Asian Abstracts

Papers from Journals Published in Australia, India, and Japan in 1984

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The periodicals investigated are: 1) *Transactions of the Institute of Electronics and Communication Engineers of Japan* (*Trans. IECEJ*), 2) *Journal of the Institution of Engineers, Electronics and Telecommunication Engineering Division*, India (*JIE*, Part *ET*), 3) *Journal of the Institution of electronics and Telecommunication Engineers*, India (*JIETE*), 4) *Journal of Electrical and Electronics Engineering, Australia* (*JEEE*), and 5) *Australian Telecommunication Research* (*ATR*).

As for the Japanese papers in the *Trans. IECEJ* which carry volume numbers J67-B and J67-C, short English summaries are found in the *Trans. IECEJ*, vol. E67, issued in the same month. Papers carrying volume number E67 are papers originally written in English. These issues are published from the *IECEJ*, Kikai-Shinko-Kaikan, 3-5-8, Minato-ku, Tokyo, 105 Japan.

The full translations of some Japanese papers will appear in *Electronics and Communications in Japan*, published by Scripta Publishing Co., 7961 Eastern Avenue, Silver Spring, MD 20910.

The abstracts of these papers are grouped as follows:

1) Solid-State Microwave Devices
2) Transmission Lines and Passive Microwave Devices
3) Microwave Integrated Circuits
4) Microwave Antennas
5) Microwave Propagation
6) Microwave Medical/Biological Applications
7) Laser and Other Devices
8) Optical Fibers/Waveguides

1) Solid-State Microwave Devices

1

Effect of Impurity Concentration and Biasing-Current Density on the Performance of a New DDR Heterojunction IMPATT Diode, by B. B. Pal, and R. U. Khan (Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi, 221 005 India): *JIETE* (India), vol. 30, pp. 22–24, Jan. 1984.

Large-signal analysis is carried out for DDR heterojunction IMPATT diodes. The junctions are made by a combination of GaAs and Ge. Plots of the power and efficiency for these structures as a function of bias current density and impurity concentration reveal that DDR heterojunction diodes give better power and efficiency than the conventional GaAs IMPATT diodes.

2

Noise Performance of Microwave HEMT (Letters), by M. Niori, T. Saito, K. Joshin, and T. Mimura (Fujitsu Laboratories Ltd., Kawasaki, 211 Japan): *Trans. IECEJ*, vol. J67-B, pp. 224–225, Feb. 1984.

Microwave characteristics of HEMT's (High Electron Mobility Transistor) have been evaluated. A 20-GHz HEMT amplifier with a 3.9-dB noise figure and a 30-dB gain has been demonstrated.

3

5 GHz GaAs Monolithic Astable Multivibrator Type Voltage Controlled Oscillator, by M. Shigaki*, Y. Daido*, Y. Takeda*, K. Imamura*, and H. Suzuki** (*Fujitsu Laboratories Ltd., Kawasaki, 211 Japan; **Fujitsu Limited, Kawasaki, 211 Japan): *Trans. IECEJ*, vol. E67, pp. 161–165, Mar. 1984.

A 5-GHz GaAs monolithic astable-multivibrator-type voltage-controlled oscillator has been developed. The oscillator includes 2-mm-long self-aligned TiW-silicide gate MESFET's and Shottky diodes for variable capacitances. The FET and diode models for computer simulation are improved by taking the Gaussian donor distribution into account.

4

A Study on SAW Voltage-Controlled Oscillator Using a Method of the Vector Summation, by S. Saito, and S. Urabe (Yokosuka Electrical Communication Lab., NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. J67-B, pp. 424–431, Apr. 1984.

A SAW voltage-controlled oscillator using the method of vector summation is proposed for miniaturizing frequency synthesizers of mobile communication equipment. The paper discusses the influence of the SAW delay line upon the oscillation characteristics. An experiment in the 800-MHz band is also described.

5

A 14 GHz Ultra-High Stability Feedback Oscillator with Balanced Amplifier, by T. Saito, M. Iwakuni, and Y. Tokumitsu (Radio and Satellite Communications Systems Laboratory, Integrated Communications Division, Fujitsu Laboratories Ltd., Kawasaki, 211 Japan): *Trans. IECEJ*, vol. E67, pp. 396–392, July 1984.

A new type of highly stabilized feedback oscillator has been developed. It consists of a balanced GaAs FET amplifier and a bandpass filter made by a dielectric resonator. A frequency stability of less than $\pm 1 \times 10^{-5}$ over a temperature range from 5 to 45°C, nearly equal to that of a microwave source using a crystal oscillator, has been obtained.

6

A High Efficiency High Power Dovatt Diode in the *X*-Band, by R. V. Khan, S. C. Chaudhary, and B. B. Pal (Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Vanarasi, 221 005 India): *JIETE* (India), vol. 30, pp. 121–124, Sept. 1984.

A $GeGa_{0.5}In_{0.5}As$ high-efficiency high-power lo–hi–lo DOVATT diode is proposed. Numerical calculation shows that it is capable to obtain a power density of the order of $10^9 W/m^2$ and an efficiency of the order of 60 percent in the *X* band.

7

A Matched Active Microwave Switch, by T. M. Percival (Department of Electrical Engineering, Sydney University, NSW 2006 Australia): *JEEE* (Australia), vol. 4, no. 3, pp. 227–230, Sept. 1984.

For realizing an RF switch in a radiotelescope, a two-input active switch which has all ports matched in both its states has been developed. The circuit is realized in microstrip and uses p-i-n diodes as switching elements and Schottky-barrier diodes for matching. The performance is measured at 1415 MHz.

8

Response of Josephson Junction with Nb-Si-Nb Short Bridge Under 100 GHz Range Millimeter Wave Radiation (Letters), by H. Saito* and Y. Okabe** (*Institute of Space and Astronautical Science, Tokyo, 152 Japan; **Faculty of Engineering, The University of Tokyo, Tokyo, 113 Japan): *Trans. IECEJ*, vol. J67-C, pp. 792–793, Oct. 1984.

The high-frequency behavior of Josephson Junction with Nb-Si-Nb microbridge using an edge junction made by a thermal oxidation process has been studied for the 100-Ghz millimeter wavelengths range. The zeroth and first Shapiro's steps have been observed.

9

Two-Dimensional Numerical Analysis for High Electron Mobility Transistors (HEMTs), by J. Yoshida and M. Kurata (Research & Development Center, Toshiba Corporation, Kawasaki, 210 Japan): *Trans. IECEJ*, vol. J67-C, no. 11, pp. 802–809, Nov. 1984.

A two-dimensional numerical model has been developed to investigate the operation mechanism of HEMT's. Calculation is carried out for a device with 1-mm gate length. It shows that the electron accumulation, which is similar to the dipole layer formation in GaAs MESFET's, is observed in the GaAs layer below the drain side gate edge under a high drain bias condition.

10

Analysis of Response of Josephson Weak-Link in Submillimeter Wavelength Region (Letters), by S. Yoshimori and M. Kawamura (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IECEJ*, vol. J67-C, pp. 908–909, Nov. 1984.

The response of the Josephson weak-link in the submillimeter wavelength region is analyzed using the time-dependent Ginzburg–Landau equation. It is shown that the frequency characteristic of the response of the weak-link is very different from that of the tunnel junction.

11

Nanometer Bridge on Edge Junction, by T. Yamashita, K. Hamasaki, K. Matusmoto, Y. Kodaira, and T. Komata (The Technological University of Nagaoka, Nagaoka, 949-54 Japan): *Trans. IECEJ*, vol. J67-C, pp. 886–891, Nov. 1984.

Nanometer bridges are fabricated on the junctions of two Nb electrode films. The bridge has an effective length of less than 50 nm, a width of about 2 mm, and a bridging film thickness of about 30 nm. Experimental results of the threshold curves of the DC-SQUID are in excellent agreement with calculations based on the sinusoidal current-phase relation.

12

The Gunn Effect Oscillator Tuned by the YIG Film Resonator (Letters), by M. Tsutsumi, T. Masumoto, and N. Kumagai (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1313–1314, Nov. 1984.

The frequency tuning (10.4–13.2 GHz) of a Gunn effect oscillator is described, in which a YIG film resonator is used as a tuning element. The oscillator circuit, the power profile, and the tuning characteristic are presented.

2) Transmission Lines and Passive Microwave Devices

1

Field Distribution of the Parallel-Plate Capacitor in an Anisotropic Medium (Letters), by H. Shibata* and R. Terakado** (*Department of Electrical Engineering, Ibaraki Technical College, Katsuta, 312 Japan; **Faculty of Engineering, Ibaraki University, Hitachi, 316 Japan): *Trans. IECEJ*, vol. E67, pp. 53–54, Jan. 1984.

Exact equipotentials and lines of electric flux between two thin conducting plates in an anisotropic medium are theoretically presented by using an affine transformation and a conformal mapping technique.

2

On a Multiple Scattering in electromagnetic Scattering by Many Perfectly Conducting Circular Cylinders, by A. Komiyama (Faculty of Engineering, Meiji University, Kawasaki, 214 Japan): *Trans. IECEJ*, vol. J67-B, pp. 86–93, Jan. 1984.

