency Response." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1223-1229.

This paper develops the design of microwave transistor amplifier combinations that have controlled frequency response over a specified bandwidth. Theoretical analysis of such an amplifier with an arbitrary number of sections is presented. The response of the amplifier is controlled by tapering the frequency selectivity or Q of each section of the amplifier. To verify the theory, a three-section amplifier with maximally-flat time delay response is designed, constructed, and evaluated. Existing traveling-wave amplifiers are modeled as lossy transmission lines. Although the amplifiers are relatively broadband, a prescribed frequency response is not achieved, and each transistor does not receive an equal portion of the signal power. Resistive elements are required for impedance matching at the input and output. The amplifier design developed in this work seeks to improve on existing techniques by trading bandwidth for controlled gain. By making the transmission line that connects the amplifier sections non-uniform, the frequency response is controlled over the design bandwidth. The impedance of the transmission lines is specified so that all of the input power is delivered to each transistor equally. No resistive elements are required for impedance matching, thus reducing the inherent noise of the amplifier. The designs are easily implemented using familiar components.

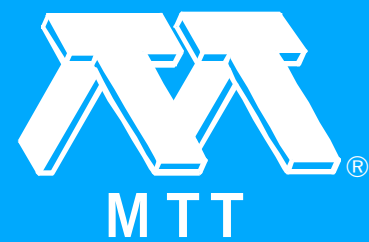


An Overview of the Solar Power Satellite Option

P.E. Glaser. "An Overview of the Solar Power Satellite Option." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1230-1238.

The objective of the solar power satellite (SPS) is to convert solar energy in space for use on Earth. Its most significant benefit is the potential for continuously generating large-scale electric power for distribution on a global basis. While there has been no SPS development program in the United States since 1980, it has continued to be investigated in several countries. The SPS system is outlined and the status of the SPS concept development is reviewed. Results of assessments of key issues are reported including economic considerations and environmental issues such as health and ecological effects of microwave beaming, non-microwave health and ecological effects, beam effects on the atmosphere and ionosphere, and electromagnetic compatibility, as well as physical resource requirements including land use, materials availability and energy pay-back periods. Legal issues and the need for international agreements on SPS operations are outlined. International SPS-related activities are discussed within the context of evolving space programs with the focus on Europe, Japan and the former U.S.S.R. An approach for an evolutionary advancement of SPS to meet requirements for power supplied at first for use on Earth and in space is presented, and a growth path to achieve the potential of power from space for use on Earth is outlined. The significance of advancements in technologies applicable to the development of the SPS as an alternative energy option for use on Earth, and as a potential stimulus for space infrastructure evolution, including the use of extraterrestrial resources, are discussed.





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Beamed Microwave Power Transmission and its Application to Space

W.C. Brown and E.E. Eves. "Beamed Microwave Power Transmission and its Application to Space." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1239-1250.

The general principles and special components of beamed microwave power transmission systems are outlined and their application to the space program discussed. The beamed system is defined as starting with a dc source of power at the transmitting end, converting it to a microwave beam for transmission through space, and ending with the dc power output at the receiving end. Using this definition, an experimentally measured and certified dc to dc efficiency of 54% has been achieved. The major contribution of beamed power to the development of space is its unique ability to transfer energy across long distances and across large differences in gravitational potential, making possible such developments in space as the Solar Power Satellite system. In that system electric energy obtained from the sun by satellites in geostationary orbit is transmitted to Earth. The application that is discussed in detail is a low-Earth orbit to geostationary orbit (LEO to GEO) transportation system that depends upon vehicles propelled by electric thrusters whose power is supplied by a microwave beam originating at the Earth's surface. A scenario for such a system is chosen and the performance results presented. The advantages of the all electronic system over a chemically propelled system are enumerated. The principles of space propulsion, particularly as they relate to electric propulsion, are outlined. Key components at the terminals of the system are discussed including the "rectenna" which provides a source of continuous dc power in space with a revolutionary low ratio of mass to dc power output of 1 kg/kW. Environmental considerations are discussed.

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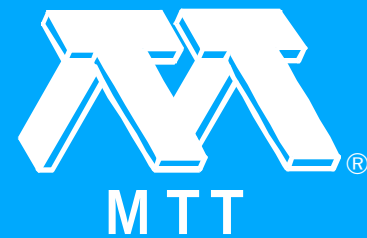


Abstracts

Millimeter Wave Technology for Space Power Beaming

P. Koert and J.T. Cha. "Millimeter Wave Technology for Space Power Beaming." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1251-1258.

This paper reports on the design and development of millimeter wave rectennas and power beaming systems. It includes a brief discussion on the history of power beaming, the basic components of a high frequency power beaming system, the advancement of millimeter wave rectenna technology, and possible terrestrial, space and lunar applications.



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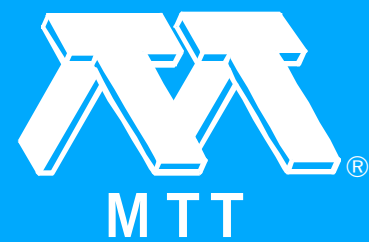
Theoretical and Experimental Development of 10 and 35 GHz Rectennas

T.-W. Yoo and K. Chang. "Theoretical and Experimental Development of 10 and 35 GHz Rectennas." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1259-1266.

A 35 GHz rectenna has been developed with 39% conversion efficiency. The rectenna uses a microstrip dipole antenna and a commercially available mixer diode. Over 60% conversion efficiency was demonstrated using this diode at 10 GHz. A theoretical analysis was derived to predict the performance of the rectenna. The analysis is a useful tool for device and circuit design. The theoretical and experimental results should have many applications in microwave power transmission and detection.

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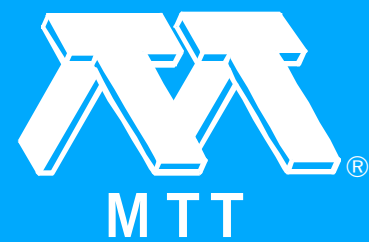
The Main Principles of a 70-M Radio Telescope Reflecting System Design

V.A. Grishmanovsky, A.N. Kozlov and V.B. Tarasov. "The Main Principles of a 70-M Radio Telescope Reflecting System Design." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1267-1273.

Design work intended to create a 70-m axisymmetrical reflector antenna with modified reflector profiles started in 1969 in the USSR. It took four years to complete experimental investigations, development of design documentation, technical and financial examination in order to validate the financial risk when realising such a large project. The financing was opened in 1973 and the cooperative efforts of numerous industrial and building/erecting enterprises was crowned with successful commission of RT-70 radiotelescope in 1978 in Yevpatoriya. Since 1982 the pedestal room of the antenna is equipped by six feeds, and the operation mode switching is implemented by means of special asymmetrical dual-reflector communication system. Photograph of such antenna is shown in Fig. 1. In course of design work the intensive progress of geometry-optical method for synthesis of a dual-reflector system with specified characteristics was stimulated. The synthesis problems remain actual up to now. The synthesis theory used under RT-70 designing differs from well-known approaches by the strictness of a task statement and a solution generality. In process of RT-70 designing the complex problems arose due to diffraction phenomenon on the twin-reflector commutator the reflector size-in which in decimetric wave range does not exceed 4-5 λ . In order to solve these problems the special diffraction shields had to be applied here. In the centimeter wave range the problems connected with diffraction are getting unessential. All these questions are omitted in this article. Another problem the designers encountered was the problem of phase compensation of the reflector system gravitational deformation. The reflector shape is not the second order surface in this system. This problem was solved successfully and results of the radioastronomical investigations of the phase compensation system performance efficiency are given in the paper.

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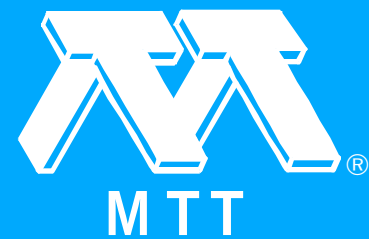
Beam-Waveguide Antenna Performance Predictions with Comparisons to Experimental Results

D.A. Bathker, W. Veruttipong, T.Y. Ootshi and P.W. Cramer, Jr.. "Beam-Waveguide Antenna Performance Predictions with Comparisons to Experimental Results." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1274-1285.

This article presents an overview of a NASA/JPL antenna project, with specific focus on the methodology used to predict the microwave performance of a new 34-m-diameter beam-waveguide (BWG) reflector antenna, designated DSS 13. Deep Space Station 13 is the research and development facility serving the NASA/JPL Deep Space Network. Three companion articles in this issue detail the microwave test packages, test results, and microwave holography-based evaluations and alignment. This article provides microwave performance predictions as well as a summary of test results for the antenna, which has Cassegrain and centerline BWG operating modes at X-band (8.450-GHz) and Ku-band (32-GHz) frequencies. Predictions were used to identify critical and poorly understood areas needing further study and diagnostic testing, and assisted in planning, scheduling, and evaluating the final results of a detailed test program. Predictions were assembled for all known losses that contribute to antenna performance degradations, including antenna area efficiencies, corresponding beampeak gains, and noise temperatures. It was found that predictions and experimental results agreed reasonably well for beampeak gain and corresponding efficiency, and for several (but not all) noise temperatures. It is believed that the performance predictions and measurements described herein may be the most detailed and accurate available for a large reflector antenna with two significant operating modes and two frequencies.

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Portable Microwave Test Packages for Beam-Waveguide Antenna Performance Evaluations

T.Y. Otoshi, S.R. Stewart and M.M. Franco. "Portable Microwave Test Packages for Beam-Waveguide Antenna Performance Evaluations." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1286-1293.

Portable microwave test packages used to evaluate a new 34-m-diameter beam-waveguide (BWG) antenna are described. The experimental methodology involved transporting test packages to different focal points of the BWG system and making noise temperature, antenna efficiency, and holography measurements. Comparisons of data measured at the different focal points enabled determinations of performance degradations caused by various mirrors in the BWG system. It is shown that, due to remarkable stabilities and accuracies of radiometric data obtained through the use of the microwave test packages, degradations caused by the BWG system were successfully determined.

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Microwave Antenna Holography

D.J. Rochblatt and B.L. Seidel. "Microwave Antenna Holography." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1294-1300.

Microwave holography, as applied to reflector antennas, is a technique which utilizes the Fourier Transform relation between the complex farfield radiation pattern of an antenna and the complex aperture distribution. Resulting aperture phase and amplitude distribution data are used to precisely characterize various crucial performance parameters, including panel alignment, subreflector position, antenna aperture illumination, directivity at various frequencies, and gravity deformation effects. The holography technique provides a methodology for analysis, evaluation, and RF performance improvement of large reflector and beam waveguide antennas. Strong C W signals obtained from geostationary sources were used as far-field sources. This article describes the application of the holography technique to the newly constructed NASA/JPL Deep Space Network (DSN) 34-m beam-waveguide antenna, resulting in 4.1-dB performance improvement at 32 GHz by reducing the main reflector rms surface error to 0.43 mm. The improved antenna performance was verified by additional holographic measurements and efficiency measurements at X-band (8.45 GHz). Microwave holography has been demonstrated to be a required tool for achieving antenna aperture efficiency of 52% at Ka-band (32 GHz), and is likely required for maintaining an operational DSN Ka-band ground antenna capability.

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Efficiency Measurement Techniques for Calibration of a Prototype 34-Meter-Diameter Beam-Waveguide Antenna at 8.45 and 32 Ghz

S.D. Slobin, T.Y. Otoshi, M.J. Britcliffe, L.S. Alvarez, S.R. Stewart and M.M. Franco. "Efficiency Measurement Techniques for Calibration of a Prototype 34-Meter-Diameter Beam-Waveguide Antenna at 8.45 and 32 Ghz." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1301-1309.

Efficiency measurement: at 8.45 and 32 GHz (X- and Ku-bands) have been carried out on a new 34-meter-diameter beam-waveguide antenna now in use at the NASA/JPL Goldstone Deep Space Communications Complex. The use of portable test packages enabled measurements at both the Cassegrain and beam-waveguide focal points. Radio sources (quasars and Venus) were used as calibrators, and updated determinations of flux and source size correction were made during the period of the measurements. Gain and efficiency determinations as a function of elevation angle are presented, and the effects of the beam-waveguide system and antenna structure are clearly seen. At the beam-waveguide focus, an 8.45-GHz peak efficiency of 72.38 percent was measured; at 32 GHz, 44.89 percent was measured.

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Direct PO Optimized Dual-Offset Reflector Antennas for Small Earth Stations and for Millimeter Wave Atmospheric Sensors

B. Schlobohm, F. Arndt and J. Kless. "Direct PO Optimized Dual-Offset Reflector Antennas for Small Earth Stations and for Millimeter Wave Atmospheric Sensors." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1310-1317.

An efficient direct numerical synthesis method for dual offset reflector antennas is described which is directly based on the physical optics procedure for both reflectors (PO-PO-method) and where the reflector surfaces are advantageously characterized in the spatial domain by a two-dimensional Fourier-transformation. The method involves an evolution strategy optimization algorithm in order to shape immediately both reflectors, so as to generate the desired far field with prescribed criteria. The efficiency of the design method is demonstrated for two computer-optimized dual offset antenna design examples for space applications. The first example, a very compact optimum shaped Gregorian dual offset earth station antenna with high offset angle (70°) and small subreflector size (13 k) achieves a very low sidelobe attenuation level within the envelope of only 23-25 log OdBi, and low crosspolarization attenuation (38 dB). The second example, a shaped dual offset Cassegrain atmospheric sensor antenna for 200 GHz, demonstrates that beam scanning by more than 10 half-power beamwidths is possible with nearly constant half-power beamwidth by simply displacing linearly the subreflector. The consequent advantage is the very low mass to be moved. The theory is verified by available measured results.

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The Effect of Quasi-Optics Errors on Reflector Antenna Performance

P.R. Foster and R.J. Wylde. "The Effect of Quasi-Optics Errors on Reflector Antenna Performance." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1318-1322.

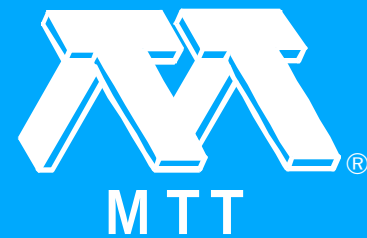
The use of quasi-optics feed systems with a reflector antenna allows multiple frequency operation over a very wide bandwidth for remote sensing of the earth and atmosphere from space. The errors in such a multichannel quasi-optical feed system must be controlled in order to limit the degradation of system performance. These errors can be attributed to the presence of higher order Gaussian modes but the errors can be minimised if the quasi-optical system can be made independent of frequency. If volume limitations preclude a frequency independent design, the amplitude of the higher order Gaussian modes must be controlled.



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Call for Papers - Symposium on Adaptive Antenna Systems (Jun. 1992 [T-MTT])

"Call for Papers - Symposium on Adaptive Antenna Systems (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1323-1323.



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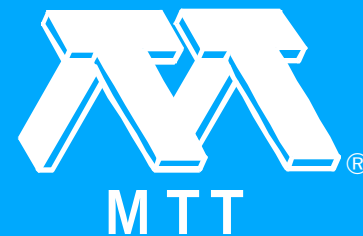
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Call for Papers - Quasi-Optical Techniques (Jun. 1992 [T-MTT])

"Call for Papers - Quasi-Optical Techniques (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1324-1324.



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Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Jun. 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1325-1325.



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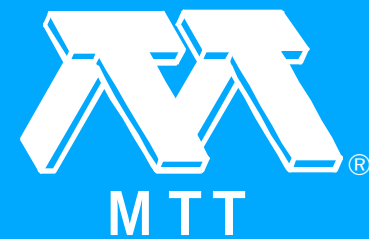
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"Home Video Tutorials on Emerging Technologies (Advertisement) (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1327-1327.



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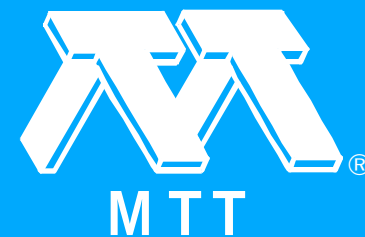
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"IEEE Conference Proceedings (Advertisement) (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): 1328-1328.



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"Back Cover (Jun. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.6 (Jun. 1992 [T-MTT] (Special Issue on Microwaves in Space)): b1-b2.



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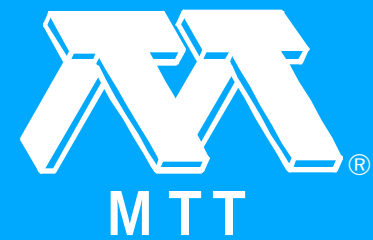
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Abstracts

Front Cover (Jul. 1992 [T-MTT])

"Front Cover (Jul. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): f1-f2.



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Process-Oriented Microwave CAD and Modeling -- Guest Editorial (Jul.1992 [T-MTT])

J.W. Bandler and R.H. Jansen. "Process-Oriented Microwave CAD and Modeling --Guest Editorial (Jul.1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1329-1332.

Design by computer was once regarded by some with serious misgivings. It is now embraced by almost every engineer as an essential component of the art and science of engineering practice. Real, hands-on engineering design now includes computer hardware, computer software and information processing in various relevant forms. Indeed, technical advances have created a situation in which it is sometimes hard to distinguish between simulation of information processing systems and the information processing activity itself.



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Physics-Based Electron Device Modelling and Computer-Aided MMIC Design

F. Filicori, G. Ghione and C.U. Naldi. "Physics-Based Electron Device Modelling and Computer-Aided MMIC Design." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1333-1352.

The paper provides an overview on the state of the art and future trends in physics-based electron device modelling for the computer-aided design of monolithic microwave IC. After a review of the main physics-based approaches to microwave modelling, special emphasis is placed on innovative developments relevant to circuit-oriented device performance assessment, such as efficient physics-based noise and parametric sensitivity analysis. The use of state-of-the-art physics-based analytical or numerical models for circuit analysis is discussed, with particular attention to the role of intermediate behavioral models in linking multidimensional device simulators with circuit analysis tools. Finally, the model requirements for yield-driven MMIC design are discussed, with the aim of pointing out the advantages of physics-based statistical device modelling; the possible use of computationally efficient approaches based on device sensitivity analysis for yield optimization is also considered.

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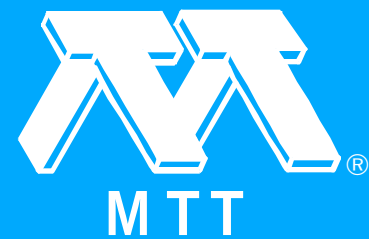
Yield Optimization Using a GaAs Process Simulator Coupled to a Physical Device Model

D.E. Stoneking, G.L. Bilbro, P.A. Gilmore, R.J. Trew and C.T. Kelley. "Yield Optimization Using a GaAs Process Simulator Coupled to a Physical Device Model." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1353-1363.

A physics based large-signal GaAs MESFET model and circuit simulator has been developed to predict and optimize the yield of GaAs MESFET designs before fabrication. Device acceptance criteria include both small- and large-signal RF operating characteristics such as small-signal gain, maximum added efficiency, and output power at 1 dB gain compression. Channel doping details are described directly from processing specifications for parameters such as material deposition, ion implantation, and implant annealing. Monte Carlo techniques are used to estimate yield when disturbances in the physical parameters are modeled as multivariate Gaussian distributions. The yield estimator is integrated with an optimizer so that a design can be centered for maximum yield in the presence of process disturbances.

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Efficient Development of Mass Producible MMIC Circuits

E.M. Bastida, G. Donzelli and M. Pagani. "Efficient Development of Mass Producible MMIC Circuits." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1364-1373.

The state of the art criteria and tools for an efficient development of mass producible MMIC's are discussed with reference to a specific development philosophy. The available yield evaluation systems are then critically analyzed and the results are reported of a systematic functional yield evaluation we performed on a large number of monolithic circuit components. Subsequently a statistically meaningful data base (including both FET equivalent circuit and S parameters) is reported, that we developed for parametric yield evaluation and yield driven design centering. Finally, through a significant example, the possibility is demonstrated of drastically improving the accuracy of the parametric circuit yield forecasts by using a small set of mutually uncorrelated process dependent parameters and by making reference to a physically based semiempirical FET model.

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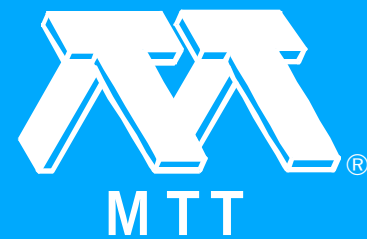


Abstracts

Integrated Physics-Oriented Statistical Modeling, Simulation and Optimization

J.W. Bandler, R.M. Biernacki, Q. Cai, S.H. Chen, S. Ye and Q.-J. Zhang. "Integrated Physics-Oriented Statistical Modeling, Simulation and Optimization." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1374-1400.

We contribute herein to the effective utilization of physics-, geometry- and process-related parameters for yield-driven microwave device modeling and circuit design. We address physics-based modeling of MESFETs from the point of view of efficient simulation, accurate behavior prediction and robust parameter extraction. We present a novel integration of a large-signal physics-based model into the harmonic balance equations for simulation of nonlinear circuits, involving an efficient Newton update. We exploit this integration in gradient-based FAST (Feasible Adjoint Sensitivity Technique) circuit optimization. For the purpose of yield-driven circuit design we present a relevant physics-based statistical modeling methodology. Our statistical implementations use models originated by Ladbrooke and Khatibzadeh and Trew. We embed these physics based device models in the yield optimization process for MMICs using appropriate multidimensional statistical distributions. Quadratic approximation of responses and gradients suitable for yield optimization is discussed. We verify our theoretical contributions and exemplify our computational results using built-in and user-programmable modeling capabilities of the CAE systems OSA90/hope™ and HarPE™. In this context, we report on results of device modeling using a field-theoretic nonlinear device simulator.



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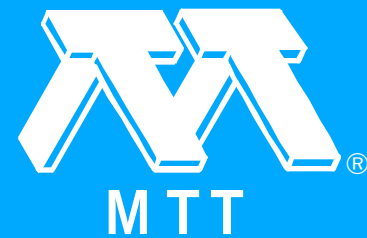


Abstracts

GaAs MESFET Physical Models for Process-Oriented Design

C.M. Snowden and R.R. Pantoja. "GaAs MESFET Physical Models for Process-Oriented Design." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1401-1409.

A detailed physical model is described which is used to accurately predict the dc and microwave performance of GaAs MESFET's. This model, which accounts for hot electron effects in sub-micron FET's, includes trapping phenomena and heating due to power dissipation. It is used to determine the optimal design for small-signal and power devices, including single- and double-recessed FET's. The spread in device characteristics can be directly related to the variation in device geometry and process parameters experienced in fabrication. The accuracy and flexibility of this approach is demonstrated by comparison with measured data for a variety of devices.



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Instantaneous Model of a MESFET for use in Linear and Nonlinear Circuit Simulations

I. Corbella, J.M. Legido and G. Naval. "Instantaneous Model of a MESFET for use in Linear and Nonlinear Circuit Simulations." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1410-1421.

A formal approach for nonlinear modeling of FET's is presented. The intrinsic transistor is described by current and charge generators, that are instantaneously dependent on the two internal voltages. The extrinsic parasitic elements are also included. This instantaneous model is obtained from the small signal equivalent circuit computed at a number of bias points, by integration of the bias dependent elements. A program for using this model in nonlinear circuit analysis has been developed. The process has been carried out for two transistors, one being of low noise, and the other a power MESFET. Good agreement has been observed when comparing the non-linear analysis with measured data. Finally a Solid State Power Amplifier at 28 GHz has been designed using the power transistor, delivering 21 dBm at 1 dB compression point.



Impedance Characterization of GaAs FET Switches

H. Takasu and E. Yamashita. "Impedance Characterization of GaAs FET Switches." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1422-1429.

The FET switch is a very complicated device to analyze all characteristics at the same time because of the existence of nonlinearity, three-dimensional electrodes, passivation layers, and depletion regions. Since the GaAs FET switch can be regarded as a linear small-signal device in the on- and off-state, a linear analysis is carried out in this paper only of the two states but by taking into account the geometry of electrodes, passivation layers, and depletion regions. The rectangular boundary division method is applied to solve Laplace's equation for the impedance characterization of GaAs FET switches. Equivalent electrical circuits composed of capacitors and resistors are defined for the on-state and off-state of a FET switch. The capacitances and resistances in the equivalent circuits are estimated and compared with experimentally measured values at 10 GHz. The quality factor of the FET switch, which can be used for estimating insertion loss, is calculated by using the two equivalent series impedances of the FET switch corresponding to the two states.





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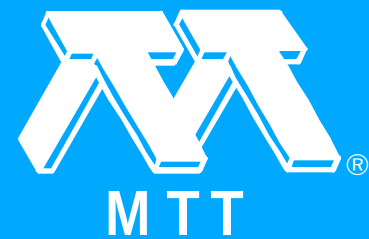
A Technique for Modelling S-Parameters for HEMT Structures as a Function of Gate Bias

S.J. Mahon, D.J. Skellern and F. Green. "A Technique for Modelling S-Parameters for HEMT Structures as a Function of Gate Bias." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1430-1440.

A physically based technique for modelling HEMT structure S-parameters is presented. The core of the model is directly dependent on the HEMT wafer structure and the physical gate length. The model accurately predicts the device's S-parameters as a function of the applied gate bias. The physical basis facilitates the modelling of different types of HEMT structures. In this paper we present measured S-parameters and simulation results, over a frequency range of 1 to 25 GHz, for three different HEMT structures: uniformly-doped, GaAs-channel; pulse-doped, GaAs-channel; and uniformly-doped, strained-InGaAs-channel.

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HEMT for Low Noise Microwaves: CAD Modeling Oriented

A. Caddemi, G. Martines and M. Sannino. "HEMT for Low Noise Microwaves: CAD Modeling Oriented." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1441-1445.

By means of an automatic measuring system which allows the rapid and accurate characterization of microwave transistors in terms of noise and scattering parameters simultaneously, 32 HEMT's of four manufacturers have been tested. From the experimental data so obtained the equivalent circuit of the "typical" device which represents each transistor set has been extracted using a decomposition technique. This procedure allows the optimum fitting of the global performance by exploiting the correlation between the model elements and the measured parameters over the operating frequency range. Since the method takes into account also the noise behavior of several devices of each series, we get a substantial improvement of the model performance to be employed in (M)MIC CAD of low noise amplifiers.

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Simultaneous Thermal and Electrical Analysis of Nonlinear Microwave Circuits

V. Rizzoli, A. Lipparini, V.D. Esposti, F. Mastri and C. Cecchetti. "Simultaneous Thermal and Electrical Analysis of Nonlinear Microwave Circuits." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1446-1455.

The paper introduces a new software tool for the simultaneous determination of the thermal and electrical steady-state regimes of nonlinear microwave circuits containing temperature-dependent active devices. The analysis technique is an extension of the classic piecewise harmonic-balance method, and is quite general-purpose. It can be applied to networks operating under multipletone excitation, including pulsed-RF regimes. The simulation problem is reduced to a nonlinear algebraic solving system whose unknowns are electrical and thermal state-variable harmonics. Advanced numerical techniques are used to effectively overcome the difficulties arising from the high degree of nonlinearity and from the very large number of unknowns of the numerical problem. The program incorporates a facility for the evaluation of the thermal constants of multiple-finger planar devices starting from geometrical data.

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A Nonlinear Integral Model of Electron Devices for HB Circuit Analysis

F. Filicori, G. Vannini and V.A. Monaco. "A Nonlinear Integral Model of Electron Devices for HB Circuit Analysis." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1456-1465.

A technology-independent large-signal model of electron devices, the Nonlinear Integral Model (NIM), is proposed. It is rigorously derived from the Volterra series under basic assumptions valid for most types of electron devices and is suitable for Harmonic-Balance circuit analysis. Unlike other Volterra-based approaches, the validity of the NIM is not limited to weakly nonlinear operation. In particular, the proposed model allows the large-signal dynamic response of an electron device to be directly computed on the basis of data obtained either by conventional measurements or by physics-based numerical simulations. In this perspective, it provides a valuable tool for linking accurate device simulations based on carrier transport physics and Harmonic-Balance circuit analysis algorithms. Simulations and experimental results, which confirm the validity of the Nonlinear Integral Model, are also presented.

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Technology Related Design of Monolithic Millimeter-Wave Schottky Diode Mixers

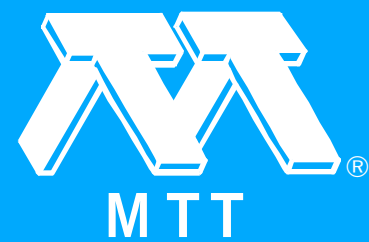
J.-M. Dieudonne, B. Adelseck, K.-E. Schmegner, R. Rittmeyer and A. Colquhoun. "Technology Related Design of Monolithic Millimeter-Wave Schottky Diode Mixers." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1466-1474.

The development of monolithic millimeter-wave Schottky diode mixers based on technological parameters is described. The complete equivalent circuit of the monolithic Schottky diode is calculated taking into account the semiconductor layer structure and the device geometry. This model has been used in a harmonic balanced software for designing monolithic single balanced mixers. In V-band a minimum DSB noise figure of 3.3 dB and a minimum conversion loss of 6 dB have been achieved. In W-band a minimum DSB noise figure of 4 dB and a minimum conversion loss of 7 dB have been obtained.

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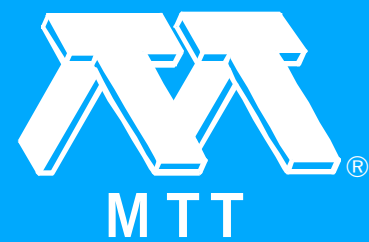
Rigorous Analysis of 3-D Planar Circuit Discontinuities Using the Space-Spectral Domain Approach (SSDA)

K. Wu, M. Yu and R. Vahldieck. "Rigorous Analysis of 3-D Planar Circuit Discontinuities Using the Space-Spectral Domain Approach (SSDA)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1475-1483.

A new method, the Space-Spectral Domain Approach (SSDA), has been developed to determine scattering parameters for arbitrarily shaped multilayered planar MIC /MMIC discontinuities. Although the basic framework of the SSDA has been introduced previously, only resonant frequencies of planar circuit discontinuities could be calculated. The SSDA as presented in this paper is not only significantly extended, but it also introduces the new concept of self-consistent hybrid boundary conditions to replace the modal source concept in the feed line. Furthermore, a general error function is derived to provide a direct assessment of the discretization accuracy. The convergence behavior of this new method is investigated, and current standing-wave profiles along microstrip throughlines with matched, open and short-circuited conditions are given. Finally, S-parameters for several microstrip discontinuities with abrupt and smooth transition are illustrated to demonstrate the flexibility of this new approach.

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A Technique for the Fullwave Automatic Synthesis of Waveguide Components: Application to Fixed Phase Shifters

F. Alessandri, M. Mongiardo and R. Sorrentino. "A Technique for the Fullwave Automatic Synthesis of Waveguide Components: Application to Fixed Phase Shifters." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1484-1495.

An efficient, computer synthesis technique for waveguide components, based on rigorous field-theoretical models, has been developed. A computer code has been specifically set up for the automatic design of fixed phase shifters in rectangular waveguide technology. Only the electrical specifications are required to generate, normally in 15 to 20 minutes on a 386/16 MHz IBM PC, the geometrical structure of the components. The agreement with the experiments is shown to be so accurate as to avoid any tuning of the circuits realized. The efficiency and accuracy of the code is based on i) a suitable segmentation technique of the microwave structure to obtain a very simple but rigorous network model; ii) the efficient representation of the modal series for the electromagnetic fields; iii) a synthesis procedure based on a simplified model to obtain a good initial guess for the final full-wave optimization routine.

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Fast Capacitance Extraction of General Three-Dimensional Structures

K. Nabors, S. Kim and J. White. "Fast Capacitance Extraction of General Three-Dimensional Structures." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1496-1506.

In [1], a boundary-element based algorithm is presented for computing the capacitance of three-dimensional m-conductor structures whose computational complexity grows nearly as mn , where n is the number of elements used to discretize the conductor surfaces. In that algorithm, a generalized conjugate residual iterative technique is used to solve the $n \times n$ linear system arising from the discretization, and a multipole algorithm is used to compute the iterates. In this paper, several improvements to that algorithm are described which make the approach in [1] applicable and computationally efficient for almost any geometry of conductors in a homogeneous dielectric. In particular, a new adaptive multipole algorithm is described, along with a strategy for accelerating the iterative algorithm by exploiting electrostatic screening. Results using these techniques in a program which computes the capacitance of general three-dimensional structures are presented to demonstrate that the new algorithm is nearly as accurate as the more standard direct factorization approach, and is more than two orders of magnitude faster for large examples.

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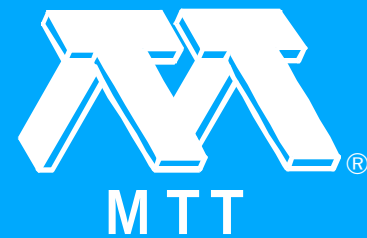


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Circuit Models for Three-Dimensional Geometries Including Dielectrics

A.E. Ruehli and H. Heeb. "Circuit Models for Three-Dimensional Geometries Including Dielectrics." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1507-1516.

The Partial Element Equivalent Circuit (PEEC) approach has proven to be useful for the modeling of many different electromagnetic problems. The technique can be viewed as an approach for the electrical circuit modeling for arbitrary three dimensional geometries. For example, the "3D transmission line" properties of VLSI interconnects and packages can be modeled. Recently, we extended the method to include retardation with the rPEEC models. So far the dielectrics have been taken into account only in an approximate way. In this paper, we generalize the technique to include arbitrary homogeneous dielectric regions. The new circuit models are applied in the frequency as well as the time domain. The time solution allows the modeling of VLSI systems which involve interconnects as well as nonlinear transistor circuits.



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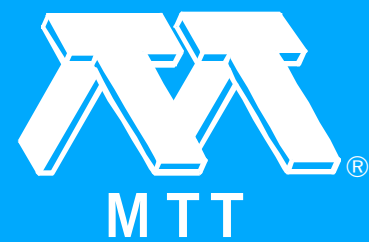
Time Domain Electromagnetic Simulation for Microwave CAD Applications

W.J.R. Hoefer. "Time Domain Electromagnetic Simulation for Microwave CAD Applications." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1517-1527.

Rapid progress in time domain modeling and computer technology have brought practical time domain simulators within reach. The next decade will see the emergence of sophisticated time domain simulation tools linking geometry, layout, physical and processing parameters of a microwave or high speed digital circuit with its system specifications and the desired time and frequency performance, including electromagnetic susceptibility and emissions. These CAD systems will most likely employ dedicated parallel processors configured specifically for modeling three-dimensional field problems. Furthermore, the nature of discrete time domain algorithms allows the designer to employ optimization and synthesis procedures which differ from those employed in traditional frequency domain CAD tools. In this paper, recent progress in time domain modeling will be highlighted, and the possible impact of these development on future CAD procedures and systems will be discussed.

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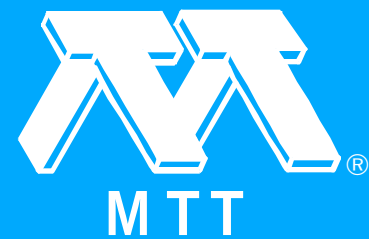
Modal S-Matrix Design of Metal Finned Waveguide Components and its Application to Transformers and Filters

J. Bornemann and F. Arndt. "Modal S-Matrix Design of Metal Finned Waveguide Components and its Application to Transformers and Filters." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1528-1537.

Optimized all-metal E-plane finned waveguide components are designed with the rigorous method of modal field expansion into the ridged eigenmodes, which includes both the higher order mode interaction between the step discontinuities and the finite thickness of the fins. The design which combines the advantage of constant fin thickness with that of the optimum matching potential of different waveguide inner cross-section dimensions and fin heights achieves very broad-band transformers and evanescent-mode filters with improved performance. Computer optimized data demonstrate the efficiency of the method by typical design examples: Compact transformers for WR112, WR42, WR15, and WR12 input waveguides to E-plane finned waveguides achieving return losses of more than 33 dB, or 20 dB, respectively, for the whole waveguide bands; corrugated lowpass filters designed for a cutoff frequency in the waveguide Ku- (12-18 GHz) and U-band (40-60 GHz) with return losses of better than 20 dB together with a stopband attenuation of more than 60 dB; and an evanescent-mode bandpass filter with unequal fin heights achieving 33 dB return loss for about 2% bandwidth at 56.5 GHz. The theory is verified by available measurements.

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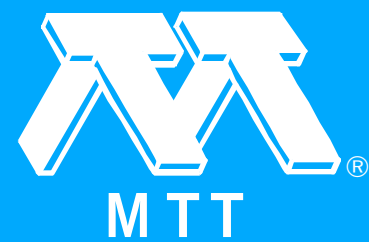
Scattering and Transmission Matrix Representations of Multiguide Junctions

F. Dai. "Scattering and Transmission Matrix Representations of Multiguide Junctions." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1538-1544.

The scattering and transmission matrix representations of the mode-matching technique are generalized for multiguide junctions with arbitrarily shaped coupling apertures. A comparison between both representations is given with respect to the CPU time. The relative convergence phenomenon arising in cascaded discontinuities of multiguide junctions is investigated. A numerical criterion for choosing the correct mode ratio among the guides is presented. Also studied is the application to a kind of multiguide junction between a circular waveguide and a coaxial waveguide with hollow inner.

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CAD-Oriented General Circuit Description of Uniform Coupled Lossy Dispersive Waveguide Structures

T. Dhaene and D. De Zutter. "CAD-Oriented General Circuit Description of Uniform Coupled Lossy Dispersive Waveguide Structures." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1545-1554.

A general full-wave circuit description of uniform coupled lossy dispersive waveguide structures is presented. Starting from Maxwell's equations, the generalized coupled telegrapher's equations are directly found and the frequency dependent line parameter matrices $R(\omega)$, $G(\omega)$, $L(\omega)$ and $C(\omega)$ are defined in an unambiguous way. A new symmetric high-frequency characteristic impedance matrix $Z_{\text{sub } c}(\omega)$ is introduced which is much more suited for circuit simulation purposes than the traditional line-mode impedances. The reciprocity relation is explicitly taken into account. The complete power distribution over the different modes and different lines are calculated in a rigorous and concise way. The major advantage of this high-frequency model is its simple circuit-interpretation and its compatibility with the well-known quasi-static circuit models. The matrix formalism is used throughout this paper. This guarantees a compact, easily implementable and very general description which is well suited for CAD applications.



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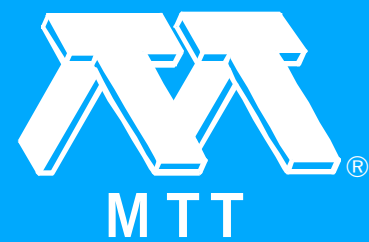
Minimization of Delay and Crosstalk in High-Speed VLSI Interconnects

Q.-J. Zhang, S. Lum and M.S. Nakhla. "Minimization of Delay and Crosstalk in High-Speed VLSI Interconnects." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1555-1563.

This paper presents design optimization of time responses of high-speed VLSI interconnects modeled by distributed coupled transmission line networks. The problem of simultaneous minimization of crosstalk, delay and reflection is formulated into minimax optimization design variables include physical/geometrical parameters of the interconnects and parameters in terminating/matching networks. A recently published simulation and sensitivity analysis technique for multiconductor transmission lines is expanded to directly address the VLSI interconnect environment the new approach permits efficient physical/geometrical oriented interconnect design using exact gradient based minimax optimization. Examples of interconnect optimization demonstrate significant reductions of crosstalk, delay, distortion and reflection at all vital connection ports. The technique developed is an important step towards optimal design of circuit interconnects for high-speed digital computers and communication systems.

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An Integrated System for the Synthesis of Coated Waveguides from Specified Attenuation

S.R.H. Hoole. "An Integrated System for the Synthesis of Coated Waveguides from Specified Attenuation." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1564-1571.

The problem of describing the thickness and material properties of inner coatings of waveguides so as to produce a specified rate of attenuation is an increasingly important one however, the technology for solving such problems is not yet suitable for routine use because (i) the solution procedure requires the solution of two finite element eigenvalue problems to compute the gradient of the object function with respect to every parameter of description and as a result, convergence to the optimum is very slow, and (ii) there is no integrated system for the implementation of these methods that would allow easy use. This paper presents the modules for an integrated synthesis system that incorporates (i) a new, algorithm for the quick computation of the gradients of the object function, and (ii) integrates drafting and word-processing packages into the finite element field computations so as to allow easy implementation of the synthesis algorithms and their comfortable incorporation into an engineer's other duties, such as writing reports and proposals.

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Yield Sensitivity of HEMT Circuits to Process Parameter Variations (Short Papers)

J.C. Sarker and J.E. Purviance. "Yield Sensitivity of HEMT Circuits to Process Parameter Variations (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1572-1576.

This work summarizes the use of a graphical tool, yield factor histograms, to study the yield sensitivity of HEMT circuits to process parameter variations. A computer program called SPICENTER is used to incorporate the HEMT statistical physical model with a SPICE circuit model and then to generate the yield factor histograms and yield sensitivities as functions of the process parameters. This work presents, for the first time, the application of these tools to microwave circuits. Two example HEMT circuits, a 2-input NOR gate and an inverter chain, illustrate the concepts. Yield sensitivity is presented as yield percent change per parameter percent change.

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Analytic Physics-Based Expressions for the Empirical Parameters of the Statz-Pucel MESFET Model (Short Papers)

S. D'Agostino, G. D'Inzeo, P. Marietti, L. Tudini and A. Betti-Berutto. "Analytic Physics-Based Expressions for the Empirical Parameters of the Statz-Pucel MESFET Model (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1576-1581.

In this paper we present a novel approach to the evaluation of the dc parameters of a semi-empirical MESFET model: starting from the analytical expression of the drain current derived from a physics-based model, previously proposed, we provide a method to calculate the empirical dc parameters of the so called "Raytheon" model. The comparison between computed and measured dc characteristics is quite satisfactory on GaAs microwave FET's of 1 μm or more gate length. By adding to the results, obtained in this work, an adequate model of the stray capacitances, the circuit performance can be optimized using the technological characteristics of active devices.

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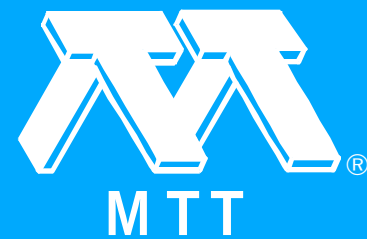


Abstracts

Fullwave Analysis of Planar Microwave Circuits by Integral Equation Methods and Bilinear Transformations (Short Papers)

A. Janhsen, B. Schiek and V. Hansen. "Fullwave Analysis of Planar Microwave Circuits by Integral Equation Methods and Bilinear Transformations (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1581-1584.

Planar microwave circuits are simulated by a mixed space-spectral domain integral method which allows the consideration of space-varying impedances. For an efficient computation of scattering parameters of circuits containing lumped elements within this full wave analysis, a bilinear transformation is used. Furthermore, by this so-called Mobius transformation it is possible to decide whether an impedance region of finite size can be interpreted as a lumped element or not.



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Abstracts

A High Frequency Model Based on the Physical Structure of the Ceramic Multilayer Capacitor (Short Papers)

L.C.N. de Vreede, M. de Kok, C. van Dam and J.L. Tauritz. "A High Frequency Model Based on the Physical Structure of the Ceramic Multilayer Capacitor (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1584-1587.

In this paper modelling of the high frequency behavior of ceramic multilayer capacitors based on device physics is presented. An accurate predictive model incorporating physical dimensions, material constants and aspects of the CMC application environment is presented. This model is suitable for use in the design and development of improved high frequency CMC structures.



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Unified Dispersion Model for Multilayer Microstrip Line (Short Papers)

A.K. Verma and G.H. Sadr. "Unified Dispersion Model for Multilayer Microstrip Line (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1587-1591.

A unified dispersion model is presented to calculate frequency dependent dielectric constant for a multilayer microstrip line. The model is a combination of TTL method, the method for the reduction of multilayer structures to an equivalent single layer microstrip line and the Kirschning and Jansen dispersion model. The result of the model has been confirmed within an accuracy of 1% against the results from SDA, IMDT AND MM i.e., various forms of full wave analysis. These results have been confirmed between 2 GHz and 18 GHz. The present model is suitable for use in a CAD package for MIC, MMIC, and printed antenna design.

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Channel Expansion and Tolerance Analysis of Waveguide Manifold Multiplexer (Short Papers)

X.-P. Liang, K.A. Zaki and A.E. Atia. "Channel Expansion and Tolerance Analysis of Waveguide Manifold Multiplexer (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1591-1594.

A computer aided optimization procedure is introduced to enable the addition of extra channels to an already existing waveguide manifold multiplexer, without changing any of the existing multiplexer elements. The process provides the important advantage of the ability to expand the number of channels as required, a property which was only feasible before for channel dropping type multiplexer. The process is illustrated by practical examples that show its validity. Analysis of the effect of mechanical tolerances on the multiplexer performance is also presented to provide guide lines for the tolerance ranges in manifold multiplexer fabrication.

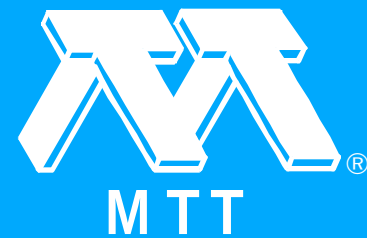
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Abstracts

Call for Papers - Quasi-Optical Techniques (Jul.1992 [T-MTT])

"Call for Papers - Quasi-Optical Techniques (Jul.1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1595-1595.



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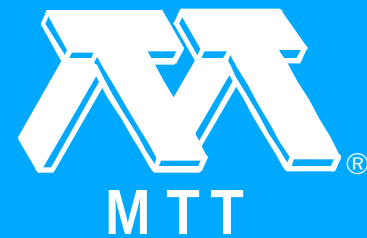
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Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Jul.1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Jul.1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1596-1596.



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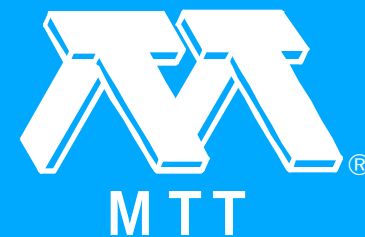
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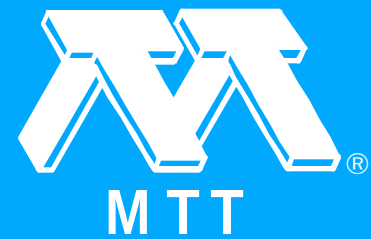
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IEEE Conference Proceedings (Advertisement) (Jul. 1992 [T-MTT])

"IEEE Conference Proceedings (Advertisement) (Jul. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1598-1598.



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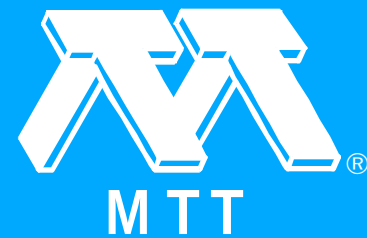
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"Home Video Tutorials on Emerging Technologies (Advertisement) (Jul. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.7 (Jul. 1992 [T-MTT] (Special Issue on Process-Oriented Microwave CAD and Modeling)): 1599-1599.



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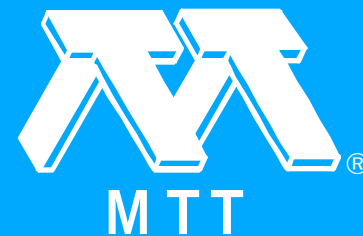
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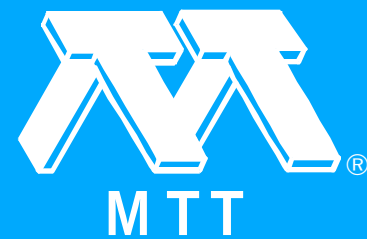


Abstracts

Editorial (Aug. 1992 [T-MTT])

S.A. Maas. "Editorial (Aug. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1601-1601.

As of this issue of the Transactions, I am stepping down as editor. My excuse is that I need to return to a normal life, and to recover from the sheer exhaustion that this job seems to engender. Those who know me comment on my almost daily increase in gray hair; although in my case hair of any color is welcome, the inevitable truth is that this job has aged me. Dan Masse is the new editor. Dan is well known to the MTT community, and has had a distinguished career in the development of IMPATT circuits and devices. The selection committee should be congratulated for their choice, and Dan has my best wishes (and leftover aspirin).



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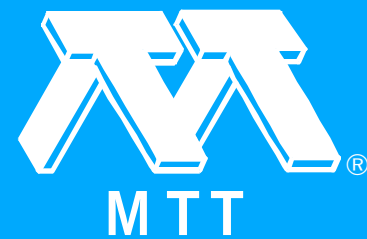


Abstracts

The Finite Difference Method for S-Parameter Calculation of Arbitrary Three-Dimensional Structures

S. Haffa, D. Hollmann and W. Wiesbeck. "The Finite Difference Method for S-Parameter Calculation of Arbitrary Three-Dimensional Structures." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1602-1610.

This paper describes the application of the finite-difference method for the determination of scattering parameters of passive, arbitrary three-dimensional, lossy structures. Maxwell's equations are solved in the frequency domain by solution of a boundary value problem. The generalized S-parameters can be computed for any one port or two port structure, while, for the first time, dielectric and conductor losses are taken into account. Higher order mode coupling can be considered and different geometries are allowed at the input and output ports. Verification calculations are given and results are presented for typical structures.



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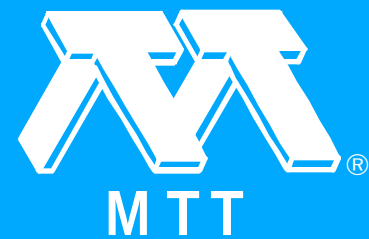
Fast Finite-Difference Time-Domain Analysis of Resonators Using Digital Filtering and Spectrum Estimation Techniques

Z. Bi, Y. Shen, K. Wu and J. Litva. "Fast Finite-Difference Time-Domain Analysis of Resonators Using Digital Filtering and Spectrum Estimation Techniques." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1611-1619.

In this paper we discuss the use of digital filtering and spectrum estimation techniques for improving the efficiency of the FD-TD algorithm in solving eigenvalue problems. The great improvement of the efficiency of the method is demonstrated by means of both numerical and measurement results. In addition, several improvements to the present FD-TD method for eigenvalue analysis are presented. These include the analysis of open dielectric resonators and the extraction of the resonant frequencies from the FD-TD results. The result for the open dielectric resonator analysis is validated using measured data.

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Cut-Off Space of Cloverleaf Resonators with Electric and Magnetic Walls

J. Helszajn and D.J. Lynch. "Cut-Off Space of Cloverleaf Resonators with Electric and Magnetic Walls." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1620-1629.

A planar resonator that has the symmetry of a junction circulator is the cloverleaf one. The purpose of this paper is to describe the isotropic cut-off space of this class of resonator using the finite element approach. Circuits with 3 and 4-fold symmetries and with a magnetic or an electric sidewall are separately dealt with. Standing-wave solutions are included for completeness. The gyromagnetic problem is separately investigated.

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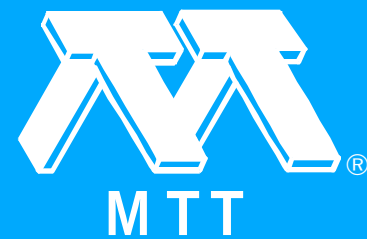


Abstracts

An Efficient Numerical Spectral Domain Method to Analyze a Large Class of Nonreciprocal Planar Transmission Lines

F. Mesa, R. Marques and M. Horno. "An Efficient Numerical Spectral Domain Method to Analyze a Large Class of Nonreciprocal Planar Transmission Lines." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1630-1641.

This paper presents an efficient numerical application of the Galerkin method in the spectral domain, (SD), to the analysis of strip-like/slot-like coplanar transmission lines embedded in a bianisotropic multilayered medium. The method is based on the obtaining of the spectral dyadic Green's function by the equivalent boundary method (EBM), a suitable third order extraction technique of the asymptotic behavior of the Green's dyad, an enhanced numerical integration scheme and the use of an adequate contour integral method for searching zeros in the complex plane. This method, namely the SD-EBM, has been found to be very suitable to analyse transmission lines with semiconductor and/or ferrites magnetised at an arbitrary direction, including the study of magnetostatic wave propagation phenomena.



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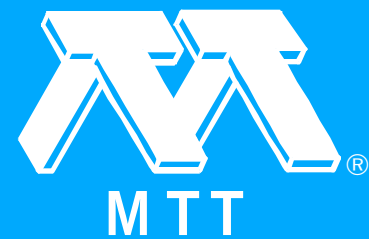
Analysis and Synthesis of Tapered Microstrip Transmission Lines

M. Kobayashi and N. Sawada. "Analysis and Synthesis of Tapered Microstrip Transmission Lines." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1642-1646.

The input voltage reflection coefficient on a tapered microstrip transmission line is analyzed and a new Fourier transform pair is derived which introduces echo time and frequency as variables. Calculations of the input reflection coefficient take into account the frequency dispersion-characteristics of the effective permittivity. An efficient method is proposed for analysis and synthesis of microstrip tapers and numerical results are presented for microstrip exponential tapers and microstrip Tchebycheff tapers. The present paper is the first one shown the frequency-dependent characteristics of reflection coefficients.

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New Boundary Integral Equations for CAD of Waveguide Circuits: Guided-Mode Extracted Integral Equations

K. Tanaka and M. Nakahara. "New Boundary Integral Equations for CAD of Waveguide Circuits: Guided-Mode Extracted Integral Equations." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1647-1654.

Novel boundary integral equations which are applicable to the analysis of many kinds of waveguide circuits are presented. The new integral equations can treat the waveguide discontinuity problems like the scattering by the isolated finite-sized metallic objects or cavity problems and do not employ normal-mode expansion techniques. They are suitable for the basic theory of CAD software for various waveguide circuits. The 2-port and H-plane waveguide discontinuity problems which satisfy the single-mode and two-mode conditions are treated in this paper. The case of waveguide corner bend is considered as an example. The numerical examples are shown in order to confirm the validity of the new integral equations.

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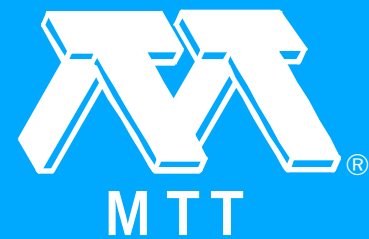
Functionals in the Variational Method Applied to Equivalent Impedance Matrix of Metallic Posts Unsymmetrically Positioned in a Rectangular Waveguide

T. Toyama and E. Sawado. "Functionals in the Variational Method Applied to Equivalent Impedance Matrix of Metallic Posts Unsymmetrically Positioned in a Rectangular Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1655-1660.

New functional for calculation of a variational method of equivalent impedance matrix elements of a metallic post have been proposed, in which the cross section shape of the metallic post can be arbitrary, and the post can be placed at an arbitrary position in a rectangular waveguide. The functional are also applicable to a group of metallic posts placed unsymmetrically on the $z =$ constant plane.

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A Procedure for Defining Behavior of Weight Functions Near the Edge for Best Convergence Using the Galerkin Method

P.S. Fridberg and I.M. Yakover. "A Procedure for Defining Behavior of Weight Functions Near the Edge for Best Convergence Using the Galerkin Method." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1661-1667.

A general procedure is described for determining the behavior of the weight functions (WF) near the edge so as to provide the best convergence using the Galerkin Method (GM) for calculating linear functional of the electromagnetic theory. It is believed that our procedure is proposed for the first time. The procedure is based on the equivalence of two methods of calculating such functionals the--GM and the variational method (VM). To implement the procedure the sought linear functional is expressed as a variational functional. The stationarity condition of the latter leads to some auxiliary problem. Due to the equivalence mentioned above the WF behavior near the edge is the same as that obtained from the solution of the auxiliary problem. The efficiency of the procedure i.e. high speed of convergence is illustrated by two examples: 1) calculation of the equivalent circuit shunt impedance of the capacitive diaphragm in a plane waveguide, and 2) calculation of the capacitance of a metal tube segment filled with dielectric.

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Microwave Characteristics of High T_c Superconducting Coplanar Waveguide Resonator

H. How, R.G. Seed, C. Vittoria, D.B. Chrisey, J.S. Horwitz, C. Carosella and V. Folen.

"Microwave Characteristics of High T_c Superconducting Coplanar Waveguide Resonator." *1992 Transactions on Microwave Theory and Techniques* 40.8 (Aug. 1992 [T-MTT]): 1668-1673.

A theoretical formulation has been developed to calculate the coupling coefficient, London penetration depth, and surface resistance of a coplanar waveguide resonator fabricated from films of superconducting YBCO material. Experimental data of the reflection coefficient as a function of temperature and frequency agree reasonably well with calculations. The formulation is of sufficient generality to be applicable to other guided structures.

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Parameter De-Embedding Accuracy Dependency Upon Material Sample Dimensions

A. Park and A. Dominek. "Parameter De-Embedding Accuracy Dependency Upon Material Sample Dimensions." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1674-1680.

The sensitivity of the sample fit in rectangular waveguide fixtures is examined for constitutive parameter de-embedding. The sensitivity is characterized through a percent error figure between the de-embedded and known parameter values when an air gap exists between the sample and the side walls of the fixture. The de-embedding process assumed a completely filled waveguide in which rigorously calculated S parameters for material sample air gaps in either the E or H plane walls of the waveguide were used. The presence of an air gap was very noticeable for a E-plane gap. Commonly used gap correction factors provided limited improvement in reducing air gap related errors.

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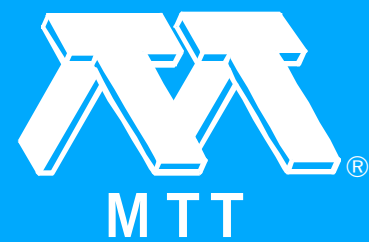


Analytical Model for Optically Generated Currents in GaAs MESFETs

A. Madjar, P.R. Herczfeld and A. Paoletta. "Analytical Model for Optically Generated Currents in GaAs MESFETs." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1681-1691.

The MESFET as an optically sensitive microwave element on MMIC's has attracted much attention. The theoretical modelling of the device, however, needs more consideration. This paper proposes an analytical model for the illuminated MESFET, complete in that all major contributions to the optical response are considered. The dependence of the response on bias conditions, the wavelength and intensity of the optical input, and the particulars of device structure, are incorporated in the model. The importance of the internal photovoltaic effect, which has not been properly modelled previously, is emphasized. The novel theoretical model is verified by experimental results.





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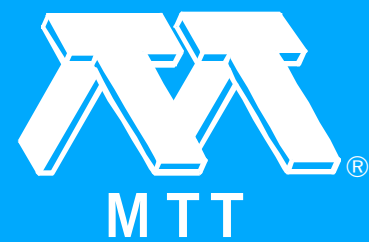
FDTD Analysis of Power Deposition Patterns of an Array of Interstitial Antennas for Use in Microwave Hyperthermia

P.C. Cherry and M.F. Iskander. "FDTD Analysis of Power Deposition Patterns of an Array of Interstitial Antennas for Use in Microwave Hyperthermia." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1692-1700.

In earlier contributions where the Method of Moments (MOM) was used to model and calculate the electromagnetic (EM) power distribution pattern in tumors heated using interstitial antennas, some modeling difficulties were encountered. This includes inaccuracies at dielectric interfaces when pulse basis functions were used for expansion and the inability to model large tumors because of the increasingly large matrices involved. In this paper, we use the Finite-Difference Time-Domain (FDTD) method to calculate EM power deposition patterns in inhomogeneous tissue models of tumors. The radiated near-field patterns from an array of uniformly and step-insulated interstitial antennas were used as incident fields on the excitation planes to calculate the scattered fields and total SAR patterns in tumors. Comparison of FDTD data with results from the Method of Moments show that FDTD solution, in this particular application, overcomes some of the modeling difficulties encountered in the Method of Moments. Results for some specific tumor geometries are also presented to show the effectiveness of the microwave interstitial heating techniques in treating large tumors. Other advantages of the FDTD method, such as improved accuracy in modeling dielectric interfaces and the ability to model large tumors, are also illustrated.

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Design and Performance of a Non-Contacting Probe for Measurements on High-Frequency Planar Circuits

S.S. Osofsky and S.E. Schwarz. "Design and Performance of a Non-Contacting Probe for Measurements on High-Frequency Planar Circuits." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1701-1708.

Optimal design of a non-contacting magnetic probe for measurements on the interior of planar high-frequency circuits has been studied, and performance of the probe has been determined. The probe is a relatively simple device that may find uses in circuit design and optimization, troubleshooting, and production testing. In the present work we have studied its design by means of enlarged models tested at frequencies 100 times lower than those of the actual intended use. The nature of its errors has been investigated, and some techniques for error reduction have been found. The accuracy of measurements on circuits with SWR < 3.0 is typically 0.18 dB in magnitude and 7° in phase. S-parameter measurements on general 2-ports can also be made by using the probe at several different positions on the associated transmission lines. This technique effectively eliminates the problem of de-embedding that arises in other kinds of S-parameter measurements. Examples of measurements with the large model probe are presented and compared with theory. Performance appears to be acceptable for the intended applications. The probe has been designed with eventual microfabrication in mind, but difficulties in this final step remain to be resolved.

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A Semidistributed HEMT Model for Accurate Fitting and Extrapolation of S-Parameters and Noise Parameters (Short Papers)

M.T. Hickson, P. Gardner and D.K. Paul. "A Semidistributed HEMT Model for Accurate Fitting and Extrapolation of S-Parameters and Noise Parameters (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1709-1712.

A model is described for a low noise mm-wave HEMT device. It takes account of the distributed nature of the gate and drain electrodes by dividing the active region of the device into a number of slices. Each slice is modelled as an intrinsic HEMT with thermal noise sources and the slices are connected together through lossy reactance. The parameters of the first slice are made different from those of the remaining slices, in order to account for the inevitable differences in the field distribution in the gate feed region. The model parameters have been optimized numerically to fit the manufacturer's measured S-parameters and all four noise parameters, for a commercially available HEMT chip. A good fit has been achieved simultaneously to all of these parameters, and the model therefore provides a reasonable basis for extrapolation to higher frequencies. The significance of the distributed gate effect and the unequal slice effect are assessed by comparing the best fit achievable when these effects are not included.

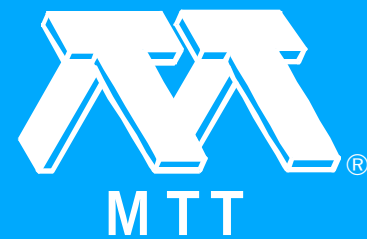


Abstracts

Accurate Modeling of Axisymmetric Two-Port Junctions in Coaxial Lines Using the Finite Element Method (Short Papers)

W.R. Scott, Jr.. "Accurate Modeling of Axisymmetric Two-Port Junctions in Coaxial Lines Using the Finite Element Method (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1712-1716.

A technique is developed for analyzing axisymmetric two-port junctions (axisymmetric discontinuities) in coaxial lines using the finite element method. Boundary conditions are developed for the input and output ports that absorb the reflected and transmitted waves while injecting the incident wave. The use of higher order elements is shown to greatly improve the accuracy, i.e., the accuracy increases rapidly with the order of the elements even when the number of nodes is kept roughly constant. The accuracy of the technique is verified by comparison with the theoretical and experimental results of other investigators for three discontinuities, and the agreement is shown to be excellent.



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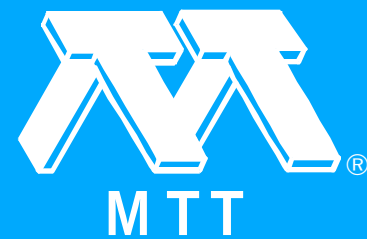


Abstracts

On the Interaction of the MMIC and its Packaging (Short Papers)

Y.L. Chow, G.E. Howard and M.G. Stubbs. "On the Interaction of the MMIC and its Packaging (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1716-1719.

The software WATMIC-EMsim is used to simulate the interaction of an MMIC circuit and its packaging. Specifically in this paper, the circuit is the spiral transformer, and the packaging is the surrounding ground ring used to interface the transformer to its coplanar probes. It is found that the resonant frequencies of the transformer are affected greatly with the introduction of the ring but, with its introduction, only slightly by the width of the ring. This paper points out that this finding of interaction mimics the well known phenomenon in electrostatic capacitance. More importantly, this paper points out that in the field theoretic analysis of an MIC/MMIC circuit the influence of the packaging must be considered.



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Grounding Microstrip Lines with via Holes (Short Papers)

D.G. Swanson, Jr.. "Grounding Microstrip Lines with via Holes (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1719-1721.

Grounding microstrip circuits with via holes is an established technology and modeling isolated via holes with analytical models is well known. However, the availability of electromagnetic field solvers provides an opportunity to model via holes and the metalization surrounding them in a more realistic fashion. Calculated equivalent inductances for single and double via hole configurations are presented. A microstrip interdigital filter with grounded resonators provides experimental verification.

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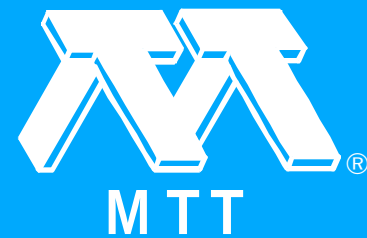


Abstracts

Large Signal Analysis of Optical Directional Coupler Modulators (Short Papers)

M.T. Abuelma'atti. "Large Signal Analysis of Optical Directional Coupler Modulators (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1722-1725.

This paper deals with the large-signal analysis of optical directional coupler modulators. Expressions are obtained for the output harmonic and intermodulation products of such devices when driven by multisinusoidal input signals. The special case of relatively small input amplitudes is considered. The results presented are verified through comparisons with previously published results.



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Frequency Response Characteristics of the Multiport Planar Elliptic Patch (Short Papers)

F.A. Alhargan and S.R. Judah. "Frequency Response Characteristics of the Multiport Planar Elliptic Patch (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1726-1730.

Currently there is no analytical formulation for the multiport elliptic patch. In this paper the single series Green's function for the elliptic patch is derived and its impedance matrix is formulated. Theoretical and experimental results are compared for a four port elliptic patch.

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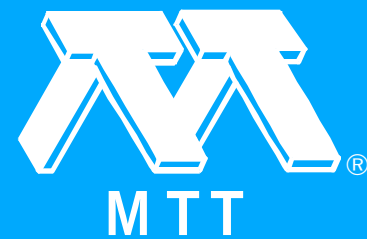


Abstracts

On the Modal Expansion of Resonator Field in the Source Region (Short Papers)

A.S. Omar, E. Jensen and S. Lutgert. "On the Modal Expansion of Resonator Field in the Source Region (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1730-1732.

Two field expansions for the electromagnetic field radiated by electric and magnetic currents in a cavity resonator are presented. The first utilizes the cavity resonant modes only, while the other utilizes, in addition, the irrotational modes. The first expansion is shown to be more suitable if the exciting currents have volume distributions. On the other hand, the second expansion is more suitable if the resonator contains surface or filamentary current distributions. Typical examples are given to demonstrate the convergence behavior of the two expansions near and within the source region.



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Power-Handling Capability of the Rhombic Waveguide (Comments and Reply)

P.A.A. Laura, L. Ercoli, P.L. Overfelt and C.S. Kenney. "Power-Handling Capability of the Rhombic Waveguide (Comments and Reply)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1733-1733.

The purpose of the present correspondence is two fold: first to congratulate the author for his important contribution and the second to present some considerations regarding the solution of Helmholtz equation as well as other wave-type equations in rhombic domains.

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



Abstracts

Spectral-Domain Computation of Characteristic Impedances and Multiport Parameters of Multiple Coupled Microstrip Lines (Comments and Reply)

S. Amari, V.K. Tripathi and H. Lee. "Spectral-Domain Computation of Characteristic Impedances and Multiport Parameters of Multiple Coupled Microstrip Lines (Comments and Reply)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1733-1736.

In the above mentioned paper the authors present an extensive discussion of the problem of systems of coupled lines. The spectral domain technique is used to extract the dispersion relations of the structure along with the corresponding current densities on the different lines. However, in equation (7) page 216, they state that the eigencurrent matrix $[M/\text{sub } I/]$ and the corresponding eigenvoltage matrix $[M/\text{sub } v/]$ are related by $[M/\text{sub } v/] = [[M/\text{sub } I/]/\text{sup } T/]/\text{sup } -1/$.



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Abstracts

Modeling Three-Dimensional Discontinuities in Waveguides Using Non-Orthogonal FDTD Algorithm (Correction)

J.-F. Lee, R. Palandech and R. Mittra. "Modeling Three-Dimensional Discontinuities in Waveguides Using Non-Orthogonal FDTD Algorithm (Correction)." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1736-1736.

In the above paper, there were several typographical errors:



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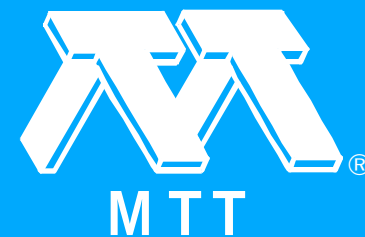
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Abstracts

Call for Papers - Quasi-Optical Techniques (Aug. 1992 [T-MTT])

"Call for Papers - Quasi-Optical Techniques (Aug. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1737-1737.



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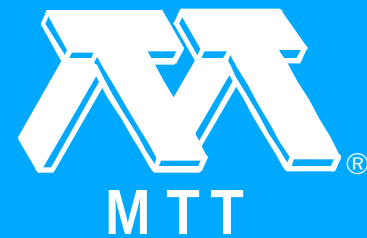
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Abstracts

Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Aug. 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Aug. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1738-1738.



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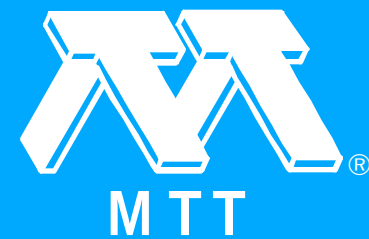
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Abstracts

Call for Papers - 1993 SBMO International Microwave Conference/Brazil (Aug. 1992 [T-MTT])

*"Call for Papers - 1993 SBMO International Microwave Conference/Brazil (Aug. 1992 [T-MTT])."
1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1739-1739.*



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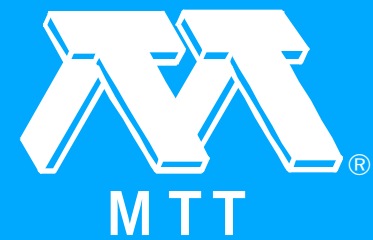
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Abstracts

Information for Authors (Aug. 1992 [T-MTT])

"Information for Authors (Aug. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): 1740-1740.



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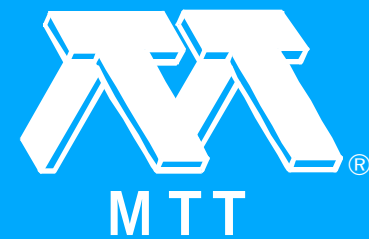
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Abstracts

Back Cover (Aug. 1992 [T-MTT])

"Back Cover (Aug. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.8 (Aug. 1992 [T-MTT]): b1-b2.



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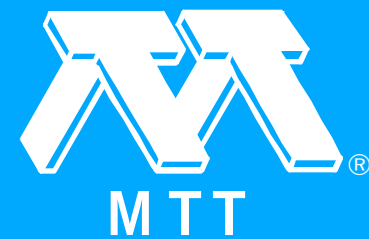
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Front Cover (Sep. 1992 [T-MTT])

"Front Cover (Sep. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): f1-f2.



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Electromagnetic Modeling of Passive Circuit Elements in MMIC

D.C. Chang and J.X. Zheng. "Electromagnetic Modeling of Passive Circuit Elements in MMIC." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1741-1747.

A spatial-domain mixed-potential integral equation method is developed for the analysis of microstrip discontinuities and antennas of arbitrary shape. The algorithm is based on roof-top basis functions on a rectangular and triangular mixed grid and analytical evaluation of the quadruple moment integrals involved. The algorithm is successfully implemented into an accurate, efficient and versatile computer program. The numerical results agree with the measured ones very well.

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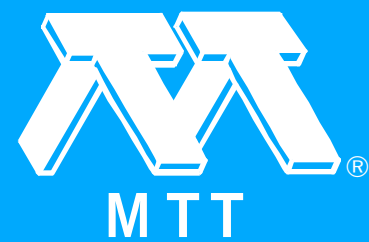
Quasi-Analytical Static Solution of the Boxed Microstrip Line Embedded in a Layered Medium

F. Medina and M. Horno. "Quasi-Analytical Static Solution of the Boxed Microstrip Line Embedded in a Layered Medium." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1748-1756.

In this paper, a quasi-analytical method is presented to carry out the quasi-TEM study of a microstrip line embedded in a general layered substrate with rectangular enclosure. Electric walls, magnetic walls and periodic boundary conditions are considered. The analysis is based on the spectral domain formulation and the use of a proper expansion of the free charge distribution (Chebyshev polynomials with edge condition). Two different approaches are proposed to speed up the evaluation of the spectral series in such a way that only a few spectral terms must be retained in the numerical computations of the mentioned series. The propagation parameters and the charge distribution are obtained with extreme accuracy in fractions of one second on a personal computer.

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The Three-Dimensional Weak Form of the Conjugate Gradient FFT Method for Solving Scattering Problems

P. Zwamborn and P.M. van den Berg. "The Three-Dimensional Weak Form of the Conjugate Gradient FFT Method for Solving Scattering Problems." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1757-1766.

The problem of electromagnetic scattering by a three-dimensional dielectric object can be formulated in terms of a hypersingular integral equation, in which a grad-div operator acts on a vector potential. The vector potential is a spatial convolution of the free space Green's function and the contrast source over the domain of interest. A weak form of the integral equation for the relevant unknown quantity is obtained by testing it with appropriate testing functions. As next step, the vector potential is expanded in a sequence of the appropriate expansion functions and the grad-div operator is integrated analytically over the scattering object domain only. A weak form of the singular Green's function has been used by introducing its spherical mean. As a result, the spatial convolution can be carried out numerically using a trapezoidal integration rule. This method shows excellent numerical performance.

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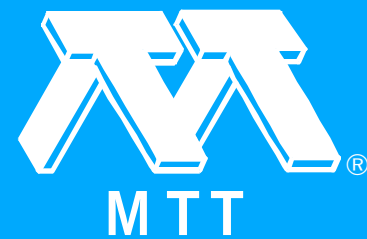


Abstracts

A Note on the Application of Edge-Elements for Modeling Three-Dimensional Inhomogeneously-Filled Cavities

J.-F. Lee and R. Mittra. "A Note on the Application of Edge-Elements for Modeling Three-Dimensional Inhomogeneously-Filled Cavities." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1767-1773.

The application of edge-elements for modeling three-dimensional inhomogeneously-filled cavities is presented in this paper. Explicit representations for the two element matrices, $[S]_{\text{e}}$ and $[T]_{\text{e}}$, are provided in order to facilitate the implementation of the FEM formulation. Also included are the results of a numerical experiment that investigates the rate of convergence of the computation of the dominant resonance frequency of a rectangular cavity when the edge-element formulation is employed.



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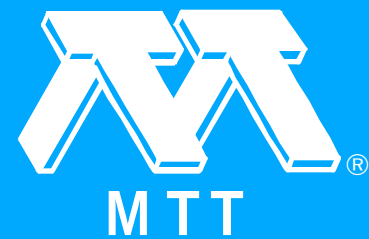
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Full-Wave Perturbation Theory for the Analysis of Coupled Microstrip Resonant Structures

G.W. Hanson and D.P. Nyquist. "Full-Wave Perturbation Theory for the Analysis of Coupled Microstrip Resonant Structures." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1774-1779.

A full-wave perturbation theory for the system of N coupled microstrip disk structures is presented. The theory is based on the electric field integral equation description of the circuit, which includes all of the wave phenomena associated with the conductors and the surrounding media. This method is suitable for quantification of nearly degenerate coupling between open microstrip disks, yielding the complex system eigenmodes. For the case of two coupled disks, the perturbation theory analytically separates, though simultaneously solves for, the symmetric and antisymmetric system eigenmodes. The development of the perturbation theory leads to good physical insight for this mode splitting phenomena. Numerical results obtained with the perturbation theory agree well with those obtained by a more accurate method of moments solution to the coupled set of electric field integral equations, as well as with experimental data.

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Nonlinear Microwave Optics in Liquid Suspensions of Shaped Microparticles

D. Rogovin, R. McGraw, W. Ho, R. Shih, H.R. Fetterman and B. Bobbs. "Nonlinear Microwave Optics in Liquid Suspensions of Shaped Microparticles." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1780-1788.

The unique properties of shaped microparticle suspensions make them suitable as candidate media for such active optical process as phase conjugate via degenerate four-wave mixing at microwave and millimeter wavelengths. We have generated up to 250 mW of phase conjugate radiation, a medium composed of rod shaped carbon fibers suspended in a passive fluid dielectric that is maintained in a waveguide. The theory for the nonlinear optical properties of shaped particle suspensions is presented and shown to be in excellent agreement with the available experimental data.

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Optimization of Multilayer Antireflection Coatings Using an Optimal Control Method

J.J. Pesque, D.P. Bouche and R. Mittra. "Optimization of Multilayer Antireflection Coatings Using an Optimal Control Method." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1789-1796.

The design of a thin, light weight and broadband radar absorber is a problem of considerable interest and is cast in this paper as a minimization problem off the following quantities, namely the reflection coefficient at the set of frequencies $\{f_{\text{sub } 1}, f_{\text{sub } 2}, \dots, f_{\text{sub } n}\}$ and the thickness (or surface mass) of the absorber. We attempt to synthesize an absorber with a undefined number of layers and assume we have the freedom to choose the permittivity and the permeability of the material in each layer from a set of m specified value of $\epsilon_{\text{sub } k}(f)$ and $\mu_{\text{sub } k}(f)$. The usual approach to the design problem is to consider classical types of absorbers, such as Dallenbach or Jaumann layers. In this paper, we present a design procedure based upon an Optimal Control method, that simultaneously determines both the material properties of the different layers as well as their thicknesses, to minimize at the same time the reflection coefficient over a prescribed range of frequencies and surface mass or thickness. Illustrative examples of multilayer absorbers synthesized with this method are presented and the results are compared with those designed by using the Simulated Annealing method.





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Quasi-Optical Slot Antenna SIS Mixers

J. Zmuidzinas and H.G. LeDuc. "Quasi-Optical Slot Antenna SIS Mixers." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1797-1804.

We describe a new quasi-optical SIS mixer designed for efficient radiation coupling. The mixer uses a twin-slot antenna which has the advantages of a good beam pattern and a low impedance. The radiation and impedance characteristics of the antenna were obtained from a moment-method calculation. Tapered superconducting microstrip transmission lines are used to carry the radiation from the slot antennas to the tunnel junction. The effective impedance seen by the tunnel junction is quite low, about 4 Ω , which allows micron-size junctions to be used at 500 GHz. The mixers have been fabricated using Nb /Al-oxide/Nb tunnel junctions and a receiver noise temperature of 420 K (DSB) was measured at 490 GHz, which is the best yet obtained for a quasi-optical mixer at this frequency. The comparatively large junction area increases the saturation power and allows strong suppression of noise the Josephson effect by the application of a magnetic field of modest strength.

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The Reconstruction of the Relative Phases and Polarization of the Electromagnetic Field Based on Amplitude Measurements

D.B. Nguyen and S. Berntsen. "The Reconstruction of the Relative Phases and Polarization of the Electromagnetic Field Based on Amplitude Measurements." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1805-1811.

This paper addresses the problem of determining the relative phases among the components of a monochromatic electromagnetic field at a single point based on amplitude measurements only. This problem arises in many practical situations, from the determination of the polarization characteristics of an antenna in its near field to the design of electromagnetic field probes that provide phase information without the need for synchronization leads. In this paper, we answer the following questions: 1) How is the phase information reconstruction from amplitude measurements? 2) Do amplitude measurements contain enough information to reconstruct the phases uniquely? 3) How many amplitude measurements are required? and 4) In what directions must the amplitude measurements be taken to ensure that the reconstructed phases are unique? To answer these questions, we propose and solve a more general problem in n dimensions, the special case where $n = 3$ being the solution to the problem above.

Click on title for a complete paper.



Ferromagnetic Tridisk-Coupled Resonator and Magnetically Tunable Stripline Y Circulator

T. Nagao and Z. Tanaka. "Ferromagnetic Tridisk-Coupled Resonator and Magnetically Tunable Stripline Y Circulator." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1812-1820.

