Asia–Pacific Abstracts

Papers from Journals Published in Australia, India, China, and Japan in 1993

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The periodicals inverstigated are 1) *Journal of Electrical and Electronics Engineering* (*JEEE*), Australia, 2) *Australian Telecommunication Research* (*ATR*), Australia, 3) *Journal of the Institution of Electronics and Telecommunication Engineers* (*JIETE*), India, 4) *Acta Electronica Sinica* (*AES*), China, 5) *Journal of China Institute of Communications* (*JCIC*), China, 6) *Journal of Infrared and Millimeter Waves* (*JIMW*), China, 7) *Journal of Applied Sciences* (*JAS*), China, 8) *Journal of Electronics* (*JE*), China, 9) *Journal of Microwaves* (*JM*), China, 10) *Journal of Chinese Institute of Engineering* (*JCIE*), Taiwan, 11) *Transactions of the Institute of Electronics, Information and Communication Engineers* (*Trans. IEICE*), Japan, 12) *IEICE Transactions on Communications* (*IEICE Trans. Commun.*), Japan, and *IEICE Transactions on Electronics* (*IEICE Trans. Electron.*), Japan. As for the Japanese papers in the *Trans. IEICE* that carry volume numbers J76-B-II, J76-C-I, and J76-C-II, short English summaries are found in the *IEICE Trans. Commun.*, vol. E76-B and *IEICE Trans. Electron.*, vol. E76-C, issued the same month. Papers carrying volume numbers E76-B and E76-C are papers originally written in English. These issues are published by the IEICE, Kikai-Shinko-Kaikan, 3-5-8, Minato-ku, Tokyo, 105 Japan.

The full trnaslations of some Japanese papers will appear in *Electronics and Communications in Japan*, published by Scripta Technica, Inc., John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158.

The 1991 and 1992 issues of the *JIETE* which have not been introduced in the earlier Asia–Pacific Abstracts are also included in this Asia–Pacific Abstracts.

The abstracts of these papers are grouped as follows:

1) Solid-State Microwave Devices and MMIC's
2) Transmission Lines and Passive Microwave Devices
3) Microwave Antennas
4) Microwave/Lightwave Propagation and Scattering
5) Microwave Medical/Biological Applications
6) Lasers and Other Devices
7) Optical Fibers/Waveguides
8) Superconductive Devices
9) Special Issues Related to Microwave Theory and Techniques (only the titles and their authors)

1) Solid-State Microwave Devices and MMIC's

(1) Broadband and Nonlinear Characteristics of IMPATT Amplifier, by S.-Q. Wang, W.-G. Lin, and L.-J. Xue (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 21, pp. 35–39, Aug. 1993.

It is verified by the experiments that a double-tuned circuit can improve the bandwidth of microwave and millimeter-wave IMPATT amplifier. The small and large signal characteristics of the amplifier are analyzed in detail, and the conditions to realize the maximum bandwidth are given.

(2) A New Quasi-Optical Watt-Level Solid-State Power Combiner, by F.-X. Zhang, R.-B. Zhang, C.-G. Lin, L.-G. Zhang, and X.-Y. Yu (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 431–434, July 1993.

Experimental structure and results of a new type of solid-state power combiner with short focal length open cavity are presented. The experimental results show that the opening machine CW output power is over 1 W and that stable CW output power is about 850 mW in the X-band.

(3) Characteristic Analysis of a Harmonic Power Combiner with the Frequency-Domain Harmonic Balance Method, by L. Chen and Y.-Y. Wang (National Laboratory of Millimeter Waves, Southeast University, Nanjing, P.R.C.): *JM*, no. 3, pp. 43–48, July 1993.

The frequency-domain harmonic balance method for the nonlinear network analysis is used to analyze the steady-state characteristic of a harmonic power combiner. Analytical results show that this method is simpler and more practical than other nonlinear analytic methods.

(4) Desired Mode Excitation by Power Additive Signal Injection in a Transmission-Type, Multiple-Device Cavity Combiner (Letters), by S. Tanaka*, S. Nogi**, K. Fukui**, and H. Ohshima** (*Faculty of Engineering, Fukuyama University, Fukuyama, 729-02 Japan; **Faculty of Engineering, Okayama University, Okayama, 700 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 110–113, Apr. 1993.

This letter describes the conditions for undesired mode suppression and desired mode excitation by power additive signal injection in a transmission-type, multiple-device cavity combiner.

(5) Switched Branch-Line P-I-N Diode Phase Shifter, by M. Matsunaga*, S. Nakahara**, T. Katagi*, and T. Hashimoto* (*Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; **Computer & Information Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 181–188, May 1993.

A design method and experimental results of the phase shifter, named the switched branch-line type, are described. In this phase shifter, making the impedance ratio of the main line to the branch line 1:2 allows to satisfy the matching condition that does not depend on the diode impedance. Under this matching condition, the inherent diode losses in this phase shifter is derived by the use of the switching cutoff frequency. The condition to obtain 180° phase shift is expressed in terms of circuit and diode parameters, and then the relations between the incident power and the applied RF voltage to diodes, which indicate the power rating due to the diode break-down voltage, are obtained.

(6) Analysis of Microstrip Crossovers Using the Nonorthogonal Finite-Difference Time-Domain Method, by T. Kitamura, S. Nakamura, M. Hira, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 358–364, Sept. 1993.

An Analysis based on the nonorthogonal finite-difference time-domain (FD-TD) method is described for microstrip crossovers. First, a summary of the nonorthogonal FD-TD method is described. Then it is shown that the results obtained by this method never depend on the variation of cell forms. Lastly, S parameters as a function of normalized frequency, crossing angle, and relative height are shown.

(7) A 10-GHz MMIC Predistortion Linearizer Fabricated on a Single Chip (Letters), by N. Imai (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1847–1850, Dec. 1993.

A 10-GHz MMIC predistortion linearizer fabricated on a single chip is demonstrated for the first time. It employs less hybrid circuits compared with conventional devices and is suitable for miniaturization. The distortion reduction effect is examined using this linearizer.

(8) Higher-Order Anlaysis on Phase Noise Generation in Varactor-Tuned Oscillators: Baseband Noise Upconversion in GaAs MESFET Oscillators (Letters), by T. Ohira (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1851–1854, Dec. 1993.

Phase noise generation in varactor-tuned oscillators is analyzed by an asymptotic perturbation technique. It is found out that $1/f$ noise and AM noise are converted into phase noise by first- and higher-order nonlinearlities of the varactor.

2) TRANSMISSION LINES AND PASSIVE MICROWAVE DEVICES

(1) Transient Analysis of High-Speed Digital Transmission Lines Terminated with Nonlinear Networks, by S.-X. Qi and Q.-R. Yang (Southeast University, Nanjing, P.R.C.): *AES*, vol. 21, pp. 97–100, Jan. 1993.

The transient response of high-speed digital transmission lines terminated with nonlinear networks is simulated by combining the characteristic method with the iterative waveform relaxation algorithm. Simulation results show that a considerable reduction of CPU time and memory has been achieved.

(2) Design, Modelling, and Measurements for Multichip High-Density Interconnections, by U. A. Shrivastava (Motorola, Inc. Mail Stop B136 Final Manufacturing Research and Development, Phoenix, AZ 85008 USA): *JIETE*, vol. 37, pp. 250–259, Mar.-Apr. 1991.

Results from design studies for interconnects as controlled impedance transmission lines are summarized. Effects of substrate and conductor properties on the interconnect parameters are emphasized. High-density interconnects have considerable resistance. Results of a theoretical analysis of the time domain reflectometer responses of a lossy interconnect are presented.

(3) Microstrip Discontinuities in Ionized Plasma Medium, by D. Bhatnagar (Department of Physics, University of Rajasthan, Jaipur 302 004, India): *JIETE*, vol. 38, pp. 13–16, Jan.-Feb. 1992.

A study of radiation properties from discontinuities of an open circuit microstrip line is carried out using hydrodynamic theory and potential function techniques in ionized plasma medium. Effects of strip current and dielectric polarization beneath the strip are included in the present analysis.

(4) An Improved Transducer Configuration for Phase-Coded Surface Acoustic Wave Devices, by S. Majumder and B. S. Panwar (Centre for Applied Research in Electronics, Indian Institute of Technology, New Delhi 110 016, India): *JIETE*, vol. 38, pp. 47–52, Jan.-Feb. 1992.

The influence of second-order effects on the performance of a 13-bit phase-coded surface acoustic wave device, realised on Y-Z $LiNbO_3$, is demonstrated. A bandpass sampling technique is used to reduce the acoustic regeneration phenomenon in highly dispersive delay lines. An improvement in the correlation peak of a 6.5-μsec long phase-coded delay line is obtained after reducing the number of sensors by this technique.

(5) Transmission Line Properties of Coaxial Cable Variant Structure, by K. D. Patil, S. K. Maiti, and S. Mahapatra (Indian Institute of Technology, Powai, Bombay 400 076, India): *JIETE*, vol. 38, pp. 225–229, July-Aug. 1992.

This paper deals with a transmission line structure where the outer conductor consists of two parallel semi-infinite conducting planes forming a semicircular edge at one end, and the inner conductor is a right circular cylinder. The space between the two conductors is filled by a uniform dielectric material. The self-capacitance between the two conductors is obtained for various structural configurations.

(6) A Moment Method Solution for the Active- and Mutual-Admittance of Longitudinal Slots in a Rectangular Waveguide, by B. Sinha and D. Guha (Department of Electronics and Computer Engineering, University of Roorkee, Roorkee 247 667, India): *JIETE*, vol. 38, pp. 235–244, July-Aug. 1992.

This paper presents a moment procedure to study the admittance properties of mutually coupled longitudinal slots in the broad-wall of a rectangular waveguide. The method inherently incorporates the effect of wall thickness and utilizes the actual field distribution within the slot.

(7) Broadwall-to-Broadwall Coupling between Two Cross Rectangular Waveguides Through an Offset Slot, by G. Sahoo*, B. K. Sarap**, and S. P. Dasgupta*** (*Radar and Communication Centre, Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur 721 302, India; **University College of Engineering, Burla 768 018, India; ***Department of Civil Engineering. Indian Institute of Technology, Kharagpur 721 302, India): *JIETE*, vol. 38, pp. 261–266, Sept.-Oct. 1992.

The problem of coupling through a slot in the broadwall between two rectangular waveguides is investigated, and the method of moments is used to find the coefficients of the field function. The resonant length is found to change noticeably with offsets.

(8) Finite Element Studies on Two-Conductor Balanced Line with Rounded End Walls, by K. D. Patil, S. K. Maiti, and S. Mahapatra (Advanced Centre for Research in Electronics, Indian Institute of Technology, Bombay 400 076, India): *JIETE*, vol. 38, pp. 271–277, Sept.-Oct. 1992.

The impedances for even and odd modes for two-circular-conductor balanced line are determined by the finite element analysis. Effects of variations of the ratio of ground plane spacing to rod radius and of the distance of the rod from the rounded semicircular adjacent end wall are studied. As the ratio of ground plane spacing to rod radius decreases, the coupling is reduced.

(9) Use of Infinite Elements for Potential Problems (Letters), by K. D. Patil, S. K. Maiti, S. Mahapatra, and R. Aiyar (Advanced Centre for Research in Electronics, Indian Institute of Technology, Bombay 400 076, India): *JIETE*, vol. 38, pp. 299–301, Sept.-Oct. 1992.

A study is made of the effect of various parameters of the infinite element on the accuracy of the solution of potential problems.

(10) A High-Power, Low-Cost S-Band Waveguide Load for Accelerator Applications (Letters), by B. Baskaran*, S. K. Jain**, and S. S. Ramamurthi** (*PS Division, CERN CH-1211, Geneva, Switzerland; **Accelerator Division, Centre for Advance Technology, Indore 452 013, India): *JIETE*, vol. 38, pp. 302–304, Sept.-Oct. 1992.

The design and constructional aspects of a dissipative wall waveguide load in S-band are described. The load is fabricated for the high-power microwave transmission line of 20-MeV microtron. A mixture of cement and graphite is used as an attenuating material. A low VSWR is obtained by providing linear taper along the length of the waveguide. The load can be operated up to peak power of 5 MW and average power of 500 W. The VSWR of the load is better than 1.1 at the operating frequency of 2.856 GHz.

(11) On the Domain Decomposition Procedure for Waveguide Problems, by Inderjit and M. Sachidananda (Department of Electrical Engineering, Indian Institute of Technology, Kanpur 208 016, India): *JIETE*, vol. 39, pp. 13–19, Jan.-Feb. 1993.

The use of proper domain decomposition is shown to have bearing on the computation time in a mode-matching formulation. A simple L-shaped waveguide is taken and analyzed using mode-matching with two different ways of domain decomposition. An L-shaped waveguide with arbitararily chosen dimensions is fabricated and used to experimentally verify the accuracy of the two ways of domain decomposition.

(12) Electromagnetic Analysis of Eccentric Coaxial Cylinders, by B. N. Das, K. S. R. Rao, and S. B. Chakrabarty (Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur, 721 302, India): *JIETE*, vol. 39, pp. 251–254, July-Aug. 1993.

This paper presents a method of evaluation of absolute values of equipotential boundaries of eccentric coaxial line using two types of conformal transformation. Cotangent hyperbolic transformation with an appropriate normalizing constant transforms the line to a parallel plate configuration. Bilinear transformation expressed in terms of mutually inverse points transforms the same structure to a coaxial configuration.

(13) Analysis of TEM Mode Line Excited by Steady State and Transient-Type Current Wave-Forms, by B. N. Das*, A. L. Das**, and B. K. Sinha** (*Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur, 721 302, India; **SAMEER-Centre for Electromagnetics, CIT Campus, II Cross Road, Taramani, Madras 600 113, India): *JIETE*, vol. 39, pp. 305–311, Sept.-Oct. 1993.

This paper presents a method of analysis of TEM mode line excited from sources generating steady state as well as transient-type current waveforms. The impedance and field distribution of two wires as well as multiconductor lines are determined considering excitation from a steady-state current generator. Expressions for the field distribution are also derived for excitation from a source generating transient-type current waveform.

(14) A Multigrid Method for Computation of the Rotational Symmetrical Electrostatic Field, by Z.-Q. Zhang*, L.-W. Zhou*, W.-Q. Jin*, and E.-L. Fang** (*Beijing Institute of Technology, Beijing, P.R.C.; **Xi'an Institute of Modern Chemistry, Xi'an, P.R.C.): *AES*, vol. 21, pp. 2–5, June 1993.

A multigrid method is described to calculate the electrostatic potential distributions for the rotational symmetrical electron-optical systems that have internal electrodes and different boundaries. This method can be applied to design and analyze the electrostatic field for image tubes and camera tubes with electrostatic focusing.

(15) Moment-Method-Analysis of Capacitive Posts in a Rectangular Waveguide, by W. Cao* and J.-S. Zhang** (*Nanjing University of Posts and Telecommunications, Nanjing, P.R.C.; **Nanjing Research Institute of Electronic Engineering, Nanjing, P.R.C.): *AES*, vol. 21, pp. 97–100, June 1993.

Capacitive posts and diaphragms in a rectangular waveguide are analyzed by the method of moments. In the analysis, no restrictions are imposed on the number, shape, and arrangement of the posts and diaphragms, therefore the theoretical formulation and the corresponding computer programs are applicable to the analysis of a wide variety of capacitive waveguide elements.

(16) A Study of High Resolution Image Reconstruction of Target by Using FMCW Millimeter Wave Technology, by S.-H. He and G.-R. Guo (National University of Defense Technology, Changsha, P.R.C.): *AES*, vol. 21, pp. 6–14, Sept. 1993.

A novel method of reconstructing target with two-dimensional image under strong clutter background is presented. This method has the advantage of not only better performance of suppressing clutter and noise, but also of high resolution of super-resolution spectrum estimation algorithm.

(17) Time-Domain Responses Analysis of Nonuniform Multiconductor Transmission Lines by the Waveform Relaxation Method, by J.-F. Mao and Z.-F. Li (Shanghai Jiaotong University, Shanghai, P.R.C.): *AES*, vol. 21, pp. 62–69, Sept. 1993.

A differential equation describing the ABCD matrices of transmission is derived from the Telegrapher's equation in the frequency-domain. Then, the waveform relaxation method is used to numerically solve the ABCD matrices of nonuniform lines, and the time-domain responses of arbitrarily loaded transmission lines are analyzed with the FFT and convolution techniques.

(18) Matrix Method of Photothermal Radiometry for Multilayer Media, by L. Qian, Z.-M. Wu, and P.-Z. Li (Suzhou University, Suzhou, Jiangsu, P.R.C.): *JIMW*, vol. 12, pp. 275–280, Aug. 1993.

Based on the characteristic matrix of a lamellar structure, a matrix method about thermal wave transmission and reflection coefficients is presented and a calculating formula for photothermal radiometry signal of the multilayer media is given.

(19) Millimeter-Wave Radar Technique for Measuring Charge Level in Blast Furnaces, by Y.-Y. Ding (University of Electronics Science Technology of China, Chengdu, P.R.C): *JAS*, vol. 11, pp. 119–205, July 1993.

A new millimeter-wave real-time, three-dimensional FMCW imaging radar system is developed to obtain the image of charge level in the blast furnace. The image principle, design idea, and characteristics of the radar system are given and some successful results of system testing on a simulation blast furnace are presented.

(20) The Green's Functions in Sectoral Waveguide and Its Cavity, by J.-W. Lu (Beijing University of Aeronautics and Astronautics, Beijing, P.R.C.): *JE*, vol. 15, pp. 92–97, Jan. 1993.

The Green's functions for electric and magnetic vector potentials in a sectoral waveguide and its cavity are derived by using the separation of variables, Fourier transform, and residue theory.

(21) Impedance Matching of Twin-Toroid Phase Shifter Using Grooved Waveguide, by J.-D. Wen, Y.-Z. Xiong, M.-J. Shi, and J. Hu (Electrical Engineering Department of ECIT, Nanjing, P.R.C.): *JE*, vol. 15, pp. 170–173, Mar. 1993.

The impedance-matching technique for twin-toroid latching ferrite phase shifter using a grooved waveguide is studied. The transfer matrices used for impedance matching are given.

(22) Analysis of the Dispersion Characteristics for a Cylindrical Dielectric Waveguide with Periodic Metallic Strips, by S.-J. Xu and X.-Z. Wu (University of Science and Technology of China, Hefei, P.R.C.): *JE*, vol. 15, pp. 279-286, May 1993.