Electromagnetic scattering by an arbitrary configuration of many parallel perfectly conducting circular cylinders is discussed. Scattering cross sections, scattering patterns, total electric fields in the vicinity of cylinders, and total magnetic fields on the surfce of cylinders are calculated for various cylinder configurations.

3

Direct Experimental Confirmation of New Leakage Effects on Open Dielectric Strip Waveguides (Letters), by H. Shigesawa*, M. Tsuji*, H. Hirata*, S. T. Peng**, and A. A. Oliner** (*Faculty of Engineering, Doshisha University, Kyoto, 602 Japan; **Polytechnic Institute of New York, Brooklyn, NY, 11201): *Trans IECEJ*, vol. J67-B, pp. 98–99, Jan. 1984.

The leakage and the resonant effect, which is closely related to the leakage, are measured for open-structure dielectric strip waveguides.

4

SSBW and Leaky SAW Propagating on Rotated Y-Cuts of $LiNb0_3$, by K. Hashimoto, M. Yamaguchi, K. Yamamori, and H. Kogo (Faculty of Engineering, Chiba University, Chiba, 260 Japan): *Trans. IECEJ*, vol. J67-C, pp. 158–165, Jan. 1984.

This paper discusses the two propagating waves, the surface skimming bulk wave and leaky surface acoustic wave, in $LiNb0_3$ and $LiTa0_3$ crystals. The velocity difference of the two waves, which determines the dominant propagation mode, is discussed.

5

Telegraph Equations in Tapered Waveguides (Letters), by T. Inami*, N. Kodama*, K. Taira*, and N. Kikuyama** (*Faculty of Engineering, University of the Ryukyus, Okinawa, 903-01 Japan; **Faculty of Junior College, University of the Ryukyus, Okinawa, 903-01 Japan): *Trans. IECEJ*, vol. E67, pp. 121–122, Feb. 1984.

A method is shown to determine the telegraph equations in tapered waveguides having two symmetric planes.

6

External Q of Loop Coupled Dielectric Resonator, by T. Kaneki* and S. Kobayashi** (*Faculty of Technology, Tokyo Metropolitan University, Tokyo, 158 Japan; **Asahi Glass Co., Ltd., Tokyo, 100 Japan): *Trans. IECEJ*, vol. J67-B, pp. 179–185, Feb. 1984.

A dielectric resonator, enclosed by a cylindrical metal case and coupled by a loop, is studied. The total induced voltage in the loop and the dissipated power in the load connected to the loop are derived from the magnetic field. The calculated external Q agrees with the experimental value at 3.5-GHz band.

7

Coupling of Electromagnetic Waves to Transmission Lines, by Y. Kami* and R. Sato** (*Junior Technical College of Electro-Communications, Chofu, 182 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IECEJ*, vol. J67-B, pp. 209–215, Feb. 1984.

In this paper, a set of transmission-line equations including two electromotive forces (one in series and one in parallel to the transmission line) is discussed. The two electromotive forces represent the coupling between the external electromagnetic waves and the transmission line. The physical meaning of the equivalent circuit parameters are discussed.

8

Attenuation Constant of Rectangular Dielectric Waveguide of Small Cross Section (Letters), by U. Tomabechi (Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IECEJ*, vol. J67-B, pp. 216–217, Feb. 1984.

Attenuation constants of rectangular dielectric waveguides are calculated for the case of small width. The obtained constants show a good agreement with experimental results.

9

Analytical Method for the Scattering Problem of Surface Waves by a Conducting Strip (Letters), by U. Hayashi and S. Ohno (Faculty of Engineering, Kitami Institute of Technology, Kitami, 090 Japan): *Trans. IECEJ*, vol. J67-B, pp. 230–231, Feb. 1984.

The problem of scattering of surface waves by a metalic strip on a dielectric-clad ground plane is treated. The Green's function is rigorously evaluated and the reflection and transmission coefficients of the TE and TM surface waves are discusses.

10

A 30 MHz Standard Attenuator, by T. E. Cousins and H. Kobler (CSIRO, Division of Applied Physics, Australia): *JEEE* (Australia), vol. 4, pp. 1–5, Mar. 1984.

A standard attenuator has been constructed operating at 30 MHz with a resolution of 0.0001 dB and using a laser interferometer as indicator.

11

Modal Expansion Theory by Almost Periodic Functions for Dielectric Gratings, by N. Yamauchi (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): *Trans. IECEJ*, vol. J67-B, pp. 257–264, Mar. 1984.

This paper proposes a new modal theory to analyze the diffraction by a dielectric grating whose permittivity varies sinusoidally in the transversal direction. Numerical calculations show that, in the case that the refractive index of grating is greater than that of the outer medium, anomalous diffractions occur at a certain thickness of the grating.

12

Nonlinear Interaction of Surface Acoustic Waves in Waveguide, by Y. Nakagawa and M. Ono (Faculty of Engineering, Yamanashi University, Kofu, 400 Japan): *Trans. IECEJ*, vol. J67-C, pp. 310–317, Mar. 1984.

Theoretical and experimental results of nonlinear interaction of surface acoustic waves (SAW) are reported. It is shown 1) that a new SAW is generated, whose frequency is the sum of two originally propagating waves, and 2) that the propagating direction of the new wave is determined by the difference of the frequencies of those two waves.

13

A Study of the Factors Having Influence on the Convergency of Electro-Magnetic Field Around Delay Line (Letters), by K. Okamoto (Telecommunication Division, Hitachi Cable Ltd., Tokyo, 100 Japan): *Trans. IECEJ*, vol. J67-B, pp. 346–347, Mar. 1984.

The electromagnetic field around a coaxial-type delay line (used for a radio diffusion cable) is calculated by Basset integral function. It discusses 1) the field pattern around the cable end, and 2) the field distribution as a function of attenuation constant, propagation constant, and irregularities of cable.

14

An Experiment on the Electromagnetic Scattering of Conducting Cylinders with Rectangular Cross Section (Letters), by M. Nishimura*, S. Takamatsu**, and H. Shigesawa** (*Department of Electrical Engineering, Maizuru Technical College, Maizuru, 625 Japan; **Faculty of Engineering, Doshisha University, Kyoto, 602 Japan): *Trans. IECEJ*, vol. J67-B, pp. 348–349, Mar. 1984.

This paper shows an experimental result of Gaussian-like beam scattering by multiple conducting cylinders with rectangular cross section. The result well agrees with the numerical calculation previously presented by the same authors.

15

Vectorial Finite-Element Formulation without Spurious Modes for Dielectric Waveguides, by M. Koshiba, K. Hayata, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. E67, pp. 191–196, Apr. 1984.

A new vectorial finite-element method for the analysis of three-dimensional dielectric waveguides is developed. In this method, all three components of the magnetic field are taken into consideration. The numerical results for a rectangular waveguide, half-filled with dielectric, are presented and are compared with previously presented results.

16

Radiation from Surface Wave Excitation by an Open-Ended Dielectric-Loaded Parallel-Plate Waveguide, by K. Uchida and K. Aoki (Faculty of Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): *Trans. IECEJ*, vol. E67, pp. 218–224, Apr. 1984.

This paper deals with radiation from and surface-wave excitation by a semi-infinite parallel-plate waveguide. A dielectric material is filled inside the parallel plate and its permittivity changes abruptly. The quantity of radiated and transmitted power is calculated.

17

Reflection Characteristics of Twisted Component in Rectangular Waveguides, by H. Yabe, K. Nishio, and Y. Mushiake (Junior Technical College of Electro-Communications, Chofu, 182 Japan): *Trans. IECEJ*, vol. J67-B, pp. 408–415, Apr. 1984.

By applying the perturbation and modal analysis technique to the hybrid-mode fields in twisted rectangular waveguides, analytic expressions of reflection coefficients for a straight-to-twist junction are obtained in the second-order perturbation.

18

Dielectric Waveguide-Type Millimeter-Wave Modulator Using Photoconductivity, by K. Ogusu and I. Tanaka (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): *Trans. IECEJ*, vol. J67-B, pp. 416–423, Apr. 1984.

This paper is concerned with the millimeter-wave modulator in which the permittivity of the substrate semiconductor is modulated by applied light power. For obtaining a high modulation index, a new structure of the semiconductor and dielectric is proposed. Theoretical and experimental results are presented.

19

External Q of Slot Resonator in Cutoff Waveguide (Letters), by T. Kaneki and H. Maehara (Faculty of Technology, Tokyo Metropolitan University, Tokyo, 158 Japan): *Trans. IECEJ*, vol. J67-B, pp. 459–460, Apr. 1984.

External Q of a slot resonator mounted in a waveguide is calculated. The calculation is made based upon a magnetic current conceptually placed on the slot. The calculation is compared with experimental results.

20

Design Curves for an Inhomogeneously-Loaded Helical Slow-Wave Structure for a Broad-Band Travelling-Wave Tube, by U. N. Singh, B. B. Pal, B. N. Basu, and N. C. Vaidya (Centre of Research in Microwave Tubes, Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi, 221 005 India): *JIETE* (India), vol. 30, pp. 55–58, May 1984.

In the slow-wave structure consisting of a helix supported by a dielectric whose permittivity increases in the radial direction, the parameters of the dielectric tube (tube diameter, permittivity as a function of radius) for broadening the bandwidth are discussed.