A ferromagnetic tridisk-coupled (TDC) resonator was constructed by placing three YIG ferrite disks mutually attached on the circular center conductor. The EM fields in one of three disks is described in terms of expanded circular harmonics with an approximated transformation of derivative, and the EM fields in a TDC resonator is synthesized from the respective constituent EM fields of three disks, by sum-transformation, regarding three eigen junctures of the TDC resonator. The synthetic EM fields include coefficients A , B and D which are described as functions of radius ratio r_0/r and azimuthal angle Φ . In this paper, a special case that $A = D = 0$ is treated. It is remarked that the resonant mode curves having a lowered eigenvalue is bounded by the ferrite anisotropic splitting factor $B_0/(K/\mu)$, B_0 being a function of r_0/r^2 and $\Phi = 0$. Calculation of two conditional equations of perfect Y circulation is carried out. Theoretical analysis of the magnetically tunable operation is made on the first conditional curves which are drawn super-imposed on the resonant mode curves, and subsequently on the second conditional curves of Z_{yeq} the equivalent input impedance of the stripline Y junction. The latter gives the graphical way of impedance matching of the device. Finally the magnetically tunable operation is examined experimentally with the theoretical analysis.





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A Temperature Noise Model for Extrinsic FETs

B. Hughes. "A Temperature Noise Model for Extrinsic FETs." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1821-1832.

A resistor temperature noise model for FETs has been successfully applied to extrinsic FETs to predict the frequency dependence of minimum noise figure, F_{min} , and associated gain, G_{Aopt} . The model gives a fixed relationship between F_{min} and G_{Aopt} , with one fitting parameter T_{d} . An extensive comparison to published results shows that the majority of FETs can be modelled with effective T_{d} values (the temperature of the output resistor) between 300 and 700 K for all of frequencies (8 to 94 GHz), gate lengths (0.8 to 0.1 μm) and material types examined. The analysis shows that InP-based MODFETs exhibit significantly lower F_{min} and higher G_{Aopt} than conventional and pseudomorphic GaAs-based MODFETs of the same gate length. The results suggest a high f_{max} , is a key factor for low noise figure.

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Data Reduction Method for Q Measurements of Strip-Line Resonators (Short Papers)

S. Toncich and R.E. Collin. "Data Reduction Method for Q Measurements of Strip-Line Resonators (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1833-1836.

This paper describes a technique that enables the attenuation constant α of a microstrip line to be found from the measured return loss curve as a function of frequency for a half wavelength resonator. Data averaging is incorporated and the effects of dispersion are included. This method does not require the use of an equivalent resonator model for the stripline, nor does it rely on graphical techniques.

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Abstracts

Conformal Mapping Analyses of Microstrips with Circular and Elliptical Cross-Sections (Short Papers)

M.A. Martens, R.W. Brown and E.M. Haacke. "Conformal Mapping Analyses of Microstrips with Circular and Elliptical Cross-Sections (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1836-1840.

A new conformal transformation is derived in terms of a Schwarz-Christoffel transformation involving elliptic integrals of the first and third kind. This mapping function is used to give exact solutions for TEM excitations of microstrips and coupled microstrips with circular and elliptical cross-sections. Using these maps, the uniformity of the TEM mode magnetic field inside an elliptical slotted tube transmission line is investigated.



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Abstracts

Analysis of an N-Port Consisting of a Radial Cavity and E-Plane Coupled Rectangular Waveguides (Short Papers)

M.E. Bialkowski. "Analysis of an N-Port Consisting of a Radial Cavity and E-Plane Coupled Rectangular Waveguides (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1840-1843.

An analysis of an n-port including a radial or coaxial cavity and E-plane coupled rectangular waveguides is presented. A non-standard field matching technique which exploits both circular and rectangular boundaries, is used to determine the scattering matrix parameters of the n-port. Validity of the analysis is verified through comparison with an alternative analysis and experiment.



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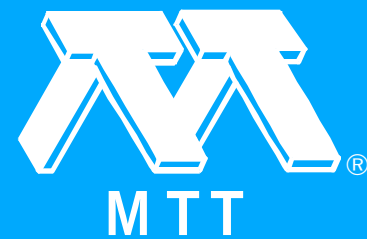


Abstracts

Experimental Study of Multihole Directional Couplers Providing a Rippled Response (Short Papers)

D.L. Swartzlander and R.S. Elliott. "Experimental Study of Multihole Directional Couplers Providing a Rippled Response (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1843-1846.

The directivity versus frequency of a multihole waveguide coupler may be expressed as a polynomial whose complex roots, if placed off the unit circle, provide the opportunity of a rippled response. Two designs using seven equispaced holes, one each with 3.0 and 0.5 dB ripple, were implemented at X-band and experimental validation of the theory has been excellent.



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Time Domain Modeling of Impedance Boundary Condition (Short Papers)

C.F. Lee, R.T. Shin and J.A. Kong. "Time Domain Modeling of Impedance Boundary Condition (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1847-1850.

A methodology developed to handle dispersive materials in the time domain is extended to model the dispersive characteristics of the impedance boundary condition used for a thin layer coating over perfect conductors. The impedance boundary condition is first approximated as a rational function of frequency. This rational function is then transformed to a time domain equation, resulting in a partial differential equation in space and time. Discretization of the time domain model to efficiently handle the thin layer coating is presented in the context of the finite-difference time-domain (FD-TD) technique. The methodology is verified by solving a one-dimensional problem using the FD-TD technique and comparing with the analytical results.

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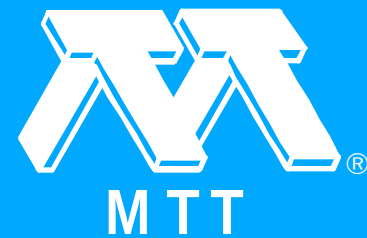


Abstracts

Criteria for the Onset of Oscillation in Microwave Circuits (Comments)

R.W. Jackson. "Criteria for the Onset of Oscillation in Microwave Circuits (Comments)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1850-1851.

The paper listed above notes that the device reflection coefficient, $\Gamma_d(s)$, in the expression, . . . represents the port reflection coefficient of a device which may result in an unstable circuit only after connecting it with a resonator having a reflection coefficient, $\Gamma_c(s)$.



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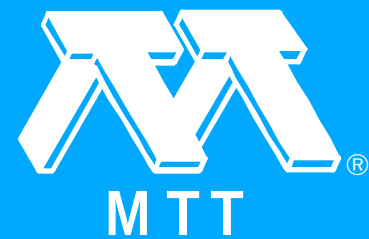
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Open Resonator for Precision Dielectric Measurements in the 100-GHz Band (Corrections)

B. Komiyama, M. Kiyokawa and T. Matsui. "Open Resonator for Precision Dielectric Measurements in the 100-GHz Band (Corrections)." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1851-1851.

Owing to an error in calculation programming, $\tan \delta$ in Table II in the above paper was calculated as $\Phi/d = 0$ in equation (3). $\tan \delta$ in Table II should be changed as follows:

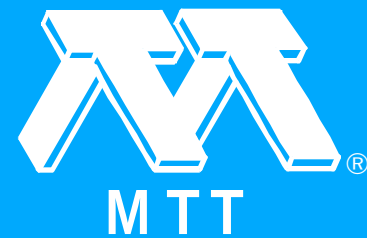
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Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Sep. 1992 [T-MTT])

"Call for Papers - Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits (Sep. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1852-1852.



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Call for Papers - Combined Optical-Microwave Earth and Atmosphere Sensing (Sep. 1992 [T- MTT])

"Call for Papers - Combined Optical-Microwave Earth and Atmosphere Sensing (Sep. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1853-1853.



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Call for Papers - The Global Reach of Microwaves (Sep. 1992 [T-MTT])

"Call for Papers - The Global Reach of Microwaves (Sep. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1855-1855.



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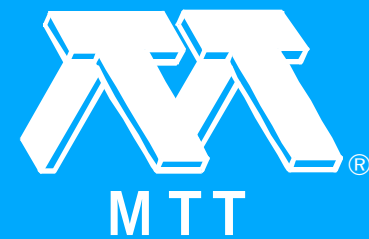
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IEEE Conference Proceedings (Advertisement) (Sep. 1992 [T-MTT])

"IEEE Conference Proceedings (Advertisement) (Sep. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): 1856-1856.



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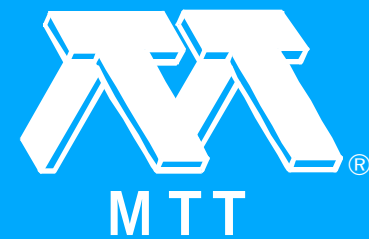
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Back Cover (Sep. 1992 [T-MTT])

"Back Cover (Sep. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.9 (Sep. 1992 [T-MTT]): b1-b2.



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Front Cover (Oct. 1992 [T-MTT])

"Front Cover (Oct. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): f1-f2.



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Abstracts

Electric Field Integral Equation Formulation for a Dynamic Analysis of Nonuniform Microstrip Multi-Conductor Transmission Lines

T.R. Arabi, A.T. Murphy and T.K. Sarkar. "Electric Field Integral Equation Formulation for a Dynamic Analysis of Nonuniform Microstrip Multi-Conductor Transmission Lines." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1857-1869.

The objective of this paper is to present a numerical technique based on a combined approach of using a "quasi-dynamic," a "dynamic" and an asymptotic approach for the analysis of nonuniform microstrip transmission lines and discontinuities using the grounded dielectric slab Green's functions. The regions of validity of the quasi-dynamic and asymptotic approximations have been determined in terms of the required accuracy in the Green's functions. Finally, numerical examples have been presented and checked with available data to check the accuracy of this new technique.



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Interaction of Electromagnetic Waves with General Bianisotropic Slabs

J.L. Tsalamengas. "Interaction of Electromagnetic Waves with General Bianisotropic Slabs." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1870-1878.

In a number of recent papers an efficient, elegant and systematic formulation technique has been developed which, combining Fourier transform with matrix analysis methods, was found to be quite suitable for problems related to radiation by dipole or other sources in the presence of an arbitrarily general stratified anisotropic medium. In the present paper this technique is adapted and further extended so as to allow the presence of general bianisotropic media described by four tensors with no limitations on their elements. Two specific applications pertaining to some canonical problems of fundamental importance are included to exemplify the method and demonstrate its usefulness. Considered here are: a) radiation by an arbitrarily oriented elementary electric dipole source located in the vicinity of a general bianisotropic slab, either grounded or ungrounded, leading to the expressions of the dyadic Green's function of the structure, and b) reflection and transmission of an arbitrarily polarized plane wave incident upon such a slab, leading to closed-form concise expressions for the reflection and transmission coefficient matrices. These derivations may serve as a basis for formulating and solving numerous propagation, radiation and scattering problems for planar structures which use such materials as substrates.





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Radiation Modes and Step Discontinuities in Dielectric Rib Waveguide

T. Rozzi, L. Zappelli and M.N. Husain. "Radiation Modes and Step Discontinuities in Dielectric Rib Waveguide." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1879-1888.

Dielectric rib waveguides are common transmission lines in integrated optics, with interesting possibilities for millimetrics. Guided modes of uniform lines have been extensively investigated. In actual circuits, discontinuities or bends produce radiation from the waveguide, that can not be explained by means of the guided modes alone and inclusion of the continuous spectrum is essential in understanding the physical effects that arise there. In this work, we introduce the continuum of the rib waveguide, a part of the spectrum that was not reported up to date. The theory is applied to the abrupt step discontinuity in the E-plane of the rib guide under LSE polarization and to the abrupt termination problem, including radiative effects never investigated before.

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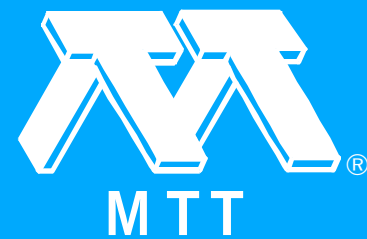


Abstracts

Boundary-Marching Method for Discontinuity Analysis in Waveguides of Arbitrary Cross Section

S.L. Foo and P.P. Silvester. "Boundary-Marching Method for Discontinuity Analysis in Waveguides of Arbitrary Cross Section." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1889-1893.

A recursive algorithm previously used in diffusion problems of geophysics and in electrostatics, is extended to wave phenomena. It is used to construct a matrix representation for an infinitely long waveguide of arbitrary cross-sectional shape. This representation is used in finite element analysis of waveguide discontinuities. In numerical tests, scattering matrices for the long guides converge to nearly full wave-length in 6-7 recursion steps, and discontinuity characteristics are within 1%-2% of known results where they exist.



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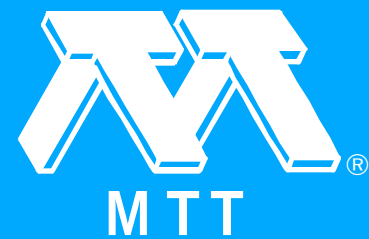
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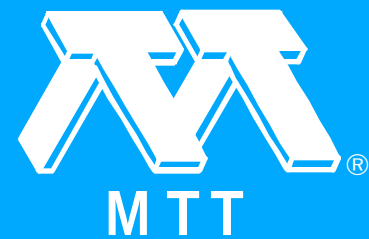
Capacitance Characterization Method for Thick-Conductor Multiple Planar Ring Structures on Multiple Substrate Layers

F. Tefiku and E. Yamashita. "Capacitance Characterization Method for Thick-Conductor Multiple Planar Ring Structures on Multiple Substrate Layers." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1894-1902.

A capacitance characterization method for thick-conductor multiple planar ring structures on multiple substrates layers has been made for the first time by extending the rectangular boundary division method. The region to be considered in the analysis is divided into subregions of thick-wall cylindrical tubes in each of which Laplace's equation is solved by the method of the separation of variables. A special application scheme of the boundary conditions is devised to decrease the number of necessary equations. Numerical results are shown for circular disk and planar ring structures in comparison with other available data.

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Modal Dispersion Control and Distortion Suppression of Picosecond Pulses in Suspended Coplanar Waveguides

Y. Qian, E. Yamashita and K. Atsuki. "Modal Dispersion Control and Distortion Suppression of Picosecond Pulses in Suspended Coplanar Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1903-1909.

In this paper we investigate the propagation and dispersion characteristics of picosecond electrical pulses in a suspended coplanar waveguide (SCPW) and show that the SCPW is a very promising transmission structure for ultra-short pulses with picosecond and subpicosecond durations, compared with conventional coplanar waveguides (CPWs). Numerical results of modal dispersion of the SCPW are presented and compared to those of the conventional CPW, and a field coupling theory is employed to explain the evolution in the dispersion behavior. An evaluation based on the numerical analysis shows that the SCPW with properly controlled dispersion can result in an improvement of about 5 times in pulse transmission capability than the conventional CPW. The propagation of picosecond pulses along the SCPW has been studied by both computer simulations and experimental measurements, both showing a substantial suppression in pulse distortion compared to the case of conventional coplanar waveguides.

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Very Wideband Operation of Twin-Layer Inset Dielectric Guide

S.R. Pennock, N. Izzat and T. Rozzi. "Very Wideband Operation of Twin-Layer Inset Dielectric Guide." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1910-1917.

Inset Dielectric Guide has been proposed as a transmission line for millimeter wave circuits and antennas. However, little has been determined concerning the guide parameters which control the bandwidth of the guide or the achievable bandwidth limits. In order to investigate these parameters we have analyzed the IDG structure in the case where the dielectric filling may be a multilayer structure. As a result, we have found that while IDG with a single filling can have a bandwidth exceeding that of rectangular metal waveguide, the use of just two dielectric layers can give bandwidths exceeding those typical of double ridge waveguide.





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Domain-Integral Analysis of Channel Waveguides in Anisotropic Multi-Layered Media

H.J.M. Bastiaansen, N.H.G. Baken and H. Blok. "Domain-Integral Analysis of Channel Waveguides in Anisotropic Multi-Layered Media." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1918-1926.

A domain-integral equation method is presented to determine both propagation constants and the electromagnetic field distributions of guided surface wave modes in integrated optical waveguides. Both the waveguide and its multi-layered embedding are anisotropic. The permittivity tensor of the embedding is assumed to be piecewise homogeneous. The kernels of the domain-integral equations consist of Green's tensors. The scattering-matrix formalism is used to construct the Green's tensors. The integral equations form an eigenvalue problem, where the electric field strength represents the eigen-vector. This problem is solved numerically by applying the method of moments. Numerical results are presented for an anisotropic ridge waveguide, embedded in an anisotropic multilayered medium.

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Field Analysis of New Coaxial Dielectrometer

W. Xi and W.R. Tinga. "Field Analysis of New Coaxial Dielectrometer." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1927-1934.

In response to the new developments in high temperature microwave dielectrometers, a field analysis of a composite sample insertion hole in a coaxial re-entrant cavity is performed via a mode-matching formulation. In this paper, the formulation and the numerical method are presented. The numerical results are discussed with attention focused on the hole effects on the dielectric loaded cavity. By virtue of this analysis and the structure which allows for the sample insertion holes, a new dielectrometer is obtained featuring both ease of sample insertion and accuracy in dielectric determinations. This paper demonstrates that solid, liquid or powdered samples can be readily accommodated and measured, and the dielectric data obtained via two theoretically calculated calibration curves are in good agreement with published data.



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An Ultra-Wideband MMIC Balanced Frequency Doubler Using Line-Unified HEMTs

T. Takenaka and H. Ogawa. "An Ultra-Wideband MMIC Balanced Frequency Doubler Using Line-Unified HEMTs." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1935-1940.

A very small, ultra-wideband MMIC balanced frequency doubler, which employs line-unified HEMT configurations, is proposed. A chip size of 1.0 mm x 0.9 mm is achieved with a conversion loss of 8-10 dB in the 4-40 GHz output harmonics frequency range and fundamental frequency signal isolation of better than 21 dB above the input fundamental frequency of 7 GHz. Circuit parameters are optimized in a novel and simple prediction using an equation derived from HEMT's dc characteristic and a linear-state CAD software package. The doubler promises to realize miniaturized, wideband MMIC transmitters/receivers.





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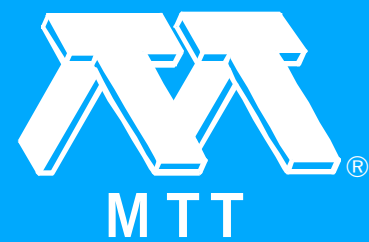
Voltage Calibration of the Direct Electrooptic Sampling Technique

D.R. Hjelme and A.R. Mickelson. "Voltage Calibration of the Direct Electrooptic Sampling Technique." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1941-1950.

A detailed study of various voltage calibration factors for the direct electrooptic sampling technique is presented. In reflection mode optical probing, the circuit substrate forms an etalon for the optical probe beam. Analytical expressions for the calibration factors due to etalon effects and decaying surface potentials are derived. Depending on the length of the sampling pulse relative to the substrate transit time, the etalon will affect either the voltage calibration factor or the system bandwidth. For pulses long compared to the transit time, interference at the surface results in a probe wavelength dependent storage time effect. The resulting electrooptic signal shows a resonant behavior as a function of wavelength or substrate thickness. For pulses short compared to the substrate transit time, multiple reflections reduce the effective system bandwidth to a bandwidth less than that given by the single transit time or the sampling pulse width. Experimental verification of the theoretical results are presented. Various deembedding procedures for implementing the voltage calibration are discussed.

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Numerical Analysis of a TM/sub 010/ Cavity for Dielectric Measurement

X. Zhao, C. Liu and L.C. Shen. "Numerical Analysis of a TM/sub 010/ Cavity for Dielectric Measurement." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1951-1959.

The property of a TM/sub 010/ cavity containing a lossy dielectric material is obtained by using the transmission-line-matrix (TLM) technique with serial nodes in cylindrical coordinates. The TM/sub 010/ cavity operating at 1.1 GHz has three concentric layers and an air gap between the sample and cavity cover. The influence of this air gap in terms of the Q-factor and the resonant frequency is studied by the numerical method. Employing the serial graded TLM technique, the resonant curve of the cavity is computed. From this, the Q factor and the center frequency can be evaluated. In the TLM method, the entire cavity space is discretized into small cells, Maxwell's equations in each cell are transformed into a matrix of transmission line equations. The voltage and the current in the inter-connected transmission line network are proportional to the electric and the magnetic field. The formulation of the method is in cylindrical coordinates and each cell may have different physical dimensions. Compared with the TLM method in rectangular coordinates and uniform grids, the present method is more efficient and easier to program for the analysis of the cavity with cylindrical symmetry. Computed results show that the air gap between the sample and cavity cover is very critical to the accuracy of the measurement of the dielectric property of the sample when the sample diameter is small, but negligible when the diameter of the sample is large.

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A 20 GHz Microwave Sampler (Short Papers)

K. Madani and C.S. Aitchison. "A 20 GHz Microwave Sampler (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1960-1963.

This paper describes a microwave sampler circuit which operates over the frequency band 1-20 GHz and has a number of novel features. These features include a new wideband microstrip to slot balun and a wideband active isolator whose function is to reduce the local oscillator to RF leakage from the input port of the sampler. The signal to noise ratio over the input bandwidth is greater than 20 dB at an input power level of -32 dBm. This signal to noise ratio is measured in an IF bandwidth of 175 MHz and includes the contribution from the IF amplifier. The sampler, which is made on alumina using MIC techniques has an integrated impulse generator which is driven with a sinusoidal local oscillator of only 20 dBm over the frequency band 250-350 MHz. The IF signal is in the band 10-175 MHz. The RF input VSWR is better than 2:1 up to 20 GHz whilst the local oscillator to RF breakthrough is better than -58 dBm (-78 dBc) when driven with a local oscillator of 20 dBm. This unusually low leakage has been achieved by using the active isolator prior to the sampling circuit.

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Abstracts

Characterizing Microwave Planar Circuits Using the Coupled Finite-Boundary Element Method (Short Papers)

K.-L. Wu, C. Wu and J. Litva. "Characterizing Microwave Planar Circuits Using the Coupled Finite-Boundary Element Method (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1963-1966.

A general approach is presented for the analysis of microwave planar circuits. The technique is particularly well suited to the analysis of circuits with complicated geometries and dielectric loads. The proposed technique is a hybrid, consisting of an amalgamation of the finite element and the boundary element techniques. The new technique can handle problems with mixed electric and magnetic walls, as well as complicated dielectric loads, such as those composed of ferrite materials. Computed and measured data for various complicated devices are compared, showing excellent agreement.



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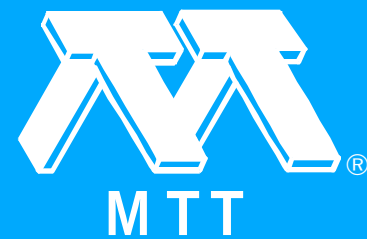


Abstracts

A Modified Transverse Resonance Method for the Analysis of Multilayered, Multiconductor Quasiplanar Structures with Finite Conductor Thickness and Mounting Grooves (Short Papers)

J.-W. Tao. "A Modified Transverse Resonance Method for the Analysis of Multilayered, Multiconductor Quasiplanar Structures with Finite Conductor Thickness and Mounting Grooves (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1966-1970.

A modified transverse resonance method is presented for analyzing generalized multilayered, multiconductor quasiplanar structures with practical parameters such as finite conductor thickness and mounting grooves. Recurrence relations are obtained by using network theory, for obtaining the overall transverse equivalent network, while the discontinuity involving finite thickness metal sheet and mounting groove is carried out by field-theory based multimodal variational formulation. The frequency behavior of propagating, evanescent and complex modes are obtained for several commonly used quasiplanar lines, showing good agreement with published results. Furthermore, the leaky-wave study is carried out for open structures, since the open condition can be included in this formulation without difficulties.



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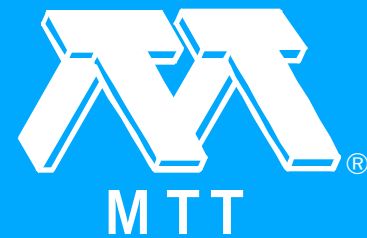


Abstracts

Dispersion and Leakage Characteristics of Coplanar Waveguides (Short Papers)

J.-Y. Ke, I.-S. Tsai and C.H. Chen. "Dispersion and Leakage Characteristics of Coplanar Waveguides (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1970-1973.

The spectral-domain approach is utilized to discuss the dispersion and leakage phenomenon in a coplanar waveguide structure caused by the substrate surface wave. In this study, the effective dielectric constant and the attenuation constant due to surface wave leakage are presented and discussed in detail.



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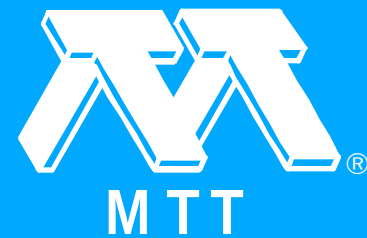


Abstracts

The Scattering Matrix Formulation for Overmoded Coaxial Cavities (Short Papers)

W. Lawson and P.E. Latham. "The Scattering Matrix Formulation for Overmoded Coaxial Cavities (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1973-1977.

The scattering matrix formulation for complex right-circular cavities is extended to coaxial circuits with variable inner radii. The modified eigenvectors, which include the TEM wave, and the modified boundary conditions are presented. The properties of several configurations are examined and transmission measurements are shown to be in good agreement with theory.



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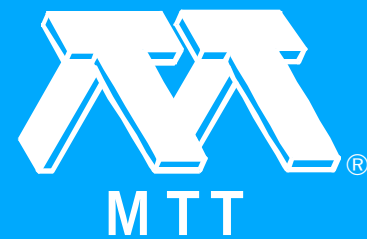


Abstracts

Method of Interpolation Factorization (MIF) for the Solution of Two-Dimensional Diffraction Problems (Short Papers)

V. Volman and J. Gavan. "Method of Interpolation Factorization (MIF) for the Solution of Two-Dimensional Diffraction Problems (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1977-1979.

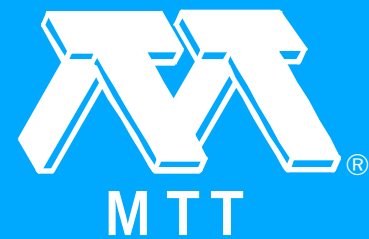
A new method for exact solution of two-dimensional diffraction problems is presented.



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Optimal Microwave Source Distributions for Heating Off-Center Tumors in Spheres of High Water Content Tissue (Short Papers)

C.M. Rappaport and J.G. Pereira. "Optimal Microwave Source Distributions for Heating Off-Center Tumors in Spheres of High Water Content Tissue (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1979-1982.

A surface distribution of electric dipoles can be used to represent a multi-element microwave hyperthermia applicator for non-residue invasive heating of off-center targets within a spherical high-water-content tissue volume--such as the head. This paper presents a method for finding the optimal surface distributions for delivering maximum power for arbitrarily located deep tumors in such a uniform spherical volume. The resulting focused power dissipation pattern for any tumor location has a global maximum at the tumor, and also is the largest spherical volume for which no healthy tissue is overheated. The optimization uses spherical field harmonics, centered at the tumor target, summed with suitable complex weights to iteratively minimize surface power. Once the best field distributions are derived, the current sources which generate these distributions are determined. The resulting excitations represent the theoretically ideal spherical microwave hyperthermia configuration for which no physical applicator system can surpass.

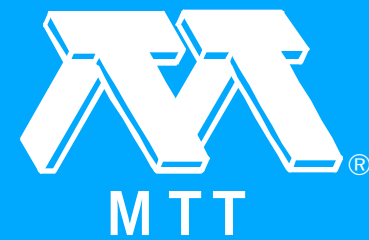
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Adaptive Antenna Systems Symposium (Oct. 1992 [T-MTT])

"Adaptive Antenna Systems Symposium (Oct. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1983-1983.



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Call for Papers - Combined Optical-Microwave Earth and Atmosphere Sensing (Oct. 1992 [T- MTT])

"Call for Papers - Combined Optical-Microwave Earth and Atmosphere Sensing (Oct. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1984-1984.



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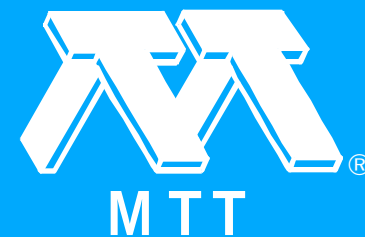
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Call for Papers - The Global Reach of Microwaves (Oct. 1992 [T-MTT])

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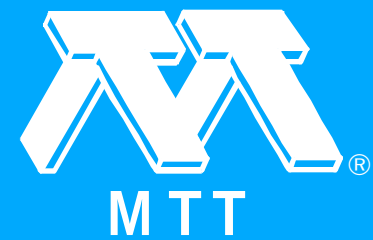
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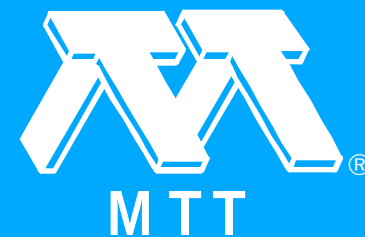
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Emerging Technologies (Advertisement) (Oct. 1992 [T-MTT])

"Emerging Technologies (Advertisement) (Oct. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1988-1988.



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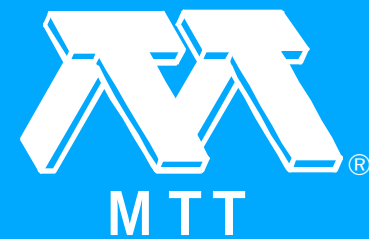
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High-Speed, 100+ W RF Switches Using GaAs MMICs

P. Katzin, B.E. Bedard, M.B. Shifrin and Y. Ayasli. "High-Speed, 100+ W RF Switches Using GaAs MMICs." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 1989-1996.

We have developed a low-loss, inductive gate bias network structure which allows very high stacking level of FET devices for high-power rf switching applications. We describe the design, implementation, and performance of S- and C-band SPDT switches based on this structure, using multiple GaAs MMIC chips integrated into a suspended-substrate hybrid circuit. At S-band, we demonstrated switch rise-fall times of less than 40 ns and an rf power handling capability of 300 W CW. This input signal level could be maintained during the switch state transitions ('hot-switching'), while being switched between the two output ports at rates up to 500 KHz.

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Planar MESFET Grid Oscillators Using Gate Feedback

R.M. Weikle, II, M. Kim, J.B. Hacker, M.P. De Lisio and D.B. Rutledge. "Planar MESFET Grid Oscillators Using Gate Feedback." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 1997-2003.

A new method for quasi-optically combining the output power of MESFET's is presented in which drain and source leads couple directly to the radiated field. The design consists of a planar grid of devices placed in a Fabry-Perot cavity. Capacitive feedback is provided to the gate. This is in contrast to previous MESFET grid designs where the radiated electric field was coupled to the drain and gate currents. The new gate-feedback grids can oscillate at much higher frequencies than these previous grids. The oscillation frequency is dependent on the device characteristics, the resonator cavity, and is also a function of the symmetries of the grid. A transmission-line model for the grid is discussed and used to design two oscillator arrays. Experimental results are presented for oscillator grids operating at X-band and Ku-band. A 16-element grid has produced 335 mW of power at 11.6 GHz with a DC-to-RF conversion efficiency of 20%. This design was scaled to produce a 36-element grid oscillator with output power of 235 mW at 17 GHz. These results represent a significant improvement in the performance of planar grid oscillators which were previously limited to an operating frequency of 5 GHz and output power of 6 mW per device when using the same transistor. In addition, the planar configuration of the grid is very convenient for monolithic integration and is easily scalable to millimeterwave frequencies.



Abstracts

Wave Techniques for Noise Modeling and Measurement

S.W. Wedge and D.B. Rutledge. "Wave Techniques for Noise Modeling and Measurement." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2004-2012.

The noise wave approach is applied to analysis, modeling, and measurement applications. Methods are presented for the calculation of component and network noise wave correlation matrices. Embedding calculations, relations to two-port figures-of-merit, and transformations to traditional representations are discussed. Simple expressions are derived for MESFET and HEMT noise wave parameters based on a linear equivalent circuit. A noise wave measurement technique is presented and experimentally compared with the conventional method.



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A General Noise De-Embedding Procedure for Packaged Two-Port Linear Active Devices

R.A. Pucel, W. Struble, R. Hallgren and U.L. Rohde. "A General Noise De-Embedding Procedure for Packaged Two-Port Linear Active Devices." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2013-2024.

A general noise de-embedding procedure is described for packaged two-port linear active devices. The method is based on the noise correlation technique and its applications developed previously. In its most general form, the package, which need not be reciprocal, may consist of an arbitrary interconnection of linear passive elements at thermal equilibrium. Only the terminal admittance properties of the package need be known, not its topology. However, under certain special cases which lead to singular submatrices of the admittance matrix the method is inapplicable as will be pointed out. This situation may occur when elements such as isolators are part of the package. Our objective in this paper is to draw together, in one place, the necessary theoretical foundation and experimental techniques to enable workers, not familiar with the field, to assemble the software and laboratory setup for two-port noise de-embedding. In line with this objective, we have borrowed from the work of earlier authors. In furtherance of our goal to make the paper self-contained, we describe in some detail the automated noise measurement system used for data acquisition and the mathematical basis for it. Last, but not least, we establish the validity of the de-embedding approach with extensive experimental data obtained on three MESFETs and a PsHEMT.

Click on title for a complete paper.



Abstracts

Frequency-Domain Analysis of Coupled Nonuniform Transmission Lines Using Chebyshev Pseudo-Spatial Techniques

G.-W. Pan, G.J. Wunsch and B.K. Gilbert. "Frequency-Domain Analysis of Coupled Nonuniform Transmission Lines Using Chebyshev Pseudo-Spatial Techniques." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2025-2033.

The analysis of nonuniform cross-section, lossy and coupled transmission lines is frequently necessary in the design and simulation of high speed microelectronics systems. This paper presents a method of performing such simulations on lossy lines of arbitrary cross section, under the quasi-TEM assumption. The technique incorporates a Chebyshev expansion in the frequency domain, and is one of the most suitable methods presently in existence for incorporation into computer aided design tools.



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Conductor Loss in Hollow Waveguides Using a Surface Integral Formulation (Nov. 1992 [T-MTT])

M. Swaminathan, T.K. Sarkar, P. Petre and T. Roy. "Conductor Loss in Hollow Waveguides Using a Surface Integral Formulation (Nov. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2034-2041.

The power-loss method along with a surface integral formulation has been used to compute the attenuation constant in hollow waveguides of arbitrary cross-section. An E-field integral equation is developed for the surface electric currents which is transformed into a matrix equation using the method of moments. An iterative technique, i.e., Muller's method is used to obtain the relation between the propagation constant and frequency. The attenuation constants have been calculated and formulated for various waveguides and are in good agreement with published data.

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Continuous Spectrum of a Flange-Backed Slotted Waveguide with Application

T. Rozzi and M. Mongiardo. "Continuous Spectrum of a Flange-Backed Slotted Waveguide with Application." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2042-2049.

The continuum of an open waveguide describes radiation as simply, in principle, as the discrete spectrum of a classical guide describes any physical field in it. This part of the spectrum, however, has received little attention for guides of nonseparable two-dimensional cross-sections. To illustrate its derivation, in this contribution we establish the continuum of a flange-backed rectangular waveguide slotted on its narrow wall. As a demonstration for its use, we determine the transmission and radiation properties of the junction between an ordinary and slotted guide.

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Characteristics of Inhomogeneously Filled Double L-Septa Waveguides

P.K. Saha and D. Guha. "Characteristics of Inhomogeneously Filled Double L-Septa Waveguides." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2050-2054.

Three types of inhomogeneous Double L-Septa Guides produced by selective dielectric loading of the different regions have been analyzed. The cut-off and bandwidth characteristics of these configurations are compared with inhomogeneous T-septa guide and homogeneous DLSG. From the study an optimum configuration with very large bandwidth emerges as a potential structure for practical implementation.





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Derivation of Closed-Form Green's Functions for a General Microstrip Geometry

M.I. Aksun and R. Mittra. "Derivation of Closed-Form Green's Functions for a General Microstrip Geometry." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2055-2062.

The derivation of the closed-form spatial domain Green's functions for the vector and scalar potentials is presented for a microstrip geometry with a substrate and a superstrata, whose thicknesses can be arbitrary. The spatial domain Green's functions for printed circuits are typically expressed as Sommerfeld integrals, that are inverse Hankel transform of the corresponding spectral domain Green's functions, and are quite time-consuming to evaluate. Closed-form representations of these Green's functions in the spatial domains can only be obtained if the integrands are approximated by a linear combination of functions that are analytically integrable. In this paper, we show we can accomplish this by approximating the spectral domain Green's functions in terms of complex exponential by using the least square Prony's method.

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Abstracts

Estimation of Spurious Radiation from Microstrip Etches Using Closed-Form Green's Functions

M.I. Aksun and R. Mittra. "Estimation of Spurious Radiation from Microstrip Etches Using Closed-Form Green's Functions." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2063-2069.

The problem of spurious radiation from electronic packages is considered in this paper by investigating the power radiated from microstrip etches that are excited by arbitrarily-located current sources, and terminated by complex loads at both ends. The first step in the procedure is to compute the current distribution on the microstrip line by using the method of moments (MoM). Two novel contributions of this paper are: (i) employing the recently-derived closed-form Green's functions in the spatial domain that permit an efficient computation of the elements of the MoM matrix; (ii) incorporating complex load terminations in a convenient manner with virtually no increase in the computation time. The computed current distribution is subsequently used to calculate the spurious radiated power and the result is compared with that derived by using an approximate, transmission line analysis.



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A Solution of Coplanar Waveguide with Air-Bridges Using Complex Images

A.A. Omar and Y.L. Chow. "A Solution of Coplanar Waveguide with Air-Bridges Using Complex Images." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2070-2077.

A new method is proposed to solve general CPW circuits including air-bridges. This method generalizes the integral equation technique to nonplanar structures containing hybrid electric and magnetic currents. It also exploits the full wave complex image technique to efficiently calculate the Green's functions of this structure. The proposed method, therefore, offers a substantial reduction in computer time and memory over many other full wave methods. The accuracy of the proposed method is checked by comparing with available FDTD-theoretical and experimental results for a CPW band reject filter. Using only 92 matching points, our method gave very good agreement.

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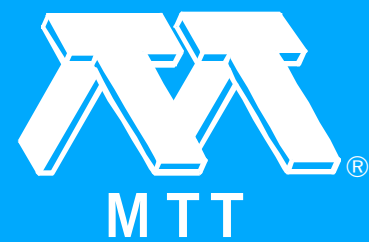
A New Implementation of a Multiport Automatic Network Analyzer

A. Ferrero, U. Pisani and K.J. Kerwin. "A New Implementation of a Multiport Automatic Network Analyzer." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2078-2085.

A generalized multiport network analyzer implemented using commercially available hardware is presented. Measurement calibration is accomplished through a novel calibration procedure which requires only conventional standards used for two-port calibrations. The calibration theory accounts for the errors due to the signal switching network but does not systematically remove errors due to signal leakage between port pairs. The approach is verified on a three-port test set implementation, and the measuring system can be expanded to n-ports with additional hardware in a straightforward manner. Experimental verification was carried out through measurement of one, two, and three ports devices connected to the test set ports in several different ways. Excellent agreement of the same corrected S-parameters measured at different test set ports was observed, and confidence in system accuracy is established through measurement of two-port verification standards.

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A Novel Highly Accurate Synthetic Technique for Determination of the Dispersive Characteristics in Periodic Slow Wave Circuits

H. Guo, Y. Carmel, W.R. Lou, L. Chen, J. Rodgers, D.K. Abe, A. Bromborsky, W. Destler and V.L. Granatstein. "A Novel Highly Accurate Synthetic Technique for Determination of the Dispersive Characteristics in Periodic Slow Wave Circuits." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2086-2094.

A novel, highly accurate (0.1-0.5%) synthetic technique for determining the complete dispersive characteristics of electromagnetic modes in a spatially periodic structure is presented. It was successfully applied for the cases of the fundamental (TM/sub 0(1)/) as well as higher order (TM/sub 0(2)/, TM/sub 0(3)/) passband modes in a corrugated waveguide. This structure is commonly used in relativistic backward wave oscillators, traveling wave tubes, extended interaction oscillators and a variety of multiwave Cerenkov generators. An appropriately shorted periodic structure resonates at specific frequencies. To accurately and unambiguously measure these frequencies we used unique antenna radiators to excite pure modes in the circuit under test. An analytical technique to derive the complete dispersion relation using the experimentally measured resonances is presented. This technique, which is based on the intrinsic characteristics of spatially periodic structures, is applicable to slow wave structures of arbitrary geometry.

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Absorbing Boundary Conditions for the TLM Method

J.A. Morente, J.A. Porti and M. Khalladi. "Absorbing Boundary Conditions for the TLM Method." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2095-2099.

The numerical boundary conditions when behavior of different absorbing applied to the transmission-line modelling method is presented. These conditions may be classified into three different groups according to the way they are derived. The first group is obtained by discretizing one-way analytical conditions derived for the analytical wave equation. The second group is a set of discrete conditions directly obtained for the discrete wave equation. The last group is based on appropriate reflection coefficients derived purely from transmissionline theory. Due to its different behavior, the numerical study is explicitly carried out for both two- and three-dimensional free-space scattering problems.

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Dielectric Resonator Filters with Wide Stopbands (Short Paper)

R.V. Snyder. "Dielectric Resonator Filters with Wide Stopbands (Short Paper)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2100-2103.

Use of dielectric resonators in filter networks enables construction of small, low-loss, stable filters. However, such resonators present a modal spectrum with undesired, or spurious, resonances in close proximity to the desired one. Through the use of evanescent mode bandpass irises tuned to the filter center frequency, the resonator spurious modes are suppressed, resulting in N-section filters with stopbands clean to at least (N-1) times the individual iris stopband levels. The tuned irises contribute a small amount of insertion loss but also further reduce the size of the composite filter as compared to a conventional design. The problem of achieving a wide stopband is thus reduced to the more or less well-known problems of realizing the resonating capacitance required in an evanescent bandpass filter plus the computation of the junction susceptance occurring at the interface between a larger evanescent section (the resonator enclosure) and the smaller iris opening. The technique to be described results in high-Q resonator filters with stopbands clean to at least -55 dBc, out to at least 1.7 times the filter center frequency.

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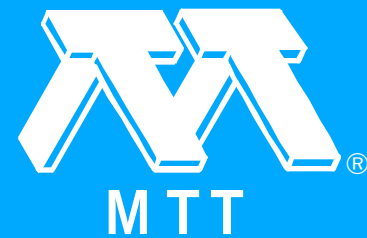


Abstracts

Analysis and Modeling of Coupled Dispersive Interconnection Lines (Short Papers)

T. Dhaene, S. Criel and D. De Zutter. "Analysis and Modeling of Coupled Dispersive Interconnection Lines (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2103-2105.

In this short paper, we present a standard method for the analysis and the simulation of coupled dispersive interconnection structures. A high-frequency circuit model is proposed which is well-suited for CAD applications. A lot of attention is paid to the physical interpretation of the full-wave parameters.



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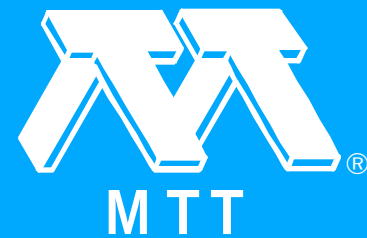


Abstracts

Computation of Cavity Resonances Using Edge-Based Finite Elements (Short Papers)

A. Chatterjee, J.M. Jin and J.L. Volakis. "Computation of Cavity Resonances Using Edge-Based Finite Elements (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2106-2108.

In this paper, the eigenvalues of a cavity resonator are computed using edge-based finite elements, and it is shown that these elements offer significant improvements in accuracy, in addition to being suitable for modelling arbitrarily shaped inhomogeneous regions. A performance comparison between the edge-based tetrahedral and rectangular brick elements is also carried out.



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Dielectric Property Measurements of Materials Using the Cavity Technique (Short Papers)

A. Baysar and J.L. Kuester. "Dielectric Property Measurements of Materials Using the Cavity Technique (Short Papers)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2108-2110.

A cavity technique based on frequency shift was used to measure dielectric properties (dielectric constant and loss factor) of some particulate materials as a function of temperature. The materials studied were alumina, cobalt/alumina, dolomite and sand. The properties were measured at various points between room temperature and 610° C in the frequency range of 925-995 MHz. The dielectric constant and loss factor of all samples, except the cobalt/alumina catalyst sample, were approximately constant with temperature. The dielectric constant and loss factor of the cobalt/alumina sample exhibited a noticeable increase with temperature.

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Abstracts

Analysis of Superconducting Microwave Structures: Application to Microstrip Lines (Comments)

Y.L. Chow, R. Faraji-Dana and S. Safavi-Nacini. "Analysis of Superconducting Microwave Structures: Application to Microstrip Lines (Comments)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2111-2112.

The above paper suggests a strong relation between the axial current distribution J_z over the cross section of a superconducting microstripline and the accumulated charge density ρ_s on its boundary surface.



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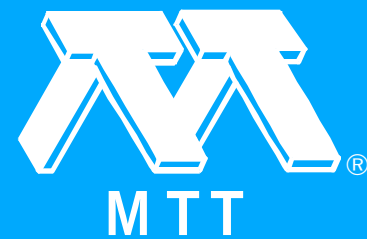


Abstracts

A Study of the Nonorthogonal FDTD Method Versus the Conventional FDTD Technique for Computing Resonant Frequencies of Cylindrical Cavities (Corrections)

P.H. Harms, J.-F. Lee and R. Mittra. "A Study of the Nonorthogonal FDTD Method Versus the Conventional FDTD Technique for Computing Resonant Frequencies of Cylindrical Cavities (Corrections)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2115-2116.

A few corrections should be noted in our paper. The reference numbers in Table I and II are incorrect, and a third reference should be added. Also, a mode shown for the results of the nonorthogonal FDTD analysis in Fig. 9 (b) was not included in Table II.



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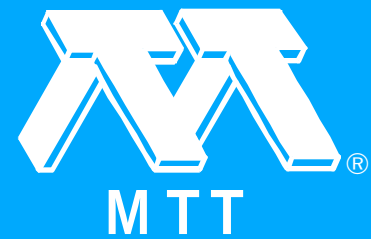


Abstracts

Analysis of Multilayer Microstrip Lines by a Conformal Mapping Method (Correction)

J. Svacina. "Analysis of Multilayer Microstrip Lines by a Conformal Mapping Method (Correction)." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2116-2116.

The above paper contains one typographical error.



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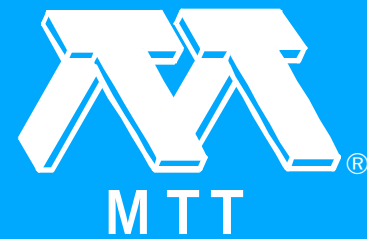
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"Adaptive Antenna Systems Symposium (Nov. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 2117-2117.



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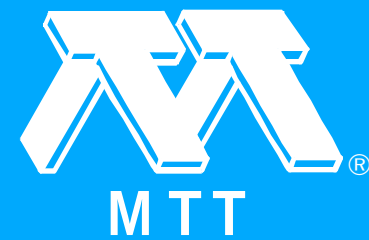
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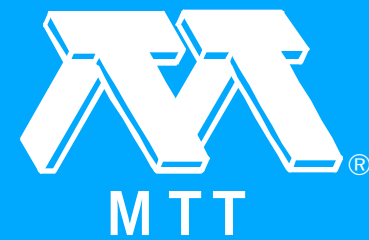
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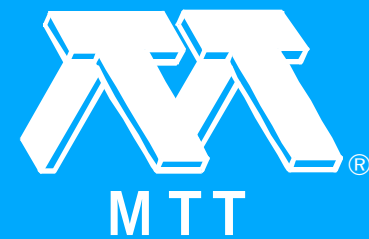
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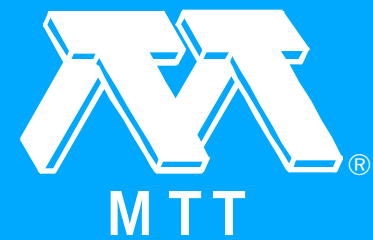
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Guest Editors' Overview (Dec. 1992 [T-MTT])

E.K. Miller and E.W. Strid. "Guest Editors' Overview (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2123-2124.

The 1992 international microwave symposium (IMS) and microwave and millimeter-wave circuits symposium (MMWMCS) in Albuquerque, NM attracted a large number of papers. Of the 646 submission to the IMS and 68 submissions to the MMWMCS, 380 and 48 respectively, were accepted. From these, expander versions of 89 IMS papers and eight MMWMCS papers were submitted for publication in this issue and following the review process 38 IMS and six MMWMCS papers were accepted. A significant number of papers were returned to the authors for revision and resubmission to Dr. Stephen A. Maas because the publication deadline of this issue did not allow for a second review cycle. Some of these papers will be published in future issues of Transactions.

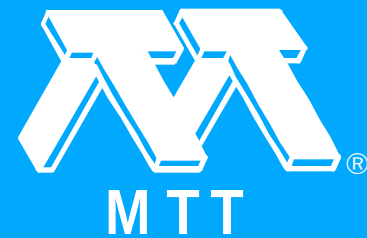
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Abstracts

The 1992 IEEE MTT-S International Microwave Symposium (Dec. 1992 [T-MTT])

J. Hausner. "The 1992 IEEE MTT-S International Microwave Symposium (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2125-2128.



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1992 MTT-S Awards (Dec. 1992 [T-MTT])

"1992 MTT-S Awards (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2129-2136.



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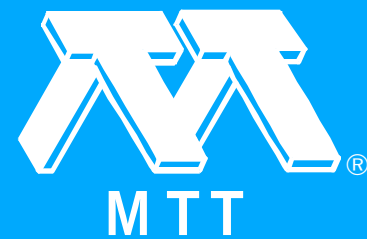


Abstracts

Full-Wave Spectral-Domain Analysis of Compensation of Microstrip Discontinuities Using Triangular Subdomain Functions (Dec. 1992 ([T-MTT]))

T.-S. Horng, W.E. McKinzie and N.G. Alexopoulos. "Full-Wave Spectral-Domain Analysis of Compensation of Microstrip Discontinuities Using Triangular Subdomain Functions (Dec. 1992 ([T-MTT]))." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2137-2147.

This paper presents a full-wave spectral-domain analysis to investigate compensation of a variety of microstrip discontinuities including open-ends, bends and T junctions. To properly model the discontinuities with miters as well as 90° corners, vector-valued triangular subdomain functions are used as both expansion and testing functions in the moment method procedure. Special consideration is given to the numerical treatment of the reaction integral between two triangular sub-domains such that rather complicated geometrical configurations can be handled very efficiently. Comparison of some numerical results with available experimental data shows excellent agreement. The losses due to radiation and surface waves for some discontinuities are also included.



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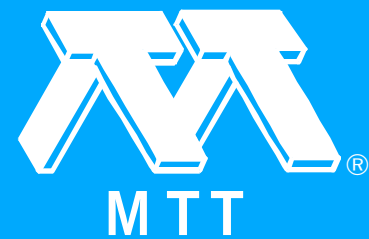
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MIS Slow-Wave Structures Over a Wide Range of Parameters (Dec. 1992 [T-MTT])

J.P.K. Gilb and C.A. Balanis. "MIS Slow-Wave Structures Over a Wide Range of Parameters (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2148-2154.

The high dielectric losses of the semiconducting substrates used in MMIC's and VLSI interconnects can strongly affect all of the characteristics of these lines. No single approximate formulation is accurate over a wide range of substrate parameters or over a large frequency range; thus it is necessary to use a full-wave approach. Multi-conductor MIS structures are analyzed with the spectral domain approach over a wide range of frequency and substrate loss. The modal attenuation and propagation constants are presented for two and four conductor structures as a function of the substrate loss tangent. Single conductor structures are characterized with contour plots showing the complex effective dielectric constant as a function of both frequency and conductivity. MIS slow-wave structures are analyzed for both Si-SiO/sub 2/ and GaAs configurations.

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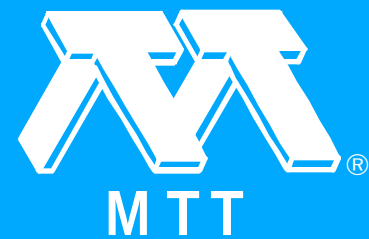
Time-Domain Electromagnetic Analysis of Interconnects in a Computer Chip Package

W.D. Becker, P.H. Harms and R. Mittra. "Time-Domain Electromagnetic Analysis of Interconnects in a Computer Chip Package." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2155-2163.

The determination of an equivalent circuit to approximate the behavior of an interconnect in a computer package is an important step in the performance evaluation of a computer. Equivalent circuits allow the analysis of a complete interconnect path in a circuit simulator where a full-wave analysis tool would require more memory or computer time than is currently available. Two important components of an interconnect in a computer package are uniform transmission lines, such as a microstrip line or a stripline, and a discontinuity in the interconnect, such as a via between two transmission lines. This paper presents a methodology for deriving a frequency-dependent description of coupled transmission lines and equivalent circuit of a via using time-domain full-wave solutions of Maxwell's equations.

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Field Theoretical Treatment of E-Plane Waveguide Junctions with Anisotropic Medium

Y.-Y. Tsai and A.S. Omar. "Field Theoretical Treatment of E-Plane Waveguide Junctions with Anisotropic Medium." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2164-2171.

An analysis of E-plane waveguide junctions containing an anisotropic medium is presented. The analysis is based on the equivalence principle and on cavity field expansions. Using the equivalence principle, magnetic surface currents are introduced at the imaginary boundaries chosen between the central region of the junction and the waveguides. The electric displacement D in the junction is expressed in terms of a solenoidal set while the magnetic induction B is expressed in terms of a solenoidal set and an irrotational set. Matching the tangential magnetic field at the imaginary boundaries leads to a matrix equation, the unknown of which are the amplitudes of the scattered waveguide modes. Using this method, the performance of E-plane waveguide junctions with full-height and partial-height ferrite post is analyzed. The influence of the completeness terms $G/\text{sub } oq/$ on the numerical results of an empty E-plane Y-junction is shown. The numerical results are compared with previously published experimental and theoretical results.

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Coaxial Probe Modeling in Waveguides and Cavities (Dec. 1992 [T-MTT])

J.-F. Liang, H.-C. Chang and K.A. Zaki. "Coaxial Probe Modeling in Waveguides and Cavities (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2172-2180.

Modeling, design and sensitivity analysis of probe-excited cavities are presented. The 3 cavities moment method is used to obtain the 2-port scattering matrix of the probe-excited semi-infinite waveguide while a novel equivalent circuit is introduced and used as a circuit model for the scattering matrix. A design procedure for probe-excited input/output cavities in waveguide filters is proposed and a sensitivity analysis is carried out to show the effect of the probe's dimensions on the electrical characteristics of the circuit. Agreement with experimental data is excellent for loosely-coupled probe-excited semi-infinite waveguide problems. An example for a 15 GHz thick iris filter verifies the validity of the proposed design.

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Broadside-Coupled Coplanar Waveguides and Their End-Coupled Band-Pass Filter Applications

C. Nguyen. "Broadside-Coupled Coplanar Waveguides and Their End-Coupled Band-Pass Filter Applications." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2181-2189.

New broadside-coupled coplanar waveguides, suitable for applications requiring wide bandwidths, tight couplings, and large mode effective-dielectric-constant ratios, are presented. Their analysis and investigation are described. Simple equations relating the per-unit-length capacitances of the c- and pi-modes and the per-unit-length capacitance matrices of the coupled structures to those obtained when applying even- and odd-symmetric voltages are also derived. New broadside end-coupled band-pass filters have been developed at X-band (8-12 GHz) with less than 1.5 and 1.0 dB passband insertion losses using the proposed four-ground-plane and two-ground-plane coplanar waveguide structures, respectively. Good agreement between the experimental results and those predicted theoretically was also observed.

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Abstracts

A Generalized Model for Coupled Lines and its Applications to Two-Layer Planar Circuits

C.-M. Tsai and K.C. Gupta. "A Generalized Model for Coupled Lines and its Applications to Two-Layer Planar Circuits." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2190-2199.

A generalized network model for asymmetrical and inhomogeneous coupled lines has been derived based on normal mode parameters. This model is useful for synthesis of single and multi-layer coupled-line circuits, such as planar baluns and directional couplers. The synthesis procedures are described and have been verified by comparing with analysis results.



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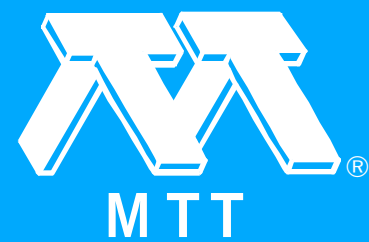
A Rigorous and Efficient Method of Moments Solution for Curved Waveguide Bends

A. Weisshaar, S.M. Goodnick and V.K. Tripathi. "A Rigorous and Efficient Method of Moments Solution for Curved Waveguide Bends." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2200-2206.

An accurate and computationally efficient method of moments solution together with a mode-matching technique for the analysis of curved bends in a general parallel-plate waveguide is presented. In order to exemplify the techniques, the method is applied to study the transmission characteristics of single and cascaded curved E- and H-plane bends in a rectangular waveguide. It is shown that the effect of the orientation of cascaded bends on the transmission properties can be significant, and examples to demonstrate this effect are included. Results of the convergence with increasing number of expansion functions illustrate that only a few terms need to be considered for accurate evaluation of the transmission characteristics of structures having single and multiple bends. Comparison with measurements for single and cascaded curved H-plane bends in a WR-90 waveguide show good agreement with the predicted result.

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The Frequency-Domain Transmission Line Matrix Method--A New Concept

H. Jin and R. Vahldieck. "The Frequency-Domain Transmission Line Matrix Method--A New Concept." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2207-2218.

A new frequency-domain TLM method is presented for the frequency selective s-matrix computation of 3- D waveguide discontinuities. The new approach combines the flexibility of the conventional TLM method with the computational efficiency of frequency-domain methods. The basis for this new technique is a novel excitation of an impulse train of sinusoidally modulated magnitude. At any time step, this excitation retains the form of an impulse while its envelop contains the information of the structure at the modulation frequency. Utilizing the diakoptics technique in conjunction with the new concept of the intrinsic scattering matrix, which relates the reflected and incident impulses at the exterior branches of any discontinuity structure, the original electromagnetic field problem is simplified into a matrix algebra problem, allowing the use of linear algebra tools to further enhance the computational efficiency of the algorithm. A variety of structures have been analyzed in order to check the accuracy of this new approach and excellent agreement has been observed in all cases. S-parameters for CPW air-bridges including finite thickness and conductivity of the metallizations are computed. For the first time in literature, also the effect of superconductor air-bridges is analyzed.

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Analysis of 3-D Metallization Structures by a Full-Wave Spectral Domain Technique

T. Becks and I. Wolff. "Analysis of 3-D Metallization Structures by a Full-Wave Spectral Domain Technique." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2219-2227.

A full-wave method for the investigation of microstrip- and coplanar-structures including 3-D metallization structures is presented. The spectral domain analysis method is used to calculate the S-parameters of unshielded microwave components containing bond-wires and air-bridges. The general formulation and the implementation procedure of the method are described. The application of the theory is given by a comparison of measured and calculated results for a spiral inductor, including an air-bridge.

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Abstracts

Full-Wave Modeling of via Hole Grounds in Microstrip by Three-Dimensional Mode Matching Technique (Dec. 1992 [T-MTT])

R. Sorrentino, F. Alessandri, M. Mongiardo, G. Avitabile and L. Roselli. "Full-Wave Modeling of via Hole Grounds in Microstrip by Three-Dimensional Mode Matching Technique (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2228-2234.

A rigorous full-wave analysis of microstrip via hole grounds is presented using a three-dimensional mode-matching technique in connection with a suitable segmentation of the structure into homogeneous parallelepipedal cells. The adoption of the novel impressed source technique reduces substantially the numerical effort compared to the transverse resonance technique and, in addition to the finite metallization thickness, accounts for possible package interaction. Theoretical results are compared with several experimental data from various sources, including our experiments, showing excellent agreement. Package effects have been observed experimentally and shown to be fully predicted by the theory.



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Asymetric Excitation of Symmetric Single-Mode Y-Junctions: The Radiation Mode Effects

D.A.M. Khalil, P. Benech and S. Tedjini. "Asymetric Excitation of Symmetric Single-Mode Y-Junctions: The Radiation Mode Effects." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2235-2242.

The asymmetric excitation of a symmetric single-mode Y-junction is studied in this work using two techniques: the standard BPM and a modal analysis based on the radiation spectrum. We found that the power splitting between the two outputs of the junction is strongly dependent on the coherent coupling of the odd radiation modes excited at the input of the junction. A GaAs/GaAlAs single mode junction excited by a single mode fiber is experimentally tested and a splitting ratio as high as 12 dB is obtained. Such a result, which could not be explained if the radiation field is neglected, proposes new applications of the Y-junction like an optical displacement sensor with a high sensitivity in the order of 5 dB/ μm .

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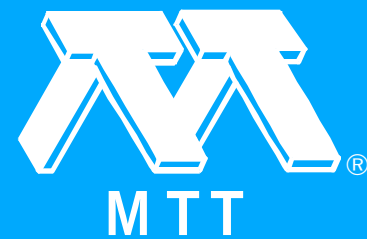


Abstracts

Coaxial Antenna Array for 915 MHz Interstitial Hyperthermia: Design and Modelization-Power Deposition and Heating Pattern-Phased Array

J.-C. Camart, J.-J. Fabre, B. Prevost, J. Pribetich and M. Chive. "Coaxial Antenna Array for 915 MHz Interstitial Hyperthermia: Design and Modelization-Power Deposition and Heating Pattern-Phased Array." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2243-2250.

Coaxial antennas different in their active length have been designed, to be used in a complete 915 MHz hyperthermia system with temperature control by microwave radiometry. Heating patterns are reconstructed from the power deposition associated with the bioheat transfer equation. Temperature control is effected by means of microwave radiometry and used in order to determine bioheat parameters. Phased arrays are studied allowing heated volume expansion.



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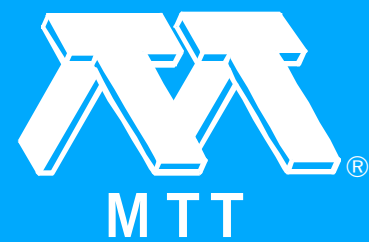
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Generalized Spectral-Domain Analysis for Multilayered Complex Media and High-Tc Superconductor Applications

Z. Cai and J. Bornemann. "Generalized Spectral-Domain Analysis for Multilayered Complex Media and High-Tc Superconductor Applications." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2251-2257.

An efficient algorithm to rigorously derive the spectral-domain impedance dyadic Green's function for MMIC's on general complex anisotropic or bi-anisotropic substrates is developed. The main advantage of the applied technique is that it provides closed-form expressions for transverse propagation constants and related immittances in the spectral domain and, therefore, allows the following parameters to be taken into account: dielectric and magnetic losses of anisotropic or bi-anisotropic media without restrictions to the magnitude of tensor elements, alternative directions for magnetic bias, the finite metallization thickness of conventional conductors and/or superconductors including their losses, microstrip and coplanar waveguide structures in open, shielded and conductor-backed technology. The theory is verified by comparison with previously published data. The flexibility is demonstrated for both superconductor and conventional conductor (M)MIC structures on ferrite-dielectric or bi-anisotropic substrates with different directions for magnetic bias. The CPU time is 10-20 seconds per frequency sample on a modern workstation.

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A New Empirical Nonlinear Model for HEMT and MESFET Devices

I. Angelov, H. Zirath and N. Rorsman. "A New Empirical Nonlinear Model for HEMT and MESFET Devices." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2258-2266.

A new large signal model for HEMT's and MESFET's, capable of modeling the current-voltage characteristic and its derivatives, including the characteristic transconductance peak, gate-source and gate-drain capacitances is described. Model parameter extraction is straightforward and is demonstrated for different submicron gate-length HEMT devices including different /spl part/-doped pseudomorphic HEMTs on GaAs and lattice matched to InP, and a commercially available MESFET. Measured and modeled dc and S-parameters are compared and found to coincide well.

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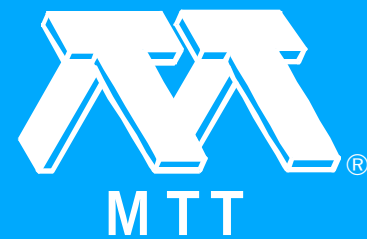


Abstracts

Moving Boundaries in 2-D and 3-D TLM Simulations Realized by Recursive Formulas

U. Mueller, A. Beyer and W.J.R. Hoefer. "Moving Boundaries in 2-D and 3-D TLM Simulations Realized by Recursive Formulas." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2267-2271.

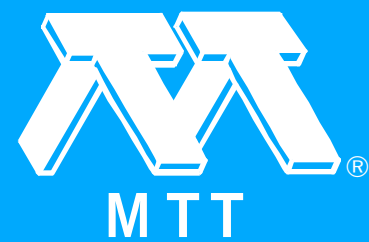
In this paper a novel technique for arbitrary boundary positioning in TLM networks will be described. This capability removes the restriction that dimensions of TLM models can only be integer multiples of the mesh parameter and allows superior boundary resolution. Since the position of boundaries can be continuously varied even during a simulation, this feature can model moving boundaries for time domain optimization and phenomena such as the Doppler effect.



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An Efficient Two-Dimensional Graded Mesh Finite-Difference Time-Domain Algorithm for Shielded or Open Waveguide Structures

V.J. Brankovic, D.V. Krupezevic and F. Arndt. "An Efficient Two-Dimensional Graded Mesh Finite-Difference Time-Domain Algorithm for Shielded or Open Waveguide Structures." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2272-2277.

A finite-difference time-domain (FD-TD) algorithm is described for the efficient full-wave analysis of a comprehensive class of millimeter-wave and optical waveguide structures. The FD-TD algorithm is based on a two-dimensional graded mesh combined with adequately formulated absorbing boundary conditions. This allows the inclusion of nearly arbitrarily shaped, fully or partially lateral open or shielded guiding structures with or without layers of finite metallization thickness. Moreover, lossy dielectrics and/or lossy conductors are included in the theory. The algorithm leads to a significant reduction in cpu time and storage requirements as compared with the conventional three-dimensional eigenvalue FD-TD mesh formulation. Dispersion characteristic examples are calculated for structures suitable for usual integrated circuits, such as insulated image guides, ridge guides, dielectric waveguides, trapped image guides, coplanar-lines and microstrip lines. The theory is verified by comparison with results obtained by other methods.

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Fiber Optic Microwave Links Using Balanced Laser Harmonic Generation, and Balanced/Image Cancellation Laser Mixing (Dec. 1992 [T-MTT])

H. Ogawa and H. Kamitsuna. "Fiber Optic Microwave Links Using Balanced Laser Harmonic Generation, and Balanced/Image Cancellation Laser Mixing (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2278-2284.

This paper proposes three fiber optic link configurations for use in microwave transmission. Two laser diodes are used to generate balanced harmonics and the optical power from each diode is combined and detected by photodiodes. The fundamental and odd harmonics are suppressed and even harmonics added. The balanced and image cancellation laser mixing which utilizes a combination of microwave components and optical devices can suppress the local and image frequencies, respectively. These configurations are experimentally investigated at microwave frequencies and frequency suppression is successfully demonstrated.

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Millimeter-Wave Fiber Optics Systems for Personal Radio Communication

H. Ogawa, D. Polifko and S. Banba. "Millimeter-Wave Fiber Optics Systems for Personal Radio Communication." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2285-2293.

System concepts for millimeter-wave personal communication systems and the advantages of millimeter-wave band usage are briefly described. Demonstration of broad-band millimeter-wave subcarrier transmission concepts over fiber optic links is performed. Several fiber optic link architectures, including one using a combination of direct laser modulation and indirect (external) optical modulation, are outlined with respect to signal transmission at millimeter-wave frequencies. Several configurations are experimentally investigated using 70 MHz, 300 MHz and 26 GHz subcarriers which transmit either FM or QPSK data signals. Additionally, the use of optical MMIC technology, which can result in the design of compact and cost-effective optical receivers, is described with respect to personal communication radio base station equipment. MMIC HEMTs operating as photodetectors are newly characterized in terms of digital and analog signal reception with excellent performance being observed.

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Dual Mode Coupling by Square Corner Cut in Resonators and Filters (Dec. 1992 [T-MTT])

X.-P. Liang, K.A. Zaki and A.E. Atia. "Dual Mode Coupling by Square Corner Cut in Resonators and Filters (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2294-2302.

A new method for realization of dual mode coupling in rectangular waveguide cavities is described and analyzed. The method completely replaces the coupling screw, and therefore can be used to eliminate the need for tuning in dual mode waveguide cavity filters. It also offers a wide range of coupling values and can achieve higher power handling capability than coupling screws. Mode matching method is used to calculate the mode chart of the infinitely long square corner cut rectangular waveguide (SCCRW), the field distributions of each mode, and the resonant frequencies of the cavity. Evanescent mode rectangular waveguide is used to provide dual mode couplings between adjacent cavities. The junction discontinuity between the SCCRW and the rectangular waveguide is modeled by double mode matching method, obtaining modal scattering parameters of the junction. A 4-pole dual mode elliptic function rectangular waveguide cavity filter using the new coupling method was constructed. The natural frequencies of the whole filter structure is calculated and is verified by measurements. The experimental filter results showed excellent agreement with theory.

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Abstracts

A New Criterion for Linear 2-Port Stability Using a Single Geometrically Derived Parameter

M.L. Edwards and J.H. Sinsky. "A New Criterion for Linear 2-Port Stability Using a Single Geometrically Derived Parameter." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2303-2311.

A new stability parameter " $\mu(S)$ ", is defined for linear 2-port circuits using a geometrical approach.



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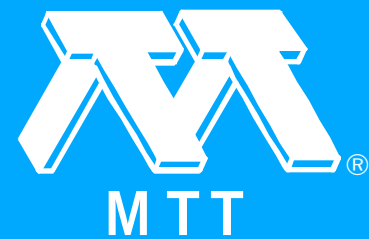
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On-Wafer Photoconductive Sampling of MMICs

S.-L.L. Huang, E.A. Chauchard, C.H. Lee, H.-L.A. Hung, T.T. Lee and T. Joseph. "On-Wafer Photoconductive Sampling of MMICs." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2312-2320.

Photoconductive (PC) sampling has been shown to be a very powerful technique for characterizing the high-frequency response of monolithic microwave integrated circuits (MMICs). It also has higher signal sensitivity than other optical sampling techniques. On-wafer PC sampling could significantly reduce the cost of MMIC evaluation and give better accuracy, especially in the millimeter-wave regime. This is the first report of PC test structures being fabricated monolithically with MMIC amplifiers for microwave characterization using PC sampling. Good agreement was obtained between the measured results and those obtained from a conventional network analyzer. The special requirements for achieving on-wafer PC sampling are also discussed.

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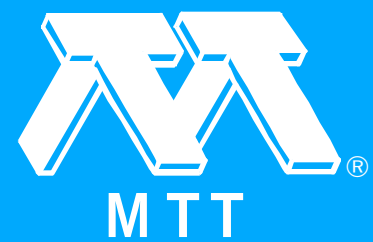
A Flexible Quasi-Optical System for Polarimetric Submillimeter-Wave Reflectometry

J. Brune. "A Flexible Quasi-Optical System for Polarimetric Submillimeter-Wave Reflectometry." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2321-2324.

First measurements of the reflectivity of different natural and artificial materials in the 600 GHz range are reported. The investigations were carried out using a heterodyne broadband dual-polarization reflectometer which was realized in a flexible quasi-optical technique. This special construction allows the design to be changed very quickly according to the desired measurement task. The design principles of this setup are presented. Compared to Fourier-transform spectrometers the described reflectometer is capable to carry out real-time measurements even outside the laboratory. Reflectivity data of several interesting materials are presented in co- and crosspolarization.

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On-Wafer Microwave Measurement Setup for Investigations on HEMT's and High T/sub c/ Superconductors at Cryogenic Temperatures Down to 20 K

H. Meschede, R. Reuter, J. Albers, J. Kraus, D. Peters, W. Brockerhoff, F.-J. Tegude, M. Bode, J. Schubert and W. Zander. "On-Wafer Microwave Measurement Setup for Investigations on HEMT's and High T/sub c/ Superconductors at Cryogenic Temperatures Down to 20 K." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2325-2331.

In this paper an on-wafer measurement setup for the microwave characterization of HEMT's and high T/sub c/ superconductors at temperatures down to 20 K is presented. Both S-parameter and noise measurements, can be performed in the frequency range from 45 MHz to 40 GHz and 2 GHz to 18 GHz, respectively, using standard calibration techniques and commercial microwave probe tips. Microwave measurements on a pseudomorphic FET and an AlGaAs /GaAs HEMT as well as investigations on a superconducting filter are presented to demonstrate the efficiency of the developed system.

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A W-Band Image-Rejection Downconverter

K.W. Chang, H. Wang, T.-N. Ton, T.-H. Chen, K.L. Tan, G.S. Dow, G.M. Hayashibara, B.R. Allen, J. Berenz, P.-H. Liu, D.C. Streit and L.C.T. Liu. "A W-Band Image-Rejection Downconverter." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2332-2338.

This paper presents the design, fabrication, and evaluation of a W-band image-rejection downconverter based on pseudomorphic InGaAs/GaAs HEMT technology. The image-rejection downconverter consists of a monolithic three-stage low-noise amplifier, a monolithic image-rejection mixer, and a hybrid IF 90° coupler with an IF amplifier. The three-stage amplifier has a measured noise figure of 3.5 dB with an associated small signal gain of 21 dB at 94 GHz while the image-rejection mixer has a measured conversion loss of 11 dB with a +10 dBm LO drive at 94.15 GHz. Measured results of the complete image-rejection downconverter including the hybrid IF 90° coupler and a 10 dB gain IF amplifier show a conversion gain of more than 18 dB and a noise figure of 4.6 dB at around 94 GHz.





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Monolithic High-Tc Superconducting Phase Shifter at 10 GHz (Dec. 1992 [T-MTT])

*J.H. Takemoto-Kobayashi, C.M. Jackson, E.B. Guillory, C. Pettiette-Hall and J.F. Burch.
"Monolithic High-Tc Superconducting Phase Shifter at 10 GHz (Dec. 1992 [T-MTT])." 1992
Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992
Symposium Issue)): 2339-2344.*

We describe a monolithic high temperature super-conductor (HTS) phase shifter integrated into a 10 GHz microstrip line. This is the first demonstration of a nonresonant HTS circuit based on a distributed Josephson inductance approach. We observed phase shifts greater than 150 degrees in resonant structures, and 20 degrees in broadband circuits.

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New Approach to GaAs MESFET Analog Frequency Dividers with Low Threshold Input Power and High Conversion Gain (Dec. 1992 [T-MTT])

H. Amine, O. Llopis, M. Gayral, J. Graffeuil and J.F. Sautereau. "New Approach to GaAs MESFET Analog Frequency Dividers with Low Threshold Input Power and High Conversion Gain (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2345-2351.

A new approach to frequency dividers is proposed based on the nonlinear feedback control of MESFET in the forced oscillation mode. The input signal is used to control the MESFET gain, imposing oscillation conditions. A design of frequency dividers based on this approach is proposed and allows the threshold input power to be reduced and the conversion gain to be increased. Frequency division is tested using time domain simulation, and then an X-band experimental MESFET analog frequency divider is achieved and exhibits a high conversion gain and a low threshold input power.

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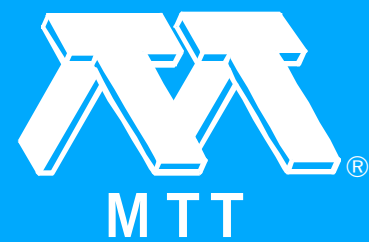


More Compact Ferrite Circulator Junctions with Predicted Performance

A.M. Borjak and L.E. Davis. "More Compact Ferrite Circulator Junctions with Predicted Performance." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2352-2358.

The analysis of two novel types of 3-port junction circulator is discussed in detail, and, neglecting losses, graphs of the predicted performance of specific theoretical designs are shown. The first type of circulator is based on a ferrite ring, and it is shown that by appropriately selecting the ratio of the inner/outer radius of the ring the need for transformers can be eliminated. An 11 GHz design with 1 GHz bandwidth is presented. The second type is based on a three-port ferrite disk having two ports positioned 60° away from a middle port. This provides a more compact layout and a design for 94 GHz is presented.





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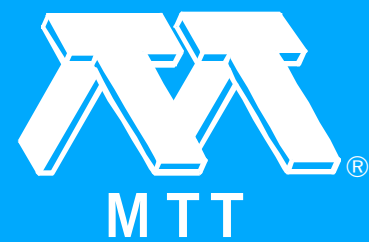
Authors

Theoretical and Experimental Investigation of a Rectenna Element for Microwave Power Transmission

J.O. McSpadden, T. Yoo and K. Chang. "Theoretical and Experimental Investigation of a Rectenna Element for Microwave Power Transmission." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2359-2366.

The diode characteristics at 2.45 and 35 GHz and the use of a frequency selective surface are investigated for the application of microwave power transmission. A method has been devised to experimentally characterize a packaged GaAs Schottky barrier diode by inserting in a microstrip test mount. The nonlinear equivalent circuit parameters of the diode are determined by a small signal test method. The method analyzes the diode's scattering parameters at various bias levels. A large signal measurement using the same test mount has also been configured to determine the power conversion efficiency from microwave to dc as well as determining the de-embedded network impedance of the diode. A nonlinear circuit simulation program using a multi-reflection algorithm is used to verify the experimental results of a 2.45 GHz diode. A Ka-band mixer diode is also simulated for a 35 GHz rectenna. Based on the simulation results, a patch-type 35 GHz rectenna is designed and tested in a waveguide simulator. The efficiency is measured as 29% with a 120 mW input power. Because the diode could generate undesirable harmonic radiation, a frequency selective surface is designed to reduce the second harmonic radiation for a 2.45 GHz rectenna. Theoretical results agree fairly well with experiments for all these studies.





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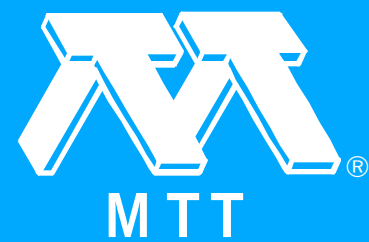
Evaluation of the Factors Determining HBT High-Frequency Performance by Direct Analysis of S-Parameter Data

D.R. Pehlke and D. Pavlidis. "Evaluation of the Factors Determining HBT High-Frequency Performance by Direct Analysis of S-Parameter Data." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2367-2373.

A novel parameter extraction formalism for the evaluation of Heterojunction Bipolar Transistor (HBT) device physics is presented. The technique employs analytically derived expressions for direct calculation of the HBT T-Model equivalent circuit element values in terms of the measured S-parameters. All elements are directly calculated with the exception of the emitter leg of the T-model. This approach avoids errors due to uncertainty in fitting to large, overdetermined equivalent circuits and does not require the use of test structures and extra measurement steps to evaluate parasitic. Detailed bias dependent results for the directly calculated circuit elements are presented. An analysis is also reported of the short circuit current gain that separates the transit times and RC products and allows evaluation of their individual contribution to the measured $f_{sub T}$ and significance in limiting the HBTs high frequency performance.

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Mechanisms Determining Third Order Intermodulation Distortion in AlGaAs/GaAs Heterojunction Bipolar Transistors

A. Samelis and D. Pavlidis. "Mechanisms Determining Third Order Intermodulation Distortion in AlGaAs/GaAs Heterojunction Bipolar Transistors." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2374-2380.

The third order intermodulation distortion (IMD3) mechanisms of HBT's are analyzed using Volterra Series theory. A T-equivalent circuit is used for the large-signal model of the HBT. The third order nonlinear currents generated by the device nonlinearities are evaluated for this purpose and current cancellation is discussed. It is found that, even though the C_{je} and g_{je} related currents do not show pronounced cancellation, the total base-emitter current and the total base-collector current cancel partially. Second harmonic loading is addressed in view of IMD3 optimization while, at the same time, maintaining high gain through conjugate matching at the fundamental frequency. IMD3 is very sensitive to the nonlinear currents generated by g_{je} and α . Optimum IMD3 occurs at high second harmonic reflection coefficients corresponding to open load conditions. Finally, minimum and maximum IMD3 occurs for second harmonic load reflection coefficient phases close to analogous extremes of the dominant nonlinear current of the device.

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Pseudomorphic Inverted HEMT Suitable to Low Supplied Voltage Application (Dec. 1992 [T-MTT])

M. Kasashima, Y. Arai, H.I. Fujishiro, H. Nakamura and S. Nishi. "Pseudomorphic Inverted HEMT Suitable to Low Supplied Voltage Application (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2381-2386.

Enhancement-mode pseudomorphic inverted HEMT with short gate length shows superior saturation properties in low drain voltage. Excellent saturation properties in the low field is suitable to low supplied voltage application. High frequency properties of FET were also studied by using two types of frequency dependent measurement systems which represent active load and common-source circuits. It was confirmed that the feature of low knee voltage in the static I-V is preserved above 100 kHz, which predicts the microwave characteristics of the device. The estimated output power for the device was 50% higher than that of conventional pseudomorphic HEMT at supplied voltage of 1 V.