The dispersion characteristics of a cylindrical dielectric waveguide with periodic metallic strips are analyzed by Galerkin's method. The variations of the width of the stopband, the center frequency, and the maximum attenuation constant in the stopband with the metallic strip width are given.

(23) Analysis of the Transmission Properties of Tapered Multiconductor Interconnecting Buses in High-Speed Intergrated Circuit, by B.-Z. Wang (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 337–342, July 1993.

An analysis approach and a formula for the transmission properties of uniform multiconductor interconnecting buses in high-speed integrated circuits are presented. A tapered bus system is analyzed as a set of cascaded uniform buses with slightly different strip widths. Results obtained are in good agreement with the experimental data.

(24) A Spectral-Domain Immitance Approach for Propagation Characteristics of Finline Loaded with Ferrite Medium, by C.-Q. Gu (Nanjing Aeronautical Institute, Nanjing, P.R.C.): *JE*, vol. 15, pp. 351–358, July 1993.

The extraordinary waves of the ferrite medium are decomposed into TE and TM modes through the Fourier transformation and a coordinate rotation of Maxwell's equations. The forward and backward propagation constants for the unilateral finline loaded with magnetized ferrite are calculated numerically.

(25) An Efficient Multirate Preprocessing Technique for Microwave Imaging, by W.-D. Li, Z.-R. Wang, and M.-H. Xue (Beijing University of Aeronautics and Astronautics, Beijing, P.R.C.): *JE*, vol. 15, pp. 410–415, July 1993.

An effective multirate preprocessing technique for microwave imaging is presented. The technique has the advantages of largely compressing the original collected spectral data and reducing computational complexity of some imaging alogrithms.

(26) High-Order Finite Element Analysis of Dispersion and Loss Characteristics of Groove Guide with Arbitrary Shapes, by S.-J. Xu and Y.-J. Zhang (University of Science and Technology of China, P.R.C.): *JE*, vol. 15, pp. 541–545, Sept. 1993.

The dispersion and loss characteristics of groove guides with arbitrary shapes are analyzed with high-order finite-element method. The effectiveness and the reliability of the method are verified by the experiments and the results obtained by other methods.

(27) Analysis of Conducting Strip Interdigital Capacitance on a Dielectric Substrate with Moment Method, by X.-K. Ma (Xi'an Jiaotong University, Xi'an, P.R.C.): *JE*, vol. 15, pp. 616–624, Nov. 1993.

The conducting strip interdigital capacitance on a dielectric substrate is analyzed with the method of moment. The correctness and the effectiveness of the present method are verified by the experimental data.

(28) An Analysis on Input Impedance of a Signal Microstrip Patch in the Quasi-Optical Cavity, by Y.-J. He and Q.-R. Yang (Southeast University, Nanjing, P.R.C.): *JE*, vol. 15, pp. 625–630, Nov. 1993.

The electromagnetic field integral equation in the quasi-optical cavity is obtained using the dyadic Green's function. An expression is derived for the input impedance of a single microstrip patch cavity excited by a coaxial probe using the method of moment.

(29) A Real-Time Processing Method for Microwave Network S Parameter Measurement Based on a Neural Network, by L.-G. Zhang, J.-H. Li, and W.-B. Wang (Xi'an Jiaotong University, Xi'an, P.R.C.): *JM*, no. 1, pp. 17–22, Jan. 1993.

A real-time data processing method for microwave network S parameters measurement is performed by using Hopfield neural network, and a new kind of method for processing the data from microwave measurement experiments is proposed.

(30) The Modification of the Phase Term in the Transfer Function of Lossy High-Speed Digital Transmission Lines, by C. Yu, S.-X. Qi, and Q.-R. Yang (Southeast University, Nanjing, P.R.C.): *JM*, no. 2, pp. 8–11, Apr. 1993.

The phase term in the transfer term of lossy transmission lines is modified and a more accurate model is presented. Test results show that the new model is more efficient and accurate than previous ones.

(31) Calculation of the Resistance Matrix of the Interconnects in High-Speed Large Scale Circuit System by the Boundary Integral Equations, by Z.-F. Li and X. Feng (Shanghai Jiaotong University, Shanghai, P.R.C.): *JM*, no. 4, pp. 22-28, Oct. 1993.

The method of boundary integral equations is delivered for computing the resistance matrix of the interconnects in a high-speed large-scale circuit system. The numerical examples and the effective range of the method are presented.

(32) Biconical Sampler for Microwave Instrumentation, by Q.-D. Yang (Lanzhou University, Lanzhou, P.R.C.): *JM*, no. 4, pp. 58–62, Oct. 1993.

A biconical sampler for microwave instrumentation is successfully studied and manufactured. The main manufacturing and adjusting methods are described and experimental results are given.

(33) Transmission and Radiation Properties of the Surface Wave Transmission Line with a Bend, by T. Nakamura, S. Kamiya, and S. Yokokawa (Faculty of Engineering, Gifu University, Gifu, 501-11 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 45–52, Jan. 1993.

A theoretical and experimental study of the radiation from a bend of a surface wave transmission line is given. It is assumed that the current along the line is expressed by traveling-wave modes. Treating a discontinuous point of a traveling-wave mode current as a radiating source, the radiation field from the bend of the line is obtained by the principle of pattern multiplication.

(34) Far-End Crosstalk of Parallel Printed Circuit Traces (Letters), by Y. Kami (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 546–547, June 1993.

Far-end crosstalk between parallel traces for digital circuits is studied. An error in the operation may be caused by large crosstalk at the far-end than that at the near-end if the rise time of pulse is shorter than the difference between the propagation times of odd and even modes of the parallel line.

(35) Radiation from the Multi-Branching Point of a Transmission Line, by T. Nakamura, A. Ozawa, and S. Yokokawa (Faculty of Engineering, Gifu University, Gifu, 501-11 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 715–721, Aug. 1993.

This paper presents a theoretical and experimental study of the radiation from the multi-branching point of a transmission line. Treating a discontinuous point of a traveling-wave mode current as a radiating source, the radiation field from the multi-branching point of the line is obtained by the principle of pattern multiplication.

(36) A Method for Analyzing Properties of Rectangular Waveguides of Steeply Tapered Width, by T. Suga and F. Ishihara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 65-73, Mar. 1993.

A normal mode method for analyzing the properties of steeply tapered waveguides, taking into account many higher modes, is described. The waveguides considered have straight axes and their thermal losses may be negligible. The properties extrapolated from a few higher modes agree with exact properties when compared to all infinite higher modes.

(37) Generalized Rat-Race Circuit with an Arbitrary Power-Split Ratio, by I. Ohta and T. Kawai (Faculty of Engineering, Himeji Institute of Technology, Himeji, 671-22 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 89–98, Apr. 1993.

This paper treats a generalized rat-race-type circuit consisting of four line sections with arbitrary lengths and admittances and derives conditions that all the ports are matched and a desired power-split ratio is obtained. A circuit having a longer ring-line than half a wavelength possesses a property of directional coupler in principle and, particularly for a longer ring-line than one wavelength, any power-split ratio can be realized.

(38) Analysis of Microstrip Lines Having Thick Strip Conductor by the Modified Mode-Matching Method, by T. Nakai, M. Tsuji, and H. Shigesawa (Faculty of Engineering, Doshisya University, Kyoto, 602 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 99–106, Apr. 1993.

An analytical method is presented for microstrip lines with finite metallization thickness of the strip. This method is developed from the modified mode-matching method that considers the field-continuity conditions via the singular aperture field at conductor edges expanded into a finite series of known singular functions with unknown coefficients.

(39) Microwave Magnetic Field Response of the Magneto-Optic Effect in the YIG Film (Letters), by M. Tsutsumi and V. Priye

(Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 114–115, Apr. 1993.

The microwave magnetic field response of the magnetooptic effect is experimentally investigated using 100-μm-thick YIG film. The response shows the dependence on microwaves up to 4 GHz and also on the dc magnetic field.

(40) Design of Miniaturized Dielectric Duplexer with Attenuation Poles, by H. Matsumoto and T. Nishikawa (Murata Manufacturing Company, Ltd., Muko, 617 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 164–172, May 1993.

A method of designing a miniaturized dielectric duplexer with attenuation poles is proposed. A simple design method of bandpass filter with attenuation pole is derived from Chebyshev filter by modification of the structure and the elements values. The filters are also constructed with minimum numbers of elements.

(41) Analysis of Thin Film Microstrip Lines with Conductor Loss Utilizing the Finite Difference Time-Domain Method, by T. Kitamura, M. Hira, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 173-180, May 1993.

This paper has presented full-wave analysis of thin-film microstrip lines utilizing the finite difference time-domain (FD-TD) method. Metal conductor loss is taken into account in the analysis, which has been ignored in most of previous FD-TD treatments. Furthermore, a nonuniform mesh is used and many grid points are arranged in the regions of large field variation in order to obtain good computational efficiency and accuracy.

(42) A Tapered Waveguide Delay Equalizer that Equalizes Delay Distortion Expressed in the Cubic Equation of Frequency, by F. Ishikawa and T. Kamei (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 240–246, June 1993.

Wide applications of a tapered waveguide delay equalizer, which equalizes delay distortion expressed in the cubic equation of frequency, are presented. The tapered shape is obtained by using a simple and practical approximation. Also, the possibility of achieving wide synthesis for the equalizer is demonstrated.

(43) Finite Element Analysis of Electromagnetic Fields by Using Hexahedral Edge Elements (Letters), by T. Yoshizawa and T. Yamabuchi (Faculty of Engineering, Toyama University, Toyama, 930 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 247–250, June 1993.

Welij-type edge elements are introduced to eliminate spurious solutions in the three-dimensional finite element analysis of electromagnetic fields.

(44) Resonant Frequency Analysis of a Dielectric Ring Resonator for a Moisture Content Measurement (Letters), by T. Masuda and S. Okamura (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 254–257, June 1993.

Resonant frequencies of a dielecric ring resonator in which an arbitrary dielectric sample is inserted are analyzed considering an air gap between a sample and a dielectric ring.

(45) Miniaturization of 35-GHz NRD-Guide Transmitter and Receiver, by I. Uchida, F. Kuroki, and T. Yoneyama (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 270–276, July 1993.

The performance of 35-GHz NRD-guide transmitter and receiver is improved and their size is reduced. The miniaturization of the transmitter is proposed by reducing the size of the terminator. Since the reflection of the balanced mixer for heterodyne detection is reduced, miniaturization of the receiver is obtained by removing the circulator used for the protection from reflection.

(46) Magnetoelastic Waves in the Yttrium Iron Garnet Film, by T. Kukawa* and M. Tsutsumi** (*Faculty of Education, Gifu University, Gifu, 502 Japan; **Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 352–357, Sept. 1993.

Nonuniform magnetic fields in a rectangular yttrium iron garnet film are calculated for different film thicknesses, and the possibility of excitation of the magnetoelastic wave by nonuniform field is discussed. Experiments of magnetoelastic wave are undertaken using the 100-μm-thick yttrium iron garnet film of dimensions of 5×15 mm^2.

(47) The Edge Guide Mode Isolator Using YIG Film (Letters), by K. Okubo* and M. Tsutsumi** (* Faculty of Computer Science and System Engineering, Okayama Prefectural Unversity, Sojya, 719-11 Japan; ** Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 523–525, Nov. 1993.

The edge guide mode isolator using YIG film is demonstrated experimentally. The circular stripline with shorted outer radius is fabricated on the 100-μm-thick YIG film to increase isolation. The YIG film is magnetized nonuniformly by the bowl-shaped magnetic poles to get wide band characteristics of the isolator.

(48) A Method of Design of a Tapered Waveguide Type Delay Equalizer with Quadratic and Cubic Delay Distortions on a Negative Inclination, by T. Kamei* and F. Ishihara** (*Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan; **Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 545–552, Dec. 1993.

A design method for tapered waveguide delay equalizers with negatively inclined distortion is presented. In the delay equalizer, a uniform waveguide with negatively inclined distortion is connected to a cutoff tapered waveguide with positively inclined distortion.

(49) Novel Narrowband Interference Rejection for an Asynchronous Spread Spectrum Wireless Modem Using a SAW Convolver, by H. Nakase and K. Tsubouchi (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 947–954, Aug. 1993.

A new narrowband interference rejection technique based on the reference signal control for the asynchronous spread spectrum modem using a SAW convolver is proposed. The reference signal control proposed here gives the interference rejection capability to the SAW convolver itself. The technique can be used in addition to the conventional interference rejection techniques, such as notched filter at IF.

(50) A SAW-Based Spread Spectrum Wireless LAN System, by K. Takehara (Maruyasu Industries Co., Ltd., Okazaki, 444 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 990–995, Aug. 1993.

A compact spread spectrum (SS) transceiver for the SS wireless LAN whose data ratio is 230 kbps is realized. The SS transceiver is based on a direct sequence for the modulation, and the demodulation is carried out by a specially developed SAW device.

(51) Determination of Resonant Frequencies of Shielded Circular Ring Resonators with Thick Strip Conductors, by F. Tefiku and E. Yamashita (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 649–656, Apr. 1993.

Boundary integral equations are derived from the Green's identity of the second kind in circular cylindrical coordinates and are applied to determine the resonant frequencies of shielded circular ring and disk resonantors. The integral equations are numerically solved by discretizing the integration path representing the air-dielectric interface and the surface of thick strip conductor.

(52) Resonant Mode of Surface Wave in Goubau Line (Letters), by K. Sakina and J. Chiba (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 657–660, Apr. 1993.

It is shown from a computer analysis that there exists a resonant mode of a surface wave that propagates along Goubau line, and that the attenuation of such a mode is very low.

3) Microwave Antennas

(1) A Class of Linear Antenna Array for interference Rejection, by M. H. Er (Centre for Signal Processing, School of Electrical and Electronic Engineering, Nanyang Technological University, Nanyang Avenue, Singapore 2263): *JEEE*, vol. 13, pp. 17–22, Mar. 1993.

A class of linear antenna array that gives a minimum average integrated power response over the spatial region $[-\pi/2, \pi/2]$ is presented. The basic idea is to find a weight vector that minimizes the average intergrated power response of the array over the field of view $[-\pi/2, \pi/2]$ subject to a unity length constraint. It is shown that the resulting weight vector also minimizes the mean output power of the array system due to cylindrically isotropic noise and maximizes the superdirectivity ratio.

(2) Electroacoustic Radiation Properties of Annular Ring Microstrip Antenna, by J. Singh and R. K. Gupta (Department of Electrical Engineering, Malaviya Regional Engineering College, Jaipur 302 017, India): *JIETE*, vol. 37, pp. 285–289, May-June 1991.

Expressions for the electroacoustic and electromagnetic field components of an annular ring microstrip antenna in plasma medium are obtained using linearized hydrodynamic theory and vector wave function techniques. The variation of radiation resistance and efficiency of the annular ring microstrip antenna with different ratios of plasma-to-source frequency is obtained.

(3) Beam Focusing and Suppression of Side-Lobe Levels of V-Slotted Waveguide Antenna by Flange Technique, by P. V. Hunagund* and K. G. Nair** (*Department of Applied Electronics, Gulbarga University, Gulbarga, 585 106, India; **Department of Electronics, Cochin Unversity of Science and Technology, Cochin, 682 022, India): *JIETE*, vol. 38, pp. 16–18, Jan.-Feb. 1992.

The effect of slot angle of a V-slotted waveguide antenna on the radiation characteristics and suppression of side-lobes by a flange technique are presented. It is observed that the beam can be shaped by adjusting flange angle to the optimum position.

(4) Electroacoustic Waves and Their Effect on Radiation Properties of Different Microstrip Array Antennas in Plasma, by A. Dinesh, J. Singh, and R. K. Gupta (Department of Electrical Engineering, Malaviya Regional Engineering College, Jaipur 302 017, India): *JIETE*, vol. 38, pp. 19–25, Jan.-Feb. 1992.

Electroacoustic radiation properties of four-element linear array and 2×2 element planar array of square patch microstrip antenna immersed in warm plasma are studied. Far-zone field expressions of the array antennas for electromagnetic as well as for electroacoustic modes are derived. The expressions are also obtained for radiation conductance, directive gain, and efficiency of the antennas, and the effect of electroacoustic waves in plasma is observed.

(5) Effect of Electroacoustic Waves on Radiation Properties of Microstrip Dipole Antenna with Displaced Feed Points Transverse to the Antenna Axis in Plasma Medium, by P. K. S. Pourush and R. K. Gupta (Department of Electrical Engineering, Malaviya Regional Engineering College, Jaipur 302 017, India): *JIETE*, vol. 38, pp. 229–235, July-Aug. 1992.

Expressions for the electroacoustic and electromagnetic field components of a microstrip dipole antenna with its feed points displaced transverse to the antenna axis are obtained in an isotropic warm plasma medium by using linearized hydrodyanamic theory and vector wave function techniques. The expressions for other radiation properties such as radiation resistance and radiation efficiency are derived. It is observed that the radiation properties of the antenna are modified considerably in the presence of plasma.

(6) Strip Loaded Hollow Dielectric Sectoral Horn Antennas, by V. P. Joseph* and K. T. Mathew** (*Department of Physics Christ College, Irinjalakuda, India; **Department of Electronics, Cochin University of Science and Technology, Kochi 682 022, India): *JIETE*, vol. 38, pp. 266–270, Sept.-Oct. 1992.

Radiation characteristics of a hollow dielectric E-plane sectoral horn antenna loaded with metal sheet on the E walls are discussed. The hollow dielectric horn with metal sheets of optimum length on the E walls becomes a highly directive antenna. The determination of optimum strip lengths for different flare angles is carried out with the assumption that the hollow dielectric horn is equivalent to a solid dielectric horn of varying effective dielectric constant.

(7) Studies on the Radiation Pattern of a Sinusoidally Edge-Modulated Microstrip Patch Antenna, by D. N. Khanra* and A. K. Mallick** (*Department of Physics, V S Mahavidyalaya, Manikpara 721 513, India; **Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur 721 302, India): *JIETE*, vol. 39, pp. 323–327, Sept.-Oct. 1993.

A sinusoidally edge-modulated microstrip patch antenna is proposed. The modal expansion cavity model is employed for the analysis, which shows that the physical parameters of the modulated structure have significant effects on its radiation characteristics. The property of widening of the beamwidth with the modulation factor suggests that the proposed antenna structure may find application in mobile communication systems.