21

A Short-Terminated Non-Resonant Slotted Dielectric-Filled Waveguide Array, by B. K. Mulhopadhyay and K. N. Pandey (Defence Research and Development Laboratory, Hyderabad, 500 258 India): *JIETE* (India), vol. 30, no. 3, pp. 58–61, May 1984.

The equivalent circuit of a slotted dielectric-filled waveguide array and the radiation from it are discussed for the purpose of applying it to an airborne antenna. A fabricated antenna after the theory shows good efficacy for flight worthiness.

22

Optimum Ports Arrangements for a Planar-Circuit-Type 3-dB Hybrid (Letters), by I. Ohta, T. Yamashita, and I.

Hagino (Department of Electronics, Himeji Institute of Technology, Himeji, 671-22 Japan): *Trans. IECEJ*, vol. E67, pp. 287–288, May 1984.

A planar-circuit-type 3-dB hybrid, consisting of a four-port disk-shaped resonator, is investigated. It shows that the mismatch loss can be reduced by taking into consideration the higher order resonant modes.

23

Theoretical Study on the Coupling of Two-Dimensional Gaussian Beam to a Dielectric Slab Waveguide, by E. Nishimura, N. Morita, and N. Kumagai (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-C, pp. 474–481, May 1984.

Mode coupling, reflection, and radiation of the incident two-dimensional Gaussian beam at the arbitrarily shaped end-surfaces of the slab waveguide are analyzed. Numerical results and a simpler approximate calculation method are also shown.

24

A Design of High-Q Dielectric Resonators for MIC Applications, by N. Imai and K. Yamamoto (Yokosuka Electrical Communication Lab., NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. J67-B, pp. 497–504, May 1984.

The design of a radiation-suppressed dielectric resonator is presented. The resonant frequency and unloaded Q of the resonator are discussed for various diameters of the metal cap (used for suppressing the radiation). It shows that a proper choice of the metal cap and the dielectric dimensions gives a high external Q value.

25

Near Field Behavior by an Infinite Line Sources Located Near the Dielectric Interface (Letters), by S. Kozaki and J. Kagawa (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): *IECEJ Trans.*, vol. J67-B, pp. 576–577, May 1984.

The field distribution generated by a filament current source, which is placed on the boundary surface of two media with different permittivity, is discussed.

26

Transient Analysis of Microstrip Gap, by S. Koike, N. Yoshida, and I. Fukai (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-B, pp. 662–669, June 1984.

The time-domain analysis of three-dimensional microstrip gaps (the thickness of microstrip conductor is finite) is described. The gap capacitance is calculated as a function of conductor thickness.

27

Effect on an Inhomogeneous Magnetic Field in the YIG Film Delay Lines (Letters), by M. Tsutsumi, T. Sakurai, and N. Kumagai (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-B, pp. 680–681, June 1984.

The group-delay characteristics of the magnetostatic forward volume wave in a nonuniformly magnetized yttrium–iron–garnet film are described. The long time delay (more than 1 ms with low propagation loss at S band) is observed by the pulse experiment.

28

Dielectric Measurements at 100 GHz Range Using Resonant Cavity (Letters), by H. Saito (Institute of Space and Astronautical Science, Tokyo, 153 Japan): *Trans. IECEJ*, vol. J67-B, pp. 686–687, June 1984.

The dielectric constant of GaAs has been measured with a rectangular cavity in the 100-GHz band. The material dimension and resulting error are discussed.

29

Reflection and Transmission of the Three Dimensional Gaussian Beam for Homogeneous Multilayers (Letters), by S. Kozaki, M. Ohki, and T. Kanetsuna (Faculty of Engineering, Gunma University Kiryu, 376 Japan): *Trans. IECEJ*, vol. J67-B, pp. 696–697, June 1984.

The reflected and transmitted beam of three-dimensional Gaussian beam for an arbitrary permittivity is described. A multilayer approximation is used. As an inhomogeneous medium, a periodic multilayer is considered.

30

On the Dielectric Measurement by H-Plane Dielectric Loaded Resonator, by H. Yamanaka and U. Farooq (Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IECEJ*, vol. J67-B,. pp. 707–713, July 1984.

A new measuring method of complex dielectric constant by using the TE_{013} mode is proposed. The numerical solutions of the transcendental equation are obtained by computer using the Newton's method. The experiments of a polymethyl methacrylate resin and a polystyrene resin at a frequency of 6 GHz are described.

31

A Study of the Mechanism of Infrared Responsivities on PtSi-Si (p-Type) Schottky Barrier Diode, by S. Uematsu, M. Kimata, and M. Denda (LSI Research and Development Laboratory, Mitsubishi Electric Corp., Itami, 664 Japan): *Trans. IECEJ*, vol. J67-C, pp. 617–622, Aug. 1984.

For explaining the response of PtSi-Si Schottky-barrier diodes in infrared region, a model based upon hot holes generated on the PtSi layer is proposed. This model is verified by the experiments performed in 3–5-mm region.

32

Channel Multiplexers for Broadcasting Satellite Transponders in the 12 GHz Band, by T. Nomoto (Satellite Broadcasting Research Division, NHK Technical Research Laboratories, Tokyo, 157 Japan): *Trans. IECEJ*, vol. J67-B, pp. 916–923, Aug. 1984.

The channel multiplexers have been designed and fabricated. These multiplexers satisfy necessary characteristics required of the channel multiplexers for high-power broadcasting satellite transponders in the 12-GHz band.

33

Experimental Study on the Phase Distribution Around the Dielectric Waveguide End, by K. Matsumura and T. Ueda (Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IECEJ*, vol. E67, pp. 469–473, Sept. 1984.

An experimental study of the near-field distribution around the dielectric waveguide end has been made on the microwave region. The measured results are separated into amplitude and phase and expressed by equi-amplitude and equi-phase contour maps.

34

Eigenvalue Economizer Method for the Finite-Element Analysis of Dielectric Waveguides (Letters), by K. Hayata, M. Koshiba, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-B, pp. 992–993, Sept. 1984.

For the vectorial finite-element analysis of dielectric waveguides, the eigenvalue economizer method is proposed. In this approach, it is possible to reduce the size of the matrix dimension by classifying variables into two groups, master and slave variables.

35

Numerical Analysis of Composite Planar Circuits by Point Matching Method (Letters), by N. Kishi, E. Yamashita, K. Atsuki, and K. Kotegawa (Faculty of Electro-Communications, The University of Electro-Communications, Chofu, 182 Japan): *Trans. IECEJ*, vol. J67-B, pp. 994–995, Sept. 1984.

The point-matching method is applied to the analysis of transmission characteristics of a two-port circular planar circuit which contains composite dielectric media.

36

Numerical Analysis of Scattered Waves from Thick Obstacles in a Waveguide (Letters), by H. Liu, K. Wantanabe, and T. Itakura (Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1000–1001, Sept. 1984.

A mode-matching method is applied to solve the problem of scattering from the waveguides with a semi-circle, a triangular, and a square obstacle. It is shown that the calculation of the reflection coefficients by this method is more accurate and requires less computation time than the moment method.

37

An Analysis of Dielectric Branching Waveguides by Boundary Element Method (Letters), by Y. Nakajima, M. Sugimoto, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-C, pp. 794–795, Oct. 1984.

This paper describes the boundary-element method applied to dielectric branching waveguide problems with hypothetical boundaries. The electric field distribution and propagation characteristic of symmetrical branching waveguides are evaluated.

38

Waveguide-Type Dielectric Filter (Letters), by K. Kanao and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1177–1178, Oct. 1984.

The waveguide-type dielectric bandpass filter which is composed of one or more dielectric rod resonators between parallel conducting plates is analyzed using the boundary-element method.

39

On the Usefulness of Variable-Number-Nodes Elements for the Analysis of Dielectric Waveguides by the Finite-Element Method (Letters), by K. Hayata, M. Koshiba, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1179–1180, Oct. 1984.

Variable-number-nodes elements are introduced for analysis of dielectric waveguides by the finite-element method. In this procedure, it is possible to reduce the size of the matrix dimension and to use computer memory economically.

40

Boundary Element Analysis of Shielded Microstrip Lines with Dielectric Layers, by M. Ikeuchi (Graduate School of Science, Okayama University of Science, 700 Japan): *Trans. IECEJ*, vol. E-67, pp. 585–590, Nov. 1984.

The analysis is based upon the Green's theorem. For obtaining a simple calculation procedure of characteristic quantities of transmission lines, the law of total charge conservation is utilized. Numerical results for the balanced-type and coplanar-type striplines are demonstrated in order to show the usefulness of this method.

41

Electromagnetic Scattering Coefficient of an Elliptic Cylinder (Letters), by T. Ando (Faculty of Engineering, Osaka Institute of Technology, Osaka, 535 Japan): *Trans. IECEJ*, vol. E67, pp. 623–624, Nov. 1984.

The electromagnetic scattering coefficient of an infinite elliptic cylinder is presented. Fundamental properties of the coefficient are discussed for the case where the incident plane wave has parallel and perpendicular polarizations.

42

Outer Electromagnetic Field of Helical Coaxial Line with Regard to Earth Effect, by M. Suzuki*, J. Chiba**, and T. Hosono*** (*The Furukawa Electric Co., Ltd., Yokohama, 220 Japan; **Faculty of Engineering, Tohoku University,

Sendai, 980 Japan; ***College of Science and Technology, Nihon University, Tokyo, 101 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1223–1230, Nov. 1984.

