Overseas Abstracts

PAPERS FROM JOURNALS PUBLISHED IN JAPAN

Compiled by Prof. T. Okoshi, Department of Electronic Engineering, University of Tokyo. Prof. Okoshi points out that where articles in Trans. IECEJ, *in Japanese, are referenced, these may be available in English translation, with a few months' delay, in* Electronics and Communications in Japan.

1

Three Methods for Equalizing the Even- and Odd-Mode Phase Velocities of a Coupled Strip Line with Inhomogeneous Medium, by K. Atsuki and E. Yamashita (The University of Electro-Communications, Chofu-shi, Japan 182); *Trans. IECEJ* (Corresp.), vol. 55-B, pp. 424–426, July 1972.

Equalization of phase velocities of even and odd modes is important for obtaining good impedance match in directional couplers. This correspondence proposes three new methods for achieving the above purpose: 1) addition of a conductive ceiling; 2) addition of a dielectric slab; and 3) separation of the dielectric substrate and conducting base plate.

2

TE_{on} Mode Filter for a 51 mm Circular Waveguide, by K. Hashimoto and S. Shimada (Musashino Electrical Communication Laboratory, N.T.T., Musashino-shi, Japan 180); *Trans. IECEJ* (Corresp.) vol. 55-B, pp. 426–428, July 1972.

The circular-waveguide transmission of millimeter waves is going to be used in short local trunks in the cities. In such an application many bends must be used since straight tunnel is rather scarce in the cities. The TE_{on}-mode filter described in this short paper has been developed for use in such systems to suppress the spurious modes generated at the bends. It features a widebandness and relatively small size (shorter than 1 m).

3

Branching Filter System Operating in the 4-, 6-, 11-, 18-, and 28-GHz Bands for an Experimental Satellite-Communication Ground Station, by M. Koyama, S. Shimada (Musashino Electrical Communication Laboratory, N.T.T., Musashino-shi, Japan 180), T. Hashimoto, and S. Tachikawa (Mitsubishi Electric Co., Kamakura-shi, Japan 247); *Trans. IECEJ*, vol. 55-B, pp. 433–440, Aug. 1972.

This paper describes design and experiment of a multifrequency branching filter to be used in the ground station of an experimental satellite-communication system featuring multifrequency access. It separates five frequency bands ranging in a wide spectrum: 6 and 28 GHz for upward link, 4 and 18 GHz for downward link, and 11-GHz band for propagation experiments. The measured insertion losses are below 0.7, 0.5, 1.5, and 2.3 dB for the 4-, 6-, 18-, and 28-GHz bands, respectively.

4

Analysis of Microwave Planar Circuit, by T. Miyoshi and T. Okoshi (Faculty of Engineering, University of Tokyo, Tokyo, Japan 113); *Trans. IECEJ*, vol. 55-B, pp. 441–448, Aug. 1972.

Three principal categories have been known in the electrical circuitry so far. They are the lumped-constant (0-dimensional) circuit, distributed-constant (1-dimensional) circuit, and waveguide (3-dimensional) circuit. The planar circuit discussed in general in this paper is a circuit category that should be positioned as a 2-dimensional circuit.

The features of the planar circuit are discussed first. Next the methods of analysis of the planar circuit are described in general. As a simple example of the planar circuit, a disk-shaped coupled-mode circuitry is discussed; experimental results are described and compared with theory.

5

Analysis of Admittance of Reentrant Cavity, by K. Uenakada (NHK Technical Research Laboratories, Kinuta, Tokyo, Japan 147); *Trans. IECEJ*, vol. 55-B, pp. 471–476, Aug. 1972.

An exact expression of the admittance of a reentrant microwave cavity is derived through Rayleigh–Ritz's method. An improved simple approximate formula is also presented. Both formulas are compared with experimental data and show better agreements as compared with conventional design formulas.

6

Flexible Helix Waveguides with Low Bending Losses at Millimeter Wavelength, by N. Suzuki (Musashino Electrical Communication Laboratory, N.T.T., Musashino-shi, Tokyo, Japan 180) and K. Inada (Fujikura Cable Works Ltd., Tokyo, Japan 135); *Trans. IECEJ* (Corresp.), vol. 55-B, pp. 479–481, Aug. 1972.

Flexible helix waveguides are used in the vicinity of the repeaters in millimeter-wave communication systems. However, conventional flexible guides give rise to total loss of 2.5–3.0 dB for one repeater, which is as high as 20 percent of the overall transmission loss. This paper describes an improved flexible waveguide featuring the use of metal shield tubing. The use of the new flexible waveguide reduced the total loss for one repeater to 1.1–1.8 dB.

7

Helical-Strip Slow-Wave Structure for Traveling-Wave Deflection System, by T. Nishino and H. Maeda (Matsushita Research Institute Tokyo, Inc., Kawasaki-shi, Japan 214); *Trans. IECEJ*, vol. 55-B, pp. 489–495, Sept. 1972.