(8) Steady-State Analysis and Realization of the GSC Adaptive Antenna System with a Systolic Array, by Y. Du* and S.-J. Zhao** (*Zhuhai S.E.Z.Peace Telecommunications Industry Corporation (PTIC), Zhuhai, P.R.C.; **Xidian University, Xi'an, P.R.C.): *AES*, vol. 21, pp. 35–39, June 1993.

The steady-state performance of the GSC adaptive antenna system with a systolic array is analyzed. New expressions are proposed for the Wiener solution. Some problems for constructing a systolic array are also discussed.

(9) Worst-Case Tolerance Optimization of Low Sidelobe Linear Arrays, by Y.-C. Jiao*, Y.-H. Qi**, and N.-H. Mao* (*Xidian University, Xi'an, P.R.C.; **Southeast University, Nanjing, P.R.C.): *AES*, vol. 21, pp. 77–81, Sept. 1993.

The worst-case tolerance optimization of linear arrays is discussed with excitation coefficients as design parameters. A fixed tolerance problem and a variable tolerance problem are given, and the new algorithms for solving the problems are presented. The numerical results of the 6- and 16-element linear array tolerance optimization designs are given.

(10) FSS Reflector Antennas with Small RCS, by Y.-Z. Ruan, L. Feng, and X.-Y. Han (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 21, pp. 91–93, Sept. 1993.

A stealthy reflector antenna with small radar cross section (RCS) is constructed by means of frequency selective surface (FSS) instead of metallic surface. The experimental results show this antenna can obtain about 15 dB of RCS reduction in comparison with ordinary metallic reflector antennas.

(11) A New Method of Designing Active Antenna, by W.-X. Li (Harbin Institute of Shipbuilding Engineering, Harbin, P.R.C.): *AES*, vol. 21, pp. 108–112, July 1993.

An active antenna consisting of electrically small antennas and a negative impedance changing circuit is analyzed. The stable operating condition of the active antenna is also given. The analysis shows that the active antenna designed with this method has higher sensibility and optimum small size. The experimental confirmation shows that this method is correct.

(12) Research of Broadband Microstrip Antenna Elements, by C.-L. Lin*, and Q.-J. Rao** (*University of Electronic Science and Technology of China, Chengdu, P.R.C.; **Guangxi Normal University, Guilin, P.R.C.): *JCIC*, vol. 14, pp. 40–47, Jan. 1993.

Broadband microstrip antenna elements are analyzed for resonant frequency radiation patterns and input impedance. The varitional method and the model expansion technique are used for the analysis. The usefulness and the accuracy of the method are verified by the experimental results for some species deformed elements.

(13) A New Coaxial Antenna with the Loaded Inductance at the Base, by Q.-H. Liu and X.-D. Ju (Xidian University, Xi'an, P.R.C.): *JCIC*, vol. 14, pp. 81–84, Jan. 1993.

A new coaxial antenna with the loaded inductance at the base is presented. An equivalent circuit and the principle are described. A formula is developed to calculate effective height and optimum loading inductance. Several numerical examples and experimental results are given.

(14) Tolerance Synthesis Technique for Arrays Radiation Pattern, by Y.-H. Qi, Y.-C. Jiao, and C.-F. Ye (State Key Laboratory of Millimeter Waves, Southeast University, Nanjing, P.R.C.): *JE*, vol. 15, pp. 181–186, Mar. 1993.

Tolerance synthesis techniques of array radiation pattern are investigated. The physical model for arbitrary tolerance distribution of array elements is presented. Numerical examples are given for the broadside array in which the excitation amplitude coefficients have tolerances.

(15) Research on Resonant Frequency of Deformed Circular Microstrip Antennas, by Q.-J. Rao*, and C.-L. Lin** (* Guangxi Normal University, Guilin, P.R.C.; ** University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 187-190, Mar. 1993.

A resonant frequency of the deformed circular microstrip antennas is investigated based on the variational principle and the perturbation concept. Theoretical and experimental bases for the synthesis of microstrip antennas are presented.

(16) Time-Domain Radiation Characteristic of V-Dipole Array, by J.-H. Wang (Southwest Jiaotong University, Chengdu, P.R.C.): *JE*, vol. 15, pp. 343–350, July 1993.

The time-domain radiation characteristic of a three-V-dipole array is studied by a direct time-domain method. Some valuable results are given.

(17) A Stealthy Antenna with Frequency Selective Reflector, by L. Feng, Y.-Z. Ruan, and P. Lei (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 506–511, Sept. 1993.

A Cassegrain antenna with a frequency-selective reflector is introduced and the measured radiation properties and radar cross-section (RCS) of the antenna are given. In comparison with ordinary metallic reflectors, this antenna can obtain similar radiation pattern and about 15 dB of RCS reduction.

(18) Analysis of Resonant Characteristic on Eccentric Ring Microstrip Antennas with Arbitrary Shape, by Q.-J. Rao (Guangxi Normal University, Guilin, P.R.C.): *JE*, vol. 15, pp. 551–555, Sept. 1993.

Resonant characteristic of eccentric ring microstrip antennas is studied using the point-matching mothod. The good agreement between measured and calculated results of resonant wave-number of eccentric circular ring microstrip antenna indicates that the method can be used to analyze characteristic of arbitrary shape microstrip antennas.

(19) Radiation Properties of Microstrip Array Antennas Fed by Radial Line, by O. Shibata, S. Saito, and M. Haneishi (Faculty of Engineering, Saitama University, Urawa, 338 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 20–27, Jan. 1993.

This paper presents new types of arrays that excite singly-fed circularly polarized microstrip anttena via a low loss radial line. In order to check the performance of this antenna, some planar arrays are fabricated and tested at the SHF-band. As a result of experiments, this type of array demonstrats high-efficiency performance (approximately 90% aperture efficiency).

(20) Design of Optics for a Millimeter-Wave Phase-Imaging System and Its Application to Plasma Diagnostics, by K. Uehara, T. Yonekura, H. Nishimura, K. Miyashita, and K. Mizuno (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 28–36, Jan. 1993.

A millimeter-wave phase-imaging interferometer is developed and applied to the University of Tsukuba GAMMA 10 tandem mirror in order to measure the plasma-density profile. The imaging array consists of lens-coupled, 10-element, trap-loaded Yagi antennas integrated with beam-lead Schottky diodes. The time evolution and radial profiles of the plasma density are successfully measured at the plug-cell plasma of GAMMA 10, and the results are very close to those obtained by a millimeter-wave interferometer with scanning horn antennas, which is used for the cross-calibration.

(21) On the Green's Function of Microstrip Antennas (Letters), by M. Chiba and T. Okuzawa (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 62–65, Jan. 1993.

The Sommerfeld-type integrals used commonly for the radiation problem of printed antenna are expressed in terms of an expansion form of ρ, the distance between receiving and radiating points. A novel method for evaluating the integrals is described by making use of the fact that the coefficients of the expansion series are independent of ρ.

(22) Analysis of MRI Antenna inside an RF Shield, by H. Ochi*, E. Yamamoto*, K. Sawaya**, and S. Adachi** (*Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 79–85, Feb. 1993.

Optimization of an antenna for magnetic resonance imaging (MRI) requires an accurate analysis of antennas located inside a conducting cylindrical RF shield. A Galerkin-moment method analysis that can be used for an arbitrary shaped shield is employed. Numerical results are compared with measured input impedances, confirming the validity of the proposed method.

(23) A Paraboloid Antenna Fed by the Equiangular-Spiral-Bent Slotted Waveguide, by I. Ohtera*, H. Ujiie*, and T. Yoneyama** (*Tohoku Institute of Technology, Sendai 982 Japan; **Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 86–95, Feb. 1993.

A new feed system for offset parabolic antennas, which is another type of microwave focusing radiators with the virtual focus, is proposed. Some of the radiation properties of offset parabolic antennas fed by the feed system are discussed numerically and experimentally, and the feasibility of frequency scanning is examined.

(24) A Scattering Matrix of a Slot Set for the Aperture Illumination Design of Radial Line Slot Antennas, by J. Takada*, M. Takahashi**, M. Ando**, and N. Goto** (*Faculty of Engineering, Chiba University, Chiba, 263 Japan; **Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 96–104, Feb. 1993.

A scattering matrix of a slot set for radial line slot antennas is presented. The scattering parameters are determined by the moment method analysis and are related to the aperture illumination design under the assumption of the traveling-wave operation.

(25) Dependence Between Feed Point and Input Impedance of Small Rectangular Loop Antenna (Letters), by K. Cho* and H. Itakura** (*NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan; **NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 145–150, Feb. 1993.

Input impedance characteristics of rectangular loop antennas are investigated. As a result, it is clarified that the input resistance of the antenna whose feed point is placed at the long side is larger than that of the uniform current model.

(26) Analysis of 3m Site Attenuation: Above the Dry Earth Ground Plane(Letters), by H. Kawakami*, G. Sato*, H. Sudo**, K. Gyoda***, R. Wakabayashi****, and K. Shimada**** (*Antenna Giken Co., Ltd., Omiya, 330 Japan; **Matsushita Communication Industrial Co., Ltd., Yokohama, 223 Japan; ***Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; ****Tokyo Metropolitan College of Aeronautical Engineering, Tokyo, 116 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 151–154, Feb. 1993.

Using the Sommerfeld formulation, site attenuation values for vertical and horizonal polarizations are calculated in the case of antennas above the infinite dry earth ground plane.

(27) Measurement of a Mesh Reflecting Surface for Large Deployable Antennas, by E. Hanayama, S. Araki, and T. Takano (Institute of Space and Astronautical Science, Sagamihara, 229 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 268–276, Apr. 1993.

Measurement systems for transmission and reflection losses of a mesh reflecting surface for large deployable antennas are presented. It becomes clear that these losses depend on incident angle and polarization to show anisotropy. The residual loss that cannot be attributed to transmission and reflection losses is derived from the measured data.

(28) Adaptive Antennas Using a Kalman Filter for Fast Mobile Communications, by J. Wang*, T. Takano*, and K. Hagino** (*Institute of Space and Astronautical Science, Sagamihara, 229 Japan; **Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 277–285, Apr. 1993.

Weights for adaptive antenna elements are examined under a nonstationary condition that the incidence angle changes with motions of a mobile station. A state transition matrix of the weights is deduced. A control algolithm for the weights is studied by applying the obtained transition matrix to Kalman filter.

(29) Design of Dual-Frequency Reflector Antenna Illuminated by a Horn and a Printed Antenna Array, by T. Hori and K. Kagoshima (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 504–511, June 1993.

A dual-frequency reflector antenna illuminated by a horn and a printed array is proposed. Based on the theoretical study for determining prameters of a horn and a printed array by aiming at antenna aperture efficiency and edge level, it is evident that the design optimization is available when frequency ratio for frequency sharing is more than 5. The validity of design technique is verified by the experimental results for the fabricated dual-frequency primary feed operating in 2- and 11-GHz bands.

(30) Spherical Near-Field Antenna Measurement System Based on a Simple and Efficient Alignment Technique, by Y. Ohtaki, Y. Konishi, W. Chujo, and M. Fujise (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 520–529, June 1993.

A facility alignment technique using one reference axis and one tower, which improves the alignment efficiency in comparison with the conventional alignment method, is proposed. A large-scale spherical-scanning near-field antenna measurement system is developed and tested experimentally using the technique. As a results, low-level pattern measurement capability below -40 dB from peak directivity is successfully obtained through the measurements of X-band low-sidelobe antennas and L-band broad-beam antennas.

(31) A Circular Microstrip Antenna Having Notches for Reception on Microwave Power Transmission (Letters), by T. Muramatsu, K. Sawaya, and S. Adachi (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 656–658, July 1993.

A circular microstrip antenna having radial notches is proposed as an element of the rectenna used for the microwave power transmission in the stratosphere stationary radio relay system. Experimental results show that this element can be applied to a thin rectenna element not only receiving arbitrary polarization but also reducing the reradiation of higher harmonics.

(32) Radiation Pattern of 280 MHz Flat Antenna Mounted on Truck (Letters), by H. Arai (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 722–724, Aug. 1993.

A flat disk-loaded monpole is presented for the radio control system at 280 MHz. The radiation pattern measurements show that the flat antenna mounted on the loof top eliminates dead points of the radiation pattern.

(33) Applicability of the Standard-Site Method for Determining Antenna Factors (Letters), by K. Harima*, A. Sugiura*, T. Morikawa*, T. Morikawa*, and R. Hayashi** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **Faculty of Engineering, Kagoshima University, Kagoshima, 890 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 837–840, Oct. 1993.

Rigorous theoretical formulation is made for the standard-site method that has been commonly used in calibration of EMI antennas. Correction factors specified in ANSI-C63.5 are found to be inappropriate.

(34) A Study of the Pattern Forming Method of Arbitrary Conformal Array Antenna(Letters), by O. Hashimoto and N. Takayanagi (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 841–844, Oct. 1993.

A pattern-forming method for arbitrary conformal array antennas is shown. Lower sidelobe patterns for hemicircular array antennas are given.

(35) Time-Domain Analysis of Yagi-Uda Antennas Using the FD-TD Method, by T. Kashiwa, S. Tanaka, and I. Fukai (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 872–879, Nov. 1993.

Transient analysis of the Yagi-Uda antennas is carried out using the FD-TD method. First, input impedances and directivities obtained are compared with those calculated by the moment method. Next, the quasi-impulse responses are calculated. As a result, the difference in characteristics of the length of the parasitic elements is indicated, showing the early time responses and late time responses.

(36) Rigorous Analysis of a Loop Antenna System for Magnetic Interference Measurement, by T. Shinozuka, A Sugiura, and A. Nishikata (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 20–28, Jan. 1993.

Theoretical and actual experimental investigations are made on a loop antenna system (LAS) consisting of N-gap loop antennas. A general formula for the LAS response to an external EM field is derived by using both the method of moments and techniques for transmission-line analysis. Numerical evaluation verifies that the LAS has favorable characteristics, such as invariable response within a wide frequency range.

(37) Antenna Gain Measurements in the Presence of Unwanted Multipath Signals Using a Superresolution Technique, by H. Yamada, Y. Ogawa, and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 694–702, June 1993.

The multiple signal classification algorithm has the advantage of being able to eliminate unwanted responses when performing antenna measurements in situations where the antenna band-width is too narrow to support FFT-based techniques. In this paper, experimental results of antenna gain measurements in a multipath environment show the accuracy and resolving power on this technique.

(38) Improvement of the Isolation Characterisitcs of a Two-Layer Self-Diplexing Array Antenna Using a Circularly Polarized Ring Patch Antenna (Letters), by W. Chujo*, M. Fujise*, H. Arai**, and N. Goto*** (*ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan; **Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan; ***Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 755–758, July 1993.

Isolation characteristics of the self-diplexing array antenna are investigated. First, calculated and experimental results for each feed location of the element antenna are compared and good agreement is found. Second, experimental results with a 19-element planar array indicate that a self-diplexing antenna with suitably chosen feed configuration is effective in improving the isolation in a phased-array antenna.

(39) On a Numerical Solution for the Near-Field of Microstrip Antennas(Letters), by Y. Sasaki, M. Kominami, and S. Sawa (Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 759–761, July 1993.

Numerical solutions for the near-field of microstrip antennas are presented. The field distribution is calculated by taking the inverse Fourier transform involving the current distribution with the help of the spectral-domain moment method.

(40) FDTD Method Analysis of Mutual Coupling between Microstrip Antennas(Letters), by K. Uehara and K. Kagoshima (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 762–764, July 1993.

Mutual coupling between two microstrip antenns is analyzed by using the finite-difference time-domain method. It is suitable for substrates that have a complex configuration or include feed line structures.

(41) Aperture Illumination Control in Radial Line Slot Antennas, by M. Takahashi*, J. Takada**, M. Ando**, and N. Goto** (*Faculty of Engineering, Chiba University, Chiba, 263 Japan; **Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 777–783, July 1993.

This paper presents measured performances of the single-layered radial line slot antenna with non-uniform aperture illumination. Low-cost and mass-producible models of 0.2–0.6 m diameter are fabricated. The efficiency enhancement of about 10% is observed; the measured gain of 36.7 dBi (87%) and 32.9 dBi (81%); and the axial ratio around 1 dB for a 0.6 mϕ and 0.4 mϕ antennas, respectively, verify this technique.

(42) Separated Equivalent Edge Current Method for Calculating Scattering Cross-Sections of Polyhedron Structures, by Y. Sunahara*, H. Ohmine*, H. Aoki**, T. Katagi*, and T. Hashimoto* (*Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; **Kamakura Works, Mitsubishi Electric Co., Kamakura, 247 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 1439–1444, Nov. 1993.

A novel method to calculate the fields scattered by a polyhedron structure for an incident plane wave is described. In this method, the fields diffracted by an edge are calculated using the equivalent edge currents that are separated into components dependent on each of the two surfaces that form the edge. Using this separated equivalent edge current method, fields scattered by a polyhedron structure can be calculated without special treatment of the singularity in the diffraction coefficient.

(43) On the Surface-Patch and Wire-Grid Modeling for Planar Antenna Mounted on Metal Housing, by M. Analoui and Y. Kagawa (Faculty of Engineering, Okayama University, Okayama, 700 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 1450–1455, Nov. 1993.

Numerical analysis of the electromagnetic radiation from conducting surface structures is concerned. The method of moments is discussed with the surface-patch modeling in which the surface quantities, i.e. the current, charge, and impedance are directly introduced and with the wire-grid modeling in which the surface quantities are approximated by the filamentary traces.

4) Microwave/Lightwave Propagation and Scattering

(1) Imaging of Buried Objects Using an Inpulse Radar Model, by F. J. Paoloni (Department of Electrical and Computer Engineering, University of Wollongong NSW 2500, Australia): *JEEE*, vol. 13, pp. 32-40, Mar. 1993.

This paper describes a two-dimensional subsurface radar model incorporating a trasmitting line source and receiver above a lossy, dispersive, dielectric half-plane containing a buried object. The model includes two-dimensional plane wave scattering from a metallic or dielectric cylinder or a metallic wedge. Simulated data demonstrates that resolution can be improved by measuring the scattered wavefronts and using Fourier back-propagation filters to recreate the scattering center.