This paper describes analytical formulations and experimental evaluations of the electromagnetic fields around the helical coaxial line which has a high-permeability magnetic core. It is pointed out that the field is enhanced and stabilized by increasing the permeability of the core material.

43

Theoretical and Experimental Study on Rectenna Array for Microwave Power Transmission, by Y. Shimanuki and S. Adachi (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1301–1308, Nov. 1984.

Theoretical and experimental studies on a rectenna for microwave power transmission are described. The conversion efficiency to dc energy and the spurious radiation of harmonics, generated by the rectenna, are calculated numerically. Measured conversion efficiency agrees with the theoretical value.

44

Scattering of Electromagnetic Waves by Two Perfectly Conducting Rectangular Cylinders (Letters), by T. Kobayashi, S. Kozaki (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1315–1316, Nov. 1984.

Scattering of the plane wave by two perfectly conducting rectangular cylinders is analyzed by the point-matching method. The scattered field distribution in the vicinity of the rectangular cylinder is obtained. In order to check the theory, a model experiment is performed.

45

Attenuation Characteristics of Corrugated Rectangular Waveguide with Rounded Corners (Letters), by M. Suzuki and T. Kanai (The Furukawa Electric Co., Ltd., Yokohama, 220 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1317–1318, Nov. 1984.

This paper describes calculation formulas and measured values of cutoff frequency and attenuation characteristics of corrugated waveguide which has a rectangular cross section with rounded corners. The attenuation characteristics of eight types of flexible waveguides are shown for frequencies of 2 to 30 GHz.

46

Study of Spurious Solution of Finite-Element Methods in the Three-Component Magnetic Field Formation for Dielectric Waveguide Problem, by M. Koshiba, K. Hayata, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan.): *Trans. IECEJ*, vol. J67-B, pp. 1333–1338, Dec. 1984.

This paper discusses a new vector H-field finite-element method for eliminating the spurious solutions. The new spurious solutions appear only in the fast-wave region, and therefore, in the solutions of slow-wave propagation, the appearance of spurious solutions is not serious.

47

An Analysis of Michelson Interferometer-Type Hybrid by the Boundary-Element Method, by H. Sano and S. Kurasono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1392–1398, Dec. 1984.

A Michelson interferometer-type hybrid using the oversized rectangular TE_{10} mode is analyzed by the boundary-element method. It is found that the frequency response of the coupling coefficient has dips at the cutoff frequencies of higher order modes.

48

Magnetic Circuits of Lumped-Element Circulator with Thin-Type Structure, by S. Takeda (Magnetic & Electronic Materials Research Laboratory, Hitachi Metals Ltd., Kumagaya, 360 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1399–1406, Dec. 1984.

A new construction of the magnetic circuit for circulators is proposed. A garnet is put between a magnet and a heat sink, instead of two magnets in the conventional construction. Experimental results for temperature dependence of electrical performances and power capability verify the feasibility of this construction.

49

A 3-Port Ferrite Resonator Circuit Using Slotline, by K. Ohmi and F. Okada (Department of Electrical Engineering, the National Defense Academy, Yokosuka, 239 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1431–1437, Dec. 1984.

This paper proposes a new three terminal-pair nonreciprocal circuit. On the dielectric substrate, a slotline is formed and a ferrite sphere is placed. The theoretical calculation of its S matrix and nonreciprocal property, and the experimental verification are shown.

50

Near Field Behavior by an Infinite Line Source Located in the Homogeneous Dielectric Slab (Letters), by K. Satoh and S. Kozaki (Faculty of Engineering, Gunma University, Kiryu, 276 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1484–1485, Dec. 1984.

The field inside and outside a homogeneous dielectric slab, excited by a line current source, is analyzed. This analysis gives an insight into the excitation efficiency of optical fibers excited by lasers.

3) Microwave Integrate Circuits

1

MIC Linearizer for Satellite Communications, by G. Sato (Research and Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Tokyo, 153 Japan): *Trans. IECEJ*, vol. J67-B, pp. 630–637, June 1984.

This paper describes a newly developed soft-limiter-type linearizer. This linearizer is composed of an MIC linearizer and a limiter amplifier. The operation principle and its experimental results for 4–6 GHz are shown.

4) Microwave Antennas

1

Cross-Correlation Method Applied to Random Periodic Phased Arrays, by P.V.D.S. Rao (Department of Electronics, College of Engineering, Jawaharlal Nehru Technological University, Anantapur, 515 002 India): *JIETE* (India), vol. 30, pp. 15–21, Jan. 1984.

An analysis of random periodic arrays is made. The statistical average of the element input admittance and transmission/reflection coefficient are derived. The method is applicable to other arrays having apertures of statistical nature.

2

Effect of Source Antenna Directivity on the Performance of an Anechoic Chamber, by M.C. Chandra Mouly* and V. Ranganadha Rao** (*VR Siddhartha Engineering College, Vijayawada, India; **IIT Kharagpur, India): *JIE*, Part *ET* (India), vol. 64, pp. 60–62, Feb. 1984.

This paper discusses the influence of the source antenna on the reflectivity level in the quiet zone of a rectangular anechoic chamber, employing the ray optic method. Theoretical results are compared with those obtained from practical measurements.

3

4, 5, 6 GHz Band Offset Antenna Featuring Low Sidelobe and High Cross Polarization Discrimination, by N. Nakajima*, Y. Shimanuki**, K. Abe***, and T. Furuno*** (*Yokosuka Electrical Communication Laboratory, NTT, Yokosuka, 238 Japan; **Radio Regulator Bureau, Ministry of Posts and Telecommunications, Tokyo, 100 Japan; ***Kamakura Works, Mitsubishi Electric Corp., Kamakura, 247 Japan): *Trans. IECEJ*, vol. J67-B, pp. 194–201, Feb. 1984.

A tri-reflector offset antenna has been developed to meet the requirements of digital microwave systems. The design method and the performances of a fabricated antenna are described. Measurement shows that the sidelobe is reduced about 10 dB and the cross polarization discrimination during fading is improved about 8 dB, compared with existing microwave antennas.

4

Pattern Synthesis of Array-fed Reflector Antennas, by S. Mano*, T. Tsutsumi**, and T. Katagi* (*Information Systems and Electronics Development Laboratory, Mitsubishi Electric Corp., Kamakura, 247 Japan; **Communication Equipment Works, Mitsubishi Electric Corp., Amagasaki, 661 Japan): *Trans. IECEJ, vol. J67-B, pp.* 202–208, Feb. 1984.

Gain optimization and sidelobe suppression of a reflector antenna which is fed by a phased array are theoretically investigated. The theory is based upon a general consideration of an antenna each feed element of which has an arbitrary phase and amplitude. Experimental results using an *X*-band model show good agreement with the theory.

5

Power Optimizing Adaptive Antenna Arrays (Letters), by T. G. Palanivelu (Department of Electronics and Communication Engineering, Regional Engineering College, Tiruchirapalli, 620 015 India): *JIETE* (India), vol. 30, pp. 49–51, Mar. 1984.

Power optimization problems of an adaptive antenna system are discussed by the use of step-size random search and random pattern search methods. It is shown that an *m*-subarray partial adaptive system gives better signal-to-noise ratio compared with an *m*-element full adaptive system.

6

Circularly Polarized Printed Array Antenna Composed of End-Fed Strip Dipoles and Slots, by Ito (Faculty of Engineering, Chiba University, Chiba, 260 Japan): *Trans. IECEJ*, vol. J67-B, pp. 289–296, Mar. 1984.

This paper discusses the gain enhancement for a circularly polarized printed array antenna composed of strips and slots. An approximate analysis, a design procedure, and experiments in the *S* band are described.

7

Radiation Properties of a Choke Loaded Circular Waveguide Antenna—Choke Position Effects (Letters), by K. Miyata (Department of Electrical Engineering, Akita Technical College, Akita, 011 Japan): *Trans. IECEJ*, vol. E67, pp. 236–237, Apr. 1984.

A single-choke circular waveguide antenna with a better beam circularity and cross-polar properties is experimentally obtained by selecting a proper choke position.

8

Radiation Mechanism of Perfectly Conducting Antennas—A Consideration by Nukiyama's Vector, by S. Tokumaru (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IECEJ*, vol. J67-B, pp. 377–383, Apr. 1984.

A new theory for explaining the radiation mechanism of a perfect conducting antenna is proposed. The theory is based upon Nukiyama's vector which yields a power theorem equivalent to the Poynting theorem. A reasonable and comprehensible explanation of energy transfer from/to an antenna has been obtained.

9

Experimental Study of a Square Corrugated Horn Antenna, by P.S Bhatnagar and M. D. Singh (Central Electronics Engineering Research Institute, Dilani (Rajasthan), India): *JIE*, Part *ET* (India), vol. 64, pp. 86–88, May 1984.

This paper discusses the radiation characteristics of a square corrugated horn. It shows that a horn with four side corrugations exhibits considerable better performances compared with a horn with two side corrugations.

10

Rectangular and Tapered Microwave Anechoic Chambers—A Comparative Performance Analysis, by M. C. Chandra Mouly* and C. Raja Rao** (*VR Siddhartha Engineering College, Vijayawada, India, **SVU College of Engineering, Tirupati, India): *JIE*, Part *ET* (India), vol. 64, pp. 89–94, May 1984.