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Average Power Capacity of Rotary-Field Ferrite Phase Shifters

W.E. Hord. "Average Power Capacity of Rotary-Field Ferrite Phase Shifters." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2387-2391.

The rotary-field ferrite phase shifter inherently achieves excellent phase accuracy which has led to application in many single-axis phase scanned antennas. The limitation on power capacity of this device is generally dictated by average power rather than peak power. This paper analyzes the average power capacity of the phase shifter as determined by the increase in rod temperature and the maximum thermal gradient. An equivalent circuit model for thermal analysis is developed, and its parameters are determined by r-f and temperature measurements. An alternative geometry is described which results in significantly improved average power capacity without noticeable degradation of r-f performance. An experimental phase shifter using the alternative technique was built and tested. Comparison with a conventional rotary-field phase shifter demonstrates the improvement achieved.

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A New Type of Optoelectronic Millimeter-Wave Finline Switches (Dec. 1992 [T-MTT])

D. Xu, L.-p. Song and K.-q. Wu. "A New Type of Optoelectronic Millimeter-Wave Finline Switches (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2392-2396.

A new type of millimeter-wave finline switches constructed on teflon substrates is proposed, which can be easily fabricated and mounted. The experimental results are reported, which show less than 2 dB insertion loss in the region of 26-40 GHz and 23.4 dB on/off ratio have been reached. Because of its good compatibility with the conventional finline structures, it will have a wide application field. A very simple method has been given to analyze its behaviors which has successfully predicted the experimental results. A nonlinear relation between the photoconductivity and the light power is given which has been confirmed by experiment.

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Multiple Element Oscillators Utilizing a New Power Combining Technique (Dec. 1992 [T-MTT])

A. Mortazawi and B.C. De Loach, Jr.. "Multiple Element Oscillators Utilizing a New Power Combining Technique (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2397-2402.

A new method is presented to combine the microwave and millimeter wave power generated by many two or three terminal devices. This method forms a single resonant structure from many active devices, and therefore the combiner is stable and does not suffer from simultaneous multimode difficulties. This technique produces compact structures and is readily adaptable to monolithic integration. Through an eigenvalue-eigenvector analysis of the structure, multiple device circuit interactions are investigated. Furthermore, the oscillation stability is demonstrated by large signal analysis of the circuit in the time domain. Experimental results from several power combiners utilizing Gunn diodes are presented.

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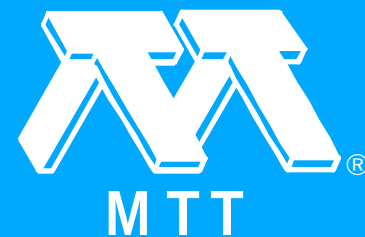


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A Frequency Domain Approach to Performance Optimization of High-Speed VLSI Interconnects

R. Liu, Q.-J. Zhang and M.S. Nakhla. "A Frequency Domain Approach to Performance Optimization of High-Speed VLSI Interconnects." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2403-2411.

An efficient method is presented for the computation of exact group delay, gain slope and their sensitivities with respect to design parameters in multi-conductor transmission line networks. The group delay and gain slope sensitivities with respect to transmission line parameters are evaluated in terms of the second-order derivatives of the eigenvalues and eigenvectors of the propagation matrix. By combining this method with minimax optimization, a frequency-domain approach is developed to minimize transient delay and distortion in high-speed VLSI interconnects. Examples of interconnect optimization demonstrate simultaneous reductions of signal propagation delay, distortion and crosstalk at several vital connection ports. Compared to direct time domain optimization, the proposed approach is more than three times faster. The proposed technique is useful in optimal design of circuit interconnects for high-speed digital computers and communication systems.



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A High Power On-Wafer Pulsed Active Load Pull System (Dec. 1992 [T-MTT])

D.D. Poulin, J.R. Mahon and J.-P. Lanteri. "A High Power On-Wafer Pulsed Active Load Pull System (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2412-2417.

This paper describes a unique on-wafer load pull system that is capable of measuring load pull contours on true high power and large periphery devices. Measurements are made under low duty cycle pulsed dc and RF conditions to minimize the effects of heating due to power dissipation in the on-wafer environment. With the current implementation of the load pull system, any load impedance on the Smith chart can be presented to the output of four Watt devices. The system is fully error corrected for reflection coefficient, transmission coefficient, input power incident, input power delivered, and output power delivered. The system is capable of automatic control and measurement by means of a HP 9000 series workstation. Data taken on C band MMIC power amplifiers and 2 mm GaAs FET's are presented.

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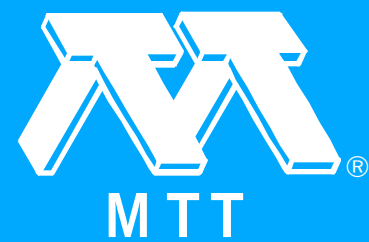


Dielectric Properties of Substrates for Deposition of High-T_c Thin Films Up to 40 GHz

J. Konopka and I. Wolff. "Dielectric Properties of Substrates for Deposition of High-T_c Thin Films Up to 40 GHz." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2418-2423.

Dielectric properties of CaNdAlO/sub 4/, LaAlO/sub 3/, SrLaAlO/sub 4/, SrLaGa/sub 3/O/sub 7/ and NdGaO/sub 3/ monocrystals, prospective substrate materials for the deposition of thin films of high-temperature superconductors, were measured with high accuracy at frequencies up to 40 GHz in the temperature range 10 to 300 K. Most materials exhibit uniaxial anisotropy with epsilon/sup //sub r/ ranging from 8.88 (SrLaGa/sub 3/O/sub 7/ along optical c-axis) to 24.18 (LaAlO/sub 3/). A decrease of epsilon/sup //sub r/ with temperature decrease was observed in all materials except CaNdAlO/sub 4/ (perpendicular to c-axis) where epsilon/sup //sub r/ increases. Microwave losses in LaAlO/sub 3/, SrLaAlO/sub 4/ and SrLaGa/sub 3/O/sub 7/ decrease with temperature while CaNdAlO/sub 4/ and NaGaO/sub 3/ pronounced loss increase was found at temperatures below 100 K. We suggest, that in the latter materials at lower temperatures, neodymium ions become magnetically ordered and are responsible for the observed effects.





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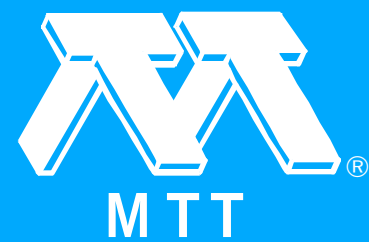
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High T_c Superconductor-Sapphire Microwave Resonator with Extremely High Q -Values Up to 90 K (Dec. 1992 [T-MTT])

Z.-Y. Shen, C. Wilker, P. Pang, W.L. Holstein, D. Face and D.J. Kountz. "High T_c Superconductor-Sapphire Microwave Resonator with Extremely High Q -Values Up to 90 K (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2424-2432.

A theoretical analysis was performed for an extremely high Q resonator formed by a sapphire rod sandwiched by a pair of high T_c superconductor (HTS) films. A number of these HTS-sapphire-HTS resonators in C-band and Ku-band were designed, fabricated and tested. At 5.552 GHz, Q_0 reached 2×10^6 at 90 K, 3×10^6 at 80 K and 1.4×10^7 at 4.2 K with circulating power up to 500 kW. Formulas for calculating the resonant frequency and Q -value derived from the theoretical analysis were verified by experimental data with good agreement. Three different thin film HTS materials: $Tl_{2/3}Ba_{2/3}CaCuO_{0.8}$, $YBa_2Cu_3O_{7-\delta}$ and $Tl_{0.5}Pb_{0.5}Sr_2CaCuO_{0.7}$ were tested. The sensitivity of the high Q -value and the parasitic coupling to the case modes are discussed. Applications, such as frequency stabilized oscillators, filters and characterization for HTS films are described.





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A Low Current GaAs Monolithic Image Rejection Downconverter for X-Band Broadcast Satellite Applications

T. Yoshimasu, K. Sakuno, N. Matsumoto, E. Suematsu, T. Tsukao and T. Tomita. "A Low Current GaAs Monolithic Image Rejection Downconverter for X-Band Broadcast Satellite Applications." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2433-2438.

This paper describes the design, fabrication and performance of a fully integrated X-band monolithic image rejection downconverter. The downconverter consists of a low noise amplifier, an image rejection mixer and an intermediate frequency amplifier. The downconverter receives RF signals between 11.7 and 12.3 GHz and converts them down to IF frequency between 1.0 and 1.6 GHz. A conversion gain of 46 ± 1 dB, a noise figure of less than 3.3 dB and an image rejection of more than 30 dB have been achieved over the RF frequency range. The chip size of the downconverter is 1.9 mm x 2.2 mm and its current dissipation is only 43 mA. Since the downconverter has sufficient image rejection due to an on-chip bandstop filter, it requires no off-chip circuits. Therefore, the use of this down-converter in X-band broadcast satellite applications will lead to a great reduction in size and current dissipation.

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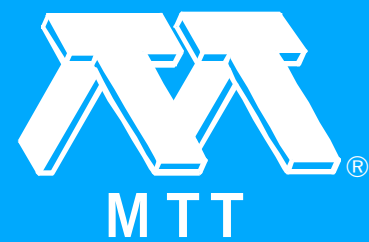
An Ultra Broadband GaAs MESFET Preamplifier IC for a 10 Gb/s Optical Communication System

M. Miyashita, K. Maemura, K. Yamamoto, T. Shimura, M. Nogami, K. Motoshima, T.I Kitayama and Y. Mitsui. "An Ultra Broadband GaAs MESFET Preamplifier IC for a 10 Gb/s Optical Communication System." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2439-2444.

An ultra broadband GaAs MESFET preamplifier IC has been developed for a 10 Gb/s optical communication system. High transimpedance of 44 dB Omega has been obtained over dc to 12 GHz. A receiver has also been fabricated by using this preamplifier IC and a photodiode. The receiver operates with extremely low equivalent input noise current of 12.6 pA/spl radic/Hz over dc to 7.8 GHz. This paper describes circuit design and high frequency characteristics of both the preamplifier IC and the receiver.

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Design and Characterization of High Performance 60 GHz Pseudomorphic MODFET LNAs in CPW-Technology Based on Accurate S-Parameter and Noise Models (Dec. 1992 [T-MTT])

M. Schlechtweg, W. Reinert, P.J. Tasker, R. Bosch, J. Braunstein, A. Hulsmann and K. Kohler. "Design and Characterization of High Performance 60 GHz Pseudomorphic MODFET LNAs in CPW-Technology Based on Accurate S-Parameter and Noise Models (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2445-2451.

An accurate database for active and passive MMIC components valid up to millimeter-wave frequencies has been established. The CAE models for the transistors and the passive CPW-components, which include the coplanar T-junction, are derived from on-wafer S-parameter measurements up to 63 GHz. For noise modeling of the MODFETs up to millimeter-wave frequencies, we have pursued a novel approach which is based on the temperature noise model reported by Pospiezalski. The parameter $T_{sub d}$ which is required for the temperature model, is extracted from on-wafer noise parameter measurements up to 18 GHz. Using this database, we have designed and fabricated low noise V-band 2-stage amplifiers using pseudo-morphic MODFETs on GaAs substrate which have a performance of 10.5 dB gain and 5.2 dB noise figure at 58.5 GHz. A very good agreement between simulated and measured MMIC gain and noise performance is achieved up to V-band.

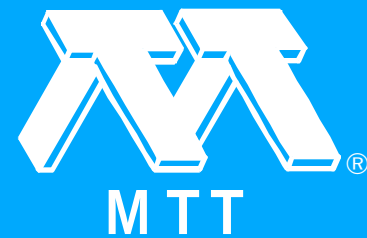


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Lifetesting GaAs MMICs Under RF Stimulus (Dec. 1992 [T-MTT])

W.J. Roesch, T. Rubalcava and C. Hanson. "Lifetesting GaAs MMICs Under RF Stimulus (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2452-2460.

This paper summarizes very high temperature lifetest results on MMIC switches and attenuators designed, assembled and screened by Motorola GEG and manufactured and tested by TriQuint. It was found that individual heating and RF bias resulted in data which indicates the devices degrade linearly with lognormal failure distributions that compare favorably with historical dc lifetesting of MMIC amplifiers. Electrical measurements indicated MESFET gate degradation was occurring, which was confirmed by failure analysis. The failure mechanism was found to be highly accelerated by temperature and is not expected to impede device lifetimes at normal use conditions for thousands of years.



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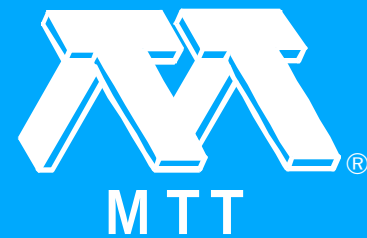


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Technology Transfer of High Frequency Devices for Consumer Electronics

S. Watanabe. "Technology Transfer of High Frequency Devices for Consumer Electronics." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2461-2466.

The aspects of high volume production on the order of millions of devices per month for consumer electronics are different from those for small and medium scale production and high-end telecommunication, instrumentation or military applications. The keys to technology transfer are also different. By investigating the examples of successful technology transfer of high frequency devices at Sony, these issues will be illustrated. The author's opinion regarding some future applications of high frequency devices in consumer electronics will also be presented. Then, a proposal for global industrial collaboration to bring these products to a sufficient level of maturity for widespread use is made.



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Ultra-Low DC Power Consumptions in Monolithic L-Band Components

K.R. Cioffi. "Ultra-Low DC Power Consumptions in Monolithic L-Band Components." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2467-2472.

A set of monolithic L-band components operating at milliwatt and sub-milliwatt dc power consumption have been designed and fabricated. A maximum gain/power quotient of 19.1 dB/mW was recorded for a monolithic amplifier at a frequency of 1.25 GHz with a cascade of 2 MMIC amplifiers yielding a total gain of 15.3 dB on a total power consumption of just 800 μ W. This is believed to be the highest gain/power quotient ever reported for a monolithic circuit at L-band. A four pole voltage controlled filter with low power amplifier gain stages showed a loss of 1.6 dB with 15% 3dB bandwidth on a power consumption of 6.75 mW at 1.575 GHz. A subsystem containing the chips was assembled and tested. The ultra-low power consumption were obtained with a standard foundry process using an enhancement mode MESFET with a variety of design techniques. Yields obtained on two 4" GaAs wafers were 96-100%.

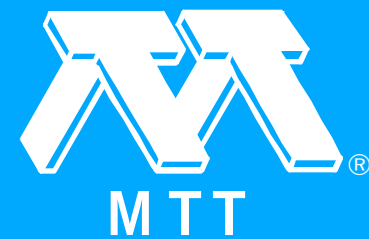
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Fourth International Symposium on Space Terahertz Technology (Dec. 1992 [T-MTT])

"Fourth International Symposium on Space Terahertz Technology (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2473-2473.



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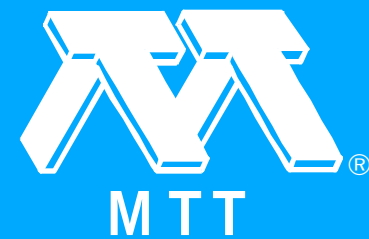
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Call for Papers - Interconnections and Packaging (Dec. 1992 [T-MTT])

"Call for Papers - Interconnections and Packaging (Dec. 1992 [T-MTT])." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2474-2474.



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Filters and Passive Components (Special Issue)

"Filters and Passive Components (Special Issue)." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2475-2475.



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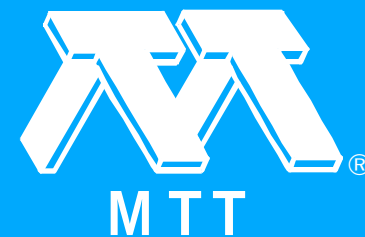
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Index, IEEE [T-MTT] 1992, Volume 40, and MTT-S Sponsored Conferences

"Index, IEEE [T-MTT] 1992, Volume 40, and MTT-S Sponsored Conferences." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2476-2552.



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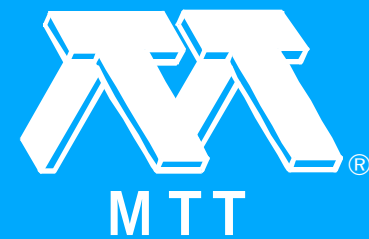
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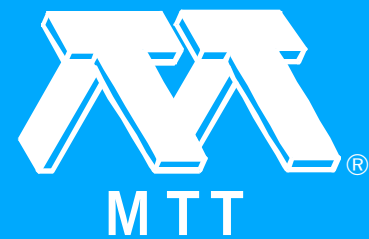


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Editorial (Jan. 1992 [MGWL])

T. Itoh. "Editorial (Jan. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 1-1.

This is the first anniversary issue of the IEEE Microwave and Guided Wave Letters (MGWL). Due to enthusiastic support by the MTT-S ADCOM, authors, reviewers, and everyone else involved, MGWL has had a good start and has completed a successful first year. The number of submissions has steadily increased. As a result, the burden on the reviewers has also been increased since maintenance of the highest possible quality of the journal is of the utmost importance while the nature of the quick turn around time needs to be addressed continuously. It is expected that the growth of this journal will continue. At the same time, the duration between submission and publication is increasing from the planned three months to five months in many cases. In order to meet these requirements, this journal is implementing several mechanisms that are hoped to improve the service to the authors and readers without increasing the burden to the already overtaxed reviewers. Let me start with the request to the author.



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Suggestions to Existing and Prospective Authors Wishing to Supply Manuscripts in Electronic Form

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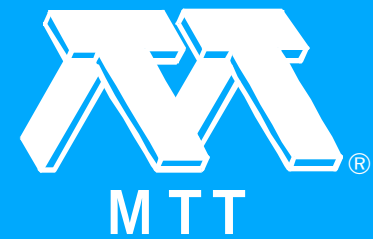
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T. Itoh. "Asia-Pacific Abstracts Associate Editors." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 3-5.



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Influence of Buffer Layers within YBa/sub 2/Cu/sub 3/O/sub 7-x/ Coplanar Waveguide Structures

J. Kebler, R. Dill and P. Russer. "Influence of Buffer Layers within YBa/sub 2/Cu/sub 3/O/sub 7-x/ Coplanar Waveguide Structures." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 6-7.

A YBa/sub 2/Cu/sub 3/O/sub 7-x/ coplanar waveguide structure is investigated theoretically by means of a partial wave synthesis. The high-T/sub c/. superconductor material is described by the two-fluid model and the London theory. A very thin buffer layer of about 100 nm thickness is positioned between the substrate and the superconducting film. The material combinations considered for buffer layer/substrate are: zirconium oxide/sapphire, strontium titanate/sapphire, zirconium oxide/silicon and lanthan aluminate/silicon. The influence of these buffer layers on effective permittivity and attenuation is examined over a wide range of structure widths whereby the attenuation is subdivided into superconductor losses, losses in the buffer layer and substrate losses. It is shown that zirconium oxide as buffer layer on a sapphire substrate is a very interesting choice, because the superconductor losses are the dominant losses over the considered range of gap widths from 1 μm to 100 μm .

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Novel Slow-Wave Meander Lines Using Multilayer MMIC Technologies

H. Kamitsuna and H. Ogawa. "Novel Slow-Wave Meander Lines Using Multilayer MMIC Technologies." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 8-10.

Slow-wave lines in a meander configuration, fabricated with multilayer MMIC technologies are proposed and their performance is investigated experimentally. Multilayer construction of capacitive triplate lines allows reduction of the chip area of periodic slow-wave line circuits. With this design, less than one half of the area of conventional straight slow-wave lines is required. Additionally, it permits higher frequency operation up to 40 GHz with a negligible dispersion.

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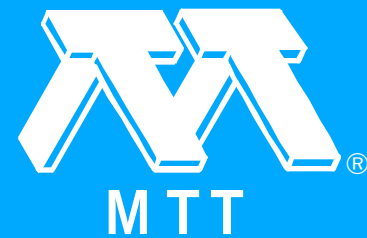


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Optoelectronic Phase-Locking of Microwave Signals Up to 18 GHz by a Laser-Diode-Based GaAs:Cr Photoconductive Harmonic Mixer

H.-H. Wu, C.-S. Chang and C.-L. Pan. "Optoelectronic Phase-Locking of Microwave Signals Up to 18 GHz by a Laser-Diode-Based GaAs:Cr Photoconductive Harmonic Mixer." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 11-13.

A GaAs:Cr photoconductive switch activated by 30ps optical pulses from a gain-switched laser diode ($\lambda = 0.79 \mu\text{m}$) was used as a harmonic mixer to optoelectronically phase-lock microwave signals up to 18.01 GHz. The conversion loss of the harmonic mixer was 70 dB at 16.01 GHz. The phase noise degradation of the phase-locked 16.01-GHz signal at 5-kHz offset measured with respect to the 1.0-GHz synthesizer signal for driving the laser diode was 30 dB.



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A Matrix Formulation for Noise Transduction as a General Case of Noise Measure

R.B. Hallgren. "A Matrix Formulation for Noise Transduction as a General Case of Noise Measure." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 14-16.

Conventional noise characteristics of an active device are given by the minimum noise figure, $F_{\min}$, the optimum source reflection coefficient, Γ_{sopt} , and a noise resistance R_n . The noise measure extends the noise figure to include the available gain of network, for the case of a conjugate output match, and gives values that minimize the noise power available from the network consistent with maximum available gain. Noise transduction follows as a general case of noise measure by using the transducer gain with any output load. A new noise equation is derived that is solved for the minimum transduced noise, $N_{\min}$, the optimum source impedance, and the optimum load impedance. These equations minimize the noise power delivered to the load impedance consistent with a maximum in the transducer gain.





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2--19-GHz Low-DC Power and High-IP/sub 3/ Monolithic HBT Matrix Amplifier

K.W. Chang, B.L. Nelson, A.K. Oki and D.K. Umemoto. "2--19-GHz Low-DC Power and High-IP/sub 3/ Monolithic HBT Matrix Amplifier." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 17-18.

The design and performance of the first wideband, low-dc power and high-IP/sub 3/ monolithic matrix amplifier using GaAs/AlGaAs heterojunction bipolar transistors (HBT's) is reported. The amplifier uses four $2 \times 10 \mu\text{m}^2$ quad-emitter HBT's in a 2×2 matrix configuration and has a measured gain of 9.6 ± 0.9 dB over the 2--19-GHz frequency band. Measured output IP/sub 3/ and 1-dB compression point are 26 dBm and 13 dBm, respectively, at 18 GHz. The total dc-power dissipation is less than 200 mW. The input and output return losses are better than -9.5 dB within the 2--16-GHz bandwidth.

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Influence of Optical Dispersion on the Performances of an Electrooptic Phase Modulator

P. Chazan, M. Haelterman and S. Tedjini. "Influence of Optical Dispersion on the Performances of an Electrooptic Phase Modulator." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 19-21.

An equation for electrooptic modulation taking the optical dispersion into account is established using the standard perturbation method. The influence of the optical dispersion on the characteristics of an electrooptic phase modulator is analyzed with a numerical approach. The existence of an amplitude modulation due to the optical dispersion is demonstrated. For high-modulation frequencies, the dispersion can affect significantly the response of the phase modulator. The modulation factor can reach 50%.

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A Coplanar Transmission Line High-T_c Superconductive Oscillator at 6.5 GHz on a Single Substrate

R. Klieber, R. Ramisch, A.A. Valenzuela, R. Weigel and P. Russer. "A Coplanar Transmission Line High-T_c Superconductive Oscillator at 6.5 GHz on a Single Substrate." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 22-24.

The design and construction of a planar, low-noise cryogenic oscillator operating at 6.5 GHz are presented. The oscillator has been built as a hybrid superconductive microwave integrated circuit (SMIC) on a single 10x10 mm LaAlO₃ substrate. Single-sided, coplanar line structures are used throughout the circuit with YBa₂Cu₃O_{7-δ} as conductor material. The oscillator was constructed around a GaAs-MESFET as the active device. The complete oscillator is cooled by immersion into liquid nitrogen. An output power of 4.9 dBm was obtained. Single-sided noise power at 10 kHz offset from carrier was -90 dBc/Hz.

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Characterization of Resistive Transmission Lines by Short-Pulse Propagation

A. Deutsch, G. Arjavalingam and G.V. Kopcsay. "Characterization of Resistive Transmission Lines by Short-Pulse Propagation." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 25-27.

A method for completely characterizing resistive transmission lines by short-pulse propagation is described. Using the loss and dispersion of pulses propagated on two different lengths of line, together with the measured low-frequency capacitance, the frequency-dependent propagation constant, attenuation, and the complex impedance are determined. The basic method is demonstrated with results from low-loss cables and a well-controlled coplanar waveguide sample.

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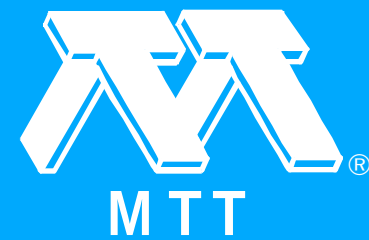
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"50th Annual Device Research Conference (Jan. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.1 (Jan. 1992 [MGWL]): 42-42.



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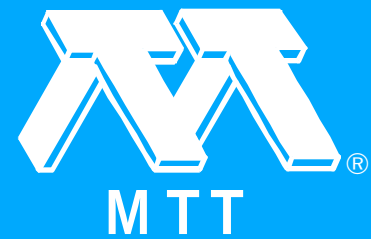
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Low-Noise Pseudomorphic Dual-Gate Cascode HEMT's with Extremely High Gain

J. Wenger, P. Narozny, H. Dambkes, J. Splettstosser and C. Werres. "Low-Noise Pseudomorphic Dual-Gate Cascode HEMT's with Extremely High Gain." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 46-48.

Quarter micron InGaAs-GaAs dual-gate HEMT's connected as a cascode MMIC in a compact manner have been fabricated and investigated. The devices show a high-output impedance and a very low-feedback capacitance resulting in a high-voltage gain factor $g_{\text{m}}/g_{\text{d}}$ of 125 and a $C_{\text{gs}}/C_{\text{gd}}$ ratio of 45. The current gain cutoff frequency f_{T} is 45 GHz and the maximum stable gain is 23.5 dB at 10 GHz and 19 dB at 20 GHz. The pseudomorphic cascode HEMT's show a low-noise figure of 1.1 dB with an associated gain of 22 dB at 10 GHz, at 18 GHz the minimum noise figure is 1.9 dB with 16-dB gain. These data represent the highest gain values and the best noise performance yet reported for dual-gate HEMT devices.

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Matrix Singular Value Decomposition for Pole-Free Solutions of Homogeneous Matrix Equations as Applied to Numerical Modeling Methods

V.A. Labay and J. Bornemann. "Matrix Singular Value Decomposition for Pole-Free Solutions of Homogeneous Matrix Equations as Applied to Numerical Modeling Methods." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 49-51.

A general technique for solving homogeneous matrix equations as applied to numerical modeling procedures in microwave and millimeter-wave structures is introduced. By using singular value decomposition, well-known numerical problems related to poles and steep gradients in the determinant function are eliminated. The proposed technique is generally applicable, improves the accuracy and reliability of computed results, and significantly reduces the CPU time due to a more moderate behavior of the function to be analyzed. A dispersion characteristics example of a conductor-backed slotline MMIC structure illustrates the advantage of the pole-free formulation over conventional determinant calculations.



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Diagonalization of Difference Operators and System Matrices in the Method of Lines

R. Pregla and W. Pascher. "Diagonalization of Difference Operators and System Matrices in the Method of Lines." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 52-54.

In the method of lines, the eigensolutions for the difference operator for the electric field can be calculated from the corresponding eigensolutions for the magnetic field. For an arbitrary discretization of a homogeneous layer it is proved that this is achieved by a simple matrix multiplication, which yields numerical advantages, especially in the cases of nonequidistant discretization or absorbing boundaries. Secondly, a transformation to principal axes of the system matrices for multilayered planar structures is given which enables an easier transfer of the field components from one layer interface to the other. The result corresponds to that of the immittance approach in the spectral-domain method.



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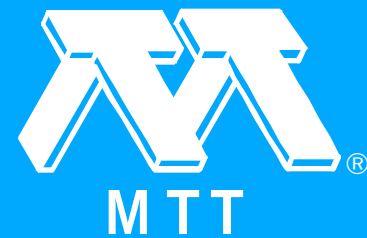


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A Simple Analysis of a Symmetric Waveguide Five-Port Junction

M.E. Bialkowski. "A Simple Analysis of a Symmetric Waveguide Five-Port Junction." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 55-57.

A simple analysis of a symmetric waveguide five-port junction is described. Based on this analysis a computer algorithm for determining the admittance matrix parameters for the junction is developed. The validity of the algorithm is verified through the comparison with computationally more involved algorithms and experiment.



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A Cryogenically-Cooled Wide-Band HEMT MMIC Low-Noise Amplifier

C.C. Yang, B. Nelson, W. Jones and B. Allen. "A Cryogenically-Cooled Wide-Band HEMT MMIC Low-Noise Amplifier." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 58-60.

A balanced single-stage wide-band HEMT MMIC low-noise amplifier (LNA) was designed, fabricated, cooled to a temperature of 19 K, and evaluated from 8-18 GHz. The MMIC LNA performed without damage at all test temperatures. The amplifier gain flatness over the 8--18-GHz frequency band was maintained at both room and cryogenic temperature, indicating that the broad-band design topology is relatively insensitive to operation temperature. Gain increased an average of 2 dB, while the noise temperature exhibited as much as an eightfold reduction from 160 K to 20 K at 19 K operation temperature. This is the first result on performance of a cryogenically-cooled HEMT MMIC LNA.

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A 0.5-Watt 47-GHz Power Amplifier Using GaAs Monolithic Circuits

G. Hegazi, K. Pande, F. Phelleps, E. Chang, A. Cornfeld, P. Rice, M. Ghahremani and P. Pages. "A 0.5-Watt 47-GHz Power Amplifier Using GaAs Monolithic Circuits." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 61-62.

47-GHz Monolithic microwave integrated circuit (MMIC) power amplifier chips have been developed using 0.35mm gate-length molecular beam epitaxial (MBE) MESFET technology. The amplifier chips have been assembled in a waveguide package to constitute a 47 GHz power amplifier with nominal output power of 0.4 Watt and 15 dB of gain. The saturated output power of this amplifier exceeded 0.5 Watt. These power and gain results might represent the highest reported to date at this frequency from an MMIC amplifier utilizing 0.35-mm gate-length MESFET. This amplifier has an application as a driver for a monolithic doubler circuit to reliably produce greater than 80 mW of output power at 94 GHz for missile seeker application.

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A W-Band, High-Gain, Low-Noise Amplifier Using PHEMT MMIC

T.N. Ton, B. Allen, H. Wang, G.S. Dow, E. Barnachea and J. Berenz. "A W-Band, High-Gain, Low-Noise Amplifier Using PHEMT MMIC." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 63-64.

A W-band, high-gain, low-noise amplifier based on pseudomorphic InGaAs/GaAs HEMT devices has been developed. The amplifier has a measured about 50-dB stable gain, and 6-dB noise figure from 91 to 95 GHz. The overall amplifier measured 1.068" x1.281" x0.72" and consumes a total dc power of 560 mW. These results demonstrate the highest gain ever achieved at these frequencies.

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Leakage Losses for the Dominant Mode of Conductor-Backed Coplanar Waveguide

W.E. McKinzie and N.G. Alexopoulos. "Leakage Losses for the Dominant Mode of Conductor-Backed Coplanar Waveguide." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 65-66.

The attenuation constant for the dominant mode of covered, conductor-backed coplanar waveguide (CBCPW) is computed using the spectral domain technique. Attenuation is due to leakage in the form of the parallel-plate TEM mode in the substrate region. Curves are provided to assist in predicting leakage losses for monolithic microwave integrated circuits.

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A Microstrip Parallel Delay-Line Circuit for an Autocorrelation Radiometer

W.A. Teso, P.W. Gaiser, C.T. Swift and R.E. McIntosh. "A Microstrip Parallel Delay-Line Circuit for an Autocorrelation Radiometer." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 67-69.

A microstrip circuit used to measure the autocorrelation function is presented. The circuit will be part of an autocorrelation radiometer (CORRAD) that directly measures the autocorrelation of downwelling atmospheric thermal emission. A discussion of the CORRAD hardware is included. The microstrip network receives two C-band signals as inputs. The circuit generates eight parallel time-delays and combines the two signals which are then multiplied and averaged to yield the autocorrelation function. The introduction of this circuit to CORRAD will reduce the data acquisition time by a factor of sixteen, while degrading the frequency resolution by a factor of two.

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A Novel Cascode Feedback GaAs MMIC LNA with Transformer-Coupled Output Using Multiple Fabrication Processes

F. Ali, C. Hutchinson and A. Podell. "A Novel Cascode Feedback GaAs MMIC LNA with Transformer-Coupled Output Using Multiple Fabrication Processes." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 70-72.

The design, development and performance of a novel high dynamic range cascode feedback GaAs MMIC LNA with transformer-coupled output is presented. The baseline design (chip size: 48 x 48 mils) operates over any 1 GHz bandwidth (with a simple off-chip input inductor) in the 0.5--3-GHz frequency range and has typically 15-dB small signal gain, 2.1-dB noise figure and greater than 15 dBm of output power at 1-dB gain compression point. Performance results of this circuit fabricated in three different foundry processes are also presented.

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A 20-dB Quasi-Integrated Horn Antenna

G.V. Eleftheriades, W.Y. Ali-Ahmad and G.M. Rebeiz. "A 20-dB Quasi-Integrated Horn Antenna." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 73-75.

A multimode quasi-integrated dipole-fed horn antenna is presented with a performance comparable to that of waveguide-fed corrugated horn antennas. The antenna has been designed using fullwave analysis and has been fabricated and tested at 91 GHz. The horn has a gain of 20 dB with very symmetric patterns, a Gaussian coupling efficiency of 97%, and a cross-polarization level of -22.7 dB. This antenna provides a significant improvement in integrated antenna designs and is suitable for millimeter-wave communication and radar systems and as a Gaussian-beam launcher in quasi-optical receiver systems.

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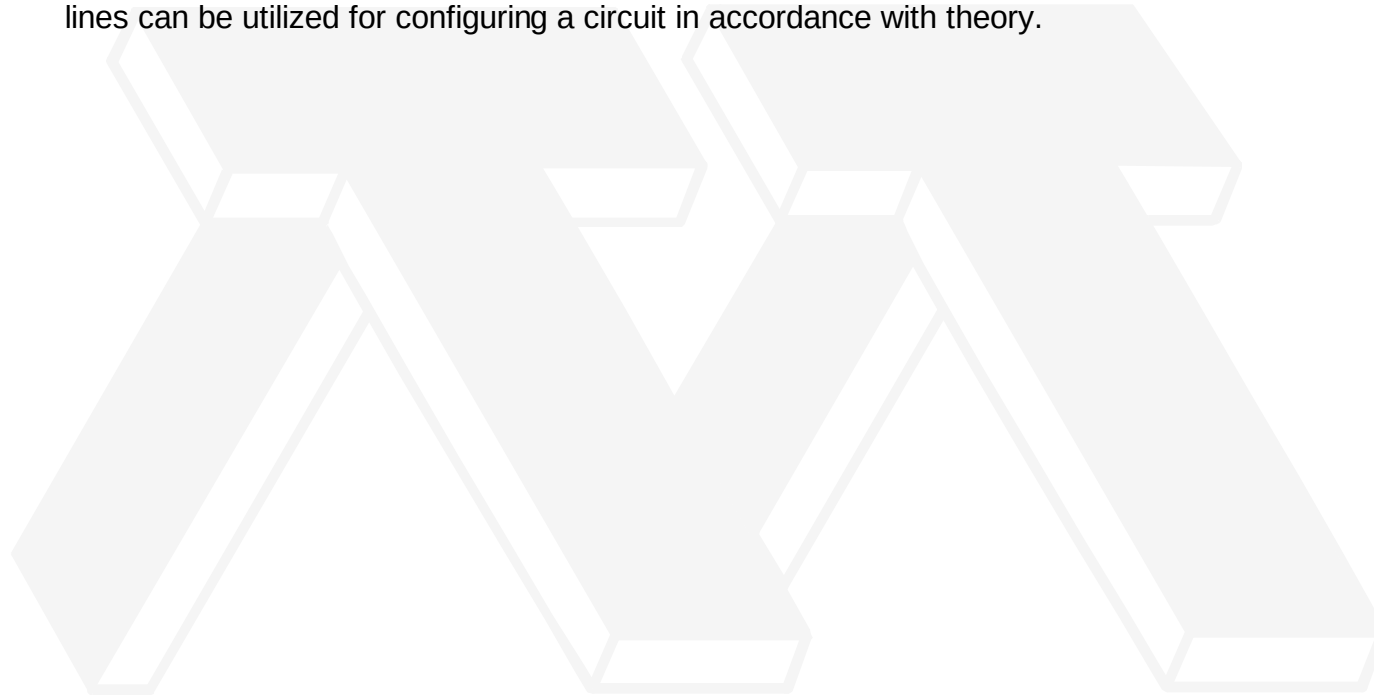


Abstracts

A Branchline Hybrid Using Valley Microstrip Lines

T. Hasegawa, S. Banba and H. Ogawa. "A Branchline Hybrid Using Valley Microstrip Lines." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 76-78.

The branchlike hybrid is investigated as an application of valley microstrip lines to a circuit that consists of valley microstrip lines both with and without a slit. It is shown that valley microstrip lines can be utilized for configuring a circuit in accordance with theory.



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Measurements of Strip Dipole Antennas on Finite-Thickness Substrates at 230 GHz

M.A. Gouker and G.S. Smith. "Measurements of Strip Dipole Antennas on Finite-Thickness Substrates at 230 GHz." 1992 Microwave and Guided Wave Letters 2.2 (Feb. 1992 [MGWL]): 79-81.

Gain and field pattern measurements at 230 GHz are reported for strip dipole antennas on finite-thickness substrates without ground planes. Four substrate thicknesses are investigated ranging from 0.25 λ to 1.53 λ (λ = wavelength in substrate material). Measured results are in good agreement with theoretical predictions. A unique detector/low-pass filter design, composed of a bolometer and an interdigitated capacitor, is used to eliminate the distortion of the measured field patterns caused by the reception of the leads connecting the antenna with the monitoring instrumentation.

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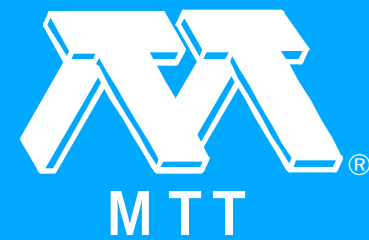
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A Study of Subharmonic Injection Locking for Local Oscillators

X. Zhang, X. Zhou, B. Aliener and A.S. Daryoush. "A Study of Subharmonic Injection Locking for Local Oscillators." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 97-99.

The analysis of a subharmonic injection locked local oscillator introduced here is based on a general nonlinear input-output model for the subharmonic synchronized oscillator. The results show the n th-order subharmonic injection locking oscillator is locked primarily by the n th harmonic output of injected signal that is generated by the current-voltage nonlinearity of the active device. The measurement of subharmonic injection locking range, at factors of $1/2$, $1/3$, and $1/4$, of a MESFET DRO verified these results.



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Dispersion Characteristics of Moderately Thick Microstrip Lines by the Spectral Domain Method

R.T. Kollipara and V.K. Tripathi. "Dispersion Characteristics of Moderately Thick Microstrip Lines by the Spectral Domain Method." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 100-101.

The influence of the metallization thickness on the propagation characteristics of the microstrip lines is modeled by utilizing the computationally efficient spectral domain method with an approximate Green's function. The Green's function is based on the current and charge distribution at the top and bottom surfaces of the microstrips. The calculated effective dielectric constants and impedances are plotted for single and coupled microstrip lines as a function of frequency. It is seen that the effective dielectric constants obtained from resonance measurements are in good agreement with the calculated values for moderately thick ($t/W \sim 0.15$) single and coupled lines.

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Radial-Line to Coaxial-Line Junction with a Dielectrically Sheathed Post

R.B. Keam and A.G. Williamson. "Radial-Line to Coaxial-Line Junction with a Dielectrically Sheathed Post." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 102-104.

An analysis of a coaxial line/radial line junction is presented for the case where the centre conductor of the coaxial line extends the full width across the radial line and is completely sheathed in a lossless dielectric. The problem is analyzed by the Fourier transform method using a realistic model for the coaxial excitation. Expressions for the current distribution on the post and the admittance of the junction are deduced. Comparison of theoretical and experimental results show the theory to be very accurate.

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Modification of the Condensed 3-D TLM Node to Improve Modeling of Conductor Edges

J.S. Nielsen and W.J.R. Hoefer. "Modification of the Condensed 3-D TLM Node to Improve Modeling of Conductor Edges." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 105-107.

A modified condensed node TLM structure is proposed which, when used in conjunction with the conventional condensed node, improves the field simulation in the vicinity of conductive edges. This results in a substantial improvement in modeling accuracy of stripline and finline type structures.

Click on title for a complete paper.



A Novel Microwave Limiter-Discriminator: Design and Analysis

T. Chattopadhyay and M. Bhattacharya. "A Novel Microwave Limiter-Discriminator: Design and Analysis." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 108-110.

A new microwave discriminator that incorporates an efficient amplitude limiter is described. The amplitude limiting action is obtained from a pair of low-noise Gunn oscillators synchronized with the input microwave signal. The proposed limiter-discriminator works on the principle of phase-splitting action of the waveguide line as in the case of a passive microwave discriminator. The figure of merit of the proposed discriminator is the highest among the passive and the active discriminators reported in literature. The implementation of the proposed limiter-discriminator can be easily extended to mm wave and sub-mm wave region of the electromagnetic spectrum.



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S-Parameter Characterization and Modeling of Three-Terminal Semiconductive Devices at Cryogenic Temperatures

J.W. Smuk, M.G. Stubbs and J.S. Wight. "S-Parameter Characterization and Modeling of Three-Terminal Semiconductive Devices at Cryogenic Temperatures." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 111-113.

Three generations of three-terminal microwave semi-conductive devices are measured and analyzed at 297K and 77K. FET's, HEMT's, and Pseudomorphic-HEMT's (P-HEMT's) are accurately characterized over the frequency range from 1 GHz to 20 GHz using a newly developed split-block test fixture and the Through-Reflect-Line (TRL) calibration technique. Accurate characterization allows small-signal models to be closely fitted at both temperatures. The performance improvement offered by low temperature operation is described.

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A Deterministic Quasi-Static Approach to Microstrip Discontinuity Problems in the Space-Spectral Domain

M. Yu, K. Wu and R. Vahldieck. "A Deterministic Quasi-Static Approach to Microstrip Discontinuity Problems in the Space-Spectral Domain." 1992 Microwave and Guided Wave Letters 2.3 (Mar. 1992 [MGWL]): 114-116.

A new deterministic quasi-static space-spectral domain approach has been developed to analyze planar circuit discontinuities. This method represents an important modification of the SSDA which combines the advantages of the 1-D MoL and the 1-D SDA. Since the SSDA was developed as an eigenvalue approach, it was only capable of calculating resonant frequencies of planar resonators of arbitrary shape. In this modified SSDA approach an algebraic matrix equation replaces the eigenvalue matrix and the quasi-static discontinuity capacitances and s-parameters are computed very efficiently. To demonstrate the performance of this new method the microstrip open-end is calculated as an example.

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Patent Abstracts (Mar. 1992 [MGWL])

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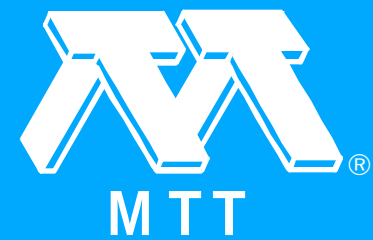
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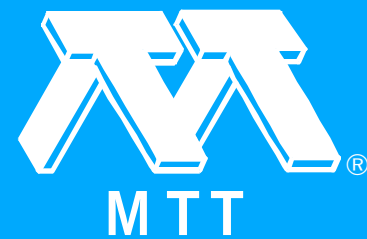


Abstracts

Power Coupling Equations for Single-Mode, Single-Polarization Optical Fibers with Effects of Leaky Modes and Broad-Band Light Source

C.-X. Shi and T. Okoshi. "Power Coupling Equations for Single-Mode, Single-Polarization Optical Fibers with Effects of Leaky Modes and Broad-Band Light Source." 1992 *Microwave and Guided Wave Letters* 2.4 (Apr. 1992 [MGWL]): 133-134.

A set of coupled equations for single-mode single-polarization (SMSP) optical fibers applicable to the case with effects of leaky modes and broad-band light source has been derived. The power coupling coefficients are related not only to the birefringence of the SMSP fiber, but also to the leaky mode loss and the spectral line width of the light source.



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A Large-Signal GaAs MESFET Model for Nonlinear Circuit Simulation

M. Imam, M.A. Osman and Y. Prieto. "A Large-Signal GaAs MESFET Model for Nonlinear Circuit Simulation." 1992 Microwave and Guided Wave Letters 2.4 (Apr. 1992 [MGWL]): 135-137.

A GaAs MESFET large-signal model suitable for use in time-domain circuit simulation CAD tools such as PSPICE has been developed. The improved model includes accurate analytic representation of the transconductance and conductance dependence upon the operating voltages. The new model gives better fit to GaAs MESFET I-V characteristics over a wider bias voltage range compared with the Curtice quadratic model. It also provides a simpler and more efficient parameter acquisition procedure in comparison to the TriQuint model. The procedure for extracting the model parameters using the bias dependence of the small-signal elements is also described.

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Coplanar Waveguide Aperture-Coupled Microstrip Patch Antenna

R.Q. Lee and R.N. Simons. "Coplanar Waveguide Aperture-Coupled Microstrip Patch Antenna." 1992 Microwave and Guided Wave Letters 2.4 (Apr. 1992 [MGWL]): 138-139.

The performance characteristics of a coplanar waveguide (CPW) aperture-coupled microstrip patch antenna was investigated experimentally. A grounded CPW with a series gap in the center strip conductor was used to couple microwave power to the antenna through an aperture in the common ground plane. Results indicate good coupling efficiency and confirms the feasibility of this feeding technique.

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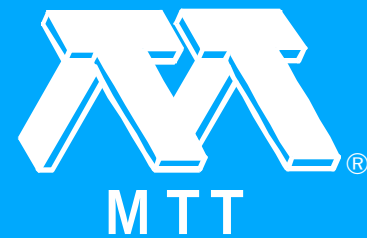


Abstracts

Wavelet Analysis of Backscattering Data from an Open-Ended Waveguide Cavity

H. Ling and H. Kim. "Wavelet Analysis of Backscattering Data from an Open-Ended Waveguide Cavity." 1992 Microwave and Guided Wave Letters 2.4 (Apr. 1992 [MGWL]): 140-142.

The wavelet analysis technique is applied to analyze the electromagnetic backscattering data from an open-ended waveguide cavity. Compared to the conventional short-time Fourier transform, the wavelet transform results in a better representation of the scattering features in the time-frequency plane, due to its multiresolution property.



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Performance of a Four-Element Ka-Band High-Temperature Superconducting Microstrip Antenna

M.A. Richard, K.B. Bhasin, C. Gilbert, S. Metzler, G. Koepf and P.C. Claspy. "Performance of a Four-Element Ka-Band High-Temperature Superconducting Microstrip Antenna." 1992 Microwave and Guided Wave Letters 2.4 (Apr. 1992 [MGWL]): 143-145.

Superconducting four-element microstrip array antennas operating at 30 GHz have been designed and fabricated on a lanthanum aluminate (LaAlO/sub 3/) substrates. The experimental performance of these thin film Y-Ba-Cu-O superconducting antennas is compared with that of identical antenna patterned with evaporated gold. Efficiency measurements of these antennas show an improvement of 2 dB at 70 K and as much as 3.5 dB at 40 K in the superconducting antenna over the gold antenna.

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RCS Reduction of Dielectric Cylinders Using the Simulated Annealing Approach

E. Michielssen and R. Mittra. "RCS Reduction of Dielectric Cylinders Using the Simulated Annealing Approach." 1992 Microwave and Guided Wave Letters 2.4 (Apr. 1992 [MGWL]): 146-148.

A novel technique is presented for reducing the bistatic scattering of dielectric struts for radomes, modeled herein as infinite dielectric cylinders, that are illuminated by TMz plane waves. The reduction is achieved by loading the cylinders with perfectly-conducting narrow strips oriented parallel to the cylinder axis, and the strip configurations are obtained iteratively by using the technique of simulated annealing. The technique is useful for systematically deriving strip configurations that reduce the RCS simultaneously for different observation angles and/or frequencies.

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



Complementary HBT Push-Pull Amplifier by Selective MBE

K.W. Kobayashi, D.K. Umemoto, J.R. Velebir, A.K. Oki and D.C. Streit. "Complementary HBT Push-Pull Amplifier by Selective MBE." 1992 Microwave and Guided Wave Letters 2.4 (Apr. 1992 [MGWL]): 149-150.

Microwave performance results are presented of the first monolithically integrated GaAs-AlGaAs complementary HBT push-pull amplifier fabricated using selective molecular beam epitaxy and a merged HBT process. The push-pull amplifier integrates four n-p-n transistors with one p-n-p transistor on the same GaAs chip. The amplifier has a sharp dc characteristic curve with no cross-over offset, a voltage swing of 6.3 V using a 9 V supply, and a linear voltage gain of 20. The bandwidth is dc to 2.5 GHz, with a saturated output power of 7.4 dBm at 2.5 GHz.



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Full-Wave Analysis of Guided Wave Structures Using a Novel 2-D FDTD

S. Xiao, R. Vahldieck and H. Jin. "Full-Wave Analysis of Guided Wave Structures Using a Novel 2-D FDTD." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 165-167.

A two-dimensional Yee's mesh with reduced grid size is proposed for the full-wave analysis of arbitrarily shaped guided wave structures. By introducing a phase shift $\beta \Delta h$ along the z -direction (propagation direction), it is now possible to calculate the propagation constant of hybrid modes by using only a two-dimensional mesh. This step not only allows the frequency selective application of the finite difference time-domain (FDTD) method, as desired in many design problems, but it also reduces the memory space and CPU time of the full-wave FDTD significantly. Furthermore, by introducing a phase shift, the size of the space grid in propagation direction is reduced to half its normal size.

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Inset Dielectric Guide Mounting of a Detector Diode

S.R. Pennock, T. Rozzi and A. DiFilippo. "Inset Dielectric Guide Mounting of a Detector Diode." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 168-170.

Inset dielectric guide (IDG) is an alternative to dielectric guides such as Image or Insular Guide for millimeter wave and antenna applications. Antennas, bends, and couplers in IDG have already been examined showing good characteristics, but the problem of mounting diodes in IDG has not previously been addressed. A simple detector diode mount is examined and its performance in IDG is compared to that achieved when the same diode is mounted in a rectangular metal waveguide. Performance in IDG is good, if a little worse than in waveguide due to some radiation loss from the diode mount.

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Measurement of a 24-GHz Broad-Band Multilayer Ceramic Feedthru for Microwave Packaging

M.P. Goetz and G. Mancias, III. "Measurement of a 24-GHz Broad-Band Multilayer Ceramic Feedthru for Microwave Packaging." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 171-173.

A feedthru using a microstrip to stripline to conductor backed coplanar waveguide (CBCWG) design is investigated for microwave performance. The feedthru was manufactured using a high-temperature cofired multilayer ceramic process. The study was instigated from the need to have a field-replaceable, Ku-band transmit/receive module as part of an existing DARPA MIMIC program. The result is a feedthru capable of transmitting microwave frequencies to 24 GHz with acceptable loss characteristics. The feedthru performance exceeds existing published results.

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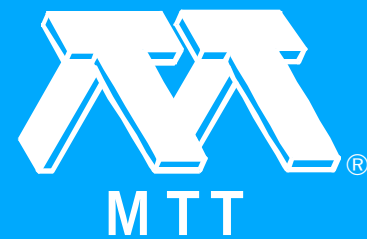


Abstracts

Use of Self Bias to Improve Power Saturation and Intermodulation Distortion in CW Class B HBT Operation

D.A. Teeter, J.R. East and G.I. Haddad. "Use of Self Bias to Improve Power Saturation and Intermodulation Distortion in CW Class B HBT Operation." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 174-176.

It is shown that the dc base bias circuit can be used to control the RF performance of an HBT operating under CW conditions near class B mode. By a careful choice of base bias resistance, gain can be linearized, output power at 1-dB gain compression increased, and intermodulation distortion reduced. Measurements on HBT's biased near class B operation showed a 10-dB improvement in 1-dB gain compression point and 10-dB reduction in intermodulation distortion for moderate power levels. Results for various values of dc base resistance for a typical HBT are presented.



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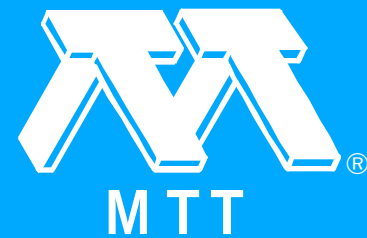


Abstracts

A Pulsed Microwave Oscillator Using Optically Controlled Active Feedback

W.D. Jemison and P.R. Herczfeld. "A Pulsed Microwave Oscillator Using Optically Controlled Active Feedback." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 177-179.

An optically controlled microwave oscillator is demonstrated using MMIC compatible design techniques. The oscillator uses an optically controlled active inductor as a tunable feedback element in a two-port common gate FET circuit configuration. Experimental results are presented for a pulsed mode of operation that is triggered by illuminating the active feedback circuit.



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Full-Wave Analysis of a Lossy Rectangular Waveguide Containing Rough Inner Surfaces

C.-D. Chen, C.-K.C. Tzuang and S.T. Peng. "Full-Wave Analysis of a Lossy Rectangular Waveguide Containing Rough Inner Surfaces." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 180-181.

The full-wave mode-matching method employing the similarity transformation to derive the eigenvalue equation for the periodic bumpy regions that model the surface roughness of a WR-10 (75-110 GHz) waveguide is presented. For the particular case study under the particular conditions applied, attenuation losses increase by approximately 60% (36%) at 75 GHz (110 GHz).

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Scattering Solution of Three-Dimensional Array of Patches Using the Recursive T-Matrix Algorithms

L. Gurel and W.C. Chew. "Scattering Solution of Three-Dimensional Array of Patches Using the Recursive T-Matrix Algorithms." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 182-184.

The recursive T-matrix algorithms are used to solve for the vector electromagnetic scattering problem of a three-dimensional array of patches. The formulation uses only the E_x and E_y components of the electromagnetic field wherein the three-dimensional scalar addition theorem can be used. The coefficients for the scalar addition theorem is calculated with an efficient recurrence relation. This results in reduced memory requirement and computation time. When the addition theorem is violated, a generalized recursive T-matrix algorithm is used to mitigate the problem caused by the violation of the addition theorem. The scattering solutions are validated by comparison with the method of moments and the reduced computational complexity of the solution is demonstrated.

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Analysis of Dual-Frequency Stacked Patch Antennas Using Subsectional Bases

S. Couture, J.C. Beal and Y.M.M. Antar. "Analysis of Dual-Frequency Stacked Patch Antennas Using Subsectional Bases." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 185-187.

The analysis of stacked, microstrip patches for dual-frequency antenna applications is performed by the method of moments applied in the spatial domain and using simple, subsectional, basis functions. The moment matrix is filled, and solved, quickly by exploiting symmetries and performing all computations in four-byte, single precision. The use of subsectional bases enables applications to microstrip structures of arbitrary shapes. Resonant frequencies and reflection coefficients of two stacked patches are well-predicted by linear systems of surprisingly low order.

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Novel Symmetrical Three-Branch Optical Waveguide with Equal Power Division

S. Banba and H. Ogawa. "Novel Symmetrical Three-Branch Optical Waveguide with Equal Power Division." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 188-190.

Symmetrical three-branch optical waveguide structures, which can divide power equally at each branch, are proposed from calculations by the beam propagation method. The structures are constructed with a triangular shaped spacing area in the central branch to control the transmission coefficient between each branch and the main waveguide. The proposed three-branch waveguides can be easily designed due to their simple configuration.





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Characterization of Picosecond Pulse Propagation in a Microstrip Line Divider

Y. Qian, L. Zhu and E. Yamashita. "Characterization of Picosecond Pulse Propagation in a Microstrip Line Divider." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 191-193.

Many extremely broad bandwidth circuit components have to be newly developed for practical applications of ultrashort electrical pulses. Theoretical and experimental investigation of the transmission property of picosecond pulses through a microstrip line divider are reported. Full-wave analysis results in the frequency domain are incorporated into a Fourier transform algorithm for computer simulations of pulse propagation through a 3-db microstrip line divider with curved-line branching circuit pattern. An excellent agreement has been found between our theoretical predications and the results of experimental measurements.

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Ultra Low-Noise Performance of 0.15-Micron Gate GaAs MESFET's Made by Direct Ion Implantation for Low-Cost MMIC's Applications

M. Feng, J. Laskar, J. Kruse and R. Neidhard. "Ultra Low-Noise Performance of 0.15-Micron Gate GaAs MESFET's Made by Direct Ion Implantation for Low-Cost MMIC's Applications." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 194-195.

The high-speed and noise performance of 0.15-micron gate GaAs MESFET's for microwave and millimeter-wave IC applications is reported on. The best extrinsic $f_{sub\ t/}$ is 109 GHz without correction for pad parasitic which is equivalent to an intrinsic $f_{sub\ t/}$ of 134 GHz. The 0.15 x 200-micron gate GaAs MESFET achieved 0.6-dB noise figure with 17-dB associated gain at 10 GHz and 0.9-dB noise figure with 13-dB associated gain at 18 GHz. The measured noise figure and associated gain is the best reported performance for GaAs MESFET's and comparable to the best noise/gain performance of HEMT's and P-HEMT's.

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RCS Reduction for a Microstrip Antenna Using a Normally Biased Ferrite Substrate

D.M. Pozar. "RCS Reduction for a Microstrip Antenna Using a Normally Biased Ferrite Substrate." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 196-198.

It is shown that the radar cross section of a microstrip antenna can be significantly reduced over a broad frequency range by using a ferrite substrate biased to a cutoff state. When unbiased, the antenna operates in its usual fashion, with relatively large RCS peaks at frequencies corresponding to the resonances of the patch element. When the ferrite substrate is properly biased, the antenna element becomes effectively short-circuited, resulting in the elimination of the resonant behavior of the scattering response of the patch, and a reduction of 20-40 dB in its RCS. This mechanism allows the implementation of a microstrip antenna or array system that can be switched to an "off" state, where it will be much less visible to an interrogating radar. Calculated results are obtained from a full-wave moment method solution for the RCS of a microstrip antenna on a normally biased ferrite substrate.

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Rapid Pulsed Microwave Propagation (Comments)

A. Tichy-Racs. "Rapid Pulsed Microwave Propagation (Comments)." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 199-206.

In [1], there is a statement about an "experimental observation," which "shows that the leading edge of the pulse modulated microwaves propagates with the velocity $c/\cos \Theta$ in a direction Θ in open space. Only when Θ was chosen to be 0, it was c ." If this were correct, it would be a discovery of great importance.

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Abstracts

Diagonalization of Difference Operators and System Matrices in the Method of Lines (Correction)

R. Pregla and W. Pascher. "Diagonalization of Difference Operators and System Matrices in the Method of Lines (Correction)." 1992 Microwave and Guided Wave Letters 2.5 (May 1992 [MGWL]): 206-206.

In the above letter, the following corrections are necessary.



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Millimeter-Wave Power Performance of Ion-Implanted In/sub x/Ga/sub (1-x)/As on GaAs Metal Semiconductor Field-Effect Transistors

M. Feng, C.L. Lau, P. Brusenback and L.J. Kushner. "Millimeter-Wave Power Performance of Ion-Implanted In/sub x/Ga/sub (1-x)/As on GaAs Metal Semiconductor Field-Effect Transistors." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 225-227.

Millimeter-wave power performance achieved by ion-implanted InGaAs-GaAs MESFET's with a gate length of 0.25 micron is described. When the device with a gate width of 150 micron was measured at 22 GHz, an output power of 95 mW, a power-added efficiency of 33%, and an associated gain of 7.3 dB were achieved. At an output power of 93 mW, a power-added efficiency of 25%, and an associated gain of 4 dB were obtained at 44 GHz. When the device with a gate width of 200 micron was measured at 60 GHz, an output power of 121 mW with 3 dB associated gain and 13% power-added efficiency were achieved.

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Investigation of Passive Bandpass Filters Using MMIC Technology

M.I. Herman, S. Valas, D.M. McNay, R. Knust-Graichen and J.C. Chen. "Investigation of Passive Bandpass Filters Using MMIC Technology." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 228-230.

It is a unique concept to dedicate a MMIC processing run solely for passive filter components. After going through preliminary design procedures, key parameters such as tap position, resonator length and coupling gaps may be studied in a controlled experiment to ascertain the optimal design. The MMIC fabrication process allows the design engineer the luxury of numerous filter designs within a single iteration and is extremely cost effective when compared with an equal number of hybrid MIC designs. MMIC filters are extremely small, highly reliable, and utilized existing processing technology. Passive filters are important when prime power consumption is limited as in advanced phased arrays for air and space applications. Ku-band MMIC parallel coupled, elliptical, and interdigital designs are investigated. The interdigital type yielded state-of-the-art performance and required the least substrate area.

Click on title for a complete paper.



A Varactor-Tuned Active Microwave Bandpass Filter

H. Trabelsi and C. Cruchon. "A Varactor-Tuned Active Microwave Bandpass Filter." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 231-232.

Traditionally, microwave filters have been implemented as passive networks of wave guide, transmission-line, or discrete lumped elements. More recently, microwave active filters have also been realized. A microwave high-Q active bandpass filter is presented, using a varactor diode for tuning, and an active component giving a substantial increase in Q of the resonant sections of filter. High-Q filter elements offer low-filter insertion loss and also yield sharp passband corners, which cannot be achieved by lossy filter and amplifier combination.

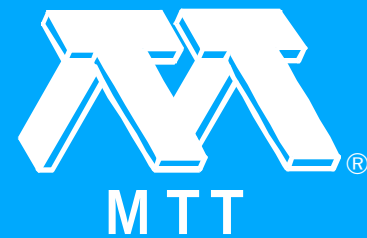


Abstracts

Rigorous Full-Wave Analysis of Microstrip Transmission Structures

B. Song and J. Fu. "Rigorous Full-Wave Analysis of Microstrip Transmission Structures." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 233-235.

A boundary-element technique is proposed for the rigorous full-wave study of a generalized microstrip transmission configuration. The method is accurate and covers the metallization thickness, mounting grooves, and arbitrary cross sections. Comparison of the obtained results with data available in literature shows the efficiency of this approach.



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Monolithic InP HEMT V-Band Low-Noise Amplifier

R.T. Webster, A.J. Slobodnik, Jr. and G.A. Roberts. "Monolithic InP HEMT V-Band Low-Noise Amplifier." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 236-238.

A fully monolithic iridium phosphide high electron mobility transistor (InP HEMT) two-stage low-noise amplifier has achieved a noise figure of 4.2 dB with an associated gain of 15.25 dB over the band from 56 to 60 GHz. All noise matching and bias decoupling are accomplished on-chip. The successful performance of the amplifier is credited to accurate characterization of the active and passive devices that make up the circuit.

Click on title for a complete paper.



Abstracts

Method of Lines with Special Absorbing Boundary Conditions--Analysis of Weakly Guiding Optical Structures

R. Pregla and D. Kremer. "Method of Lines with Special Absorbing Boundary Conditions--Analysis of Weakly Guiding Optical Structures." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 239-241.

It is shown that the introduction of special absorbing boundary conditions (SABC) in the method of lines (MoL) for applications in the integrated optics allows to make the discretized area smaller. The numerical effort decreases substantially. This effect will be demonstrated in case of a slab waveguide.



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Cryogenic Small-Signal Model for 0.55- μm Gate-Length Ion-Implanted GaAs MESFET's

J. Laskar, J. Kruse and M. Feng. "Cryogenic Small-Signal Model for 0.55- μm Gate-Length Ion-Implanted GaAs MESFET's." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 242-244.

The cryogenic microwave performance of 0.5 x 300 μm gate ion-implanted GaAs MESFET's are presented. The devices studied here have been fabricated as part of a process control monitor chip (PCM) which uses comparable industry standard design rules. We have performed detailed small-signal element modeling to determine the temperature dependence of important physical parameters over a lattice temperature range from 300 K to 115 K. We find appreciable improvement in cut-off frequency and well behaved temperature dependence of transconductance ($g_{\text{sub } m/}$) and gate-source capacitance ($C_{\text{sub } gs/}$). Empirical relations for the temperature dependence of $f_{\text{sub } T/}$, $f_{\text{sub } \text{max}/}$, $g_{\text{sub } m/}$, and $C_{\text{sub } gs/}$ that should provide accurate temperature dependant device and circuit models, are presented.

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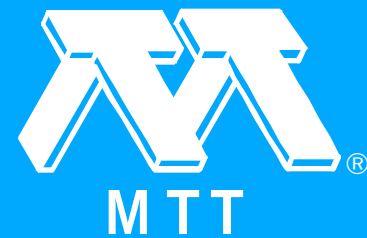


Abstracts

A Novel Aperture Coupled Microstrip "Magic-T"

M.W. Katsube, Y.M.M. Antar, A. Ittipiboon and M. Cuhaci. "A Novel Aperture Coupled Microstrip "Magic-T"." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 245-246.

A novel "Magic-T" type constructed in microstrip technology using aperture coupling is proposed and investigated. The goal is to obtain optimum coupling, phase, and isolation characteristics over a certain bandwidth for its future use in planar multilayer microwave integrated circuit applications. Preliminary results are presented and they successfully demonstrate the concept and show good agreement between theory and measurements.



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Asymmetric Bandpass Filter Using a Novel Microstrip Circuit

P.L. Field, I.C. Hunter and J.G. Gardiner. "Asymmetric Bandpass Filter Using a Novel Microstrip Circuit." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 247-249.

A method for increasing the skirt, selectivity on one side of a bandpass filter is presented. One such application is the receive filter of a PCN mobile terminal. An asymmetric synthesis method has been used, realising finite transmission zeros as cross couplings. A novel microstrip structure has been devised to demonstrate the electrical design. Although the insertion loss measured was greater than that required for a practical system, the procedure described is applicable to compact dielectric resonator structures with potentially lower loss capability.

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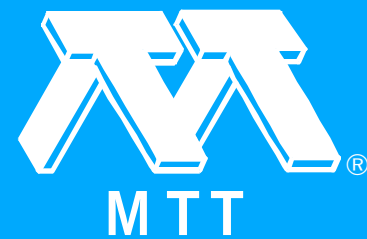


Abstracts

Conductor Loss Computation in Multiconductor MIC's by Transverse Resonance Technique and Modified Perturbational Method

F. Alessandri, G. Baini, G. D'Inzeo and R. Sorrentino. "Conductor Loss Computation in Multiconductor MIC's by Transverse Resonance Technique and Modified Perturbational Method." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 250-252.

Rigorous computation of conductor loss in MMIC's transmission lines requires high computer expenditures, while conventional approaches become invalid for thin line conductors. Using a modified perturbational method, originally proposed by Horton et al., in conjunction with the generalized transverse resonance technique, very accurate results are obtained with relatively modest computer effort.



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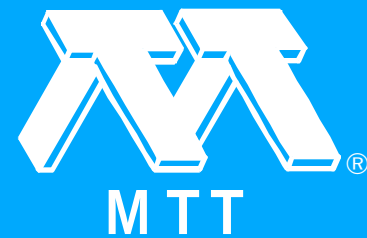


Abstracts

V-Band and W-Band Broad-Band, Monolithic Distributed Frequency Multipliers (Jun. 1992 [MGWL])

E. Carman, M. Case, M. Kamegawa, R. Yu, K. Giboney and M.J.W. Rodwell. "V-Band and W-Band Broad-Band, Monolithic Distributed Frequency Multipliers (Jun. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 253-254.

Broad-band V-Band and W-Band frequency multiplication is reported using soliton propagation on a GaAs monolithic device. With 24-dBm input, a doubler attained 17.4-dBm peak output power with at least 52-63.1-GHz, 3-dB bandwidth, and a tripler attained 12.8-dBm peak output power with at least 81--108.8-GHz, 3-dB bandwidth. These multipliers, fabricated with 3- μ m design rules on GaAs and driven by lower frequency amplifiers, have applications as cost-effective sources in mm-wave systems.



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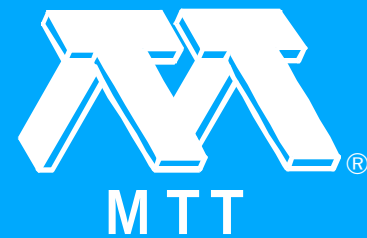


Abstracts

Velocity of an RF Pulse Signal Propagating in a Waveguide

W. Su, I.M. Besieris and S.M. Riad. "Velocity of an RF Pulse Signal Propagating in a Waveguide." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 255-256.

An RF pulse signal has been used to investigate the velocity of a wave propagating in a waveguide. Contrary to a recent report, the measurements demonstrate that an RF pulse signal cannot travel faster than light. The energy of the signal is transported at the "subliminal" group speed that can be measured.



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Multiple Dielectric Structures to Eliminate Moding Problems in Conductor-Backed Coplanar Waveguide MIC's

M.A. Magerko, L. Fan and K. Chang. "Multiple Dielectric Structures to Eliminate Moding Problems in Conductor-Backed Coplanar Waveguide MIC's." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 257-259.

Conventional conductor-backed (grounded) coplanar waveguides (CBCPW) leak energy from its dominant mode in the form of a parallel plate mode (PPM) in the substrate region at all frequencies which can generate undesirable coupling effects and produce an ineffective circuit. A multiple dielectric structure with appropriate dimensions is used to suppress the leakage effects and the spectral domain method (SDM) predicts the critical frequency (transition point for leaky and nonleaky modes) for the waveguide. Experimental data verifies this procedure and demonstrates the significance of the moding (leakage coupling) problems.

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Patent Abstracts (Jun. 1992 [MGWL])

"Patent Abstracts (Jun. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.6 (Jun. 1992 [MGWL]): 260-272.



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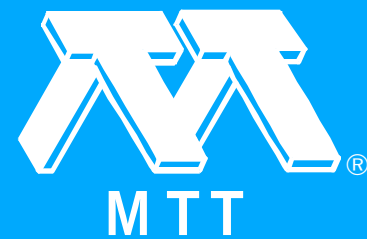


Abstracts

A Laser-Diode-Based Photoconductive Harmonic Mixer for Microwave Waveform and Spectrum Measurements

H.-H. Wu, C.-S. Chang and C.-L. Pan. "A Laser-Diode-Based Photoconductive Harmonic Mixer for Microwave Waveform and Spectrum Measurements." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 273-275.

A laser-diode-based photoconductive harmonic mixer has been used to obtain low-frequency replicas of an optoelectronically phase-locked 12.01-GHz microwave signal as well as the waveform and spectrum of picosecond electrical pulses generated by a step recovery diode.



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Millimeter-Wave Imaging Using Preamplified Diode Detector

W. Lam, P. Lee, L. Yujiri, J. Berenz and J. Pearlman. "Millimeter-Wave Imaging Using Preamplified Diode Detector." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 276-277.

A 2-pixel imaging array was developed to demonstrate millimeter-wave imaging. Each pixel consists of a Q-band Vivaldi antenna and a preamplifier diode detector, using InGaAs pseudomorphic HEMT MMIC low noise amplifiers (LNA) and beam-lead Schottky-diode detector. The approach does not require local oscillator (LO) power, is compatible with MMIC technology, and can reduce the complexity and manufacturing cost of millimeter-wave imaging arrays. The preamplifier diode detector exhibited 17 V/uW responsivity at 44 GHz and -75 dBm tangential sensitivity at 1-MHz video bandwidth. The array demonstrated millimeter-wave imaging of three vehicles in a parking lot.

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On the Complex Nature of Higher Order Modes in Lossless Nonreciprocal Transversely Magnetized Waveguides

R. Marques, F. Mesa and M. Horno. "On the Complex Nature of Higher Order Modes in Lossless Nonreciprocal Transversely Magnetized Waveguides." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 278-280.

Propagation of nonreciprocal modes in transversely magnetized lossless nonreciprocal waveguides is analyzed. It is shown that purely evanescent modes cannot exist if the wave propagation is nonreciprocal. As a consequence of this all the modes which do not support a net average power flux must be complex. These modes are called here pseudo-evanescent complex modes. The meaning of the cutoff frequency concept of such pseudo-evanescent complex modes is also discussed.

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A Si-SiGe HBT Dielectric Resonator Stabilized Microstrip Oscillator at X-Band Frequencies

U. Guttich, A. Gruhle and J.F. Luy. "A Si-SiGe HBT Dielectric Resonator Stabilized Microstrip Oscillator at X-Band Frequencies." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 281-283.

Design, fabrication, and performance of the first reported hybrid dielectric resonator oscillator (DRO) using a Si-SiGe heterojunction bipolar transistor (HBT) as the active device are described. The employed HBT with layer structures completely grown by MBE exhibits $f_{\text{sub T}}$ and $f_{\text{sub max}}$ values in the range of 38 GHz. At 9.6 GHz, an oscillator output power of 10 mW with a conversion efficiency of 17.5% is measured. Phase noise $N/C_{\text{sub FM}}$ of -85 dBc (1 Hz) is determined at 100 kHz off carrier.

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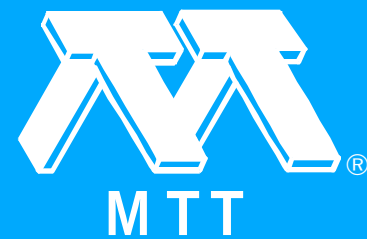


Abstracts

Microwave Imaging of Multiple Conducting Cylinders Using Local Shape Functions

W.C. Chew and G.P. Otto. "Microwave Imaging of Multiple Conducting Cylinders Using Local Shape Functions." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 284-286.

A novel technique is presented for microwave imaging of multiple conducting cylinders using local shape functions. In this method, a scattering volume is divided into small sub-scattering regions and assigned a local shape function amplitude. The reconstructed image is represented by the set of local shape functions that satisfy multiple scattering boundary conditions. Monochromatic image reconstructions have a resolution scale of 0.1λ for single scatterers; multiple scatterers can be resolved at a separation of 0.42λ .



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Conductor-Backed Coplanar Waveguide Resonators of YBa/sub 2/Cu/sub 3/O/sub 7-delta/ on LaAlO/sub 3/

F.A. Miranda, K.B. Bhasin, K.-S. Kong, T. Itoh and M.A. Stan. "Conductor-Backed Coplanar Waveguide Resonators of YBa/sub 2/Cu/sub 3/O/sub 7-delta/ on LaAlO/sub 3/." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 287-288.

Conductor-backed coplanar waveguide (CBCPW) resonators operating at 10.8 GHz have been fabricated from laser ablated and off-axis magnetron sputtered YBa/sub 2/Cu/sub 3/O/sub 7-delta/ (YBCO) high-temperature superconducting (HTS) thin films on LaAlO/sub 3/. These resonators were tested in the temperature range from 14 to 92 K. The unloaded quality factor (Q_{0}) at 77 K of the HTS CBCPW resonators was 3 to 4 times that of a similar gold (Au) resonator. To our knowledge, these results represent the first reported measurements of HTS-based CBCPW resonators.

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Quantum-Well Diode Frequency Multipliers: Varistor Case

P.D. Batelaan, T.J. Tolmunen and M.A. Frerking. "Quantum-Well Diode Frequency Multipliers: Varistor Case." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 289-291.

Local oscillators for heterodyne receivers at submillimeter wavelengths are typically made using a fundamental source followed by a harmonic frequency multiplier. An investigation of the required circuit embedding conditions for a possible new harmonic generator, the quantum-well resonant-tunneling diode, is summarized. A low-frequency multiplier has been tested that employs the resistive nonlinearity of the device as opposed to the reactive nonlinearity. The results show good agreement between practice and theory.

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A Scheme to Lower the Resonant Frequency of the Microstrip Patch Antenna

J.L. Volakis and J.M. Jin. "A Scheme to Lower the Resonant Frequency of the Microstrip Patch Antenna." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 292-293.

Simple schemes are presented for lowering the resonant frequency of the rectangular patch antenna without changing its size. In particular, by placing a perturbation below the patch it is shown that as much as 30 percent decrease from the resonant frequency of the unperturbed patch can be achieved. The specific configurations considered include a cavity-backed and an aperture-backed patch and for each case design curves are presented.

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Computer-Aided Microwave Circuit Analysis by a Computerized Numerical Smith Chart

M. Vai and S. Prasad. "Computer-Aided Microwave Circuit Analysis by a Computerized Numerical Smith Chart." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 294-296.

The Smith chart, while being a very useful graphical tool for the manual analysis and design of microwave circuits, is not suitable for computer manipulation. A computerized Smith chart represented by a numerical matrix is developed. In addition to the fact that this numerical matrix is very convenient for computer storage and efficient for algorithmic operations, it retains the locality relationships between impedances and reflection coefficients on a graphical Smith chart.

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Determination and Reduction of the Capacitance Associated with the Bonding Pads of Planar Millimeter-Wave Mixer Diodes

J.A. Wells and N.J. Cronin. "Determination and Reduction of the Capacitance Associated with the Bonding Pads of Planar Millimeter-Wave Mixer Diodes." 1992 Microwave and Guided Wave Letters 2.7 (Jul. 1992 [MGWL]): 297-299.

A calculation of the capacitance associated with the metal bonding pads of a planar millimeter-wavelength mixer diode is presented. This capacitance is the largest component associated with such a device, contributing a calculated 22 fF toward a total diode capacitance of 30 fF. A demonstration of how the pad capacitance can be almost halved by incorporating an air bridge into the diode structure is included. Computer simulations show that this additional processing step can cause a 1.2-dB drop in mixer conversion loss at 94 GHz.

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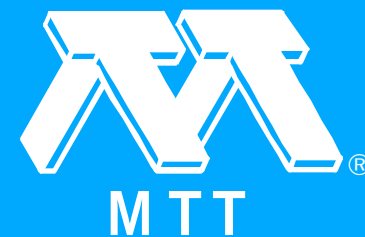
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Analysis of CPW for LiNbO/sub 3/ Optical Modulator by Extended Spectral-Domain Approach

T. Kitazawa, D. Polifko and H. Ogawa. "Analysis of CPW for LiNbO/sub 3/ Optical Modulator by Extended Spectral-Domain Approach." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 313-315.

A LiNbO/sub 3/ optical modulator using CPW with a SiO/sub 2/ buffer layer is analyzed accurately by incorporating the TW electrode thickness effect as well as anisotropic effect. By introducing a finite electrode thickness, the loss calculation becomes available for the lines with thinner as well as thicker conductors. Numerical computations show that the electrode thickness is as a dominant parameter as is the buffer layer thickness for the line characteristics. The use of thicker electrodes increases the velocity of microwaves in the interaction part and decreases the conductor loss significantly, and it can be utilized advantageously for the modulator's design.

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Analytical Inversion of a Class of Infinitely Dimensioned Matrices Encountered in Some Microwave Problems

A.S. Omar and A. Jostingmeier. "Analytical Inversion of a Class of Infinitely Dimensioned Matrices Encountered in Some Microwave Problems." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 316-318.

A method is presented for analytically inverting a class of infinitely dimensioned matrices that are usually encountered in the analysis of microwave problems by applying the generalized spectral domain (GSD) method. It is shown that numerically inverting the truncated matrix and truncating the analytically inverted matrix leads to different results, which converge to each other very slowly. CPU time and storage requirements of a number of algorithms based on the GSD method can consequently be improved by making use of the analytical inversion of such matrices.

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A Time-Domain Millimeter-Wave Vector Network Analyzer

R.Y. Yu, J. Pusi, Y. Konishi, M. Case, M. Kamegawa and M. Rodwell. "A Time-Domain Millimeter-Wave Vector Network Analyzer." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 319-321.

A millimeter-wave vector network analyzer is implemented with a monolithic GaAs directional time-domain reflectometer integrated circuit mounted directly on a microwave wafer probe. The vector network analyzer performs on-wafer network analysis up to 96 GHz with ± 1 dB accuracy.

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Experimentally Observed Frequency Variation of the Attenuation of Millimeter-Wave Coplanar Transmission Lines with Thin Metallization

W.H. Haydl. "Experimentally Observed Frequency Variation of the Attenuation of Millimeter-Wave Coplanar Transmission Lines with Thin Metallization." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 322-324.

The attenuation of small coplanar transmission lines on insulating InP and GaAs has been investigated experimentally over the frequency range 0-60 GHz by on-wafer probing. The ground to ground spacing d , the center line width w , and the metal thickness t were varied. For thin (0.25-1 μm) gold metallization, the variation of the attenuation with frequency was found to be dependent on the geometry of the line. A good fit to the experimental data was obtained when the attenuation a was modeled as $a = a_0/f^n$, where a_0 and n are geometry dependent. The exponent n was found to be in the range 0.15-0.35, and to increase with increasing w/d ratio, which is interpreted to be due to a correspondingly varying frequency dependent resistance and current distribution.