(2) Real-time Ionospheric Model Updating, by Z. Houminer*, J. A. Bennett**, and P. L. Dyson*** (*Asher Space Research Institute, Technion, Israel Institute of Technology, Haifa, Israel; **High Frequency Radar Division, Defence Science and Technology Organisation, PO Box 1500, Salisbury, SA 5108, Australia; ***Department of Physics, La Trobe University, Bundoora, VIC 3083, Australia): *JEEE*, vol. 13, pp. 99–104, June 1993.

A method for real-time prediction of ionospheric properties at one location, using an ionospheric model together with real-time ionospheric measurements at other locations, is presented. Simulation results using foF2 observations in Australia show that real-time predictions of foF2 at mid-latitude locations can be improved by using real-time observations at a grid of about five reference stations spread over the Australia continent.

(3) Quasi-Stationary Electromagnetic Fields in an Expanding Resonator, by L. J. Millott (Telecom Australia Research Laboratories, Australia): *ATR*, vol. 27, pp. 35–40, May 1993.

Simple expressions are developed in this paper for the electromagnetic fields present in a slowly expanding semi-metallic resonator illuminated by a plane wave. Conditions are then established to provide formal tests for the validity of quasi-stationary analysis of the resonator and to serve as rules of thumb for guiding similar analyses of more complicated two-body scattering systems.

(4) Determination of the Generalized Capacitance Matrix for Systems of Bare and Dielectric-Coated Cylindrical Conductors by a Method of Moments, by N. Ozergun (Telecom Australia Research Laboratories, Australia): *ATR*, vol. 27, pp. 13–24, Nov. 1993.

This paper presents the theory and some example results for a moment method of determining generalized capacitance matrices for systems of either bare or insulated multiple conductors, such as those used in the transmission of communications signals or electric power. The technique employs a previously reported approach for such problems using Fourier series basis functions.

(5) Propagation of Transverse Electromagnetic Wave Through Magnetized Plasma Slab, by S. S. Sinsinwar and D. R. Phalswal (Department of Physics, MSJ (Autonomous) College, Bharatpur 321 001, India): *JIETE*, vol. 38, pp. 11–13, Jan.-Feb. 1992.

The dispersion relation, field, and antenuation constant for a magnetized semiconductor plasma slab are derived. Numerical calculations show that carrier density collision frequency and hall angle significantly affect the attenuation constant.

(6) Nuclear Electromagnetic Interaction and Coupling Analysis in Buried Cables, by D. C. Pande*, B. Chakravarti**, and G. K. Deb*** (*Electronics and Radar Development Establishment, C V Raman Nagar, Bangalore 560 093, India; **EETF, ENTEST Lab, Research Centre Imarat, Vignyana Kancha, Hyderabad, 500 269, India; ***Electronics Research and Development Centre, P-1 Taratola Road, Calcutta 700 088, India): *JIETE*, vol. 38, pp. 26–38, Jan.-Feb. 1992.

A model is presented for numerically calculating the transient currents and voltages induced in the buried cables by an impinging nuclear electromagnetic pulse (NEMP). At first, the NEMP field at the buried cable is obtained from the theory of plane wave transmission and reflection at the air/earth interface. Then, short circuit current in the shield of the cable for different earth conductivities and angles of incidence are computed using the series impedance per unit length of the buried cable.

(7) Transequatorial Propagation of TV Signals via Sporadic-E (Letters), by V. C. Ravichandran* and M.M. Rao** (*School of Electronics and Communication Engineering, Anna University, College of Engineering, Madras 600 025, India; **Aeronomy Laboratory, Electrical Engineering Department, Indian Institute of Technology, Madras 600 036, India): *JIETE*, vol. 38, pp. 52–56, Jan.-Feb. 1992.

This letter describes the experimental results of sporadic-E propagation of video signals received at Madras (80° 10'E, 12° 59'N) with 10° N magnetic dip from Sri Lanka, the neighbouring country, operating on band III, channel 5 (174–181 MHz) situated at Kokavil (9° 19' 13"N, 80° 24' 18"E) with magnetic dip 2° S approximately, and channel 8 (195–202 MHz) situated at Pidurutalagala (7° 00' 2"N, 80° 24' 18"E) with magnetic dip 8° S approximately.

(8) Observations of Lightning Radar Echoes, by A. B. Bhattacharya (Department of Physics, Kalyani University, Kalyani 741 235, India): *JIETE*, vol. 38, pp. 216–218, July-Aug. 1992.

The detection of lightning in intense precipitation recorded at varying azimuth provides two fundamental forms of echoes. Results show that the rate of rise in signal intensity is sharper than the corresponding rate of fall and that there is a decreased volume reflectivity with increasing wavelength.

(9) Polarization Parameters of a Reflector-Type Wire-Grid Polarizer, by M. Lal and D. Chadha (Department of Electrical Engineering, Indian Institute of Technology, New Delhi 110 016, India), *JIETE*, vol. 38, pp. 278–283, Sept.-Oct. 1992.

The polarizing properties of wire-grid polarizer, consisting of closely spaced, parallel metal strips etched on a metal-backed dielectric sheet are investigated for a plane electromagnetic wave of arbitrary incidence and polarization. The structure can be designed to be used both as a linear polarization rotator and as a circular polarizer. The frequency characteristics of the polarization state parameters of the reflected wave are studied.

(10) Lightning Channel Properties Determined with C-Band, S-Band, and UHF-Radars, by A. B Bhattacharya (Department of Physics, University of Kalyani, Kalyani 741 235, India): *JIETE*, vol. 39, pp. 21–29, Jan.-Feb. 1993.

The role of plasma temperature in radar response of lightning is first pointed out. Observations of pulse-to-pulse behaviour, radar range dependence of lightning echo amplitude, and dual wavelength measurements including a comparison of echoes from lightning and from precipitation are presented.

(11) Broad Band Thin Sheet Absorbers for S-, C-, X-, and Ku-Bands, by S. C. Gupta, N. K. Agrawal, and M. V. C. Kumar (Department of Electronics and Computer Engineering, University of Roorkee, Roorkee 247 667, India): *JIETE*, vol. 39, pp. 197–200, May-June 1993.

The design procedure for a single-layer thin sheet microwave absorber that exhibits broad band characteristics is described. Using the proposed design approach, single-layer absorbers of thickness less than 7 mm in S-band, 5 mm in C-band, 4 mm in X-band, and 3 mm in Ku-band to give a minimum 10-dB absorptions over their entire respective bands are theoretically designed. Barium hexa-ferrite are used as the radar absorbing material and rubber as binder in the design.

(12) Equivalent Electromagnetic Parameters in Mixture Random Media with Strong Scattering Particles, by C.-M. Qiw, S.-Z. Liu, and W.-G. Lin (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 21, pp. 4–12, June 1993.

With the aid of a generalized multiple scattering theory, formulas for effective electromagnetic parameters ϵ_{eff} and μ_{eff} of mixture media of random ellipsoid particles are derived and applied to the strong scattering of metal particles for the first time. The theoretical results are in good agreement with the measured data.

(13) Inverse Scattering Method for Fractal Cantor Multilayers, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 21, pp. 14–18, June 1993.

An inverse scattering method for fractal Cantor multi-layered structure is investigated by using a time domain signal flow graph technique to reconstruct the fractal dimension and its self-similar structure from the reflection spectrum.

(14) Asymptotic Solutions of Transient Electromagnetic Waves in Lossy Media, by C.-Li Ruan (University of Electronic Science and Technology of China, P.R.C.): *AES*, vol. 21, pp. 65–71, June 1993.

The transient of electromagnetic wave is discussed using the boundary-layer theory and the asymptotic solutions of the overlap wave equation are obtained. Analysis shows that Maxwell equations are still true in case of transient for lossy medium. Attenuation factor of transient EM waves is $\exp(-\sigma t/2\epsilon)$.

(15) Application of OSRC to Electromagnetic Scattering from Two-Dimensional Homogeneous Dielectric Cylinder, by Z.-N. Chen*, W.-X. Zhang**, and X.-R. Xie** (* Institute of Communications Engineering, Nanjing, P.R.C.; ** Southeast University, Nanjing, P.R.C.): *AES*, vol. 21, pp. 94–96, June 1993.

The application of OSRC to electromagnetic scattering from two-dimensional homogeneous dielectric cylinder is discussed. The third-order OSRC operator is used to analyze the scattering from a homogeneous dielectric cylinder illuminated by a TM- or TE-polarized plane wave. The numerical results are in good agreement with the exact solutions.

(16) An Application of Numerical Absorbing Boundary Condition to OSRC Method, by J.-X. Jiang (University of Science and

Technology of China, Hefei, P.R.C.): *AES*, vol. 21, pp. 49–54, Sept. 1993.

A numerically derived absorbing boundary condition is introduced to apply to the on-surface radiation condition (OSRC) method for the solution of open region scattering problems. Numerical results for perfectly condition and homogeneous penetrable circular cylinder are presented. It is shown that the accuracy of OSRC method can be significantly improved by using this kind of numerical absorbing boundary condition.

(17) A New Approach to Solving Integral Equation for Transient Scattering by a Lossy Dielectric Cylinder, by Z.-Q. Peng (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 21, pp. 68–76, Sept. 1993.

The transient scattering of an electrically polarized, 2-D pulsed wave by 2-D inhomogeneous, lossy dielectric cylinder is investigated. A piecewise bilinear interpolation is used for space discretization. The integrals over patches are carried out analytically in closed form. The discretized equation in complex-frequency domain is solved by the CG-FFT method and the initial estimates are generated by a new extrapolation scheme.

(18) On the Feasibility of Electromagnetic Missiles, by S.-T. Zhou and S.-C. Ge (Fudan University, Shanghai, P.R.C.): *AES*, vol. 21, pp. 94–95, Sept. 1993.

Due to the quantization of electromagnetic fields, there is an upper frequency limit in the spectrum of any finite energy transmitted by an electromagnetic system. It is shown that the existing electromagnetic missile theory is based on the classic theory. The electromagnetic missile is not feasible physically. Subsequent attempts to realize or utilize the electromagnetic missile phenomena theoretically and experimentally are in conflict with existing quantum theory.

(19) Generalized Transmission Line Theory of the Multilayered Two-Dimensionally Periodic Structure, by S.-M. Liu and J.-H. She (Huazhong University of Science and Technology, Wuhan, P.R.C.): *JCIC*, vol, 14, pp. 28–33, Jan. 1993.

An efficient approach to determine the overall scattering characteristics of multilayered, two-dimensionally periodic structure is developed, and the generalized transmission line theory is used to obtain a generalized transmission matrix of the whole structure.

(20) High-Order Finite-Element Analysis for Scattering Characteristics of II-VI Semiconductor Materials, by S.-J. Xu*, X.-Q. Sheng*, P. Greiner**, C.R. Becker**, and R. Geick** (*University of Science and Technology of China, Hefei, P. R.C.; **Physikalisches Institut der Universitat, Wurzburg, Germany): *JIMW*, vol. 12, pp. 177–184, June 1993.

The scattering characteristics of the II-VI semiconductor are analyzed by a method that combines the second-order finite-element method with the rigorous mode-matching procedure. The accuracy and efficiency of the present method are verified by the experimental data.

(21) A Transmission Method to Determine Complex Refractive Indices of Small Particles by Simplified Mie Theory and K-K Relation, by Q.-Z. Yu, H.-P. Tan, L.-M. Ruan, and J .-L. Su (Harbin Institute of Technology, Harbin, Heilongjiang, P.R.C.): *JIMW*, vol. 12, pp. 340–346, Oct. 1993.

The complex refractive index of small particles is determined from the transmittance spectrum by the use of the simplified Mie scattering theory and Kramers-Kronig relation. The numerical simulation results for the soot particles with relatively large size show that this method is simple as compared with the existing method. The transmittance spectrum of the coal particle cloud is measured by an infrared spectrometer and its complex refractive index is determined.

(22) Scaling Calculation for RCS of Lossy Targets: Further Discussion on the Similarity of Lossy Electromagnetic Systems, by Z.-D. Shi, S.-W. Yang, and C.-S. Ding (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JAS*, vol. 11, pp. 109–114, Apr. 1993.

The theory of similarity and dimensional analysis are used for the scaling measurements of RCS of lossy targets. Scaling calculation formulas between the prototype and models are derived. The RCS of the prototype can be inferred precisely from the measured values of models with these formulas.

(23) The electromagnetic Similitude of the Object Containing Lossy Materials and the RCS Scaled-Down Relationships of the Coated Plate, by X.-G. Zeng, W.-G. Lin, and C.-Li Ruan (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JAS*, vol. 11, pp. 213–218, July 1993.

The electromagnetic similitude conditions of the object containing lossy materials and the scaled-down relationships of the variables considered are derived. As an example, the RCS scaled-down relationship of a coated plate is studied.

(24) Modified Discrete Convolution Method for EM Problem of Electrically-Large Geometry, by Y.-M. Bo and W.-X. Zhang (Southeast University, Nanjing, P.R.C.): *JAS*, vol. 11, pp. 283–289, Oct. 1993.

On the basis of discrete convolution method (DCM), a modified discrete convolution method (MDCM) is proposed by zeroizing the Frobenius norm of the iterative matrix. The MDCM is suitable for the electromagnetic scattering or radiation of an electrically large body, especially for the scattering of the finite periodic structure.

(25) Improvement of Distorted Born Iterative Method in 2-D Electromagnetic Inverse Scattering, by Z.-G. Peng (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JAS*, vol. 11, pp. 297–302, Oct. 1993.

A number of effective procedures for improving the distorted Born iterative method are proposed. The convergence and stability of the iterative solution and the resolution of the reconstruction are improved significantly.

(26) Inelastic Scattering by Active Molecules Embedded in a Single Mode Optical Fiber, by Z.-Z. Wang and W.-G. Lin (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JAS*, vol. 11, pp. 321–327, Oct. 1993.

The analysis of the inelastic scattering by active molecules embedded in a single-mode optical fiber is presented. The analytical expressions and the numerical results of the scattering coefficients for the inelastically scattered guided HE_{11} modes are obtained.

(27) Application of SBR: Calculating the RCS of an Arbitrary Shaped Open-Ended Cavity, by G.-B. Xiao and J. Zhang (National University of Defence Technology, Chengdu, P.R.C.): *JAS*, vol. 11, pp. 328–332, Oct. 1993.

The main idea of SBR (shooting and bouncing rays) is discussed. Using SBR, the RCS of a complicated S-shaped open-ended cavity is calculated.

(28) The Optimal Approximation Algorithm of Feature Coefficients and Recognition of Target, by S.-P. Liao, X.-G. Li, and D.-G. Fang (East China Institute of Technology, Nanjing, P.R.C.): *JE*, vol. 15, pp. 26-32, Jan. 1993.

On the basis of target transfer function, a method for solving the target feature coefficients is investigated by the approximation theory. The feature coefficients are classified by the minimum distance criterion to recognize the target automatically.

(29) Elastic and Coherent Inelastic Scattering by an Arbitrary Body Uniformly Filled with Active Molecules, by H. Jin* and Z.-L. Wang** (*Shanghai Jiaotong University, Shanghai, P.R.C.; **University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 52–59, Jan. 1993.

Formulas for the elastic and coherent inelastic scattering by an arbitrary body uniformly filled with active molecules are presented with the method of eigenfunction expansion. The formulas are not restricted to the situation of weak scattering. Some numerical results for the coherent inelastic scattering by an ellipsoid uniformly filled with active molecules are given.

(30) RCS Analysis of Modified Cassegrainian Antenna with Polarization Rotator, by Y.-Z. Ruan (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 88–91, Jan. 1993.

The radar cross-section (RCS) of modified Cassegrainian antenna under the incidence of EM waves of various frequencies and polarizations is evaluated based on antenna scattering theory. The numerical results show that this kind of antenna contributes a substantial RCS in the nose-on region, and it will be quite a difficult task to reduce its RCS contribution without degradation of antenna performances.

(31) A New Algorithm for Electromagnetic Scattering of Multilayered Sphere, by Z.-S. Wu and Y.-P. Wang (Xidian University, Xi'an, P.R.C.): *JE*, vol. 15, pp. 174–180, Mar. 1993.

More stable and accurate recursive formulas and a computing procedure to calculate scattering coefficients for a multilayered sphere are proposed. The asymptotic behavior, stability, and accuracy of the procedure and scattering coefficients are discussed for various complex refractive indices.

(32) Regression-Circle Method for Reconstructing One-Layer Lossy Medium and the Background Medium, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *JE*, vol. 15, pp. 191–195, Mar. 1993.

A new method for reconstructing lossy medium by regression circle technique is presented. In high-frequency regions, the locus of the reflection coefficient as a function of the wave number in the complex plane yields a circle, from which some properties of the medium can be reconstructed without recourse to any numerical techniques. The method can be not only applied to the complex reflection spectrum, but also adapted to treat the amplitude spectrum alone.

(33) Laser Backscattering by an Arbitrarily Shaped Dielectric Object with Rough Surface, by Z.-S. Wu (Xidian University, Xi'an, P.R.C.): *JE*, vol. 15, pp. 359–366, July 1993.

The backscattering of light wave from arbitrary convex dielectric objects with rough surface is investigated and the formulas for calculating the backscattering cross-section of both coherent and incoherent fields are obtained.

(34) Reconstruction of the Permittivity Profiles of Arbitrarily Continuous Medium in Layered Regions, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *JE*, vol. 15, pp. 512–518, Sept. 1993.

A differential equation for the reflection coefficient of a continuously varied medium is derived by using a network theory, from which an approximation for reconstructing the permittivity profiles is obtained in closed form. The permittivity profiles of an arbitrary continuous medium is reconstructed in layered regions.

(35) Study of the Beam Transmission Properties of Radome Using Complex Ray Theory, by G.-M. Wang, F.-S. Deng, and J.-Q. Wang (Air Force Missile Institute, Shanxi, Sanyuan, P.R.C.): *JE*, vol. 15, pp. 556–560, Sept. 1993.

The complex ray theory for three-dimensional space is researched, from which the method of complex ray tracing for arbitrary configuration in three-dimensional space is derived, and the beam-transmission properties of a rotating parabolic radome are solved. According to the data calculated, the patterns of the beam transmitted through a rotating parabolic radome are plotted. Then, they are compared with the patterns without radome and the effects of radome on the beam transmission are depicted.