This paper discusses performances of rectangular and tapered configurations of microwave anechoic chambers. It shows that the tapered configuration gives better performances.

11

Microstrip Antenna Having Posts for Circular Polarization, by S. Tokumaru and S. Fukui (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IECEJ*, vol. J67-B, pp. 529–536, May 1984.

A new antenna in which posts are incorporated for separating two degenerated modes within a circular microstrip is proposed. The input impedances, axial ratio, radiation patterns, and directive gain are discussed.

12

Analysis on Antenna Pattern Diversity Effects for Complex Radiation Pattern (Letters), by T. Takeuchi*, F. Ikegami*, S. Yoshida*, and Y. Tokui** (*Faculty of Engineering, Kyoto University, Kyoto, 606 Japan; **Engineering Bureau, NTT, Tokyo, 100 Japan): *Trans.*, vol. J67-B, pp. 570–571, May 1984.

Correlation coefficient of the complex radiation patten (which is expressed by amplitude and phase) of two antennas, and the diversity effect by use of phase directivity difference are discussed.

13

Radiation Properties of Linearly-Polarized Microstrip Antennas in an Ionized Medium, by Deepak Bhatnagar and R. K. Gupta (Electromagnetic Laboratory, Department of Physics, M. R. Engineering College, Jaipur, 302 017 India): *JIETE* (India), vol. 30, pp. 92–96, July 1984.

This paper discusses the effect of the plasma medium on the radiation pattern of linearly-polarized microstrip patch antennas. It shows that the reduction in intensity in electromagnetic field patterns occurs due to generation of electroacoustic mode.

14

Effect of Counterpoise on VOR Antenna Radiation Pattern, by M. C. Chandra Mouly, S. Surender, C. Damorada Rao, and S. Srinivas Kumar (VR Siddhartha Engineering College, Vijayawada, India): *JIE*, Part *ET* (India), vol. 65, pp. 11–13, Aug. 1984.

This paper discusses the effect of the ground and the counterpoise on the radiation pattern of the VOR antenna system. It shows that the use of counterpoise can reduce the number of the lobes.

15

Improvement on Polarization Property of Turnstile Spherical Array Antenna (Letters), by S. Horiguchi*, T. Ishizone**, and Y. Mushiake*** (*Education Center for Information Processing, Tohoku University, Sendai, 980 Japan; **Faculty Engineering, Tohoku University, Sendai, 980 Japan; ***Faculty of Engineering, Tohoku Institute of Technology, Sendai, 982 Japan): *Trans. IECEJ*, vol. E67, pp. 451–452, Aug. 1984.

Design principle of a turnstile spherical array antenna and the numerical results are discussed. The design for scanning a hemisphere without any significant gain variation is described.

16

Radiation Pattern Analysis of Reflector Antennas, by M. Ando (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IECEJ*, vol. J67-B, pp. 853–860, Aug. 1984.

A new calculation method of radiation patterns of reflector antennas is proposed. This method is characterized by a combination of geometrical optics and physical optics, and gives a precise analysis of the radiation pattern in all directions. The precision is verified by applying this method to a circular disk in which an accurate solution is being obtained.

17

Studies on Excitation of Strip Dipoles, by V. L. Rao* and B. N. Das** (*Bharat Electronics Ltd., Barat Nagar Post, Ghaziabad, 201 008 India; **Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur, 721 302 India): *JIETE* (India), vol. 30, pp. 116–119, Sept. 1984.

This paper discusses methods of exciting microstrip diopoles 1) from balun transformers, 2) using coplanar lines, and 3) using microstrip lines. The characteristic impedance and bandwidth are calculated for each case.

18

Designing Method of Microstrip Antenna Considering the Bandwidth, by Y. Suzuki and T. Chiba (Komukai Works, Toshiba Corp., Kawasaki, 210 Japan): *Trans. IECEJ*, vol. E67, pp. 488–493, Sept. 1984.

A design method of a microstrip antenna for obtaining a broader bandwidth is presented. The relationship between the unloaded Q and the bandwidth of the microstrip antenna is obtained. The measured result agrees with the calculated result.

19

Investigations into the Behavior of Radome Materials, by M. C. Chandra Mouly, K. Bhupathi Reddy, K. Phani Raj

Kumar, and B. V. Subba Rao (VR Siddhartha Engineering College, Vijayawada, India): *JIE*, Part *ET* (India), vol. 65, pp. 52–54, Nov. 1984.

Power reflection and transmission of the randome are discussed. Design parameters for the randome material and its thickness are shown.

20

Twin Delta Loop Antenna and its Application to Antenna with Plane Reflector, by T. Tsukiji, Y. Kumon, S. Tou, and M. Okubo (Faculty of Engineering, Fukuoka University, Fukuoka, 814-01 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1270–1277, Nov. 1984.

The twin-delta loop antenna, which is a two-coupled coplanar top-driven delta loop, is proposed as a broad-band and high-gain antenna. Precise design data are presented. It is shown that the twin delta loop antenna is useful for TV broadcast in VHF or UHF.

21

Analysis of a Slot Antenna Cut on a Finite Conducting Plane, by H. Shoki and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1446–1453, Dec. 1984.

The characteristics of a slot antenna cut on a finite conducting plane are analyzed by using the geometrical theory of diffraction, combined with the moment method. The input impedance is calculated by the reaction matching method which contains diffraction effect. The variation of the radiation fields depending upon the substrate structure is also discussed.

22

Design and Characteristics of Sector/Cosecant-Square Shaped Beam Antenna, by T. Yamada, K. Kagoshima, and Y. Itami (Yokosuka Electrical Communication Laboratories, NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1454–1461, Dec. 1984.

A new antenna with a single shaped reflector for the use of the base station of radio local distribution systems has been developed. The azimuthal and elevational radiation patterns are 90° fan-shaped and squared cosecant, respectively. The synthesizing method of reflector surface and experimental antenna performance are described.

23

Planar Array Composed of Dielectric Resonator Antenna (Letters), by M. Haneishi, H. Takazawa, and T. Aoki (Faculty of Engineering, Saitama University, Urawa, 338 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1486–1487, Dec. 1984.

A new class of planar arrays consisting of dielectric resonator antenna (DRA) is discussed. A test DRA array constructed by 4×4 DRA elements is fed by a microstrip feeding network behind the ground plane.

5) Microwave Propagation

1

Propagation at 500 MHz for Mobile Radio, by B. R. Davis and R. E. Bogner (University of Adelaide, Australia): *ATR* (Australia), vol. 18, pp. 13–32, Jan. 1984.

The basic characteristics of radio paths relevant to mobile radio communication at UHF are reviewed. Data gathered in urban and suburban Melbourne are compared with several mathematical models. Factors limiting the validity of the models are discussed. The capability of space diversity is also discussed.

2

Transmission Loss Reduction of Window Glasses Using Matching Layers in 26 GHz Band (Letters), by A. Satoh and E. Ogawa (Yokosuka Electrical Communication Laboratory, NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. 67-B, pp. 104–105, Jan. 1984.

For obtaining low reflection loss of window glasses, a matching layer attached on the window glass is proposed. The transmission loss is reduced by 3 dB in the 26-GHz band for a wide variation in incident angle.

3

Differential Emmission Measurement for Atmospheric Attenuation at 20.3 and 31.4 GHz by a Radiometer, by T. Ojima (Radio Research Laboratories, Koganei, 184 Japan): *Trans. IECEJ*, vol. E67, pp. 88–95, Feb. 1984.

Attenuation of clear atmosphere was measured for eight months by observing sky brightness temperature by the differential emission measurement method with a dual-frequency microwave radiometer. High resolution measurement (one order higher than the conventional emission measurement method) has been realized.

4

Frequency Spectrum of *L*-Band Multipath Fading due to Sea Surface Reflection, by Y. Karasawa and T. Shiokawa (Research and Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Tokyo, 153 Japan): *Trans. IECEJ*, vol. J67-B, pp. 171–178, Feb. 1984.

The power spectrum versus frequency of *L*-band multipath fading due to sea surface reflection is presented for various elevation angles, wave heights, ship speeds, and ship motions (rolling and pitching). The theoretical model is based upon the Pierson–Moskowitz power spectrum of sea wave motion. Then the validity of the theory is examined by field experiments.

5

Some Characteristics of 5 GHz IITD-CEERIP Short Range Tropo Link, by S. P. Uttam*, B. S. Gadhoke**, H. M. Gupta***, and S. N. Gupta*** (*Department of Electronics, Govt. of India, Lok Nayak Bhawan, New Delhi, 110 003 India; **Corps of EME, Indian Army, ***Department Electric Engineering, I.I.T., New Delhi, 110 016

India): *JIETE* (India), vol. 30, no. 2, pp. 36–39, Mar. 1984.

Theoretical evaluation of path loss, correlation bandwidth, and communication capability of a 5-GHz 158-Km troposcatter link are shown. Applicabilities of various methods and models are compared. Experimental observations on fading characteristics and spatial correlation agree with those theories.

6

On the Approximate Equation for the Attenuation Constant in Tunnels with Arbitrary Cross Section (Letters), by Y. Yamaguchi*, T. Abe*, and T. Sekiguchi** (*Faculty of Engineering, Niigata University, Niigata, 950-21 Japan; **Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IECEJ*, vol. J67-B, pp. 352–353, Mar. 1984.