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Monolithic Millimeter-Wave Pseudomorphic HEMT Power Amplifiers at Ka-Band

*T. Ho, G. Metze, A. Cornfeld, T. Lee, K. Pande, H. Huang, P. Ferguson and M. Foisy.
"Monolithic Millimeter-Wave Pseudomorphic HEMT Power Amplifiers at Ka-Band." 1992
Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 325-327.*

A Ka-band monolithic HEMT power amplifier, based on 0.25- μm gatelength single quantum-well AlGaAs-InGaAs pseudomorphic high-electron mobility transistor (PM-HEMT) technology, has been developed for millimeter-wave system applications. These amplifiers include single-ended and on-chip combined configurations and have on-chip dc-block, RF-bypass and bias network. A cascaded four-stage power amplifier exhibited 210 mW output power with an associated gain of 21.3 dB at 34.5 GHz. The saturated output power of this amplifier exceeded 230 mW. These power modules need only single positive bias to simplify system power supply requirements, and are highly stable. Moreover, multistage can easily be cascaded/combined to achieved even higher gain and power for future millimeter-wave systems.

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X-Band Monolithic Power Amplifier Using Low Characteristic Impedance Thin-Film Microstrip Transformers

M. Gillick and I.D. Robertson. "X-Band Monolithic Power Amplifier Using Low Characteristic Impedance Thin-Film Microstrip Transformers." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 328-330.

A technique is introduced for matching monolithic power amplifiers by using short thin-film microstrip transformers with very low characteristic impedance. An X-band power FET amplifier has been successfully realized with this technique, using a standard GaAs foundry two-level metal process. The amplifier has achieved over 5.5-dB small-signal gain and an output power of 1 watt at a center frequency of 11.3 GHz. This new matching technique can greatly reduce the area of the matching networks compared with conventional microstrip techniques which rely on cluster matching and power dividing/combining.

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High-Performance Microwave AlGaAs-InGaAs Pnp HBT with High-DC Current Gain

W. Liu, D. Hill, D. Costa and J.S. Harris. "High-Performance Microwave AlGaAs-InGaAs Pnp HBT with High-DC Current Gain." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 331-333.

A Pnp heterojunction bipolar transistor, which had among the highest reported values of $f_{sub T}$ (~23 GHz) and $f_{sub max}$ (~40 GHz), employed a heavily doped InGaAs pseudomorphic base. However, this HBT had very low values of dc current gain (≤ 4). Pnp microwave HBT's with a modified base design are reported, which not only achieve similar high-frequency performance, but also attain dramatically higher current gain values ~ 90.

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A Monolithic Six-Port Module

M.N. Solomon, P.S. Weitzman, C.P. McClay and H.M. Cronson. "A Monolithic Six-Port Module." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 334-336.

The design and test of the first fully monolithic microwave integrated circuit (MMIC) implementation of a complete six-port module is described. The monolithic six-port module (MSPM) includes a six-port junction, matched FET diode detectors, high-dynamic range logarithmic amplifiers, and tunable Gunn-effect oscillators. The GaAs chip is 3 x 3 mm and the circuits operate from 7 to 9 GHz. In a reflectometer configuration, the MSPM demonstrates good agreement with National Institute of Standards and Technology (NIST) measurements on the same components. This MSPM can be used as a primary building block for a new generation of low-cost, very small, and highly reliable IC's for built-in-test applications.

Click on title for a complete paper.



Abstracts

A Very Small, Low-Loss MMIC Rat-Race Hybrid Using Elevated Coplanar Waveguides

H. Kamitsuna. "A Very Small, Low-Loss MMIC Rat-Race Hybrid Using Elevated Coplanar Waveguides." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 337-339.

A very small, low-loss MMIC rat-race hybrid using elevated coplanar waveguides is proposed. A 15-GHz-band rat-race hybrid is designed and fabricated in a 0.50 mm x 0.55 mm chip area. The proposed hybrid requires less than half the area used when constructing miniaturized MMIC hybrids from TFMS lines. Furthermore, coupling loss of the proposed hybrid is reduced by approximately 2 dB in comparison to that of previously reported ones.



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Cryogenic Performance of a Monolithic W-Band Amplifier Using Picosecond Optoelectronic Technique

F. Oshita, M. Martin, M. Matloubian, H. Fetterman, H. Wang, K. Tan and D. Streit. "Cryogenic Performance of a Monolithic W-Band Amplifier Using Picosecond Optoelectronic Technique." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 340-342.

Cryogenic characterization of a monolithic W-band pseudomorphic InGaAs HEMT amplifier has been demonstrated for the first time using the picosecond optoelectronic technique. Low temperature, millimeter-wave measurements have been performed without the use of conventional millimeter-wave sources, components, and transitions. At 94 GHz, the single-stage amplifier exhibits gain of 4.5 dB at 300 K, which increases to 7 dB at 70 K.

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Two-Octave Bandwidth Monolithic Analog Phase Shifter

S. Lucyszyn and I.D. Robertson. "Two-Octave Bandwidth Monolithic Analog Phase Shifter." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 343-345.

The cascaded-match reflection-type phase shifter (CMRTPS) was recently introduced to utilize the full bandwidth of its 3-dB quadrature directional couplers. A monolithic realization of the CMRTPS is presented that maintains a high level of performance over two octaves, while using experimental one octave bandwidth offset multilayer folded directional couplers. Standard GaAs foundry processing was used to fabricate the MMIC. At the 10-GHz center frequency, the measured relative phase shift varied from 0 to 98°, with a decreasing bias potential from 0 to -10 V. Here, a maximum rms phase error of $\pm 2.8^\circ$ is maintained across the 4.4 to 16.1 GHz frequency range, for all bias levels.

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Characterization of Resistive Transmission Lines by Short-Pulse Propagation (Comments and Reply)

D.F. Williams and R.B. Marks. "Characterization of Resistive Transmission Lines by Short-Pulse Propagation (Comments and Reply)." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 346-347.

In the above letter, the authors report measurements of the complex propagation constant gamma of a coplanar waveguide and the application of Gamma to the determination of the characteristic impedance. The authors state that "the same information could, in principle, be obtained with a network analyzer" by the method described in [1]. In fact, these measurements were reported in [1]. Furthermore, the bandwidth of the network analyzer method is broad, with [1] reporting an upper limit of 40 GHz² well above the 25-GHz limit reported in the letter.

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Abstracts

Patent Abstracts (Aug. 1992 [MGWL])

"Patent Abstracts (Aug. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 348-353.



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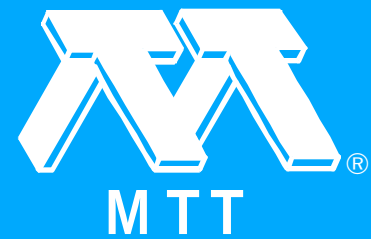
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Abstracts

IEEE Conference Proceedings (Advertisement) (Aug. 1992 [MGWL])

"IEEE Conference Proceedings (Advertisement) (Aug. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 354-354.



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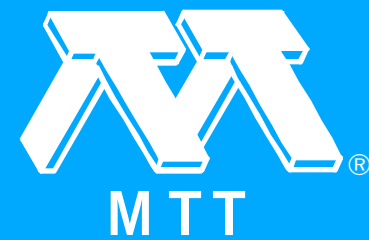
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1992 IEEE Membership Directory (Advertisement) (Aug. 1992 [MGWL])

"1992 IEEE Membership Directory (Advertisement) (Aug. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.8 (Aug. 1992 [MGWL]): 355-355.



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348-GHz Endfire Slotline Antennas on Thin Dielectric Membranes

H. Ekstrom, S. Gearhart, P.R. Acharya, G.M. Rebeiz, E.L. Kollberg and S. Jacobsson. "348-GHz Endfire Slotline Antennas on Thin Dielectric Membranes." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 357-358.

Tapered slotline endfire antennas, of BLTSA type, have been fabricated on 1.7- μm thin SiO/sub 2/-Si/sub 3/N/sub 4/ ($\epsilon_r = 4.5$) membranes. Antenna patterns in the E-, H-, D- and D-cross planes have been measured at the design frequency 348 GHz, with bismuth micro bolometer detectors. The antennas have approximately 12 dB directivity, and the --10-dB beam widths are 50° and 56° in the E- and H-planes, respectively. The 348-GHz measurements have been compared with model measurements at 45 GHz, and show good agreement.

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Effect of a Dielectric Overlay in a Microstripline on a Circular Cylindrical Surface

F. da Costa Silva, S.B. de Assis Fonseca, A.J.M. Soares and A.J. Giarola. "Effect of a Dielectric Overlay in a Microstripline on a Circular Cylindrical Surface." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 359-360.

The effect of a dielectric overlay on the propagation constant of a microstripline on a circular cylindrical surface is examined here, using dyadic Green's functions. The results show that this effect is substantial when the values of the relative dielectric permittivity and thickness of the overlay are increased.

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Asymmetric Bandpass Filter Using a Ceramic Structure

P.L. Field, I.C. Hunter and J.G. Gardiner. "Asymmetric Bandpass Filter Using a Ceramic Structure." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 361-363.

A ceramic bandpass filter with increased selectivity on the lower side of the passband is presented. One application is the receive filter of a mobile radio transceiver operating in the 1.8 GHz bands. Finite transmission zeros have been introduced by using a network with additional cross couplings. The circuit was constructed with four coaxial ceramic resonators capacitively coupled using a microstrip PCB. For a 75 MHz passband filter, a stopband attenuation of 37 dB was attained at 20 MHz offset from the passband. A midband insertion loss of 1.2 dB and bandedge loss of 3 dB were achieved.

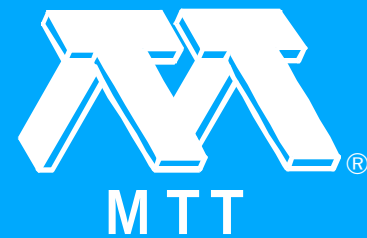


Abstracts

Modal Analysis of Open Groove Guide with Arbitrary Groove Profile

Z. Ma, E. Yamashita and S. Xu. "Modal Analysis of Open Groove Guide with Arbitrary Groove Profile." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 364-366.

A modal analysis method is proposed for groove guide with arbitrary groove profile. The formulation is versatile, efficient, and rigorous except the step approximation process of the groove profile. Numerical results have shown excellent agreement with previous data.



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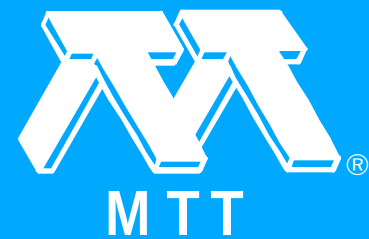
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Design-Oriented Parametrization of Truncated Periodic-Strip Gratings

L. Carin and L.B. Felsen. "Design-Oriented Parametrization of Truncated Periodic-Strip Gratings." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 367-369.

Spectral domain asymptotic are used to develop a hybrid (ray)-(Floquet mode) parametrization that models time-harmonic plane-wave interaction with a truncated grating of periodically spaced, coplanar, infinitesimally thin, perfectly conducting strips in free space. By distinctly displaying the edge effects as well as the truncated Floquet mode contributions from the body of the grating, the model-which is valid in the near and far zones-contains the necessary ingredients for finite-grating design; the truncated Floquet modes are based on those for the finite grating. Plane-wave diffraction results computed from the model are shown to agree very well with numerical reference data generated by a (spectral domain)-(method of moments) algorithm.

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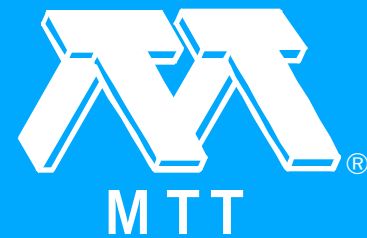


Abstracts

Laterally Shielded Coplanar Waveguide for Millimeter Waves

W.A. Artuzi, Jr. and T. Yoneyama. "Laterally Shielded Coplanar Waveguide for Millimeter Waves." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 370-371.

A laterally shielded coplanar waveguide has been proposed for millimeter wave use. It is the CPW sandwiched vertically in a below cutoff parallel plate waveguide and can suppress unwanted waves in circuits. A right angle bend as well as a straight portion of the laterally shielded CPW exhibited excellent performance.



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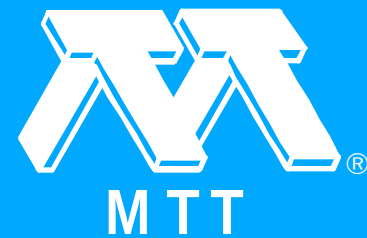


Abstracts

Modeling Microwave Devices: A Symbolic Approach

M. Vai, B. Hong and S. Prasad. "Modeling Microwave Devices: A Symbolic Approach." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 372-374.

A symbolic computation technique, which automatically converts an equivalent circuit model of an electron device into a set of closed-form S-parameter equations, is presented. It is shown how these equations are used to customize a computer-aided model generation process. Significant improvement has been observed in the computational efficiency of a modeling process utilizing these closed form equations.



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Loop-Gain Measurement and Feedback Oscillator Design

B. Meskoob and S. Prasad. "Loop-Gain Measurement and Feedback Oscillator Design." 1992 Microwave and Guided Wave Letters 2.9 (Sep. 1992 [MGWL]): 375-377.

The feasibility of a technique for the design of feedback oscillators is reported. An intermediate step is presented during which the loop gain of oscillators can be measured and tuned. Results for an oscillator operating at 6 GHz demonstrate that the output frequency and power of feedback oscillators can be predicted with sufficient accuracy using small signal loop-gain measurements together with an empirical equation given by Johnson.

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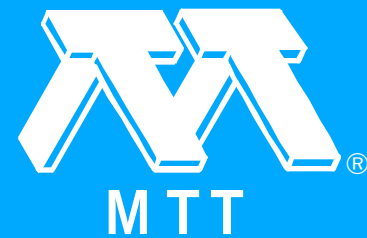


Abstracts

Power Coupling Equations for Single-Mode, Single-Polarization Optical Fibers with Effects of Leaky Modes and Broad-Band Light Source (Correction)

C.-X. Shi and T. Okoshi. "Power Coupling Equations for Single-Mode, Single-Polarization Optical Fibers with Effects of Leaky Modes and Broad-Band Light Source (Correction)." 1992 *Microwave and Guided Wave Letters* 2.9 (Sep. 1992 [MGWL]): 378-378.

In the above letter, please note the following corrections.



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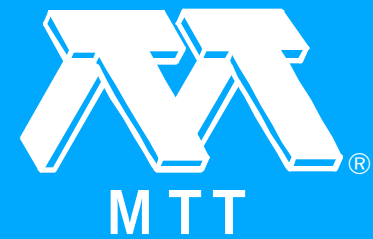
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Abstracts

A Simple Quasi-Static Determination of Basic Parameters of Multilayer Microstrip and Coplanar Waveguide

J. Svacina. "A Simple Quasi-Static Determination of Basic Parameters of Multilayer Microstrip and Coplanar Waveguide." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 385-387.

Two generalized multilayer transmission lines are investigated: microstrip line (MSL) and asymmetrical coplanar waveguide (CPW). The conformal mapping method is used to obtain simple analytical expressions for quasi-TEM effective permittivity of these structures. Accuracy of derived generalized formulas is verified for any special cases of multilayer structures.



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Wafer Probe Transducer Efficiency

D.F. Williams, R.B. Marks, D.K. Walker and F.R. Clague. "Wafer Probe Transducer Efficiency." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 388-390.

Experimental evidence is presented that shows the conventional expression relating the transducer efficiency of a two-port to measured scattering parameters is incorrect when the characteristic impedance at one of the ports is complex. This evidence is based on the measurement of the power from a microwave source transferred through a probe to a lossy coplanar waveguide. The conventional expression differs from the measurement by up to 20%. An alternative expression, accounting for the complex characteristic impedance, gives accurate results.

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Closed-Form Expressions for a Number of Fourier-Bessel Series Encountered in the GSD Method

A. Jostingmeier, C. Rieckmann and A.S. Omar. "Closed-Form Expressions for a Number of Fourier-Bessel Series Encountered in the GSD Method." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 391-393.

In the application of the generalized spectral-domain (GSD) method to the analysis of waveguides, infinite sums over eigenmodes have to be evaluated. The efficiency of the GSD method is considerably enhanced if these sums can be replaced by closed-form expressions. Up to now, appropriate identities are known for circular and rectangular waveguides only. Expressions associated with sector waveguides will be considered.

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V-Band High-Efficiency Monolithic Pseudomorphic HEMT Power Amplifiers

C.K. Pao, G.L. Lan, C.S. Wu, A. Igawa, M. Hu, J.C. Chen and Y.C. Shih. "V-Band High-Efficiency Monolithic Pseudomorphic HEMT Power Amplifiers." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 394-396.

V-band monolithic power amplifiers have been developed and have demonstrated state-of-the-art performance. For the single-stage MMIC amplifier employing a 200- μm pseudo-morphic HEMT, 151.4 mW (757 mW/mm) output power with 26.4% power-added efficiency at 60 GHz is achieved. Maximum power-added efficiency of 30.6% at 130-mW output power was also obtained. A three-stage MMIC amplifier utilizing the same devices demonstrated 80-mW output power, 20.5% power-added efficiency, and 17-dB associated gain at 57 GHz. The linear gain of the amplifier was 21.5 dB.

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Millimeter-Wave AlGaAs-GaAs HBT Power Operation

N.-L. Wang, W.-J. Ho and J.A. Higgins. "Millimeter-Wave AlGaAs-GaAs HBT Power Operation." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 397-399.

The AlGaAs-GaAs HBT has demonstrated good power performance up to 18 GHz. Although $f_{\text{sub max}}$ is typically above 100 GHz, the power performance limitation and large signal operation at millimeter wave have not yet been studied. Power results at 35GHz of two HBT structures, with an analysis based on numerical simulation are summarized. The HBT demonstrated 8.5-dB linear power gain, 30% PAE with 7.8-dB gain and 7.5-V $V_{\text{sub ce}}$ bias. The power density reaches $1.25 \text{ mW}/\mu\text{m}^2$. A shorter collector ($0.4 \mu\text{m}$) is shown to be better suited for 35-GHz operation as a result of shorter collector transit time and smaller "residual collector voltage." Improvement can be achieved by reducing the base and collector resistance, and the collector capacitance.

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Rigorous Modal S-Matrix Analysis of the Cross-Iris in Rectangular Waveguides

R. Ihmels and F. Arndt. "Rigorous Modal S-Matrix Analysis of the Cross-Iris in Rectangular Waveguides." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 400-402.

A rigorous field theory analysis is presented for cross-irises in rectangular waveguides as well as for cross-iris coupled rectangular waveguide resonators. The theory is based on the full-wave mode-matching method for the key-building block discontinuity rectangular waveguide to crossed rectangular guide associated with the generalized S-matrix technique. Arbitrary iris location, unequal E- and H-plane cross size and finite thickness are rigorously taken into account. The scattering parameters of a cross-iris coupled one-resonator filter in the waveguide Ku-band (12-18 GHz) are presented as a calculation example. The theory is verified by comparison with available data for cut-off frequencies as well as with measurements.

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Abstracts

A Boundary Contour Mode-Matching Method for the Rigorous Analysis of Cascaded Arbitrarily Shaped H-Plane Discontinuities in Rectangular Waveguides

J.M. Reiter and F. Arndt. "A Boundary Contour Mode-Matching Method for the Rigorous Analysis of Cascaded Arbitrarily Shaped H-Plane Discontinuities in Rectangular Waveguides." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 403-405.

A rigorous boundary contour mode-matching (BCMM) method is presented for the efficient calculation of the modal scattering matrix of cascaded, arbitrarily shaped H-plane discontinuities, junctions and/or obstacles in rectangular waveguides. For the inhomogeneous waveguide region with general contour, the field is expanded in the complete set of cylindrical wave functions. At the boundary to the ports with homogeneous waveguide sections, the mode-matching technique is applied that yields the modal scattering matrix of the corresponding key-building block directly. To show the usefulness of the method, the filter design of inductive iris coupled resonators with rounded corners is presented. The theory is verified by comparison with results obtained by other methods.



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Impedance Calculation for the Microshield Line

N.I. Dib and L.P.B. Katehi. "Impedance Calculation for the Microshield Line." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 406-408.

The microshield line, a new type of monolithic planar transmission line, is investigated analytically, highlighting its features with respect to other conventional planar lines. The characteristic impedance of the new line is obtained using two different techniques: the computationally intensive point matching method (PMM) and the analytical conformal mapping method (CMM). In the latter method, a CAD-oriented analytical expression, in terms of all finite line dimensions, is obtained using conformal mapping techniques. It is shown that the results of both methods agree very well which verifies both analyses. In addition, the effect of finite-extent ground planes on the characteristic impedance is demonstrated.

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Abstracts

Highly Accurate Quasi-Static Modeling of Microstrip Lines Over Lossy Substrates

E. Tuncer and D.P. Neikirk. "Highly Accurate Quasi-Static Modeling of Microstrip Lines Over Lossy Substrates." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 409-411.

A highly accurate quasi-static model of a microstrip over a semiconductor layer has been developed. The model agrees with full-wave calculations in all three modes of propagation (skin-effect, slow-wave, and dielectric quasi-TEM), for both the attenuation constant α and the propagation constant β over a very wide range of dimension, substrate conductivity, and frequency. To achieve this level of agreement, a nonuniform cross-section, transverse resonance technique has been applied to find the series impedance per unit length of the microstrip transmission line.



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Planar Noncontacting Short Circuits for Millimeter-Wave and Submillimeter-Wave Applications

T. Newman and K.T. Ng. "Planar Noncontacting Short Circuits for Millimeter-Wave and Submillimeter-Wave Applications." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 412-414.

Adjustable planar noncontacting short circuits for both rectangular and circular waveguides have been designed and tested. The planar configuration allows these short circuits to be fabricated photolithographically, therefore reducing fabrication cost and eliminating the machining tolerance requirements of conventional noncontacting short circuits. Scale model tests show that the new short circuits can offer a return loss < 0.1 dB and linear phase variation over a single mode bandwidth. Successful application of a planar short circuit in a 300-365 GHz mixer further demonstrates the usefulness of these short circuits at high frequency.

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Abstracts

A Broad-Band Coplanar Waveguide to Slotline Transition

T.Q. Ho and S.M. Hart. "A Broad-Band Coplanar Waveguide to Slotline Transition." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 415-416.

A novel approach for designing a broad-band coplanar waveguide (CPW) to slotline transition is presented. A slotline hollow patch creates open circuit conditions on one arm of the CPW and resonates the transition so that maximum power transfer may occur. Excellent performance is observed over a 5:1 bandwidth.



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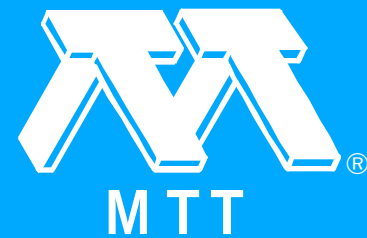


Abstracts

A Diode Mixer with Harmonic-Distortion Suppression

S.G. Mitra and S.A. Maas. "A Diode Mixer with Harmonic-Distortion Suppression." 1992 Microwave and Guided Wave Letters 2.10 (Oct. 1992 [MGWL]): 417-418.

Second- and third-harmonic distortion in a singly balanced diode mixer was reduced significantly by short-circuiting the diodes at the second and third LO harmonics. This verifies earlier predictions that short-circuiting these products should improve IM performance.



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A Broad-Band E-Plane 180° Millimeter-Wave Balun (Transition)

R.W. Alm and R.J. Hwu. "A Broad-Band E-Plane 180° Millimeter-Wave Balun (Transition)." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 425-427.

A broad-band 180° millimeter-wave balun has been developed using E-plane techniques which provides a practical transmission line transition suitable for many millimeter-wave integrated circuit applications. A novel dual-transition approach was taken that provides a transition from a standard rectangular waveguide to a balanced pair of narrow coplanar striplines. In this experiment, a Ka-band (26.5-40 GHz) balun was designed to provide a 100 Ohm coplanar strip (balanced) output. Bandwidth performance was excellent with less than 2 dB of variation over the full waveguide band.



Abstracts

A New, Small-Sized Transmission Line Impedance Transformer, with Applications in High-Speed Optoelectronics

M.C.R. Carvalho, W. Margulis and J.R. Souza. "A New, Small-Sized Transmission Line Impedance Transformer, with Applications in High-Speed Optoelectronics." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 428-430.

A new, small-sized transmission line transformer (TLT) is described, which matches 50- Ω circuits to low input resistance components, as semiconductor lasers and PIN photodiodes. This TLT is formed by different coplanar waveguide configurations, and printed on a very high-dielectric constant substrate ($\epsilon_r = 80$). This TLT considerably improves the temporal response of high-speed photodiodes as compared with the conventional coupling scheme.



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Computation of Resonant Frequencies and Quality Factors of Open Dielectric Resonators by a Combination of the Finite-Difference Time-Domain (FDTD) and Prony's Methods

J.A. Pereda, L.A. Vielva, A. Vegas and A. Prieto. "Computation of Resonant Frequencies and Quality Factors of Open Dielectric Resonators by a Combination of the Finite-Difference Time-Domain (FDTD) and Prony's Methods." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 431-433.

Open dielectric resonators using the FDTD method are analyzed. Resonant frequencies and quality factors are calculated using Prony's method instead of the classical fast Fourier transform. In this way, reductions of up to two orders of magnitude are achieved in computation time. The results obtained are in good agreement with those reported by other authors.



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A Method for Incorporating Different Sized Cells into the Finite-Difference Time-Domain Analysis Technique

D.T. Prescott and N.V. Shuley. "A Method for Incorporating Different Sized Cells into the Finite-Difference Time-Domain Analysis Technique." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 434-436.

A method is presented that simplifies the process of incorporating a refined mesh around a discontinuity in a finite-difference time-domain algorithm. The technique is used to calculate the tangential electric fields on the boundaries between different sized cells in a variable step size mesh environment. A waveguide is modeled in two dimensions and the accuracy of the mesh refinement algorithm is tested by measuring the amount of field reflected during the transition from a coarse mesh to a fine mesh. The amount of error is found to be less than 1%.

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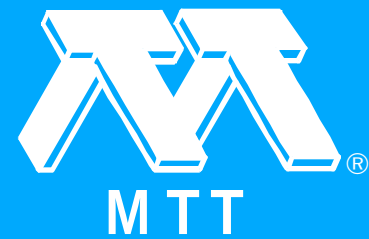
Design and Performance of Novel Printed-Circuit Spurline Bandpass Filters

C. Nguyen. "Design and Performance of Novel Printed-Circuit Spurline Bandpass Filters." 1992 *Microwave and Guided Wave Letters* 2.11 (Nov. 1992 [MGWL]): 437-438.

Novel spurline bandpass filters are presented. Approximate design equations are derived. Two microstrip spurline bandpass filters employing two- and three-conductor spurline resonators, with pass bands centered near 5 GHz, have been designed and tested with less than 1- and 1.3-dB insertion losses and more than 20- and 15-dB return losses in the pass bands, respectively. Good agreement between the measured and calculated results has been observed. The filters behave very similar to the conventional open-circuited shunt-stub bandpass filters, but are more compact and less radiative, sensitive to the adjacent objects, and dispersive, making them more attractive.

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Properties of Meander Coplanar Transmission Lines

W.H. Haydl. "Properties of Meander Coplanar Transmission Lines." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 439-441.

Experimental results for a new type of coplanar transmission line on insulating gallium arsenide, applicable to the miniaturization of MMIC's, are presented. The center conductor of the transmission line has the form of a meander line, and results in an increased inductance per unit length of coplanar line. Low propagation velocities in the range $0.5 - 1 \times 10^{10}$ cm/s have been measured. Lines of different dimensions have been characterized by on-wafer S-parameter measurements and equivalent circuit modeling.

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Noise Characterization of Schottky Barrier Diodes for High-Frequency Mixing Applications

S. Palczewski, A. Jelenski, A. Grub and H.L. Hartnagel. "Noise Characterization of Schottky Barrier Diodes for High-Frequency Mixing Applications." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 442-444.

The noise performance of Schottky barrier diodes for mixing applications is the most important aspect when operating at millimeter and submillimeter wavelengths. Therefore, the understanding and characterization of the diode noise sources plays an important role for the modeling of the diode performance. Experimental noise characteristics of diodes with different parameters are presented and discussed with respect to the dominant noise sources. It is shown that diodes with high doped epi-layers cannot be described by the common noise sources. Excellent agreement with measured and calculated results can be achieved for all diodes when the noise contribution due to interracial traps in the epi-layer is taken into account. The separate sections are devoted to discuss the basic noise model of mm-wave Schottky barrier diode and a concept of the noise temperature measurement.

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An Analog MMIC Phase Modulator for X-Band Satellite Transponder Applications

F. Ali and N. Mysoor. "An Analog MMIC Phase Modulator for X-Band Satellite Transponder Applications." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 445-446.

The design and measured performance of a novel GaAs MMIC analog linear phase modulator for the next generation space-borne communications systems are presented. The analog phase shifter is based on the reflection-type hybrid coupled approach and uses a novel lumped quadrature hybrid and MESFET varactors as a building block. Three cascaded sections (with tapered varactor sizes) of this building block along with two high-isolation amplifiers have been realized in a single chip (96 mils x 36 mils). This MMIC provides an X-band ($8415 \pm 50\text{MHz}$) phase modulation with ± 2.6 radians (300°) of peak phase deviation, +2% of phase deviation linearity, 1.5-dB insertion loss and better than 12 dB input and output return loss performance.

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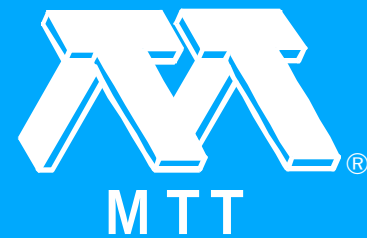


Abstracts

A 1-Watt, 8--14-GHz HBT Amplifier with >45% Peak Power-Added Efficiency

M. Salib, F. Ali, A. Gupta and D. Dawson. "A 1-Watt, 8--14-GHz HBT Amplifier with >45% Peak Power-Added Efficiency." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 447-448.

Four 0.25-W gallium arsenide heterojunction bipolar transistors (HBT's) were combined in a single-stage hybrid microstrip amplifier. An output power of >1 W was achieved over the 8.5--13.5-GHz band with >35 % power-added efficiency (PAE). The peak PAE was 45.4% at 12.5 GHz. This result was repeated on a second unit that was subsequently tuned for improved performance at the upper end of the band. The PAE at 14 GHz increased to >43% with 1-W output while, at 8 GHz, it remained at ~30%.



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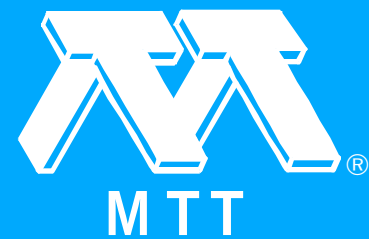
Superconducting Nonreciprocal Devices for Microwave Systems

E. Denlinger, R. Paglione, D. Kalokitis, E. Belohoubek, A. Pique, X.D. Wu, T. Venkatesan, A. Fathy, V. Pendrick, S. Green and S. Mathews. "Superconducting Nonreciprocal Devices for Microwave Systems." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 449-451.

The feasibility of applying high-temperature super-conductor (HTS) technology to nonreciprocal microwave devices has been demonstrated for the first time. Such devices in the form of isolators and circulators are used widely to achieve stability, reliability, and reproducibility in microwave circuit performance. The experimental X-band device, a three-port stripline circulator consisting of a thin sapphire substrate coated with a YBCO film and sandwiched between two ferrite disks, showed how insertion loss (0.25 dB) and very high isolation (>30 dB) at an operating temperature of 77 K. This technology permits the integration of many HTS microwave components together with nonreciprocal devices on a common substrate.

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Multiple Frequency Surface Resistance Measurement Technique Using a Multimode TE/sub 01n/ Cylindrical Cavity on a TiBaCaCuO Superconducting Film

J.S. Derov, A.J. Drehman, M.J. Suscavage, R.J. Andrews, E. Cohen, N. Ianno and D. Thompson. "Multiple Frequency Surface Resistance Measurement Technique Using a Multimode TE/sub 01n/ Cylindrical Cavity on a TiBaCaCuO Superconducting Film." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 452-453.

A multiple frequency surface resistance measurement technique for high-temperature superconductors has been developed using a modified multimode cylindrical cavity made of niobium operating in the superconducting state. The surface resistance vs. frequency relationship of TiBaCaCuO high-temperature superconducting thin films was determined over the frequency range of 50-100 GHz with an extrapolation down to 1 GHz. The TE/sub 01n/ ($n = 1, 2$, and 3) modes of the cylindrical niobium waveguide cavity had resonances at 52, 71, and 95 GHz and the measured surface resistances at these frequencies were 5.1, 8.5, and 21.1 milliohms, respectively.

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Progress on Tunerless SIS Mixers for the 200-300 GHz Band

A.R. Kerr, S.-K. Pan, A.W. Lichtenberger and D.M. Lea. "Progress on Tunerless SIS Mixers for the 200-300 GHz Band." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 454-456.

Hitherto, the best superconductor-insulator-superconductor (SIS) receivers have used one or two waveguide tuners to adjust the embedding impedance of the mixer. An integrated SIS mixer for the 200-300 GHz band with no adjustable tuning is described. A waveguide input is coupled to a coplanar mixer circuit with six individually tuned SIS junctions in series. Using the best mixer, the receiver noise temperature is 45-80 K DSB over 215-275 GHz. The mixer noise temperature at 230 GHz is 12 K DSB, and the conversion loss is 2.5 dB DSB.



Dual-Mode Circular Waveguide Filters Without Tuning Screws

M. Guglielmi, R.C. Molina and A.A. Melcon. "Dual-Mode Circular Waveguide Filters Without Tuning Screws." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 457-458.

The manufacture of dual-mode circular waveguide filter is a complex and labor intensive task that could be greatly simplified with the use of accurate and fast CAD tools to predict the electrical behavior of the structures being developed. This is especially true for the "tuning screws assembly" that is an integral part of this type of filters. A method is proposed for the rigorous and efficient analysis of the tuning screws assembly for dual-mode filters in circular waveguide. The method is based on the introduction of a new waveguide called ridged circular waveguide and in its use as a key component for the implementation of dual-mode filters. The modal spectrum of the ridged circular waveguide is investigated using the finite-element technique to show how the introduction of this waveguide can effectively resolve the problem of the CAD of the tuning screws in dual-mode filters in circular waveguide.





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Operator Factorization of Scalar Wave Equation in Frequency-Domian

Z.-N. Lu. "Operator Factorization of Scalar Wave Equation in Frequency-Domian." 1992 *Microwave and Guided Wave Letters* 2.11 (Nov. 1992 [MGWL]): 459-460.

The partial differential operator factorization of the scalar wave equation in the time-domain were derived by Engquist and Majda. A set of absorbing boundary conditions were provided by using these equations. An alternative way to derive these equations in the frequency-domain is shown. The limitation and accuracy of the resulting one-way wave equations may be easier to see from this derivation. Recently, the finite-difference vector beam propagation method has been developed. The possibility of the similar finite-difference method based on the one-way wave equations derived by the operator factorization is also discussed.

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"Call for Papers - Electrical Performance of Electronic Packaging (Nov. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.11 (Nov. 1992 [MGWL]): 467-467.



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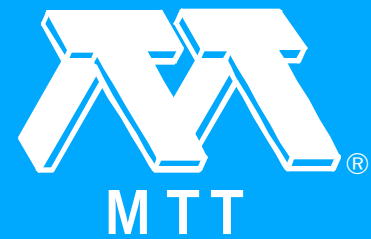
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Abstracts

A High-Efficiency Quarter-Wave Zone Plate Reflector

Y.J. Guo and S.K. Barton. "A High-Efficiency Quarter-Wave Zone Plate Reflector." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 470-471.

A multilayered quarter-wave zone plate reflector antenna operating in the microwave range is presented. The theory for designing the reflector and experimental results are given. An efficiency of 55% was obtained with a prototype reflector antenna.



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Influence of Surface Layers on the RF-Performance of AlInAs-GaInAs HFET's

*J. Dickmann, H. Dambkes, H. Nickel, R. Losch, W. Schlapp, J. Bottcher and H. Kunzel.
"Influence of Surface Layers on the RF-Performance of AlInAs-GaInAs HFET's." 1992
Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 472-474.*

The influence of thickness and doping level of the GaInAs cap layer in AlInAs-GaInAs-InP HFET structures on the dc- and RF-performance is systematically investigated. We compare three different approaches, the undoped cap layer, the highly doped thick cap layer, and as a new approach, the thin doped and therefore surface depleted cap layer. HFET devices with 0.3 μm gates have been processed. While all devices demonstrate $f_{\text{sub T}}$ -values around 80GHz distinct differences are observed for the $f_{\text{sub max}}/f_{\text{sub T}}$ ratios between 1 (highly doped cap) over 1.3 (undoped cap) to 2.7 (surface depleted cap). The best $f_{\text{sub max}}$ of 240 GHz is achieved for the new cap layer approach. A systematic investigation of the influence of the $g_{\text{sub m}}/g_{\text{d}}$ and $C_{\text{sub gs}}/C_{\text{sub ds}}$ ratios demonstrates the strong influence of a proper layout of the cap layer at the drain side of the gate region.

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Abstracts

A New Termination Condition for the Application of FDTD Techniques to Discontinuity Problems in Close Homogeneous Waveguide

F. Moglie, T. Rozzi, P. Marozzi and A. Schiavoni. "A New Termination Condition for the Application of FDTD Techniques to Discontinuity Problems in Close Homogeneous Waveguide." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 475-477.

It would be useful to avail a "general purpose" algorithm such as finite difference in the time domain to analyze discontinuity problems in classical waveguide. Its direct application, however, has been rendered difficult so far by the absence of exact termination conditions appropriate to the close waveguide environment. In the present contribution, a novel rigorous termination condition specific to homogeneous waveguide is introduced, that is based on the convolution proprieties of the modal characteristic impedance of the "accessible modes." This condition is straightforward to implement, as demonstrated by application to the nontrivial problem of a five cavity inductive post filter. Numerical results are compared to existing analytical and experimental data showing excellent accuracy.



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Full-Wave Analysis of Strip Transmission Line on Circular Dielectric Rod

L. Zhu and E. Yamashita. "Full-Wave Analysis of Strip Transmission Line on Circular Dielectric Rod." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 478-479.

Dispersion characteristics of the strip transmission line on a circular dielectric rod is investigated based on a full-wave analysis using the eigenfunction-weighted boundary integral equation method. Numerical results clearly demonstrate the usefulness of this method in finding propagation properties of the dominant mode and high-order modes, and variation of parameters with respect to the radius of the rod and the angle occupied by the strip conductor for a wide frequency range.

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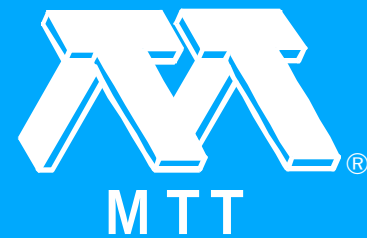


Abstracts

A New Simple and Accurate Formula for Microstrip Radial Stub

R. Sorrentino and L. Roselli. "A New Simple and Accurate Formula for Microstrip Radial Stub." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 480-482.

A new closed form formula is derived for the input impedance of the microstrip radial stub. The formula combines the advantages of simplicity of the radial transmission line approach and accuracy of the resonant mode expansion technique.



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Magnetic Tuning of a Microstrip Patch Antenna Fabricated on a Ferrite Film

P.J. Rainville and F.J. Harackiewicz. "Magnetic Tuning of a Microstrip Patch Antenna Fabricated on a Ferrite Film." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 483-485.

Patch antennas are widely used because they are lightweight, conformal and easy to manufacture. Their principal disadvantage--narrow instantaneous bandwidth--has led to the investigation of the incorporation of ferrites with patches to obtain magnetic tuning of the radiation frequency of the patch. A square, single-feed patch, fabricated on a ferrite film, that produced orthogonally polarized, well-formed radiation patterns is described. The application of a small in-plane magnetic field tuned the frequency, and hence phase, of one polarization only. Prior work on patch antennas fabricated on bulk ferrite substrates demonstrated magnetic tuning, but only linear polarization was obtained. The present work indicates that 1) thin ferrite films, which are monolithically integrable, may be useful for a magnetically-tunable antenna, and 2) the radiation polarization of the patch can be varied by the application of a small in-plane magnetic bias field.

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Comparison of Measured and Computed Conversion Loss from a Resonant Tunneling Device Multiplier

C.V. Sammut and N.J. Cronin. "Comparison of Measured and Computed Conversion Loss from a Resonant Tunneling Device Multiplier." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 486-488.

The behavior of a resonant tunneling device (RTD) as a multiplier over a range of bias voltages is investigated. The experimental results agree well with large-signal simulations based on a simple equivalent circuit with element values derived from the I-V characteristic and low-frequency small-signal impedance measurements. The technique can be extended to assist in the design and realization of millimeter and submillimeter RTD multipliers.

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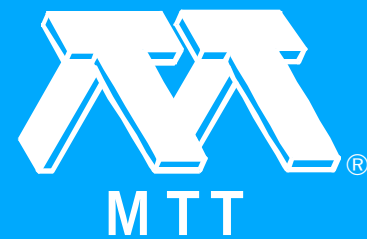


Abstracts

A New Method for the Characterization of Groove-Guide Leaky-Wave Antenna with an Asymmetrically Located Metal Strip

Z. Ma and E. Yamashita. "A New Method for the Characterization of Groove-Guide Leaky-Wave Antenna with an Asymmetrically Located Metal Strip." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 489-491.

A full-wave characterization of the groove-guide leaky-wave antenna is described based on the mode-matching procedure. All higher order modes are taken into account, and the radiating open end is treated in a concise and accurate way by using the generalized scattering matrix technique. The formulation is versatile and rigorous. Numerical results are compared with previous data.



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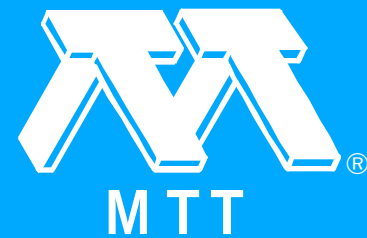


Abstracts

Extension of the E-Plane Scanning Range in Large Microstrip Arrays by Substrate Modification

M. Davidovitz. "Extension of the E-Plane Scanning Range in Large Microstrip Arrays by Substrate Modification." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 492-494.

The effect of the substrate structure modification on the E-plane scanning performance in large microstrip arrays is studied with the aid of a two-dimensional model. The goal is to alleviate scan blindness effects. The finite-element method of lines is used to solve the electromagnetic equations, thus demonstrating its applicability to open, periodic structures.



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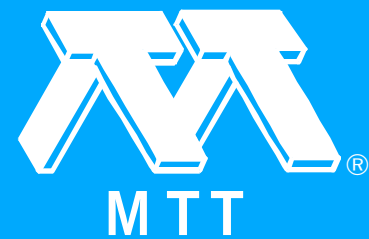
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Absorption Characteristics of Periodic Arrangements of Infinite Helices

J. Svelj, E. Michielssen and R. Mittra. "Absorption Characteristics of Periodic Arrangements of Infinite Helices." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 495-496.

The absorption properties of periodic arrangements of lossy, infinite helices are investigated. The helices are assumed to be embedded in free space and backed by a p.e.c. plane. The method of moments is used to solve for the scattering parameters of a single layer, and a multiscattering technique is used to form a composite matrix that describes the scattering due to several layers. The resistivity of the wire, the pitch to length ratio of the helix, and the thickness of the layer are shown to affect the power absorbed.

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Compact Multilayer Filter Structures for Coplanar MMIC's

W. Menzel, H. Schumacher, W. Schwab and X. Zhang. "Compact Multilayer Filter Structures for Coplanar MMIC's." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 497-498.

Coplanar filter structures using two metallization layers separated by a polyimide film on GaAs were investigated. This arrangement provides additional degrees of freedom compared to standard coplanar line resulting in extremely compact filters suitable for monolithic integration.

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Comparison and Evaluation of Boundary Conditions for the Absorption of Guided Waves in an FDTD Simulation

V. Betz and R. Mittra. "Comparison and Evaluation of Boundary Conditions for the Absorption of Guided Waves in an FDTD Simulation." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 499-501.

Several absorbing boundary conditions suitable for terminating the finite-difference time-domain (FDTD) simulation of microstrip structures are compared via numerical experiments. Both a super-absorbing boundary and a modified form of Litva's dispersive boundary condition are found to produce significantly lower reflection than the traditional first-order Mur boundary. The sensitivity of these boundary conditions to the choice of the input parameters, particularly the effective dielectric constant ϵ_{eff} , is investigated, and optimal choices of these parameters are given.

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Parameter-Extraction Method for Heterojunction Bipolar Transistors

S.A. Maas and D. Tait. "Parameter-Extraction Method for Heterojunction Bipolar Transistors." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 502-504.

A method for determining the equivalent-circuit element values of a small-signal heterojunction bipolar transistor (HBT) is described. Most important is the ability to separate the parasitic emitter resistance from the junction resistance. No use of "cold" measurements or test patterns is required. The method may also be applicable to homojunction bipolars.

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Two-Port Network Analyzer Calibration Using an Unknown "Thru"

A. Ferrero and U. Pisani. "Two-Port Network Analyzer Calibration Using an Unknown "Thru"." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 505-507.

A procedure performed by using a generic two port reciprocal network instead of a standard thru in a full two-port error correction of an automatic network analyzer is presented. Although it can be applied to any type of waveguide system the proposed technique is particularly useful with noninsertable coaxial or on-wafer devices. Experimental comparisons show that the suggested procedure provides a great degree of accuracy.

Click on title for a complete paper.



Abstracts

Advanced Multimode Cavity Filter Design Using Source/Load-Resonance Circuit Cross Couplings

U. Rosenberg and W. Hagele. "Advanced Multimode Cavity Filter Design Using Source/Load-Resonance Circuit Cross Couplings." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 508-510.

Several degenerate resonances of one cavity are simultaneously coupled to the same interface (waveguide) port that represents source or load of the network. This new method extends significantly the design possibilities for multimode cavity filters-- odd-order true elliptic function designs are now possible and other conspicuous design variants by novel coupling structures. Experimental verification is provided for this approach by a 3-order elliptic function filter realized with one triple-mode cavity.



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"Call for Papers - Electrical Performance of Electronic Packaging (Dec. 1992 [MGWL])." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): 545-545.



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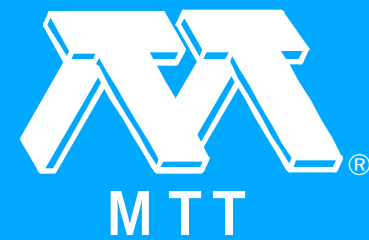
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Fourth International Symposium on Space Terahertz Technology (Dec. 1992 [MGWL])

*"Fourth International Symposium on Space Terahertz Technology (Dec. 1992 [MGWL])." 1992
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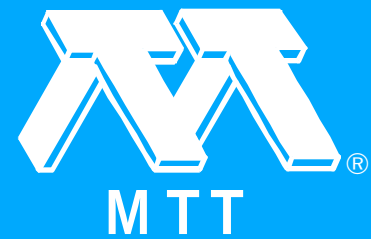
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Index, IEEE Microwave and Guided Wave Letters, Volume 2, 1992

"Index, IEEE Microwave and Guided Wave Letters, Volume 2, 1992." 1992 Microwave and Guided Wave Letters 2.12 (Dec. 1992 [MGWL]): i1-i15.



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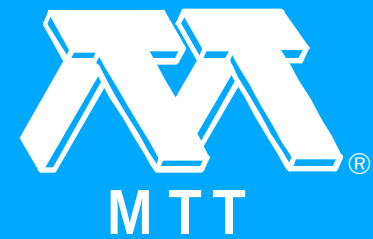
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Abstracts

New Books from IEEE Press (Advertisement) (Dec. 1992 [MGWL])

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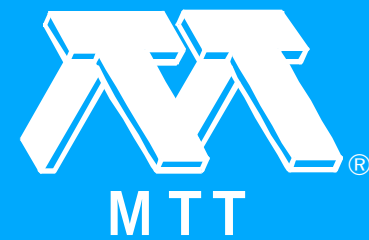
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1992 IEEE Membership Directory (Dec. 1992 [MGWL])

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Abstracts

Welcome (1992 Vol. I [MWSYM])

"Welcome (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): iii-iii.

Microwave Week 1992 is the culmination of the effort by the steering committee and all the presenters who have come to this symposium to share their work with you. Foremost, the technical presentations are a record number of 380. These were tediously selected by the Technical Program Committee from about 640 submissions. They were selected on the basis of quality, with the conviction that we would find a way to present all works that met high standards. The resulting escalation in the number of presentations is accommodated by increasing the number of papers presented at the Interactive (Open) Forum and, by enlarging the number of parallel sessions on Thursday.



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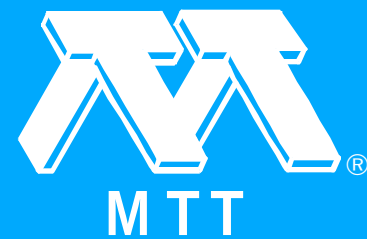
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Abstracts

Committees, Awards, Distinguished Lecturers, Historical Exhibit, Panel Sessions, Workshops, Technical Program (1992 Vol. I [MWSYM])

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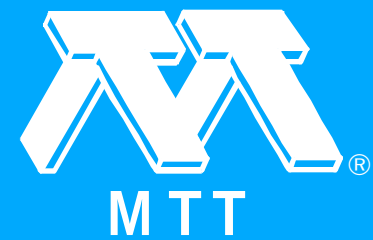
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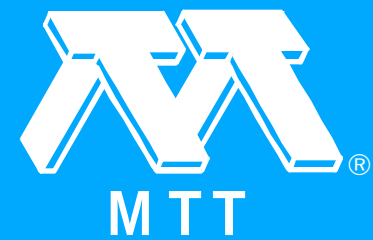
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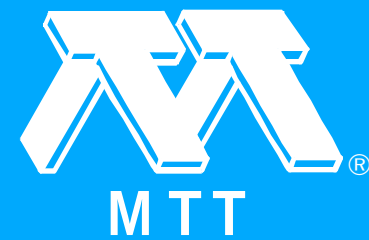
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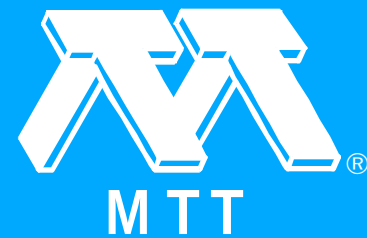
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Abstracts

1992 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium Schedule (1992 Vol. I [MWSYM])

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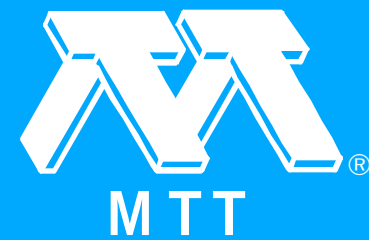
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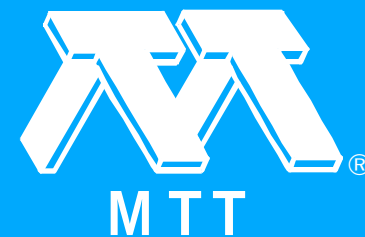
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Session A -- (Joint with MMWMC) Subsystems 2

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Advanced MMIC T/R Module for 6 to 18 GHz Multifunction Arrays (1992 Vol. I [MWSYM])

J. Bugeau, W. Coughlin, III, M. Priolo and G. St. Onge. "Advanced MMIC T/R Module for 6 to 18 GHz Multifunction Arrays (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 81-84.

A high performance 6-18 GHz dual channel MMIC T/R module is presented with significant advances in integration and performance. This advanced module features critical spacing for 2-dimensional arrays, an Aluminum Silicon Carbide housing, multilayer ceramic substrates for RF and control circuitry, a custom hermetic DC multipin connector, new high performance MMIC LNAs and power amplifiers, and specialized multifunction MMIC chips for a reduced parts count. Each of the two channels feature a selectable horizontal and vertical polarization capability. The module is very densely packaged with 2 complete T/R channels occupying 0.97 in³.

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Abstracts

An Enhanced GaAs Monolithic Transimpedance Amplifier for Low Noise and High Speed Optical Communications (1992 Vol. I [MWSYM])

J.A. Casao, P. Dorta, J.L. Caceres, M. Salazar-Palma and J. Perez. "An Enhanced GaAs Monolithic Transimpedance Amplifier for Low Noise and High Speed Optical Communications (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 85-88.

The design, implementation and test results of a simple GaAs Monolithic Transimpedance Amplifier with, enhanced performance for high speed optical communications is described. A cascode configuration, improved in terms of bandwidth and noise is used. On-wafer and on-carrier measurements show close agreement with simulated behavior. Excellent performance with high transimpedance gain, a bandwidth from DC to 1.6 GHz, low noise and low power consumption is obtained. The temperature and bias point sensitivity are negligible. This last fact turns out to be a major commercial achievement.



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An Ultra Broadband GaAs MESFET Preamplifier IC for a 10Gb/s Optical Communication System (1992 Vol. I [MWSYM])

M. Miyashita, K. Maemura, K. Yamamoto, T. Shimura, M. Nogami, K. Motoshima, T. Kitayama and Y. Mitsui. "An Ultra Broadband GaAs MESFET Preamplifier IC for a 10Gb/s Optical Communication System (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 89-92.

An ultra broadband GaAs MESFET preamplifier IC is developed for a 10 Gb/s optical communication system. High transimpedance of 44 dBΩ has been obtained for DC to 12 GHz. A receiver has also been fabricated by using this preamplifier IC and a photodiode. The receiver operates with extremely low equivalent input noise current of 12.6 pA/sqrt(Hz) for DC to 7.8 GHz. This paper describes circuit design, high frequency characteristics of the preamplifier IC and the receiver.





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GaAs Monolithic Image Rejection Down-Converter for Point-to-Multipoint Communication Systems (1992 Vol. I [MWSYM])

G.L. Bonato and A. Boveda. "GaAs Monolithic Image Rejection Down-Converter for Point-to-Multipoint Communication Systems (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 93-96.

A fully integrated GaAs monolithic image rejection down-converter for L/S Band operation is presented. All the necessary subcircuits such as RF splitter, LO phase shifter, two mixers and its biasing circuits are included inside a GaAs chip, and are described. Only an IF hybrid is needed as external component. Experimental results verify the good operation of the device showing more than 20 dB of image rejection, 8 dB gain conversion, 30 dB LO to IF isolation and 20 dB LO to RF isolation throughout the operating band. The MMIC contain 18 MESFETs and 40 passive components in a 1.2 x 3 mm² area.

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Abstracts

Session B -- Passive Components

"Session B -- Passive Components." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 97-97.



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Characterization of Non-Symmetric Coplanar Waveguide Discontinuities

N.I. Dib and L.P.B. Katehi. "Characterization of Non-Symmetric Coplanar Waveguide Discontinuities." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 99-102.

A general technique to characterize non-symmetric coplanar waveguide (CPW) discontinuities with air-bridges, where both the fundamental coplanar and slotline modes may be excited together, is presented. First, the CPW discontinuity without air-bridges is analyzed using the Space Domain Integral Equation method. Second, the parameters (phase, amplitude and wavelength) of the coplanar and slotline modes are extracted from an amplitude modulated-like standing wave existing in the CPW feeding lines. Then, a $2n \times 2n$ Generalized Scattering matrix of the discontinuity without air-bridges is derived which includes the occurring mode conversion. Finally, this Generalized Scattering matrix is reduced to an $n \times n$ one by enforcing suitable conditions at the ports which correspond to the excited slotline mode. For the purpose of illustration, the method is applied to a shielded non-symmetric short-end shunt CPW stub whose scattering parameters are also compared with those of a symmetric one.

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Finite-Difference Analysis of Open and Short Circuits in Coplanar MMIC's Including Finite Metallization Thickness and Mode Conversion

K. Beilenhoff, W. Heinrich and H.L. Hartnagel. "Finite-Difference Analysis of Open and Short Circuits in Coplanar MMIC's Including Finite Metallization Thickness and Mode Conversion." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 103-106.

Open and short circuits as used in MMIC's are investigated by means of a Finite-Difference method in the frequency domain. Both mode conversion and finite metallization thickness are accounted for. For the open stub, noticeable mode conversion is observed whereas the short circuit behaviour shows a significant dependence on metallization thickness.

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Full-Wave Spectral-Domain Analysis of Compensation of Microstrip Discontinuities Using Triangular Subdomain Functions (1992 Vol. I [MWSYM])

T.-S. Horng, W.E. McKinzie and N.G. Alexopoulos. "Full-Wave Spectral-Domain Analysis of Compensation of Microstrip Discontinuities Using Triangular Subdomain Functions (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 107-110.

This paper presents a full-wave spectral-domain analysis to investigate compensation of a variety of microstrip discontinuities including bends and T junctions. To properly model the discontinuities with miters as well as 90° corners, vector-valued triangular sub domain functions are used as both expansion and testing functions in the moment method procedure. Special consideration is given to the numerical treatment of the reaction integral between two triangular subdomains such that rather complicated geometrical configurations can be handled very efficiently. Comparison of some numerical results with available experimental data shows excellent agreement. The losses due to radiation and surface waves in some discontinuities will also be discussed in the presentation.

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Millemetre Wave Receiver Components Using Packaged HEMTs

H. Ashoka, V. Waris and P. Martin. "Millemetre Wave Receiver Components Using Packaged HEMTs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 111-113.

A narrow band low noise amplifier (LNA) and a mixer at 30 GHz have been developed using packaged commercial HEMTs and waveguide matching circuits. The four-stage HEMT LNA provided 26 dB gain and 2.8 dB noise figure at 30 GHz. The HEMT mixer provided a conversion gain of 0.5 dB with 5 dB noise figure. The design features very simple construction and tuning.

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Abstracts

Coaxial Probe Modeling in Waveguides and Cavities (1992 Vol. I [MWSYM])

J.-F. Liang and K.A. Zaki. "Coaxial Probe Modeling in Waveguides and Cavities (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 115-118.

Extraction of 2-port scattering matrix of a probe-excited semi-infinite waveguide based on moment method solutions of three short circuited guides is presented. Results show that this solution: (i) provides an easy way to determine the 2-port scattering matrix of probe-excited waveguide problems; and (ii) enable the accurate determination of the loading effects of the probe on the resonant frequencies of unperturbed cavities. Both of these are keys in the design of input/output cavities of waveguide filters. Agreement with experimental data is excellent for loose-coupled probe-excited semi-infinite waveguide problems.



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A Transmission-Line-Type Eight-Port Hybrid

I. Ohta, T. Kawai, S. Shimahashi and K. Ilo. "A Transmission-Line-Type Eight-Port Hybrid." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 119-122.

A novel transmission-line-type eight-port hybrid is proposed and investigated theoretically and experimentally. A bandwidth comparable with that of a branch-line 3 dB hybrid is obtained for moderate values of characteristic admittances of line sections. This circuit is useful for applications to a comparator circuit in a, four-port monopulse radar system and a four-way power combiner/divider with four input/output arms isolated from one another.

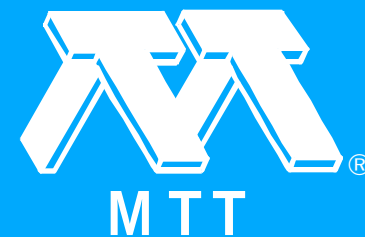
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Abstracts

Session C -- "Q" High Power Components and Systems

"Session C -- "Q" High Power Components and Systems." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 123-123.



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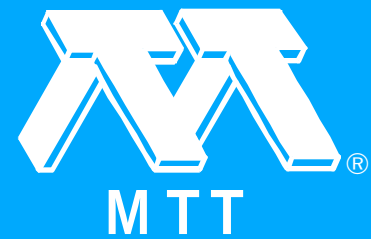


Abstracts

The 500-KW CW X-Band Goldstone Solar System Radar

A. Freiley, R. Quinn, T. Tesarek, D. Choate, R. Rose, D. Hills and S. Petty. "The 500-KW CW X-Band Goldstone Solar System Radar." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 125-128.

In recent years the Goldstone Solar System Radar (GSSR) has undergone significant improvements in performance in the areas of increased transmitter power and increased receiver sensitivity. An overview of the radar system and each of these improvements are discussed. Additional plans for future improvements are also discussed.



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Design and Testing of an 8.5-GHz Polarization-Sensitive Grid Power Combiner at 500-KW CW

R. Perez, D. Hoppe, P. Stanton and H. Reilly. "Design and Testing of an 8.5-GHz Polarization-Sensitive Grid Power Combiner at 500-KW CW." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 129-131.

A power combiner using a polarization-sensitive quasioptical grid has been designed to operate at 8.5-GHz and 1-MW CW. The combiner has been successfully tested at 500-kW CW. The design and operating principle are discussed, and the evaluation facilities and instrumentation used in high-power testing are presented.

Click on title for a complete paper.



Abstracts

A 100 KW Solid State Coaxial Switch

S.D. Patel and S.N. Stitzer. "A 100 KW Solid State Coaxial Switch." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 133-136.

A high power L-band PIN diode switch is described. The design uses 16 high voltage PIN diodes in a novel coaxial structure. The switch has been tested to 100 kW peak power. Insertion loss is less than 0.25 dB and isolation is greater than 25 dB across 14% bandwidth.



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Surface Array Waveguide Mode Analyzer

J.M. Baird, D.H. Roper and R.W. Grow. "Surface Array Waveguide Mode Analyzer." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 137-140.

A new type mode analyzer based on an array of field probes at the surface of an overmoded circular waveguide is described. This type device is needed in high power microwave research where waveguide sizes typically permit dozens of modes to propagate. Initial experiments at 11 GHz using a 2 inch diameter waveguide with 16 propagating modes and 20 surface probes have demonstrated the feasibility of the technique which relies on singular value decomposition algorithms for modal analysis. To make calibration feasible, the field probes must respond only to the E-field or the H-field at the waveguide wall. Optimization of probe placement, and anticipated errors are analyzed.

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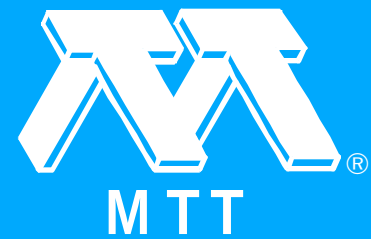


Abstracts

S Band Amplifier Module for Solid State Transmitter

M. Cicolani. "S Band Amplifier Module for Solid State Transmitter." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 141-144.

This paper describes the realization, the performance and the application of an amplifier module that for its characteristics can be used to build High Power Amplifiers in Solid State Radar Transmitters (SST).



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High-Power Multiple Beam TWTs and the TWT-Based Amplifying Chains

M.I. Lopin, A.S. Pobedonostsev and B.V. Sazonov. "High-Power Multiple Beam TWTs and the TWT-Based Amplifying Chains." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 145-146.

The results of development of a new class of multimode high-power vacuum devices, named multiple beam TWTs (MBTWTs), and based on their amplifying chains are presented. Technical and technological aspects of their fabrication are considered. The example of such TWT designed for 3-cm wave-length range, pulsed output power of 5 kW and amplifying chain based on it are shown.

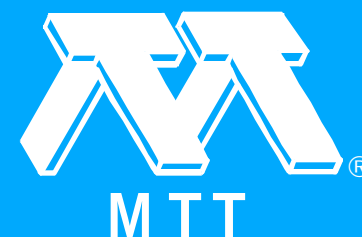
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Abstracts

Session D -- Monolithic Thin MMIC Film Resonators on Structures (Focused Session)

*"Session D -- Monolithic Thin MMIC Film Resonators on Structures (Focused Session)." 1992
MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 147-147.*



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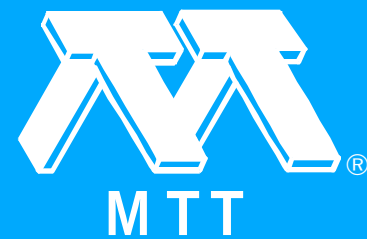


Abstracts

Modeling of Thin Film Resonators and Filters

K.M. Lakin. "Modeling of Thin Film Resonators and Filters." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 149-152.

Thin film piezoelectric resonators have been used in the synthesis of crystal filters at microwave frequencies and for oscillator control. These resonators may be modeled using equivalent circuits or analytical expressions derived from acoustic boundary value excitation problems. Results of the modeling are described in three forms; 1) impedance characteristics plotted versus frequency, 2) analytical expressions of impedance, and 3) lumped element equivalent circuits useful for filter design and analysis. Two filter types are modeled, a simple ladder filter and a more complex stacked crystal filter using acoustically coupled resonators.



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Film Bulk Acoustic Wave Resonator and Filter Technology

S.V. Krishnaswamy, J.F. Rosenbaum, S.S. Horwitz and R.A. Moore. "Film Bulk Acoustic Wave Resonator and Filter Technology." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 153-155.

Film Bulk Acoustic Resonators (FBARs) are monolithically integrable with semiconductor devices, leading to small size and low cost, high Q rf circuit elements with wide applications in the EW radar and communications area. We review in this paper recent developments in film resonator and the miniature monolithic filters based on these resonators.

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



Abstracts

X-Band Thin Film Acoustic Filters on GaAs (1992 Vol. I [MWSYM])

R.B. Stokes and J.D. Crawford. "X-Band Thin Film Acoustic Filters on GaAs (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 157-160.

The Semiconductor Bulk Acoustic Resonator (SBAR) is composed entirely of thin films, piezoelectric aluminum nitride (AlN) and metal electrode films (primarily aluminum). It is fabricated on gallium arsenide (GaAs) wafers by depositing the thin film layers on top of the wafer and then etching away the GaAs from below, leaving a thin membrane supported by its edges. SBAR resonators and filters can be fabricated as part of the HBT or MESFET Monolithic Microwave Integrated Circuit (MMIC) processes, offering the high selectivity associated with acoustic resonators and filters to the MMIC designer. This paper describes performance of a recent SBAR filter which has only 6.1 dB insertion loss at 7.8 GHz (2nd harmonic) and 7.5 dB insertion loss at 11.6 GHz (third harmonic), with fractional bandwidths less than 1%. This filter demonstrates that SBAR technology is practical for X-band filters in MMICs.



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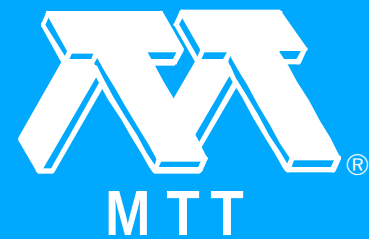


Abstracts

Applications of AlN Thin-Film Resonator Topologies as Antennas and Sensors

R.J. Weber, S.G. Burns, C.F. Campbell and R. O'Toole. "Applications of AlN Thin-Film Resonator Topologies as Antennas and Sensors." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 161-164.

The use of thin-film resonator (TFR) technology as on-wafer components is of considerable current interest. Cointegration of the TFR and active devices has been demonstrated. We report on two novel microwave applications of the TFR technology. The first application is the use of an array of TFRs as an on-wafer, phased-array antenna; the second is as a gas and chemical mass sensor with nanogram sensitivity.



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Application of Film Bulk Acoustic Resonators

S. Horwitz and C. Milton. "Application of Film Bulk Acoustic Resonators." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 165-168.

Multi-pole film bulk acoustic resonators (FBAR) bandpass filters are being designed and fabricated on various substrates, including silicon and GaAs. Capable performance has been demonstrated for the large number of system insertions within the low microwave (1-3 GHz) range. Progress in applying FBAR to microwave system applications is reviewed.

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Abstracts

Session E -- (Joint with MMWMC) Components 2

"Session E -- (Joint with MMWMC) Components 2." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 169-169.



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Abstracts

A Single Chip X-Band Phase Shifter with 6 Bit Uncorrected Phase Resolution and More Than 8 Bit Corrected Phase Resolution (1992 Vol. I [MWSYM])

T.C.B. Tieman, A.P. de Hek, F.L.M. van den Bogaart and W.M.A. van Hoek. "A Single Chip X-Band Phase Shifter with 6 Bit Uncorrected Phase Resolution and More Than 8 Bit Corrected Phase Resolution (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 171-174.

The design, fabrication, performance and production results of a GaAs monolithic phase shifter, based on a vector modulator principle, are described. The device exhibits a typical RMS phase error of about 3 degrees and an RMS amplitude error less than 0.30 dB across the frequency band from 7.0 - 10.5 GHz and over a linear controllable gain range of 15 dB. Typical insertion gain is 0 dB, input return losses are better than 15 dB and output return losses are better than 10 dB. The device is intended for application in a wide-band active phased-array antenna. The analogue control of the device enables the correction of the systematic phase errors and amplitude errors. Tests have demonstrated that through phase correction the RMS phase error is reduced to less than 0.7 degrees while the RMS amplitude error is still less than 0.30 dB.



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Abstracts

A Novel Design for a MMIC 180 Degree Phase Shifter (1992 Vol. I [MWSYM])

M.E. Goldfarb. "A Novel Design for a MMIC 180 Degree Phase Shifter (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 175-177.

A novel circuit topology is discussed for the design of a 180 degree phase shifter. The approach exploits the dual nature of the tee and pi configurations of the lowpass and highpass filter topologies. The resulting configuration requires fewer elements than conventional switched filter approaches and does not require complementary control voltages.



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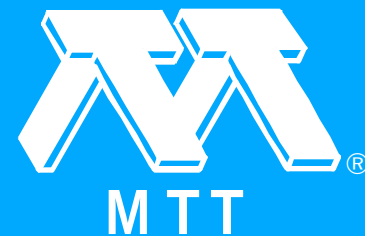


Abstracts

A Successive GaAs MMIC for a 2-7GHz Detection Logarithmic Amplifier

L.W. Chua. "A Successive GaAs MMIC for a 2-7GHz Detection Logarithmic Amplifier." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 179-182.

This paper reports on a GaAs MMIC for a successive detection logarithmic amplifier which gives a logging linearity over the instantaneous bandwidth 2-7GHz of $\pm 1.25\text{dB}$ (theory: $\pm 1.1\text{dB}$). It represents the best published results for both hybrid MIC and MMIC realisations, and the lowest chip count per stage, to date, for frequencies above 2GHz.



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A GaAs MMIC Based Successive Detection Logarithmic Amplifier (1992 Vol. I [MWSYM])

D.J. Nelly and D.S. Parsons. "A GaAs MMIC Based Successive Detection Logarithmic Amplifier (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 183-185.

A six stage successive detection logarithmic amplifier (SDLA) is described in which each stage is a GaAs Monolithic Microwave Integrated Circuit (MMIC) incorporating RF amplification, detection and a novel video summation technique, using standard 0.5 micron process field effect transistors (FET) and schottky diodes. The circuit has a dynamic range of 80 dB at 3.8 GHz with linearity of ± 1 dB and power dissipation of 4.0 W.

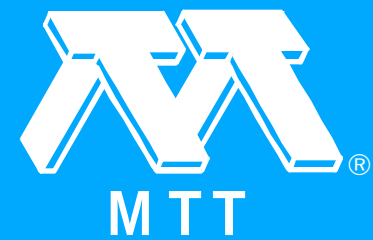
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Abstracts

Session F -- Superconductive Passive Devices

"Session F -- Superconductive Passive Devices." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 187-187.



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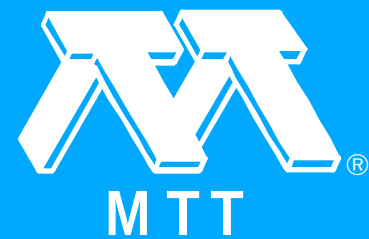
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High-Temperature Superconductor Meander-Antenna

H. Chaloupka, H. Piel, A. Pischke, G. Gieres, M. Peiniger, L. Schultz, M. Bode and J. Schubert. "High-Temperature Superconductor Meander-Antenna." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 189-192.

A novel type of an electrically small multiresonant microstrip antenna is presented. It possesses a bandpass frequency response characterized by a bandwidth which can be chosen to be relatively wide with respect to the small size of the antenna. Due to the miniaturization and especially the required narrow line - width of the strip conductors a sufficiently high radiation efficiency can only be achieved by the utilization of superconductive material. Experimental results for a 4.2 GHz version of this multi-resonant meander antenna made from the high - T_c super-conductor YBCO epitaxially grown on $LaAlO_3$ with a size of $\lambda/10$ indicate a half - power bandwidth of 4% and a radiation efficiency of more than 60% at 77 K.

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High T_c Superconductor-Sapphire Microwave Resonator with Extremely High Q -Values Up to 90 K (1992 Vol. I [MWSYM])

Z.-Y. Shen, C. Wilker, P. Pang and W.L. Holstein. "High T_c Superconductor-Sapphire Microwave Resonator with Extremely High Q -Values Up to 90 K (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 193-196.

Several high temperature superconductor (HTS)-sapphire TE₀₁₁ mode resonators were designed, fabricated and tested. At 5.552 GHz, Q_0 reached 2×10^6 at 90 K, 3×10^6 at 80 K, and 1.4×10^7 at 4.2 K with circulating power up to 500 kW. Formulas for calculating the resonant frequency and Q -value were derived. These theoretical results showed good agreement with the experimental measurements. Applications, such as frequency-stabilized oscillators, filters and the characterization of HTS films, are discussed.

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Abstracts

Nonlinear Model of Superconducting Strip Transmission Lines

C.W. Lam, D.M. Sheen, S.M. Ali and D.E. Oates. "Nonlinear Model of Superconducting Strip Transmission Lines." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 197-199.

The Ginzburg-Landau theory is used to predict the nonlinear behavior in superconducting strip transmission lines. A method for calculating the nonlinear inductance and the fractional change in the resonant frequency of a stripline resonator is presented. Comparisons with measurements for two $\text{YBa}/\text{sub } 2/\text{Cu}/\text{sub } 3/\text{O}/\text{sub } 7-x/$ stripline resonators show excellent agreement.



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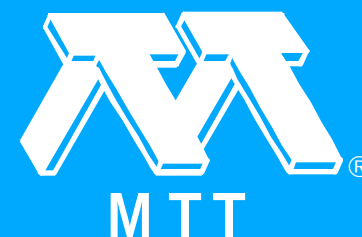
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Abstracts

Session G -- O-1 Transmission Properties of Coplanar Structures

"Session G -- O-1 Transmission Properties of Coplanar Structures." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 201-201.



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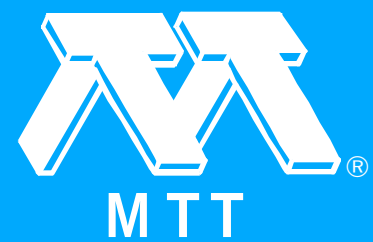
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Fullwave Analysis of the Radiative Properties of Short-Circuit Discontinuities in Modified Coplanar Stripline

J.S. McLean and T. Itoh. "Fullwave Analysis of the Radiative Properties of Short-Circuit Discontinuities in Modified Coplanar Stripline." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 203-206.

Spectral domain analysis is used to determine for the first time the radiation loss of short-circuit discontinuities in modified coplanar stripline. These results are compared with those for short-circuit discontinuities in coplanar waveguide and it is shown that, in the two cases analyzed, the radiation loss of the modified coplanar stripline short circuit is lower than that of the coplanar waveguide short circuit. The physical basis for this behavior is discussed.

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Calculation of Frequency-Dependent S-Parameters of CPW Air-Bridges Considering Finite Metallization Thickness and Conductivity

H. Jin and R. Vahldieck. "Calculation of Frequency-Dependent S-Parameters of CPW Air-Bridges Considering Finite Metallization Thickness and Conductivity." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 207-210.

Two types of CPW air-bridges are studied using the new full-wave frequency-domain TLM method. The finite thickness and conductivity of the air-bridge metallization, including superconductivity, is taken into account. Air-bridge s-parameters are presented for varying dimensions. Furthermore, cascading air-bridges and CPW discontinuities is investigated to determine the degree of interaction possible.

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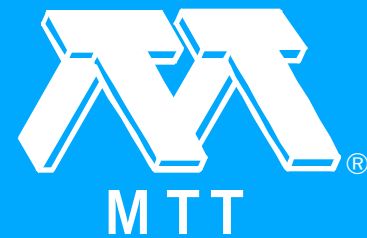


Abstracts

Novel Coplanar Stripline: Design, Characterization and Applications

F. Williams. "Novel Coplanar Stripline: Design, Characterization and Applications." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 211-214.

Up to this point, Coplanar Waveguide (CPW) has been the coplanar transmission line of choice for microwave probes and coplanar GaAs interconnect, while Coplanar Stripline (CPS) has found very limited use. The reason for this is that the traditional CPS is not nearly as well behaved as CPW. The CPS would find wide use, due to the significant real estate savings, if it would perform adequately.



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Theoretical and Experimental Evaluation of Picosecond Pulse Propagation in Suspended Coplanar Waveguides

Y. Qian, E. Yamashita and K. Atsuki. "Theoretical and Experimental Evaluation of Picosecond Pulse Propagation in Suspended Coplanar Waveguides." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 215-218.

The propagation and dispersion characteristics of picosecond pulses in a suspended coplanar waveguide (SCPW) are presented. An evaluation based on numerical analysis shows that the SCPW can result in an improvement of about 5 times in pulse transmission capability than conventional CPWs. Pulse propagation along the SCPW is studied by both simulations and experiments, both showing a substantial suppression in pulse distortion.

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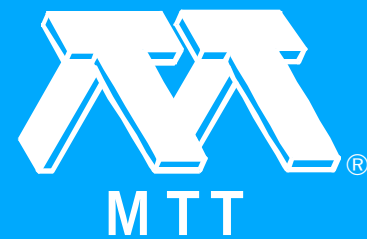


Abstracts

A WH/GSMT Based Full-Wave Analysis of the Power Leakage from Conductor-Backed Coplanar Waveguides

L.-M. Chou, R.G. Rojas and P.H. Pathak. "A WH/GSMT Based Full-Wave Analysis of the Power Leakage from Conductor-Backed Coplanar Waveguides." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 219-222.

A full-wave analysis using the Wiener-Hopf procedure and the generalized scattering matrix technique (WH/GSMT) is applied to study the EM field propagation of conductor-backed coplanar waveguides. The power leakage from the dominant mode and the effect of finite extent lateral ground planes will be emphasized.



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Session H -- Advances in High Power Microwave Source Technology (Focused Session)

*"Session H -- Advances in High Power Microwave Source Technology (Focused Session)."
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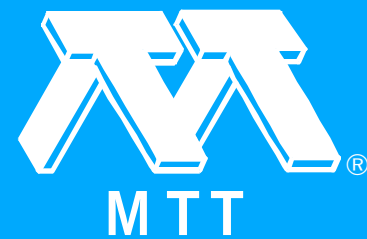


Abstracts

Long-Pulse, High-Power, Phase-Locked Magnetron Studies

T.A. Treado, P.D. Brown, R.A. Bolton and T. Hansen. "Long-Pulse, High-Power, Phase-Locked Magnetron Studies." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 225-228.

We have developed a 60 MW, 60% efficient, 35 Joule/pulse secondary emission magnetron at S-band. We report on experimental results from this moderate voltage (120 kV), repetitively pulsed (10 Hz), injection locked (14-15 dB gain) magnetron. Limitations imposed by high voltage breakdown, rf breakdown, and thermal loading are discussed. By increasing the voltage, the drive power, and the magnetron length and by using a tungsten alloy anode, 120 MW should be achievable for approximately 4 μ s pulses at 130 kV with the pulse length limited by transient heating of the anode.



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High Peak and Average Power Microwave Source Research at Physics International

D. Price, J. Benford, S. Ashby, N. Cooksey, D. Drury, B. Harteneck, J.S. Levine, L. Schlitt, P. Sincerny, D. Sprehn, L. Thompson and M. Willey. "High Peak and Average Power Microwave Source Research at Physics International." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 229-232.

CLIA (Compact Linear Induction Accelerator) is a 750 kV, 10 kA pulse power generator using magnetic switching to produce 100 ns long pulses at 200 Hz (150 kW average power) for longer than 1 second. An L-band magnetron, an S-band, frequency-agile klystron and an L-band, high perveance klystron have been successfully operated in bursts with peak powers exceeding 1 GW and average powers approaching 10 kW.



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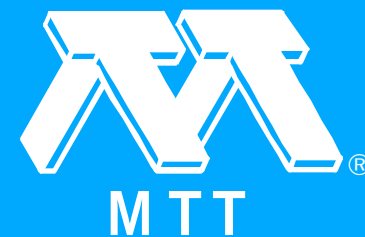


Abstracts

Super-Reltron Analysis and Experiments

R.B. Miller, W.F. McCullough, K.T. Lancaster and C.A. Muehlenweg. "Super-Reltron Analysis and Experiments." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 237-240.