(36) Propagation Characteristics of Tweek Atmospherics below Anisotropic and Inhomogeneous Ionosphere Models, by K. Baba*, K. Ohta*, and M. Hayakawa** (*Faculty of Engineering, Chubu University, Kasugai, 487 Japan; **Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 11–19, Jan 1993.

Propagation characteristics of tweek atmospherics are represented in terms of the earth-ionosphere waveguide mode theory using realistic ionosphere models. Computed results for the polarization of mode 1 are very sensitive to the choice of electron density profiles and the earth's magnetic field parameters.

(37) Differential Detection with Adaptive Sequence Estimation (DD-ASE): Performance in Frequency Selective Fanding Mobile Radio Channels, by H. Suzuki and K. Fukawa (NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 71–78, Feb. 1993.

The differential detection with adaptive sequense estimation (DD-ASE), which is an adaptive equalization sheme for time-varing multipath distortion in selective fading radio channels, is proposed. Computer simulations clarify various characteristics of DD-ASE and show the BER performance in static and dynamic environments.

(38) Bearing Fluctuation in Doppler VOR by Sea Surface Reflection, by K. Yamamoto (Electronic Navigation Research Institute, Ministry of Transport, Mitaka, 181 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 105–112, Feb. 1993.

This paper describes the mechanism of bearing fluctuation in Doppler VOR (DVOR) by sea surface reflection and presents a formula for predicting the magnitude of the fluctuation. Intrinsic bearing error in DVOR is noted and influence of the sea reflection on it is analyzed. Flight experiment is performed for several VOR's to measure the fluctuation.

(39) A Method of Suppressing Radar Clutter Using Weighted Moving Average Filter, by S. Takahashi and S. Miwa (Faculty of Engineering, Tokyo Denki University, Tokyo, 101 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 113–120, Feb. 1993.

In order to improve the signal-to-clutter ratio in the radar systems, methods that use the moving average and the weighted moving average data after pulse intergration are proposed. By using the moving average method for an X-band radar, the signal-to-clutter ratio is improved by 4.2 dB compared with the mere threshold detection, whereas the weighted moving average improves it by 5.0 dB.

(40) An Experiment of 12 GHz Radio Wave Propagation through Stairs in a Building (Letters), by T. Iwasaki and J. Chiba (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 130–131, Feb. 1993.

An experiment of radio propagation is carried out in stairs of a building. A radio signal of 12.31 GHz is transmitted from the fifth floor to the third floor. In order to decrease propagation loss, plane reflectors are used. Consequently, the propagation loss is almost equal to free-space transmission loss.

(41) A Suggestion of a Communication Method Between Lunar Surface Points in Near Future (Letters), by J. Hashimoto and F. Ishihara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 135–137, Feb. 1993.

An effective technique using low altitude satellites for communications between points on the lunar surface is discribed. Suggestions are also made regarding research targets that should be achieved in the development of such inter-lunar communications.

(42) FDTD Analysis of Transient Cylindrical Electromagnetic Wave Scattered by Objects Buried in a Two-Dimensional Inhomogeneous Medium (Letters), by O. Maeshima, T. Uno, Y. He, and S. Adachi (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 138–141, Feb. 1993.

The scattering characteristics of transient electromagnetic fields are analyzed by using the FDTD method for the case that dielectric objects and/or perfect conductors are buried in two-dimensionally inhomogeneous medium.

(43) Target Detection from a 50 GHz-Band Back-Scattered Wave by the Fractal Brownian Function (Letters), by T. Watanabe and Y. Onozawa (College of Industrial Technology, Nihon University, Narashino, 275 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 181–183, Mar. 1993.

Target detection from a 50-GHz-band back-scattered wave is carried out using a fractal-based analysis. Some experiments show good detection, even in a weak field back-scattered by a target such as a thin brass wire or a rectangular styrofoam post, by analyzing the mappings of fractal dimension and linearity.

(44) Finite Element Method Calculation of VLF Propagation Characteristics in the Earth-Ionosphere Waveguide, by K. Baba* and M. Hayakawa** (*Faculty of Engineering, Chubu University, Kasugai, 487 Japan; **Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 236–244, Apr. 1993.

The finite element method is applied to the VLF mode propagation in the earth-ionosphere waveguide. For propagation constants and fields in the guide the high degree of accuracy can be obtained as the size of the element subdivision in the ionosphere is reduced to 5 to 2 km.

(45) FDTD Analysis of Two-Dimensional Transient Scattering of Cylindrical Wave by Conducting Objects Buried in the Ground, by Y. He, T. Uno, and S. Adachi (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 245–252, Apr. 1993.

Two-dimensional scattering properties of a transient electromagnetic wave, when a current sourse is located above the ground surface and conducting objects are buried in the ground, are analyzed by using the FDTD method. The characteristics of transient electromagnetic wave transmitted from the source and scattered by various objects are visualized and studied in detail.

(46) Scattering from a Periodic Array of Arbitrary Shaped Elements on a Semi-Infinite Substrate, by M. Kominami*, H. Wakabayashi*, S. Sawa*, and H. Nakashima** (* Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan; ** Technical Center, Central Glass Co., Ltd., Matsusaka, 515 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 260–267, Apr. 1993.

Electromagnetic wave scattering by a periodic array of arbitrary-shaped elements on a semi-infinite dielectric substrate is analyzed. The solution is based on the moment method in the spectral domain. From the results, the scattering characteristics of a linearly and circularly polarized incidence are discussed.

(47) A Study on $\lambda/4$ Type mm-Wave Absorber at 50-GHz Range(Letters), by T. Tanaka*, Y. Hashimoto*, S. Iwagaki**, and O. Hashimoto** (*Electro-magnetic Wave Division, TDK Co., Ltd., Ichigaya, 272 Japan; **College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 301–303, Apr. 1993.

Absorption characteristics of $\lambda/4$-type mm-wave absorber with thickness of about 850 to 950 μm at 50-GHz range is designed using measured permittivity and surface resistance. As a result, the maximum reflection loss is about 36 dB at 49 GHz.

(48) Measurement of Reflecting Characteristics of the Objects by Range-Doppler Imaging in the Room (Letters), by O. Hashimoto and K. Hanabusa (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 304–307, Apr. 1993.

A measurement method of reflecting characteristics from the objects by range-doppler imaging in the room is discussed. For a 30×30-cm metal plate, the measurable range of about -40 to -45 dB in X band is obtained.

(49) Measurement Error of Transmission Loss of Sheet Device due to Incidence of Spherical Wave (Letters), by E. Hanayama, S. Araki, and T. Takano (Institute of Space and Astronautical Science, Sagamihara, 229 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 308–310, Apr. 1993.

The measurement error of transmission loss of a sheet device due to incidence of spherical wave is investigated using Fresnel diffraction equation.

(50) Realization and Design Chart of Microwave Absorber Using Epoxy-Modify Urethane Rubber Mixed Carbon Praticles (Letters), by O. Hashimoto*, S. Kondo*, A. Tsujimura*, and T. Sohu** (*College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan; **Yokohama Rubber Co., Ltd., Hiratsuka, 254 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 311–313, Apr. 1993.

Many kinds of design charts are presented using experimental formulas for permittivity of epoxy-modify urethane rubber mixed carbon particles.

(51) Fundamental Propagation Path Characteristics of a Microwave Direct Repeater System, by M. Ueda (Shikoku Regional Headquarters, Electric Power Development Co., Ltd., Takamatsu, 760 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 512–519, June 1993.

Special features of the microwave direct repeater system are explained and some results of the propagation path design on certain model hops are shown. This paper also refers to the correlation coefficient of two-hop diversity system of being used for the direct repeater systems.

(52) Multipath Characteristics Measurement for Metropolitan Microcellular Mobile Radio Communication Systems (Letters), by E. Moriyama*, Y. Nagata**, and H. Misaizu*** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **C & C Systems Research Laboratory, NEC Co., Kawasaki, 213 Japan; ***Computer & Communication Research Center, Tokyo Electric Power Co., Ltd., Tokyo, 104 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 551–554, June 1993.

Delay spread and propagation loss measurements are made in Tokyo metropolitan area under microcellular environment at 2.6 GHz. The results show that the line-of-sight delay spread increases slightly as the propagation distance increases.

(53) Estimation Formulas of Median Field Strength on UHF Band Mobile Communications in Urban Area (Letters), by K. Morita*, S. Sato**, and S. Aizawa*** (*NEC Mobile Communications, Ltd., Yokohama, 222 Japan; **Faculty of Science and Engineering, Tokyo Denki University, Saitama-ken, 350-03 Japan; ***Nippon Idou Tsushin Co., Tokyo, 102 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 559–564, June 1993.

The median field strength is estimated for the frequency band of 300 to 3,000 MHz by using the parameters such as base station antenna height, antenna beam width and beam-tilt angle, mobile station antenna height, mean building height, mean distance between adjacent buildings, and propagation path length.

(54) High-Frequency Analysis of Electromagnetic Fields on Variable Radius of Concave Conducting Boundary, by T. Ishihara and K. Goto (Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 605–614, July 1993.

High-frequency analysis of electromagnetic fields on cylindrical concave conducting boundaries is generalized to account for the fields on variable radius of concave boundaries. The fields on the slowly varying boundaries are represented by ray tracing plus adiabatic whispering gallery modes and ray tracing plus modified integral-type interference wave. The limit of applicability of two alternative representations is clarified.

(55) Full-Wave Calculation Method of VLF Wave Radiated from a Dipole Antenna in the Ionosphere: Analysis of Joint Experiment by HIPAS and Akebono Satellite, by I. Nagano*, K. Miyamura*, S. Yagitani*, I. Kimura**, T. Okada***, K. Hashimoto****, and A.Y. Wong***** (*Faculty of Engineering, Kanazawa University, Kanazawa, 920 Japan; **Faculty of Engineering, Kyoto University, Kyoto, 606 Japan; *** Faculty of Engineering, Toyama Prefectual University, Toyama-ken, 939-03 Japan; ****Faculty of Engineering, Tokyo Denki University, Tokyo, 101 Japan; *****Department of Physics, University of California, Los Angeles, USA): *Trans. IEICE*, vol. J76-B-II, pp. 615–624, July 1993.

A full-wave method to provide the wave field distribution both in the ionosphere and on the ground is developed for the case that a source dipole is located in the ionosphere. This method is applied to the simultaneous observation at the Akebono satellite and on the ground of VLF waves radiated from polar electrojet currents when high-power HF waves are transmitted from HIPAS, Alaska.

(56) Observations of K-Distributed Sea Clutter by Means of X-Band Radar, by Y. Ishikawa, M. Sekine, and T. Musha (Graduate School at Nagatsuta, Tokyo Institute of Technology, Yokohama, 227 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 625–633, July 1993.

Sea clutter amplitude distributions are quantitatively examined by using AIC (Akaike Information Criterion) for an X-band raw data. The data are obtained for high sea state with the wave height of 6 to 9 m and the wind velocity of 25 m/s. Under these conditions, it is shown that sea clutter obeys a lognormal distribution for whole data and obeys a K-distribution within the antenna beamwidth.

(57) An Estimation Method of Buried Pipe Location by Using Zero-Crossed Synthetic Aperture, by Y. Nagashima*, H. Yoshida*, J. Masuda*, and K. Komatsu** (*NTT Technical Assistance and Support Center, Musashino, 180 Japan; **NTT Kesennuma Branch, Kesennuma, 988 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 634–640, July 1993.

This paper describes a new zero-crossed synthetic aperture to estimate an underground propagation velocity of electro-magnetic waves. In the pulse radar method, the underground velocity is needed to calculate a depth of buried objects. Because the shape of a hyperbolic pattern in a cross-sectional image is related to the velocity, the velocity can be calculated from the shape of the pattern.

(58) Wide-Band Characteristics of Fin Ferrite Electromagnetic Wave Absorber, by Y. Naito*, M. Takahashi**, T. Mizumoto*, and H. Nose* (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **URO Electronics Co., Ltd., Tokyo, 140 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 641–646, July 1993.

A novel structure of electromagnetic wave absorber composed of sintered ferrite is proposed. Its wide-band characteristics for suppressing reflection is shown by a numerical analysis. It consists of ferrite fins placed perpendicular to the electric field of incident wave. Dependence of characteristics on geometrical parameters and permeability of ferrite is discussed.

(59) Widening the Bandwidth of Ferrite Electromagnetic Wave Absorbers by Attaching Rubber Ferrite, by Y. Naito*, T. Mizumoto*, M. Takahashi**, and Y. Wakita* (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **URO Electronics Co., Ltd., Tokyo, 140 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 647–655, July 1993.

Widening the bandwidth of ferrite electromagnetic wave absorber is discussed to cover the frequency range from 30 to 1500 MHz higher. Calculation shows that a three-layered structure consisting of sintered ferrite, low-permittivity dielectric, and rubber ferrite provides the reflection less than −20 dB in the frequency range from 30 to 1830 MHz. Experimental results are also demonstrated to verify that the proposed structure provides wider bandwidth than a conventional ferrite single-layered sbsorber.

(60) Scattering of Circularly Polarized Waves by Conducting Circular Cylinder: A Consideration by Circularly Polarized Energy Flux Densities, by S. Tokumaru and P. Wang (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 690–697, Aug. 1993.

Poynting vector and circularly polarized energy flux densities are applied to understand scattering porcperties of circularly polarized waves by an infinitely long conducting circular cylinder. Stream lines of the circularly polarized flux densities drawn around a scatterer clarify a process of changing from a right-handed circularly polarized incident wave to a left-handed circularly polarized scattered wave on the surface of the scatterer.

(61) Maximum Radiated Interference Field Estimation Method of Electric Equipments by Using Randomly Assigned Phase Terms, by K. Murakawa and N. Kuwabara (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 706–714, Aug. 1993.

The maximum electric field strength estimation method is presented. In this method, the near electric field strength of the equipment under test is measured and the phase of electric field is assigned. Using the integral representation of electric field, the maximum electric field strength radiated from the equipment under test is estimated.

(62) 50-GHz Band Wave Absorber Using FRP Incorporated with Sillicon Carbide Fiber (Letters), by O. Hashimoto (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 725–727, Aug. 1993.

Absorption characteristics of FRP-type wave absorbers incorporated with silicon carbide fibers at 50-GHz band are shown. The measured reflection loss is about 28 dB at 54 GHz and the technique for obtaining high reflection loss is discussed.

(63) Phase Disturbance of Loran-C Signal Near a Coast Line, by N. Sato*, M. Yamashita**, K. Taguchi***, and T. Nishi*** (*Hiroshima National College of Maritime Technology, Hiroshima, 725-02 Japan; **Nagoya City College of Child Education, Owari-Asahi, 488 Japan; ***Faculty of Fisheries, Kagoshima University, Kagoshima, 890 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 820–826, Oct. 1993.

This paper presents experiments concerning the phase disturbance of Loran-C signals. To simplify the analysis, the propagation path of the Loran-C is chosen to be at right angle with respect to the coast line .

(64) A Study on Delay Spread Prediction Method in Digital Mobile Communication Systems (Letters), by S. Kozono*, T. Tanaka**, and S. Aoyama** (*Chiba Institute of Technology, Narashino, 275 Japan; **NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 834–836, Oct. 1993.

A delay spread prediction method is described for mobile communication systems. It is shown that large values of delay spread frequency arise in an open area where the mobile station is in the line of sight from distant strong reflectors.

(65) Approximate Theory of Shielding Effectiveness Calculated from Sheet Resistivity (Letters), by Y. Shimizu and H. Nagao (CRADLE, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 845–849, Oct. 1993.

Simple formulas of shielding effectiveness are presented. This theory is derived from sheet resistivity of shielding materials, and skin depth phenomena in the sheet are also considered.

(66) A New Ground-Based Direction Finding Method Using a Linear Reconstruction of Wave Distribution Function of Magnetospheric VLF/ELF Radio Waves, by M. Yamaguchi*, K. Hattori**, N. Iwama**, S. Shimakura***, and M. Hayakawa* (*Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan; **Faculty of Engineering, Toyama University, Toyama, 930 Japan; ***Faculty of Engineering, Chiba University, Chiba, 263 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 880–889, Nov. 1993.

A new direction finding method for magnetospheric VLF/ELF waves is proposed. It is based on the wave distribution function using the linear regularization of Phillips-Tikhonov, which is aided by the generalized cross validation in optimizing the reconstructed image. The results of numerical simulations for a single-wave source show the effectiveness of the method.

(67) Widening the Bandwidth of Ferrite Electromagnetic Wave Absorbers by Attaching Rubber Ferrite: Application to Dielectric/Sintered Ferrite Double-Layered Structure, by Y. Naito*, T. Mizumoto*, M. Takahashi**, and Y. Wakita* (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **URO Electronics Co., Ltd., Tokyo, 140 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 890–897, Nov. 1993.

Based on the scheme of loading a pair of low-permittivity dielectric and rubber-ferrite layers, widening the bandwidth of electromagnetic wave absorber is discussed to cover the frequency range from 30 to 1500 MHz higher. It is shown that the four-layered structure, composed of dielectric, sintered ferrite, low-permittivity dielectric, and rubber-ferrite provides reflection less than -20 dB in the frequency range from 30–1910 MHz.

(68) Characteristics of Grid Ferrite Electromagnetic Wave Absorber, by Y. Naito*, M. Takahashi**, H. Anzai*, and T. Mizumoto* (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **URO Electronics Co., Ltd., Tokyo, 140 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 898–905, Nov. 1993.

The wide-band characteristics of a novel ferrite grid electromagnetic wave absorber composed of sintered ferrite are investigated. Its wide-band characteristics for suppressing reflection are shown by a computer simulation. It is concluded that there exists an optimum geometrical structure depending on the material constant of sintered ferrite. In addition, the return loss of grid absorber is impaired by an air gap between ferrite and conductor.

(69) Fadings on a Microwave Link across the Tsugaru Passage (Letters), by T. Munehiro*, I. Sakagami*, H. Nakamizo**, and A. Nishitsuji* (*Department of Electric and Electronic Engineering, Muroran Institute of Technology, Muroran, 050 Japan; **Information and Communication Systems Department, Electric Power Development, Co., Ltd., Tokyo, 104 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 906–910, Nov. 1993.

Fadings occurring on a microwave link across the straits of Tsugaru are measured and evaluated from September to November, 1990 and from January to October, 1991. The link is operated at 6.7 GHz band and its distance is 81.0 km.

(70) Analysis of Transitional Responses of Electric Fields Accompanied by a Movement of a Discharge Electrode (Letters), by M. Masugi (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 916–919, Nov. 1993.