Attenuation constants are calculated for tunnels with various cross sections (circular, elliptical, horse's hoof, and rectangular tunnels). Approximate expressions are derived from these calculations.

7

Inference of Raindrop Size Distribution from Rain Attenuation Statistics at 12, 35 and 82 GHz, by T. Ihara, Y. Furuhama, and T. Manabe (Radio Research Laboratories, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IECEJ*, vol. E67, pp. 211–217, Apr. 1984.

Rain Attenuation has been measured for three years at three different frequencies form 11 to 82 GHz. By using the raindrop size distribution obtained from measurement, attenuation coefficients due to rain are scaled in the frequency range from 10 to 300 GHz.

8

Co-Channel Interference Measurement Using Envelope Differential on Mobile Communications (Letters), by S. Kozono, S. Nakashima, and M. Sakamoto (Yokosuka Electrical Communication Lab., NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. J67-B, pp. 572–573, May 1984.

The measuring method of co-channel interferences using the envelope differential detection of receiver IF output signals is proposed. The measuring principle and experimental confirmation are shown.

9

A Unified Analysis of Multipath Degradation in Multi-Level Modulation Radio Systems, by T. Murase (Yokosuka Electrical Communication Laboratory, NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. J67-B, pp. 908–915, Aug. 1984.

For evaluating transmission quality during fading in digital radio systems, a waveform factor is introduced. It is shown that the factor is uniquely determined by system parameters, such as modulation scheme, system impulse response, and symbol rate. The intersymbol interference and outage are estimated in terms of this factor.

10

Measurements of Night-Time Sky Wave Field Strengths of Medium Frequencies over Short Distance during a Maximum Sunspot Number Period, by M. Mambo*, I. Nagano*, T. Fukami*, and Y. Kagawa** (*Faculty of Technology, Kanazawa University, Knazawa, 920 Japan; **Department of Electrical Engineering, Ishikawa Technical College, Ishikawa, 929-03 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1286–1293, Nov. 1984.

The night-time sky wave field strengths of three medium frequencies over 153 to 235 km in Japan were measured for two years during the maximum sunspot number period. It has been found that some of the observed results can be explained by theoretical calculations.

11

Electromagnetic Field Distribution on the Ground Excited by a Ducted Downgoing Whistler Wave (Letters), by I. Nagano, M. Mambo, T. Fukami, and K. Kawahata (Faculty of Technology, Kanagawa University, Kanagawa, 920 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1323–1324, Nov. 1984.

A computer calculation method has been developed which enables us to estimate precisely the amplitude of a down-going whistler wave exited from the duct. The numerical result of the distribution of the amplitude and polarization is shown.

12

Space and Frequency Correlation Characteristics of *L*-Band Multipath Fading due to Sea Surface Reflection, by Y. Karasawa and T. Shiokawa (Research and Development Laboratories, KDD, Tokyo, 153 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1347–1354, Dec. 1984.

Spatial and frequency correlation characteristics of *L*-band multipath fading due to sea reflection are analyzed, based on a theoretical fading model previously reported by the authors.

6) Microwave Medical/Biological Applications

1

Estimation of the Temporal Resolution of the Laser Doppler Velocity Meter with an Optical Fiber (Letters), by K. Mito*, G. Tomonaga*, K. Tsujioka*, Y. Ogasawara*, O. Hiromatsu*, M. Kagiyama*, H. Nishihara**, and F. Kajiya** (*Department of Medical Engineering and System Cardiology, Kawasaki Medical School, Kurashiki, 701-01 Japan; **Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. E67, pp. 55–56, Jan. 1984.

A method of estimating the temporal resolution of a catheter-type blood velocity meter and a laser doppler blood velocity meter is described. Measurements are made in model flow tubings and in the coronary of mongrel dog.

2

1–10-GHz Microwave Applicators for Medical Applications, by M. Miyakawa (Electrotechnical Laboratory, Ibaraki, 305 Japan): *Trans. IECEJ*, vol. J67-C, pp. 150–157, Jan. 1984.

A set of direct contact microwave applicators has been developed for medical use. A new temperature-control system which permits an accurate brightness measurement of the tissues has also been developed for those applicators.

3

The Performance of the Dipole Array Applicator for Radio-Frequency Hyperthermia, by N. Terada and Y. Amemiya (Faculty of Engineering, Nagoya University, Nagoya, 464 Japan): *Trans. IECEJ*, vol. J67-B, pp. 163–170, Feb. 1984.

The temperature elevation of a dynamic phantom which is heated with a cylindrical dipole array applicator is discussed. The theoretical and experimental investigation shows that heat generation by microwave exposure is uniform within the phantom but that selective heating occurs in poorly perfused region.

4

A Microwave Interferometer System for the Displacement Measurements of Biological Subject, by I. Arai and T. Suzuki (Faculty of Electro-Communications, The University of Electro-Communications, Chofu, 182 Japan): *Trans. IECEJ*, vol. J67-C, pp. 513–520, June 1984.

The operation principle of a microwave interferometer system for the noncontact measurement of a small displacement of a biological body and the experimental results are presented. In the experimental laboratory setup, the maximum allowable displacement is 36 cm with an accuracy of ± 0.4 mm.

5

Power Deposition in a Block Model of Man Exposed to the Near Field of a Dipole Antenna, by S. Uebayashi and Y. Amemiya (Faculty of Engineering, Nagoya University, Nagoya, 464 Japan): *Trans. IECEJ*, vol. J67-B, pp. 877–883, Aug. 1984.

Absorbed power in a realistic model of a man in the near field of a portable radio transmitter is numerically calculated using a block model. The effect of a body and the ground upon the absorbed power in a head is found to be less in the near field of a dipole antenna than in the field of a plane wave.

6

Distribution of Temperature Rise Inside an Insect Due to Microwave Irradiation (Letters), by Y. Gotoh, O. Fujiwara, and Y. Amemiya (Faculty of Engineering, Nagoya University, Nagoya, 464 Japan): *Trans. IECEJ*, vol. J67-B, pp. 928–929, Aug. 1984.

This paper analyzes the temperature rise inside an insect pupa irradiated and heated by microwaves. Numerical calculations on the pupa exposed to 2.45-GHz and 6-GHz standing-wave fields are given, and the results are compared with those by thermal heating.

7

Measurements of Electric Field Distribution around a Biological Body by an Optical Technique, by H. Endo, K. Shimizu, and G. Matsumoto (Research Institute of Applied Electricity, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-C, pp. 964–969, Nov. 1984.

To analyze the coupling of an ELF electric field to a human body, the field distribution is measured by an optical-field sensor and displayed by a color-graphic pattern. The accuracy of the measurement is also discussed by comparing the measured values with numerically calculated values.

7) Lasers and Other Devices

1

Nonlinear Distortion Properties of Laser Diode Influenced by Coherent Reflected Waves, by K. Kikushima and Y. Suematsu (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IECEJ*, vol. E67, pp. 19–25, Jan. 1984.

This paper discusses the harmonic distortion and intermodulation distortion of a laser diode due to the injection of reflected waves. Numerical examples are shown for various frequencies of modulation. The experimental result agrees with the theory.

2

Nb-Diffused $LiTaO_3$ Waveguides and Light Modulators by Use of Guided-to-Radiation Mode Coupling, by H. Onodera, M. Okuda, I. Awai, M. Nakajima, and J. Ikenoue (Faculty of Engineering, Kyoto University, Kyoto, 606 Japan): *Trans. IECEJ*, vol. J67-C, pp. 70–77, Jan. 1984.

This paper shows theoretically that a light modulator utilizing guided-to-radiation mode coupling in a Nb-diffused Z-cut $LiTaO_3$ waveguide has a high modulation efficiency. The operation principle, the design of waveguide material, and modulation efficiency are discussed. The basic characteristics are verified by experiments.

3

Analysis of Modulation Characteristics of Lateral Field Coupling Control Semiconductor Laser, by K. Gen-ei, H. Ito, and H. Inaba (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IECEJ*, vol. J67-C, pp. 126–133, Jan. 1984.

Optical loss modulation characteristics of the semiconductor diode laser are analyzed both for small and large signals. Based on the rate equation analysis, it is shown that the loss modulation scheme is effective beyond 10 GHz. The present analysis is generally applicable to the internal loss modulation of other types of semiconductor diode lasers.

4

Subpicosecond Coherent Optical Pulse Generation by Passive Mode Locking of an AlGaAs Semiconductor Diode Laser, by H. Yokoyama, H. Ito, and H. Inaba (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IECEJ*, vol. J67-C, pp. 142–149, Jan. 1984.

Subpicosecond coherent optical pulses as short as 0.58 ps are generated by passive mode locking of an AlGaAs DH diode laser. The experimental setup, oscillation characteristics (output versus dc input, oscillation waveform, and pulse width versus cavity length) are shown.

5

Design of the Pregroove-Shape on an Optical Disc Based on the Light Diffraction Analysis, by T. Murakami (Research and Development Center, Toshiba Corporation, Kawasaki, 210 Japan): *Trans. IECEJ*, vol. J67-C, pp. 219–226, Feb. 1984.

In a DRAW (Direct Read After Write) optical disc memory system, it is necessary to fabricate a pregroove on an optical disc in order to increase the storage capacity. In this paper, diffracted light distribution from the pregroove (rectangular, trapezoid, V-shape) is analyzed following the scalar diffraction theory. The optimum dimension of the pregroove is discussed.