The helical-strip slow-wave structure is proposed for the traveling-wave electron-beam deflection system. It features extremely wideband characteristics. The theoretical analysis giving the determinantal equation of the phase velocity is described first. The results obtained are compared with experiments. Finally, an experimental traveling-wave beam-deflection tube is described, which shows an almost flat response from dc through 7 GHz.

8

Development of Broad-Band Microwave Communication System, by I. Someya (Nippon Electric Co., Ltd., Tokyo, Japan); *J. IECEJ*, vol. 55, pp. 1300–1303, Oct. 1972.

A historical review of the development of the nationwide broad-band microwave communication system in Japan. Emphasis is placed upon the early stages (1945–1960) of the development.

9

On the Numerical Reconstruction of the Image from a Microwave Hologram, by K. Nagai, H. Morimoto, Y. Aoki, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo-shi, Japan 060); *Trans. IECEJ*, vol. 55-B, pp. 588–593, Nov. 1972.

A new method of numerical reconstruction of the image from a microwave hologram is described. The intensity distribution of the image is computed from the hologram data by using the piecewise linear approximation of the hologram pattern and the high-speed Fourier-transform technique. The sampling point number can be reduced as compared with conventional methods.

10

A 20-GHz-Band Ring-Type Channel-Dropping Filter Using Multi-Slit Directional Couplers, by T. Nunotani (Shimada Physical and Chemical Industrial Co., Chofu-shi, Japan 182) and I. Ohtomo (Musashino Electrical Communication Laboratory, N.T.T., Musashino-shi, Japan 180); *Trans. IECEJ* (Corresp.), vol. 55-B, pp. 629–631, Nov. 1972.

This short paper describes a new channel-dropping filter for use in the longer millimeter-wave frequencies. It features the use of a ring-shaped resonator and multi-slit couplers between the waveguides and the resonator. An experimental filter for the 18-GHz band showed bandwidth of 300 MHz, branching loss of 0.22 dB, and transmission loss below 0.1 dB.

11

Computer Analysis of Microwave Planar Circuit Based Upon Integral Equation, by T. Miyoshi (Faculty of Engineering, Kobe University, Kobe-shi, Japan 157) and T. Okoshi (Faculty of Engineering, University of Tokyo, Tokyo, Japan 113); *Trans. IECEJ*, vol. 55-B, pp. 645–652, Dec. 1972.

In another paper in those *Transactions* (August issue), the same authors discussed the necessity and usefulness of a new circuit concept: planar circuit or two-dimensional circuit. They also described in that paper the analytical approaches to this circuitry.

This paper describes computer analyses of an arbitrarily shaped planar circuit. It is shown that the equivalent circuit parameters of an arbitrarily shaped planar circuit can be given by solving an integral equation along the periphery of the circuit.

12

Self-Mixing Effect of Gunn Oscillator, by M. Kotani and S. Mitsui (Central Research Laboratory, Mitsubishi Electric Co., Itami-shi, Japan 664); *Trans. IECEJ*, vol. 55-B, pp. 659–666, Dec. 1972.

Using the nonlinear characteristics of an oscillating Gunn-effect device, one can construct a self-oscillating mixer featuring simple construction. This paper describes the experiment and computer simulation of such a device. The theory and experiment show good agreement. The noise consideration is also described.

13

A Frequency Stabilized Self-Oscillating Converter Using a Solid-State Oscillator, by H. Shiota, K. Kohiyama, and S. Kita (Yokosuka Electrical Communication Laboratory, N.T.T., Yokosuka-shi, Japan, 238-03); *Trans. IECEJ* (Corresp.), vol. 55-B, pp. 691–692, Dec. 1972.

This short paper describes the experiment of a self-oscillating up-converter using an IMPATT diode, featuring frequency stabilization using a high-Q (typically 15 000) cavity. The experiment performed at 18 GHz showed a 3-dB bandwidth of 1.0 GHz.

14

On the Power Gain of a Phase-Coherent Degenerate Parametric Amplifier, by H. Umeda and K. Yamauchi (Faculty of Engineering, Fukui University, Fukui-shi, Japan 910); *Trans. IECEJ*, vol. 55-B, pp. 698–699, Dec. 1972.

Large-signal numerical analyses are performed. The results are compared with conventional small-signal analysis. Conditions for obtaining positive power gain are described.

15

Rectangular Waveguide Bandpass Filter for Millimeter Waves, by T. Nakagami and S. Takenaka (Fujitsu Laboratories Ltd., Kawasaki-shi, Japan 211); *Trans. IECEJ* (Corresp.), vol. 55-B, pp. 669–670, Dec. 1972.