Analysis results of electromagnetic pulses caused by electrostatic discharge are described. Transitional responses for an electric dipole model using the inverse Laplase method are calculated to investigate the effect of the movement of a discharge electrode.

(71) Estimation Techniques of Radiated Interference Field in Actual Configurations, by K. Murakawa, H. Masuda, M. Masugi, and M. Tokuda (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 936–944, Dec. 1993.

An estimation technique of radiated interference field from equipments in actual configurations is discussed. Using the difference of transmission properties between the actual configurations and the test site, the radiated interference field of equipments in the actual configuration can be obtained from the radiated interference field measured at the test site. The estimation technique, where a spherical dipole antenna is used as an emission source for equipments, is presented.

(72) Electromagnetic Plane Wave Scattering by a Trough on the Ground (Letters), by R. Sato*, H. Shirai*, and K. Hirayama** (*Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan; **Hino Works, Toshiba Co., Hino, 191 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 107–109, Apr. 1993.

Plane wave scattering by a rectangular trough on the perfectly conducting ground is formulated using the Weber-Schafheitlin's discontinuous integrals. Numerical calculation is done to obtain scattering far field patterns and radar cross-sections.

(73) Extended Ray Theory for Analyzing Electro-Magnetic Scattering Process on Two-Dimensional Smooth Objects, by H. Ikuno, T. Ohmori, and M. Nishimoto (Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 119–129, Apr. 1993.

A unified technique based on the extended ray theory (ERT) to interpret the events observed in scattering from smooth cylindrical objects is proposed. Scattering processes are represented in terms of reflection, refraction, and diffraction events in the ERT. The scattering process is classified into six elementary processes on electromagnetic scattering problem.

(74) Construction of Electromagnetic Scattered Fields from Smooth Dielectric Cylindrical Objects with Relative Refractive-Index Less than 1 by Using the Extended Ray Theory, by T. Ohmori, H. Ikuno, and M. Nishimoto (Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 130–138, May 1993.

Using the extended ray theory (ERT), transient responses by smooth dielectric cylinders with relative refractive-index less than 1 are investigated. It is confirmed that the ERT solutions agree well with reference ones and that there are strong contributions of complex rays in scattering from the object with concave-convex boundaries.

(75) Wiener-Hopf Technique from Filtering Viewpoint and Its Application, by K. Uchida, T. Noda, and T. Matsunaga (Faculty of Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 139–146, May 1993.

This paper is concerned with the filtering operation in spectral domain and its application to electromagnetic problems. It is demonstrated that only the algebraic filtering operations lead to the rigorous Wiener-Hopf solution for a semi-infinite boundary value problem.

(76) On Stability of Diffraction Tomography Based on Modified Newton-Kantorovich Method (Letters), by H. Harada*, M. Tanaka**, T. Takenaka***, and H. Goto** (*Division of NBU Media Center, Nippon Bunri University, Oita, 870-03 Japan; **Faculty of Engineering, Oita University, Oita, 870-11 Japan; ***Faculty of Engineering, Nagasaki University, Nagasaki, 852 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 189–191, May 1993.

This letter investigates the actual potentiality of a reconstruction algorithm for diffraction tomography based on the modified Newton-

Kantorovich method. From the simulated results, it can be seen that the proposed algolithm is stable for moderately noisy data.

(77) Numerical Method for Calculating Surface Current Density on Three-Dimensional Smooth Scatterers, by H. Ikuno, M. Gondo, and M. Nishimoto (Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 197–205, June 1993.

Surface current densities are calculated by using an approximate total tangent magnetic vector field that is expressed by a finite number of a linear combination of tangent vector of spherical vector wave functions. Sampling points are determined by considering the property of associated Legendre and trigonometrical functions.

(78) A Numerical Analysis of Plane-Wave Diffraction from a Multilayer-Overcoated Grating by T. Matsuda* and Y. Okuno** (*Kumamoto National College of Technology, Kumamoto-ken, 861-11 Japan: **Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 206–214, June 1993.

A numerical algorithm based on the Yasuura method is described for the analysis of plane-wave diffraction from a multilayer-overcoated grating. The grating consists of any number of dielectric (or metallic) layers with corrugated interfaces having a common period.

(79) Effect of Lidar Multiple Scattering on Visibility (Letters), by K. Noguchi (Chiba Institute of Technology, Narashino, 275 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 251–253, June 1993.

Multiple scattering effects of lidar multiple scattering on visibility are calculated by Monte Carlo method. It is found that the visibility depends on the field of view, extinction coefficient, and phase function.

(80) Image Reconstruction Characteristics of Phase Conjugator Via Nearly Degenerate Four-Wave Mixing (Letters), by A. Okamoto*, K. Sato**, T. Mishima*, and I. Sakuraba** (*Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan; **Faculty of Engineering, Hokkai-Gakuen University, Sapporo, 064 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 277-280, July 1993.

Image reconstruction with phase conjugation via nearly degenerate four-wave mixing is studied. An equation describing the dependence of the conjugate image location on the wavelength detuning is derived and the reconstructed images of distorted probe object are calculated.

(81) Numerical Analysis of Diffracted Power from a Fourier Grating by the Extended-Boundary-Condition Method (Letters), by T. Kurihara, M. Ohki, and S. Kozaki (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 313–316, Aug. 1993

Characteristics of diffracted power by Fourier gratings consisting of a perfect conductor are numerically investigated by applying the extended-boundary-condition method. Both TE and TM polarizations are treated.

(82) Characteristics on Propagation of Radio Wave from a Horizonal Dipole Located in Two-Dimensional Tunnels (Letters), by K. Hakamata, M. Ohki, J. Horikoshi, and S. Kozaki (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 317–320, Aug. 1993

The field from the dipole antenna located horizontaly in two-dimensional tunnels is obtained by residue theorem. The validity of the method is proved by the comparison with the image theory.

(83) Filtering in Discrete Fourier Transform and Its Application, by K. Uchida, T. Noda, and T. Matsunaga (Faculty of Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 506–513, Nov. 1993.

This paper is concerned with the filtering operation in discrete Fourier transform (DFT) and its application to electromagnetic problems. In order to solve the problem numerically, three types of computational methods, namely, direct numerical method, iteration method, and conjugate gradient method are proposed. As an application of the conjugate gradient method the electromagnetic scattering by an infinite plane grating, is considered.

(84) On Precision of Solutions by Finite-Difference Time-Domain Method of Different Mesh Spacing (Letters), by M. Kodama and M. Kuninaka (Faculty of Engineering, University of the Ryukyus, Okinawa, 903-01 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 315–317, Mar. 1993.

This letter discusses errors of solutions by the finite-difference time-domain method when the three mesh spacings are different and presents the best mesh spacings for minimizing the errors of the solutions.

(85) Predictive Analysis of the Differential Rain Attenuation Between a Satellite Path and an Adjacent Terrestrial Microwave System, by J. D. Kanellopoulos and C. Sofras (Department of Electrical Engineering, National Technical University of Athens, 9 Iroon Polytechniou, Zografou 157 73, Greece): *IEICE Trans. Commun.*, vol. E76-B, pp. 768–776, July 1993.

A prediction method for the differential rain attenuation statistics is proposed that is based on a model convective rain-cell strcture of the rainfall medium. The assumption that the point rainfall statistics follows a lognormal form is also adopted. The results of the predictive procedure are compared with the only available set of experimental data taken from Yokosuka, Japan.

(86) Amplitude Statistics of Sea Clutter Using an X-Band Radar, by Y. Ishikawa*, M. Sekine*, M. Ide**, M. Ueno***, and S. Hayashi*** (*Graduate School at Nagatsuta, Tokyo Institute of Technology, Yokohama, 227 Japan; **Oki Electric Industry Co., Ltd., Tokyo, 108 Japan; ***Tokyo University of Mercantile Marine, Tokyo, 135 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 784–788, July 1993.

Sea clutter is measured using an X-band radar at very high grazing angles between 8.2° and 17.5°. The sea state is 7 with the wave height of 6 to 9 m. The wind velocity is 25 m/s. It is shown that sea clutter amplitudes obey the lognormal and K distributions using the Akaike Information Criterion (AIC).

(87) Detection of Radar Target by Meams of Texture Analysis, by N. Hirano and M. Sekine (Graduate School at Nagatsuta, Tokyo Institute of Technology, Yokohama, 227 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 789–792, July 1993.

A ship is observed as a radar target embedded in sea clutter using a millimeter wave radar. The shape of the ship and sea clutter are discriminated by using texture analysis in image processing. As a discriminator, a nonlinear transformation of a local pattern is defined to deal with high-order statistics.

(88) Analysis of Electromagnetic Wave Scattering by a Cavity Model with Lossy Inner Walls, by N.-H. Myung and Y.-S. Sun (Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, 373-1 Kusong-Dong Yusung-Gu, Taejon 305-701, Korea): *IEICE Trans. Commun.*, vol. E76-B, pp. 1445–1449, Nov. 1993.

An approximate but sufficiently accurate high-frequency solution is developed for analyzing the problem of electromagnetic plane wave scattering by an open-ended, perfectly-conducting, semi-infinite parallel-plate waveguide with a thin layer of lossy or absorbing material on its inner wall and with a planar termination inside. The high-frequency solution combines uniform geometrical theory of diffraction and aperture integration methods.

(89) Power Line Radiation Over Eastern Asia Observed by the Satellite OHZORA, by I. Tomizawa and T. Yoshino (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 1456–1469, Nov. 1993.

Statistically improved results of power line radiation (PLR) over Eastern Asia ovserved at 50 and 60 Hz are described. A total number of 150 orbits observed from June 1984 to January 1986 by the Japanese scientific satellite OHZORA are used to detect PLR over Eastern Asia around the Japanese Islands.

(90) Analysis of Transient Electromagnetic Fields Radiated by Electrostatic Discharges (Letters), by O. Fujiwara and N. Andoh (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 1478–1480, Nov. 1993.

In order to analyze transient electromagnetic fields caused by electrostatic discharge (ESD), a new ESD model is presented. Numerical calculation is also given to explain the distinctive phenomenon being well-recognized in the ESD event.

(91) Diffraction by a Parallel-Plate Waveguide Cavity with a Thick Planar Termination, by S. Koshikawa and K. Kobayashi (Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 142–158, Jan. 1993.

The diffraction of a plane electromagnetic wave by a parallel-plate waveguide cavity with a thick planar termination is rigorously analyzed for both the E and the H polarization using the Wiener-Hopf technique. Introducing the Fourier transform for the unknown scatterd field and applying boundary conditions in the transform domain, the problem is formulated in terms of the simultaneous Wiener-Hopf equations, which are solved exactly in a formal sense via the factorization and decomposition procedure.

(92) Scattering of Electromagnetic Plane Waves by a Grating with Several Strips Arbitrarily Oriented in One Period, by M. Shimoda* and T. Itakura** (*Kumamoto National College of Technology, Kumamoto-ken, 861-11 Japan; **Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 326–337, Feb. 1993.

The problem of two-dimensional scattering of electromagnetic waves by a grating with several strips arbitrarily oriented in one period is analyzed by means of the Wiener-Hopf technique together with the formulation using the concept of the mutual field. A formulation for the analysis of multiple scattering from the grating is based on the representation of the scattered field by a grating composed of one strip in one period.

(93) Polarization Diplexing by a Double Strip Grating Loaded with a Pair of Dielectric Slabs, by A. Matsushima and T. Itakura (Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 486–495, Mar. 1993.

An accurate numerical solution is presented for the electromagnetic scattering from a double strip grating, where the strip planes are each supported by a dielectric slab. The dependence of the diplexing properties on grating parameters is examined in detail. The cross-polarization characteristics at skew incidence are also referred. From these results, an algorithm for the design of polarization diplexers is constructed.

(94) Numerical Analysis of Optical Bistability in a Variety of Nonlinear Fabry-Perot Resonators, by K. Ogusu (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1000–1006, June 1993.

This paper presents a simple numerical method for calculating the stationary transmission and reflection characteristics of a variety of nonlinear Fabry-Perot resonators. The input-output characteristics of the Kerr-like nonlinear film with and without reflection mirrors are calculated to demonstrate the usefulness and versatility of the proposed method and to find out resonator configurations exhibiting optical bistability at low incident-power levels.

(95) Equivalent Edge Currents for Modified Edge Representation of Flat Plates: Fringe Wave Components, by T. Murasaki, M. Sato, Y. Inasawa, and M. Ando (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1421–1419, Sept. 1993.

Novel approximate equivalent edge currents are proposed for use in the modified edge repesentation (MER) for flat plates. The key feature of this approach is that uniform fields are predicted everywhere, though only classical diffraction coefficients are used. MER also simplifies the ray-tracing in the secondary diffraction analysis.

5) MICROWAVE MEDICAL/BIOLOGICAL APPLICATIONS

(1) Numerical Modelling of the Human Body Under Electromagnetic Exposure: A Review, by I. Chatterjee (Department of Electrical Engineering, University of Nevada, Reno, NV 89557, USA): *JIETE*, vol. 38, pp. 283–289, Sept.–Oct. 1992.

This paper discusses several numerical methods available for the calculation of the detailed distribution of the specific absorption rate and temperature in the human body. Emphasis is placed on the methods for the more complex 3-D models rather than on the simplified 2-D models for individual cross-sections of the human body.

(2) Effects of Submillimeter Laser Irradiation on Somaclonal Variation of Rice, by Z.-P. He*, S.-P. Xu*, J. Xu*, S.-R. Xiong**, and J.-W. Su** (*Shanghai Institute of Plant Physiology, Chinese Academy of Sciences, Shanghai, P.R.C.; **Shanghai Institute of Technical Physics, Chinese Academy of Science, Shanghai, P.R.C.): *JIMW*, vol. 12, pp. 474–478, Dec. 1993.

The embryos of *Oryza sativa L. japonica* are irradiated by 118.8 μm wavelength from an optically far infrared laser, then cultured in vitro to induce calli and regenerants. In comparison with nonirradiated group (HF), the significant variations in 118.8 μm irradiated group (118) are observed from the 2nd to the 6th generations. The results show that the 118.8 μm wave has a beneficial effect on the induction of rice mutation.

(3) Analysis of MRI Antenna Loaded by a Man Model, by H. Ochi*, E. Yamamoto*, K. Sawaya**, and S. Adachi** (*Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 253-259, Apr. 1993.

A computer code for obtaining the current distribution on the antenna loaded by a man model with an arbitary geometry and material properties is developed by incorporating the impedance method into the method of Richmond. Numerical results for the input impedance are compared with measured impedances. Furthermore, sensitivity distributions of antennas loaded by a man model are calculated.

(4) Power Absorption of Obliquely Incident Electromagnetic Wave for a Multilayered Cylindrical Human Model (Letters), by K. Kanai, S. Kuwano, and K. Kokubun (College of Engineering, Nihon University, Koriyama, 963 Japan): *Trans. IEICE*, vol. J76-B-II, pp. 565–566, June 1993.

Absorption characteristics of a multilayered cylindrical human model are presented as a function of angle of incidence for electromagnetic wave irradiation. There exists a specific frequency that the absorbed power has no relation to the angle of incidence.

(5) Analysis of MRI Slotted Tube Resonator Having a Shield of Conducting Circular Cylinder, by Q. Chen*, K. Sawaya*, S. Adachi*, H. Ochi**, and E. Yamamoto** (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 553–560, May 1993.

A slotted tube resonator (STR) having a shield of conducting circular cylinder that is used as a probe for the magnetic resonance imaging (MRI) is analyzed by using the variational method and the dyadic Green's function of a circular waveguide. Resonant frequency, Q value, and the magnitude of magnetic field distributions for various radii of the shields are obtained to show the effects of the shield.

(6) Usefulness of Spherical Model of Human Head in SAR Calculation for UHF Plane-Wave Exposure (Letters), by O. Fujiwara and K. Iino (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 561–564, May 1993.

This letter describes the usefulness of a homogeneous spherical model of the isolated human head in SAR calculation for UHF plane-wave exposure. Comparison is made between this SAR and several results that were computed and measured for the homogeneous but realistic whole-body model of the human by other researchers.

(7) A Dielectric Rod Waveguide Applicator for Microwave Hyperthermia, by R. Tanaka*, Y. Nikawa**, and S. Mori* (*Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 703–707, June 1993.

A dielectric rod waveguide applicator for microwave heating such as microwave hyperthermia is described. The applicator consists of the acrylic cylinder filled with deionized water. By circulating the deionized water, the dielectric rod waveguide applicator acts as a surface cooling device, so that it doesn't need any bolus.

(8) Correlation between Spatial Distributions of Surface-SAR and Magnetic Near-Field in Realistic Head Model for Microwave Exposure (Letters), by O. Fujisawa and M. Nomura (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 765–767, July 1993.

Correlation between the surface-SAR and external magnetic near-field in a realistic head model for 1.5 GHz microwave far-field exposure is described. The regression relation is shown between the one gram averaged SAR and squared external magnetic field on the cross-sectional perimeter of the head model.

6) Lasers and Other Devices

(1) The Study of the Characteristics of Travelling Waveguide Electro-Optic Modulator, by Y.-F. Wang, X. Wang, and L. Li (Shanghai University of Science and Technology, Shanghai, P.R.C.): *AES*, vol. 21, pp. 101–104, June 1993.

Based on the theory of coupled model, the characteristics and dynamic range of travelling waveguide electrooptical modulators are studied.

(2) Fullwave Analysis of Ultra-Short Pulse Photoconductive Switches, by X.-Q. Li, K.-Z. Guo, and Q. Zhuo (Institute of Electronics, Academica Sinica, Beijing, P.R.C.): *AES*, vol. 21, pp. 20–26, Sept. 1993.

A fullwave analysis method of ultra-short pulse photoconductive switches is described. Three-dimensional Maxwell equations, including the conductive current components, are solved using a finite-difference time-domain scheme. The influence of the static electric field on boundary condition is taken into account in the analysis and a more reasonable photoconductive mathematical model is employed.

(3) Planar InGaAs/InP PIN Photodetectors Grown by MOCVD, by Z.-H. Yang, S.-T. Wang, J. Zhen, L.-G. Zhu, J. Shun, C.-H. Xia, R. Shen, and Q. Gui (Institute of Semiconductors, Chinese Academy of Sciences, Beijing, P.R.C.): *JIMW*, vol. 12, pp. 155–158, Apr. 1993.