6

Distance Sensor with an Optical-Fiber-Array Spatial Filter, by A. Hayashi, J. Taguchi, and Y., Kitagawa (Industrial Research Institute of Hyogo Prefecture, Kobe, 654 Japan): *Trans. IECEJ*, vol. J67-C, pp. 239–240, Feb. 1984.

A new distance sensor with an optical-fiber-array spatial filter is proposed. The operation principle and experimental results are reported. A sensing error less than 1 percent has been obtained.

7

Infrared Laser Detection by Antenna-Coupled Point Contact Schottky Diode, by N. Inoue and Y. Yasuoka (Department of Electrical Engineering, The National Defense Academy, Yokosuka, 239 Japan): *Trans. IECEJ*, vol. J67-C, pp. 270–277, Mar. 1984.

The responsivity of antenna-coupled point contact Schottky diode for CO_2 laser radiation is experimentally studied. It is shown that fabricated devices can respond up to the frequency of CO_2 lasers as a square-law detector, and that the detection is due to the nonlinear current–voltage characteristic.

8

Blocking Oscillation in Guided-Wave Optical Bistable Devices Caused by Photoexciting Carriers, by J. Yumoto, H. Yajima, S. Ishihara, and M. Nakajima (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IECEJ*, vol. J67-C, pp. 345–352, Apr. 1984.

Analysis and experiments of blocking oscillation in the guided-wave optical bistable devices caused by photoexcited carriers in $LiNbO_3$ waveguide are reported.

9

PZT Cylindrical Phase Shifter and Modulator in a Single-Mode Fiber Interferometer, by M. Imai, M. Tsujii, and Y. Ohtsuka (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. E67, pp. 274–278, May, 1984.

A cylindrical PZT around which optical fiber is wound is demonstrated to be a component of an optical phase shifter and a modulator in a single-mode fiber interferometer. The sensitivity, amplitude response linearity, and frequency response uniformity are discussed.

10

Mirror-Type Optical Switch and Its Application, by H. Takahashi, C. Masuda, A. Ibaraki, and K. Miyaji (Shibaura Institute of Technology, Tokyo, 108 Japan): *Trans. IECEJ*, vol. E67, pp. 267–273, May 1984.

A mirror-type optical switch using a Z-cut $LiNbO_3$ crystal is fabricated. An optical filter, and a one-by-four optical switch using a combination of an acoustooptic tunable filter employing a TeO_2 crystal and this mirror-type crystal, are proposed for applications.

11

An RF-Excited CW HCN Laser by Capacitive Coupling (Letters), by I. Kobayashi, T. Fukuyama, M. Tanaka, and M. Kawamura (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans IECEJ*, vol. J67-C, pp. 490–491, May 1984.

The paper compares two methods of excitation, one by the inductance coupling and the other by capacitive coupling. It shows that the capacitive coupling excitation (especially, transverse electrodeless RF excitation) gives a better excitation efficiency.

12

Two-Dimensional Analysis of A1GaAs/GaAs Heterostructure Devices, by K. Yokoyama, M. Tomizawa, and A. Yoshii (Atsugi Electrical Communication Laboratory, NTT, Atsugi, 243-01, Japan): *Trans. IECEJ*, vol. J67-C, pp. 810–817, Nov. 1984.

A two-dimensional device simulator, which is available for A1GaAs/GaAs heterostructure devices, has been developed. Comparing a heterostructure bipolar transistor (HBT) with a GaAs homotransistor by applying this program shows potential advantages of the HBT, such as a high injection efficiency, a low voltage drop in the base region, and a high-frequency operation.

13

Thin-Film Energy Transfer Dye Lasers in Spectral Region of Near Ultraviolet to Violet, by S. Muto*, F. Shiba*, S. Sano*, C. Ito*, and H. Inaba** (*Faculty of Engineering, Yamanashi University, Kofu, 400 Japan; **Research In-

stitute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. ICEEJ*, vol. J67-C, pp. 957–963, Dec. 1984.

This paper reports the laser properties of two types of thin-film energy transfer dye lasers (ETDL) operating from near-ultraviolet to violet. These thin film ETDL's, pumped by an N_2 laser of 60-kW peak power and 5-ns pulse width, operate efficiently without any significant degradation in oscillation power.

14

A Reconstruction Method of Nondistorted SAR Images Using Stereo Radar Technique (Letters), by K. Yamane and M. Matsuo (Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1480–1481, Dec. 1984.

This paper presents a method of eliminating a distortion from SAR (synthetic aperture radar) images. The distortion is eliminated by the data of terrain height which is subtracted from stereo SAR images.

8) Optical Fibers/Waveguides

1

Analysis of Anisotropic Optical Slab Waveguides by Using Hypothetical Boundaries, by M. Geshiro and S. Sawa (Faculty of Engineering, Ehime University, Matsuyama, 790 Japan): *Trans. IECEJ*, vol. J67-C, pp. 9–16, Jan. 1984.

This paper discusses an effective method to solve the coupled-mode equation for anisotropic optical slab waveguides, in which the coupling between a guided mode and radiation modes is of major importance. The accuracy and validity of the method are shown by analyzing the hybrid leaky modes in $LiNbO_3$ planar waveguides.

2

Optical-Fiber Sensor for Distance and Velocity Measurements, by A. Hayashi and Y. Kitagawa (Industrial Research Institute of Hyogo Prefecture, Kobe, 654 Japan): *Trans. IECEJ*, vol. J67-C, pp. 33–38, Jan. 1984.

An optical-fiber sensor, making use of laser-speckle-pattern motion, for measuring the distance and the velocity of a moving object is described. The detectable ranges of distance and velocity and their accuracies are discussed. The usefulness of this sensor is confirmed by experimental measurements.

3

Analysis of Partially Metal-Clad and Dielectric Overlay-Loaded Diffused Optical Waveguide, by K. Hayata, M. Koshiba, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-C, pp. 39–46, Jan. 1984.

An approximate scalar finite-element program for the analysis of a lossy diffused optical waveguide, including a metal film and a dielectric overlay, is described. The effect of the lossy metal cladding and the dielectric overlay on the propagation of the guided modes is examined. Calculated results on dispersion and attenuation characteristics are also reported.

4

Ultra-Long Optical Fiber Fault Location Using a Ge-p-i-n Photodiode Cooled by Liquid Nitrogen (Letters), by K. Noguchi (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 102–103, Jan. 1984.

This paper describes S/N improvement due to the use of a Ge-p-i-n photodiode cooled by liquid nitrogen for ultra-long optical fiber fault location. Experimental results show that a 14-dB S/N improvement is achieved compared with a Ge-APD at room temperature.

5

Optical Loss Change of Jacketed Fiber Caused by Hydraulic Pressure, by N. Yoshizawa, K. Ishihara, and T. Yabuta (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 133–140, Feb. 1984.

The increase in loss due to the air gap between the buffer layer and the jacketing layer is discussed. It is shown theoretically that the loss increase is attributed to the local bending of fibers caused by the external hydraulic pressure. The experimental value agrees with the theory. A jacketing with low loss is proposed.

6

Testing Method for Optical-Fiber-Connector Surfaces (Letters), by I. Sankawa, N. Kashima, and T. Satake (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 226–227, Feb. 1984.

The operation principle of this method utilizes the optical interference between the optical flat plate and connector surface. Tilt angles and surface conditions are measured easily by the interference fringe pattern variation.

7

Refractive Index Measurements of Diffused Optical Fiber (Letters), by T. Nobuyoshi* and U. Unrau** (*Faculty of Science, Okayama-Rika University, Okayama, 700 Japan; **Institute für Hochfrequenztechnik, Braunschweig University, Braunschweig, 3300 W. Germany): *Trans. IECEJ*, vol. J67-C, pp. 235–236, Feb. 1984.

The refractive index profile of the BaO-diffused multimode fiber is measured using the *X*-ray microanalyzer method and the refracted near-field method. The measured value agrees with the theoretical estimation obtained from the diffusion equation of the dopant distribution.

8

Fusion Splicing between Deposited Silica Waveguides and Optical Fibers, by N. Shimizu (Musashino Electrical Communication Laboratory, NTT, Musashino, 180 Japan): *Trans. IECEJ*, vol. J67-C, pp. 247–253, Mar. 1984.

Splicing an optical fiber with a planar deposited silica waveguide is done by using a CO_2 laser as a heat source of fusion. The average splicing loss is less than 0.2 dB. Reflection from the splicing point is very low. This method is promising to the simultaneous splicing of a cable with a high fiber density.

9

Axis Misalignment and Splice Loss Estimation of Single-Mode Optical Fiber Splicing Using Core Direct Monitoring, by O. Kawata, K. Hoshino, Y. Miyajima, M. Ohnishi, and K. Ishihara (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 281–288, Mar. 1984.

The splicing loss of single-mode optical fibers due to axis misalignment is discussed. The relationship between the splicing loss distribution and the axis misalignment before splicing is studied. It is found that splicing losses less than 0.1 dB are achieved when the alignment error is less than 0.5 mm.