We have developed a highly efficient, high-power microwave tube called SUPER-RELTRON. We have achieved operation at >400 MW with ~50% efficiency at 1 GHz, and >300 MW with 50% efficiency at 3 GHz. The rf pulse durations are typically a few hundred nanoseconds. These lightweight, compact tubes do not require an external magnetic field. The rf output coupling is straightforward and power is delivered directly via the fundamental TE/sub 10/ wave in rectangular waveguide without a mode converter. The key features of our tube include generation of a well-modulated electron beam by periodic virtual cathode formation, post-acceleration of the modulated beam to reduce the relative electron energy spread, and a multi-cavity output section that efficiently extracts power without rf breakdown. In this paper, we discuss various aspects of our device and briefly summarize our experimental results.



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Session IF1 -- Interactive Forum I

"Session IF1 -- Interactive Forum I." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 241-241.



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Electromagnetic Modelling of a Parallel-Plate Waveguide Applicator Irradiating an Inhomogeneous Lossy Medium

L. Martens, N. Fache, D. De Zutter and C. De Wagter. "Electromagnetic Modelling of a Parallel-Plate Waveguide Applicator Irradiating an Inhomogeneous Lossy Medium." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 243-246.

An integral method is presented to correctly calculate the mutual coupling between a parallel-plate waveguide applicator and an inhomogeneous lossy structure. The aperture field and hence the electromagnetic absorption in the biological structure is a result of this coupling. The results are presented for the TE/sub 1/-mode excited parallel-plate waveguide applicator. The possibility of changing the electromagnetic absorption in the biological structure by introducing a dielectric material in the waveguide is investigated.

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Abstracts

Advanced Piecewise-Harmonic-Balance Noise Analysis of Nonlinear Microwave Circuits with Application to Schottky-Barrier Diodes

V. Rizzoli, F. Mastri and D. Masotti. "Advanced Piecewise-Harmonic-Balance Noise Analysis of Nonlinear Microwave Circuits with Application to Schottky-Barrier Diodes." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 247-250.

The paper introduces a number of significant advances in harmonic-balance noise analysis algorithms, and discusses their incorporation in a general-purpose nonlinear circuit simulator. The new capabilities allow for the first time the implementation of a full noise model of the Schottky diode, including the excess noise produced by hot electron generation, intervalley scattering, and trapping effects, and accounting for the series resistance nonlinearity.



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Large-Signal Relaxation-Time Model for HEMTs and MESFETs

M.C. Foisy, P.E. Jeroma and G.H. Martin. "Large-Signal Relaxation-Time Model for HEMTs and MESFETs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 251-254.

A nonquasi-static charge-conserving spline-based model has been implemented in the EESof harmonic-balance simulator. The model uses a relaxation-time approximation to describe the intrinsic charging dynamics of unipolar transistors under arbitrary excitation. On-wafer large-signal measurements of HEMTs closely match simulation results.

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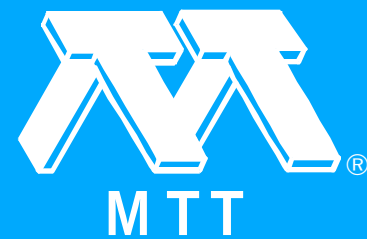


Abstracts

Experimental Evaluation of Large-Signal Modeling Assumptions Based on Vector Analysis of Bias-Dependent S-Parameter Data from MESFETs and HEMTs

D.E. Root and S. Fan. "Experimental Evaluation of Large-Signal Modeling Assumptions Based on Vector Analysis of Bias-Dependent S-Parameter Data from MESFETs and HEMTs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 255-258.

This paper presents, for the first time, a systematic experimental examination of the validity of basic large-signal modeling assumptions by subjecting measured S-parameter data versus bias from MESFETs and HEMTs to various mathematical operations of vector analysis. Several approaches are used to determine the degree to which pairs of device nonlinearities can be accurately modeled by charge-based nonlinear capacitors, voltage-controlled current sources, and higher-order elements arranged in a standard equivalent circuit topology. Implications are discussed for such circuit modeling concepts as terminal charge conservation and its extension to other state-functions.



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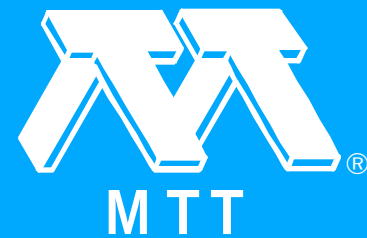


Abstracts

Accurate Millimeter-Wave Large Signal Modeling of Planar Schottky Varactor Diodes

S. Lucyszyn, G. Green and I.D. Robertson. "Accurate Millimeter-Wave Large Signal Modeling of Planar Schottky Varactor Diodes." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 259-262.

A large signal model for GaAs Planar Schottky Varactor Diodes (PSVDs) is presented which maintains a high level of accuracy into the millimetric frequency range -- for both forward and reverse bias. Using this new model, the simulated performance for a number of PSVD structures gave accurate predictions up to 40GHz.



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Analysis of Intermodulation Distortion in GaAs/AiGaAs HBT's

D.A. Teeter, M. Karakucuk, J.R. East and G.I. Haddad. "Analysis of Intermodulation Distortion in GaAs/AiGaAs HBT's." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 263-266.

The purpose of this work is to help explain the third-order intermodulation distortion properties of the heterojunction bipolar transistor at millimeter wave frequencies. By using both measured data and an analytical computer model that includes transit time effects, we have investigated the frequency and bias dependence of the IMD3 intercept point. A computer controlled mechanical tuner system has been used to measure the IMD3 performance of several HBT's from 8 to 16 GHz. A separate active load pull system has been built to characterize the HBT's from 26.5 to 35 GHz. Comparison between theoretical and experimental results is given.

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Abstracts

Full Nonlinear Analysis of Detector Using Ritz-Galerkin Theory Circuits

R.G. Harrison. "Full Nonlinear Analysis of Detector Using Ritz-Galerkin Theory Circuits." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 267-270.

The Ritz-Galerkin method provides an algebraic approach to the large-signal analysis of exponential-diode detector circuits that avoids the limitations imposed by truncated series approximations. The resulting closed-form algebraic expressions account for the details of operation in both the square-law and linear regions, and are consistent with numerical simulations. At high signal levels the results agree with the predictions of a piecewise-linear analysis.



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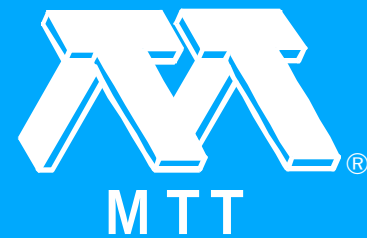


Abstracts

Transit Time Effect in High-Frequency Characteristics of HBTs

S. Lee and A. Gopinath. "Transit Time Effect in High-Frequency Characteristics of HBTs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 271-272.

We present simulation results that show negative output resistance may exist at frequencies beyond $f_{\text{sub max}}$ in the conventional mesa emitter-up AlGaAs/GaAs heterojunction bipolar transistors. It is shown that larger collector transit time is preferable choice to increasing base transit time in the design of this structure.



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Practical Realisation of Difficult Microstrip Line Hybrid Couplers and Power Dividers

H. Ashoka. "Practical Realisation of Difficult Microstrip Line Hybrid Couplers and Power Dividers." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 273-276.

Microstrip line asymmetrical branch-line couplers, Wilkinson power dividers, and rat race hybrids with coupling values and division ratios that are almost unrealisable using conventional techniques, have been realised using impedance - and admittance inverters with practical microstrip line dimensions. Experimental results for some extreme examples are given.

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HEMT Models for S-Parameter and Noise Parameter Extrapolation

M.T. Hickson, P. Gardner and D.K. Paul. "HEMT Models for S-Parameter and Noise Parameter Extrapolation." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 277-280.

Four models have been developed and assessed for fitting the measured noise parameters up to 26GHz and S-parameters up to 40GHz, for a commercial HEMT chip. The first treats the intrinsic noise sources as uncorrelated, thermal sources. The second is an extension of this, allowing a better fit to be achieved by including the distributed nature of the gate and drain electrodes using a semidistributed, sliced model. The third model neglects the distributed effect but takes into account the partial correlation of the gate and drain noise sources. This causes a larger improvement in the quality of fit, allowing the model to fit the measured data within reasonable measurement limits. Fourthly, the addition of the distributed effect to the correlated model allows a further marginal improvement, but the conditioning of the problem and the accuracy of the data appear to be insufficient to allow accurate extraction of the additional parameters needed.





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20-GHz High-Efficiency Power Amplifiers Using Monolithic Multi-Cell Permeable Base Transistors

R. Actis, K.B. Nichols, R.W. Chick and R.A. McMorran. "20-GHz High-Efficiency Power Amplifiers Using Monolithic Multi-Cell Permeable Base Transistors." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 281-284.

The performance at 20 GHz of high-efficiency power amplifiers using a new class of GaAs permeable base transistors (PBTs) is described. These devices utilize chip-level power-combining of multi-cell 8-by-20- μm PBT active areas and have demonstrated an output power of 437 mW with a power-added efficiency of 35% in a connectorized microstrip amplifier. The power, efficiency, and gain performance of demonstration amplifiers using these new devices is described.

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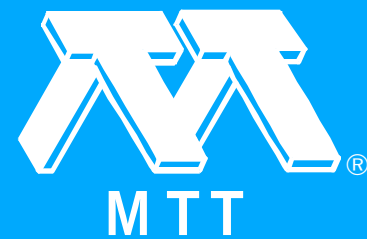


Abstracts

New Approach to GaAs MESFET Analog Frequency Dividers with Low Threshold Input Power and High Conversion Gain (1992 Vol. I [MWSYM])

H. Amine, O. Llopis, M. Gayral, J. Graffeuil and J.F. Sautereau. "New Approach to GaAs MESFET Analog Frequency Dividers with Low Threshold Input Power and High Conversion Gain (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 285-288.

A new approach to frequency dividers is proposed based on the nonlinear feedback control of MESFET in forced oscillation mode. The input signal is used to control the FET gain, imposing oscillation conditions. Firstly, this approach is tested by time domain simulation. An experimental MESFET analog frequency divider is then achieved.



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Microwave Noise Figure in MESFETs and HEMTs with Kink-Effect and (or) Parallel Conduction

J.A. Reynoso-Hernandez, L. Escotte, R. Plana and J. Graffeuil. "Microwave Noise Figure in MESFETs and HEMTs with Kink-Effect and (or) Parallel Conduction." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 289-291.

This paper considers the influence, on the microwave noise figure, of the kink effect often noticed in MESFETs and HEMTs and then of parallel conduction sometimes observed in HEMTs. It is found that kink effect impacts mostly on MESFET noise and that parallel conduction impacts on HEMT noise especially when operated at large drain current. Consequences on optimal bias conditions for low noise amplifiers are outlined.

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Abstracts

Highly Consistent FET Model Parameter Extraction Based on Broadband S-Parameter Measurements

G. Kompa and M. Novotny. "Highly Consistent FET Model Parameter Extraction Based on Broadband S-Parameter Measurements." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 293-296.

A new FET model parameter extraction procedure is proposed which yields highly consistent model element values of a widely used 15-element model. For unique extraction of the elements from hot scattering parameters, the gate resistance R_{gs} is previously derived from cold S-parameter coefficients measured at gate-voltages lower than the pinch-off voltage.



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Abstracts

A Unified Analysis of MMIC Power Amplifier Stability

R.G. Freitag. "A Unified Analysis of MMIC Power Amplifier Stability." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 297-300.

High power MMIC amplifiers require large periphery output devices in order to meet their output power goals. Bandwidth and impedance matching considerations typically require that this large output device be subdivided into smaller devices and power combined on-chip. This power combining introduces n possible modes of oscillation when n devices are combined. The usual K, B1-factor stability analysis only addresses one mode (the even mode). This paper presents an analytical approach for predicting and stabilizing oscillations for all n modes. Specific cases for $n=2$ and 4 are discussed. The approach can be implemented using standard small signal analysis software.



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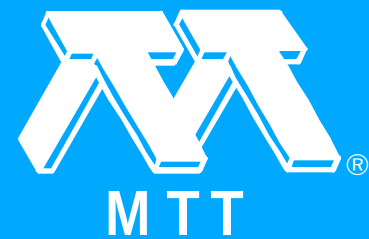
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High Efficiency C-Band 1000 Element Rectenna Array for Microwave Powered Applications

S.S. Bharj, R. Camisa, S. Grober, F. Wozniak and E. Pendleton. "High Efficiency C-Band 1000 Element Rectenna Array for Microwave Powered Applications." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 301-303.

A highly efficient rectenna array, at 5.87 GHz, comprising of 1000 dipole elements has been designed, developed, and demonstrated for the first time for microwave powered applications. The rectenna dipole elements exhibit an rf to dc efficiency exceeding 80% with a uniform illuminated aperture. The rectification element consists of a custom packaged Silicon Schottky diode quad bridge with a high reverse breakdown voltage. The novel mechanical structure of the low cost rectenna consist of a dipole array substrate and a busbar substrate suitably assembled to ensure diode cooling through conduction and convection.

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Abstracts

A Comparison of the Performance of Three Different Phase Locked Oscillators Fabricated at 21 GHz

J. Perez, P. Dorta and F. Sierra. "A Comparison of the Performance of Three Different Phase Locked Oscillators Fabricated at 21 GHz." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 305-308.

This paper describes the construction and fabrication of three different Phase Locked Oscillators (PLO) at 21 GHz. The first PLO consists of a direct division (analog and digital) from 21 GHz to the reference frequency. The second approach uses only one analog divider to reach 10.5 GHz and then a sampling phase detector. The final one consists of a 10.5 GHz MESFET Dielectric Resonator Oscillator (DRO) phase locked by means of a sampling phase detector and a multiplier (by two). A comparison of analysis, fabrication and performance of the three PLOs is presented.



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Analysis of E-Plane Waveguide Junction with Partial Height Dielectric and Ferrite Inserts

Y.Y. Tsai and A.S. Omar. "Analysis of E-Plane Waveguide Junction with Partial Height Dielectric and Ferrite Inserts." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 309-312.

A method is presented to treat a three port E-plane waveguide junction with partial height dielectric and ferrite inserts without finding the propagation constants of the guided modes in the dielectric and ferrite inserts. It is shown that in order to completely describe the fields in the junction some nonphysical terms have to be included in the irrotational set. The numerical results are compared with the experimental results for the E-plane waveguide junction with partial height dielectric and ferrite inserts.

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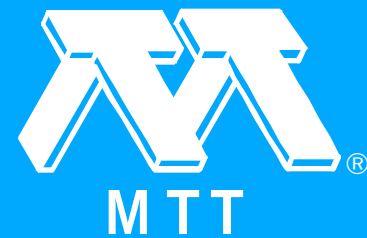


Abstracts

Thin-Film YIG Oscillators with Low Phase Noise and High Spectral Purity

D.W. Van Der Weide. "Thin-Film YIG Oscillators with Low Phase Noise and High Spectral Purity." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 313-316.

Two broadband bipolar thin-film YIG oscillators have been developed, one having frequency coverage of 2.7 to 7.5 GHz with phase noise of -109 dBc at 10 kHz at a 3.0 GHz carrier. Another 0.5 to 2.0 GHz circuit exhibits -55 dBc second harmonic levels and is much more stable than a similar YIG-sphere circuit. This paper discusses design and measurement of thin-film resonators, as well as practical improvements that stabilize thermal drift.



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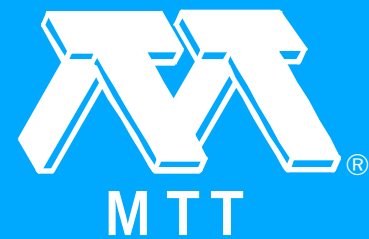
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Design of a Single Layer Broadband Microwave Absorber Using Cobalt-Substituted Barium Hexagonal Ferrite

S.C. Gupta, N.K. Agrawal and C. Kumar. "Design of a Single Layer Broadband Microwave Absorber Using Cobalt-Substituted Barium Hexagonal Ferrite." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 317-320.

A microwave absorber is generally used to reduce the reflection from the large scale structures such as aircraft, ships, tanks etc. In order to design a good absorbing system it is very important to not only determine the characteristics of the parameters of the absorbing medium, but also to estimate & minimize the effects of the angle of incidence and polarization of the incident wave. In this communication we present a theoretical and practical design of a single layer microwave absorber which exhibits broad band characteristics for both normal and oblique incidence. A single layer absorber was designed, fabricated and tested at normal as well as at oblique incidence. It is found that the theoretical & practical results agree very closely.

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Dynamic-Range Figure of Merit in High-Gain Amplifiers

P.K. Ikalainen. "Dynamic-Range Figure of Merit in High-Gain Amplifiers." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 321-324.

An optimum scaling that maximizes the (output and input) two-tone third-order intercept point of an amplifier with respect to dc power consumption is derived. The expression for spurious-free dynamic range of a high-gain amplifier is factored to separate effects of device parameters on dynamic range and to derive a new figure of merit.

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Design of Oscillators for Optically Fed MMW Phased Array

D.J. Sturzebecher, X. Zhou, X. Zhang and A.S. Daryoush. "Design of Oscillators for Optically Fed MMW Phased Array." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 325-328.

A new approach for design of the optically synchronized millimeter wave local oscillators is introduced based on subharmonically injection locked phase-locked loop technique. The experimental results support the desired goal of frequency and phase coherency of the millimeter wave oscillators, while maintaining the low FM noise degradation and large subharmonic locking range.

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Laboratory Demonstration of Electronic Polarization Basis Rotation

A.J. Gasiewski and D.B. Kunkee. "Laboratory Demonstration of Electronic Polarization Basis Rotation." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 329-332.

A hardware and software technique for rotation of the polarization basis of a dual orthogonal-linearly polarized radiometer is discussed. The technique requires precise measurement of the two orthogonal-mode antenna temperatures along with cross-correlation of the two mode amplitudes (the first three Stokes parameters). An innovative polarized blackbody load was developed for accurate calibration of the cross-correlating channel. Using 90-GHz near-Brewster angle observations of a polarizing water surface, rotation of the antenna's polarization basis by a matrix transformation was performed. The experimental results demonstrate the viability of Electronic Polarization Basis Rotation (EPBR) and suggest practical calibration schemes for full-polarization radiometers. Applications of EPBR include mechanically-scanned polarization-sensitive imaging radiometers.

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Simulation & Modelling of a Heterojunction Bipolar Transistor Mixer

B.A. Xavier and C.S. Aitchison. "Simulation & Modelling of a Heterojunction Bipolar Transistor Mixer." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 333-336.

The first low power HBT mixer intended for use in mobile communications equipment is described. Measured conversion gain and intermodulation performance superior to active MESFET mixers is reported. An HBT model developed for mixer simulation is presented and accompanying predictions are given along with an analytical expression for predicting conversion gain.

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Integrated Tuning Elements for Millimeter and Sub-Millimeter SIS Mixers

G. Pance and M.J. Wengler. "Integrated Tuning Elements for Millimeter and Sub-Millimeter SIS Mixers." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 337-340.

We present two different designs of integrated tuning elements for superconducting tunnel junction (SIS) mixers. The structures consist of a self-complementary log-periodic antenna, superconductor-insulator-superconductor (SIS) tunnel junction, and the broadband superconducting tuning circuit placed between the center of the antenna and the SIS junction. The designs allow good coupling to relatively large area ($7 \mu\text{m}^2$) junctions. The best design has 3-dB bandwidth of 102 GHz at the central frequency of 98 GHz, and 75 GHz at the central frequency of 492 GHz. Microwave scale model measurements show excellent agreement with the simulation results. Devices are being fabricated in niobium technology at Westinghouse Science & Technology Center.

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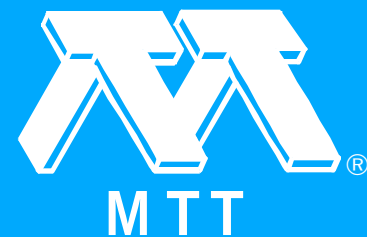


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A 30-180GHz Harmonic Mixer-Receiver

B.K. Kormanyos and G.M. Rebeiz. "A 30-180GHz Harmonic Mixer-Receiver." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 341-344.

We have combined integrated circuit antenna technology with microwave circuit design and a back-to-back Schottky diode chip to build a wideband millimeter-wave harmonic mixer-receiver. The design is planar, very simple to build and yields excellent performance from 30-180 GHz. Application areas include wideband early warning systems and search and rescue applications and for extending the range of spectrum analyzers and power meters to the millimeter-wave region.



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35 GHz Rectenna Implemented with a Patch and a Microstrip Dipole Antenna

T. Yoo, J. McSpadden and K. Chang. "35 GHz Rectenna Implemented with a Patch and a Microstrip Dipole Antenna." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 345-348.

35 GHz rectennas have been developed using a patch and a microstrip dipole antenna. The power conversion efficiencies from RF to DC were measured as 29% and 39% with an input power of 120 mW. The multi-reflection method developed for the analysis of a mixer was used to analyze the performance of a 35 GHz rectenna using a Ka-band mixer diode. Through this analysis, the effect of the reactive elements of the diode on the efficiency were investigated and the optimum operating circuit conditions and the maximum conversion efficiency were obtained.





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Attenuation of Millimeterwave Coplanar Lines on Gallium Arsenide and Indium Phosphide over the Range 1-60 GHz

W.H. Haydl, J. Braunstein, T. Kitazawa, M. Schlechtweg, P. Tasker and L.F. Eastman.

"Attenuation of Millimeterwave Coplanar Lines on Gallium Arsenide and Indium Phosphide over the Range 1-60 GHz." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 349-352.

Extensive attenuation data of coplanar lines on semi-insulating GaAs and InP is presented over the frequency range 1-60 GHz. On-wafer measurements were used to obtain the S-parameters. A ground-to-ground spacing of 30, 60, 90 and 120 μ m, typical for that used in today's microwave and millimeterwave integrated circuit applications, was investigated. The center line width (impedance) and the evaporated gold metal thickness were varied. For the frequency range investigated (metal thickness less than 2-3 times the skin depth), the attenuation was found to be inversely proportional to the metal thickness. The attenuation varies with frequency as $f^{1/n}$, with $n < 0.5$.

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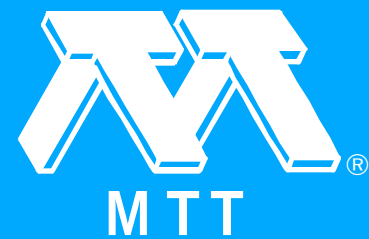
A Balanced Millimeter Wave Doubler Based on Pseudomorphic HEMTs

I. Angelov, H. Zirath, N. Rorsman and H. Grönqvist. "A Balanced Millimeter Wave Doubler Based on Pseudomorphic HEMTs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 353-356.

A balanced HEMT doubler for operation at millimeter waves has been analyzed, fabricated and characterized. Particular attention has been paid to the influence of the output circuit on the performance of the doubler. The doubler was analyzed with a harmonic balance method and experimentally an output power of 4dBm at 42 GHz was obtained. The conversion gain is approximately -1 dB at 40 GHz at an input power of 5dBm. Bias and frequency response were very close to the predicted ones.

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Polarimetric Submillimeterwave Reflectometry Using a Real-Time Quasi-Optical System

J. Brune. "Polarimetric Submillimeterwave Reflectometry Using a Real-Time Quasi-Optical System." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 357-360.

First measurements of the reflectivity of different natural and artificial materials in the 600 GHz range are reported. The investigations were carried out using a heterodyne broadband dual-polarization reflectometer in quasi-optical technique. Comparing to Fourier-transform spectrometers the described reflectometer is capable to carry out real-time measurements even outside the laboratory. Reflectivity data of several interesting materials are presented in co- and crosspolarization.

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A New Type of Optoelectronic Millimeter-Wave Finline Switches (1992 Vol. I [MWSYM])

X. De-ming, S. Lie-pu and W. Ke-qin. "A New Type of Optoelectronic Millimeter-Wave Finline Switches (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 361-364.

A new type of millimeter-wave finline switches constructed on telfon substrates is proposed, which can be easily fabricated and mounted. The experiment results are reported, which show 1.6 dB insertion loss and 23.4 dB on/off ratio have been reached. Because of its good compatibility with the conventional finline structures, it may have a wild application field, especially in the hybrid integrated millimeter-wave circuits.

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W-Band Optically Controlled Gunn Subharmonic Oscillator

X. Wei Zhu, Y.Y. Chen and S.F. Li. "W-Band Optically Controlled Gunn Subharmonic Oscillator." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 365-368.

This paper describes a new method of controlling the frequency of W-band subharmonic Gunn oscillator using laser beam. In our experiment the maximum optical tuning frequency shift of 7MHz has been observed. A cavity with a silicon piece glued on backshort is analyzed. The complex frequencies of the cavity as a function of plasma densities are obtained.

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Study of Absorbing Boundary Conditions in the 3D-TLM Symmetrical Condensed Node Model

Z. Chen, M.M. Ney and W.J.R. Hoefer. "Study of Absorbing Boundary Conditions in the 3D-TLM Symmetrical Condensed Node Model." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 369-372.

The TLM method is a numerical technique based on temporal and spatial sampling of electromagnetic fields. As with the FD-TD method, the absorbing boundary conditions are needed to truncate computational regions when open structures are simulated. The Finite-Difference Time-Domain absorbing boundary conditions have been adapted to and implemented in the 3D-TLM symmetrical condensed node model. It is also demonstrated that instability may occur due to spurious modes of the 3D-TLM condensed node mesh.

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The Compensation of Coarseness Error in 2D TLM Modeling of Microwave Structures

U. Mueller, P.P.M. So and W.J.R. Hoefer. "The Compensation of Coarseness Error in 2D TLM Modeling of Microwave Structures." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 373-376.

In this paper the origin of the coarseness error in two-dimensional TLM meshes is investigated, and a method for compensating the coarseness effect without increasing the computational expenditure is presented. The efficiency and accuracy of this method is demonstrated by comparison with analytically exact solutions.

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Abstracts

Simulations with the 3D TLM SCN Using FD-TD Absorbing Boundary Conditions

U. Mueller, A. Beyer and M. Rittweger. "Simulations with the 3D TLM SCN Using FD-TD Absorbing Boundary Conditions." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 377-380.

The FD-TD absorbing boundary conditions for one-dimensional wave propagation are adapted to the 3D SCN (Symmetrical Condensed Mode) TLM mesh. The properties of these boundary conditions are characterized for a simple TEM waveguide structure, and their applicability to complex structures is demonstrated by calculating scattering parameters for a microstrip step.



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Analysis of Planar Millimeter Wave Slot Antennas Using a Spectral Domain Approach

E.M. Biebl, J. Muller and H. Ostner. "Analysis of Planar Millimeter Wave Slot Antennas Using a Spectral Domain Approach." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 381-384.

Self radiating oscillators in the millimeter wave range can be built by combining a slot resonator with an impatt diode. Good performance can be achieved only, if the input impedance of the slot, seen at the terminals of the impatt diode, is in a proper range. In this paper the input impedance, obtained by a rigorous full wave analysis, is presented in dependence of the design parameters slot width and substrate height for silicon and PTFE. It will be shown that the required input resistance (typically 2...5 Ω) can be achieved by choosing narrow slots. The comparison with a recently published self radiating oscillator shows the validation of the simulation.

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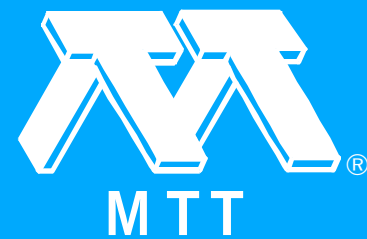


Abstracts

Fast and Accurate Computation of Dielectric Losses in Mult-Layer, Multi-Conductor Microstrip Structures

J.P.K. Gilb and C.A. Balanis. "Fast and Accurate Computation of Dielectric Losses in Mult-Layer, Multi-Conductor Microstrip Structures." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 385-388.

Accurate analysis of the dielectric losses in complex microstrip structures is important in the computer-aided design of microwave and millimeter-wave integrated circuits. The proposed approach can be used in lieu of lossy, full-wave solutions to provide accurate and efficient data for the CAD of multi-layer, multi-conductor MIC and MMIC structures. This new application gives results that are as accurate as lossy full-wave techniques over a wide range of frequency, including the dispersive region. In addition to giving accurate results, this method is up to three times faster, depending on the number and type of substrates or superstrates. Results are shown for various symmetric and asymmetric, multi-conductor, multi-layer structures which have good agreement with the lossy, full-wave approach and use significantly less computer time.



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Abstracts

An Improved FD--TD Full Wave Analysis for Arbitrary Guiding Structures Using a Two-Dimensional Mesh

F. Arndt, V.J. Brankovic and D.V. Krupezevic. "An Improved FD--TD Full Wave Analysis for Arbitrary Guiding Structures Using a Two-Dimensional Mesh." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 389-392.

A new finite-difference time-domain (FD-TD) formulation is proposed for the efficient analysis of arbitrary waveguiding structures. In contrast to the conventional FD-TD eigenvalue formulation, which requires a three--dimensional mesh for adequately formed resonator sections, this method utilizes advantageously a two--dimensional mesh for analyzing the full-wave dispersive characteristic of guided structures. This leads to a significant reduction in cpu time and storage requirements. Numerical examples are presented for bi- and unilateral finlines with finite metallization thickness and for a pair of coupled shielded dielectric guides. The theory is verified by comparison with results obtained by other methods.



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Abstracts

A Technique for the Efficient Computation of the Periodic Green's Function in Layered Dielectric Media

R.M. Shubair and Y.L. Chow. "A Technique for the Efficient Computation of the Periodic Green's Function in Layered Dielectric Media." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 393-396.

This paper presents a novel technique for the efficient computation of the periodic Green's function in layered dielectric media. This technique is based upon approximating the spectral Green's function by a set of inverse-transformable complex exponential functions. This enables the use of Poisson's summation formula to express the periodic Green's function as a combination of a spectral series and a spatial series each of which is rapidly convergent. The proposed technique is useful as it can be applied to a wide class of problems where periodic structures are to be modeled.



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Electromagnetic Simulation of Microstrip Structures with Symmetrically Coupled Microstrip Ports

J.-X. Zheng and P. Draxler. "Electromagnetic Simulation of Microstrip Structures with Symmetrically Coupled Microstrip Ports." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 397-399.

An electromagnetic simulation, based on a triangular grid and a rectangular grid, is applied to the analysis of coupled microstrip structures, and a standing wave detection algorithm is developed for the S-parameter extraction of symmetrically coupled microstrip lines. The process extracts the ratios of the reflected waves over the incident waves and the propagation constants of the two modes (even and odd) from the numerically solved electric current standing wave distributions. Presented in this paper is a full-wave analysis of coupled microstrip structures and a de-embedding technique that solve for the propagation constants and S-parameters based on the guided wave modes of the feed structures. The technique can also be applied to other symmetrically coupled structures.

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Abstracts

Analysis of Overmoded Waveguides Using the Finite-Difference Time Domain Method

D.H. Roper and J.M. Baird. "Analysis of Overmoded Waveguides Using the Finite-Difference Time Domain Method." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 401-404.

This paper presents techniques developed for analyzing scattering and coupling in overmoded waveguides using the Finite-Difference Time Domain method. Sources and absorbing boundary conditions for waveguide modes are examined. The stair-step approximation to round surfaces is considered, and a technique is described for finding the effective radius of a cylindrical model. A numerical example of scattering from a step diameter transition in circular waveguides is presented and compared to the analytic solution.



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Abstracts

An Efficient Algorithm for the Calculation of Parasitic Coupling Between Lines in MICs

J.M. Dunn and L.C. Howard. "An Efficient Algorithm for the Calculation of Parasitic Coupling Between Lines in MICs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 405-408.

A new algorithm is developed to calculate parasitic coupling between transmission lines in an efficient manner. The algorithm works by using the currents and voltages on the lines in the absence of parasitic to calculate independent voltage and current sources, which then give the approximate coupling strength between the various lines. These sources are easy to place in a CAD program. The algorithm is demonstrated on a double stub filter structure. The observed splitting of the resonance, for this particular example, is modeled by using dependent sources as calculated from the independent sources.



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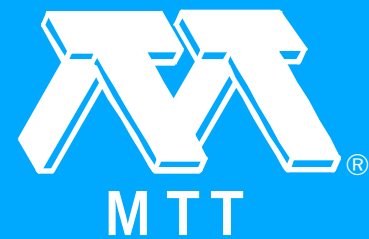
Theoretical and Experimental Investigation of Some General Suspended Stripline Discontinuities

C. Amrani, M. Drissi, V.F. Hanna and J. Citerne. "Theoretical and Experimental Investigation of Some General Suspended Stripline Discontinuities." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 409-412.

An integral equations technique associated with a 2D moment method, is used to characterise some general suspended stripline discontinuities namely: a stub, a meander, a bend and a bent-stub, for which two components for strip surface current are taken into consideration. A numerical simulation of a matched load at terminations of the studied discontinuities is achieved and is used for a precise determination of scattering matrix parameters for these discontinuities. Good agreement is achieved between numerical results and experimental ones that are obtained using the de-embedding calibration technique. The effect of parasitic waveguide modes is also discussed.

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Analysis of Discontinuities of Microstrip and Suspended Substrate Lines

Y.S. Xu, J. Marquardt and A.S. Omar. "Analysis of Discontinuities of Microstrip and Suspended Substrate Lines." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 413-416.

Based on an improved formulation of the singular integral equation method for microstrip and suspended substrate lines, their discontinuities including arbitrary composition of steps are analyzed using the mode matching method. Results show that previous analyses using the mode matching were not sufficiently accurate. The influence of complex modes is discussed.

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Three Dimensional Finite Element Analysis of N-Port Waveguide Junctions Using Edge-Elements

M.F. Wong, O. Picon and V.F. Hanna. "Three Dimensional Finite Element Analysis of N-Port Waveguide Junctions Using Edge-Elements." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 417-420.

The finite element method is formulated in such a way that the electromagnetic solution of an excited cavity formed from an N-port waveguides junction leads directly and naturally to circuit characteristics of this junction. The use of edge-elements eliminates non physical solutions. The reliability of the solution is assured compared to a penalty method. Accuracy of the method is demonstrated through the presentation of results for a waveguide T-junction while its efficiency is proven through the presentation of results for a case study of a finline step discontinuity.

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Analysis of Circular Horn Antennas Using the FD-TD Method.

C. Mroczkowski, W.K. Gwarek, T. Morawski and J. Modelski. "Analysis of Circular Horn Antennas Using the FD-TD Method.." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 421-424.

Application of the vector two-dimensional FD-TD method to the analysis of circular horn antennas is presented. An antenna should maintain axial symmetry of boundary conditions and can be arbitrarily shaped in two others directions - in the cylindrical coordinate system. Medium filling the antenna can be inhomogeneous. Modes of excitation of sinusoidal dependence on angle can be considered. A full-wave solution is obtained. An example of a circular horn antenna has been computed and compared with experimental data.

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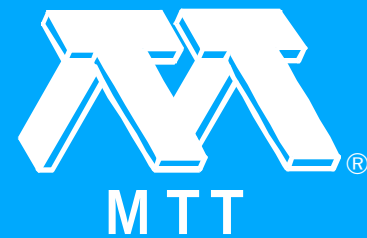


Abstracts

Analysis of Radiating Planar Resonators with the Method of Lines

A. Dreher and R. Pregla. "Analysis of Radiating Planar Resonators with the Method of Lines." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 425-428.

The method of lines (MOL) is extended to analyze radiating planar resonators by the use of absorbing boundary conditions. The complex frequency of a microstrip patch is computed and compared to results achieved by the integral equation method.



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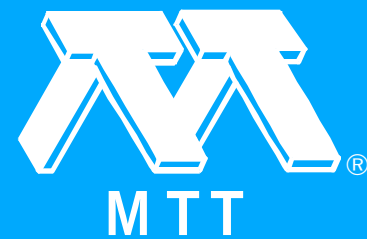


Abstracts

Coupled-Oscillator Arrays for Millimeter-Wave Power-Combining and Mode-Locking

R.A. York and R.C. Compton. "Coupled-Oscillator Arrays for Millimeter-Wave Power-Combining and Mode-Locking." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 429-432.

Arrays of coupled oscillators have recently been considered for millimeter-wave power-combining. Such systems possess a number of interesting and potentially useful nonlinear dynamical phenomena. A new theory describing arrays of coupled millimeter-wave oscillators is presented, and two important applications of such arrays--CW power combining, and a new mode-locking technique for pulse generation--will be discussed. Conditions for establishing mutual synchronization and the correct phase relationships have been investigated with the theory, and verified experimentally using several prototype X-band arrays.



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Planar Dielectric Resonator Stabilized HEMT Oscillator Integrated with CPW/Aperture Coupled Patch Antenna

R.N. Simons and R.Q. Lee. "Planar Dielectric Resonator Stabilized HEMT Oscillator Integrated with CPW/Aperture Coupled Patch Antenna." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 433-436.

A new design of an active antenna with a dielectric resonator stabilized HEMT oscillator (DRO) and an aperture-coupled patch antenna is reported. The circuit is fabricated using coplanar waveguide (CPW) with the oscillator and the antenna on opposite sides of the substrate. The active antenna was demonstrated at 7.6 GHz; however, the design can be scaled to higher frequencies. Excellent oscillator characteristics and radiation pattern have been obtained.

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Fiber Optic Fed C-Band Active Phased Array Antennas

A.S. Daryoush, R. Saedi, N. Samant, P.R. Herczfeld and M. Belaga. "Fiber Optic Fed C-Band Active Phased Array Antennas." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 437-440.

Experimental results are presented demonstrating operation of optically controlled phased array antennas at C-band. More specifically we present experimental results of optically controlled 2x4 MMIC based active T/R modules over the frequency of 5.5 to 5.8GHz. Custom designed fiber optic links have been employed to provide distribution of data and frequency reference signals to phased array antennas used in T/R Level Data Mixing architecture system.

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Asymmetric Excitation of Symmetric Single-Mode Y-Junction: The Radiation Mode Effects

D.A.M. Khalil, P. Benech and S. Tedjini. "Asymmetric Excitation of Symmetric Single-Mode Y-Junction: The Radiation Mode Effects." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 441-444.

This work studies, for the first time, a symmetric single-mode Y-junction under the asymmetric excitation by an optical fiber. The asymmetric excitation is due to fiber displacement with respect to junction axis. The power splitting between the two outputs of the junction is found to depend strongly on the fiber position. The theoretical analysis shows a splitting ratio as high as 14 dB, that could not be explained if the radiation mode coherent coupling is neglected, A GaAs/GaAlAs junction is tested and the experimental results confirm these theoretical predictions.

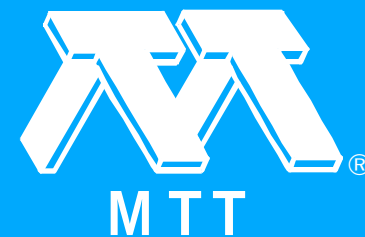
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Abstracts

Session I -- (Joint with MMWMC Symp) - Frequency Converters and Mixers

"Session I -- (Joint with MMWMC Symp) - Frequency Converters and Mixers." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 445-445.



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Ultra Small Sized Low Noise Block Downconverter Module (1992 Vol. I [MWSYM])

T. Sekiguchi, N. Shiga, S. Nakajima, K. Otobe, N. Kuwata, K.-I. Matsuzaki and H. Hayashi.
"Ultra Small Sized Low Noise Block Downconverter Module (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 447-450.

A compact low noise block (LNB) downconverter module for use in direct broadcast satellite (DBS) utilizing only GaAs MMICs has been successfully demonstrated. Four kinds of MMICs designed with 0.5 μm -gate pulse-doped MESFETs were assembled in a miniaturized flat package (24.5x17.8X 6.0mm³). 52dB conversion gain and 2.1dB noise figure were obtained using no discrete HEMTs in the preceding stage and no stub-tuning.





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A Ku Band Converter IC (1992 Vol. I [MWSYM])

T. Kaneko, T. Miya and S. Yoshida. "A Ku Band Converter IC (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 451-454.

A Ku-Band VCO converter IC for DBS and CS receivers was developed on a 1.2x2.8mm² chip using a 0.5μm MESFET process. This converter IC includes five(5) functional blocks; i.e. prescaler, VCO, LNA, mixer and IF Buffer. This converter IC had 7.5dB noise figure and -80dBc/Hz phase noise at a 10KHz offset from a 10.75GHz carrier signal.

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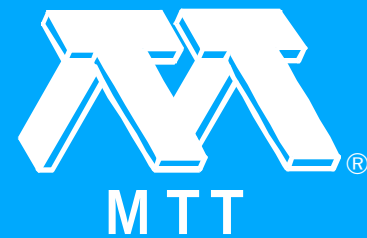


Abstracts

A Broadband Upconverter IC (1992 Vol. I [MWSYM])

D. Neilson, B. Allen, M. Kintis and M. Hoppe. "A Broadband Upconverter IC (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 455-458.

This paper describes the design and performance of a single-chip upconverter IC consisting of a doubly balanced dual-gate FET mixer, a four-stage LO amplifier, and a single-stage IF amplifier. It converts a dc-to-5 GHz input to an 8-to-10 GHz IF. State-of-the-art performance was achieved through the use of advanced models and circuit-design techniques.



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A Double Balanced 3-18 GHz Resistive HEMT Monolithic Mixer (1992 Vol. I [MWSYM])

T.H. Chen, K.W. Chang, S.B.T. Bui, L.C.T. Liu and S. Pak. "A Double Balanced 3-18 GHz Resistive HEMT Monolithic Mixer (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 459-462.

A double balanced (DB) 3-18 GHz resistive HEMT monolithic mixer has been successfully developed. This mixer consists of a AlGaAs/InGaAs HEMT quad, an active LO balun and two passive baluns, RF and IF. At 16 dBm LO power, this mixer achieves the conversion losses of 7.5-9 dB for 4-14 GHz RF and 7.5-11 dB for 3-18 GHz RF. The simulated conversion loss is very much in agreement with the measured results. Also, a third order input intercept of +26 dBm is achieved for a 10-11 GHz RF and 1 GHz IF at a LO drive of 16 dBm. This design is believed to be the first DB resistive HEMT MMIC mixer covering up to 6:1 bandwidth.

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A New Phase Noise Reduction Technique for MMIC Oscillators (1992 Vol. I [MWSYM])

A.M. Darwish, A.K. Ezzeddine, H.-L.A. Hung and F.R. Phelleps. "A New Phase Noise Reduction Technique for MMIC Oscillators (1992 Vol. I [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 463-466.

A new technique for reducing oscillator phase noise has been demonstrated. The technique utilizes a pair of limiting diodes to keep the metal-semiconductor field-effect transistor operating in a linear region. An X-band monolithic microwave integrated circuit oscillator was designed, fabricated, and tested to demonstrate the concept. A reduction of 15 dB in phase noise at 5 kHz from the carrier was measured.

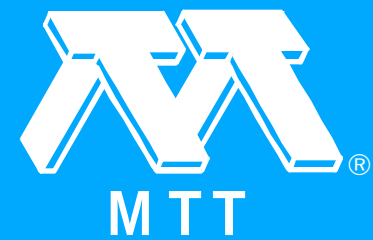
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Abstracts

Session J -- Superconductive Microwave Circuits

"Session J -- Superconductive Microwave Circuits." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 467-467.



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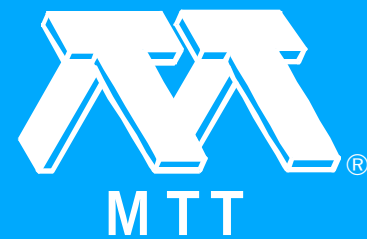


Abstracts

Monolithic High-TC Superconducting Phase Shifter at 10 GHz (1992 Vol. I [MWSYM])

*J.H. Takemoto-Kobayashi, C.M. Jackson, E.B. Guillory, C. Pettiette-Hall and J.F. Burch.
"Monolithic High-TC Superconducting Phase Shifter at 10 GHz (1992 Vol. I [MWSYM])." 1992
MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 469-472.*

We describe a monolithic high temperature superconductor (HTS) phase shifter integrated into a 10 GHz microstrip line. This is the first demonstration of a non-resonant HTS circuit based on our design. We observed phase shifts greater than 150 degrees in resonant structures, and 20 degrees in broadband circuits.



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Planar X-Band Squid-Gradiometer Design for HTS Applications

B. Mayer, R. Knochel, T. Bade, M. Schilling and B. David. "Planar X-Band Squid-Gradiometer Design for HTS Applications." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 473-476.

An RF-SQUID gradiometer integrated in a $\lambda/2$ length microstrip resonator is described. The device was realized with low temperature superconductors (LTS) using a shunted NbN/MgO/NbN SIS junction as the active element. Various measurement results are given. Measurements of the complex reflection coefficient show clearly a periodic dependence on an applied dc flux. Due to the fully planar design, the SQUID is an appropriate basic element of a one chip magnetometer including flux transformer. Work is under way to realize the circuit in high temperature superconductors (HTS).

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Phase Noise of a Tunable and Fixed Frequency Sapphire Loaded Superconducting Cavity Oscillator

M.E. Tobar and D.G. Blair. "Phase Noise of a Tunable and Fixed Frequency Sapphire Loaded Superconducting Cavity Oscillator." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 477-480.

Measured phase noise of two GaAs FET amplifiers, and a varactor phase shifter at 9.7 GHz, reveal that optimum FET and diode bias voltage changes when cooling from room to liquid helium temperatures. This understanding enables optimization of the noise in an all cryogenic Sapphire Loaded Superconducting Cavity X-Band loop oscillator. We show that we can reduce the current measured oscillator noise of -120 dBc/Hz at 1 kHz, by 20 to 45 dB.

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Performance of a Y-Ba-Cu-O Superconducting Filter/GaAs Low Noise Amplifier Hybrid Circuit

K.B. Bhasin, S.S. Toncich, C.M. Chorey, R.R. Bonetti and A.E. Williams. "Performance of a Y-Ba-Cu-O Superconducting Filter/GaAs Low Noise Amplifier Hybrid Circuit." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 481-483.

A superconducting 7.3 GHz two-pole microstrip bandpass filter and a GaAs low noise amplifier (LNA) were combined into a hybrid circuit and characterized at liquid nitrogen temperatures. This superconducting/semiconducting circuit's performance was compared to a gold filter/GaAs LNA hybrid circuit. The super-conducting filter/GaAs LNA hybrid circuit showed higher gain and lower noise figure than its gold counterpart.

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Abstracts

Hybrid Semiconductive/High Temperature Superconductive Ku-Band Oscillator and Amplifier MICs

J.W. Smuk, M.G. Stubbs and J.S. Wight. "Hybrid Semiconductive/High Temperature Superconductive Ku-Band Oscillator and Amplifier MICs." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 485-488.

The design, fabrication and testing of hybrid semiconductive/high temperature superconductive (HTSC) Ku-band Microwave Integrated Circuits (MICs) operating at cryogenic temperatures is described. The first cooled feedback oscillator using GaAs FET Monolithic Microwave Integrated Circuit (MMIC) low-noise amplifiers for gain and a high Q TlBaCaCuO linear resonator for stabilization is presented together with a low-noise HEMT amplifier using TlBaCaCuO distributed stubs for matching. Both demonstrate that HTSC and semiconductive elements can be successfully integrated.



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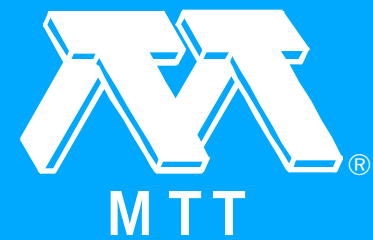
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Abstracts

Session K -- New Guided Wave Physical Effects

"Session K -- New Guided Wave Physical Effects." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 489-489.



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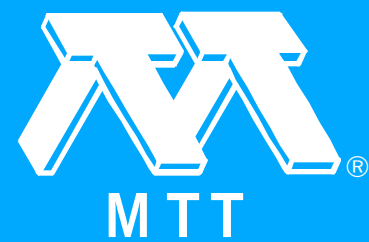
Leakage of the Strip Line Dominant Mode Produced by a Small Air Gap

D. Nghiem, J.T. Williams, D.R. Jackson and A.A. Oliner. "Leakage of the Strip Line Dominant Mode Produced by a Small Air Gap." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 491-494.

Stripline may have an inhomogeneous dielectric medium, due to inadvertent air gaps. For such inhomogeneous stripline, two dominant modes are generally present, a proper (bound) mode and an improper complex (leaky) mode; the properties of both dominant modes have been obtained by using a full-wave spectral-domain approach. Of these two dominant modes, we find that it is the leaky mode that is the continuation of the conventional stripline mode when a very small air gap is introduced. This presentation discusses the nature of this leaky dominant mode, and shows that the leaky mode may be responsible for spurious transmission-line effects in stripline. In addition, under certain conditions interference effects can occur between the two dominant modes. These conclusions are confirmed by measurements.

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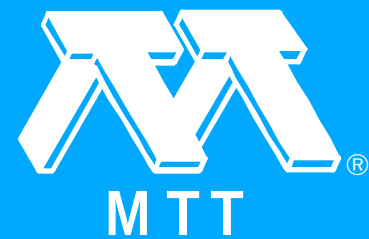
New Surface-Wave-Like Mode on CPWS of Infinite Width and its Role in Explaining the Leakage Cancellation Effect

M. Tsuji and H. Shigesawa. "New Surface-Wave-Like Mode on CPWS of Infinite Width and its Role in Explaining the Leakage Cancellation Effect." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. 1 [MWSYM]): 495-498.

At the 1990 International Microwave Symposium we showed that a new mode, not previously recognized, could exist on coplanar waveguide of finite width. This mode can propagate down to zero frequency, and its field distribution resembles that of a TM/sub 0/ surface wave on a grounded dielectric layer. We therefore called this new mode a "surface-wave-like," or SWL, mode. We also demonstrated, both theoretically and experimentally, that this mode couples to the dominant CPW mode over a narrow frequency region. Although the frequency corresponding to this coupling region is relatively high, it is lower than the frequency at which the dominant CPW mode changes from a bound mode to a leaky mode. The two modes that couple are therefore real everywhere within the coupling region, so that the coupling behavior is exactly that of the classical forward directional coupling type. The behavior is illustrated in Fig. 1, which presents the normalized phase constant as a function of the normalized frequency. Power leaks from the dominant CPW mode in the form of a TE/sub 0/ surface wave on the ungrounded dielectric layer outside of the strip region, but that leakage occurs only for frequencies higher than the crossing between the CPW curve and the one for the TE/sub 0/ surface wave. In Fig. 1 the CPW curve stops at exactly that crossing point.

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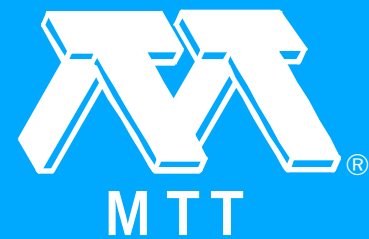
Effects of Metal Thickness and Finite Substrate Width on Leaky Waves in Coupled Microstrip Lines

C.-C. Tien, C.-K.C. Tzuang and S.T. Peng. "Effects of Metal Thickness and Finite Substrate Width on Leaky Waves in Coupled Microstrip Lines." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 499-502.

The propagation characteristics of leaky waves in thick coupled microstrip lines integrated on substrate with infinite and finite widths are presented. The field-theoretic results, based on the full-wave mode-matching method incorporating the metal modes, show that the thickness of metal strips can convert a non-leaky bounded mode into a leaky wave. On the other hand, when the infinite substrate width is reduced to a finite value, a leaky wave may become a bounded propagation mode and additional leaky waves are found. The effects of metal thickness and finite substrate width on leaky waves are discussed.

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Radiation Modes of Slotline with Application to Millimetric Circuits

T. Rozzi, G. Gerini and M. Righi. "Radiation Modes of Slotline with Application to Millimetric Circuits." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 503-506.

Bound modes of slotline have been extensively investigated. Due to its open nature, slotline also features a continuum of radiation modes both in air and into the dielectric substrate that are excited by discontinuities such as steps, bends, short circuits, etc. Moreover, transverse metal strips across the slot form array patterns in slotline antennas, coupling strongly to radiation modes. Such fields propagate without attenuation a long way away from their source and are difficult to, handle by standard numerical techniques. This part of the spectrum has never been investigated before. This contribution deals with the continuum of slotline in full hybrid form: its simple application to the problem of transverse metal strip is then demonstrated providing including currently details of radiation patterns. The cascade of strips, interaction via the radiation field, is being investigated.

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Abstracts

Session L -- Advances in High Power Microwave Source Technology (Focused Session)

"Session L -- Advances in High Power Microwave Source Technology (Focused Session)." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 507-507.



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Abstracts

Relativistic Plasma Microwave Electronics: Studies of High Power Plasma Filled Backward Wave Oscillators

Y. Carmel, W.R. Lou, T.M. Antonsen, Jr., J. Rodgers, B. Levush, J. Tate, W.W. Destler and V.L. Granatstein. "Relativistic Plasma Microwave Electronics: Studies of High Power Plasma Filled Backward Wave Oscillators." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 509-509.

The area of relativistic plasma microwave electronics has only recently generated renewed interest in the microwave and millimeter wave device community. We present new experimental data demonstrating that the presence of a low density background plasma in a relativistic backward wave oscillator leads to several beneficial effects, including enhanced interaction efficiency (40%), operation at very low and possibly zero guiding magnetic field, tunability by controlling the plasma density, a high degree of spectral purity, and operation well above the vacuum limiting current.



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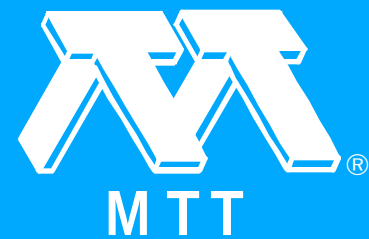
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Pasotron High-Energy Microwave Source

J.M. Butler, D.M. Goebel, R.W. Schumacher, J. Hyman, J. Santoru, R.M. Watkins, R.J. Harvey, F.A. Dolezal, R.L. Eisenhart and A.J. Schneider. "Pasotron High-Energy Microwave Source." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 511-514.

We describe the operation and performance of a new high-energy microwave source called the PASOTRON, for Plasma-Assisted, Slow-wave Oscillator. Recently developed at Hughes Research Laboratories, the PASOTRON is a unique combination of a novel electron-gun and plasma-filled slow-wave structure which creates a source capable of generating 100 μ sec-long rf pulses maintained at power levels of a few MW without the use of any magnetic focusing fields. A Hughes' hollow-cathode-plasma electron-gun is used to produce long, high-power beam pulses from which energy is efficiently extracted and converted into electromagnetic radiation. We present results which show rf output power is in the 1-to-5 MW range, for rf pulse lengths up to 120 μ sec from a PASOTRON tube designed to operate in the C-band frequency range. The integrated rf energy per pulse is up to 500 J, and the electron-beam to microwave-radiation power-conversion efficiency is $\sim 20\%$. Instantaneous bandwidth measurements confirm that for the long rf pulse duration, the PASOTRON's oscillation center frequency is maintained in a narrow line < 3 MHz.

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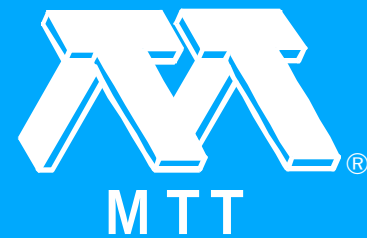


Abstracts

Review of High Power Traveling Wave Tube Amplifiers

D. Shiffler, J.A. Nation, L. Schachter, J.D. Ivers and G.S. Kerslick. "Review of High Power Traveling Wave Tube Amplifiers." 1992 MTT-S International Microwave Symposium Digest 92.1 (1992 Vol. I [MWSYM]): 515-517.

In this paper, we review work performed on high power traveling wave tube amplifiers. The tubes operated in the X-band at 8.76 GHz with both a single stage and severed amplifier configuration. The peak total powers achieved were on the order of 400 MW, corresponding to gains of 37 dB.



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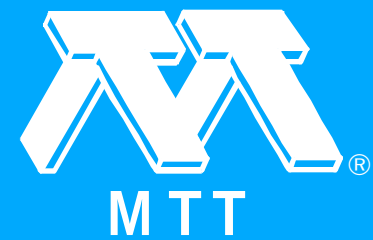
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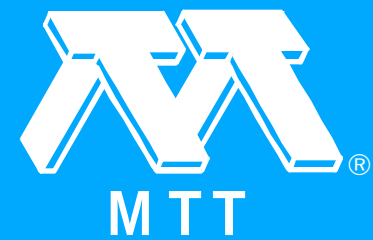
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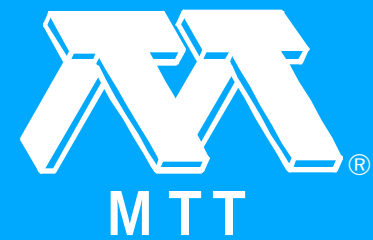
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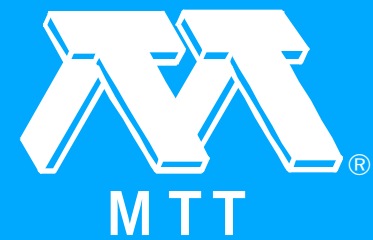
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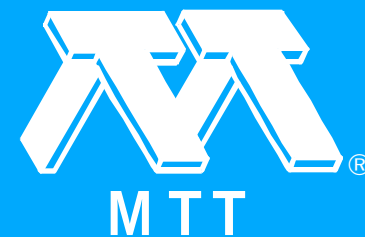
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Abstracts

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"Technical Program Contents (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): vii-xxxix.



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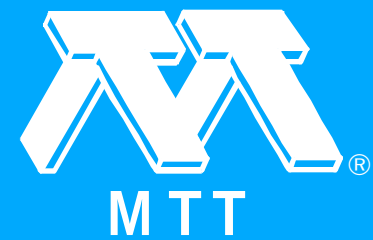
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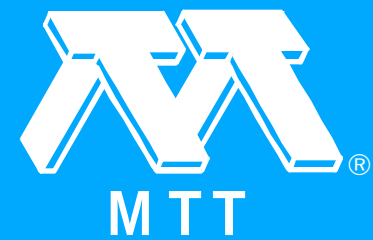
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Abstracts

A 0.8-Watt, Ka-Band Power Amplifier

J.M. Schellenberg, K.L. Tan, R.W. Chan, C.H. Chen, T.S. Lin, D.C. Streit and P.H. Liu. "A 0.8-Watt, Ka-Band Power Amplifier." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 529-532.

A hybrid, 2-stage, HEMT power amplifier is reported operating over the 32 to 35 GHz band with a minimum output power of 28 dBm. At 34 GHz, an output power of 0.8 watt with an associated power-added efficiency of 26.6 percent has been demonstrated. Biased for efficiency, this amplifier has demonstrated a power added efficiency of 32.2 percent with an output power of over 0.7 watt.



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Distortion Properties of MESFET and PIN Diode Microwave Switches

R.H. Caverly and G. Hiller. "Distortion Properties of MESFET and PIN Diode Microwave Switches." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 533-536.

This paper presents a comparison of the distortion properties of microwave switches that employ either PIN diodes or GaAs MESFET semiconductor devices. It analyzes the distortion properties of both devices in a typical switch application. This information will enable design engineers to predict distortion performance and will facilitate the choice of either element in a distortion sensitive application. The results of the analysis indicate that either device is capable of performing with third order intercept point at approximately 40 dBm or better at frequencies from 10 MHz through beyond X-Band. This level of distortion is generally satisfactory for many small signal applications. If better distortion performance is required, the PIN diode is superior.

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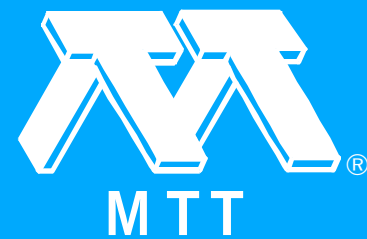


Abstracts

A Thorough Investigation of Dynamic Bias on Linear GaAs FET Power Amplifier Performance

T.H. Miers and V.A. Hirsch. "A Thorough Investigation of Dynamic Bias on Linear GaAs FET Power Amplifier Performance." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 537-540.

Methods which involve increasing the gate bias on GaAs power FETs at reduced input power levels are excellent techniques for increasing efficiency. This paper presents the results of a thorough study on the effects of dynamic gate bias on GaAs power FET performance. Detailed information concerning the effects of gate bias changes on gain, input return loss, and linearity are included. A two-stage linear power amplifier was built and tested that successfully demonstrated dynamic gate bias optimization. This amplifier produced over 5 Watts of output power at L-Band with high efficiency and excellent linearity.



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Phase Distortion Mechanism of a GaAs FET Power Amplifier for Digital Cellular Application

H. Ikeda, T. Ishizaki, Y. Yoshikawa, T. Uwano and K. Kanazawa. "Phase Distortion Mechanism of a GaAs FET Power Amplifier for Digital Cellular Application." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 541-544.

A conventional class AB amplifier with high efficiency has had phase distortion which is not suitable for $\pi/4$ -shift QPSK signal. A simple FET model including four non-linear elements is presented to explain the distortion mechanism. By using those parameters, a class AB amplifier with low phase variation of less than 2 degrees is designed.

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A Periodic Spatial Power Combining MESFET Oscillator

J. Heinbockel, A. Mortazawi and T. Itoh. "A Periodic Spatial Power Combining MESFET Oscillator." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 545-548.

A planar periodic MESFET based spatial power combiner is designed and fabricated in X-band. A microstrip transmission line is periodically connected to four MESFET devices driving a linear microstrip antenna array. An effective radiated power of 3.2 Watts is obtained for this structure at an oscillation frequency of 11.2 GHz. A frequency tuning bandwidth of 36 MHz is achieved, by varying the gate bias, V_{gs} .

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Nonlinear Design and Experimental Results of a Low-Noise Varactor Tunable Oscillator Using a Coupled Microstrip Resonator

V. Gungerich, M. Schwab and P. Russer. "Nonlinear Design and Experimental Results of a Low-Noise Varactor Tunable Oscillator Using a Coupled Microstrip Resonator." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 549-552.

A varactor tunable oscillator with a coupled microstrip resonator was designed, using a nonlinear predictor-corrector method. Calculated and measured tuning characteristic agree better than 1%. Even at a low quality factor of the varactor the oscillator has the very low phase noise of +95dBc/Hz at 100KHz offset frequency.

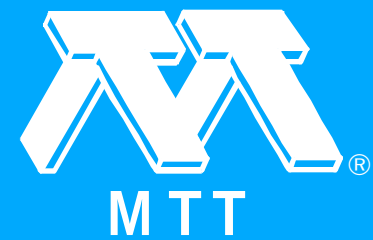
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Session N -- Wideband Opto-Electronic Links

"Session N -- Wideband Opto-Electronic Links." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 553-553.



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Abstracts

Fiber Optic Millimeter-Wave Subcarrier Transmission Links for Personal Radio Conununication Systems

H. Ogawa and D. Polifko. "Fiber Optic Millimeter-Wave Subcarrier Transmission Links for Personal Radio Conununication Systems." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 555-558.

This paper proposes two configurations of fiber optic links for use in millimeter-wave subcarrier transmission for personal radio communication systems. The system concepts for millimeter-wave personal communication systems are first described and the advantages of millimeter-wave frequencies are discussed. The combination of direct modulation and indirect (external) modulation techniques are utilized to transmit millimeter-wave signals. The fiber optic link is experimentally investigated. The 25-GHz band FM transmitter/receiver and 70-MHz QPSK MODEM are connected to the fiber optic link. These signals are simultaneously transmitted and excellent performance is observed.



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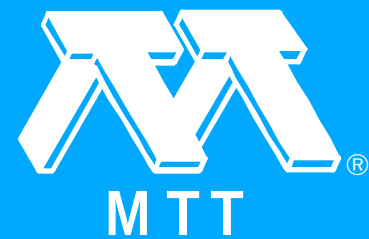
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Fiber Optic Microwave Links Using Balanced Laser Harmonic Generation, and Balanced/Image Cancellation Laser Mixing (1992 Vol. II [MWSYM])

H. Ogawa and H. Kamitsuna. "Fiber Optic Microwave Links Using Balanced Laser Harmonic Generation, and Balanced/Image Cancellation Laser Mixing (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 559-562.

This paper proposes three configurations of fiber optic links for use in microwave transmission. Two laser diodes are used for balanced harmonic generation and the optical power from each diode is combined and detected by photodiodes. The fundamental and odd harmonics are suppressed and even harmonics added. The balanced and image cancellation laser mixing which utilizes the combination of microwave components and optical devices can suppress the local and image frequencies, respectively. These configurations are experimentally investigated at microwave frequencies and the frequency suppression is successfully demonstrated.

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A Balanced Fiberoptic Communication Link Featuring Laser RIN Cancellation

A. Madjar and O. Malz. "A Balanced Fiberoptic Communication Link Featuring Laser RIN Cancellation." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 563-566.

This paper presents a novel scheme of a balanced optical communication link intended to reduce the effect of the transmitter laser RIN on the total noise figure and dynamic range of the link. The method is based on splitting the laser's power into two fibers, and modulating only one branch by the RF signal. Maintaining perfect amplitude and phase balancing allows complete cancellation of the laser RIN. In practice, to achieve 20 db of laser noise reduction an amplitude balancing of 0.5 db or phase balancing of 6 degrees is required. To maintain the balancing under changing conditions it might be necessary to use an adaptive circuit. The method presented is particularly important for microwave high dynamic range links, which may be limited by laser noise.

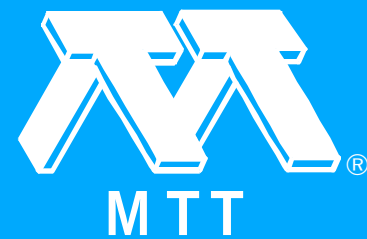
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Abstracts

On-Wafer Characterization, Modelling, and Optimization of InP-Based HEMTs, pin-Photodiodes and Monolithic Receiver-OEICs for Fiber-Optic Communication

D. Kaiser, H. Grosskopf, I. Gyuro, U. Koerner, W. Kuebart, J.-H. Reemtsma and H. Eisele. "On-Wafer Characterization, Modelling, and Optimization of InP-Based HEMTs, pin-Photodiodes and Monolithic Receiver-OEICs for Fiber-Optic Communication." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 567-570.

We will demonstrate results achieved with receiver OEICs consisting of InGaAs pin-photodiodes and InAlAs/InGaAs HEMTs fabricated by low pressure MOVPE. A 3 dB-bandwidth of 1.6 GHz and an open eye at 3.0 Gb/s NRZ modulation of the monolithically integrated photoreceiver were obtained by on-wafer characterization.



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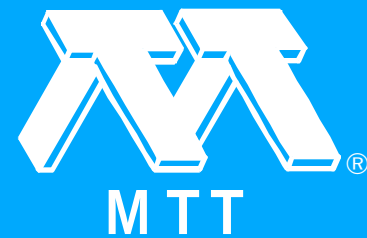


Abstracts

MMIC Based Optical Modulator Design

M.T.C. Silva and P.R. Herczfeld. "MMIC Based Optical Modulator Design." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 571-574.

The work presented in this paper concerns the development of an MMIC based optical modulator, a key element of the chip level integration of photonic and microwave components. The fundamental interaction between microwaves and light is depletion of carriers, which modulates the index of refraction. The carrier modulation gives rise to a field induced grating, which yields a modulated optical signal.



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An Externally Modulated Fiber-Optic Link Test Bed for Characterizing Link Performance in a System

C.H. Cox, III, L.A. Bernotas, G.E. Betts, A.I. Grayzel, D.R. O'Brien, J.J. Scozzafava and A.C. Yee. "An Externally Modulated Fiber-Optic Link Test Bed for Characterizing Link Performance in a System." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 575-576.

The design and environmental testing of a modular analog fiber-optic link are reported. Over a 10-MHz bandwidth the link noise figure is 8 dB without electronic amplification. The link performance and the systems effects with active and passive implementations of module calibration and modulator bias stabilization are discussed.

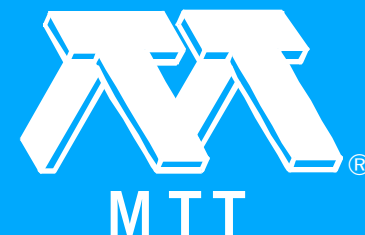
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Abstracts

Session O -- Millimeter and Submillimeter Wave Components

"Session O -- Millimeter and Submillimeter Wave Components." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 577-577.



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Ka-Band High Efficiency 1 Watt Power Amplifier

*G.S. Dow, K. Tan, N. Ton, J. Abell, M. Siddiqui, B. Gorospe, D. Streit, P. Liu and M. Sholley.
"Ka-Band High Efficiency 1 Watt Power Amplifier." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 579-582.*

This paper describes the design and performance of a miniaturized 35 GHz power amplifier. The two-stage amplifier has achieved an output power of 1 watt with an associated gain of 10 dB and a power-added efficiency of 25.1%. The design is based on TRW 0.25 μm T- gate Pseudomorphic InGaAs HEMT device technology. The amplifier is designed using a 1 mm device driving a 2 mm device. The complete amplifier mounted on a carrier measures 0.26" x 0.16" x 0.02". The amplifier results reported here represent the best power gain and efficiency performances achieved from a single amplifier at 35 GHz.

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Millimeter-Wave Monolithic Gain Block Amplifiers Using Pseudomorphic HEMT

H. Yoshinaga, B. Abe, K. Shibata, H. Kawasaki, M. Ohtomo and I. Tokaji. "Millimeter-Wave Monolithic Gain Block Amplifiers Using Pseudomorphic HEMT." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 583-586.

Monolithic gain blocks for millimeter-wave amplifiers have been developed using 0.1 μm -gate planar-doped pseudomorphic HEMTs and successfully applied to U- and W-band single-stage amplifiers. The gain block consists of the HEMT and input/output matching circuits integrated in a single chip. The U-band amplifier exhibits a gain of 5.0 ± 0.7 dB and a noise figure of less than 2.8 dB over 45-55 GHz. The W-band amplifier shows a gain of 3.1 ± 0.3 dB and a noise figure of 4.5 ± 0.5 dB over 94-98 GHz.

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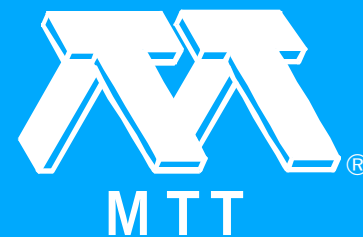


Abstracts

60 GHz Power Amplifier Using PHEMT

J. Goel, K.L. Tan, D.I. Stones, R.W. Chan, D.C. Streit, S. Peratoner and J. Schellenberg. "60 GHz Power Amplifier Using PHEMT." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 587-589.

A Millimeter developed wave power amplifier has been using 0.15 μm , T-gate pseudomorphic HEMT. It utilizes a novel low loss planar combiner. The performance obtained was 715 mWatt output power with more than 13 dB linear gain at 60 GHz, which are highest reported in the literature to date. These state-of-the-art results are attributed to the excellent device and combiner performance.



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W-Band Quasioptical Integrated PIN Diode Switch

K.D. Stephan and P.F. Goldsmith. "W-Band Quasioptical Integrated PIN Diode Switch." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 591-594.

A quasioptical reflection/transmission switch using 464 PIN diodes in a 2.3-cm diameter grid array has been designed and tested. In the reflection state (diodes off), reflection loss was less than 0.5 dB at 94 GHz, and transmission loss exceeded 20 dB over a 12-GHz bandwidth. In the transmission state (diodes on), the array's transmission loss fell to as little as 3.7 dB, with a corresponding return loss of 9 dB, at 94 GHz. Potential applications of this new component include radar T/R switches, communications signal path routing, and electronic replacements for mechanical Dicke-switching choppers in millimeter-wave radiometers. Advantages include the ability to switch multiple beams simultaneously, and potentially high power-handling capability.

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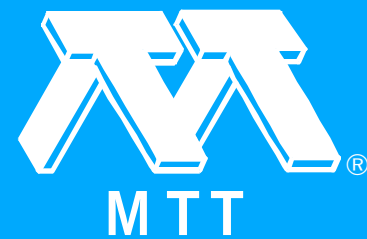


Abstracts

A 200 GHz Planar Diode Subharmonically Pumped Waveguide Mixer with State-of-the-Art Performance

P.H. Siegel, R.J. Dengler, I. Mehdi, W.L. Bishop and T.W. Crowe. "A 200 GHz Planar Diode Subharmonically Pumped Waveguide Mixer with State-of-the-Art Performance." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 595-598.

This paper presents recent performance data for a 200 GHz subharmonically pumped waveguide mixer using an antiparallel pair of planar air bridge type GaAs Schottky barrier diodes. The measured mixer noise and conversion loss are below that of the best reported whisker contacted or planar diode mixers using the subharmonic pump configuration. In addition, the required local oscillator power is as low as 3 mW for the unbiased diode pair and significant LO noise suppression was observed. The waveguide design is a prototype for 640 GHz and uses split-block rectangular waveguide with a 2:1 width to height ratio throughout.



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A Millimeterwave Subharmonically Pumped Resistive Mixer Based on a Heterostructure Field Effect Transistor Technology

H. Zirath, I. Angelov and N. Rorsman. "A Millimeterwave Subharmonically Pumped Resistive Mixer Based on a Heterostructure Field Effect Transistor Technology." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 599-602.

A subharmonically pumped resistive mixer (SPRM) working at millimeterwaves based on a HFET technology is described for the first time. Nonlinear simulations of the mixer were performed and a special dual HFET chip was developed and fabricated for the demonstration of this mixer. Mixer circuits were fabricated and operational characteristics at 40-45 GHz were investigated.

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Design and Measurements of a 210 GHz Subharmonically Pumped GaAs MMIC Mixer

P.H. Siegel, S. Weinreb, S. Duncan, W. Berk, A. Eskandarian and D.-W. Tu. "Design and Measurements of a 210 GHz Subharmonically Pumped GaAs MMIC Mixer." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 603-606.

A MMIC mixer chip incorporating a separately biased pair of antiparallel GaAs air-bridge Schottky diodes has been developed and tested at 210 GHz. The MMIC wafer is housed in a simple crossed waveguide mount with E-plane coupling probes to couple in the 105 GHz local oscillator and the 210 GHz signal. RF and intermediate frequency matching and filtering is provided on chip as well as separate DC bias paths for each diode. The MMIC chip is described and the measured mixer performance is presented. The measured noise and conversion loss are within 3.5 dB of the best reported subharmonic mixers using individually optimized and mounted planar or whisker contacted diodes at this frequency. The performance of a set of antiparallel diodes, identical to those used in the MMIC but flip chip mounted in a non MMIC subharmonic mixer mount, is also presented and compared with planar diodes made with a different anode deposition process in the same mixer mount.

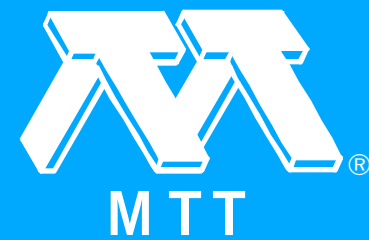
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Abstracts

Session P -- Vehicle Communications and Control Systems I

"Session P -- Vehicle Communications and Control Systems I." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 607-607.



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Abstracts

Applications of Microwaves and Millimeterwaves for Vehicle Communications and Control in Europe

H.H. Meinel. "Applications of Microwaves and Millimeterwaves for Vehicle Communications and Control in Europe." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 609-612.

Traffic is becoming a serious problem throughout the world, as it is a major problem in Europe. The ever increasing demand of road transportation has created negative effects related to traffic safety, efficiency and economy; for the future the protection of the environment is an additional challenge. Today it is widely accepted, that the solution to traffic congestion and increasing pollution lies in the application of advanced technologies to control and direct the flow of vehicles. Pan European projects like PROMETHEUS or DRIVE are supporting such solutions. Four major areas of applications have to be distinguished: Automatic Debiting Systems (ADS), Road Traffic Informatics (RTI), Microwave Doppler Sensors (MDS) and collision avoidance radar. Millimeter-wave systems have found an increasing interest, due to their specific advantages, as well as the lack of frequencies for new services.



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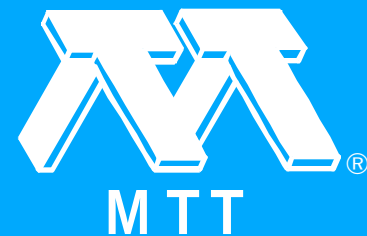


Abstracts

Automotive Radar at 80-90GHz

A.G. Stove. "Automotive Radar at 80-90GHz." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 613-616.

The idea of equipping cars with radar has been around for a long time, but it is only with the arrival of low cost compact millimetre-wave radars that such systems have become practicable. The paper will discuss a technology for low-cost mass production of automotive radar sensors and two systems applications for such sensors. The systems applications are an Intelligent Cruise Control (ICC), which uses a relatively simple forward-looking sensor, and the other is as a more sophisticated Obstacle Warning Radar (OWR).



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Experiments on Vehicle to Roadside Microwave Communication

A. Zandbergen and A.v.d. Ree. "Experiments on Vehicle to Roadside Microwave Communication." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 617-620.

Experiments on microwave communication (2.45 GHz, semi-passive transponders) between vehicle and roadside for road pricing are described. The experiments showed that the uplink was 1.5 dB short, the downlink 1 dB. From the experiments it was concluded that microwave communication is suitable, although the equipment used was not. Recent developments in Europe are shortly described, among which the CEPT decision to use the 5.8 GHz band with 3 dBW EIRP for vehicle to roadside communication in Europe. It is explained that the 'pseudo-multilane' solution provides a simple solution for vehicle to roadside communication without physical lane separation.

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Abstracts

Low-Cost Design of a Quasi-Optical Front-End for on Board MM.Wave Pulsed Radar

N. Haese, M. Benlamlih, D. Cailleu and P.A. Rolland. "Low-Cost Design of a Quasi-Optical Front-End for on Board MM.Wave Pulsed Radar." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 621-623.

The purpose of this paper is to describe a new design of a low-cost mm.wave pulsed radar for automobile applications. It is based on a quasi-optical approach and uses a limited number of microwave devices. Experimental results are provided.



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System Aspects and Design of an Automotive Collision Warning PN Code Radar Using Wavefront Reconstruction

J. Detlefsen, T. Troll, M. Rozmann and W. Zeilinger. "System Aspects and Design of an Automotive Collision Warning PN Code Radar Using Wavefront Reconstruction." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 625-628.

A collision avoidance system for automobiles to be used in freeway and similarly structured traffic environments is under study at the Technische Universitat Munchen (TUM). In principle a two-dimensional imaging problem has to be solved, because the mere detection of objects in front of a vehicle is not sufficient as potential paths of collision can only be recognized by assigning objects to their surroundings. While digital wavefront reconstruction is used for angular discrimination, a high resolution pseudonoise code radar applying a binary phase modulation to a continuous carrier has been implemented for longitudinal (range) resolution. As the system has been designed as an experimental platform rather than a prototype, provisions for recording and evaluation of online radar data have been implemented. The paper reports on concepts, the state of realization and on first experimental results.

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A 61 GHz Doppler Radar Using Inverted Strip Dielectric Waveguide

Z.-W. Li and W. Menzel. "A 61 GHz Doppler Radar Using Inverted Strip Dielectric Waveguide." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 629-632.

The measurement of true speed over ground is of great importance for road as well as rail vehicles. Using simple mm-wave systems, there is a potentially wide range application in individual car traffic. In this context, a 61 GHz Doppler radar was investigated and tested. It is based on inverted strip dielectric waveguide for both oscillator/mixer and antenna. A simple Gunn element serves as transmitter as well as (self-oscillating) mixer. In this way, a simple, compact, and potentially low-cost system is realized.



Abstracts

Session Q -- FET Devices

"Session Q -- FET Devices." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 633-633.



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A Heterostructure FET with 75.8-Percent Power Added Efficiency at 10 GHz

P. Saunier, W.S. Kopp, H.Q. Tserng, Y.C. Kao and D.D. Heston. "A Heterostructure FET with 75.8-Percent Power Added Efficiency at 10 GHz." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 635-638.

We are reporting the performance of a new AlGaAs/GaAs heterostructure FET (HFET), designed to have very high efficiency at X-band with high drain bias (9 volts and above). The combination of low doped (high 10^{16} cm/sup -3) AlGaAs under the gate and highly doped (mid 10^{17} cm/sup -3) GaAs channel and superlattice buffer layer allow high gate-drain and source-drain breakdown voltage (more than 20 volts), constant transconductance and moderate to high maximum channel current (350 to 450 mA/mm). These characteristics make the devices ideal for Class B and Class F operation. The $1200 \times 0.25\text{-}\mu\text{m}$ HFET devices have demonstrated a record power-added efficiency (PAE) of 75.8 percent with 603 mW of output power and 8.8 dB of gain with a 9-volt drain bias at 10 GHz. Other $1200 \times 0.25\text{-}\mu\text{m}$ HFET devices have demonstrated 63.2-percent PAE with 8.3 dB of gain and 851 mW of output power with a 12-volt drain bias. At 14 volts, we have measured 50-percent PAE with 7.4-dB gain and 1.1 watts of output power.