The optical characteristics and fabrication process of planar InGaAs/InP PIN devices grown by MOCVD are discussed. After growing an InP window layer on the InGaAs absorption layer and fabricating an appropriate antireflection coating, the quantum efficiency of the planar PIN devices increases obviously, reaching approximately 96%.

(4) FT-IR Magneto-Optical Spectrometer with High Optical Transportation Efficiency, by P.-L. Liu, G.-L. Shi, P.-G. Wang, M.-H. Chen, W. Lu, J.-B. Zhu, W.-J. Liu, and X.-C. Shen (National Laboratory for Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Science, Shanghai, P.R.C.): *JIMW*, vol. 12, pp. 271–274, Aug. 1993.

The FT-IR magneto-optical spectrometer with high optical transportation efficiency is developed by adopting a novel design. The construction and characteristics of the spectrometer are described. The test results and a typical magneto-optical spectrum measured are given.

(5) Optical Oscillation inside Photorefractive Crystal and Optical Limiter, by X.-F. Yue, Z.-S. Shao, X.-D. Mu, Q. Song, J. Zhang, Y.-Y. Song, and H.-C. Chen (National Laboratory of Crystal Materials, Shandong University, Jinan, Shandong, P.R.C.): *JIMW*, vol. 12, pp. 287–291, Aug. 1993.

A new kind of optical limiter by using the energy transfer of incident beam to oscillation is proposed. The oscillation loops in the shapes of parallelogram and figure-eight are observed. The threshold conditions of different kinds of oscillation and the relation of transmittivity to the coupling constant are given.

(6) The Choice of Permittivity in the Cherenkov FEL, by D.-H. Zhao (Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Science, Shanghai, P.R.C.): *JIMW*, vol. 12, pp. 429–435, Dec. 1993.

The effects of variation of permittivity in the Cherenkov FEL on the output property of laser are calculated. The results show that smaller or larger values of permittivity not only decrease the efficiency of laser, but also greatly influence the gain property of laser.

(7) Some Parameter Characteristics of CPM Unstable Resonator Nd:YAG Laser, by W.-Z. Zhang (Hua Qiao University, Quanzhou, Fujian, P.R.C.): *JIMW*, vol. 12, pp. 469–473, Dec. 1993.

The CPW unstable resonator Nd:YAG laser is studied that uses the property of combination of antiresonant ring structure and general unstable resonator. The optimal small-signal transmittivity of dye solution used is analyzed, and the stability of this type of resonator is experimentally and theoretically investigated.

(8) High-Birefringence-Fiber Polarization Coupler, by Z.-H. Jin, Z.-M. Huang, and W.-N. Xiao (Shanghai University of Science and Technology, Shanghai, P.R.C.): *JAS*, vol. 11, pp. 115–118, Apr. 1993.

A new polarization coupler high-briefringence-fiber is presented. The coupling strength can be controlled by an electrical signal for the device by using the PZT material.

(9) The Characteristics of the Cyclotron Autoresonance Maser with a Large-Orbit Electron Ring in a Partially Dielectric-Loaded Waveguide, by Y.-Z. Yin (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *JE*, vol. 15, pp. 38-44, Jan. 1993.

The characteristics of the cyclotron autoresonance maser with a large-orbit electron ring in a partially dielectric-loaded waveguide are analyzed by making use of the linearized Vlasov-Maxwell equations. The results show that the dielectric liner can reduce the energy of electron beam and that a novel radiation source can be made in the millimeter and submillimeter waveband by using this method.

(10) Ion-Channel Laser, by P.-K. Liu and Z.-H. Yang (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 367–374, July 1993.

The amplification mechanism of ion-channel laser (ICL) in low-gain regime is investigated. Using the Madey theory, the gain formula of ICL is derived and the output frequency of ICL is obtained from the resonance condition.

(11) Angular Spectrum Property of Spontaneous Emission in a Two-Dimensional Undulator Free-Electron Laser, by L.-F. Peng, Z.-H. Yang, and S.-G. Liu (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 15, pp. 493–499, Sept. 1993.

The angular spectrum of spontaneous emission in a two-dimensional undulator free-electron laser is analyzed theoretically. Numerical calculation shows that the s-th harmonic spontaneous emission power density can be greatly enhanced by using a two-dimensional undulator. Therefore, the higher harmonic operation of a free-electron laser can be realized selectively.

(12) Frequency Stabilization of a Semiconductor Laser Using the Faraday Effect of the Saturated Absorption Spectroscopy Signal of the Rb Atoms, by T. Ueno*, T. Nakazawa*, H. Nakano*, T. Sano*, and M. Shimba** (*Faculty of Engineering, Niigata University, Niigata, 950-21 Japan; **Faculty of Engineering, Tokyo Denki University, Tokyo, 101 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 10–17, Jan. 1993.

The oscillation frequency of a semiconductor laser is stabilized by using the Faraday effect of the Rb-D_2 line, which is a kind of magneto-optical effect, for obtaining the frequency reference. In order to get a Doppler-free frequency reference wihtout any direct laser frequency modulation, a new frequency stabilization that uses the saturated absorption spectroscopy is reported.

(13) Reduction of Amplified Spontaneous Emission (ASE) Noise from Transmitted Soliton Signals with a Nonlinear Amplifying Optical Loop Mirror, by E. Yamada, K. Suzuki, and M. Nakazawa (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 81–88, Apr. 1993.

A new method for reducing amplified spontaneous emission (ASE) noise is presented that uses a nonlinear amplifying loop mirror (NALM). The NALM allows intense signals to pass, but reflects weak signals, and therefore ASE noise whose amplitude is much smaller than the transmitted data signal can be removed. This method is successfully applied to ASE reduction in a 10-Gbt/s soliton transmission over 500 km.

(14) Asymmetry Analysis of Two-Dimensional Optical Phase-Modulation Characteristics of a Microchannel Spatial Light Modulator (MSLM), by T. Hori, H. Toyoda, and T. Hara (The 4th Research Laboratory, Hamamatsu Photonics K.K., Hamamatsu, 434 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 158–163, May 1993.

Two-dimensional optical phase-modulation characteristics of a microchannel spatial light modulator (MSLM) are described. Especially, asymmetry of the optical phase modulation characteristics of the MSLM are analyzed. As a result, optical phase modulation about 2π radians and high diffraction efficiency about 17% are obtained.

(15) Michelson-Type Short Wavelength Linewidth Analyzer (Letters), by A. Otani (Research Laboratory, Anritsu Co., Atsugi, 243 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 192–194, May 1993.

This letter is concerned with the development of a delayed self-homodyne spectrum linewidth measurement system using a Michelson interferometer for short wavelength (from 720 to 900 nm).

(16) Injection Locking of a Semiconductor Laser with Antiphase Optical Self-Injection, by Y. Iida and M. Morita (Faculty of Engineering, Kansai University, Suita, 564 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 261–269, July 1993.

This paper presents theoretical and experimental investigations of injection locking on a semiconductor laser (LD) having an antiphase self-injection system to which a part of LD output is injected by reflection with proper time delay and antiphase to the LD. It is shown that locking range of LD with antiphase self-injection is approximately four times wider than ordinary ones.

(17) Frequency Stabilization of a Semiconductor Laser Using the Magneto-Optical Effect and the Saturated Absorption Optical System, by T. Nakazawa*, H. Nakano*, T. Ueno*, T. Sato*, and M. Shimba** (*Faculty of Engineering, Niigata University, Niigata, 950-21 Japan; **Faculty of Engineering, Tokyo Denki University, Tokyo, 101 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 285–293, Aug. 1993.

The frequency stabilization of a semiconductor laser using the magneto-optical effect and three saturated absorption spectroscopy optical systems are investigated. The frequency control by changing the biased magnetic field strength is provided.

(18) GaAs-pin/Ferroelectric Liquid Crystal Spatial Light Modulator (GaAs-pin/FLC-SLM) and Its Applications, by M. Hashimoto*, S. Ishibashi**, Y. Fukuda***, and K. Kitayama* (*NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan; **NTT Interdisciplinary Research Laboratories, Ibaraki-ken, 319-11 Japan; ***NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 301–312, Aug. 1993.

An optically addressable spatial light modulator, GaAs-pin/ferroelectric-liquid-crystal-SLM, is developed. The device consists of GaAs-pin as photodetector and ferroelectric liquid crystal as modulation device. Experimental results of the device as both a device and a spatial light modulator are given.

(19) Analysis of Dynamic Behavior of an Open-Boundary Cherenkov Laser, by K. Horinouchi and T. Shiozawa (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 331–336, Sept. 1993.

On the basis of the energy conservation relation between an electromagnetic wave and electron beam, the dynamic behavior of an open-boundary Cherenkov laser is theoretically analyzed. It is clarified that the growth of an electromagnetic wave causes the drift velocity of the electron beam to decrease and that this disadvantage can be overcome by gradually increasing the value of the dielectric constant of the dielectric waveguide, thus slowing down the phase velocity of the wave.

(20) Low-Threshold 1.3-μm GaInAsP/InP Circular Planar Buried Heterostructure Surface Emitting Lasers, by T. Baba, Y. Yogo, K. Suzuki, F. Koyama, and K. Iga (Precision and Intelligence Laboratory, Tokyo Institute of Technology, Yokohama, 227 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 367–374, Oct. 1993.

A single-step, maskless planar buried heterostructure regrowth is applied to circular mesas in 1.3-μm surface-emitting laser diodes (SELD's), and pinholes that often appear around the circular mesas are effectively removed. With a cavity constructed by SiO_2/Si dielectric multilayer mirrors, an SELD chip operated at room temperature is obtained under pulsed condition with the threshold current of 34 mA. This value is the lowest recorded to date.

(21) Analysis of Transient Spectral Spread of Directly Modulated DFB LD's, by T. Kawai*, A. Kurihara*, M. Mori*, T. Goto*, A. Miyauchi**, and T. Nakagami*** (*Faculty of Engineering, Nagoya University, Nagoya, 464-01 Japan; **Transmission Division, Fujitsu Ltd., Kawasaki, 211 Japan; ***Communication and Space Division, Fujitsu Ltd., Kawasaki, 211 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 677–683, June 1993.

A subpeak in the time-resolved spectra of DFB LD's that are modulated by 1.6-Gbt/s RZ code is studied experimentally and numerically. Based on the experimental results, the origin of the subpeak is studied numerically.

(22) The Body Fitted Grid Generation with Moving Boundary and Its Application for Optical Phase Modulation, by M. Kuroda* and S. Kuroda** (*Faculty of Engineering, Tokyo Engineering University, Hachioji, 192 Japan; **Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 480–485, Mar. 1993.

A numerical procedure of grid generation having a coordinate line coincident with an arbitrary-shaped moving boundary is applied to a dielectric waveguide with moving boundary. This technique makes it possible not only to analyze the effect of the external disturbance in a coherent optical communication system, but also to fabricate optical modulators or couplers.

(23) Analysis of Excess Intensity Noise due to External Optical Feedback in DFB Semiconductor Lasers on the Basis of Mode Competition Theory, by M. Suhara and M. Yamada (Faculty of Engineering, Kanazawa University, Kanazawa, 920 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1007–1017, June 1993.

Generation mechanism for excess intensity noise due to optical feedback is analyzed theoretically and experimentally. Modal rate equations under the weakly coupled condition with external feedback are derived to include the mode competition phenomena in DFB and Fraday-Perot lasers

(24) First Room Temperature CW Operation of GaInAsP/InP Surface Emitting Laser (Letters), by T. Baba, Y. Yogo, K. Suzuki, F. Koyama, and K. Iga (Precision and Intelligence Laboratory, Tokyo Institute of Technology, Yokohama, 227 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1423–1424, Sept. 1993.

Room temperature CW lasing operation of GaInAsP/InP surface emitting lasers for the first time is achieved. By employing a buried heterostructure with 1.3-μm range active region and a MgO/Si heat sink mirror, CW operation is obtained up to 14°C with the threshold current of 22 mA.

(25) Multiple-Phase-Shift Super Structure Grating DBR Lasers, by H. Ishii, Y. Tohmori, F. Kano, Y. Yoshikuni, and Y. Kondo (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1683–1690, Nov. 1993.

This paper reports on broad-range wavelength tuning characteristics of DBR lasers that make use of a newly proposed multiple-phase-shift super structure grating (SSG). It is found theoretically that the SSG reflector has periodic sharp reflection peaks each with high reflectivities. DBR lasers with multiple-phase-shift SSGs are fabricated and their wavelength-tuning characteristics are studied. The maximum tuning range is 105 nm in the single longitudinal mode under a CW condition.

7) Optical Fibers/Waveguides

(1) Design of Multimode Fiber Coupler: A Theoretical Study (Letters), by D. Guha and A.S. Grewal (Department of Electronics and Computer Engineering, University of Roorkee, Rookee 247 667, India): *JIETE*, vol. 39, pp. 39–44, Jan.-Feb. 1993.

The coupling coefficient of two multimode optical fibers adjacent to each other is studied theoretically by the rigorous and approximate formulae. The variations of several parameters such as separation and diameter are considered, and their effects on the coupling coefficients for the different modes are studied.

(2) Study of the Electrode Materials of CO Laser, by J. Zhang, N.-L. Wu, J.-W. Wang, J. Zhao, and Y.-Z. Xu (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 21, pp. 28–33, Aug. 1993.

The influence of electrode on laser gas stability of CO laser by several kinds of metal materials is investigated. These materials are aluminum, phosphorus copper, OFHC copper, silver copper alloy, stainless steel, nickel, and tantalum. It is found that tantalum is a relative good electrode material for CO laser.

(3) High-Precision, Miniature Optical Fiber Transmission System for Multiple-Path Test Signal, by C.-G. Shao* and J.-R. Qin** (*Shanghai University of Science and Technology, Shanghai, P.R.C.; **No.23 Institute, The Administration of Electronic Industry, Shanghai, P.R.C.): *JIMW*, vol. 12, pp. 352–356, Oct. 1993.

A high-precision optical fiber transmission system used for multiple-path test signals in a special test system is described. A formula used to calculate the required sample rate for the system of high precision is given.

(4) The Bending Performance of Single-Mode Fibers with the Similar Mode Field Diameter and Cutoff Wavelength, by M.-H. Chen*, Y.-D. Wu*, K.-C. Huang*, and S. Chi** (*National Sun Yat-Sen University, Kaohsiung, Taiwan, China; **National Chiao Tung University, Hsinchu, Taiwan, China) *JCIE*, vol. 16, pp. 113–116, Jan. 1993.

Measurements of bending-induced losses in matched-cladding and depressed-cladding single-mode fibers with similar 1300-nm mode field diameters and cutoff wavelengths are reported. It is found that the depressed-cladding fiber demonstrates better microbending and macrobending performances than the matched-cladding fiber.

(5) New Integral Equations for Design of Dielectric Waveguide Bend Circuits: Guided-Mode Extracted Integral Equations, by K. Tanaka (Faculty of Engineering, Gifu University, Gifu, 501-11 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 1–9, Jan. 1993.

Properties in numerical analysis of dielectric waveguide discontinuity problems by new integral equations, which have been previously proposed, are investigated in detail. First, numerical results for the problem of abrupt dielectric waveguide discontinuities are compared with the rigorous solution. Then, the new integral equations are applied to the problem of transmission characteristics of arbitrarily shaped dielectric waveguide bends.

(6) A Fabrication Method of Silica-Based Optical Waveguides with Smooth Side Walles by RF-Bias Sputtering, by K. Akiba*, N. Takegata*, K. Shiraishi**, and S. Kawakami* (*Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan; **Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 18–26, Jan. 1993.

This paper discusses a ridge-shaped glass optical waveguide deposited and buried by RF bias sputtering. Both by computer simulation and by experiments, it is confirmed that smooth side walls are obtained even if the side walls initially have rought surfaces. This effect will enable fabrication of very low scattering loss optical waveguides made by sputtering of glass materials.

(7) Integrated-Multiple-Waveguides Structure Directional Coupler-Type Wavelength Filters, by K. Shimada and T. Kambayashi (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 27–34, Jan. 1993.

An integrated optical filter is proposed and its characteristics are analyzed. The device is composed of vertical 3- or 4-waveguide directional coupler. The design criteria for both demultiplexing and bandpass filter functions are given.

(8) Theoretical Analysis of Signal Light Amplification by Stimulated Raman Scattering in Optical Fibers (Letters), by M. Hosokawa*, S, Seikai**, and H. Miki* (* Faculty of Science and Engineering, Ritsumeikan University, Kyoto, 603 Japan; ** Kansai Electric Power Co., Inc., Amagasaki, 661 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 35–37, Jan. 1993.

Signal light gain caused by stimulated Raman scattering is theoretically studied for fibers with axially non-uniform fiber parameters and circular birefringence due to twist. The non-uniform fiber is divided into small segments as each of those is regarded as uniform light guide.

(9) An Analysis of Nonreciprocal Phase Characteristics of Magneto-Optic Channel Waveguides Using Finite-Element Method, by X.-P. Zhuang and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 41–47, Feb. 1993.

A finite-element method is described for the analysis of magneto-optic waveguides. The formulation is based on the scalar-wave approximation, and a simple iterative method is proposed for solving the nonlinear eigenvalue equation derived from the scalar finite-element approach. To show the validity and usefulness of this approach, examples are computed for magneto-optic rib waveguides and magneto-optic ridge waveguides, and the waveguide structures with greater nonreciprocal phase shift are investigated.

(10) Analysis of Obliquely Propagating Waves Along Dielectric Grating Waveguide with Square Corrugation, by K. Matsumoto*, K. Rokushima*, and J. Yamakita** (*Faculty of Engineering, Osaka Sangyo University, Daito, 574 Japan; **Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 57–64, Mar. 1993.

A numerical analysis is presented for the waveguidance by the dielectric grating waveguides with square corrugation, under the condition of oblique propagation. The numerical examples indicate that peculiar properties of leaky waves, stopbands, and radiation efficiencies appear due to the coupling between TE and TM waves.

(11) Effects of Inhomogeneous Refractive-Index Profile of a Guided Region in Optical Waveguides with a Nonlinear Cladding Medium (Letters), by Y. Satomura and Y. Muroi (Faculty of Engineering, Osaka Institude of Technology, Osaka, 535 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 74–77, Mar. 1993.

Propagation characteristics of TE waves guided by dielectric optical waveguides that consist of a nonlinear cladding and a guided region with inhomogeneous refractive-index profile are investigated. Linear- and exponential-profile types of indices are treated.