In future millimeter-wave communication systems, more than 100 bandpass filters for different frequencies will be used for branching channels. This paper describes the design principle and experiments of rectangular-waveguide bandpass filters featuring good designability.

16

The Planar Circuit (I), by T. Okoshi (Faculty of Engineering, University of Tokyo, Tokyo, Japan 113); *J. IECEJ*, vol. 56, pp. 52–57, Jan. 1973.

The first part of a technical review paper. The history of the investigations, features, general methods of analysis, and energy considerations of the planar circuitry are described.

17

Error Probability Characteristics of Millimeter-Wave Waveguide Transmission, by K. Kondoh (Yokosuka Electrical Communication Laboratory, N.T.T., Yokosuka-shi, Japan 238-03); *Trans. IECEJ*, vol. 56-B, pp. 49–56, Feb. 1973.

The Japanese standard millimeter-wave PCM communication system will use circular waveguides with 51-mm diameters. At positions where the transmission line must be bent with a radius of curvature less than 25 m, a waveguide corner is used rather than a waveguide bend. This paper discusses the waveform distortion and the resulting error generation due to those corners in the PCM transmission system.

18

Method of a Transmission Line Model for Microwave Acoustics in Piezoelectric Media, by M. Hikita, M. Koshiba, T. Tanihuji, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo-shi, Japan 060); *Trans. IECEJ*, vol. 56-B, pp. 65–71, Feb. 1973.

Oliner proposed the transmission line model of acoustic phenomena in isotropic media, and it was later extended by Koshiba to anisotropic media. This paper describes the generalization of those theories for piezoelectric media. Some numerical analyses are also described.

19

Analytical Method for Treating Coplanar Waveguide, by T. Kitazawa, Y. Fujiki, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo-shi, Japan 060); *Trans. IECEJ*, vol. 56-B, pp. 87–88, Feb. 1973.

In the conventional analysis of the coplanar waveguide the TEM-mode field configuration is assumed. This assumption is practically accurate enough at low frequencies but less accurate at higher frequencies. This paper describes an accurate analytical approach to the problem.

20

The Planar Circuit (II), by T. Okoshi (Faculty of Engineering, University of Tokyo, Tokyo, Japan); *J. IECEJ*, vol. 56, pp. 195–200, Feb. 1973.

The second part of a technical review paper. The computer analyses, equivalent circuits, and applications of the planar circuitry are described.

21

Slot Line on a Magnetized Ferrite Substrate, by T. Kitazawa, Y. Fujiki, M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo-shi, Japan 060), and Y. Hayashi (Kitami Institute of Technology, Kitami-shi, Japan 090); *Trans. IECEJ*, vol. 56-B, pp. 93–98, Mar. 1973.

This paper describes the theoretical analysis of the slot line upon a magnetized ferrite substrate. The determinantal equation is derived, and an example of numerical analysis is shown.

22

Microwave Holography Using Spherical Scanning, by H. Shigesawa, K. Takiyama, T. Toyonaga (Faculty of Engineering, Doshisha University, Kyoto-shi, Japan 062), and M. Nishimura (Maizuru Technical College, Maizuru-shi, Japan 625); *Trans. IECEJ*, vol. 56-B, pp. 99–106, Mar. 1973.

A new type of microwave holography is proposed, in which the transmitting and receiving antennas move upon a spherical surface to collect the image information. The experiment was performed at 9.5 GHz upon a two-dimensional basis, that is, the antennas moved along a circle to prepare a one-dimensional hologram. The image reconstruction process was not performed optically but simulated by a computer.

23

The Quasi-Optical Filter Used for the Domestic Satellite Communication System, by M. Koyama and S. Shimada (Yokosuka Electrical Communication Laboratory, N.T.T., Yokosuka-shi, Japan 238-03); *Trans. IECEJ*, vol. 56-B, pp. 115–133, Mar. 1973.

This paper describes quasi-optical branching filters to be used in the domestic satellite communication system, featuring the use of wide spectral range, that is, 4-, 6-, 18-, and 28-GHz bands. The essential part of the filter consists of multilayer dielectric slabs. The transmission loss is below 0.5 dB for both the microwave and millimeter-wave signals.

24

A Millimeter-Wave IMPATT Local Oscillator and Its Noise Performances, by M. Akaike, H. Kato (Yokosuka Electrical Communication Laboratory, N.T.T., Yokosuka-shi, Japan 238-03), and Y. Fukatsu (Musashino Electrical Communication Laboratory, N.T.T., Musashino-shi, Japan 180); *Trans. IECEJ*, vol. 56-B, pp. 169–175, May 1973.

This paper describes the feasibility studies of millimeter-wave IMPATT oscillators for use as local oscillators in repeaters of PCM millimeter-wave communication systems. The noise performance of the oscillator and the error-rate increase of the system is investigated. It is concluded that the error-rate increase due to the use of the IMPATT local oscillator is negligible.