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Abstracts

One Watt, Very High Efficiency 10 and 18 GHz Pseudomorphic HEMTs Fabricated by Dry First Recess Etching

S. Shanfield, A. Platzker, L. Aucoin, T. Kazior, B.I. Patel, A. Bertrand, W. Hoke and P. Lyman. "One Watt, Very High Efficiency 10 and 18 GHz Pseudomorphic HEMTs Fabricated by Dry First Recess Etching." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 639-641.

We report on record 10 and 18 GHz power performance of double recessed 1.2 mm periphery pseudomorphic HEMTs where the critical first recess was formed with exceptional uniformity using dry etching and an AlGaAs etch stop layer. Simultaneous power, gain, and power-added efficiency, representative of many devices, is summarized below.



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Optimized 0.1 μm GaAs MESFET's

K. Moore, J. East, G. Haddad and T. Brock. "Optimized 0.1 μm GaAs MESFET's." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 643-646.

We have optimized the design of conventional GaAs MESFET's for high frequency operation. FET's were fabricated using electron beam lithography to define 0.1 μm "mushroom" and "Gamma" gates. The best results obtained include peak transconductance of 600mS/mm, $f_{\text{sub}}/t = 93$ GHz, and $f_{\text{sub max}}/ \geq 150$ GHz. In addition, studies were carried out to examine the effect of gate shape and location on high frequency device performance.

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High Breakdown Voltage, Sub-Micro, Strained InGaAlAs/GaAs FET's

K.W. Eisenbeiser, J.R. East, G.I. Haddad and T. Brock. "High Breakdown Voltage, Sub-Micro, Strained InGaAlAs/GaAs FET's." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 647-650.

Sub-micron gate GaAs FET's with a pseudomorphic surface layer of InGaAlAs used to increase breakdown voltage have been fabricated. A 0.2 μm gate length device with $I_{\text{sub dss}}$ of 360 mA/mm and $g_{\text{sub m}}$ of 260 mS/mm has a $BV_{\text{sub ds}}$ of 9.3 V and a $BV_{\text{sub gd}}$ of 11.5 V. $F_{\text{sub max}}$ for this device is 80 GHz. The effect upon device performance of gate length, source-to-drain spacing and Al mole fraction was also investigated. The breakdown voltage shows only small changes with changes in gate length at submicron dimensions. The source-to-drain spacing changes not only the breakdown voltage but also appears to change the mechanism that limits high voltage performance.

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Pseudomorphic Inverted HEMT Suitable to Low Supplied Voltage Application (1992 Vol. II [MWSYM])

M. Kasashima, Y. Arai, H.I. Fujishiro, H. Nakamura and S. Nishi. "Pseudomorphic Inverted HEMT Suitable to Low Supplied Voltage Application (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 651-654.

The superiority of pseudomorphic inverted HEMT as a promising low-voltage-operating device was revealed. To study the high frequency properties of FET, two types of frequency variable measurement systems which represent active load and common-source circuits were employed. It was confirmed that the feature of low knee voltage in static I-V is preserved above 100kHz, which predicts the microwave characteristics of the device. Estimated output power was 50% higher than that of conventional pseudomorphic HEMT at $V_{ds}=1V$.

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Modeling on Statistical Distribution of Noise Parameters in Pulse-Doped GaAs MESFETs

*N. Shiga, S. Nakajima, K. Otohe, T. Sekiguchi, N. Kuwata, K.-I. Matsuzaki and H. Hayashi.
"Modeling on Statistical Distribution of Noise Parameters in Pulse-Doped GaAs MESFETs."
1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 655-658.*

Process-related variation of noise parameters in pulse-doped GaAs MESFETs is discussed in this paper. Fluctuation in gate length of the proposed devices is shown to be a dominant source of variation in noise parameters. The statistical distribution of the minimum noise figure (F_{min}) is modeled and the probability density function is described. Comparison between the calculated result of the derived equation and the measured distribution of F_{min} is also shown.

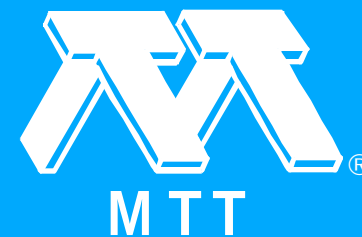
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Abstracts

Session R -- Microwave Optoelectronic Applications

"Session R -- Microwave Optoelectronic Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 659-659.



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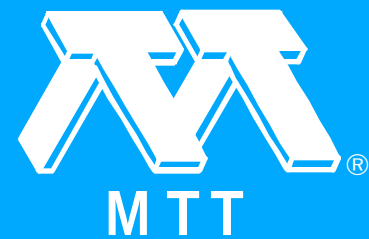
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On-Wafer Testing of MMIC with Monolithically Integrated Photoconductive Switches

S.L. Huang, E.A. Chauchard, C.H. Lee, T.T. Lee, H.-L.A. Hung and T. Joseph. "On-Wafer Testing of MMIC with Monolithically Integrated Photoconductive Switches." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 661-664.

This is the first report that photoconductive (PC) test structures have been fabricated monolithically with MMIC amplifiers for microwave characterization using an optical technique. Good agreement has been obtained between the measured results and those obtained from a conventional network analyzer.

Click on title for a complete paper.

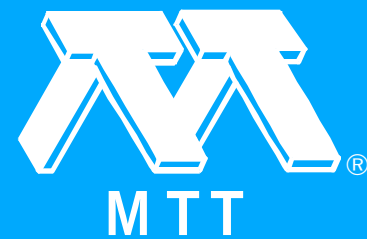


Abstracts

A Full Wave Simulation of Disturbances in Picosecond Signals by Electro-Optic Probing

D. Conn, X. Wu, J. Song and K. Nickerson. "A Full Wave Simulation of Disturbances in Picosecond Signals by Electro-Optic Probing." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 665-668.

Disturbances induced in electric fields near coplanar waveguides by electro-optic dielectric sampling probes are studied using a three dimensional FD-TD technique. Probing effects on the waveguide S-parameters are characterized and the signal field distortion in the optical tip is calculated. It is found that probes can have a significant effect on measurement accuracy in the subpicosecond domain, and that optical samples taken near the edge of the probe can result in measurements with less distortion than those taken at the center.



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Transient Response of High Electric Field Picosecond Photoconductive Switch

S.-L.L. Huang and C.H. Lee. "Transient Response of High Electric Field Picosecond Photoconductive Switch." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 669-672.

A numerical analysis has been performed to investigate the transient response of picosecond photoconductive switches under high electric field bias. For the first time the combined effect of carrier recombination and sweep-out coupled with the effect of velocity overshoot and saturation have been quantitatively analyzed. The simulated results shows that switches operating in the sweep-out regime can be as fast as switches operating in the recombination mode.

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Optoelectronic Devices for Unbiased Microwave Switching

J.L. Freeman, S. Ray, D.L. West and A.G. Thompson. "Optoelectronic Devices for Unbiased Microwave Switching." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 673-676.

Microwave switches needing no electrical bias are desirable in some environments. We present results from two devices: a surface-depleted, gateless, optical FET; and a FET controlled by an integrated photovoltaic diode. Insertion losses of 3 dB and isolations of 20 dB are obtained up to 5.6 GHz with an optical power of 1 mW.

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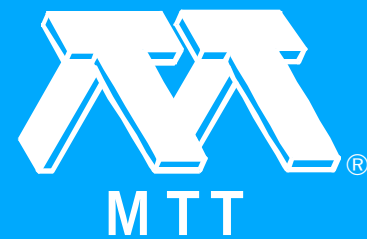


Abstracts

Fiberoptic Based Recirculating Memory Loop

R. Saedi, A. Daryoush and P. Herczfeld. "Fiberoptic Based Recirculating Memory Loop." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 677-680.

This paper presents the analysis and experimental results of a recirculating memory loop operating over 2-4GHz with delays up to millisecond using an adaptive gain equalizing technique. The effect of the number of recirculation on the fidelity of the coded microwave signals is studied. The spectral purity characteristic of recirculated signals are quantified for various recirculation times.



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Integrated 6-Bit Photonic True-Time-Delay Unit for Lightweight 3-6 GHz Radar Beamformer

E. Ackerman, S. Wanuga, D. Kasemset, W. Minford, N. Thorsten and J. Watson. "Integrated 6-Bit Photonic True-Time-Delay Unit for Lightweight 3-6 GHz Radar Beamformer." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 681-684.

Photonics will provide the interconnect solution for next-generation phased array radar antennas and satellite communications links, which have conformality, bandwidth, EMI immunity, size, and weight requirements increasingly difficult, if not impossible, to meet using conventional electrical interconnect methods. GE and AT&T aim to develop and implement fiber optic signal distribution networks that afford an octave of instantaneous bandwidth and that are 75 percent smaller and lighter than their electronic equivalents. We have developed a low-loss (nominally 14.0 ± 0.4 dB for $\lambda = 1.3 \mu\text{m}$) integrated 6-bit photonic time-delay unit to be used in the demonstration of a photonic beamformer for eight subarrays of a 3-6 GHz phased array radar.

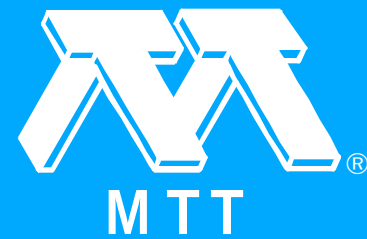
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Abstracts

Session S -- Millimeter Wave Systems Applications

"Session S -- Millimeter Wave Systems Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 685-685.



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Abstracts

Extended Range Coverage of an Imaging Radar System with Feed-Mounted 94 GHz MIMIC HEMT Low Noise Amplifier and External ILO

L.Q. Bui, Y. Alon and D. Neilson. "Extended Range Coverage of an Imaging Radar System with Feed-Mounted 94 GHz MIMIC HEMT Low Noise Amplifier and External ILO." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 687-690.

Low transmitted power and high noise figure of a homodyne FMCW front-end limit range coverage of 94 GHz imaging radars to less than 1000 meters. Using a combination of 2-stage MIMIC, 94 GHz HEMT low noise amplifier and external ILO mounted at the feed locations, the improved imaging radar can produce visible runway images up to 3,000 meters away. The very first FMCW runway images are shown to demonstrate the 94 GHz system resolution; additional images will be presented for adverse weather conditions. This is the first time low noise MIMIC technology is being used in a high potential, 94 GHz commercial airborne radar system.



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Millimeter Wave Up/Down Converter Technology for Spaceborne Applications

M. Piloni, F. Montauti and S. Crema. "Millimeter Wave Up/Down Converter Technology for Spaceborne Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 691-694.

This paper deals with the design of V band up/down converters for spaceborne communication systems. On the analysis of interesting results obtained on BB models, it demonstrates that, at present, the above design approaches represent the most reliable and performant circuits to operate as up/down converter above 60 GHz.

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A MM-Wave Frequency Divider

P. Nuchter and W. Menzel. "A MM-Wave Frequency Divider." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 695-697.

At lower GHz frequencies, frequency dividers are widely used - in conjunction with PLL circuits - for frequency stabilization. This was, up to now, difficult for mm-wave frequencies. This paper presents, for the first time, a mm-wave frequency divider with a division ratio sufficiently high (e.g. 8) so that digital dividers can be used next. The mm-wave divider is based on a combination of analogue and digital components, and it may easily be realized using (monolithically) integrated circuits.

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Quasi-Optical Stabilisation of Millimetre Wave Sources

G.M. Smith and J.C.G. Lesurf. "Quasi-Optical Stabilisation of Millimetre Wave Sources." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 699-702.

A novel tunable quasi-optical scheme is presented to provide stabilisation of both fundamental and second-harmonic oscillators at W-band (75-110GHz), with excellent isolation from the load. A reduction of phase noise by more than 40dB on free-running Gunn oscillators at 90GHz is demonstrated with SSB phase noise better than -120dBc/Hz at 100kHz away from the carrier. This stabilisation scheme uses external high Q transmission and reaction stabilising cavities, where coupling is achieved using beam-splitters with low power loss. The technique can be directly applied to improve the performance of existing oscillators and is easily applicable at higher and lower frequencies. When used in conjunction with active locking it can provide state of the art performance.



GaAs Monolithic Components Development for Q-Band Phased Array Application

M. Aust, H. Wang, R. Carandang, K. Tan, C.H. Chen, T. Trinh, R. Esfandiari and H.C. Yen.
"GaAs Monolithic Components Development for Q-Band Phased Array Application." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 703-706.

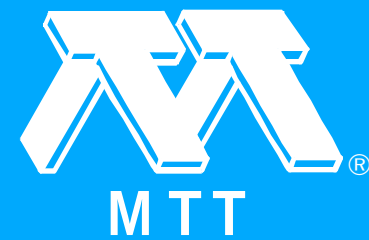
Major components for monolithic Q-band phased array applications have been developed using 0.2 μm doped channel pseudomorphic InGaAs/GaAs high electron mobility transistor technology. The components include a high gain, high efficiency monolithic amplifier and a three-bit switched line, monolithic phase shifter. At 44 GHz, measurement results of the amplifier demonstrates a small signal gain of 19.5 dB, and a power added efficiency of 20% at 3-dB compression point with an output power of 9 mW. The phase shifter has a measured insertion loss of 7.5 dB and a phase error /smaller than 7° from 43 to 45 GHz for all phase states. These components are suitable for monolithic integrated phased array transmitter applications.



Abstracts

Session T -- Vehicle Communication and Control Systems II

"Session T -- Vehicle Communication and Control Systems II." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 707-707.



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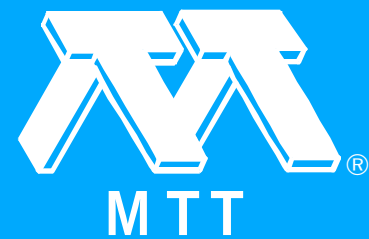
Development of Millimeter Wave Automotive Sensing Technology in Japan

M. Kotaki, Y. Takimoto, E. Akutsu, Y. Fujita, H. Fukuhara and T. Takahashi. "Development of Millimeter Wave Automotive Sensing Technology in Japan." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 709-712.

The Ministry of Posts and Telecommunications in Japan organized a committee to study millimeter wave sensing technologies in 1984. Sensors for automotive vehicles have been mostly studied as appropriate applications of millimeter waves. This paper presents the outline of three types of radars eg. FM-CW, 2D-imaging, and pulse Doppler, and also presents the study results and a lot of fundamental data measured through the laboratory and road tests. Among those, the FM-CW system shows good performance on freeway test and under adverse environmental conditions.

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An FM-CW Radar Module with Front-End Switching Heterodyne Receiver

T. Saito, N. Okubo, Y. Kawasaki, O. Isaji and H. Suzuki. "An FM-CW Radar Module with Front-End Switching Heterodyne Receiver." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 713-716.

We have developed a 60-GHz FM-CW radar module that generates sidebands by switching a HEMT front-end. Our module also uses heterodyne detection for FM-AM conversion noise reduction. The module's signal to noise ratio was 20 dB better than a previously designed homodyne FM-CW radar module.

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Improved Discrimination of Microwave Vehicle Profiles

H. Roe and G.S. Hobson. "Improved Discrimination of Microwave Vehicle Profiles." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 717-720.

An FMCW microwave system is described which can separate traffic into five classes. Profiles derived from speed and range data are characteristic but not immediately recognisable. Explanations are given and suggestions are made for a system with greater accuracy and a wider range of classification capability.

Click on title for a complete paper.

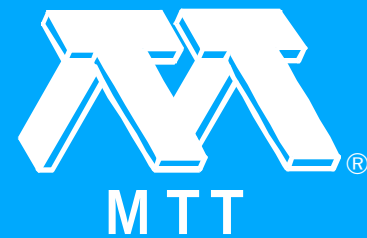


Abstracts

Millimetre Wave Radars for Automotive Applications

D.A. Williams. "Millimetre Wave Radars for Automotive Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 721-724.

This paper discusses recent developments in RADAR technology specifically in the Automotive area. The concept of Intelligent Cruise Control ICC is introduced and the application of millimetre wave sensors is discussed. FMCW and Pulse Coded RADARs are described and details of novel quasi-optical antennae and mixers are presented.



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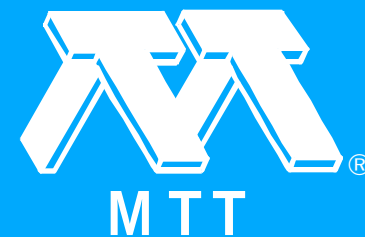
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Abstracts

Session U -- Solid-State Devices and Circuits: Non-FET I

"Session U -- Solid-State Devices and Circuits: Non-FET I." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 725-725.



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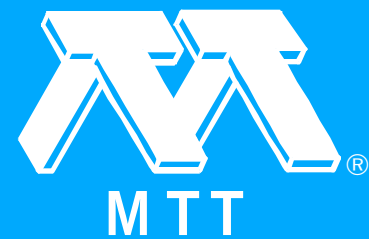
Investigation of HBT Oscillator Noise through 1/f Noise and Noise Upconversion Studies

M.N. Tutt, D. Pavlidis, A. Khatibzadeh and B. Bayraktaroglu. "Investigation of HBT Oscillator Noise through 1/f Noise and Noise Upconversion Studies." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 727-730.

It is shown that the $\mathcal{E}(f)$ characteristics of a HBT DRO can be approximated using the HBT's low frequency noise spectra and the oscillator's upconversion factor, $K'_{\text{sub FM}}$. Experimental studies have been used for this purpose and the measured $\mathcal{E}(f)$ ranged -89dBc/Hz to -101dBc/Hz at a 10kHz offset frequency (-124dBc/Hz best performance at 100kHz). It was shown that the upconversion of the low frequency noise is the primary cause of $\mathcal{E}(f)$ in the oscillator and its frequency dependence is directly impacted by the low frequency noise spectrum rather than $K'_{\text{sub FM}}$ itself. $d\mathcal{E}(f)/df$ deviates from the -30dB/decade rate, expected for upconversion of ideal 1/f noise, due to traps in the device.

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Temperature Dependence of DC Currents in HBT

H. Wang, C. Algani, A. Konczykowska and W. Zuberek. "Temperature Dependence of DC Currents in HBT." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 731-734.

A DC thermal-electrical HBT model is presented in this paper. Only three parameters were needed to simulate completely an HBT with the self-heating effect, and it can be very easily implemented in any CAD softwares which use the SPICE BJT model. Parameter extractions have been carried out on several measured data and good fittings were obtained over a wide temperature range. This model is ready to be used to design high power heterojunction bipolar transistors and circuits with their thermal effects.

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Direct Calculation of the HBT Equivalent Circuit from Measured S-Parameters

D.R. Pehlke and D. Pavlidis. "Direct Calculation of the HBT Equivalent Circuit from Measured S-Parameters." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 735-738.

A new approach for directly calculating the HBT equivalent circuit from measured S-parameters is presented. Analytically derived rather than fitted solutions are obtained in this way. Extrinsic as well as intrinsic element values are computed without the use of special test structures or additional measurement steps. Bias dependent results for base resistance, collector resistance, base-collector capacitance, base transport factor, and base and collector transit times are discussed in detail.

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Reliability Analysis of Microwave GaAs/AlGaAs HBTs with Beryllium and Carbon Doped Base

F.M. Yamada, A.K. Oki, D.C. Streit, Y. Saito, D.K. Umemoto, L.T. Tran, S. Bui, J.R. Velebir and G.W. McIver. "Reliability Analysis of Microwave GaAs/AlGaAs HBTs with Beryllium and Carbon Doped Base." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 739-742.

The reliability characteristics of microwave GaAs/AlGaAs Npn Heterojunction Bipolar Transistors (HBTs) with beryllium (Be) and carbon (C) doped base layer has been investigated and compared by means of constant stress lifetest. Three groups of Be doped devices using a newly developed MBE profile exhibit a median-time-to-failure (MTTF) of up to 1.8×10^8 hours at 125°C junction temperature based on the lifetest characteristics of dc current gain, Beta. The C doped devices displays a MTTF of 4.2×10^5 hours under the same conditions. An equivalent failure rate of <0.1 FITs and 119 FITs at 10^5 hours were calculated for Be and C doped devices, respectively. Data on HBT stability are essential for microwave circuit applications.

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On-Wafer Measurement and Modeling of Millimeter-Wave GaAs Schottky Mixer Diodes

J.L. Allen, C.-Y. Chen and D.P. Klemer. "On-Wafer Measurement and Modeling of Millimeter-Wave GaAs Schottky Mixer Diodes." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 743-746.

Direct on-wafer U-band measurements of GaAs Schottky diodes have allowed for the development of bias-dependent nonlinear device models. The devices are low-parasitic-capacitance planar diodes, fabricated on epitaxial (n-on-n+ GaAs) substrates prepared by metal-organic chemical vapor deposition. Schottky contacts with areas of $4 \mu\text{m}^2$ and $9 \mu\text{m}^2$ were formed using a Ti-Pt-Au metallization and plated airbridge contact technique. Techniques evaluated for de-embedding device measurements involved both numerical simulation as well as a novel on-chip calibration procedure. Although this work considered Schottky diodes specifically, similar techniques could be employed for determining bias-dependent and large-signal models for the gate electrode of millimeter-wave MESFET and HEMT devices.

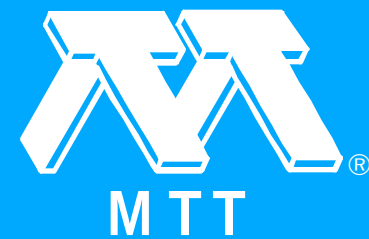
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Abstracts

Session V -- Microwave Photonic Signal Generation and Detection

"Session V -- Microwave Photonic Signal Generation and Detection." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 747-747.



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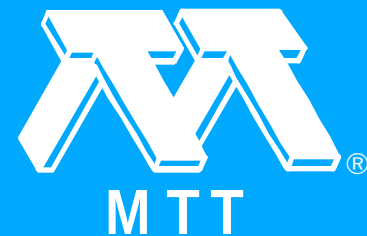


Abstracts

Microwave Opto-Electronics in Europe

A.J. Seeds. "Microwave Opto-Electronics in Europe." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 749-752.

The field of microwave opto-electronics is one of intense research interest in Europe. In this paper recent developments in components, sub-systems and applications are reviewed. Particular attention is given to work on coherent systems for signal generation and processing and to the impact of optical amplifiers on microwave opto-electronic system design.



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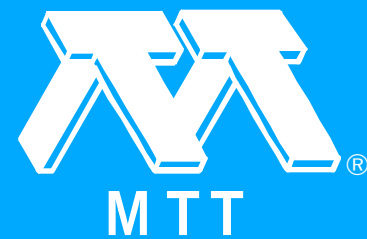
Abstracts

Microwave and Millimeter Wave Signal Generation Using Mode-Locked Semiconductor Lasers with Intra-Waveguide Saturable Absorbers

D.J. Derickson, R.J. Helkey, A. Mar, J.G. Wasserbauer, Y.G. Wey and J.E. Bowers.

"Microwave and Millimeter Wave Signal Generation Using Mode-Locked Semiconductor Lasers with Intra-Waveguide Saturable Absorbers." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 753-756.

Microwave and millimeter wave signals can be generated using mode-locked semiconductor lasers with intra-waveguide saturable absorbers. Monolithic and external cavity devices optimized for electrical and optical signal generation are discussed along with measurements of amplitude noise, phase noise, output power, and repetition rate tunability.



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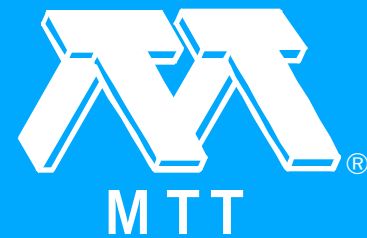


Abstracts

MMIC Compatible Lightwave-Microwave Mixing Techniques (1992 Vol. II [MWSYM])

S. Malone, A. Paoella, P.R. Herczfeld and T. Berceli. "MMIC Compatible Lightwave-Microwave Mixing Techniques (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 757-760.

The work presented in this paper concerns the mixing of a microwave signal with a modulated optical signal in a MESFET. A brief theoretical analysis of the IF term of the drain current is given in terms of the input signal parameters and device characteristics. Experimental results for two mixing configurations using the MESFET are shown, along with biasing conditions which maximize the IF response.



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Photo-Parametric Amplifier/Converter in Subcarrier Multiplexed Lightwave Communication Systems

A. Khanifar and R.J. Green. "Photo-Parametric Amplifier/Converter in Subcarrier Multiplexed Lightwave Communication Systems." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 761-764.

In this paper we shall report a novel type of low noise receiver for optical communication. The photo-parametric amplifier/converter maybe used as part of a conventions wideband receiver, offering improved noise performance, or as a low noise detector/converter in a microwave subcarrier-multiplexed optical communication system. The receiver is based on the photo-parametric mode of operation, where a photo-detector is pumped at microwave frequencies and photo-detection and parametric amplification are achieved simultaneously in a single device. Frequency conversion/amplification is also possible to suit particular system applications.

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



Laser Induced Phase Noise in Optically Injection Locked Oscillator

X. Zhang, T.-D. Ni and A.S. Daryoush. "Laser Induced Phase Noise in Optically Injection Locked Oscillator." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 765-768.

The spectral purity of a microwave reference signal, distributed by fiberoptic link to subharmonically injection lock oscillator can be degraded by laser large-signal noise. This paper present analysis predicting the conversion of the laser intrinsic noise to the FM noise of the frequency reference. The Langevin noise conversion model was validated through measurement of the phase noise of the subharmonically injection locked 5GHz oscillator.

Abstracts

The Predicted Signal to Noise Performance of a Photodiode-Distributed Amplifier Optical Detector

C.S. Aitchison. "The Predicted Signal to Noise Performance of a Photodiode-Distributed Amplifier Optical Detector." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 769-772.

This paper calculates the signal to noise ratios obtained from an optical detector consisting of a p-i-n photodiode-grounded source MESFET amplifier and also from a p-i-n photodiode-distributed amplifier combination. Expressions are given for both and compared numerically showing that the distributed amplifier combination is superior by up to 10dB for bandwidths up to 40GHz.



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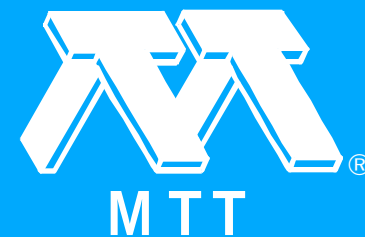
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Abstracts

Session W -- Discrete Modeling of Fields in Microwave Structures

"Session W -- Discrete Modeling of Fields in Microwave Structures." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 773-773.



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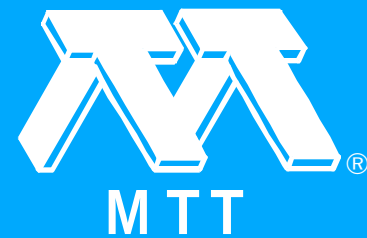


Abstracts

A Frequency Domain TLM Method

H. Jin and R. Vahldieck. "A Frequency Domain TLM Method." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 775-778.

A new TLM method is presented which operates directly in the frequency domain while following the basic time domain solution procedure. The new method combines the flexibility of the conventional TLM method with the computational efficiency of frequency domain techniques. S-parameters for 3D waveguide discontinuities are calculated and good agreement is found with other methods.



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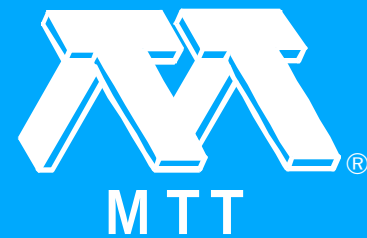


Abstracts

TLM Synthesis of Microwave Structures Using Time Reversal

M. Forest and W.J.R. Hoefer. "TLM Synthesis of Microwave Structures Using Time Reversal." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 779-782.

This paper presents a novel numerical synthesis technique based on the reversal of the TLM process in time. It allows the designer to generate the geometry of a passive circuit from its desired frequency response using alternate forward and backward time domain simulation. The essential steps of the procedure are explained and validated using, as an example, the synthesis of an inductive obstacle in a waveguide.



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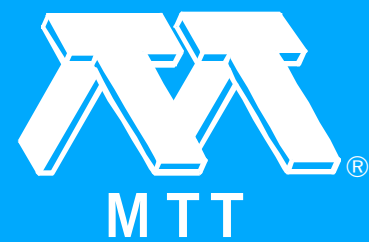
A Fast Two Dimensional FDTD Full-Wave Analyser with Adaptive Mesh Size

S. Xiao, R. Vahldieck and H. Jin. "A Fast Two Dimensional FDTD Full-Wave Analyser with Adaptive Mesh Size." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 783-786.

A two-dimensional variable Yee's mesh algorithm with reduced mid size is proposed for the full-wave analysis of arbitrarily shaped guided wave structures. The method includes losses and allows the frequency selective application of the FDTD method. The continuously variable mesh size in x- and y-direction makes it possible to resolve partially fine circuit structures in both dimensions, while in other circuit sections a coarse mesh size can still be used.

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High-T/_c/ Superconducting Coupled Coplanar Transmission Lines: A 3D-Transmission Line Matrix Analysis

M. Vanselow, B. Isele, R. Weigel and P. Russer. "High-T/_c/ Superconducting Coupled Coplanar Transmission Lines: A 3D-Transmission Line Matrix Analysis." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 787-790.

The application of the three dimensional transmission line matrix (3D-TLM) approach to straight high-T/_c/ super-conducting coupled coplanar waveguide (CCPW) structures, suitable for high-speed interconnects, is presented. We have investigated CCPW's fabricated from laser ablated YBa/₂/Cu/₃/O/₇/ (YBCO) thin-films on lanthanum aluminate (LaAlO/₃) substrates with 0.5 mm thickness. To represent three dimensional space, we use the symmetrical condensed TLM node and a non-uniform discretization scheme. The surface impedance of the high-T/_c/ superconducting film is described by London theory and modeled as a thin TLM network loaded with resistive and inductive stubs. The losses of the substrate are represented by additional conductance connected in parallel. CCPW line-to-line coupling is evaluated. Preliminary experimental results with fold CCPW's on LaAlO/₃ are discussed. The work arose from a requirement of an accurate analysis of the line-to-line coupling of bent (meander line) long length coplanar waveguides (CPW's) on a 20x20 mm² LaAlO/₃ substrate.



Abstracts

The Implementation of Smoothly Moving Boundaries in 2D and 3D TLM Simulations

U. Muller, A. Beyer and W.J.R. Hoefer. "The Implementation of Smoothly Moving Boundaries in 2D and 3D TLM Simulations." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 791-792.

In this paper a novel technique for arbitrary boundary positioning in TLM networks will be described. This capability removes the restriction that dimensions of TLM models can only be integer multiples of the mesh parameter and allows superior boundary resolution. Since the position of boundaries can be continuously varied even during a simulation, this feature can model moving boundaries for time domain optimization and phenomena such as the Doppler effect.



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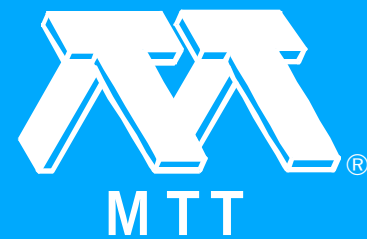


Abstracts

Digital Signal Processing of Time Domain Field Simulation Results Using the System Identification Method (1992 Vol. II [MWSYM])

W. Kuempel and I. Wolff. "Digital Signal Processing of Time Domain Field Simulation Results Using the System Identification Method (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 793-796.

A new technique for significantly reducing the computation time of time domain field simulations using modern digital signal processing techniques is presented. The procedure leads to a simple model of the investigated structure in form of a digital filter. As an example the method is applied to a TLM simulation of a resonant cavity.



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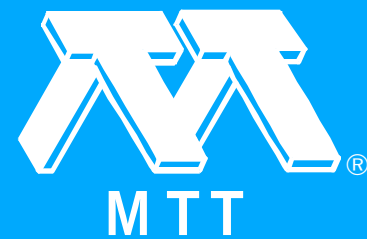


Abstracts

The Method of Lines for the Rigorous Full Wave Analysis of Rectangular Bends of Multiple-Line-Systems

F.J. Schmuckle and R. Pregla. "The Method of Lines for the Rigorous Full Wave Analysis of Rectangular Bends of Multiple-Line-Systems." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 797-800.

A new full-wave analysis for the consistent investigation of the electrical characteristics of rectangular bends of coupled lines using the Method of Lines is presented. The scattering matrices and the equivalent circuits are determined. As an application the analysis is used in the investigation of the electrical properties of rectangular spiral inductors.



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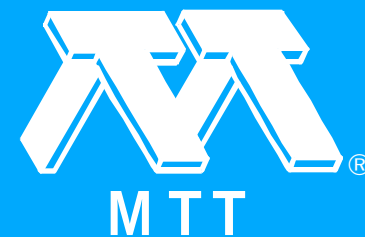
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Abstracts

Session X -- Advanced Millimeter Wave Technology (Focused Session)

"Session X -- Advanced Millimeter Wave Technology (Focused Session)." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 801-801.



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An Ultra Low Noise W-Band Monolithic Three-Stage Amplifier Using 0.1 μm Pseudomorphic InGaAs/GaAs HEMT Technology

H. Wang, T.N. Ton, K.L. Tan, G.S. Dow, T.H. Chen, K.W. Chang, J. Berenz, B. Allen, P. Liu, D. Streit, G. Hayashibara and L.C.T. Liu. "An Ultra Low Noise W-Band Monolithic Three-Stage Amplifier Using 0.1 μm Pseudomorphic InGaAs/GaAs HEMT Technology." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 803-806.

An ultra low noise W-band monolithic three-stage amplifier based on 0.1 μm pseudomorphic InGaAs/GaAs HEMT devices has been developed. This amplifier has a measured noise figure of 3.5 dB with an associated small signal gain of 21 dB at 94 GHz. This is the best reported performance of a monolithic W-band high gain LNA and shows significant improvement compared with previous records in terms of noise figure and associated gain. The success of this LNA development is attributed to the excellent device performance and a rigorous design analysis methodology. The state-of-the-art MMIC performance shows great promise of the emerging technology for low cost W-band receiver applications.

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W-Band and D-Band Low Noise Amplifiers Using 0.1 Micron Pseudomorphic InAlAs/InGaAs/InP HEMTs

P.D. Chow, K. Tan, D. Streit, D. Garske, P. Liu and R. Lai. "W-Band and D-Band Low Noise Amplifiers Using 0.1 Micron Pseudomorphic InAlAs/InGaAs/InP HEMTs." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 807-810.

We report the W-band and D-band performance of 0.1 micron T-gate pseudomorphic In/sub 0.53/Al/sub 0.47/As/In/sub 0.60/Ga.sub 0.40/As/InP High Electron Mobility Transistors (HEMTs). The device achieved 1.3 dB noise figure and 8.2 dB associated gain when biased and tuned for minimum noise figure at 95 GHz. It achieved 7.3 dB gain when biased and tuned for gain at 141.5 GHz. This is the highest gain ever reported for a three-terminal semiconductor device in this frequency range. The two-stage hybrid LNA fabricated with these devices demonstrated a minimum noise figure of 2.6 dB and 14.2 dB associated gain at waveguide interface at 92 GHz. This is the lowest reported noise figure for a two-stage LNA at this frequency.

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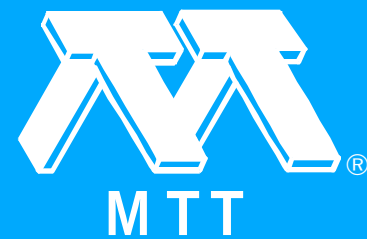


Abstracts

60 GHz Sources Using Optically Driven HBTs

D.C. Scott, D.V. Plant and H.R. Fetterman. "60 GHz Sources Using Optically Driven HBTs." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 811-814.

Millimeter wave sources at 60 GHz have been demonstrated using optically driven heterojunction bipolar transistors configured as photodetectors. Two techniques were used to optically generate the millimeter waves; the mixing of two cw lasers and the mode locking of a semiconductor laser. The millimeter wave power generated from these two configurations was radiated into free-space using integrated planar twin dipole antennas and heterodyne detected with signal to noise ratios > 40 dB. As part of these experiments, the DC optical gain and quantum efficiency of the HBT photodetectors was determined.



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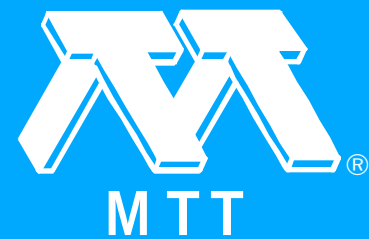
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Oscillator and Amplifier Grids

D. Rutledge, J.B. Hacker, M. Kim, R.M. Weikle, II, R.P. Smith and E. Sovero. "Oscillator and Amplifier Grids." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 815-818.

In this paper we present the largest recorded output power for a quasi-optical power-combining array and a new planar HBT grid amplifier design. A 16-element MESFET grid oscillator has been fabricated that generates an effective radiated power (ERP) of 28 W at 9.21 GHz. The total radiated power is estimated to be 2.0 W giving a dc to rf efficiency of 28%. A new planar grid amplifier is also presented that is suitable for monolithic fabrication. The planar amplifier grid is a hybrid design using HBT transistors monolithically fabricated in a differential pair configuration and wire bonded to a Duroid substrate. The grid amplifier has a measured gain of 11 dB at 9.9 GHz.

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Abstracts

V-Band and W-Band Broadband, Monolithic Distributed Frequency Multipliers (1992 Vol. II [MWSYM])

E. Carman, M. Case, M. Kamegawa, R. Yu, K. Giboney and M. Rodwell. "V-Band and W-Band Broadband, Monolithic Distributed Frequency Multipliers (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 819-822.

Broadband V-Band and W-Band frequency multiplication is reported using soliton propagation on GaAs monolithic nonlinear transmission lines. With 24 dBm input a doubler attained 17.4 dBm peak output power with at least 52-63.1 GHz 3-dB bandwidth, and a tripler attained 12.8 dBm peak output power with at least 81-108.8 GHz 3-dB bandwidth. These multipliers, fabricated with 3- μ m design rules on Gas and driven with lower frequency amplifiers, have applications as cost-effective signal sources in mm-wave communication and measurement systems.



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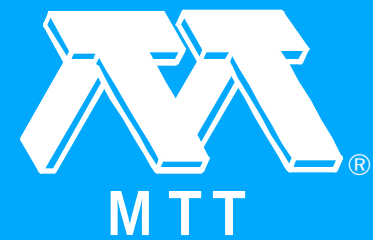
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Abstracts

Session IF2 -- Interactive Forum II

"Session IF2 -- Interactive Forum II." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 823-823.



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An Improved MESFET Model for Prediction of Intermodulation Load-Pull Characterization

J.C. Pedro and J. Perez. "An Improved MESFET Model for Prediction of Intermodulation Load-Pull Characterization." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 825-828.

An accurate characterization of the nonlinear distortion caused by the $I_{ds}(V_{gs}, V_{ds})$ current in a MESFET, does not allow the common approach of splitting this nonlinear equivalent circuit element in two voltage dependent nonlinear current sources, $G_m(V_{gs})$ and $G_{ds}(V_{ds})$. By an improved laboratory characterization procedure, it was possible to show that the cross terms of the $I_{ds}(V_{gs}, V_{ds})$ Taylor Series expansion can give an important contribution to the prediction of MESFET's intermodulation load-pull behavior.

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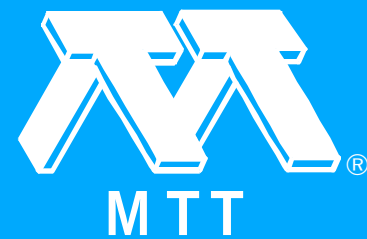


Abstracts

The S-Probe a New, Cost-Effective, 4-Gamma Method for Evaluating Multi-Stage Amplifier Stability

K. Wang, M. Jones and S. Nelson. "The S-Probe a New, Cost-Effective, 4-Gamma Method for Evaluating Multi-Stage Amplifier Stability." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 829-832.

This paper describes a generalized, automated, noninvasive, "4-Gamma" technique for stability analysis of multi-stage active circuits. It operates directly in the circuit-simulator environment and eliminates all off-line calculations. This technique can be extended to n-port networks and works equally well with circuit models or s-parameter descriptions. Most importantly, it can detect special cases of instability involving "active" terminations. These are often missed using conventional stability analysis approaches.



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Abstracts

Exact Group Delay Sensitivities for Minimization of Delay and Distortion in High-Speed VLSI Interconnects

R. Liu, Q.J. Zhang and M.S. Nakhla. "Exact Group Delay Sensitivities for Minimization of Delay and Distortion in High-Speed VLSI Interconnects." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 833-836.

Efficient computation of exact group delay and its sensitivities w.r.t. design parameters in multiconductor transmission line networks is presented. This method is combined with minimax optimization to perform gradient based minimization of delay and distortion in high-speed VLSI interconnects.



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Predictable Yield-Driven Circuit Optimization

J.W. Bandler, S. Ye, Q. Cai, R.M. Biernacki and S.H. Chen. "Predictable Yield-Driven Circuit Optimization." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 837-840.

This paper presents a comprehensive approach to predictable yield optimization. We utilize a new physics-based statistical GaAs MESFET model which combines the advantages of the dc Khatibzadeh and Trew model and the small-signal Ladbroke formulas. The yield of a broadband amplifier is significantly improved after optimization. Predicted yield over a range of specifications is verified by device data. The benefits of simultaneous circuit-device yield optimization assisted by yield sensitivity analysis are demonstrated.

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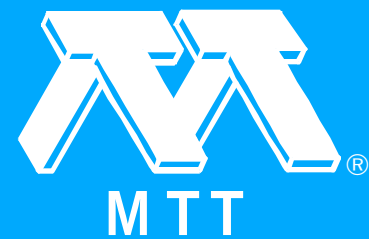


Abstracts

Computer-Aided Design and Analysis of Lightwave/Microwave Systems

T. Zhang, R. Hicks and R.S. Tucker. "Computer-Aided Design and Analysis of Lightwave/Microwave Systems." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 841-844.

This paper describes algorithms and techniques for the computer-aided design and analysis of optoelectronic circuits for microwave applications. Linear and non-linear analysis methods for hierarchically structured multiport microwave circuits with arbitrary topology have been extended to include optoelectronic device models. Ideal control sources are often used in modelling optoelectronic and optical components, and sometimes introduce problems to nodal analysis and harmonic balance methods. The paper will show how these difficulties can be overcome and how lightwave/microwave circuits can be efficiently analyzed. As an example, a novel lightwave/microwave transceiver module has been analyzed and optimized for large-signal operation at microwave frequencies.



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Abstracts

Analysis of Planar Circuit Discontinuities Using the Quasi-Static Space-Spectral Domain Approach

M. Yu, K. Wu and R. Vahldieck. "Analysis of Planar Circuit Discontinuities Using the Quasi-Static Space-Spectral Domain Approach." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 845-848.

A new deterministic quasi-static method is presented for the analysis of arbitrarily shaped planar circuit discontinuities including air bridges. Using the basic principles of the space-spectral domain approach (SSDA), this new method leads to an algebraic matrix equation for the discontinuity s-parameters. The resulting algorithm is computationally very efficient. Results are presented for microstrip and CPW discontinuities as well as CPW air bridges.



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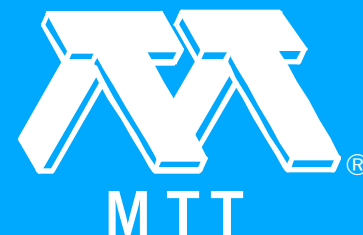


Abstracts

Impedance Domain Green's Functions in the Spectral for Layered Anisotropic Media

Z. Cai and J. Bornemann. "Impedance Domain Green's Functions in the Spectral for Layered Anisotropic Media." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 849-852.

This paper presents new formulations of the impedance Green's functions in the spectral domain for general anisotropic media. The main advantages are: first, decoupling of the relationship between electric and magnetic field as opposed to dealing with coupled equations obtained when using other methods, and secondly, obtaining closed form expressions of the different TE and TM wave propagation constants. This is essential for modelling substrates involving tensor components and for the rigorous analysis of (M)MIC structures on multiple layered anisotropic substrates. The theory is demonstrated at the example of microstrip lines on ferrite-dielectric substrates with different directions of magnetic bias. The numerical results are found to be in good agreement with previously published data.



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Effect of Dispersion in the 3-D Condensed Node TLM Mesh

J.S. Nielsen and W.J.R. Hoefer. "Effect of Dispersion in the 3-D Condensed Node TLM Mesh." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 853-855.

The general dispersion equation, derived for the 3D-TLM condensed node mesh is presented and compared to dispersion of the FD-TD and the expanded node TLM schemes. Spurious mode propagation, as predicted by the dispersion equation for the condensed node, is also addressed. Analysis of dispersive effects is essential to assessing abnormalities in time domain simulations.

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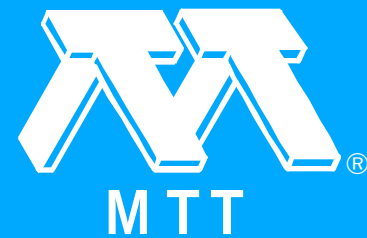


Abstracts

Production Costs Optimization of Microwave Circuits

P.C.K. Liu, K.K. So and K.C. Li. "Production Costs Optimization of Microwave Circuits." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 857-860.

Formulations on production repair and throw-away costs in microwave circuit design is presented in this paper. The traditional methods of design centering and tolerancing are extended to incorporate the anticipated production costs. The approach provides direct physical meanings to the problem of yield optimization.



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An Expert System for Microwave Amplifier Design

G. Parks and D. Linton. "An Expert System for Microwave Amplifier Design." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 861-864.

An expert system to assist in the design of different classes of linear microwave amplifiers for MIC/MMIC circuits is presented for the first time. The principal stages in the design of such a circuit are outlined and the decision to implement the expert system justified. Two important aspects of the design process are addressed; the choice of optimum circuit topology for a given specification and the selection of a suitable FET or FETs for that topology. The overall structure of the expert system is described and its operation demonstrated using a typical amplifier design.

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Characterizing Microwave Planar Circuits by Coupled Finite-Boundary Element Method

K.-L. Wu, C. Wu and J. Litva. "Characterizing Microwave Planar Circuits by Coupled Finite-Boundary Element Method." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 865-868.

A general approach to the analysis of microwave planar structures, specifically intended to treat complicated geometries and dielectric load, is presented. The proposed approach is based upon the coupling of the finite element and boundary element methods. The respective merits of these methods are extracted to yield much faster solution and to enhance computation efficiency. This general approach can handle a problem with mixed electric and magnetic walls, as well as complicated dielectric had such as ferrite materials. Computed and measured data for various complicated devices are compared, showing an excellent agreement.

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Abstracts

Enhancing Finite-Difference Time-Domain Analysis of Dielectric Resonators Using Spectrum Estimation Techniques

Z. Bi, Y. Shen, K. Wu and J. Litva. "Enhancing Finite-Difference Time-Domain Analysis of Dielectric Resonators Using Spectrum Estimation Techniques." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 869-872.

In this paper we discuss the use of digital filtering and spectrum estimation techniques for improving the efficiency of the FD-TD algorithm in solving eigenvalue problems. It is demonstrated by means of numerical results that the efficiency of the FD-TD method for dielectric resonator analysis has been improved at least one order of magnitude. This new result makes it possible for the FD-TD method to be a practical designing tool for the dielectric resonator analysis.



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Abstracts

A Generalized Model for Coupled Lines and its Application to Planar Balun Synthesis

C.M. Tsai and K.C. Gupta. "A Generalized Model for Coupled Lines and its Application to Planar Balun Synthesis." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 873-876.

A network model for unsymmetrical and inhomogeneous coupled lines has been derived based on normal mode parameters. This model is useful for synthesis of single and multi-layer coupled line circuits. As an example, the model is used for synthesis of a planar balun configuration. The synthesis procedure is verified by comparison with the analysis results.



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MIS Slow-Wave Structures Over a Wide Range of Parameters (1992 Vol. II [MWSYM])

J.P.K. Gilb and C.A. Balanis. "MIS Slow-Wave Structures Over a Wide Range of Parameters (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 877-880.

The high dielectric losses of the semiconducting substrates used in MMIC's and VLSI interconnects can strongly affect all of the characteristics of these lines. Since no single approximate formulation is accurate over a wide range of substrate parameters or over a large frequency range required for a transient analysis, a full-wave approach is required to analyze these structures. Multi-conductor MIS structures are analyzed with the spectral domain approach over a wide range of frequency and substrate loss. The modal attenuation and propagation constants are presented two and four conductor structures as a function of the substrate loss tangent. Single conduct or structures are characterized with contour plots showing the complex effective dielectric constant as a function of both frequency and conductivity.

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Abstracts

Computer-Aided Analysis and Improvement of an 8 to 18 GHz YIG-Tuned FET Oscillator

D.W. Van Der Weide. "Computer-Aided Analysis and Improvement of an 8 to 18 GHz YIG-Tuned FET Oscillator." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 881-884.

Enhancing the performance of a wide-band YIG oscillator requires a comprehensive model of the circuit so that simulation accurately reflects its behavior in the laboratory. We describe how an 8 to 18 GHz FET oscillator is modeled and improved using both circuit simulation and field solving tools, along with fixtures for measuring YIG spheres and other passive networks.



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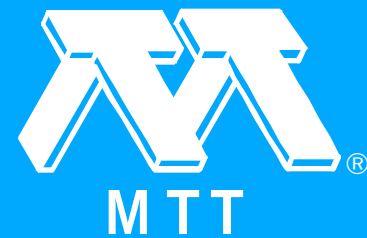


Abstracts

A Single Stability Parameter for Linear 2-Port Circuits

M.L. Edwards and J.H. Sinsky. "A Single Stability Parameter for Linear 2-Port Circuits." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 885-888.

A new stability parameter, " $\mu(S)$ ", is defined for linear 2-port circuits. It is shown that $\mu > 1$ alone is necessary and sufficient for the circuit to be unconditionally stable. This single parameter can replace the traditional Rollet condition $K > 1$ which requires that an additional auxiliary condition also be met for absolute stability.



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Abstracts

Analysis of Microstrip T-Junction and its Application to the Design of Transfer Switches

R.R. Mansour and J. Dude. "Analysis of Microstrip T-Junction and its Application to the Design of Transfer Switches." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 889-892.

A simplified field theory formulation is presented for analysing microstrip T-junctions. The computed junction scattering parameters (magnitude and phase) are in good agreement with experimental results. The formulation is extended to analyse a microwave transfer switch realized by cascading a number of microstrip T-junctions.



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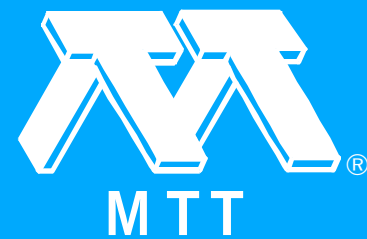


Abstracts

Statistical Performance Sensitivity - A Valuable Measure for Manufacturing Oriented CAD

J. Purviance and M. Meehan. "Statistical Performance Sensitivity - A Valuable Measure for Manufacturing Oriented CAD." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 893-896.

This paper delineates the random and deterministic components of the manufacturing and design process. Design for manufacture includes determining the deterministic parameter vector, $\mathbf{P}/\text{sub } \mathbf{o}/$, such that some manufactured unit performance statistic, like $E\{G(\mathbf{P}/\text{sub } \mathbf{o}/ + \Delta \mathbf{P})\}$, or $\text{Yield}(\mathbf{P}/\text{sub } \mathbf{o}/)$, is controlled or optimized, where $G(\cdot)$ is a nonlinear function describing performance. The statistical sensitivities are an extension of classic sensitivities, applied to the general statistical outcome of the manufacturing process, and we develop an efficient way to calculate them, using Monte Carlo estimation.



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Abstracts

Coupling Fast Walsh Transform with Waveform Relaxation Technique to Analyze Lossy Coupled Transmission Lines

S. Qi and Q. Yang. "Coupling Fast Walsh Transform with Waveform Relaxation Technique to Analyze Lossy Coupled Transmission Lines." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 897-899.

A new approach, based on the waveform relaxation technique and fast Walsh transform, is first presented for the analysis of lossy coupled transmission lines (LCTL) with arbitrary terminal networks. The simulation accuracy of the new method can be greatly improved, the disadvantage which always exists in previous methods can be avoided and a considerable saving in time and memory of CPU is obtained.



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A New Evanescent-Mode Filter for Densely Packaged Waveguide Applications

V.A. Labay and J. Bornemann. "A New Evanescent-Mode Filter for Densely Packaged Waveguide Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 901-904.

A novel evanescent-mode filter structure based on T-septum waveguide technology is presented for applications in extremely compact designs. The excellent characteristics of the T-septum waveguide are utilized to significantly reduce the resonator cutoff frequency compared with standard ridge waveguide designs. This allows the evanescent-mode guide to become smaller in cross-section, hence considerably reducing the overall length of the filter. The computer-aided design uses a full-wave mode-matching technique which takes into account higher-order mode coupling at all discontinuities involved. Design data are given for X- and Ka-band. The method is verified by measurements. The manufactured 10GHz prototype measures only 18.4 mm in length.

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Abstracts

Coaxial and Circular Waveguide Bandpass Filters Using Printed Metal Inserts

B.V. de la Filolic and R. Vahldieck. "Coaxial and Circular Waveguide Bandpass Filters Using Printed Metal Inserts." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 905-908.

This paper presents a field theoretical analysis of metal septum loaded coaxial and circular waveguide sections. Based on the s-parameters derived from this analysis, bandpass filters are designed for the 30 GHz range. Theoretical performance and measured results are in excellent agreement and are better than 1.3 dB (S/sub 21/) and 25 dB (S/sub 11/), respectively.



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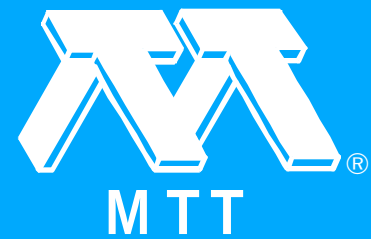


Abstracts

A Five Mode Single Spherical Cavity Microwave Filter

L. Sheng-Li and L. Wei-Gan. "A Five Mode Single Spherical Cavity Microwave Filter." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 909-912.

Triple-mode degeneracy in cylindrical cavities has been successfully applied to the design of satellite communications filter and multiplexer.



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Design and Performance of Waveguide E-Plane HTSC Insert Filters

L. Han, Y. Chen, Y. Wang, Q. Cheng, S. Yang and P. Wu. "Design and Performance of Waveguide E-Plane HTSC Insert Filters." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 913-916.

A design theory is described for waveguide E-plane inductive strip filters that takes the high order mode interaction and finite thickness of metal with dielectric substrate underneath into account. An X-band bandpass filter is fabricated with High-Tc Superconducting (HTSC) material. The measured results of the HTSC bandpass filter are presented and compared with the CAD predicted filter performances.

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Abstracts

Small-Size Comb-Line Microstrip Narrow BPF

K.-I. Konno. "Small-Size Comb-Line Microstrip Narrow BPF." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 917-920.

A small-size microstrip BPF is developed by using a high dielectric constant ($\epsilon_r = 92$) substrate, shield-lines between coupled resonators to get smaller coupling coefficient and short microstrip-line resonators of comb-line type. The newly developed three stage BPF is designed and demonstrated at 1.2GHz. This BPF can be produced at low cost and is useful for portable radio equipment.



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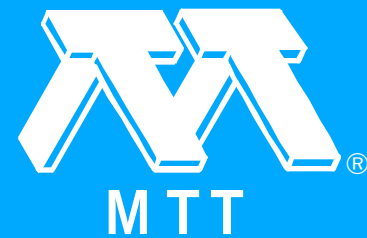


Abstracts

Tunable Active Bandpass Filters Using Three-Terminal MESFET Varactors

J. Lin and T. Itoh. "Tunable Active Bandpass Filters Using Three-Terminal MESFET Varactors." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 921-924.

The concept of three-terminal MESFET varactors is presented. Based on this concept, two types of tunable active bandpass filter working at X-band are developed. The experimental result shows the possibility of using the MESFET in the active mode to generate both a negative resistance and a variable reactance.



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Design Concept for Microwave Recursive and Transversal Filters Using Lange Couplers

L. Billonnet, B. Jarry and P. Guillon. "Design Concept for Microwave Recursive and Transversal Filters Using Lange Couplers." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 925-928.

This study focuses on the use of Lange couplers in the design of passive recursive and transversal filters in the microwave frequency range. First, a simple numerical method for the computation of the filter parameters is described. A synthesis example is given to illustrate the techniques for the wideband filter case. We then show how Lange couplers can be effectively employed in the design of recursive and transversal filters. We present analytical, computer-simulated and experimental results for two passive band-pass filters which are implemented on a Duroid substate ($\epsilon_r=2.43$; $h=500 \mu\text{m}$) in the 3-5 GHz frequency range. Good agreement is obtained between the theoretical and the measured S-parameters for the filters.

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A Multicomposite, Multilayered Cylindrical Dielectric Resonator for Application in MMIC's

W.K. Hui and I. Wolff. "A Multicomposite, Multilayered Cylindrical Dielectric Resonator for Application in MMIC's." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 929-932.

A brief summary is given of a new rigorous method to determine resonant frequencies and field distributions of all resonant modes in a multicomposite, multilayered cylindrical dielectric resonator. This resonator consists of a number of concentric cylinders, which are arbitrarily layered in axial direction. As examples, a dielectric sphere and a dielectric cone placed in MIC environment have been analysed. The sphere and the cone are structurally approximated by bodies of revolution with a stepped cross section. The calculated resonant frequencies have an accuracy of $<10^{-4}$.

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Analysis Method for Microstrip Line Power Dividers with Arbitrary Branching Circuit Pattern

L. Zhu and E. Yamashita. "Analysis Method for Microstrip Line Power Dividers with Arbitrary Branching Circuit Pattern." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 933-936.

The transmission and reflection properties of 3-dB microstrip line power dividers with a straight-line and curved branching circuit pattern have been analyzed based on the eigenfunction-weighted boundary integral equation method. Branching patterns can be arbitrary in this method. Theoretical values of scattering parameters are in reasonable agreement with initial experiment results at microwave frequencies.

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Sum-Difference Circuits Using 0 dB and -3 dB Co-Directional Couplers for Hybrid Microwave and MIMIC Circuit Applications

S. Uysal, J. Watkins and C.W. Turner. "Sum-Difference Circuits Using 0 dB and -3 dB Co-Directional Couplers for Hybrid Microwave and MIMIC Circuit Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 937-940.

A new design approach for microstrip Sigma - Delta Magic-T circuits is described. The technique employs entirely planar 0 dB and -3 dB co-directional quadrature couplers. 17% bandwidth is demonstrated at X-band from a Magic-T circuit built on an one inch square alumina substrate. Multioctave 0 dB coupling is also illustrated by a computed example. Any other coupling level can be derived directly from the 0 dB co-directional coupler thereby simplifying mask layout and significantly reducing design time. Accurate design curves for co-directional couplers on alumina substrate are given in the paper.

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Abstracts

The Full Hybrid Fields and Network Parameters of Transverse and Longitudinal Metallic Strips in Inset Dielectric Guide, (I.D.G.)

P. Sewell and T. Rozzi. "The Full Hybrid Fields and Network Parameters of Transverse and Longitudinal Metallic Strips in Inset Dielectric Guide, (I.D.G.)." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 941-944.

Arrays of metallic strips on the air-dielectric interface of an Inset Dielectric Guide, I.D.G., allow the simple fabrication of planar arrays that demonstrate pure polarisation and good efficiency and input match. This contribution presents, for the first time, a full hybrid characterisation of both transverse and longitudinal strips, producing vertical and horizontal polarisation respectively, investigating both the frequency and dimensional sensitivity of the near and far fields. In particular, we demonstrate the significant near field contribution of the radiation modes, which has important consequences for accurate design of arrays.



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A Coplanar Waveguide Broadside End-Coupled Band-Pass Filter

C. Nguyen. "A Coplanar Waveguide Broadside End-Coupled Band-Pass Filter." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 945-946.

A new broadside end-coupled band-pass filter using coplanar waveguide (CPW), suitable for wide-band microwave and millimeter-wave integrated circuits, has been developed. The shielded CPW and broadside CPW, employed in the filter, were analyzed using the quasi-static spectral-domain method. An X-band (8-12 GHz) three-resonator band-pass filter has been built and tested with a good agreement between the measured and calculated results.

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A Comprehensive Theoretical and Experimental Study of Coplanar Waveguide Shunt Stubs

N.I. Dib, G.E. Ponchak and L.P.B. Katehi. "A Comprehensive Theoretical and Experimental Study of Coplanar Waveguide Shunt Stubs." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 947-950.

A comprehensive theoretical and experimental study of straight and bent CPW shunt stubs is presented. In the theoretical analysis, the CPW is assumed to be inside a cavity, while, the experiments are performed on open structures. A hybrid technique has been developed to analyze the CPW discontinuities which has been proven to be accurate since the theoretical and experimental results agree very well. Throughout this study, the effect of the cavity resonances on the behavior of the stubs with and without air-bridges is investigated. In addition, the encountered radiation loss due to the discontinuities is evaluated experimentally.

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The Coplanar Waveguide-Fed Electronically Tunable Slotline Ring Resonator

J.A. Navarro, L. Fan and K. Chang. "The Coplanar Waveguide-Fed Electronically Tunable Slotline Ring Resonator." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 951-954.

A coplanar waveguide (CPW)-fed slotline ring resonator has been developed and integrated with varactor diodes to create an electronically tunable planar resonator. The resonator can be electronically tuned over a 23% bandwidth from 3.03 to 3.83 GHz with a 4.5 ± 1.5 dB variation in insertion loss. The resonator is truly planar offering ground planes and center conductor on one side of the substrate which allows easy series or shunt insertion of devices. Monolithic implementation can be accomplished without via holes to ground devices which should reduce processing complexity and increase yields.

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MESFET Nonlinearities Applied to Predistortion Linearize Design

R.C. Tupynamba and E. Camargo. "MESFET Nonlinearities Applied to Predistortion Linearize Design." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 955-958.

Three different circuit topologies of predistortion linearizers are proposed using MESFETs biased at low drain bias. The design of a C-band linearizer using two 1 μm gate length devices is detailed and the achieved results compare favorably with conventional designs which use Schottky diodes. The linearizer reduced by 10 dB the intermodulation products of a 10 W power amplifier operating at 6 GHz and up to 4 dB back-off.

Abstracts

An Equivalent Circuit Model of a Plated-Through-Hole Interconnect for Multilayer Stripline Circuits

G.D. Hopkins and R.K. Feeney. "An Equivalent Circuit Model of a Plated-Through-Hole Interconnect for Multilayer Stripline Circuits." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 959-962.

An empirically-based equivalent circuit model of a plated-through-hole (PTH) interconnect for multilayer stripline circuits is presented. The model, a distributed network of lumped components whose values are functions of the geometry of the interconnect, was based on the time domain analysis of extensive empirical data. The measured data were taken from a multilayer stripline test fixture containing 132 different interconnect architectures. The model provides an accurate characterization of the interconnect impedance from 0.045 to approximately 14 GHz. General design guidelines, based on observations of the physical range of configurations studied, are also presented.



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Propagation Characteristics of Lossy Distributed GaAs FET Structures

F. Alessandri, G. Baini, G. D'Inzeo and R. Sorrentino. "Propagation Characteristics of Lossy Distributed GaAs FET Structures." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 963-966.

The generalized transverse resonance technique is applied to compute the propagation characteristics of distributed FET structures. To account for conductor thickness of the order or less than the skin depth, a modified perturbational approach is applied, which yields very accurate results with negligible computational effort. Loss behaviors of the three dominant modes and the contributions of the various electrodes to the total loss have been investigated.

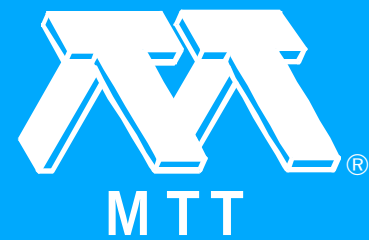
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Efficient FD-TD Analysis of Dielectric Resonators with Tuning Screw and Multilayer Structure

Y. Shen, Z. Bi, K. Wu and J. Litva. "Efficient FD-TD Analysis of Dielectric Resonators with Tuning Screw and Multilayer Structure." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 967-970.

An efficient finite difference time domain method, coupled with digital filtering and spectrum estimation techniques, is used to analyze the resonant frequencies and field distribution of two resonant structures of practical importance. The semiconductor-dielectric multilayer resonators, which are especially important in optically controlled circuits, are first time analyzed and in reasonable agreement with the experimental results. The results of a practical tuning screw dielectric resonator are also given and compared with the available rigorous results.



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Abstracts

Losses in GaAs Microstrip and Coplanar Waveguide

M. Zhang, C. Wu, K. Wu and J. Litva. "Losses in GaAs Microstrip and Coplanar Waveguide." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 971-974.

The finite-difference transmission line matrix (FD-TLM) method is applied to loss analysis for microstrip and coplanar waveguide (CPW). A feature of FD-TLM with a variable mesh size is adopted in this loss analysis. The analysis is validated through comparison with a frequency domain method. The numerical results provide a clear picture of frequency dependence of losses up to 10GHz for microstrip and coplanar waveguide.



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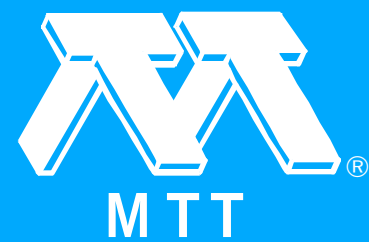
A Rigorous Method of Moments Solution for Curved Waveguide Bends and its Applications

A. Weisshaar, S.M. Goodnick and V.K. Tripathi. "A Rigorous Method of Moments Solution for Curved Waveguide Bends and its Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 975-978.

An accurate and computationally efficient method of moment solution together with a mode-matching technique for the analysis of curved planar waveguide bends is described. The method is applied to single and cascaded curved bends in rectangular waveguides, quantum waveguides and microstrips. The effect of the orientation of cascaded bends on the transmission properties is examined.

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Multilayer Coplanar Waveguide for High Speed Digital Applications

E.-B. El-Sharawy. "Multilayer Coplanar Waveguide for High Speed Digital Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 979-982.

This paper presents measurements of pulse distortion, coupling, and loss due to discontinuities of the coplanar waveguide (CPW) on single and multilayer structures. The CPW compares favorably to the microstrip line in terms of low coupling and distortion. A novel metal-backed coplanar waveguide (CPW) on multilayer structure is introduced to minimize or eliminate pulse distortion due to overmoding. The new CPW structure also has the advantage of relatively low loss at discontinuities. For a T circuit, the loss per bend in the new structure is about 0.2 dB less than a similar microstrip line.

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On the Analysis of a Transition to a Layered Ridged Dielectric Waveguide

A.G. Engel, Jr. and L.P.B. Katehi. "On the Analysis of a Transition to a Layered Ridged Dielectric Waveguide." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 983-986.

In sub-mm and THz monolithic circuits, transitions between layered ridged dielectric waveguides and power sources may include short lengths of conductor. An integral equation-mode matching technique is expanded so that such a transition may be analyzed, and results for one-port discontinuities in microstrip on a dielectric ridge and preliminary characterization of an actual transition are presented.

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Rigorous Analysis of the Characteristic Impedance in Conductor-Backed Miniature Coplanar Waveguides Considering Multiple Layers of Lossy and Finite Thickness Metal

K. Wu and R. Vahldieck. "Rigorous Analysis of the Characteristic Impedance in Conductor-Backed Miniature Coplanar Waveguides Considering Multiple Layers of Lossy and Finite Thickness Metal." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 987-990.

This paper presents a complete investigation of realistic conductor-backed miniature coplanar waveguides based on GaAs and alumina substrates. A self-consistent approach is used together with the method of lines to determine characteristic impedances, losses and propagation constants. This analysis is general and includes not only the finite thickness and conductivity of metallization but also the effect of first and second metallic layers and the via-hole location. Results are compared with those obtained with the mode-matching method and published measured data.

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Abstracts

The Feature of the Narrow-Pulse Transmission on Conventional Coplanar Waveguides when Power Leakage is Present (1992 Vol. II [MWSYM])

M. Tsuji and H. Shigesawa. "The Feature of the Narrow-Pulse Transmission on Conventional Coplanar Waveguides when Power Leakage is Present (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 991-994.

We investigate the feature of the waveform deformation and the unexpected cross talk caused by the effect of the dominant-mode power leakage that most of printed-circuit waveguides reveal, when narrow pulse is transmitted. Numerical examples for conventional coplanar waveguides prove that such a feature has serious influence on high-speed circuit design.



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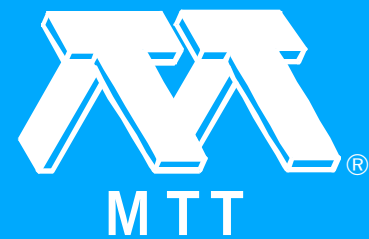


Abstracts

Full-Wave Analysis of Cascaded Junction Discontinuities of Shielded Coplanar Type Transmission Line Considering the Finite Metallization Thickness Effect

T.-W. Huang and T. Itoh. "Full-Wave Analysis of Cascaded Junction Discontinuities of Shielded Coplanar Type Transmission Line Considering the Finite Metallization Thickness Effect." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 995-998.

A full-wave analysis of cascaded junction discontinuities of coplanar type transmission lines, coplanar waveguide (CPW) and finline, is implemented by mode-matching technique. Results of the frequency dependence and the transition-length dependence of the scattering parameters of the CPW-to-finline transition incorporating the finite metallization thickness effect are presented.



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Three-Dimensionally Coupled Microstrip Lines via a Rotated Slot in a Common Ground Plane

T. Wakabayashi and T. Itoh. "Three-Dimensionally Coupled Microstrip Lines via a Rotated Slot in a Common Ground Plane." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 999-1002.

Microstrip lines coupled through a slot in a common ground plane are analyzed. The slot is rotated with respect to the propagating axis of the microstrips. The analysis is based on the spectral domain method and the reciprocity theorem. Numerical results of the S parameters are presented for different values of angle of rotation of the slot.

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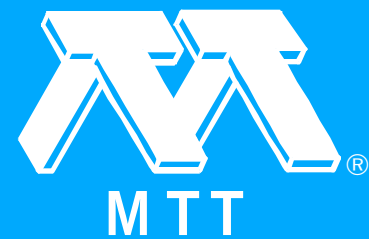
A X-Band Resonant Ring and Gas Breakdown Experiments

R. Perez and D. Hoppe. "A X-Band Resonant Ring and Gas Breakdown Experiments." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1003-1005.

An electroformed X-band resonant ring has been constructed to conduct breakdown experiments with dielectric gases. This paper introduces the design and techniques employed in the fabrication of the resonant ring, and presents gas breakdown results obtained to date using nitrogen and sulphur hexafluoride.

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MM-Wave Surface Resistance Measurements of HTS Films Using a Highly Sensitive Cavity

B. Mayer and R. Knochel. "MM-Wave Surface Resistance Measurements of HTS Films Using a Highly Sensitive Cavity." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1007-1010.

For the precise measurement of surface resistance of high temperature superconductors (HTS) a systematic design theory for truncated cone cavities is given. This kind of cavity avoids mode degeneration, which is a problem if cylindrical cavities are used. Also it offers a considerably higher sensitivity with regard to surface resistance measurements. A measurement system at 52GHz is described and results for three samples are given. The residual resistances of the three films were in the range of 5m Ω to 10m Ω at 52GHz. A measurement accuracy of ± 0.5 m Ω has been achieved.

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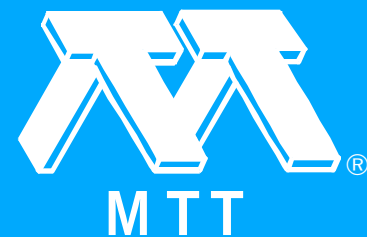


Abstracts

Fast, Accurate, On-Wafer Extraction of Parasitic Resistances and Inductances in GaAs MESFETs and HEMTs

J.C. Costa, M. Miller, M. Golio and G. Norris. "Fast, Accurate, On-Wafer Extraction of Parasitic Resistances and Inductances in GaAs MESFETs and HEMTs." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1011-1014.

A novel method of extracting the parasitic resistance and inductance values for MESFETs and HEMTs is presented. The technique requires the use of only rf two-port measurement data (ie. s-parameters), is extremely accurate, straightforward to implement and works equally well for both MESFETs and HEMTs. The technique makes use of "cold-chip" measurements in conjunction with a unique analysis that has proven to be both fast and robust.



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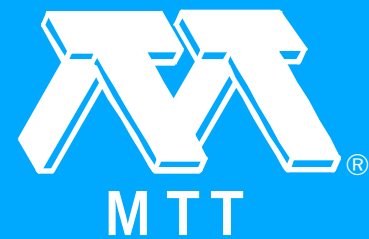
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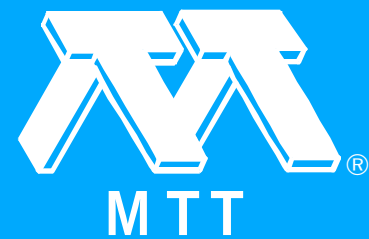
Diode Characterization in a Microstrip Measurement System for High Power Microwave Power Transmission

J. McSpadden, T. Yoo and K. Chang. "Diode Characterization in a Microstrip Measurement System for High Power Microwave Power Transmission." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1015-1018.

A method has been devised to experimentally characterize a packaged diode by inserting in a microstrip test mount. The diode is shunt mounted to the ground plane where a network analyzer measures the scattering parameters from the two-port test fixture. The equivalent circuit parameters are extracted from the measured data. A large signal measurement using the same test mount has also been configured to determine the power conversion efficiency from RF to DC as well as determining the embedded network impedance of the diode. Experimental characterization, conversion efficiencies, and input impedance of a GaAs Schottky barrier diode are presented. The method is quite general and can be used for characterizing solid-state devices for other applications.

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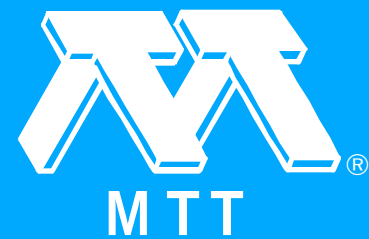
Accurate On-Wafer Power and Harmonic Measurements of MM-Wave Amplifiers and Devices

B. Hughes, A. Ferrero and A. Cognata. "Accurate On-Wafer Power and Harmonic Measurements of MM-Wave Amplifiers and Devices." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1019-1022.

A novel integrated test system that accurately measures on-wafer S-parameters, power levels, load-pull contours and harmonics over 1 to 50 GHz is presented. The capabilities and accuracy are demonstrated by measuring the power at the fundamental frequency and four harmonic frequencies of a 50 GHz traveling wave amplifier and the load-pull contours of a MODFET at 30 GHz.

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Millimeter Wave Absorption of Y-Ba-Cu Based High TC Superconductors

Z. Shi-ping, J. Bian-jun, G. jin-mo, B. Jia-shan, A. Jabbar and C.S. Ahmad. "Millimeter Wave Absorption of Y-Ba-Cu Based High TC Superconductors." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1023-1026.

Microwave absorption of the Yttrium-barium-copper oxides have been measured by using an open resonator technique in the temperature range of 20 K to samples critical temperatures and beyond. The samples with the start stoichiometries characterized as $\text{Y}_{0.4}\text{Ba}_{0.7}\text{Cu}_{11}\text{O}_x$, $\text{Y}_{0.5}\text{Ba}_{0.6}\text{Cu}_{11}\text{O}_x$, $\text{YBa}_2\text{Cu}_3\text{O}_x$ and $\text{Y}_{0.2}\text{Ba}_{0.4}\text{Cu}_{0.8}\text{O}_x$ have indicated a sharp drop in their temperature dependent surface resistance or the normal to superconducting phase transition with the range of 84 to 92 K, and the "123" sample shows a highest T_c as well as a lowest residual R_s , which is shown not only an intrinsic property of those materials but is associated with impurity phases or interfaces. significant absorption in the understudied materials was observed at temperature well below T_c , which may be associated with the intrinsic behavior of the materials despite of its sample dependent. We suggest that the anisotropy showing both in structure and electromagnetic behavior of these materials might be one of the dominate factors.

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Dielectric Properties of High-T_c Substrates Up to 40 GHz

J. Konopka and I. Wolff. "Dielectric Properties of High-T_c Substrates Up to 40 GHz." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1027-1030.

Dielectric properties of CaNdAlO₄, LaAlO₃, SrLaAlO₄, SrLaGaO₇ and NdGaO₃ monocrystals, prospective substrate materials for the deposition of high-T_c superconductors, were measured with high accuracy at frequencies up to 40 GHz in the temperature range 10 to 300 K. Most materials exhibit anisotropy while in CaNdAlO₄ and NdGaO₃ pronounced loss increase was found at temperatures below 100 K, probably of magnetic origin.



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An Improved Dielectric Resonator Method for Surface Impedance Measurement of High-Tc Superconductors

Y. Kobayashi and H. Kayano. "An Improved Dielectric Resonator Method for Surface Impedance Measurement of High-Tc Superconductors." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1031-1034.

An improved dielectric resonator method is proposed to measure temperature characteristics of surface impedance $Z_{\text{sub s}}$ of superconductors automatically with high resolution and with good reproducibility. Perturbation formula for this resonator is derived to determine $Z_{\text{sub s}}$ from measured values of resonant frequency and unloaded Q . Some measured results verify the usefulness of this method. A consideration of the effect of surface roughness enables one to compare measured temperature dependence of the complex conductivity with the BCS and three-fluid models.

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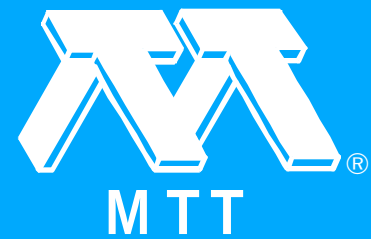


Abstracts

Circuit Techniques for Efficient Linearised GaAs MMIC's (1992 Vol. II [MWSYM])

D.G. Haigh. "Circuit Techniques for Efficient Linearised GaAs MMIC's (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1035-1038.

This paper is concerned with novel circuit designs for monolithic microwave integrated circuit technology using depletion-mode GaAs MESFET's. A synthesis method leading to high efficiency implementation of linear functions based on a square-law FET characteristic is presented and used to design a linearised isolator which is compared with a non-linearised design. A circuit equivalent to a common-gate FET, but with linearity, high efficiency, and reduced FET gate-width and power consumption, is proposed for future use in improved isolators and amplifiers.



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Paper Has Been Withdrawn (1992 Vol. II [MWSYM])

"Paper Has Been Withdrawn (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1039-1042.



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Versatility and Manufacturability Considerations for a New 3-Watt X-Band Power MMIC (1992 Vol. II [MWSYM])

D. Raicu, B.M. Kraemer, D.S. Day, J.R. Basset, J. Wei, C. Hua, Y. Chung and C.S. Chang. "Versatility and Manufacturability Considerations for a New 3-Watt X-Band Power MMIC (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1043-1046.

The paper presents a newly developed two-stage power amplifying MMIC capable of delivering 3 Watt at X-band with high efficiency. This MMIC is designed for operation with external matching circuits on separate ceramic substrates. By customizing these circuits, the same MMIC can cover an entire array of different applications. The versatility of this approach is demonstrated by the implementation of this MMIC in four-power modules specified for different bandwidths, power levels and bias voltages. The small chip size and the tunability allowed by the external circuits lead to increased manufacturing yields and make possible significant cost reductions.

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Monolithic, Lumped Element, Single Sideband Modulator (1992 Vol. II [MWSYM])

S.J. Parisi. "Monolithic, Lumped Element, Single Sideband Modulator (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1047-1050.

In monolithic microwave integrated circuit (MMIC) technology, at frequencies below 18 GHz, distributed elements consume too much valuable GaAs real estate to be cost-effective. An appreciable reduction in surface area without a degradation in electrical performance can be realized with the use of lumped elements. This paper describes the design and performance of a monolithic single sideband modulator that employs lumped element technology to achieve a compact circuit. For this design, the carrier frequency is 6.9 GHz and the modulating signal is in the range of 0 to 500 MHz. Therefore, the lower sideband is 6.4 to 6.9 GHz and the upper sideband is 6.9 to 7.4 GHz.

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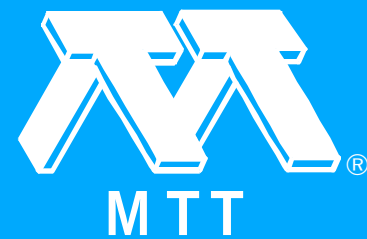


Abstracts

Novel Monolithic Ultra-Wideband Unilateral 4-Port Junction Using Distributed Amplification Techniques (1992 Vol. II [MWSYM])

I.D. Robertson and A.H. Aghvami. "Novel Monolithic Ultra-Wideband Unilateral 4-Port Junction Using Distributed Amplification Techniques (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1051-1054.