10

Effects of Resin on Fiber Centering of Ferrule-Type Optical Fiber Connectors (Letters), by T. Satake*, N. Kashima*, I. Sankawa*, and M. Hirai** (*Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan; **Research and Development Bureau, NTT, Musashino, 180 Japan): *Trans. IECEJ*, vol. J67-B, pp. 350–351, Mar. 1984.

For ferrule-type optical fiber connectors with some clearance between the fiber outer diameter and the ferrule inner diameter, the effect of adhesive resin on centering accuracy of fiber in the ferrule is discussed.

11

Consideration of Splice Loss Distribution of Optical Fibers (Letters), by M. Tachikura and T. Satake (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 354–355, Mar. 1984.

It shows theoretically that the splicing loss distribution of optical fibers is expressed by the Weibull distribution. Experimental splicing losses previously reported coincide well with this theoretical calculation.

12

Fusion Splice Loss Estimation Using Image Processing Technique for Graded Index Optical Fibers (Letters), by M. Sato, H. Kaneko, and N. Kashima (Ibaraki electrical Communication Lab., NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. E67, pp. 230–231, Apr. 1984.

A computer-aided measurement fusion of splicing loss of graded-index optical fibers is proposed. The deformation of the diameter of the fiber at the splicing point is accurately measured by the image-processing technique. This method is suitable for installation measurement.

13

Image Transmission Characteristics of Multimode Fiber, by T. Hosono, S. Yamaguchi, and K. Mori (College of Science and Technology, Nihon University, Tokyo, 101 Japan): *Trans. IECEJ*, vol. J67-C, pp. 367–374, Apr. 1984.

The image transmission characteristics of multimode fibers are analyzed by the homogeneous multilayer approximation method, Euler method, and modified Euler method.

14

Reliability of V-Grove Optical Fiber Mass Splice—Improvement of Splice Loss Temperature Characteristics, by S. Nagasawa and I. Sankawa (Ibaraki Electrical Communication Lab., NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 369–376, Apr. 1984.

This paper analyzes the splicing loss fluctuation caused by thermal expansion of the structure of V-grove optical fiber mass splicing.

15

An Efficient Approximate Scalar Finite-Element Analysis of Lossy Dielectric Optical Waveguides (Letters), by K. Hayata, M. Koshiba, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-C, pp. 420–421, Apr. 1984.

The attenuation constants of partially metal-clad and dielectric overlay-loaded diffused optical waveguides are calculated by an approximate scalar finite-element method.

16

Improvement of Transmission Characteristics for Jelly-Filled Cable (Letters), by H. Shinohara, M. Kawase, S. Kukita, and S. Hatano (Ibaraki Electrical Communication Lab., NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 465–466, Apr. 1984.

This paper proposes a new structure of jelly-filled optical fiber cable. This structure improves the mechanical strength of cables after squeezing.

17

Long-Term Reliability Assurance for Arc-Fusion Spliced Fiber, by M. Matsumoto, T. Haibara, Y. Katsuyama, M. Miyauchi, M. Tokuda, and T. Tanifuji (Ibaraki Electrical Communication Lab., NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 521–528, May, 1984.

The theoretical and experimental results of proof test of arc-fusion spliced fibers are presented. It is verified that the failure occurring probability in 20 years is suppressed below 10^{-5} by applying a proof stress of 0.15 GPa for the spliced fibers.

18

On Optical Loss Distribution of Optical Line after Test Splice (Letters), by E. Maekawa (Ibaraki Electrical Communication Lab., NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. 67-B, pp. 566–567, May 1984.

The equation of optical loss distribution after the test splice is derived for optical fiber cables with different numbers of fibers. The design of subscriber-line loss distribution allotment is discussed.

19

Fiber Failure Protection Design on an Emergency Connector due to Temperature Change (Letters), by K. Imon and Y. Ishida (Ibaraki electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-C, pp. 625–626, Aug. 1984.

This paper describes an emergency connector featuring a low loss and a good protection against fiber damage due to severe change of the ambient temperature. The design and characteristics of a fabricated connector are shown.

20

Power Coupling Coefficient of Polarization Maintaining Optical Fiber with Random Perturbations (Letters), by Y. Yoshida, M. Matsuhara, and N. Kumagai (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-C, pp. 627–628, Aug. 1984.

The power coupling coefficient between two dominant modes in polarization-maintaining optical fibers with random perturbations is theoretically investigated by a simplified model.

21

Fiber-Optic Analog/Digital Hybrid Signal Transmission Employing Frequency Modulation (Letters), by S. Aoyagi, K. Sato, and T. Kitami (Yokosuka Electrical Communication Laboratory, NTT, Yokosuka, 238 Japan): *Trans. IECEJ*, vol. J67-B, pp. 926–927, Aug. 1984.

The analog/digital hybrid transmission by FM, using multimode fibers and 1.3-mm laser diodes, is described. The hybrid signal consists of audio, video and 2-Mb/s digital data. The results obtained from experiments show the technical feasibility of this type of transmission.

22

Optical Mode Conversion Induced by Magnetostatic Surface Waves in Three-Dimensional Waveguides, by R. Bhandari and Y. Miyazaki (Faculty of Engineering, Toyohashi University of Technology, Toyohashi, 440 Japan): *Trans. IECEJ*, vol. E67, pp. 502–508, Sept. 1984.

This paper proposes a new three-dimensional structure which consists of a planar YIG and striplines. Based upon this structure, optical mode dispersion, magnetostatic surface-wave propagation, and mode conversion are discussed.

23

Boundary-Element Analysis of Polarization Holding Fibers, by M. Matsuhara (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-B, pp. 968–973, Sept. 1984.

The boundary-element method is applied to the polarization-holding elliptical-core optical fibers. The cutoff frequency, propagation constant, and geometrical anisotropy of the fundamental mode are obtained.

24

Transmission Characteristic of One-Dimensional Image Fiber—Strong-Coupling Case, by K. Mori, S. Yamaguchi, and T. Hosono (College of Science and Technology, Nihon University, Tokyo, 101 Japan): *Trans. IECEJ*, vol. J67-C, pp. 706–713, Oct. 1984.

As a simplified model of the actual image fiber, a one-dimensional model is treated. The following points are discussed: 1) cross-talk characteristics in strong-coupling case, 2) an effect of finite cross-section of image fiber, 3) the possibility to be image-processing elements.

25

Theoretical Investigation of a Gap Coupling of Two Dielectric Slab Waveguides with Arbitrarily Shaped Ends, by E. Nishimura, N. Morita, and N. Kumagai (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IECEJ*, vol. J67-C, pp. 714–721, Oct. 1984.

Scattering of guided modes by gap coupling of two dielectric slab waveguides with arbitrarily shaped ends is analyzed by means of integral equations. The relation between the waveguide structure and the coupling characteristics (reflection/transmission, radiated power, and radiation pattern) is discussed in detail.

26

Spectral Attenuation Characteristics in Multimode Graded-Index Fibers (Letters), by T. Horiguchi and Mo Tokuda (Ibaraki Electrical Communication Lab., NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1181–1182, Oct. 1984.

Contributions of various factors to optical fiber loss of multimode graded-index fibers are made clear by analyzing spectral attenuation characteristics.

27

Reliability Designing Method for Submarine Optical Fiber Cable, by Y. Miyajima and K. Ishihara (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1231–1238, Nov. 1984.

The reliability of optical fiber must be determined so that the total cost (the sum of costs for production and repair) should be minimum. This paper discusses the reliability of submarine optical cables with respect to the two costs. The reliability is calculated for various water depths.

28

Characteristics of Quasi-Monomode Fibers, by R. Yamauchi, Y. Sugawara, and T. Murayama (Fujikura Ltd., Sakura, 285 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1247–1254, Nov. 1984.

A quasi-monomode fiber is practically considered to be a monomode fiber due to its high LP_{11} mode loss. The effective cutoff wavelength, pulse waveform distortion, and micro- and macro-bending losses are investigated. Fiber-

length dependence of the effective cutoff wavelength is also discussed.

29

Finite-Element Analysis of Planar Anisotropic Inhomogeneous Optical Waveguides, by H. Kumagami, M. Koshiba, and M. Suzuki (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IECEJ*, vol. J67-C, pp. 949–956, Dec. 1984.

This paper shows the finite-element analysis of a planar anisotropic inhomogeneous optical waveguide with arbitrary permittivity tensor and loss. By applying this method to two special cases (the waveguides with metallic-film and dielectric overlays), the efficacy of this theory has been proved.

30

Fresnel Reflection Reducing Methods for Optical-Fiber Connector with Index Matching Material, by I. Sankawa, T. Satake, N. Kashima, and S. Nagasawa (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1423–1430, Dec. 1984.

This paper discusses the optimum refractive index of matching material, which minimizes the reflected light power. It also shows a measuring method of the refractive index in the visible wavelengths region.

31

Determination of Installation Cable Size and the Ratio of Common Fibers to Total Fibers in Subscriber Optical Fiber Cable Network, by H. Yamamoto, Y. Yamamoto, and M. Matsuura (Ibaraki Electrical Communication Laboratory, NTT, Ibaraki, 319-11 Japan): *Trans. IECEJ*, vol. J67-B, pp. 1470–1477, Dec. 1984.

A design method for constructing subscriber optical fiber cable network is discussed from viewpoints of economy and service versatility. The demand growth/location forecast, fiber cost, installation cost, and maintenance cost are taken into consideration.