A novel active unilateral 4-port junction operating over 1 to 20 GHz has been demonstrated in MMIC technology, using distributed amplifier techniques. The circuit has unique unilateral characteristics with a relatively constant insertion loss and high isolation, and could replace isolators, circulators and directional couplers in many ultra-wideband applications.



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GaAs ICs for 5 GHz Microwave Landing System Front-End (1992 Vol. II [MWSYM])

J.L. De Gouy, P.H. Boutigny, P. Jean and A. Grancher. "GaAs ICs for 5 GHz Microwave Landing System Front-End (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1055-1058.

The full integration of the 5 GHz front-end of MLS (Microwave Landing System) equipment shows the maturity of the GaAs ASIC design. All the different functions as amplifiers, switches, oscillators, mixers have been integrated as well as digital functions needed for fractional divider frequency synthesis. All the designed ASICs fully comply with specifications and allow the equipment to run in a military environment. The results in terms of spectral purity are very satisfactory.

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A Monolithic V-Band Upconverter Using 0.2 μm InGaAs/GaAs Pseudomorphic HEMT Technology (1992 Vol. II [MWSYM])

H. Wang, B. Nelson, L. Shaw, R. Kasody, Y. Hwang, W. Jones, D. Brunone, M. Sholly, J. Maguire and T. Best. "A Monolithic V-Band Upconverter Using 0.2 μm InGaAs/GaAs Pseudomorphic HEMT Technology (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1059-1062.

A monolithic approach to V-band upconverter development has the advantages of lighter weight and lower cost over conventional hybrid approaches for high volume insertions into transmitter systems. This paper will present the design and performance of a complete monolithic upconverter macrocell using 0.2 μm InGaAs/GaAs pseudomorphic HEMT technology. Individual components, including a 2-10 GHz IF amplifier, a V-band upconverting mixer and a V-band amplifier are also described. The measured results demonstrate a conversion gain of 10 dB at V-band by injecting a 2-10 GHz IF frequency with an LO drive of 10 dBm at 54 GHz. This is the first reported monolithic upconverter with good performance and bandwidth at this frequency.



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23-40 GHz InP HEMT MMIC Distributed Mixer (1992 Vol. II [MWSYM])

R. Majidi-Ahy, C. Nishimoto, J. Russell, W. Ou, S. Bandy and G. Zdasiuk. "23-40 GHz InP HEMT MMIC Distributed Mixer (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1063-1066.

We report the development of an active millimeter-wave InP HEMT MMIC distributed mixer operating over 23-40 GHz RF bandwidth, with IF frequencies in the range of 2-13 GHz, and fixed LO frequencies of 20 and 28 GHz. The devices were InGaAs-InAlAs-InP HEMT's with a gatelength of 0.25 μ m. The mixer had an average conversion gain of 0 dB when biased for maximum bandwidth, and an average conversion gain of 5 dB when biased for maximum gain. The overall chip dimensions for this MMIC, were 500 by 1000 μ m.

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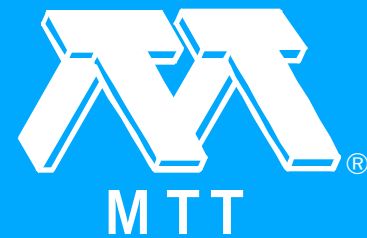


Abstracts

Broad-Band Electromagnetic Radiation Damage in GaAs MESFETs (1992 Vol. II [MWSYM])

J.H. McAdoo, W.M. Bollen and W. Catoe. "Broad-Band Electromagnetic Radiation Damage in GaAs MESFETs (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1067-1070.

A failure mechanism is observed for SiN/sub 2/-passivated metal semiconductor field-effect transistor (MESFET) devices exposed to fast risetime DC video pulses. The intensity of the pulses is about 33% of the value required to cause single-pulse failure. The failure mechanism, which degrades performance by surface flashover and erosion of the passivation layer, eventually leads to sputtering of the gate-source metallization. The results are observed using a combination of optical, electron, and X-ray micrographs, plus MESFET terminal parameters.



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3.3V GPS Receiver MMIC Implemented on a Mixed-Signal, Silicon Bipolar Array (1992 Vol. II [MWSYM])

K.J. Negus, R.A. Koupal, D. Millicker and C.P. Snapp. "3.3V GPS Receiver MMIC Implemented on a Mixed-Signal, Silicon Bipolar Array (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1071-1074.

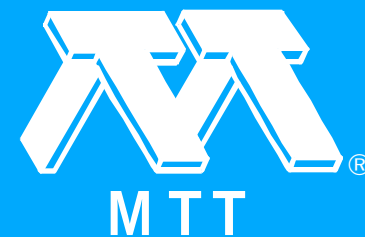
This generic GPS MMIC contains two stages and the dividers, buffers, digital downconversion phase-frequency detector and negative resistance cell required to synthesize both LOs and a TTL system clock. The MMIC operates from a 20 MHz external reference and provides overall conversion gain of about 65 dB from a 1575 MHz RF to a 15 MHz second IF. The 1.8 x 1.8 mm MMIC is implemented on a mixed-signal, silicon bipolar cell array and consumes less than 150 mW from a single 3.3V supply.



Abstracts

Session Y -- Solid-State Devices and Circuits: Non-FET II

"Session Y -- Solid-State Devices and Circuits: Non-FET II." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1075-1075.



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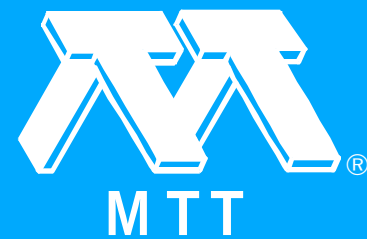


Abstracts

Low Noise Oscillators

J.K.A. Everard. "Low Noise Oscillators." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1077-1080.

A large number of papers have been published on low noise oscillators however they are usually very specific to the particular application. This paper will describe a set of design rules which are general and can be used to produce oscillators with very low noise performance where both additive (thermal noise) and Flicker noise are considered. Linear theories will be described which accurately describe the noise performance of resonator type oscillators. The limits set by varactor diodes on the noise performance will be described and the noise degradation caused by open loop phase error will be shown. Seven design examples will be demonstrated which show close correlation with the theory.



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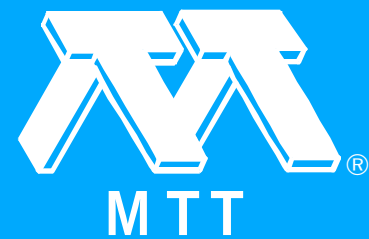
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Low Phase Noise Oscillator with Flicker (1/f) Noise Suppression Circuit

L.D. Cohen. "Low Phase Noise Oscillator with Flicker (1/f) Noise Suppression Circuit." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1081-1084.

Oscillator pushing (frequency change with bias voltage) is a controlling factor in 1/f noise generation in a Gunn diode. Suppression of 1/f noise in the output spectrum of a Gunn oscillator has been demonstrated at 10 GHz with a unique oscillator circuit that provides for zero oscillator pushing. Application areas include communication systems and Doppler radar.

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



Abstracts

New Type of Push-Push Oscipliers for the Frequency Synthesizer

H. Yabuki, M. Sagawa and M. Makimoto. "New Type of Push-Push Oscipliers for the Frequency Synthesizer." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1085-1088.

This paper describes the fundamental principle of novel voltage controlled push-push oscipliers (oscillator/doubler) and shows their application to a frequency synthesizer for L-band operation. The experimental frequency synthesizer made it clear that they have the advantages of high frequency operation, compact size and low power consumption.



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Abstracts

Design, Fabrication and Evaluation of Tunnel Transit-Time Diodes for V-Band and W-Band Power Generation

C. Kidner, H. Eisele, J. East and G.I. Haddad. "Design, Fabrication and Evaluation of Tunnel Transit-Time Diodes for V-Band and W-Band Power Generation." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1089-1092.

Tunnel injection Transit-Time (TUNNETT) diodes are very promising for medium power, low noise applications up to THz frequencies. We have successfully designed and tested GaAs $p^{+}/n^{+}/n^{-}/n^{+}$ single-drift TUNNETT diodes for V-band and W-band operation. We have measured 26 mW at 58.0 GHz and 33 mW at 93.5 GHz with good spectra.



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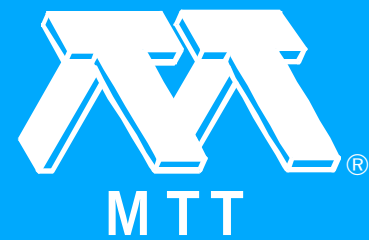


Abstracts

Multiple Element Oscillators Utilizing a New Power Combining Technique (1992 Vol. II [MWSYM])

A. Mortazawi and B.C. De Loach, Jr.. "Multiple Element Oscillators Utilizing a New Power Combining Technique (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1093-1096.

A new method to generate high microwave and millimeter wave power by combining the output of many two or three terminal devices is presented. This method forms a single resonant structure from many active devices, and therefore the combiner is stable and does not suffer from simultaneous multimode difficulties. This technique produces compact structures and is readily adaptable to monolithic integration. Experimental results from several power combiners utilizing Gunn diodes are presented.



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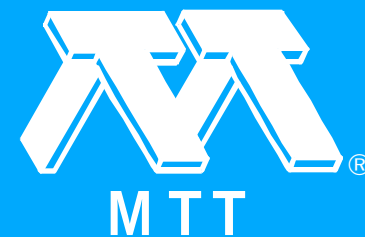
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Abstracts

Session Z -- System Applications of Microwave/Millimeter Wave Technology

"Session Z -- System Applications of Microwave/Millimeter Wave Technology." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1097-1097.



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Integrated MMIC and MIC Components for Multichannel Ka-Band Receivers

P.J. Meier, P.R. Bie and J. DeCarlo. "Integrated MMIC and MIC Components for Multichannel Ka-Band Receivers." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1099-1100.

Integrated circuit (IC) modules have been developed for a multichannel Ka-band receiver. The modules include a MMIC-compatible mixer/IF amplifier and a MIC LO-distribution network. Four mixer/IF modules have been integrated with the LO network and other components to form a multichannel receiver prototype. This work is an important step toward the realization of a new generation of compact low-cost receivers for airborne and ground-based applications.

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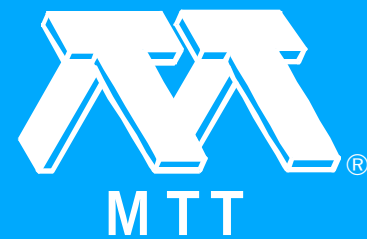


Abstracts

A 5.5 Watt 20 GHz Solid State Power Amplifier for On-Board Satellite Communication

F. Bonecchi and L. Negri. "A 5.5 Watt 20 GHz Solid State Power Amplifier for On-Board Satellite Communication." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1101-1104.

A Solid State Power Amplifier for on-board applications in the 20 GHz down-link frequency band is presented. An output power of 5.5 Watts with 47 dB gain and 17 % DC to RF efficiency have been achieved combining in parallel six 1.0 Watt power FET's by means of a novel very low-losses and extra-small waveguide power divider/combiner. The overall unit, including Electronic Power Conditioner, results compact and reliable: an attractive solution as replacement for Ka-band Traveling Wave Tube Amplifier in space.



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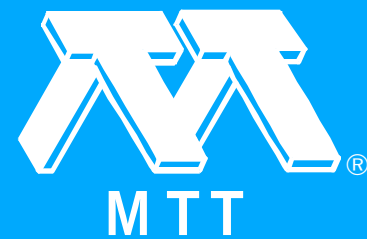


Abstracts

Experimental Performance of an Adaptive Digital Linearized Power Amplifier

A.S. Wright and W.G. Durtler. "Experimental Performance of an Adaptive Digital Linearized Power Amplifier." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1105-1108.

High power amplification of linear modulation schemes which exhibit fluctuating envelopes, invariably leads to the generation of distortion and intermodulation products. Recent theoretical work has suggested that a complex gain predistorter may be employed to linearize a non-linear power amplifier. This paper presents experimental results demonstrating that a reduction in out-of-band spectral emissions in excess of 20 dB may be achieved by employing digital feedback and a complex gain predistorter.



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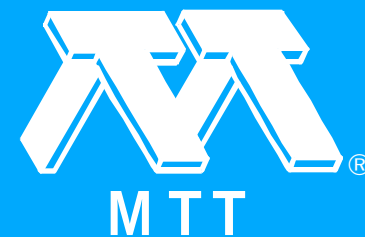
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Abstracts

Session AA -- Analytical Modeling of Fields in Microwave Structures

"Session AA -- Analytical Modeling of Fields in Microwave Structures." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1109-1109.



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A Dynamic Analysis of Non-Uniform Microstrip Multi-Conductor Transmission Lines Using the Grounded Slab Green's Functions Approach

T.R. Arabi, A.T. Murphy, T.K. Sarkar and R.F. Harrington. "A Dynamic Analysis of Non-Uniform Microstrip Multi-Conductor Transmission Lines Using the Grounded Slab Green's Functions Approach." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1111-1114.

The objective of this paper is to present a numerical technique based on a combined approach of using a "quasi-dynamic", a "dynamic" and an asymptotic approach for the analysis of non-uniform microstrip transmission lines and discontinuities using the grounded dielectric slab Green's Functions. The regions of validity of several quasi-dynamic and asymptotic approximations have been compared and determined in terms of the required accuracy and the microstrip physical parameters. Finally, numerical examples have been solved and checked with available data and measurement in order to check the accuracy of this new technique.

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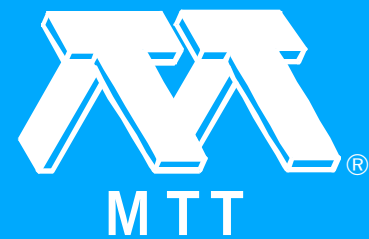


Abstracts

A Study of Sub-Millimeter Wave Coupled Dielectric Waveguides Using the GIE Method

T.E. van Deventer and P.B. Katehi. "A Study of Sub-Millimeter Wave Coupled Dielectric Waveguides Using the GIE Method." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1115-1118.

In this paper the coupling properties of coupled dielectric waveguides are evaluated using a novel and powerful method which relies on the concept of equivalent planar polarization dipole moments to simulate the guides. Generalized impedance boundary conditions are enforced to provide a simple planar integral equation (Generalized Integral Equation). This method can account for multiple dielectric strips on different levels. Phase constants of the different modes and coupling characteristics are calculated for several structures, such as rib waveguides and insulated image guides.



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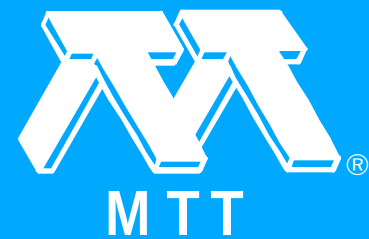
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Numerical Simulation of a Virtual Matched Load for the Characterization of Planar Discontinuities

H. Ghali, M. Drissi, J. Citerne and V.F. Hanna. "Numerical Simulation of a Virtual Matched Load for the Characterization of Planar Discontinuities." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1119-1122.

A mixed technique, based on the association of the integral equations solved by the method of moments (Galerkin) to the theory of loaded scatterers, is shown to be useful for simulating virtual matched loads for characterizing planar discontinuities. The theory of loaded scatterers is used to include the effects of either localized or distributed loads through which the matching can be achieved. Moreover, when using this technique for shielded discontinuities, the scattering parameters are obtained from the knowledge of only current or electric field maxima and hence, the errors associated with the accurate determination of the current or the electric field minimum evaluation encountered in other existing techniques are avoided. A good agreement is reported between experimental and theoretical results for some simple and multilayer discontinuities.

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Abstracts

Full-Wave Analysis of 3D Metallization Structures Using a Spectral Domain Technique

T. Becks and I. Wolff. "Full-Wave Analysis of 3D Metallization Structures Using a Spectral Domain Technique." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1123-1126.

A full-wave method for the investigation of microstrip- and coplanar-structures including 3d metallization structures is presented. Spectral domain analysis method is used to calculate the S-parameters of unshielded microwave components containing bond-wires and air-bridges. The general formulation and the procedure of the method are described. The application of the theory is given by a comparison of measured and calculated results for a spiral inductor.



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Abstracts

Modelling of Miniaturized Coplanar Striplines Based on $\text{YBa}/\text{sub } 2/\text{Cu}/\text{sub } 3/\text{O}/\text{sub } 7-x/$ Thin Films

J. Kebler, P. Russer and R. Dill. "Modelling of Miniaturized Coplanar Striplines Based on $\text{YBa}/\text{sub } 2/\text{Cu}/\text{sub } 3/\text{O}/\text{sub } 7-x/$ Thin Films." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1127-1130.

A miniaturized $\text{YBa}/\text{sub } 2/\text{Cu}/\text{sub } 3/\text{O}/\text{sub } 7-x/$ coplanar stripline (CPS) structure is investigated field-theoretically by means of a partial wave synthesis. The high- T_c superconductor material is described by the two-fluid model and the London theory. Approximation formula for effective permittivity, attenuation, and characteristic impedance are deduced from the numerical results.



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Abstracts

Characterization of Anisotropic Substrate Materials for Microwave Applications

U. Fritsch and I. Wolff. "Characterization of Anisotropic Substrate Materials for Microwave Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1131-1134.

This paper deals with the characterization of uniaxially anisotropic substrates. On the basis of the measured effective permittivity of a microstripline the permittivity tensor of the substrate is calculated using an optimization routine and a Spectral-Domain Analysis (SDA) for the microstripline properties.



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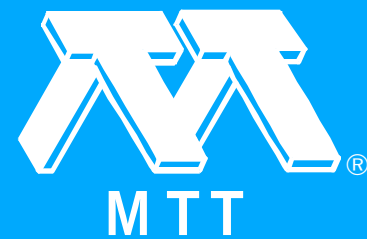


Abstracts

Using Brewster Angle for Measuring Microwave Material Parameters of Bi-Isotropic and Chiral Media

A.H. Sihvola and I.V. Lindell. "Using Brewster Angle for Measuring Microwave Material Parameters of Bi-Isotropic and Chiral Media." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1135-1138.

This contribution focuses on the retrieval of chiral and nonreciprocal material parameters of bi-isotropic media. Using the generalized Fresnel reflection coefficients, that the authors have recently derived for general bi-isotropic media, a reflection method is suggested for determining the materials parameters of an unknown material sample. The sample needs to be thick enough for no transmission and multiple reflection effects to occur, and it should have one planar surface extending widely enough to cover the beam of the measuring antenna beam.



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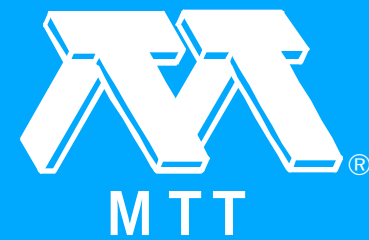
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Abstracts

Session BB -- Submillimeter-Wave Systems (Focused Session)

"Session BB -- Submillimeter-Wave Systems (Focused Session)." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1139-1139.



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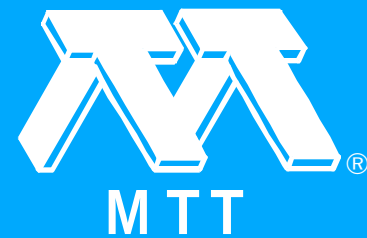


Abstracts

GaAs Schottky Barrier Diodes for THz Applications

T.W. Crowe, W.C.B. Peatman, P.A.D. Wood and X. Liu. "GaAs Schottky Barrier Diodes for THz Applications." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1141-1144.

GaAs Schottky barrier diodes are used as nonlinear elements for a variety of scientific applications at frequencies as high as 3 THz. The factors that limit the high frequency performance of these diodes are reviewed and the design process is discussed. Recent results with ultra-small Schottky anodes are presented and conclusions are drawn about the future of Schottky diodes at THz frequencies.



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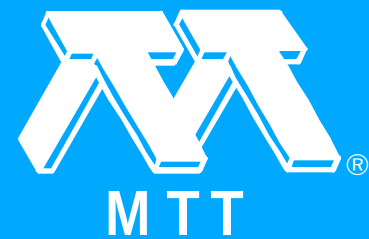
Current Status of Integrated Submillimeter-Wave Antennas

G.M. Rebeiz. "Current Status of Integrated Submillimeter-Wave Antennas." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1145-1148.

This paper summarizes the recent advances in efficient submillimeter-wave integrated antennas. The use of these antennas in planar receivers will result in very low- noise receivers for frequencies above 100 GHz. The antennas presented here are the quasi- monolithic integrated horn antennas, the substrate-backed spiral and log-periodic antennas, the endfire slot-line antennas on thin membranes, the double-dipole integrated reflector antenna and the dielectric filled parabola. Another important antenna, the substrate backed dual-slot antenna, is presented in this session in a different paper.

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A 500 GHz Transmitter/Receiver System for Phase/Magnitude Measurements

N.R. Erickson. "A 500 GHz Transmitter/Receiver System for Phase/Magnitude Measurements." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1149-1152.

A complete synthesized transmitter and tracking receiver have been built for a frequency of 500 GHz, with a swept bandwidth of >5 GHz. The system uses direct multiplication of a microwave synthesizer, with no intermediate oscillator. Both the transmitter and receiver use the same synthesizer reference, but the transmitter frequency is offset by an upconverter to produce a 3 GHz receiver IF. The receiver reference is derived without the use of a separate receiver channel. With the inclusion of a backend processor, the system is used to make vector reflectivity measurements with high phase and amplitude stability. The transmitter output power is >100 μ W and the receiver noise figure is 15 dB.

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"Index of Authors (1992 Vol. II [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.2 (1992 Vol. II [MWSYM]): 1153-1157.



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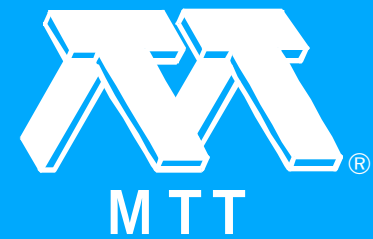
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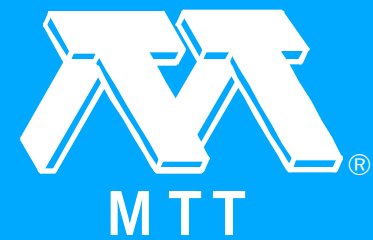
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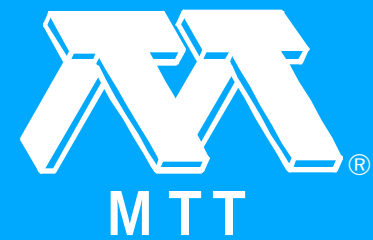
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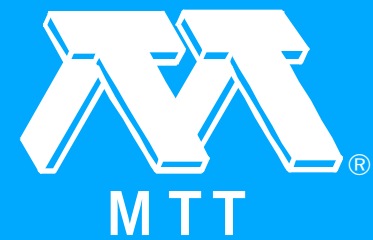
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Abstracts

Panel Sessions, Workshops (1992 Vol. III [MWSYM])

"Panel Sessions, Workshops (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): iii-xii.



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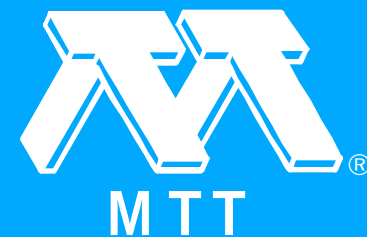
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Abstracts

Technical Program Contents (1992 Vol. III [MWSYM])

"Technical Program Contents (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): xiii-xlv.



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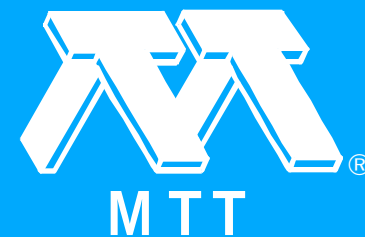
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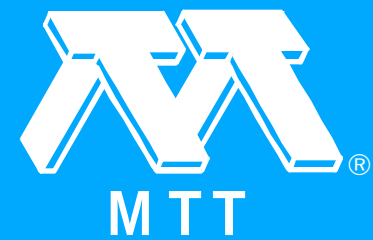
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Abstracts

Session CC -- Microwave Integrated Circuits

"Session CC -- Microwave Integrated Circuits." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1161-1161.



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Fully Integrated Double Balanced MMIC Mixer Using a Star Arrangement of Diodes for Extended IF Performance

J. Staudinger and M. Friesen. "Fully Integrated Double Balanced MMIC Mixer Using a Star Arrangement of Diodes for Extended IF Performance." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1163-1166.

A double balanced diode mixer with all circuitry contained on a single MMIC die has been designed and fabricated. The mixer consists of four diodes arranged in a star configuration connected to several balun type structures. The configuration allows extracting the IF signal at a node which is a virtual ground to both LO and RF signals. Thus, compared to conventional MMIC mixers, a significant improvement in extracting the IF signal to achieve broad bandwidth performance is possible. On chip matching circuitry is included between diodes and baluns to enhance performance across a 6 GHz IF bandwidth.

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Novel 36 GHz GaAs Frequency Doublers Using (M)MIC Coplanar Technology

M.A. Tuko and I. Wolff. "Novel 36 GHz GaAs Frequency Doublers Using (M)MIC Coplanar Technology." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1167-1170.

The design and performance of single-device and balanced versions of (M)MIC GaAs FET frequency doublers from 18 GHz to 36 GHz, fabricated in purely CPW- techniques are presented. Coplanar discontinuities which are usually neglected are taken into consideration in the analysis and design. Spiral inductors and their associated parasitic capacitances are used for impedance matching and phase shifting purposes. Simulation and measurement results are in good agreement. The investigated doublers have a minimum conversion loss of 7 dB.

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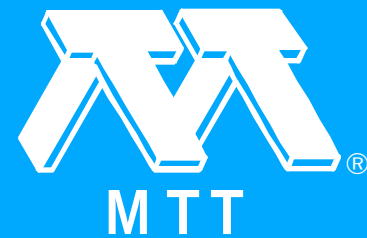


Abstracts

A Six-Bit GMIC Phase Shifter for 6-18 GHz

T.A. Murphy, J.W. Gippich, M.E. Hines and D. Kryger. "A Six-Bit GMIC Phase Shifter for 6-18 GHz." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1171-1174.

A low-loss broad-band six-bit phase shifter has been developed in a form suitable for airborne phased array radar applications. A glass-based microwave circuit integration technology (GMIC, Glass Microwave Integrated Circuit) is used, in which thin-film, process-oriented photolithographic technology is used to realize all of the passive components on a glass surface. Hybrid-coupled reflection circuitry covers the frequency range 6-18 GHz with losses averaging about 3 dB at 6 GHz to about 8 dB at 18 GHz over the 64 phase states covering a 360° range.



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Ultra Wide Band Slotline Hybrid Ring Couplers

C.-H. Ho, L. Fan and K. Chang. "Ultra Wide Band Slotline Hybrid Ring Couplers." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1175-1178.

The design procedure and results of two newly developed hybrid ring couplers using microstrip-coupled slotline ring are presented in this paper. The couplers have a wider bandwidth with an excellent power dividing balance and a fairly good isolation than the conventional microstrip hybrid ring coupler. The slotline cross-over hybrid ring coupler exhibits greater than 35 dB isolation and good power dividing balance of ± 0.2 dB over an 80% bandwidth from 1.8 to 4.2 GHz. The experimental results agree very well with the theoretical prediction. With the advantage of allowing easy series or shunt insertion of devices, these couplers are useful in many applications for MICs and MMICs.

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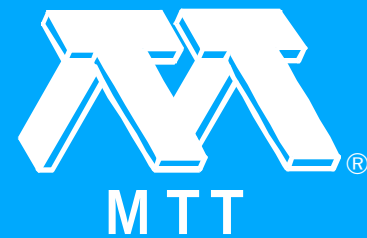


Abstracts

0.25 μm PHEMT X Band Multifunction LNA MMIC with T/R Switch and Attenuator Achieves 1.85 dB Noise Figure

S.T. Janesch, K.H.G. Duh, P. Ho, S.C. Wang and S.M.J. Liu. "0.25 μm PHEMT X Band Multifunction LNA MMIC with T/R Switch and Attenuator Achieves 1.85 dB Noise Figure." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1179-1182.

Performance of a 7-11 GHz LNA MMIC which advances performance and integration standards is presented. A 1.8 dB NF, 19 dB gain LNA is married to a 0.5 dB insertion loss T/R switch and switched attenuator for a MMIC with 1.85 dB NF, 18 dB gain at 10 GHz.



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Abstracts

A 3.5 Watt High Efficiency GaAs FET Amplifier for Digital Telephone Communications

M. Easton, R. Basset, D.S. Day, C. Hua, C.S. Chang and J. Wei. "A 3.5 Watt High Efficiency GaAs FET Amplifier for Digital Telephone Communications." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1183-1184.

A high efficiency 3.5 watt power module intended for commercial application in the digital cellular telephone market is described. The demonstration circuit is designed to be coupled with a functional gain control circuit or can be a stand alone power stage. The GaAs FET module operates at 6.2 volts, produces 35.5 dBm of output power, 12.5 dB of gain, and 53 % power added efficiency in the 890-920 MHz frequency range.



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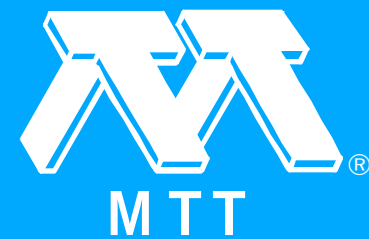
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Abstracts

Session DD -- Miniature Filters

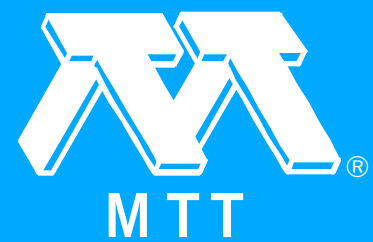
"Session DD -- Miniature Filters." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1185-1185.



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An Optimal Low Loss HF Diplexer Using Helical Resonators

R. Levy and K.J. Andersen. "An Optimal Low Loss HF Diplexer Using Helical Resonators." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1187-1190.

A diplexer comprising two narrow band closely spaced channels in the 164-175 MHz band having relatively low insertion loss, small size and light weight is described. The diplexer replaces a device with dimensions of 6 x 10 x 18 in. with one of dimensions 2.2 x 6 x 6 in. This order of magnitude reduction in size is achieved by the use of optimal asymmetric filters each having poles placed in the other passband giving high mutual isolation, combined with the use of helical resonators giving an unloaded Q of the order of 800, which is about twice as high as previous lumped element filters. Additional out-of band rejection is obtained by the unusual technique of introducing an additional attenuation pole in the output coupling.

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A 10 GHz Thin Film Lumped Element High Temperature Superconductor Filter

D.G. Swanson, Jr., R. Forse and B.J.L. Nilsson. "A 10 GHz Thin Film Lumped Element High Temperature Superconductor Filter." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1191-1193.

A narrow band thin film lumped element filter centered at 10 GHz has been fabricated using thallium-based high temperature superconductor technology. This filter does not suffer from the undesired spurious responses seen in thin film distributed filters using HTS technology. The measured filter has 2.5 dB insertion loss at band center, 3% bandwidth and is within 50 MHz of the desired center frequency. Measurements were made to confirm the broad spurious free stopbands from 1 GHz to 21 GHz.

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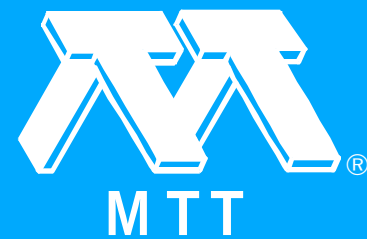


Abstracts

An MMIC Active Filter with 60-dB Rejection

R.R. Bonetti, A.E. Williams, T. Duong, R. Gupta and R. Mott. "An MMIC Active Filter with 60-dB Rejection." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1195-1198.

The design, fabrication, and characterization of a gallium arsenide (GaAs) monolithic, active, 4-GHz bandpass filter with 60-dB edge-of-band rejection is described herein. A predistorted transfer function is realized by a set of cascaded, lumped, and distributed-element inductance capacitance circuits isolated by two feedback amplifiers. The monolithic microwave integrated circuit consists of two identical 3 x 2-mm GaAs chips.



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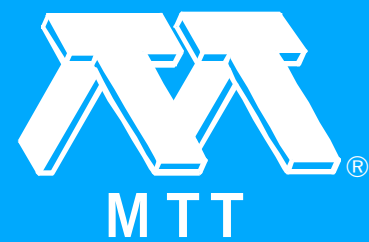
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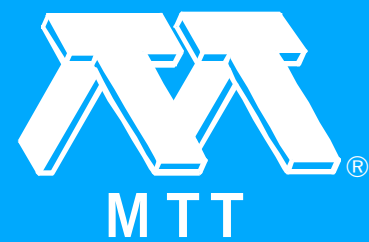
Synthesis of Planar Microwave Band-Pass Filter Based on Foster-Type Network and Normal Mode Expansion Method

J.P. Hsu, T. Anada, H. Tsubaki, Y. Migita and K. Nagashima. "Synthesis of Planar Microwave Band-Pass Filter Based on Foster-Type Network and Normal Mode Expansion Method." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1199-1202.

A new synthesis method of microwave filter circuit based on the Foster-type network representation is proposed, where two port impedance matrix which realizes the desired frequency characteristics and that of any microwave circuit structure are expanded into Foster-type network representation; microwave filter circuit can be synthesized by matching the both network representation. In this paper fundamental idea of synthesis method and practical examples are explained.

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Multi-Layered Planar Filters Based on Aperture Coupled, Dual Mode Microstrip or Stripline Resonators

J.A. Curtis and S.J. Fiedziuszko. "Multi-Layered Planar Filters Based on Aperture Coupled, Dual Mode Microstrip or Stripline Resonators." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1203-1206.

High temperature superconductivity has created a great deal of interest in replacing dual mode cavity and dielectric resonator filters with printed circuits which are dramatically smaller, lighter, and less costly. Recently, a set of dual mode filters was introduced which facilitates the realization, in a planar configuration, of the elliptic function and self-equalized responses required for satellite applications. In this paper, a new class of planar filters is introduced that is based on a multi-layered stack of dual mode stripline or microstrip resonators coupled through irises. This new filter configuration offers extremely small size and mass and is ideally suited to fabrication using thin film superconductors. All filter types that are currently implemented using dual mode cavities or dielectric resonators can be realized using this new filter structure. Novel, multi-layer, planar filters are introduced, and experimental results are presented.

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



Abstracts

Compact Bandpass Filters with Improved Stop-Band Characteristics Using Planar Multilayer Structures

W. Schwab and W. Menzel. "Compact Bandpass Filters with Improved Stop-Band Characteristics Using Planar Multilayer Structures." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1207-1209.

Using multilayer structures, very compact planar bandpass filters can be designed with improved stop-band characteristics taking full advantage of the additional degrees of freedom given by that arrangement. As examples, a suspended stripline filter with suppression of the first harmonic frequency and a finline filter with improved attenuation close to the pass-band is presented.



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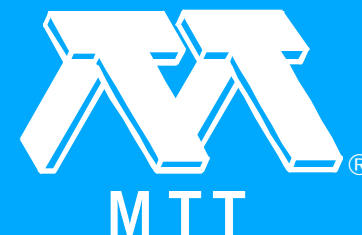
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Abstracts

Session EE -- CAD 1--Electromagnetic Simulation

"Session EE -- CAD 1--Electromagnetic Simulation." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1211-1211.



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Full Wave Analysis of Tapered Microstrip Lines Using the Conformal Grids FD-TD Method

T. Kashiwa, M. Sasaki, S. Maeda and I. Fukai. "Full Wave Analysis of Tapered Microstrip Lines Using the Conformal Grids FD-TD Method." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1213-1216.

In this paper, three-dimensional full wave analysis of tapered microstrip lines is carried out in the time domain. The method used is the conformal grids FD-TD method. Computed results are compared with experimental ones and those obtained by the finite element method. The results agree well. As a result, it is shown that the propagation characteristics are very different from those obtained through two-dimensional modeling.



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Modeling of Nonlinear Dispersive Active Elements in TLM

B. Isele and P. Russer. "Modeling of Nonlinear Dispersive Active Elements in TLM." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1217-1220.

The transmission line matrix (TLM) method is used for modeling of distributed active nonlinear domains embedded in planar microwave circuits. In this approach the nonlinearities are described by lumped elements connected to the nodes of a resistive TLM-network. With this approach the transient as well as the steady-state behaviour of nonlinear distributed active elements can be evaluated. In the paper we discuss the model of a distributed semiconductor diode. The distributed barrier is modelled by a resistive region. The physical cut-off characteristics of the semiconducting region is considered by lumped capacitors included into the TLM network. For an oscillator with a distributed diode the time history and the field contribution at different instants of time are given.

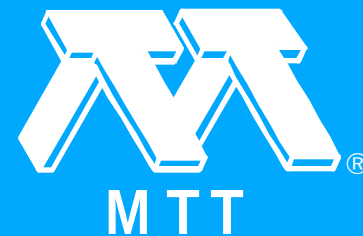


Abstracts

New 3D TLM Condensed Node Structures for Improved Simulation of Conductor Strips

J.S. Nielsen and W.J.R. Hoefer. "New 3D TLM Condensed Node Structures for Improved Simulation of Conductor Strips." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1221-1223.

This paper presents a set of modified condensed node TLM structures, compatible with the 3D TLM condensed node, that improve the modelling of conductor strips and provide a means of directly embedding lumped devices into the mesh. The improvement in accuracy is demonstrated by evaluating the propagation constant of a simulated microstrip line.



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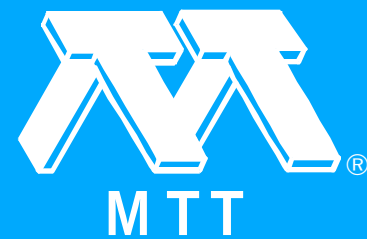


Abstracts

Removing Package Effects from Microstrip Moment Method Calculations

R.W. Jackson. "Removing Package Effects from Microstrip Moment Method Calculations." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1225-1228.

The electromagnetic behavior of microstrip circuits often depends on the package that surrounds the circuit. This is especially true if the package is electrically large. This paper discusses the importance of a damped enclosure for modeling and operating MMIC circuits. It suggests a method of damping enclosures and outlines an efficient technique for applying the method of moments so as to determine the significance of the package effects on full wave simulations.



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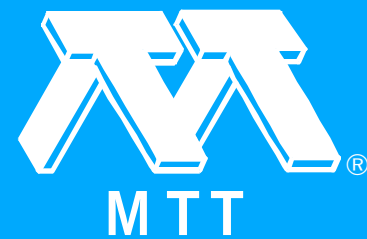


Abstracts

Time Domain Electromagnetic Analysis of a Via in a Multilayer Computer Chip Package

W.D. Becker, P. Harms and R. Mittra. "Time Domain Electromagnetic Analysis of a Via in a Multilayer Computer Chip Package." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1229-1232.

The determination of an equivalent circuit to approximate the behavior of an interconnect in a computer package is an important step in the evaluation of the computer's performance. This paper presents a methodology for deriving an equivalent circuit of a via using a time-domain full-wave solution of Maxwell's equations.



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Abstracts

A Full-Wave Electromagnetic Model of Cylindrical and Conical via Hole Grounds for Use in Interactive MIC/MMIC Design

R.H. Jansen. "A Full-Wave Electromagnetic Model of Cylindrical and Conical via Hole Grounds for Use in Interactive MIC/MMIC Design." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1233-1236.

An approximate yet accurate 3D electromagnetic model of cylindrical and conical vias in microstrip is presented. The new model is formulated entirely in terms of the via physical parameters and has been verified against measured data to 40 GHz. Its extremely short execution times make it suitable for interactive CAD.



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Abstracts

Full-Wave Modeling of via Hole Grounds in Microstrip by Three-Dimensional Mode Matching Technique (1992 Vol. III [MWSYM])

F. Alessandri, M. Mongiardo and R. Sorrentino. "Full-Wave Modeling of via Hole Grounds in Microstrip by Three-Dimensional Mode Matching Technique (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1237-1240.

A rigorous full-wave analysis of microstrip via hole grounds is performed using a three-dimensional mode-matching method by means of a suitable segmentation technique. Theoretical results are compared with measured data showing an excellent agreement. Comparisons with available approximate methods have also been made to exploit their limits of validity.



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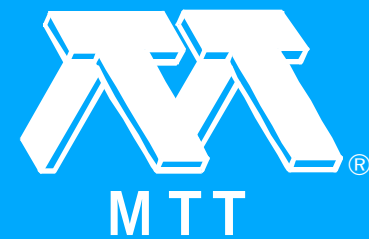
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Abstracts

Session FF -- Microwave Technology in Radio Astronomy (Focused Session)

"Session FF -- Microwave Technology in Radio Astronomy (Focused Session)." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1241-1241.



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Abstracts

The Large Synthesis Radio Telescopes of the National Radio Astronomy Observatory

P.J. Napier. "The Large Synthesis Radio Telescopes of the National Radio Astronomy Observatory." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1243-1246.

Large radio telescope arrays such as the Very Large Array and Very Long Baseline Array challenge the state-of-the-art of microwave technology in many areas. Examples include the design of optimized sparse arrays and the design and economic construction of high performance, frequency flexible antennas, reliable low noise receivers and highly phase stable local oscillator systems.



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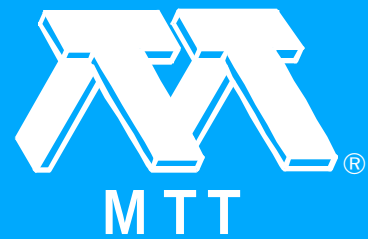


Abstracts

The Millimeter Array

A.R. Thompson. "The Millimeter Array." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1247-1250.

A brief review of the purpose and design of the Millimeter Array is given. Particular attention is paid to the effects of the atmosphere, and to millimeter wavelength components which are the antennas, the low-noise input stages and the local oscillator system.



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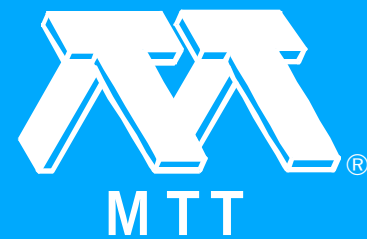


Abstracts

Design Philosophy and Technology Aspects of Submillimeter Wavelength Radio Telescopes

J.W.M. Baars. "Design Philosophy and Technology Aspects of Submillimeter Wavelength Radio Telescopes." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1251-1254.

Telescopes for wavelengths between 0.3 and 1 mm need a reflector surface accuracy of better than 25 m and a pointing precision of $<1''$ under operational conditions. It is essential to control gravitational and thermal deformations to very small values. These can be achieved by the use of carbon fiber reinforced plastic materials and multi-parameter structural optimization. This is illustrated by the design of the 10-m Submillimeter Telescope (SMT) of the MPIfR and Steward Observatory. We also discuss shortly the characteristics of present day receivers for these wavelengths. SIS-diode technology can now be applied to frequencies of about 500 GHz.



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Focal Plane Arrays for Millimeter-Wavelength Astronomy

P.F. Goldsmith. "Focal Plane Arrays for Millimeter-Wavelength Astronomy." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1255-1258.

Arrays of detectors in the focal plane offer a major avenue for increasing the data rate of astronomical observations of extended sources. While having had only limited use at centimeter and longer wavelengths, focal plane arrays are being intensively developed for use on millimeter and submillimeter telescopes. In this review I discuss some of the general characteristics of focal plane imaging systems and associated optics. Detailed discussion is focused on the two large millimeter-wavelength focal plane arrays presently in operation: the 8 element 1.3 mm wavelength NRAO array on the 12 m telescope and the 15 element 3 mm wavelength array on the FCRAO 14 m antenna. Other systems and relevant technology presently under construction or in development phase are briefly described.

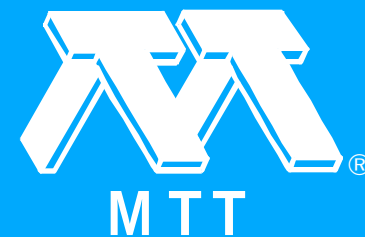
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Abstracts

Session GG -- Biological Effects and Medical Applications (1992 Vol. III [MWSYM])

"Session GG -- Biological Effects and Medical Applications (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1259-1259.



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Treatment of Intracoronary Thrombus with Microwave Thermal Balloon Angioplasty

A. Rosen, P. Walinsky, D. Nardone, B. Bravette, Y. Shi, A. Martinez-Hernandez and A. Zalewski. "Treatment of Intracoronary Thrombus with Microwave Thermal Balloon Angioplasty." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1261-1262.

We utilized microwave energy to evaluate the treatment of vascular thrombus in a canine model of coronary thrombus. We found that with microwave energy we were able to coagulate and laminate intracoronary thrombus providing a more effective of resolution intracoronary thrombus than with conventional balloon angioplasty.

Click on title for a complete paper.



Abstracts

Comparison of Microwave and Convective Heating in Rapid Specimen Preparation Techniques for Electron Microscopy

J.B. Leonard and S.P. Shepardson. "Comparison of Microwave and Convective Heating in Rapid Specimen Preparation Techniques for Electron Microscopy." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1263-1266.

Chemical fixatives preserve tissue for electron microscopy. Microwave heating reduces fixation time from hours to seconds. Comparison of microwave heating (915 MHz and 2.45 GHz) with convective heating suggests that acceleration of fixation is not unique to microwave exposure. Other heating modes appear suitable and may have advantages in cost and convenience.



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Abstracts

Sterile Docking Using Microwave Heating

K.L. Carr and R.S. Grabowy. "Sterile Docking Using Microwave Heating." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1267-1270.

Peritonitis is the single most limiting factor for patients undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD), a treatment associated with End Stage Renal Failure (ESRD). A device which destroys microorganisms that are recognized to be the most problematic in causing peritonitis has been developed and will be described. Moist heat has proven to be the most effective technique for disinfecting the inner lumen of commercially available medical connectors. Moist heat, using microwave heating, has proven to be the most effective and rapid technique. This device represents the first microwave-based medical product specifically designed for home or office use by the patient.



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Biological Applications of a Technique for Broadband Complex Permittivity Measurements

Y. Wei and S. Sridhar. "Biological Applications of a Technique for Broadband Complex Permittivity Measurements." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1271-1274.

A broadband coax technique developed by us for the measurement of dielectric properties of biological substances up to at least 20 GHz, is discussed. For water-based materials such as blood or muscle substitute phantoms, a 0.047 inch size probe is essential to minimize errors due to radiation. The data indicate the importance of the dielectric volume of the constituents, and enable tailoring of phantoms and substitutes for use in biomedical applications.

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Abstracts

Bidimensional Analysis of Planar Applicators from Spectral Domain Approach Method for 915 MHz Hyperthermia

J. Pribetich, L. Dubois, P.Y. Cresson and M. Chive. "Bidimensional Analysis of Planar Applicators from Spectral Domain Approach Method for 915 MHz Hyperthermia." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1275-1278.

This communication is a continuation and an improvement of previous modelization of planar applicators used in hyperthermia. This analysis is based on the bidimensional Spectral Domain Approach (S.D.A.) method. Theoretical and experimental results for the resonant frequencies, power deposition and heating patterns of a planar applicator radiating into human body or phantoms are presented.



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Abstracts

Phased Coaxial Antennas Array: Antenna Design - Power Deposition Diagram - Application in 915 MHz Interstitial Hyperthermia

J.C. Camart, J.J. Fabre, J. Pribetich and M. Chive. "Phased Coaxial Antennas Array: Antenna Design - Power Deposition Diagram - Application in 915 MHz Interstitial Hyperthermia." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1279-1282.

Theoretical and experimental results illustrating the design of interstitial antennas array for 915 MHz microwave hyperthermia are presented in this paper. Desktop computer programs have been developed in order to optimize phased antennas array in order to obtain the most extended heating patterns.



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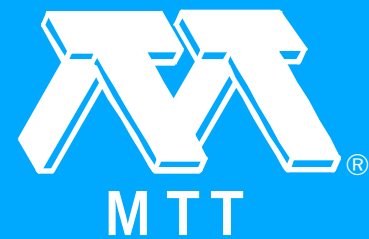
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A Frequency-dependent FDTD Method for Induced-Current Calculations for a Heterogeneous Model of the Human Body

O.P. Gandhi, J.Y. Chen and C.M. Furse. "A Frequency-dependent FDTD Method for Induced-Current Calculations for a Heterogeneous Model of the Human Body." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1283-1286.

A weakness of the FDTD method is that dispersion of the dielectric properties of the scattering/absorbing body is often ignored and frequency-independent properties are generally taken. While this is not a disadvantage for CW or narrow-band irradiation, the results thus obtained may be highly erroneous for short pulses where ultrawide bandwidths are involved. We have developed a new differential equation approach which can be used for general dispersive media for which $\epsilon^*(\omega)$ and $\mu^*(\omega)$ may be expressible in terms of rational functions, or for human tissues where multiterm Debye relaxation equations must generally be used. The method is illustrated by means of one- and three-dimensional examples of media for which $\epsilon^*(\omega)$ is given by a multiterm Debye equation and for a dispersive model of the human body.

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Microwave Radiometry for Medical Thermal Imaging: Theory and Experiment

F. Bardati, V.J. Brown, M.P. Ross and P. Tognolatti. "Microwave Radiometry for Medical Thermal Imaging: Theory and Experiment." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1287-1290.

To ascertain the capability of multifrequency microwave radiometry for imaging an inhomogeneous temperature distribution inside a cylindrical region of the human body an equivalent cylindrical phantom has been constructed. Experiments have been performed with the use of a four-channel radiometer. The physical equipment is evaluated by comparison between measured and modeled data. The effectiveness of a modified algorithm for the solution of the inverse problem of temperature retrieval from radiometric data is discussed.

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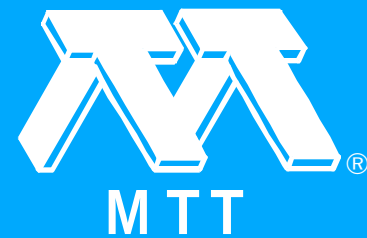


Abstracts

Microwave Thermal Radiometry for Detecting Cancer in Deep Human Tissues

X. Xiang. "Microwave Thermal Radiometry for Detecting Cancer in Deep Human Tissues." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1291-1294.

In order to overcome the depth limit of detectability by a microwave radiometer for cancer, the dual Archimedes spiral Microstrip probe has to be used, which is highly effective in receiving the Microwave thermal radiation energy. The result concerning the noninvasive microwave diagnosis of cancer in deep human tissues is given in this paper.



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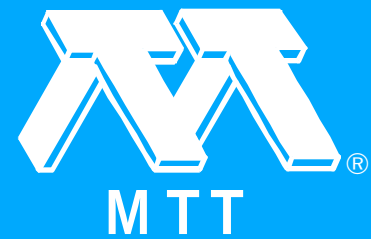
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Abstracts

Session HH -- Advances in Microwave Oscillators Technology

"Session HH -- Advances in Microwave Oscillators Technology." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1295-1295.



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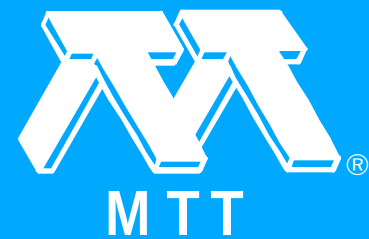
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2-22 GHz Low Phase Noise Silicon Bipolar YIG Tuned Oscillator Using Composite Feedback

A.P.S. Khanna and J. Buenrostro. "2-22 GHz Low Phase Noise Silicon Bipolar YIG Tuned Oscillator Using Composite Feedback." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1297-1299.

A fundamental YIG Tuned Oscillator is presented to cover, for the first time, the frequency range of 2 to 22 GHz, using a high frequency silicon bipolar transistor and a single YIG sphere. A unique composite feedback approach has been utilized to demonstrate a minimum of 10 dBm power output and phase noise of -95dBc/Hz @ 10KHz across most of the band. The design approach and performance results of this widest band & low noise oscillator are described.

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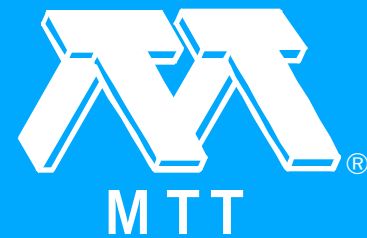


Abstracts

A Novel MMIC Approach to Sampling Phase/Frequency Detection for Microwave Quartz-Lock Oscillators

T. Nakagawa, T. Hirota and T. Ohira. "A Novel MMIC Approach to Sampling Phase/Frequency Detection for Microwave Quartz-Lock Oscillators." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1301-1304.

A novel concept in sampling phase/frequency detection for microwave quartzlock oscillators is proposed, and its prototype is developed in a GaAs MMIC. It is found out experimentally that the proposed detector provides drastic improvement over conventional sampling phase detectors in pull-in range.



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4GHz Miniaturized Low Noise Dielectric Resonator Stabilized Oscillator

K. Kamozaiki. "4GHz Miniaturized Low Noise Dielectric Resonator Stabilized Oscillator." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1305-1308.

A 4GHz Miniaturized Oscillator has been developed. It consists of a 17GHz (17.84GHz) DRO and a divide-by-four analog frequency divider. The 17GHz DRO uses a HEMT with series feedback. The frequency divider was built, based on the concept of an injection locking oscillator using a bipolar transistor. The circuit provides excellent phase noise of - 120dBc/Hz at 100kHz offset from the carrier and good temperature stability of +/- 150KHz over the temperature range - 20°C to +80°C. The circuit size is about 1/8 that of a conventional 4.46GHz DRO.





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A 23 GHz Monolithic MESFET DRO as Self-Oscillating Mixer

U. Guttich. "A 23 GHz Monolithic MESFET DRO as Self-Oscillating Mixer." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1309-1311.

A monolithic GaAs 23 GHz dielectric resonator oscillator (DRO) was investigated as self-oscillating mixer in Doppler-radar applications. A maximum conversion gain of 10 dB at low oscillator power level and small frequency off carrier was calculated and measured. The associated minimum detectable signal (MDS) was determined to be between -130 dBm and -120 dBm.

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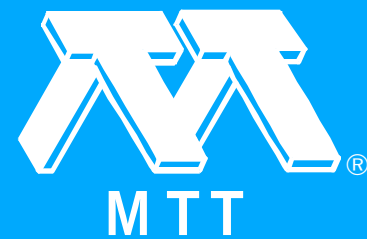


Abstracts

Fast Starting, Pulse Primed DROs without Phase Noise Degradation

G. Oborn. "Fast Starting, Pulse Primed DROs without Phase Noise Degradation." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1313-1316.

Starting time improvements of as much as 700 ns (over 60%) and virtual elimination of the associated jitter is presented for series feedback DROs by uniquely applying a pulsed priming signal. Since resonator Q reduction is not required, the inherent oscillator phase noise is not degraded. The present technique of introducing the priming signal still allows for electrical tuning of the oscillator. Finally, an X-band pulse primed DRO is presented which starts in 60 ns without any observable starting time jitter.



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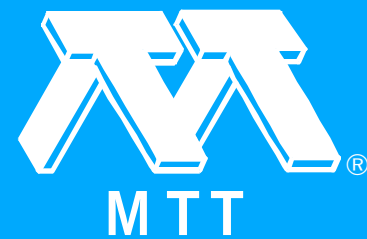


Abstracts

A Semi-Monolithic Wideband VCO with Output Power Control Capability Using an Active Power Splitter

M. Kimishima, S. Ohmura and T. Ashizuka. "A Semi-Monolithic Wideband VCO with Output Power Control Capability Using an Active Power Splitter." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1317-1320.

One-octave bandwidth semi-monolithic VCO which has output power control capability has been developed using an active power splitter. This novel VCO exhibits an output power of 13.6 ± 1.2 dBm, output power control variation of 30 dB and output power match between two output ports is less than 0.6 dB over 8.8 to 17.6 GHz.



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Abstracts

Session II -- Cavity Filters

"Session II -- Cavity Filters." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1321-1321.



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A New Type of Annular Ring Waveguide Cavity for Resonator and Filter Applications

C.-H. Ho and K. Chang. "A New Type of Annular Ring Waveguide Cavity for Resonator and Filter Applications." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1323-1326.

A new type of annular ring waveguide cavity has been developed as a waveguide component for the design of resonators, filters, and multiplexer. H-plane and E-plane annular ring waveguide cavities have been investigated thoroughly as regular and forced mode resonators. A dual resonant mode filter using a single H-plane annular ring waveguide cavity has been built with a bandwidth-center-frequency ratio of 0.77%, a stopband attenuation of more than 40 dB, and a sharp gain slope transition. Another dual resonant mode filter which was formed by cascading two E-plane annular ring waveguide cavities has also been fabricated with a bandwidth-center-frequency ratio of 1.12%, a stopband attenuation of 60 dB, a mode purity of 2 GHz around the center frequency of 26.82 GHz, and a sharp gain slope transition. Electronically-tuned resonators are also discussed in this paper.

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Dual Mode Coupling by Square Corner Cut in Resonators and Filters (1992 Vol. III [MWSYM])

X.-P. Liang and K.A. Zaki. "Dual Mode Coupling by Square Corner Cut in Resonators and Filters (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1327-1330.

A new method for realization of dual mode coupling in rectangular waveguide cavities is described and analyzed. The new method completely replaces the coupling screw, and therefore can be used to eliminate the need for tuning in dual mode waveguide cavity filters. It also offers a wide range of coupling values and can achieve higher power handling capability than coupling screws. Mode matching method is used to calculate the mode chart of the infinite corner cut rectangular waveguide, the field distributions of each mode, and the resonant frequencies of the cavity. Dual mode coupling parameter is calculated from resonant frequencies and is verified by measurements. A C-band 4-pole dual mode elliptic function rectangular waveguide cavity filter using the new coupling method was constructed and tested. The experimental results showed excellent agreement with theory.

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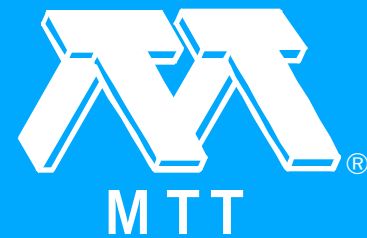


Abstracts

A Narrowband Filter with a Wide Spurious-Free Stopband

R.R. Bonetti and A.E. Williams. "A Narrowband Filter with a Wide Spurious-Free Stopband." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1331-1333.

This paper describes a 6-pole, 12-GHz, pseudo-elliptic 76-MHz bandpass filter which achieves a stopband attenuation of greater than 50 dB up to 25 GHz. This design eliminates the need for a separate low-pass filter in applications such as output multiplexer of satellite transponders.



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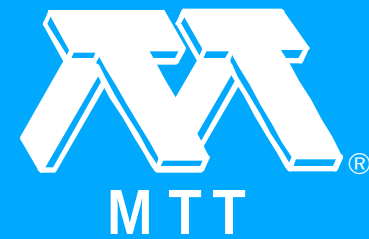
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Abstracts

Session JJ -- CAD 2-Modeling and Analysis Techniques

"Session JJ -- CAD 2-Modeling and Analysis Techniques." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1335-1335.



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Simulating Distributed Elements with Asymptotic Waveform Evaluation

J.E. Bracken, V. Raghavan and R.A. Rohrer. "Simulating Distributed Elements with Asymptotic Waveform Evaluation." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1337-1340.

A new method for simulating distributed elements is described. The Asymptotic Waveform Evaluation (AWE) technique is used to compute a low-order approximation to the admittance matrix for a system of coupled lossy lines. The Y-matrix can serve as a macromodel for the lines, so that they can be simulated together with arbitrary (nonlinear) terminations. A major advantage of the new method is that it allows general distributed elements to be simulated in the time domain without using computationally expensive lumped models or numerical inverse transform techniques.

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Fast Nonlinear Waveform Estimation for Large Distributed Networks

E. Chiprout and M. Nakhla. "Fast Nonlinear Waveform Estimation for Large Distributed Networks." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1341-1344.

A novel nonlinear waveform estimation method based on the Asymptotic Waveform Evaluation is presented. The method generates transient waveform estimation of large, distributed networks with arbitrary terminations, while using neither convolution nor numerical inversion techniques, both of which are found to be expensive for other methods. These are avoided due to the exponential form of the fundamental modes of the linear system. The linear network analysis speedup of waveform estimation, already demonstrated, is here supplemented for the nonlinear case.

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A Broadband Parameter Extraction Technique for the Equivalent Circuit of Planar Inductors

Y.C. Shih, C.K. Pao and T. Itoh. "A Broadband Parameter Extraction Technique for the Equivalent Circuit of Planar Inductors." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1345-1348.

A broadband parameter-extraction technique is developed for the equivalent circuit of planar inductors based on measured S-parameters and the use of Y parameters. The broadband information allow the definition of a concise quality measure and frequency range of application beyond the first resonance. We prove that the negative coupling capacitance appearing in the equivalent circuit is indeed required in order to approximate closely the distributed nature of the inductors even if it appears to contradict the general perception.

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Abstracts

Experimental Models of Series and Shunt Elements in Coplanar MMICs

A.K. Sharma and H. Wang. "Experimental Models of Series and Shunt Elements in Coplanar MMICs." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1349-1352.

Experimental models of several grounded coplanar waveguide discontinuity structures, such as series as well as shunt inductors and capacitors, have been developed using experimental measurements and computer optimization. The equivalent circuit models have been derived in terms of structural parameters of the discontinuity structures to facilitate their easy use in the design of coplanar MMICs.



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Approximate Calculation of the High-Frequency Resistance Matrix for Multiple Coupled Lines

G.L. Matthaei and G.C. Chinn. "Approximate Calculation of the High-Frequency Resistance Matrix for Multiple Coupled Lines." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1353-1354.

A new and relatively simple method for the calculation of the high-frequency resistance matrices of multiple coupled lines is presented. The method is based on a generalization of Wheeler's "incremental inductance rule" so as to apply to any number of coupled lines.

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Abstracts

A Novel Approach to the Synthesis of Mixed Lumped and Distributed Lossy Networks

L. Zhu. "A Novel Approach to the Synthesis of Mixed Lumped and Distributed Lossy Networks." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1355-1358.

In this paper, a general lossy transformation technique (LTT) is proposed for solving the problem of synthesis of mixed lumped and distributed (MLD) lossy networks. The elements, of which the MLD lossy networks are composed can have arbitrary frequency-dependent losses. A computer-aided design example is presented to shown the application of the new LTT of the design of a monolithic microwave integrated broadband FET amplifier with MLD lossy circuits as matching networks.



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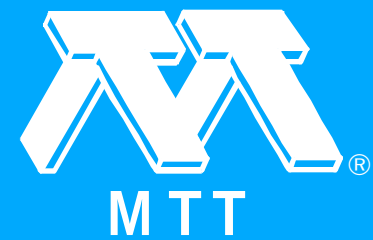
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Abstracts

Session KK -- Microwave Technology in Radio Astronomy II

"Session KK -- Microwave Technology in Radio Astronomy II." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1359-1359.



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Wideband Feed Systems for Radio Telescopes

G.L. James. "Wideband Feed Systems for Radio Telescopes." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1361-1363.

While reflector-type antennas commonly used for radio telescopes are inherently capable of extremely wide bandwidth performance, they are severely limited by the behaviour of the feed system. An overview is given of wideband feed systems for radio astronomy purposes developed at the CSIRO Division of Radiophysics. This work encompasses the feed antenna, the orthomode transducer, and the waveguide polarizer.

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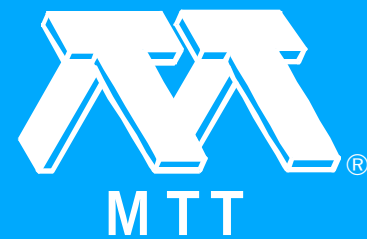


Abstracts

Receiver and Optics Designs for the 100-Meter Green Bank Telescope

R.D. Norrod, S. Srikanth and M. Balister. "Receiver and Optics Designs for the 100-Meter Green Bank Telescope." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1365-1368.

A 100-meter diameter, fully steerable, offset dual reflector radio telescope is under construction at the Green Bank, West Virginia facility of the National Radio Astronomy Observatory (NRAO). Significant performance improvements are expected of the offset design over that possible with symmetrical antennas. The antenna will be capable of operation from below 300 MHz to above 40 GHz. To take full advantage of the offset design, ultra-low-noise cryogenic receivers will be constructed and installed. This paper will summarize the trade-offs made in the design of the microwave optics, and describe plans for receivers and associated equipment.



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Abstracts

Cryogenically-Cooled, HFET Amplifiers and Receivers: State-of-the-Art and Future Trends

M.W. Pospieszalski. "Cryogenically-Cooled, HFET Amplifiers and Receivers: State-of-the-Art and Future Trends." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1369-1372.

Recent progress in the development of ultra-low-noise, cryogenically-coolable, HFET (hetero-structure field-effect transistor) amplifiers and receivers for radio astronomy applications is reported. Examples of state-of-the-art receivers at frequencies from L- to Q-band are discussed. A model-based prediction of future performance demonstrates that HFET receivers should soon be competitive with SIS mixer receivers at W-band frequencies.



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Phase Calibration of the Very Long Baseline Array(VLBA)

A.E.E. Rogers, B.E. Corey and E.F. Nesman. "Phase Calibration of the Very Long Baseline Array(VLBA)." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1373-1373.

The delay through a microwave receiver can be calibrated injecting short duration pulses (< 25 picosecond risetime) with constant repetition rate (typically 1 MHz) through a coupler into the input of the receiver. The phases of the tones generated by the pulse train are measured to determine the receiver phase and group delay.

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Microwave Technology Innovations in Orbiting VLBI

L.R. D'Addario. "Microwave Technology Innovations in Orbiting VLBI." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1375-1378.

The radio astronomical technique of very long baseline interferometry (VLBI) will soon be extended beyond the earth's surface by placing antennas and receiving systems in high earth orbit. Two such orbiting VLBI telescopes are expected to be in operation by 1995. The technical challenges of these projects have produced several interesting innovations in the microwave area, including designs of large, deployable antennas; designs of multifrequency feed systems; cryogenic low noise amplifiers; and methods of precise time synchronization with ground telescopes.

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A Differential Radiometer for MM Wavelengths

L. Piccirillo, M. Calabresi and M. Zucchetti. "A Differential Radiometer for MM Wavelengths." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1379-1382.

The performances of an antenna system operating at mm wavelengths are discussed. Results from several measurements under different test conditions are presented. The antenna was used to make observations from Antarctica of the diffuse sky emission at 94 GHz.

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Abstracts

Session LL -- Bulk and Thin Film Ferrites

"Session LL -- Bulk and Thin Film Ferrites." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1383-1383.



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Recent Developments in the Average Power Capacity of Rotary-Field Ferrite Phase Shifters

W.E. Hord. "Recent Developments in the Average Power Capacity of Rotary-Field Ferrite Phase Shifters." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1385-1388.

An air-cooled experimental S-band rotary-field ferrite phase shifter with an average power capacity of 3 Kilowatts is described. The increase in average power capacity was achieved without noticeable degradation of r-f performance. An equivalent circuit model for thermal analysis is developed. The model parameters are determined by r-f and temperature measurements. The parameters are compared with those of a conventional rotary-field phase shifter.

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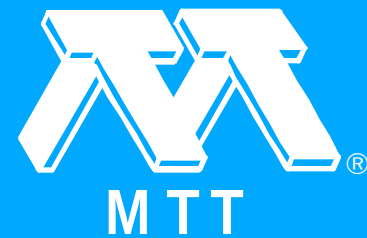


Abstracts

A Compact Broadband Microstrip Circulator for Phased Array Antenna Modules

R.E. Blight and E. Schloemann. "A Compact Broadband Microstrip Circulator for Phased Array Antenna Modules." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1389-1392.

Minimal size, weight and cost are three requirements for circulators to be packaged in T/R modules. This paper describes circulators realized under these constraints. Hybrid fabrication methods are used, in order to meet magnetic biasing and shielding requirements.



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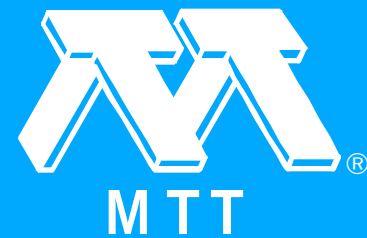


Abstracts

Novel Ferrite Circulator Junctions with Predicted Performance

A.M. Borjak and L.E. Davis. "Novel Ferrite Circulator Junctions with Predicted Performance." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1393-1396.

New results are presented for the circulation conditions and predicted performance of a symmetrical Y ring circulator (6 GHz) and of a new asymmetrical W disk circulator (94 GHz). The latter has two ports positioned 60° away from a middle port. The components can, in principle, be more compact than conventional disk circulators.



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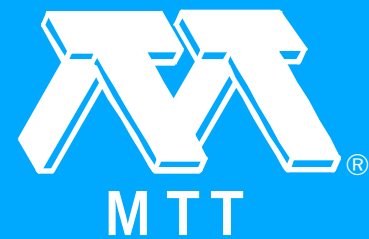
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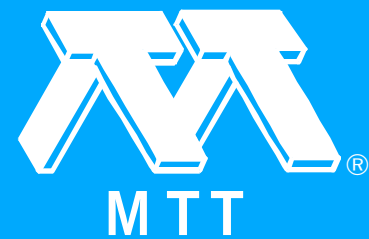
On the YIG Film Filters

M. Tsutsumi and K. Okubo. "On the YIG Film Filters." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1397-1400.

A new type of YIG film filter is proposed which consists of a microstrip line with a substrate of YIG films sandwiched between two dielectric slabs. The dispersion and transmission characteristics are calculated numerically. A sharp stop band characteristics are observed experimentally with half-power bandwidth of 16.4 MHz. Alternatively, in the same line with an air gap band-pass characteristic is observed with quality factor of 430. These experimental results are discussed with theory.

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Magnetostatic Wave Notch Filter

M.R. Daniel and J.D. Adam. "Magnetostatic Wave Notch Filter." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1401-1402.

The application of epitaxial YIG resonators is reported in a tunable notch filter desire of center frequency 9 GHz. Tuning from 8 to 10 GHz was accomplished via a miniature electromagnet of volume about 1 cm³. This volume gives the filter application in phased arrays of simultaneous transmit/receive antenna modules.

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Abstracts

A Miniaturized Low-Spurious 1.9 GHz MSW Band-Pass Filter Using YIG Resonators with Multi Metal Rings

Y. Ishikawa, T. Okada, S. Shinmura, F. Kanaya, K. Wakino and T. Nishikawa. "A Miniaturized Low-Spurious 1.9 GHz MSW Band-Pass Filter Using YIG Resonators with Multi Metal Rings." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1403-1406.

A new simple technique of forming multi metal rings on both sides of YIG element have been developed to suppress the spurious responses of YIG resonators effectively. By using this resonator, a 10x5x4 mm³ two-stage MSW band-pass filter has been developed. The insertion loss is about 2 dB at 1.9 GHz, and the suppression of spurious response is 25 dB.



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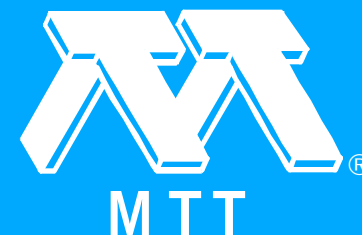
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Session MM -- Millimeter Wave Mixers and Receivers

"Session MM -- Millimeter Wave Mixers and Receivers." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1407-1407.



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High Performance Resistive EHF Mixers Using InGaAs HEMTs

K.W. Chang, T.H. Chen, S.B.T. Bui, L.C.T. Liu and L. Nguyen. "High Performance Resistive EHF Mixers Using InGaAs HEMTs." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1409-1412.

This paper presents the design, fabrication, and testing of a hybrid and a monolithic single-balanced EHF mixers. Very low mixer intermodulation distortion was achieved using $0.2 \times 160 \mu\text{m}^2$ pseudomorphic InGaAs high electron mobility transistor biased in the resistive mode. Both mixers show similar excellent measured performance. Mixer conversion loss over the 26-29 GHz RF frequency band is about 7~9 dB for DC to 2 GHz IF frequencies. With an LO power of +13 dBm, the measured input two-tone third-order intercept point is higher than +24 dBm.

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Abstracts

A Heterodyne Receiver for 40-GHz-Modulated 1.3- μm Optical Signals Using a Multi-Tasked InP-Based HEMT

C. Rauscher and K.J. Williams. "A Heterodyne Receiver for 40-GHz-Modulated 1.3- μm Optical Signals Using a Multi-Tasked InP-Based HEMT." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1413-1416.

Heterodyne reception of a millimeter-wave modulated 1.3- μm optical carrier signal is achieved with an InP-based HEMT that performs four simultaneous functions all in one. The functions comprise carrier demodulation, generation of a local oscillation signal, frequency multiplication thereof, and transistor-internal down-conversion of the modulation signal to a lower intermediate frequency band. The measured performance characteristics of the heterodyne receiver are reported together with results derived from a systematic study of optical detection and mixing properties of a HEMT by itself, observed as functions of modulation signal frequencies up through 40 GHz and bias conditions.



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Abstracts

A 90 GHz Quasi-Integrated Horn Antenna Receiver

W.Y. Ali-Ahmad and G.M. Rebeiz. "A 90 GHz Quasi-Integrated Horn Antenna Receiver." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1417-1420.

A receiver belonging to the family of integrated planar receivers has been developed at 90 GHz. It consists of a planar Schottky-diode placed at the feed of a dipole-probe suspended inside an integrated horn antenna. A machined section attached to the front of the etched horn increases the gain to 20dB and results in Gaussian coupling efficiency of 97%. The measured planar mixer single-sideband conversion loss at 91.2 GHz (LO) with a 200 MHz IF frequency is $8.3\text{dB} \pm 0.3\text{dB}$. The low cost of fabrication and simplicity of this design makes it ideal for millimeter and submillimeter-wave receivers.



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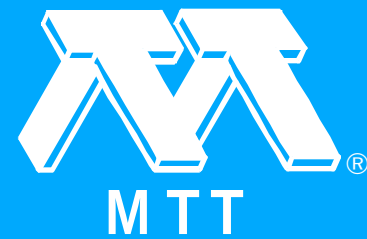


Abstracts

A Planar Quasi-Optical SIS Receiver Suitable for Array Applications

P.A. Stimson, R.J. Dengler, P.H. Siegel and H.G. LeDuc. "A Planar Quasi-Optical SIS Receiver Suitable for Array Applications." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1421-1424.

A novel planar, quasi-optical SIS receiver operating at 230 GHz is described. The receiver consists of a 2x5 array of half wave dipole antennas with ten niobium-aluminum oxide-niobium SIS junctions on a quartz dielectric-filled parabola. The 1.2 GHz intermediate frequency is coupled from the mixer via coplanar strip transmission lines and 4:1 balun transformers. The receiver is operated at 4.2 K in a liquid helium immersion cryostat. We report here accurate measurements of the performance of single receiver elements. A mixer noise temperature of 148 K DSB, receiver noise temperature of 259 K DSB and conversion loss of 10 dB into a matched load have been obtained.



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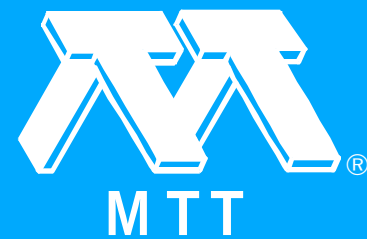


Abstracts

Reflected Power Effects in Computer Simulations Using the Quantum Theory of Mixing

Q. Ke and M.J. Feldman. "Reflected Power Effects in Computer Simulations Using the Quantum Theory of Mixing." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1425-1428.

Attention is directed to the signal reflection gain and the signal-to-image conversion gain in the quantum theory of mixing. The theory gives two distinct types of solutions for the minimum noise temperature of an SIS receiver. One has very high IF conversion gain, and the returned signal and image powers are extremely high as well. The other has moderate IF conversion gain, but the returned powers tend to be very small. This resolves a longstanding mystery.



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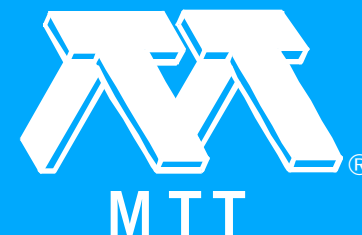
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Abstracts

Session NN -- Active On-Wafer and Time-Domain Analyzer Measurements

"Session NN -- Active On-Wafer and Time-Domain Analyzer Measurements." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1429-1429.



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A High Power On-Wafer Pulsed Active Load Pull System (1992 Vol. III [MWSYM])

D.D. Poulin, J.R. Mahon and J.-P. Lanteri. "A High Power On-Wafer Pulsed Active Load Pull System (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1431-1434.

This paper describes a unique on-wafer load pull system that is capable of measuring load pull contours on true high power and large periphery devices. Measurements are made under low duty cycle pulsed DC and RF conditions to minimize the effects of heating due to power dissipation in the on-wafer environment. With the current implementation of the load pull system, any load impedance on the Smith chart can be presented to the output of four Watt devices. The system is fully error corrected for reflection coefficient, transmission coefficient, input power incident, input power delivered, and output power delivered. The system is capable of automatic control and measurement by means of a HP 9000 series workstation. Data taken on C band MMIC power amplifiers and 2mm GaAs FET's is presented.

Click on title for a complete paper.



Abstracts

A New On-Wafer Large-Signal Waveform Measurement System with 40 GHz Harmonic Bandwidth

F. van Raay and G. Kompa. "A New On-Wafer Large-Signal Waveform Measurement System with 40 GHz Harmonic Bandwidth." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1435-1438.

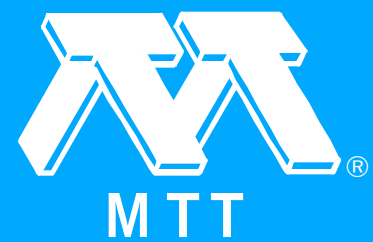
A novel on-wafer large-signal waveform measurement system with 40 GHz harmonic frequency range using a microwave transition analyzer is presented. Potential applications are illustrated by the measurement of the harmonic amplitude and phase spectra of the reflection and transmission response of a 0.3 μm InGaAs pseudomorphic HEMT under X-band sinusoidal stimulus.



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On-Wafer RF Measurement Setup for the Characterization of HEMT's and High TC Superconductors at Very Low Temperatures Down to 20 K

H. Meschede, R. Reuter, D. Peters, J. Kraus, R.M. Bertenburg, W. Brockerhoff and F.J. Tegude. "On-Wafer RF Measurement Setup for the Characterization of HEMT's and High TC Superconductors at Very Low Temperatures Down to 20 K." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1439-1442.

The possibility of microwave measurements at cryogenic temperatures is very important to investigate the pronounced RF performance of high electron mobility transistors (HEMT) /1,2/. In order to perform an exact small signal analysis of the investigated devices the On-Wafer measurement technique is an indispensable tool. A measurement setup which is cooled by liquid nitrogen has been presented by Laskar et al. /3,4/. However, to investigate the combination of high T_c superconducting materials and HEMT devices lower temperatures have to be achieved. For this reason a microwave On-Wafer measurement setup at temperatures down to 20 K and frequencies up to 40 GHz has been developed. Using this equipment a detailed RF analysis of pseudomorphic HEMT at low temperatures and measurements on a superconducting filter will be presented.

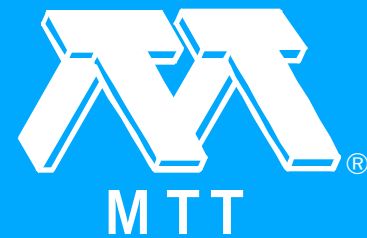


Abstracts

Two-Dimensional Field Mapping in MMIC-Substrates by Electro-Optic Sampling Technique

W. Mertin, C. Bohm, L.J. Balk and E. Kubalek. "Two-Dimensional Field Mapping in MMIC-Substrates by Electro-Optic Sampling Technique." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1443-1446.

For the first time two-dimensional substrate internal field mapping of monolithic microwave integrated structures on GaAs by direct electro-optic sampling is presented. Measurements up to 8.5 GHz have been made. It will be shown that this test technique is very useful for internal function and failure analysis of MMIC.



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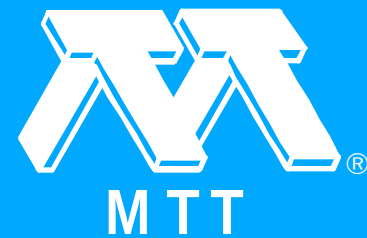


Abstracts

Thru-Match-Short Calibration for Time Domain Network Analysis

L.A. Hayden and V.K. Tripathi. "Thru-Match-Short Calibration for Time Domain Network Analysis." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1447-1450.

A technique for obtaining corrected two-port network parameters from Time Domain Reflection/Transmission (TDR/T) measurements is described. This method is based on the Thru-Match-Short (TMS) calibration procedure and allows for the extension of general Vector Network Analysis (VNA) techniques to the correction of time domain measurements.



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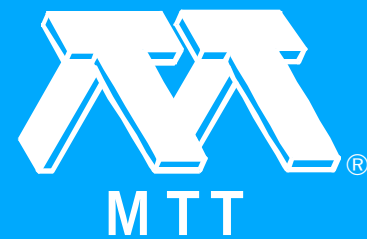


Abstracts

A Complete Calibration Procedure for Time Domain Network Analyzers

P. Ferrari, G. Angenieux and B. Flechet. "A Complete Calibration Procedure for Time Domain Network Analyzers." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1451-1454.

This paper deals with a complete calibration procedure of a TDR-TDT system which yields to the Time Domain Network Analyzer (TDNA). All measurements are achieved in the Time Domain; the errors are corrected in the Frequency Domain, after Fourier Transform. The bandwidth of the system extends from DC to 20 GHz. A comparison of the results obtained by this method with those obtained by frequency measurements using a LRL correction is made.



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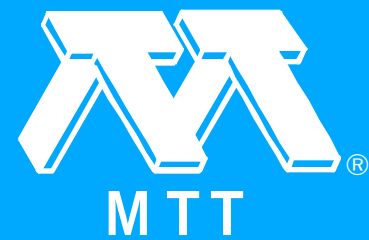


Abstracts

Introducing the Through-Line Deembedding Procedure

M.B. Steer, S.B. Goldberg, G. Rinne, P.D. Franzon, I. Turlik and J.S. Kasten. "Introducing the Through-Line Deembedding Procedure." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1455-1458.

The through-line (TL) method is introduced to replace the through-reflect-line (TRL) deembedding procedure. TL utilizes measurements of two lengths of line following approximate open-short-line calibration. TL accounts for the frequency dependent characteristic impedance of the line and avoids the periodic glitches inherent to the TRL procedure.



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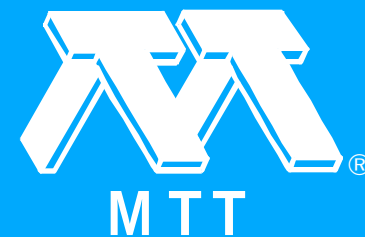
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Abstracts

Session OO -- CAD 3-Circuit Simulation and Yield Optimization

"Session OO -- CAD 3-Circuit Simulation and Yield Optimization." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1459-1459.



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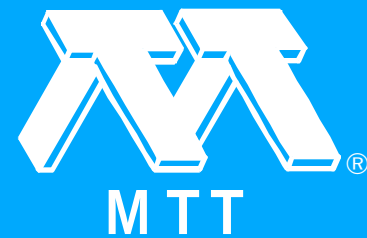


Abstracts

An Equivalent Circuit Model for the Coplanar Waveguide Step Discontinuity

C. Sinclair and S.J. Nightingale. "An Equivalent Circuit Model for the Coplanar Waveguide Step Discontinuity." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1461-1464.

An approximate analytical model for the CPW Step Discontinuity is presented which includes a lumped shunt capacitance as the dominant effect. However, the magnitude is much lower than previously published work. Good agreement is obtained with data from extensive 3-D field simulations, and verified by a limited number of measurements on alumina.



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Abstracts

A New Formulation for Yield Optimization

J.W. Bandler, S.H. Chen and R.M. Biernacki. "A New Formulation for Yield Optimization." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1465-1468.

A new and elegant formulation for yield optimization is presented with applications to microwave circuits. It extends the conventional discrete Monte Carlo estimate of yield to a continuous yield probability junction suitable for gradient-based optimization. The merit of our new method is demonstrated by yield optimization of an amplifier and a nonlinear FET doubler.



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Combining Yield Optimization with Circuit Level Electromagnetic Simulation

M.D. Meehan, P. Draxler and L.C. Henning. "Combining Yield Optimization with Circuit Level Electromagnetic Simulation." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1469-1472.

A method for first-pass MMIC design success is presented. In this paper we combine the power of statistical design and modeling with that of circuit level electromagnetic simulation in a CAD system, providing the ultimate crystal ball for predicting production success. The performance of the proposed CAD system is verified by comparing simulated vs. actual statistical response characteristics of a 3-stage, 7-11 GHz LNA GaAs MMIC from AT&T Bell Laboratories, Reading, Pennsylvania.

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Small-Signal RF Yield Analysis of MMIC Circuits Based on Physical Device Parameters

D.L. Allen, J. Beall and M. King. "Small-Signal RF Yield Analysis of MMIC Circuits Based on Physical Device Parameters." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1473-1476.

This paper describes a technique for computing small-signal RF yield of monolithic microwave integrated (MMIC) circuits based on the sensitivity of electrical model parameters to physical device parameters. Because GaAs MMICs are increasingly being used in large scale production programs, the producibility of a given design must be considered at the beginning of the design process. The RF yield analysis approach to be described uses key MMIC device physical variables and computed sensitivities of electrical model parameters to those variables.

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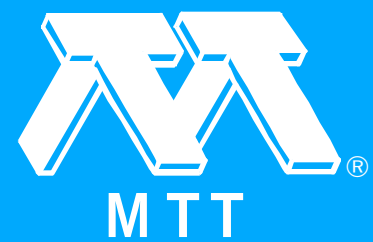
Reflectionless Broad-Band Matching Networks Using a Diplexer Approach

T.G. McKay. "Reflectionless Broad-Band Matching Networks Using a Diplexer Approach." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1477-1480.

A method is presented for generating networks which match an RC load with prescribed gain equalization while simultaneously providing good match. The technique involves the synthesis of two network conductance functions, one of which forms the input conductance of the matching circuit, and a second network which realizes the complimentary conductance. When placed in parallel, the resulting network provides constant, real input impedance, and when driven from a resistive source, provides intended gain equalization. This method has potential advantage over the classical method of balanced, reflection-equalized amplifier networks, for reduced size and lower loss, and is ideally suited for MMIC application since the need for physically large couplers is eliminated. This method preferable over the present heuristic lossy-match approaches, since it is theoretically sound and permits optimal gain-bandwidth design.



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Noise Analysis of Microwave Circuits with General Topology

P. Russer and S. Muller. "Noise Analysis of Microwave Circuits with General Topology." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1481-1484.

A method for noise analysis of microwave multiports with general internal topology is presented. The multiport circuit is separated into the connection circuit and the circuit elements. Based upon the digraph representation of the connection circuit the scattering matrix of the connection circuit is computed from the fundamental cut set matrix and the fundamental loop matrix of the connection circuit. From this and the S-parameters of the circuit elements and the correlation spectra of the internal noise sources the S-matrix of the multiport and the correlation matrix of its external equivalent noise sources may be determined directly. Circuit elements may be noisy two-terminal elements as well as noisy n-terminal elements and noisy multiports.

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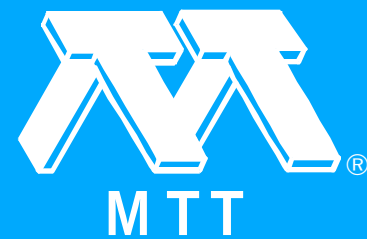


Abstracts

A New Method for the Transient Simulation of Causal Linear Systems Described in the Frequency Domain

T.J. Brazil. "A New Method for the Transient Simulation of Causal Linear Systems Described in the Frequency Domain." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1485-1488.

A convolution-based method is described for the transient analysis of causal linear systems. The main novelty lies in the method proposed for computing discrete impulse response samples, which possess excellent frequency interpolation properties to the system function, even though comparatively few samples are used. Convolution operations are accordingly highly efficient, and results are presented to validate the method in comparison to (a) theoretical analysis, (b) SPICE simulation, and (c) experimental step-response results for a lossy microstrip filter. Extensions of the method to more general nonlinear transient simulation are conceptually straightforward.



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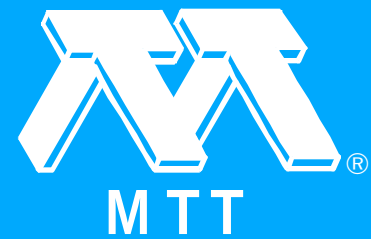
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Abstracts

Session PP (Focused Session) -- Recent Advances In UWB Systems & Technology I

"Session PP (Focused Session) -- Recent Advances In UWB Systems & Technology I." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1489-1489.



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UWB RADAR for Ground Vehicle Self Protect

J.W. Toevs, D.R. Smith, D.P. Byrne and G.F. Ross. "UWB RADAR for Ground Vehicle Self Protect." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1491-1494.

This paper describes a concept to use an impulse radar system to detect, acquire, identify, and track incoming armor piercing rounds which threaten a ground vehicle containing active armor. Data illustrating the ability of a prototype impulse radar to discriminate between different target shapes are presented. The sensitivity of the CFAR receiver used with the system appears to be adequate, but ground clutter poses a serious problem. Techniques for discriminating against ground clutter are being explored.

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CARABAS - An UWB Low Frequency SAR

H. Hellsten. "CARABAS - An UWB Low Frequency SAR." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1495-1498.

The significance of low frequency ultra wide band radar imagery has been investigated at FOA for several years. In order to verify the theoretical predictions, an airborne SAR radar system, operating over the frequency band 20 - 90 MHz has been developed. A first data collection campaign took place in January 1992. Initial data are still in the phase of evaluation. In the wavelength interval adopted, vegetation is transparent and radiation penetrates the ground to a significant degree. The system is considered capable of mapping structures and objects obscured by vegetation or buried into the ground.

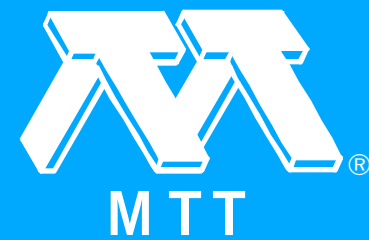
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Abstracts

Session QQ -- Microwave and Millimeter Wave Packaging

"Session QQ -- Microwave and Millimeter Wave Packaging." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1499-1499.



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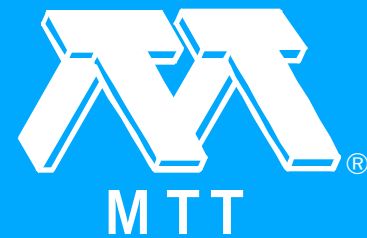


Abstracts

Packaging Requirements for High Volume Wireless Communications

D.R. Green, J.P. Beccone and R.B. Crispell. "Packaging Requirements for High Volume Wireless Communications." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1501-1501.

We present an overview of present and anticipated high volume wireless communication applications, with emphasis on cellular and cordless phones, for MMICs and MICs. Packaging requirements are discussed for existing and emerging standards.



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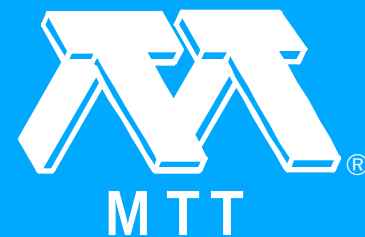


Abstracts

Microwave Module Packaging

G. Jerinic and M. Borkowski. "Microwave Module Packaging." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1503-1506.

The demonstration of a <\$50 package for GaAs MMIC microwave module applications has not been achieved yet. This paper outlines the requirements for microwave packaging and describes three low-cost metal-package solutions (1) brazed construction, (2) metal injection molded construction, and (3) pressure infiltration casting.



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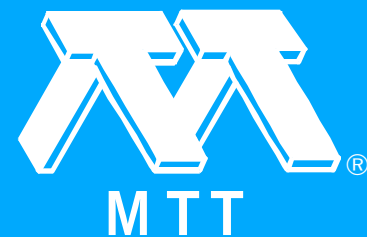


Abstracts

Millimeter-Wave Packaging

H.J. Kuno and T.A. Midford. "Millimeter-Wave Packaging." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1507-1508.

In the development of millimeter-wave devices and components, package design and implementation have often lagged behind the development of other elements such as active devices, matching circuits, and integrated circuits. The result has been the surfacing of sometimes significant packaging issues late in the product development cycle, often with the result of substantial performance compromise. This situation is partly a result of having fielded only a very limited number of millimeter-wave components and systems, thus negating the need for extensive packaging development and a packaging infrastructure. It is noteworthy that no commercial RF packages exist for operation at frequencies above 20 GHz and significant performance degradation is already evident at X-band.



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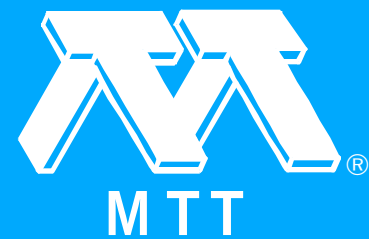


Abstracts

Microwave Module Interconnection and Packaging Using Multilayer Thin Film/Thick Film Technology

A.K. Agrawal, R.D. Clark, J.J. Komiak and R. Browne. "Microwave Module Interconnection and Packaging Using Multilayer Thin Film/Thick Film Technology." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1509-1511.

This paper describes a multichip T/R module packaging technique that combines thin film and multilayer thick film metalizations on a single alumina substrate with ceramic seal ring technology to provide a high density, wide bandwidth, high performance package.



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Abstracts

Miniaturized Stripline Circuitry Utilizing Low Temperature Cofired Ceramic (LTCC) Technology

B.A. Kopp and A.S. Francomacaro. "Miniaturized Stripline Circuitry Utilizing Low Temperature Cofired Ceramic (LTCC) Technology." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1513-1516.

LTCC substrate material has been successfully used to fabricate a 4 GHz 20-dB stripline coupler with 20 dB directivity and a low second harmonic 4 GHz stripline edge coupled filter. These circuits provide mechanical, size, performance, and cost advantages, when compared to stripline assemblies made from softboard or non-homogeneous materials.



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Highly Efficient, Very Compact GaAs Power Module for Cellular Telephone

Y. Ota, M. Yanagihara, T. Yokoyama, C. Azuma, M. Maeda and O. Ishikawa. "Highly Efficient, Very Compact GaAs Power Module for Cellular Telephone." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1517-1520.

A power module with high efficiency and small size has been developed for cellular telephones. The module, which is composed of a 2-stage amplifier with GaAs MESFETs and packaged into a very small volume of 0.8 cc, shows excellent RF characteristics of the output power $P_{\text{out}} = 32.3$ dBm and the power-added efficiency $\eta_{\text{add}} = 65\%$ at $f = 930$ MHz, $P_{\text{in}} = 7$ dBm, $V_{\text{dd}} = 4.7$ V. This power module has contributed to realization of compact cellular telephone.

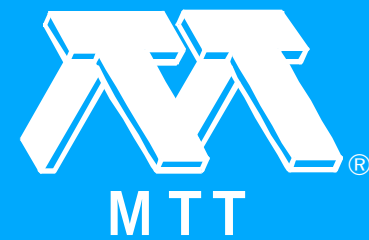
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Abstracts

Session RR -- Phased and Active Array Techniques

"Session RR -- Phased and Active Array Techniques." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1521-1521.



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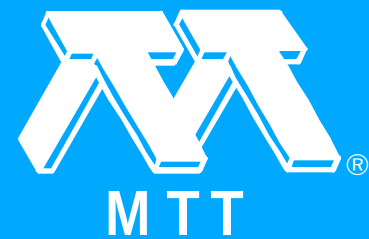
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T/R Module Architectural Consideration for Active Electronically Steerable Arrays

T.R. Burlington, F.E. Sacks and J.W. Gippich. "T/R Module Architectural Consideration for Active Electronically Steerable Arrays." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1523-1526.

The increasingly complex threat environment for target detection radars has driven the system architects to the use of electrically steerable active aperture antenna arrays. Transmit and receive modules are key elements in any active aperture system. T/R module architecture is unique for each system application and must be designed carefully to assure performance goals as well as platform limitations are met. This paper will discuss T/R module architectural considerations and show specific examples of wideband and narrow band modules which have been implemented into functional arrays.

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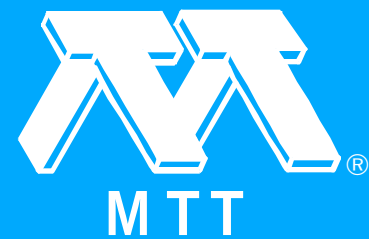


L-Band Phase Shifter with Switching FET's for Phased Array Antenna

T. Kato, Y. Tanaka, H. Ueda, H. Kano and M. Hashimoto. "L-Band Phase Shifter with Switching FET's for Phased Array Antenna." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1527-1530.

An L-band 3-bit phase shifter has been developed with switching GaAs MESFET's. To get simple and low loss phase shifter, the switching performance of the FET is improved. The FET has an on-state resistance of 1.5ohms by optimizing device structures. By using the phase shift circuit consisting of the FET and a short stub, a phase shifter insertion loss becomes 1.7 ± 0.2 dB over the range of 1540 - 1660MHz. A phased array antenna is also developed with the phase shifter.





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Ultra Small Size X Band MMIC T/R Module for Active Phased Array

T. Sakai, N. Takeuchi, A. Mizobuchi, Y. Iyama and N. Tanino. "Ultra Small Size X Band MMIC T/R Module for Active Phased Array." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1531-1534.

Ultra small size transmit/receive (T/R) module is reported with application to active phased arrays. By the application of GaAs MMIC technique and two storied stack structure, 130 prototype modules have been built each measuring 13 x 16. 5 x 8 mm and weighting 10 grams. The average module transmit power is 1 watt and the receive noise figure is less than 4.7 dB in X band.

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An FET Oscillator Element for Spatially Injection Locked Arrays

J. Birkeland and T. Itoh. "An FET Oscillator Element for Spatially Injection Locked Arrays." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1535-1538.

A new type of oscillator element for spatially injection locked arrays is presented. The element consists of an FET oscillator equipped with two patch antennas: one for reception of the injection signal and the other for radiating the oscillator output power. This element exhibits much broader locking bandwidths for a given injection signal than previous approaches. Prototype circuits operating at 6 GHz exhibit a 270 MHz locking range with 46.5 dB isotropic gain.

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Quasi-Optical Array VCO's

S. Bundy, T.B. Mader and Z.B. Popovic. "Quasi-Optical Array VCO's." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1539-1542.

Quasi-optical array voltage controlled oscillators (VCO) are presented. A quasioptical VCO consists of an array of oscillators, a variable capacitance array and a mirror. In the oscillator array, a large number of MESFETs feed a two-dimensional periodic metal structure on a dielectric substrate. The mirror provides feedback for locked power-combining of the oscillators. The electrical frequency tuning is achieved with another array loaded with varactor diodes. When the varactor bias voltage is changed, the capacitance of the diodes changes, which in turn modulates the frequency of the output power-combined wave. Two types of arrays are presented, one consisting of short dipoles, and the other of bow-tie elements. As expected, the bow-tie VCO has better performance than the dipole VCO, due to its broadband impedance. The best obtained result from a bow-tie VCO is a 10% tuning bandwidth with less than 2 dB power change. Modulating the gate bias is shown to be inferior to varactor array tuning. The VCO is the first demonstration of a quasi-optical system consisting of several periodic arrays loaded with solid-state devices.

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Abstracts

40 GHz Quasi-Optical Second Harmonic Spatial Power Combiner Using FETs and Slots

S. Kawasaki and T. Itoh. "40 GHz Quasi-Optical Second Harmonic Spatial Power Combiner Using FETs and Slots." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1543-1546.

FET oscillators integrated with slot radiators are used for constructing quasi-optical second harmonic spatial power combiners. Double-oscillator power combiner circuits with a strongly coupled structure generated the 40 GHz second harmonic frequencies. The radiation patterns of the double-oscillator power combiners are also discussed.



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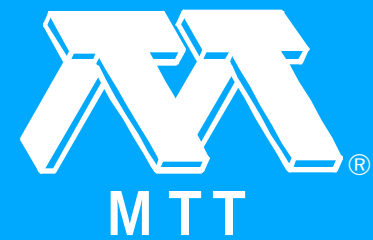
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Session SS -- Microwave Measurements

"Session SS -- Microwave Measurements." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1547-1547.



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A New Aperture Admittance Model for Open-Ended Waveguides

C.L. Sibbald and S.S. Stuchly. "A New Aperture Admittance Model for Open-Ended Waveguides." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1549-1552.

A new model for the aperture admittance of open-ended waveguide structures radiating into a homogeneous, lossy dielectric is presented. The model is based on the physical and mathematical properties of the driving point admittance of passive, stable one-port networks. The model parameters, which depend upon the geometry of the waveguide and aperture, are determined from a relatively small number of computed admittances. This computed data is obtained by a full-wave moment method solution and, hence, includes the effects of radiation and energy storage in the near-field and the evanescent waveguide modes. The accuracy of the numerical method is demonstrated by comparison with measured values. As an example, the model parameters are determined for the coaxial-line geometry. The accuracy of the model, for both the direct and inverse problem, is verified. The new model has important applications in the field of dielectric spectroscopy.

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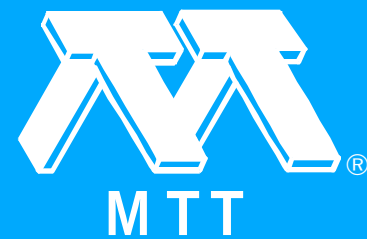


Abstracts

Microwave-Based Low-Cost Instrument for Film Thickness Measurement

L.F. Root and I. Kaufman. "Microwave-Based Low-Cost Instrument for Film Thickness Measurement." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1553-1555.

The use of inverted microstrip resonators for non-contacting real time thickness measurement of thin liquid or solid films and coatings described earlier has been developed into a low-cost instrument for general laboratory or industrial use. Although microwave-based, the instrument to be described functions without microwave test equipment. Insight into the oscillator behavior was obtained by the use of equivalent circuits and an ABCD matrix technique while several options were considered for the frequency discrimination function. The system successfully determined, the film thicknesses of water, enamel paint, silicone rubber, and copper sheet metal.



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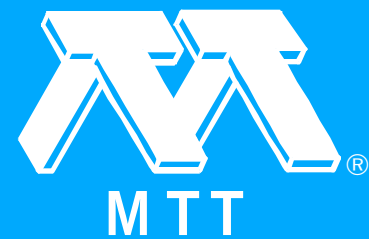
Dielectric Probe for Permittivity and Permeability Measurements at Low Microwave Frequencies

D. Derray, A. Julien, P. Guillon, P. Naud, J.L. Bonnefoy and J.P. Prulhiere. "Dielectric Probe for Permittivity and Permeability Measurements at Low Microwave Frequencies." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1557-1560.

A new non-destructive method using a dielectric probe of cross section 1 cm² for measuring the complex electromagnetic parameters (epsilon and μ) of materials around 1 GHz is developed. The theoretical analysis uses the 3 dimensional Finite Element Method. The comparison between theoretical and experimental results provides the electromagnetic parameters of the sample under test. Results for a high loss material are presented respectively at 25°C and 100°C.

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In Situ Thickness Monitor for Conducting Films

S.A. Khan, J.B. Farmer, R.J. Gutmann and J.M. Borrego. "In Situ Thickness Monitor for Conducting Films." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1561-1564.

In-situ monitoring and control are desirable to improve yield in advanced IC fabrication processes. In this paper we propose a novel way to monitor the thickness of conducting films in-situ using a microwave reflection technique. We present results indicating the feasibility of our approach and discuss the design of the probe.

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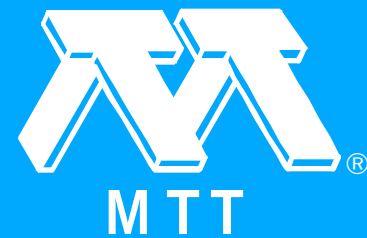


Abstracts

A Smith Chart Represented by a Neural Network and its Applications

M. Vai, S. Prasad and H. Wang. "A Smith Chart Represented by a Neural Network and its Applications." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1565-1568.

The Smith chart, while being a very useful graphical tool for the analysis and design of high frequency circuits, is subject to manual interpretation errors. A normalized impedance and admittance chart (Y-Z Smith chart) represented by a neural network type distributed computing system is developed for design automation. Two examples showing the use of such a neural network to design an impedance matching circuit are presented.



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Accuracy Improvements in Two-Port Noise Parameter Extraction Method

A. Boudiaf, M. Laporte, J. Dangla and G. Vernet. "Accuracy Improvements in Two-Port Noise Parameter Extraction Method." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1569-1572.

The 4 transistor noise parameters extraction method based on the measurement of the device noise figure for more than 4 source reflection coefficients and the subsequent minimisation of a suitable error function, have been widely studied. But with the actual improvements in the field of the transistor noise performance (ex HEMT), and the increasing need of accuracy, aiming to obtain reliable models, it becomes necessary to evaluate the precision of the estimated noise parameters.

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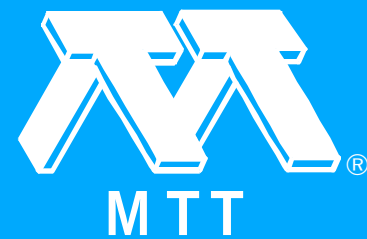


Abstracts

Theoretical and Experimental Investigations of Resonance Frequencies in a Microwave Heated Fluidized Bed Reactor

A. Baysar, J.L. Kuester and S. El-Ghazaly. "Theoretical and Experimental Investigations of Resonance Frequencies in a Microwave Heated Fluidized Bed Reactor." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1573-1576.

Fluidized bed reactors have large potential for use in high purity silicon chemical vapor deposition with microwaves as the energy source. Lowest resonance frequency modes of a cylindrical fluidized bed reactor (cavity) are theoretically and experimentally investigated. The behavior of resonant frequencies is examined with respect to varying dielectric properties. Experimental results are found to be in close agreement with theoretical predictions. The knowledge of resonant frequency behavior will help in designing and operating fluidized bed reactors efficiently.



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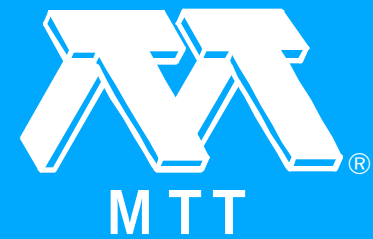
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Abstracts

Session TT -- Nonlinear CAD

"Session TT -- Nonlinear CAD." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1577-1577.



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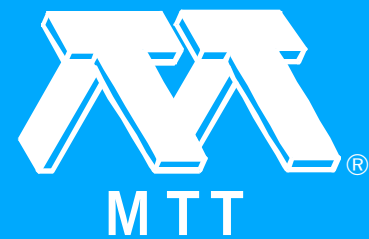


Abstracts

Direct Use of a MESFET Physical Model in Non-Linear CAD

P.J.C. Rodrigues, M.J. Howes and J.R. Richardson. "Direct Use of a MESFET Physical Model in Non-Linear CAD." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1579-1582.

This work presents a CAD tool which combines a novel quasi-two-dimensiond MESFET physical model with an efficient non-linear circuit analysis technique. Device technological parameters (dimensions, doping profile, etc.) can be directly related to electrical performance with this tool which can therefore be used in non-linear circuit yield study and optimization. An excellent agreement between simulated and measured results was obtained.



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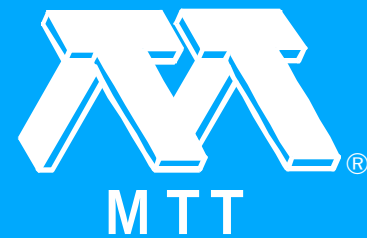


Abstracts

A New Empirical Nonlinear Model for HEMT-Devices

I. Angelov, H. Zirath and N. Rorsman. "A New Empirical Nonlinear Model for HEMT-Devices." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1583-1586.

A new large signal model for HEMTs, capable of modeling the current-voltage characteristic, and its derivatives, including the characteristic transconductance peak, gate-source- and gate-drain- capacitances is described. Model parameter extraction is straightforward and is made for a submicron gatelength /spl part/-doped pseudomorphic HEMT. Measured and modeled DC- and S-parameters are compared.



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Analysis and Optimization of Third Order Intermodulation Distortion Mechanisms in AiGaAs/GaAs Heterojunction Bipolar Transistors

A. Samelis and D. Pavlidis. "Analysis and Optimization of Third Order Intermodulation Distortion Mechanisms in AiGaAs/GaAs Heterojunction Bipolar Transistors." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1587-1590.

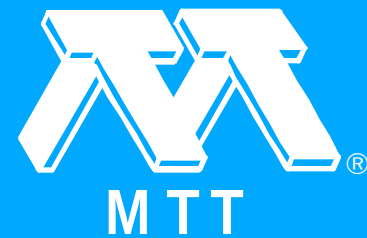
In this paper the third order intermodulation distortion (IMD3) mechanisms of HBT's are analyzed using Volterra Series theory. The third order nonlinear currents generated by the device nonlinearities are evaluated for this purpose. Second harmonic loading is addressed in view of IMD3 optimization while, at the same time, maintaining high gain through conjugate matching at the fundamental frequency. It is shown that IMD3 depends on a complex process involving interactions between various nonlinear elements and is highly sensitive to C_{bc} generated nonlinear current. The interaction of the latter with the other HBT elements significantly impacts the IMD3. Optimum IMD3 occurs at high second harmonic reflection coefficients corresponding to open load conditions. Up to 27 dBm IMD3 improvement can be obtained by proper loading.



The Application of Harmonic-Balance Methodology to the Analysis of Injection Locking

V. Rizzoli, A. Neri and D. Masotti. "The Application of Harmonic-Balance Methodology to the Analysis of Injection Locking." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1591-1594.

The paper outlines a set of software tools allowing injection locking to be quantitatively treated by harmonic-balance methodology, and discusses in detail the stability portrait of a typical injection locked microwave oscillator. The simulation can accurately describe the spreading of the unlocked oscillation spectrum near the locking range edge.



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Large Signal Design of Broadband Monolithic Microwave Frequency Dividers

A. Suarez, R. Quere, M. Camiade and E. Ngoya. "Large Signal Design of Broadband Monolithic Microwave Frequency Dividers." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1595-1598.

A monolithic regenerative divider by two with a 6 GHz central input frequency has been designed and fully characterized using an improved harmonic balance formulation, suitable to deal with autonomous and phase-locked regimes. The solution paths when the input generator power and frequency are modified have been traced. The output power at the divided frequency has been evaluated as a function of both parameters as well as the output power of the free running oscillator regime. Every result has been experimentally verified observing an excellent agreement.

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Abstracts

Session UU -- Recent Advances in UWB & Technology Systems (Focused Session)

"Session UU -- Recent Advances in UWB & Technology Systems (Focused Session)." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1599-1599.



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The Generation of High Energy Ultra Wide Band Pulses

O. Zucker and I.A. McIntyre. "The Generation of High Energy Ultra Wide Band Pulses." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1601-1604.

We present a theoretical discussion of the performance of photoconductive switches mounted in a matched transmission line structure, which addresses issues of risetime and power density. In the analysis we define a switch performance parameter, alpha, which results in a recipe for optimizing the performance of photoconductive switches. We also discuss the limits on alpha due to materials' properties and conclude with a discussion of experimental life-testing and a comparison between the theory and experimental results.

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Abstracts

High Power, 10 KHz Repetition Rate Ultra-Wideband Source Development at the U.S. Army's Missile Command

D. Birx and J.R. Fishback. "High Power, 10 KHz Repetition Rate Ultra-Wideband Source Development at the U.S. Army's Missile Command." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1605-1608.

A 250 MW ultra-wideband source capable of pulse repetition frequencies up to 10 kHz has been developed at the U.S. Army's Missile Command (MICOM). This modular pulser utilizes state-of-the-art magnetic switch pulse compression and electromagnetic shock line pulse sharpening to produce highly reliable 3 ns pulses with rise times less than 200 ps. ERP's of up to 0.75 GW have been achieved using TEM horns.



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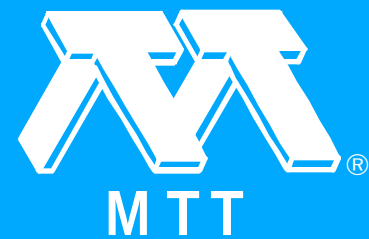
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Ultra-Wide Band, High-Repetition Rate Single Channel Mobile Diagnostic System

D.E. Voss and L.M. Miner. "Ultra-Wide Band, High-Repetition Rate Single Channel Mobile Diagnostic System." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1609-1610.

The problem of diagnosing transient electromagnetic signals with ultra-wideband, multioctave spectra extending into the microwave region occurs in a number of areas, including lightning phenomena, electrostatic discharge testing, laser and pulsed-power research, and electronic effects testing. While sometimes these phenomena can be diagnosed by standard single-shot means, they often occur at repetition rates in the kHz range and higher, and determining waveform time and frequency domain shot-to-shot reproducibility is often of major importance to the researcher. This paper describes a novel single-channel diagnostic system, the System Verification Apparatus (SVA), which is capable of measuring 100-ps risetime signals on a single-shot basis, while simultaneously measuring pulse-to-pulse variation. The SVA is a fully integrated system which includes a broadband sensor, signal and trigger conditioning electronics, multiple parallel digitizers with deep local storage, a fiber-optic data link to the controlling computer, and automated software for accurately reconstructing, archiving, and analyzing waveforms.

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Abstracts

Late Papers (1992 Vol. III [MWSYM])

"Late Papers (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1611-1611.



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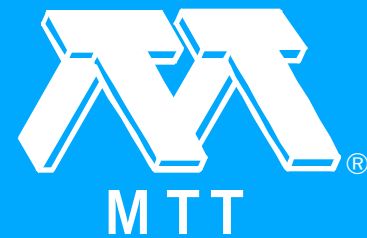


Abstracts

35 GHz and 60 GHz Low Noise HEMT MMIC Amplifiers for Civil Applications (Late Paper)

P. Bourne, P. Arsene-Henry, P. Fellon and D. Pons. "35 GHz and 60 GHz Low Noise HEMT MMIC Amplifiers for Civil Applications (Late Paper)." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1613-1616.

Monolithic HEMT low noise amplifiers have been developed for civil applications at Q and V bands. They consist of two stage amplifiers with 0.25 μ m HEMTs. At 35 GHz and 60 GHz, they exhibit respectively more than 15 dB gain with 4 dB noise, and 12.5 dB gain with a noise figure between 5 and 6 dB over a 10 percent frequency range.



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800MHz High Power Duplexer Using TM Dual Mode Dielectric Resonators

Y. Ishikawa, J. Hattori, M. Andoh and T. Nishikawa. "800MHz High Power Duplexer Using TM Dual Mode Dielectric Resonators." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1617-1620.

A novel small sized high power duplexer in 800 MHz band has been developed by using whole monoblock TM/sub 110/ dual mode dielectric resonators. Insertion loss is less than 0.35 dB over 20 MHz bandwidth in TX filter, and less than 0.47 dB over 40 MHz bandwidth in RX filter. Volume is less than 3000 cm³ which corresponds to about 20% of re-entrant cavity resonator filter. This duplexer is useful for current and future cellular base stations.

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Microwave Applications of a Laser-Diode-Based Photoconductive Harmonic Mixer

C.-L. Pan, H.-H. Wu and C.-S. Chang. "Microwave Applications of a Laser-Diode-Based Photoconductive Harmonic Mixer." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1621-1624.

We report two microwave applications of a laser-diode-based photoconductive harmonic mixer: (1) Time synchronization and relative phase of two microwave oscillators at 10 GHz to the optical pulse train at 500 MHz; (2) Measurement of the waveform of an optoelectronically phase-locked 12.01 GHz microwave signal as well as the waveform and spectrum of picosecond electrical pulses generated by a step recovery diode via a low-frequency replica.

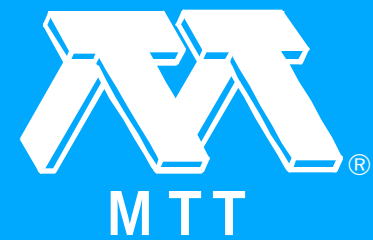
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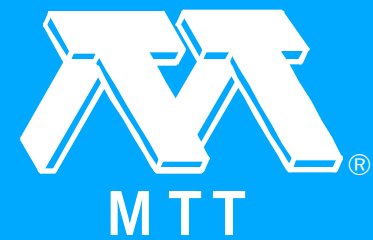
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Exhibitors (1992 Vol. III [MWSYM])

"Exhibitors (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1631-1632.



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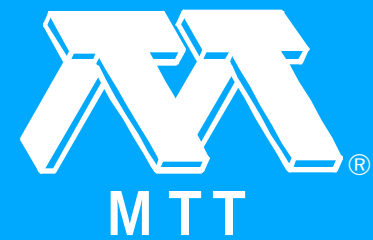
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Exhibition Guide (1992 Vol. III [MWSYM])

"Exhibition Guide (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): 1633-1648.



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"Back Cover (1992 Vol. III [MWSYM])." 1992 MTT-S International Microwave Symposium Digest 92.3 (1992 Vol. III [MWSYM]): b1-b1.



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Front Cover (1992 [MCS])

"Front Cover (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): f1-f2.



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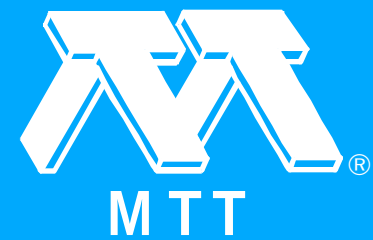
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Copyright (1992 [MCS])

"Copyright (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm1-fm2.



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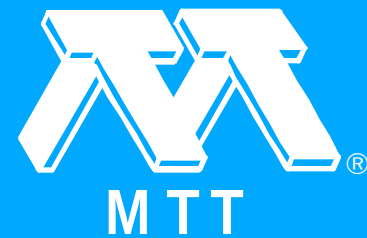


Abstracts

Message from the MMWMC Chairman (1992 [MCS])

A. Chu. "Message from the MMWMC Chairman (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm3-fm3.

1992 marks the second decade of the IEEE microwave and millimeter-wave monolithic circuits symposium. Back in 1982, the founders of this symposium wished to promote an emerging technology that would impact the microwave industry the way Silicon integrated circuits revolutionized computers and consumer electronics.



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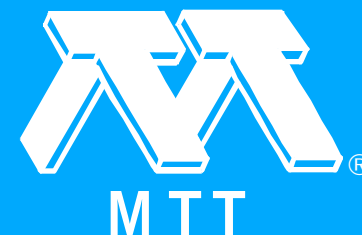
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Abstracts

1992 Symposium Microwave and Millimeter-Wave Monolithic Circuits (1992 [MCS])

"1992 Symposium Microwave and Millimeter-Wave Monolithic Circuits (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm4-fm4.



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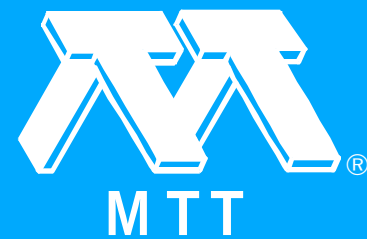


Abstracts

Message from the Technical Program Chairman (1992 [MCS])

H. Huang. "Message from the Technical Program Chairman (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm5-fm5.

On behalf of the Technical Program Committee, I would like to welcome you to the 1992 IEEE microwave and millimeter-wave monolithic circuits (MMWMC) symposium. This is the first year that the MMWMC and MTT-S International Microwave Symposium's (IMS) Monolithic Circuits Technical Subcommittees will have a joint evaluation session. We believe this coordinated technical paper evaluation will bring to the conference attendees a unified, strong MMIC session with a large number of high quality papers.



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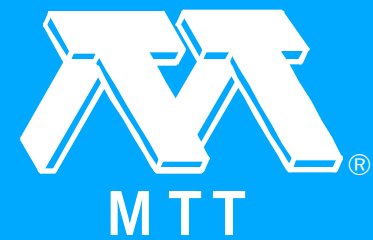
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Abstracts

Committees (1992 [MCS])

"Committees (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm6-fm6.



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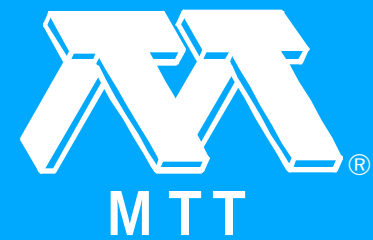
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Abstracts

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"Table of Contents (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm7-fm11.



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Session I -- Opening Session (1992 [MCS])

"Session I -- Opening Session (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): fm12-fm12.



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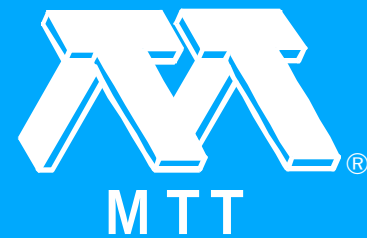


Abstracts

MMIC Consumer Application and Production

B.F. Cambou. "MMIC Consumer Application and Production." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 1-3.

Hand held radios and wireless telecommunication systems will represent in the near future a high volume market. The purpose of this paper is to discuss how GaAs can become a key technology for this application and how to leverage the expertise that we get from silicon processing.



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Abstracts

Technology Transfer of High Frequency Devices for Consumer Electronics; Concerns and Expectations

S. Watanabe. "Technology Transfer of High Frequency Devices for Consumer Electronics; Concerns and Expectations." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 5-6.

The aspects of high volume production on the order of millions of devices per month for consumer electronics are different from those for small and medium scale production for high-end telecommunication, instrumentation or military applications. The keys to technology transfer are also different. By investigating the examples of successful technology transfer of high frequency devices at Sony, these issues will be illustrated. The author's opinion regarding the future of high frequency devices in consumer electronics will also be presented.



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Abstracts

Session II -- Low-Noise and Low-Power Amplifier

"Session II -- Low-Noise and Low-Power Amplifier." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 7-7.



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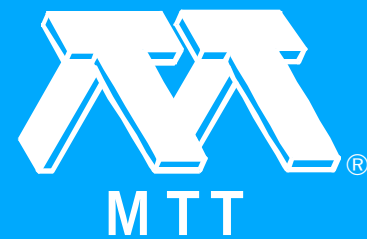


Abstracts

Monolithic L-Band Amplifiers Operating at Milliwatt and Sub-Milliwatt DC Power Consumptions

K.R. Cioffi. "Monolithic L-Band Amplifiers Operating at Milliwatt and Sub-Milliwatt DC Power Consumptions." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 9-12.

A set of monolithic L-band low noise amplifiers operating at milliwatt and sub-milliwatt DC power consumption have been designed and fabricated. A maximum gain/power quotient of 19.1 dB/mW was recorded at a frequency of 1.25 GHz with a cascade of 2 MMIC amplifiers yielding a total gain of 15.3 dB on a total power consumption of just 800 μ W. This is believed to be the highest gain/power quotient ever reported for a monolithic circuit at L-band. The ultra-low power consumption were obtained with a standard foundry process using an enhancement-mode MESFET with a variety of design techniques. Yields obtained on two 4" GaAs wafers were 96-100%.



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A Novel MMIC PHEMT Low Noise Amplifier for GPS Applications

H. Morkner, M. Frank and R. Kishimura. "A Novel MMIC PHEMT Low Noise Amplifier for GPS Applications." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 13-16.

A monolithic two stage PHEMT low-noise amplifier has been developed for the GPS and Spread Spectrum Bands (covering 0.5 to 3.0 GHz). This amplifier uses Avantek's advanced pseudomorphic HEMT (PHEMT) devices with sub 0.2-um gate-length and 0.25 dB noise figures in this band. The amplifier is unique in its usage of a source follower second stage, resistive feedback, and on-chip matching. Gain of 15 dB and noise figure of 1.7 dB have been measured. Designed to fit into a plastic 86 or SOT-143 surface mount package, the die is small (0.375 mm sq.), draws low current (<15mA), utilizes low voltage (3.3V), and has no bias choke requirement. This MMIC LNA has the best noise figure-to-gain-to-match-to-DC power performance of any product known, advertised or published.

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Ultra-Flat Low-Power Process Insensitive Ku-Band HEMT Feedback MMIC

D.R. Helms and M.J. Fithian. "Ultra-Flat Low-Power Process Insensitive Ku-Band HEMT Feedback MMIC." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 17-19.

A three-stage Ku-band MMIC amplifier, using feedback design and 0,25 μm gate-length single heterojunction HEMT devices, has demonstrated improved process insensitivity with state-of-the-art gain flatness and power dissipation. The amplifier exhibited 0.25 dB flatness from 11.4 -12.4 GHz using less than 150 mW to deliver 25 dB gain.

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A 2.5 dB Low Noise 6 to 18 GHz HEMT MMIC Amplifier

J. Panelli, N. Chiang, W. Ou, R. Chan, C. Shih, Y.C. Pao and J. Archer. "A 2.5 dB Low Noise 6 to 18 GHz HEMT MMIC Amplifier." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 21-24.

A 2-stage, 6 to 18 GHz, 15.0 dB gain monolithic GaAs HEMT low noise amplifier was designed, fabricated and tested. A typical noise figure of 2.5 dB and output power of 5 dBm were measured and is believed to be the lowest noise figure reported for a 6 to 18 GHz MMIC low noise amplifier. This MMIC amplifier exhibits excellent performance at a DC power consumption of 2 volts and 20 mA. This state-of-art performance was achieved using a production 0.25 μ m standard HEMT technology without mushroom gates. Low DC power consumption, low noise figure and high gain makes this device well suited for front-end receiver applications.

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Broadband 0.25 Micron Ion-Implant MMIC Low Noise Amplifiers on GaAs

J. Sanctuary, C.E. Woodin and J. Manning. "Broadband 0.25 Micron Ion-Implant MMIC Low Noise Amplifiers on GaAs." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 25-28.

A highly manufacturable 0.25 micron ion-implant-process has been used for the development of low noise MMIC amplifiers covering the 2-18 GHz band. Noise figures of less than 2.5 dB and 3.0 dB have been achieved with MMICs covering the 2-6 GHz and 6-18 GHz bands respectively. Insertion gains were 16 dB for the 2-6 GHz design and 10 dB for the 6-18 GHz design. This performance is comparable to that reported for HEMT processes.

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Design and Characterization of High Performance 60 GHz Pseudomorphic MODFET LNAs in CPW-Technology Based on Accurate S-Parameter and Noise Models (1992 [MCS])

M. Schlechtweg, W. Reinert, P.J. Tasker, R. Bosch, J. Braunstein, A. Hulsman and K. Kohler. "Design and Characterization of High Performance 60 GHz Pseudomorphic MODFET LNAs in CPW-Technology Based on Accurate S-Parameter and Noise Models (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 29-32.

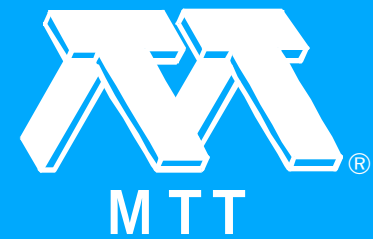
We have fabricated low noise V-band 2-stage amplifiers using PM-MODFETs which have a performance of 10.5 dB gain and 5.2 dB noise figure at 58.5 GHz in very close agreement with results predicted in advance. The CAE models for the transistors and the passive CPW-components were extracted from on-wafer S-parameter measurements up to 60 GHz and noise parameter measurements up to 18 GHz. For noise modeling of the MODFETs up to millimeter wave frequencies, we have pursued a novel approach which is based on the temperature noise model reported by Pospiezalski. A very good agreement between simulated and performance is measured MMIC gain and noise achieved up to V-band using these models.



Abstracts

Session III -- MMIC Power Amplifiers

"Session III -- MMIC Power Amplifiers." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 33-33.



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Abstracts

A UHF Band 1.3W Monolithic Amplifier with Efficiency of 63%

T. Takagi, Y. Ikeda, K. Seino, G. Toyoshima, A. Inoue, N. Kasai and M. Takada. "A UHF Band 1.3W Monolithic Amplifier with Efficiency of 63%." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 35-38.

A UHF band 1.3W 4--stage monolithic amplifier with an efficiency of 63% has been developed for transmitters of mobile communications. To obtain a high efficiency, a novel miniaturized second harmonic terminating circuit was devised, having a parallel resonant circuit comprised of lumped elements. The size of the amplifier is 8.6 X 5.8mm.



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A New Power Amplifier Topology with Series Biasing and Power Combining of Transistors

M. Shifrin, Y. Ayasli and P. Katzin. "A New Power Amplifier Topology with Series Biasing and Power Combining of Transistors." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 39-41.

A new power amplifier topology is described and demonstrated in a microwave monolithic integrated circuit (MMIC) implementation with GaAs MESFETs. This topology overcomes several limitations of the traditional approach of paralleling of power transistor unit cells. In the new topology, unit cells are both parallel and series combined. The benefits include higher input and output impedances, broadband power matched interstage networks, and high voltage biasing at reduced DC current.

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High Efficiency Broadband Power Amplifier MMIC

K. Johnson, A. Lum, S. Nelson, E. Reese and K. Salzman. "High Efficiency Broadband Power Amplifier MMIC." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 43-45.

A GaAs broadband, dual-channel high-efficiency power amplifier MMIC is presented in this paper. The average performance for a single channel of the power amplifier is 18.0 dB small-signal gain, 16% power-added efficiency, and 2 dB compressed output power of 29.4 dBm from 6 to 18 GHz at 25°C. The two channels combined off chip achieve 32 dBm average output power. This 0.5 μm ion-implanted MESFET amplifier MMIC has been demonstrated in volume production with 154 wafer starts over 3 months resulting in a 30% total yield through fixtured RF test.

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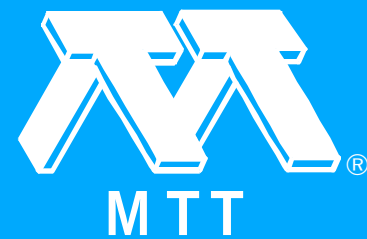


Abstracts

12W Monolithic X-Band HBT Power Amplifier

M.A. Khatibzadeh, B. Bayraktaroglu and T. Kim. "12W Monolithic X-Band HBT Power Amplifier." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 47-50.

Monolithic, 2-stage X-band power amplifiers have been designed and fabricated using AlGaAs/GaAs HBTs. Output power levels of up to 12.5 W cw have been demonstrated at 9.2 GHz from single-chip HBT amplifiers measuring 3.8 mm x 4.7 mm in size. To our knowledge, this is the highest cw output power level reported at X-band frequencies for any monolithic power amplifier and highlights the advantages of HBT technology for microwave solid-state power applications.



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High-Efficiency Broadband Monolithic Pseudomorphic HEMT Amplifiers at Ka-Band

H.Q. Tserng, P. Saunier and Y.-C. Kao. "High-Efficiency Broadband Monolithic Pseudomorphic HEMT Amplifiers at Ka-Band." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 51-54.

High-efficiency broadband (up to 7 GHz) monolithic Ka-band amplifiers using doped channel power pseudomorphic HEMTs have been demonstrated. Amplifiers with output powers as high as 500 mW and power-added-efficiencies as high as 40% were demonstrated.

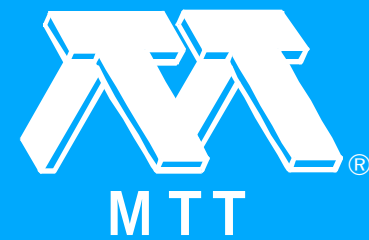
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Abstracts

Session IV -- Millimeter-Wave Monolithic Integrated Circuits

"Session IV -- Millimeter-Wave Monolithic Integrated Circuits." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 55-55.



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Highly Producing Monolithic Q-Band MESFET VCO

S. Martin, S. Meyer, E. Reese and K. Salzman. "Highly Producing Monolithic Q-Band MESFET VCO." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 57-60.

A fully monolithic self-biased VCO has been demonstrated at 40 GHz. A buffer amplifier, all bias elements, and a tuning varactor have been integrated on a 4.4- x 2.0-mm chip. Gate lengths of 0.35 μm were used in for this FET based oscillator that delivers greater than 90 mW of output power over a tuning bandwidth of 2.8 GHz.

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



Abstracts

A 5.9-16.3 GHz Agile Tuning Source Using Wideband Millimeter Wave MMIC Circuits

G. Dietz, S. Moghe, H. Fudem, R. Haubenstricker and R. Becker. "A 5.9-16.3 GHz Agile Tuning Source Using Wideband Millimeter Wave MMIC Circuits." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 61-64.

An agile tuning VCO assembly which covers a wide tuning range with a single control voltage has been developed. The VCO assembly achieved a frequency output of 5.9-16.3 GHz using a single silicon varactor over the tuning range of 0-20 volts. The VCO assembly was realized by combining specially designed wideband millimeter wave VCO/doubler, mixer and DRO MMIC chips.



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Monolithic Circuits for 60 GHz Communication Systems Using Pseudomorphic HEMT Process

P. Gamand, P. Suchet, M. Iost, M. Pertus, A. Collet, J. Bellaiche, P.A. Rolland and N. Haeze. "Monolithic Circuits for 60 GHz Communication Systems Using Pseudomorphic HEMT Process." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 65-67.

A wide band image rejection mixer and a high real estate efficiency amplifier have been designed and fabricated with a 0.25 μm pseudomorphic HEMT process. The mixer itself integrated on 0.6 mm^2 , includes an in-phase power splitter, two single ended mixers and a quadrature phase shifter. It exhibits better than 30 dB of image rejection from 52 to 60 GHz RF band with 14 dB of conversion loss including the power splitter. Combined with two 0.3 mm^2 IF monolithic amplifiers, the mixer exhibits 8 to 9 dB of conversion gain from 0.5 to 3 GHz IF frequency bandwidth. The amplifier, operating around 62-63 GHz, exhibits better than 8 dB/ mm^2 gain density, with an I/O VSWR of 2.5.

Click on title for a complete paper.



A 94 GHz Monolithic Downconverter in a MESFET Technology

J.-M. Dieudonne, R. Rittmeyer, B. Adelseck and A. Colquhoun. "A 94 GHz Monolithic Downconverter in a MESFET Technology." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 69-72.

A fully monolithic GaAs 94 GHz downconverter consisting of a single balanced diode mixer and a two-stage IF amplifier has been fabricated in a MESFET technology on a single chip. A conversion gain of 14.5 dB combined with a double side band noise figure of 6.5 dB has been achieved at 94 GHz. This is the first developed single chip MMIC 94 GHz downconverter in a MESFET technology.





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A Millimeter-Wave Monolithic Matrix Distributed Amplifier

K.M. Simon, S.L.G. Chu, R. Wolhert, M.J. Schindler and J.B. Cole. "A Millimeter-Wave Monolithic Matrix Distributed Amplifier." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 73-75.

A millimeter-wave monolithic two-stage matrix distributed amplifier with greater than 11 dB gain from 16-38 GHz has been demonstrated. This is the first reported two-stage millimeter-wave matrix distributed amplifier. The matrix amplifier topology yields a compact circuit with higher gain per unit area than a conventional distributed amplifier.

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



Abstracts

Session V -- MMIC Circuits and Techniques

"Session V -- MMIC Circuits and Techniques." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 77-77.



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Multilayer MMIC Branch-Line Coupler and Broad-Side Coupler

I. Toyoda, T. Hirota, T. Hiraoka and T. Tokumitsu. "Multilayer MMIC Branch-Line Coupler and Broad-Side Coupler." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 79-82.

Very small, multilayer MMIC couplers are newly proposed. New methods for size reduction, i.e., a quasi-lumped elements approach and a newly-developed multilayer coupled-line structure, are also described. A 24-26 GHz band branch-line coupler and a 20-30 GHz band broad-side coupler are implemented in very small areas of less than 0.4 mm x 0.4 mm and 0.2 mm x 0.2 mm, respectively.

Click on title for a complete paper.



A 1 to 18 GHz Out of Phase Combiner

M. Jouanneau-Douard, H. Brouzes, S. Bionaz and D. Levy. "A 1 to 18 GHz Out of Phase Combiner." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 83-86.

This paper presents the design, realization and performance of an ultra wide band 180° MMIC combiner. The circuit design is based on a simple original principle combining common-source and common-drain transistors to achieve wide band phase shifting and output matching. Realization of the MMIC, conducted at Thomson Composant Microondes GaAs facility, has shown very good agreement between simulated and measured performance. In the 1 to 18 GHz bandwidth, amplitude balance between the two paths is better than 0.5 dB while phase difference stays at 180° with a maximum error of 10° at 18 GHz.



A GaAs IC Broadband Variable Ring Oscillator and Arbitrary Integer Divider

A. Teetzel and R. Walker. "A GaAs IC Broadband Variable Ring Oscillator and Arbitrary Integer Divider." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 87-89.

A single GaAs IC performs as a broadband variable ring oscillator (VRO) and arbitrary integer frequency divider. The oscillator, a ring of inverters with a variable delay feature, covers two octaves in the 0.4 to 1.6 GHz range without external tuning elements, and is theoretically arbitrarily extendable lower in frequency. A provision for external signal injection enables injection locking. Frequency division is achieved with selectable arbitrary division ratio by tuning the oscillator to near the desired submultiple of the input signal. Spur-free output with constant amplitude is maintained independent of divide ratio.



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Lifetesting GaAs MMICs under RF Stimulus (1992 [MCS])

W.J. Roesch, T. Rubalcava and C. Hanson. "Lifetesting GaAs MMICs under RF Stimulus (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 91-94.

This paper summarizes very high temperature lifetest results on MMIC switches and attenuators designed, assembled, and screened by Motorola GEG and manufactured and tested by TriQuint. It was found that individual heating and RF bias resulted in data which indicates these devices degrade linearly with lognormal failure distributions that compare favorably with historical DC lifetesting of MMIC amplifiers. Electrical measurements indicated MESFET gate degradation was occurring, which was confirmed by failure analysis. The failure mechanism was found to be highly accelerated by temperature and is not expected to impede device lifetimes at normal use conditions for thousands of years.

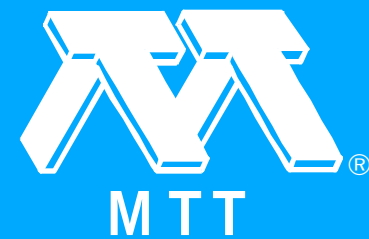
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Abstracts

Session VI -- Subsystems I

"Session VI -- Subsystems I." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 95-95.



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Extremely Low Power Transmitter/Receiver GaAs MMIC Circuits at L Band

A. Platzker, J.B. Cole, S. Davis, M. Goldfarb, K. Tabatabaie-Alavi and J. Wendler. "Extremely Low Power Transmitter/Receiver GaAs MMIC Circuits at L Band." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 97-100.

We have developed an Enhancement GaAs MMIC process which is capable of producing very low power, highly efficient transmitting receiving circuits which can be operated from unipolar 3 V batteries. We have demonstrated key circuits such as a SAW locked oscillator, a Variable Gain 180° Phase Shifter and a Variable Gain Power Amplifier. The amplifier draws a dc current of 4 mA and delivers 4 dBm to 50 Omega loads with greater than 25 dB of gain.

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A Miniature Low Current GaAs MMIC Downconverter for Ku-Band Broadcast Satellite Applications

K. Sakuno, T. Yoshimasu, N. Matsumoto, T. Tsukao, Y. Nakagawa, E. Suematsu and T. Tomita. "A Miniature Low Current GaAs MMIC Downconverter for Ku-Band Broadcast Satellite Applications." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 101-104.

A miniature low current GaAs MMIC downconverter with a novel image rejection filter has been developed for commercial Ku-band broadcast satellite receivers. The current consumption of the MMIC downconverter was only 40 mA. The chip size of the MMIC downconverter with the image rejection filter is 1.7 mm X 2.05 mm, which is believed to be the smallest size ever reported.

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Millimeter-Wave Slot Ring Mixer Array Receiver Technology

R.L. Gingras, C. Drubin, B. Cole, W. Stacey, R. Pavio, J. Wolvertson, K.S. Yngvesson and A. Cardiamenos. "Millimeter-Wave Slot Ring Mixer Array Receiver Technology." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 105-111.

This paper describes a novel quasioptical millimeter-wave (MMW) monolithic monopulse receiver and its performance when integrated with a quasioptical diplexer and antenna. Integration of the antenna, diplexer and receiver forms a complete MMW radar front end. The receiver, which is fabricated on 0.025 in. thick GaAs substrates, includes four monolithic chips. The entire receiver is packaged on the planar back surface of a 1.5 in. diameter lens. This lens, hyperhemispherical in shape, provides a dual function as a focussing lens and carrier for the monolithic receiver. Measured noise figure and conversion gain of the receiver is 8.7 dB and 19.0 dB, respectively, at 35.0 GHz.

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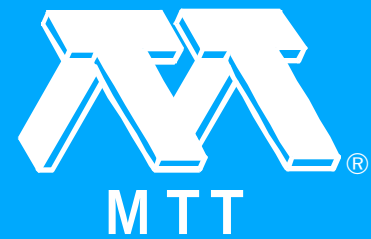


Abstracts

A Monolithic Monopulse Comparator

J.B. Cole, R. Pavio, Y. Tajima, C. Drubin, R. Gingras, D. Masse and J. Wolverson. "A Monolithic Monopulse Comparator." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 109-111.

A GaAs monolithic monopulse comparator operating at L-band has been developed. The complete circuit is composed of four summing amplifiers and four difference amplifiers. The circuit has a gain of 8.5 dB, null depths of ~25 dB to 30 dB, and is biased from a single positive supply. This is the first monolithic monopulse comparator circuit to have been demonstrated.



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High Performance HEMT MMICs for Low Cost EHF SATCOM Terminals

J.A. Lester, W.L. Jones, P. Huang, D. Garske and P.D. Chow. "High Performance HEMT MMICs for Low Cost EHF SATCOM Terminals." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 113-116.

Presented is a set of high performance pseudomorphic InGaAs HEMT MMICs for insertion into a low cost transceiver for EHF SATCOM terminal applications. A 20 GHz MMIC LNA with 1.8 dB noise figure and 38 dB gain and a 44 GHz driver amplifier with an output power of +17.8 dBm, 22.8 dB gain, and 17% efficiency are featured. Also reported are HEMT MMIC doublers with output frequencies of 17, 22, and 44 GHz which demonstrate +13, +12, and +5 dBm power outputs with 1 dB conversion loss, 1 dB conversion gain, and 4 dB conversion loss, respectively.

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



Abstracts

Session VII -- Subsystems II (Joint with IMS)

"Session VII -- Subsystems II (Joint with IMS)." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 117-117.



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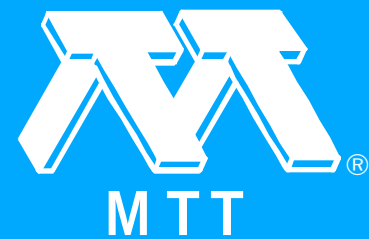
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Advanced MMIC T/R Module for 6 to 18 GHz Multifunction Arrays (1992 [MCS])

J. Bugeau, W. Coughlin, III, M. Priolo and G. St. Onge. "Advanced MMIC T/R Module for 6 to 18 GHz Multifunction Arrays (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 119-122.

A high performance 6-18 GHz dual channel MMIC T/R module is presented with significant advances in integration and performance. This advanced module features critical spacing for 2-dimensional arrays, an Aluminum Silicon Carbide housing, multilayer ceramic substrates for RF and control circuitry, a custom hermetic DC multipin connector, new high performance MMIC LNAs and power amplifiers, and specialized multifunction MMIC chips for a reduced parts count. Each of the two channels feature a selectable horizontal and vertical polarization capability. The module is very densely packaged with 2 complete T/R channels occupying 0.97 in³.

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Abstracts

An Enhanced GaAs Monolithic Transimpedance Amplifier for Low Noise and High Speed Optical Communications (1992 [MCS])

J.A. Casao, P. Dorta, J.L. Caceres, M. Salazar-Palma and J. Perez. "An Enhanced GaAs Monolithic Transimpedance Amplifier for Low Noise and High Speed Optical Communications (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 123-126.

The design, implementation and test results of a simple GaAs Monolithic Transimpedance Amplifier with enhanced performance for high speed optical communications is described. A cascade configuration, improved in terms of bandwidth and noise is used. On-wafer and on-carrier measurements show dose agreement with simulated behavior. Excellent performance with high transimpedance gain, a bandwidth from DC to 1.6 GHz, low noise and low power consumption is obtained. The temperature and bias point sensitivity are negligible. This last fact turns out to be a major commercial achievement.



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An Ultra Broadband GaAs MESFET Preamplifier IC for a 10Gb/s Optical Communication System (1992 [MCS])

M. Miyashita, K. Maemura, K. Yamamoto, T. Shimura, M. Nogami, K. Motoshima, T. Kitayama and Y. Mitsui. "An Ultra Broadband GaAs MESFET Preamplifier IC for a 10Gb/s Optical Communication System (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 127-130.

An ultra broadband GaAs MESFET preamplifier IC is developed for a 10 Gb/s optical communication system. High transimpedance of 44 dB Omega has been obtained for DC to 12 GHz. A receiver has also been fabricated by using this preamplifier IC and a photodiode. The receiver operates with extremely low equivalent input noise current of 12.6 pA//spl radic/Hz for DC to 7.8 GHz. This paper describes circuit design, high frequency characteristics of the preamplifier IC and the receiver.

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GaAs Monolithic Image Rejection Down-Converter for Point-to-Multipoint Communication Systems (1992 [MCS])

G.L. Bonato and A. Boveda. "GaAs Monolithic Image Rejection Down-Converter for Point-to-Multipoint Communication Systems (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 131-134.

A fully integrated GaAs monolithic image rejection down-converter for L/S Band operation is presented. All the necessary subcircuits such as RF splitter, LO phase shifter, two mixers and its biasing circuits are included inside a GaAs chip, and are described. Only an IF hybrid is needed as external component. Experimental results verify the good operation of the device showing more than 20 dB of image rejection, 8 dB gain conversion, 30 dB LO to IF isolation and 20 dB LO to RF isolation throughout the operating band. The MMIC contains 18 MESFETs and 40 passive components in a 1.2 x 3 mm² area.

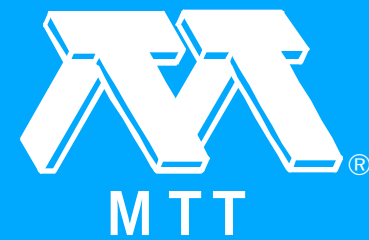
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Abstracts

Session VIII -- Phase Shifter and Logarithmic Amplifier Circuits (Joint with IMS)

"Session VIII -- Phase Shifter and Logarithmic Amplifier Circuits (Joint with IMS)." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 135-135.



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A Single Chip X-Band Phase Shifter with 6 Bit Uncorrected Phase Resolution and More Than 8 Bit Corrected Phase Resolution (1992 [MCS])

T.C.B. Tieman, A.P. de Hek, F.L.M. van den Bogaart and W.M.A. van Hoek. "A Single Chip X-Band Phase Shifter with 6 Bit Uncorrected Phase Resolution and More Than 8 Bit Corrected Phase Resolution (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 137-139.

The design, fabrication, performance and production results of a GaAs monolithic phase shifter, based on a vector modulator principle, are described. The device exhibits a typical RMS phase error of about 3 degrees and an RMS amplitude error less than 0.30 dB across the frequency band from 7.0 - 10.5 GHz and over a linear controllable gain range of 15 dB. Typical insertion gain is 0 dB, input return losses are better than 15 dB and output return losses are better than 10 dB. The device is intended for application in a wide-band active phased-array antenna. The analogue control of the device enables the correction of the systematic phase errors and amplitude errors. Tests have demonstrated that through phase correction the RMS phase error is reduced to less than 0.7 degrees while the RMS amplitude error is still less than 0.30 dB.

Click on title for a complete paper.



Abstracts

A Novel Design for a MMIC 180 Degree Phase Shifter (1992 [MCS])

M.E. Goldfarb. "A Novel Design for a MMIC 180 Degree Phase Shifter (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 141-143.

A novel circuit topology is discussed for the design of a 180 degree phase shifter. The approach exploits the dual nature of the tee and pi conjugations of the lowpass and highpass filter topologies. The resulting configuration requires fewer elements than conventional switched filter approaches and does not require complementary control voltages.



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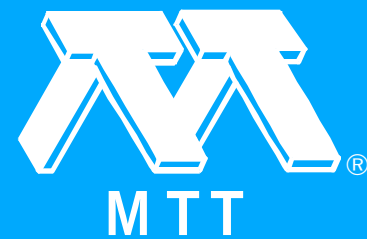


Abstracts

A GaAs MMIC for a 2-GHz Successive Detection Logarithmic Amplifier

L.W. Chua. "A GaAs MMIC for a 2-GHz Successive Detection Logarithmic Amplifier." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 145-148.

This paper reports on a GaAs MMIC for a successive detection logarithmic amplifier which gives a logging linearity over the instantaneous bandwidth 2-7GHz of $\pm 1.25\text{dB}$ (theory: $\pm 1.1\text{dB}$). It represents the best published results for both hybrid MIC and MMIC realisations, and the lowest chip count per stage, to date, for frequencies above 2GHz.



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A GaAs MMIC Based Successive Detection Logarithmic Amplifier (1992 [MCS])

D.J. Nelly and D.S. Parsons. "A GaAs MMIC Based Successive Detection Logarithmic Amplifier (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 149-151.

A six stage successive detection logarithmic amplifier (SDLA) is described in which each stage is a GaAs Monolithic Microwave integrated Circuit (MMIC) incorporating RF amplification, detection and a novel video summation technique, using standard 0.5 micron process field effect transistors (FET) and schottky diodes. The circuit has a dynamic range of 80 dB at 3.8 GHz with linearity of ± 1 dB and power dissipation of 4.0 W.

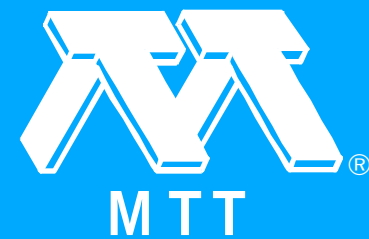
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Abstracts

Session IX -- Frequency Converters and Mixers (Joint with IMS)

"Session IX -- Frequency Converters and Mixers (Joint with IMS)." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 153-153.



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Ultra Small Sized Low Noise Block Downconverter Module (1992 [MCS])

*T. Sekiguchi, N. Shiga, S. Nakajima, K. Otobe, N. Kuwata, K.-I. Matsuzaki and H. Hayashi.
"Ultra Small Sized Low Noise Block Downconverter Module (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 155-158.*

A compact low noise block (LNB) downconverter module for use in direct broadcast satellite (DBS) utilizing only GaAs MMICs has been successfully demonstrated. Four kinds of MMICs designed with 0.5 μ m-gate pulse-doped MESFETs were assembled in a miniaturized flat package (24.5X17.8X 6.0mm³). 52dB conversion gain and 2.1dB noise figure were obtained using no discrete HEMTs in the preceding stage and no stub-tuning.



A Ku Band Converter IC (1992 [MCS])

T. Kaneko, T. Miya and S. Yoshida. "A Ku Band Converter IC (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 159-162.

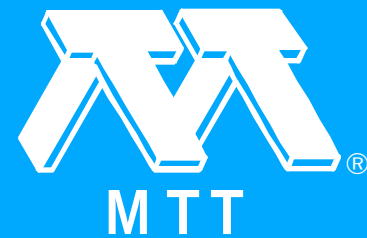
A Ku-Band VCO converter IC for DBS and CS receivers was developed on a 1.2X2.8mm² chip using a 0.5μm MESFET process. This converter IC includes five functional blocks; i.e. prescaler, VCO, LNA, mixer and IF Buffer. This converter IC had 7.5dB noise figure and -80dBc/Hz phase noise at a 10KHz offset from a 10.75GHz carrier signal.

Abstracts

A Broadband Upconverter IC (1992 [MCS])

D. Neilson, B. Allen, M. Kintis, M. Hoppe and S.A. Maas. "A Broadband Upconverter IC (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 163-166.

This paper describes the design and performance of a singlechip upconverter IC consisting of a doubly balanced dual-gate FET mixer, a four-stage LO amplifier, and a single-stage IF amplifier. It converts a dc-to-5 GHz input to an 8-to-10 GHz IF. State-of-the-art performance was achieved through the use of advanced models and circuit-design techniques.



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A Double Balanced 3-18 GHz Resistive HEMT Monolithic Mixer (1992 [MCS])

T.H. Chen, K.W. Chang, S.B.T. Bui, L.C.T. Liu and S. Pak. "A Double Balanced 3-18 GHz Resistive HEMT Monolithic Mixer (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 167-170.

A double balanced (DB) 3-18 GHz resistive HEMT monolithic mixer has been successfully developed. This mixer consists of a AlGaAs/InGaAs HEMT quad, an active LO balun and two passive baluns, RF and IF. At 16 dBm LO power, this mixer achieves the conversion losses of 7.5-9 dB for 4-14 GHz RF and 7.5-11 dB for 3-18 GHz RF. The simulated conversion loss is very much in agreement with the measured results. Also, a third order input intercept of +26 dBm is achieved for a 10-11 GHz RF and 1 GHz IF at a LO drive of 16 dBm. This design is believed to be the first DB resistive HEMT MMIC mixer covering up to 6:1 bandwidth.

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A New Phase Noise Reduction Technique for MMIC Oscillators

A.M. Darwish, A.K. Ezzeddine, H.-L.A. Hung and F.R. Phelleps. "A New Phase Noise Reduction Technique for MMIC Oscillators." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 171-174.

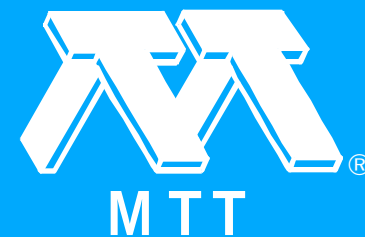
A new technique for reducing oscillator phase noise has been demonstrated. The technique utilizes a pair of limiting diodes to keep the metal-semiconductor field-effect transistor operating in a linear region. An X-band monolithic microwave integrated circuit oscillator was designed, fabricated, and tested to demonstrate the concept. A reduction of 15 dB in phase noise at 5 kHz from the carrier was measured.



Abstracts

Session X -- Interactive Forum II: GaAs Monolithic (Joint with IMS)

"Session X -- Interactive Forum II: GaAs Monolithic (Joint with IMS)." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 175-175.



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Circuit Techniques for Efficient Linearised GaAs MMIC's

D.G. Haigh. "Circuit Techniques for Efficient Linearised GaAs MMIC's." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 177-180.

This paper is concerned with novel circuit designs for monolithic microwave integrated circuit technology using depletion-mode GaAs MESFET's. A synthesis method leading to high efficiency implementation of linear functions based on a square-law FET characteristic is presented and used to design a linearised isolator which is compared with a non-linearised design. A circuit equivalent to a common-gate FET, but with linearity, high efficiency, and reduced FET gate-width and power consumption, is proposed for future use in improved isolators and amplifiers.

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Abstracts

Versatility and Manufacturability Considerations for a New 3-Watt X-Band Power MMIC (1992 [MCS])

D. Raicu, B.M. Kraemer, D.S. Day, J.R. Basset, J. Wei, C. Hua, Y. Chung and C.S. Chang. "Versatility and Manufacturability Considerations for a New 3-Watt X-Band Power MMIC (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 181-184.

The paper presents a newly developed two-stage power amplifying MMIC capable of delivering 3 Watt at X-band with high efficiency. This MMIC is designed for operation with external matching circuits on separate ceramic substrates. By customizing these circuits, the same MMIC can cover an entire array of different applications. The versatility of this approach is demonstrated by the implementation of this MMIC in four power modules specified for different bandwidths, power levels and bias voltages. The small chip size and the tunability allowed by the external circuits lead to increased manufacturing yields and make possible significant cost reductions.



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Monolithic, Lumped Element, Single Sideband Modulator (1992 [MCS])

S.J. Parisi. "Monolithic, Lumped Element, Single Sideband Modulator (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 185-188.

In monolithic microwave integrated circuit (MMIC) technology, at frequencies below 18 GHz, distributed elements consume too much valuable GaAs real estate to be cost-effective. An appreciable reduction in surface area without a degradation in electrical performance can be realized with the use of lumped elements. This paper describes the design and performance of a monolithic single sideband modulator that employs lumped element technology to achieve a compact circuit. For this design, the carrier frequency is 6.9 GHz and the modulating signal is in the range of 0 to 500 MHz. Therefore, the lower sideband is 6.4 to 6.9 GHz and the upper sideband is 6.9 to 7.4 GHz.

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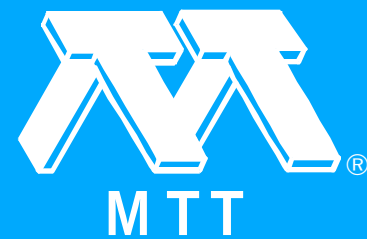


Abstracts

Novel Monolithic Ultra-Wideband Unilateral 4-Port Junction Using Distributed Amplification Techniques (1992 [MCS])

I.D. Robertson and A.H. Aghvami. "Novel Monolithic Ultra-Wideband Unilateral 4-Port Junction Using Distributed Amplification Techniques (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 189-192.

A novel active unilateral 4-port junction operating over 1 to 20 GHz has been demonstrated in MMIC technology, using distributed amplifier techniques. The circuit has unique unilateral characteristics with a relatively constant insertion loss and high isolation, and could replace isolators, circulators and directional couplers in many ultra-wideband applications.



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GaAs ICs for 5 GHz Microwave Landing System Front-End (1992 [MCS])

J.L. De Gouy, P.H. Boutigny, P. Jean and A. Grancher. "GaAs ICs for 5 GHz Microwave Landing System Front-End (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 193-196.

The full integration of the 5 GHz front-end of MLS (Microwave Landing System) equipment shows the maturity of the GaAs ASIC design. All the different functions as amplifiers, switches, oscillators, mixers have been integrated as well as digital functions needed for fractional divider frequency synthesis. All the designed ASICs fully comply with specifications and allow the equipment to run in a military environment. The results in terms of spectral purity are very satisfactory.

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Abstracts

A Monolithic V-band Upconverter Using 0.2 μm InGaAs/GaAs Pseudomorphic HEMT Technology (1992 [MCS])

H. Wang, B. Nelson, L. Shaw, R. Kasody, Y. Hwang, W. Jones, D. Brunone, M. Sholly, J. Maguire and T. Best. "A Monolithic V-band Upconverter Using 0.2 μm InGaAs/GaAs Pseudomorphic HEMT Technology (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 197-200.

A monolithic approach to V-band upconverter development has the advantages of lighter weight and lower cost over conventional hybrid approaches for high volume insertions into transmitter systems. This paper will present the design and performance of a complete monolithic upconverter macrocell using 0.2 μm InGaAs/GaAs pseudomorphic HEMT technology. Individual components, including a 2-10 GHz IF amplifier, a V-band upconverting mixer and a V-band amplifier are also described. The measured results demonstrate a conversion gain of 10 dB at V-band by injecting a 2-10 GHz IF frequency with an LO drive of 10 dBm at 54 GHz. This is the first reported monolithic upconverter with good performance and bandwidth at this frequency.



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23-40 GHz InP HEMT MMIC Distributed Mixer (1992 [MCS])

R. Majidi-Ahy, C. Nishimoto, J. Russell, W. Ou, S. Bandy and G. Zdasiuk. "23-40 GHz InP HEMT MMIC Distributed Mixer (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 201-204.

We report the development of an active millimeter-wave InP HEMT MMIC distributed mixer operating over 23-40 GHz RF bandwidth, with IF frequencies in the range of 2-13 GHz, and fixed LO frequencies of 20 and 28 GHz. The devices were InGaAs-InAlAs-InP HEMTs with a gatelength of 0.25 μ m. The mixer had an average conversion gain of 0 dB when biased for maximum bandwidth, and an average conversion gain of 5 dB when biased for maximum gain. The overall chip dimensions for this MMIC, were 500 by 1000 μ m.





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Broad-Band Electromagnetic Radiation Damage in GaAs MESFETs (1992 [MCS])

J.H. McAdoo, W.M. Bollen, W. Catoe and R. Kaul. "Broad-Band Electromagnetic Radiation Damage in GaAs MESFETs (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 205-208.

A failure mechanism is observed for SiN/sub 2/-passivated metal semiconductor field-effect transistor (MESFET) devices exposed to fast risetime DC video pulses. The intensity of the pulses is about 33% of the value required to cause single-pulse failure. The failure mechanism, which degrades performance by surface flashover and erosion of the passivation layer, eventually leads to sputtering of the gate-source metallization. The results are observed using a combination of optical, electron, and X-ray micrographs, plus MESFET terminal parameters.

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3.3V GPS Receiver MMIC Implemented on a Mixed-Signal, Silicon Bipolar Array (1992 [MCS])

K.J. Negus, R.A. Koupal, D. Millicker and C.P. Snapp. "3.3V GPS Receiver MMIC Implemented on a Mixed-Signal, Silicon Bipolar Array (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): 209-212.

This generic GPS MMIC contains two downconversion stages and the dividers, buffers, digital phase-frequency detector and negative resistance cell required to synthesize both LOs and a TTL system clock. The MMIC operates from a 20 MHz external reference and provides overall conversion gain of about 65 dB from a 1575 MHz RF to a 15 MHz second IF. The 1.8 x 1.8 mm MMIC is implemented on a mixed-signal, silicon bipolar cell array and consumes less than 150 mW from a single 3.3V supply.

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Abstracts

Back Cover (1992 [MCS])

"Back Cover (1992 [MCS])." 1992 Microwave and Millimeter-Wave Monolithic Circuits Symposium Digest 92.1 (1992 [MCS]): b1-b1.



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