(12) Soliton Transmission Control in Time and Frequency Domains, by H. Kubota and M. Nakazawa (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 147–157, May 1993.

Time and frequency domain control techniques to transmit solitons over ultra-long distances are presented. It is shown that the time domain control using an external modulation synchronous to the soliton data can eliminate jitter and nonlinear interaction between adjacent solitons. The theoretical investigations indicate that with solition controls in both the time and frequency domains, the soliton transmission distance becomes unlimited.

(13) Coupling Efficiency of Two Anisotropic Single-Mode Slab Waveguides Butt-Joined by Way of a Gap, by S. Sawa and T. Masuchi (Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 337–343, Sept. 1993.

Power-coupling efficiency between two anisotropic single-mode slab waveguides connected by way of a gap is calculated. Electromagnetic fields in the gap are expressed as a superposition of elementary plane waves propagating back and forth between the waveguides. Effects of the displacement and misalignment angle of the propagation axes of the waveguides as well as refractive index and length of the gap on the coupling efficiency are investigated.

(14) Analysis of Open Type Waveguides by the Combination of Finite Element Method and Boundary Element Method, by T. Ise* and M. Matsuhara** (*Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan; **Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 501–505, Nov. 1993.

A combined method of the finite-element method and the boundary-element method is described for the analysis of open-type waveguides. Open-type waveguides composed of the inhomogeneous finite inner region and the infinite outer region with different media are analyzed by means of this method.

(15) Measurement of Electrooptic Constants in Proton-Exchanged $LiTaO_3$ Optical Waveguides, by S. Kakio and M. Minakata (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 514–522. Nov. 1993.

Annealed proton-exchanges $LiTaO_3$ optical waveguides are characterized for design and fabrication of optical devices. First, the refractive-index changes of the waveguides are carefully measured as a function of annealing time in order to determine the three-dimensional single-mode waveguides. The electrooptic constants of the resulting waveguides are then measured for different annealing time by the phase modulation technique.

(16) A New Measuring Method for Absorption Losses in an Infrared Optical Fiber, by H. Ishiwatari (Matsushita Electric Industrial Co., Ltd., Moriguchi, 570 Japan): *Trans. IEICE*, vol. J76-C-I, pp. 529–535, Dec. 1993.

A new measuring method for absorption losses in an infrared optical fiber is proposed. This method relies on the heat expansion arising from the absorption of the laser in the optical fiber. The absorption coefficient is extracted from the measurement of the longtitudinal change due to the absorption in the fiber. A new technique for obtaining the coefficient of heat transfer of the fiber at room atmosphere is also developed by measuring the transient response of the longitudinal change of the fiber.

(17) Noise Properties of Cascaded Erbium-Doped Fiber Amplifiers in SCM Analog Video Distribution Systems, by H. Yoshinaga, K. Kikushima, and E. Yoneda (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 12–19, Jan. 1993.

Noise properties in cascaded erbium-doped fiber amplifiers (EDFA's) used in subcarrier multiplexed analog video distribution systems are experimentally examined. The noise dependency on signal wavelength is measured for a four-stage EDFA cascade. It is shown that an optical narrow bandpass filter is not necessary after each fiber amplifier for signal wavelength of 1.551 to 1.560 μm and that optical bandpass filters are necessary for shorter wavelength than 1.551 μm to avoid the noise degradation by spontaneous-spontaneous beat noise.

(18) Non-Metallic Optical Fiber Cable with High-Impact Resistant Sheath (Letters), by K. Hogari and T. Hibi (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 32–35, Jan. 1993.

This letter proposes a non-metallic optical fiber cable that contains fiber ribbons inserted into slots with a high-impact resistant sheath that affords protection against shotgun pellets. A non-metallic, 100-fiber cable with a high-impact resistant sheath is manufactured and its performance is evaluated.

(19) Optimum Mode Field Diameter Region in Thermally Diffused Expanded Core Fiber (Letters), by M. Kihara, T. Nakashima, and M. Matsumoto (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 36–38, Jan. 1993.

The existence of optimum expanded mode field diameters in thermally diffused expanded core (TEC) fibers is indicated. The optimum ranges under the experimental conditions are from 14–18 μm for both 1.3-μm single-mode fiber and 1.55-μm dispersion-shifted fiber. By applying the TEC fiber to a multifiber connector, the connection loss can be reduced to less than 0.2 dB without improving fiber and connector ferrule fabrication accuracy.

(20) Suppression of Fiber Four-Wave Mixing in Multichannel Transmissions Using Birefringent Elements (Letters), by K. Inoue (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 1219–1221, Sept. 1993.

A technique for reducing fiber four-wave mixing (FWM) in multi-channel transmissions is proposed. Birefringent elements are inserted on the way of transmission lines. Due to the effect of birefringent elements on the polarization states, the effective crosstalk due to FWM is expected to be 3/16 of that in the worst case in conventional systems.

(21) 8 × 8 Optical Matrix Switch Using Silica-Based Planar Lightwave Circuits, by M. Okuno*, A. Sugita*, T. Matsunaga**, M. Kawachi*, Y. Ohmori*, and K. Katoh* (*NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan; **NTT Communication Switching Laboratories, Musashino, 180 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1215–1223, July 1993.

Design and characteristics of an 8 × 8 matrix switch formed with SiO_2-TiO_2 single-mode waveguides on a Si substrate are presented. The measured loss, switching response characteristics, and wavelength dependence of this switch and the fabricated switch module are described in detail..

(22) Application of Beam Propagation Method to Discontinuities of Weakly Guiding Structures, by M. Hotta*, M. Geshiro*, and S. Sawa** (*Faculty of Engineering, Ehime University, Matsuyama, 790 Japan; **Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1333–1338, Aug. 1993.

This paper describes two simple modifications of the beam propagation method (BPM) to make it relevant in characterizing waveguide discontinuities at which a significant amount of reflection is expected to be observed. One of the two modifications is dealt with in the spatial domain and the other is treated in the spectral domain. Both modifications can easily be incorporated with original BPM computing programs.

(23) Properties of a Strongly-Coupled Nonlinear Directional Coupler with a Lossy MQW Coupling Layer, by X.-J. Meng*, N. Okamoto**, and O. Sugihara** (*Fujikura Co., Ltd., Sakura, 285 Japan; **Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1339–1344, Aug. 1993.

Properties of a strongly-coupled nonlinear directional coupler (NLDC) with a lossy MQW coupling layer is analyzed using the Galerkin finite-element method accompanied by a predictor-corrector algorithm. It is shown that the propagation attenuation along the NLDC is considerably smaller than that in the bulk MQW and tends to reduce with the input power. By the presence of losses, the powers guided in two waveguides do not become a maximum and a minimum at the same propagation length, unlike the lossless coupler.

(24) Effects of Air Gaps on Butt-Joints between Isotropic and Anisotropic Planar Waveguides, by M. Hotta*, M. Geshiro*, K. Kanoh*, and H. Kanetake** (*Faculty of Engineering, Ehime University, Matsuyama, 790 Japan; **Sumitomo Electric Industries, Co., Ltd., Osaka, 554 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1345–1349, Aug. 1993

Power transmission properties are investigated for a butt-joint that contains an air gap between an isotropic planar waveguide and an anisotropic one whose optical axis is lying in the plane defined by the propagation axis and the normal of the waveguide surface. The effect of the air gap and the refractive index of filling liquid as well as axial displacement and angular misalignment are discussed on the basis of numerical results.

(25) Second Harmonic Generation in Poled Polymer Films Doped with α-Cyano Unsaturated Carboxylic Acids, by C. Sugihara*, Y. Hirano*, N. Okamoto*, and Y. Taketani** (*Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan; **Teijin Tokyo Research Center, Hino, 191 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1523–1528, Oct. 1993.

Poled polymer films doped with novel nonlinear organic materials, α-cyano unsaturated carboxylic acid (α-CUCA) derivatives, are prepared. It is found that as the value of hyperpolarizability of the derivatives increases, the second-order nonlinear susceptibility of the film increases. Cerenkov-type second harmonic generation (SHG) of Nd:YAG laser is realized in a poled polymer waveguide doped with the α-CUCA material with a slight absorption at double waveglength.

(26) Temperature Dependence of Signal Gain in Er^{3+}-Doped Optical Fiber Amplifiers Pumped by 0.8 μm Band GaAlAs Laser Diodes (Letters), by M. Yamada, M. Shimizu, K. Yoshino, and M. Horiguchi (NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1529–1532, Oct. 1993.

This letter presents theoretical and experimental results on temperature-dependent gain at signal wavelengths of 1.536 and 1.552 μm for various lengths of Er^{3+}-doped optical fiber pumped by 0.825-μm GaAlAs LD's.

(27) Observation of Nonlinear Waves in a Graded-Index Planar Waveguide with a Kerr-Like Nonlinear Cover (Letters), by K. Ogusu, M. Yoshimura, and H. Komura (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1691–1694, Nov. 1993.

Nonlinear waves in a graded-index planar waveguide with a nonlinear cover are investigated experimentally. The waveguide is fabricated by means of ion-exchange techniques and the nematic liquid crystal MBBA is used as a nonlinear cover material. Specifically, the temperature dependence of he input-output characteristics is investigated.

(28) Analysis of Dielectric Hollow Slab Waveguides Using the Finite-Difference Beam-Propagation Method (Letters), by J. Yamauchi, T. Ando, and H. Nakano (College of Engineering, Hosei University, Koganei, 184 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1195–1197, Nov. 1993.

The finite-difference beam propagation method is applied to the analysis of hollow slab waveguides (HSW's). The attenuation constants for the TE_0 and TM_1 modes are evaluated and compared with those obtained by the perturbation theory. The propagating field and differential power loss in the transition from a straight HSW to a bent HSW are revealed and discussed.

8) Superconductive Devices

(1) The Superconducting Josephson Voltage Standard and the Determination of 2e/h Value, by G. R. Zhou and G.-F. Zhao (203 Institute, the Ministry of Aerospace, Beijing, P.R.C.): *AES*, vol. 21, pp. 82–84, May 1993.

The measurement system of 10-mV superconducting Josephson voltage standard is described. The total uncertainty of the system is 2.4×10^{-8} and its random uncertainty is less than 1×10^{-8} . Because it possesses very high accuracy and reliability, the system is ratified as National Temporary Voltage Natural Standard by the National Monitoring Bureau of Technology and was formally put into operation in August 1992.

(2) A Principle of Operation for High-Temperature Superconducting Infrared Detector with Grain Boundary Structure, by F.-Q. Zhou, J.-H. Hao, X.-J. YI, X.-R. Zhao, H.-D. Sun, and Z.-G. Li (Huazhong University of Science and Technology, Wuhan, Hubei, P.R.C.): *JIMW*, vol. 12, pp. 447–451, Dec. 1993.

A principle of operation for high-temperature superconducting infrared detector with grain boundary structure is proposed in which both bolometric and optically non-equilibrium effects coexist. Responsivities of the detector with the two effects are calculated, and the $YBa_2Cu_3O_{7-x}$ infrared detector with good performances is prepared.

(3) Quenching Characteristics of High-T_c Superconducting Small Antennas, by K. Itoh, O. Ishii, and O. Michikami (NTT Interdisciplinary Research Laboratories, Ibaraki-ken, 319-11 Japan): *Trans. IEICE*, vol. J76-C-II, pp. 413–421, June 1993.

Input power dependence of the radiated power is investigated for small superconductor antennas that are constructed by joining YBCO helical radiators with In solder. As the input power increases, a quenching phenomenon occurs wherein the radiated power saturates and abruptly drops at a certain critical power.

(4) High T_c Superconducting Active Antennas for 50 GHz (Letters), by T. Ohnuma and T. Kuroko (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *IEICE Trans. Commun.*, vol. E76-B, pp. 196–198, Feb. 1993.

High T_c superconducting (SC) active antennas for detecting 50-GHz electromagnetic waves are produced by the magnetron sputtering method. Furthermore, the improvement of the sensitivity of the SC active antennas is demonstrated with the use of a corner reflector.

(5) Microwave Characteristics of High T_c Superconductors by Improved Three-Fluid Model, by T. Imai, T. Skakibara, and Y. Kobayashi (Faculty of Engineering, Saitama University, Urawa, 338 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1275–1279, Aug. 1993.

In order to explain the temperature and frequency characteristics of high-T_c superconductors, a new model is proposed that will be called the improved three-fluid model, where it is assumed that the momentum relaxation time depends on temperature in the superconducting and normal states. According to this model, the complex conductivity and the surface impedance are expressed as a function of temperature.

(6) Microwave Characteristics of a Traveling-Wave-Type $LiNbO_3$ Optical Modulator with Superconducting Electrodes, by K. Yoshida*, N. Horiguchi*, and Y. Kanda** (*Faculty of Engineering, Kyusyu University, Fukuoka, 812 Japan; **Faculty of Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): *IEICE Trans. Electron.*, vol. E76-C, pp. 1287–1290, Aug. 1993.

Microwave characteristics of a $LiNbO_3$ optical modulator employing superconductor electrodes (Pb-In-Au) as a transmission line of a traveling signal are studied experimentally in the temperature range from 300–4.2 K. At frequencies between 8 and 12 GHz it is shown that the modulation efficiency obtained increases when the superconductor undergoes the transition from a normal state to a superconducting state.

9) Special Issues Related to Microwave Theory and Techniques

(1) *JIETE*, vol. 39, no. 6, Nov.-Dec. 1993, is a special issue on Microwave and MM Wave Sources and Applications-Part I.

(1.1) Small-Signal Model for Practical Helix Travelling Wave Tubes Considering the Effects of Severs, Attenuators, and Velocity Tapers, by V. Srivastava and S. N. Joshi (Microwave Tubes Area, Central Electronics Engineering Research Institute, Pilani 333 031, India): pp. 331–338.

(1.2) Computer-Aided Study of Some Re-Entrant Cavity Structures for Klystrons, by M. V. Kartikeyan*, L. M. Joshi*, A. K. Sinha*, H. N. Bandopadhyay*, and D. S. Venkateswarlu** (*Central Electronics Engineering Research Institute, Pilani 333 031, India; **Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi, 221 005, India): pp. 339–344.

(1.3) Design Aspects of a 1-kW Tunable D/E Band Klystron, by A. Sharma, L. M. Joshi, N. C. Gupta, H. N. Bandopadhyay, S. Chander, O. S. Lamba, and G. S. Sidhu (Central Electronics Engineering Research Institute, Pilani 333 031, India): pp. 345–350.

(1.4) On the Electrical Design of Pill-Box Type High-Power Microwave Window, by V. V. P. Singh, S. Chander, L. M. Joshi, A. K. Sinha, and H. N. Bandopadhyay (Microwave Tubes Area, Central Electronics Engineering Research Institute, Pilani 333 031, India): pp. 351–359.

(1.5) Microwave Characterization of an Optically Controlled High Electron Mobility Transistor, by B. K. Mishra, V. Pradeep, and P. Chakrabarti (Department of Electronics and Communication Engineering, Birla Institute of Technology, Ranchi 835 215, India): pp. 361–373.

(1.6) Phase Distortion Assisted MITATT Design for Compensation of Performance Deterioration due to Tunnel Current, by G. N. Dash*, A. K. Panda*, S. P. Pati*, and J. K. Mishra** (*Department of Physics, Sambalpur University, Jyoti Vihar, Sambalpur 768 019, India; **Department of Physics, G M College, Sambalpur 768 004, India): pp. 375–377.

(1.7) Millimeter Wave Applications in Strategic Areas, by A. K. Sen (Institute of Radio Physics and Electronics, University of Calcutta, Calcutta 700 009, India): pp. 379–385.

(1.8) A Simple Model for Anisotropic Loading of a Vane-Loaded Helix for Broad-Band Travelling-Wave Tubes (Letters), by S. Ghosh, S. R. Nagesh, P. K. Jain, and B. N. Basu (Centre of Research in Microwave Tubes, Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): pp. 387–390.

(1.9) Development of Gold Plating Techniques for Integral Heat Sink of IMPATT Diodes (Letters), by M. Mitra, B. Banerjee, and S. K. Roy (Institute of Radiophysics and Electronics, 92, APC Road, Calcutta 700 009, India): pp. 391–392.

(2) *Trans. IEICE*, vol. J76-A, no. 2, Feb. 1993, is a special issue on the SAW Technology for Mobile Communication.

(2.1) Coupled-Mode Theory of SAW Periodic Structures (Invited), by Y. Suzuki*, M. Takeuchi**, K. Nakamura***, and K. Hirota*** (*Faculty of Engineering, Yamanashi University, Kofu, 400 Japan; **Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan; ***Faculty of Engineering, Tohoku University, Sendai, 980 Japan): pp. 87–95.

(2.2) Delta Function Model Analysis of SSBW Spurious Responses in SAW Devices, by K. Hashimoto and M. Yamaguchi (Faculty of Engineering, Chiba University, Chiba, 263 Japan): pp. 96–101.

(2.3) Finite-Element Analysis of SAW Reflection from a Metallic Grating with an Arbitrary Angle of Incidence, by K. Ohbuchi* and M. Koshiba** (*Sapporo School of The Arts, Sapporo, 005 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 102–107.

(2.4) Nonlinear Equivalent Circuits of Acoustic Devices, by Y. Cho and J. Wakita (Faculty of Engineering, Yamaguchi University, Ube, 755 Japan): pp. 108–117.

(2.5) Theoretical Analysis of Nonlinear Effects in Surface Acoustic Waves on Waveguide, by Y. Nakagawa and T. Takanose (Faculty of Engineering, Yamanashi University, Kofu, 400 Japan): pp. 118–124.

(2.6) Analysis of Non-Periodic Transducers for Magnetostatic Wave Devices (Letters), by T. Koike and M. Miyahara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): pp. 125–128.

(2.7) The Characteristics of SAW Materials and the Present Status in Japanese Industries (Invited), by Y. Shimizu (The Center for Research and Development of Educational Technology, Tokyo Institute of Technology, Tokyo, 152 Japan): pp. 129–137.

(2.8) Piezoelectric Properties of ZnO Films Deposited by Using an ECR Sputtering System, by M. Kadota*, T. Kasanami*, and

M. Minakata** (*Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan; **Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 138–144.

(2.9) SAW Resonators Using Epitaxially Grown Al Electrodes, by H. Ieki and A. Sakurai (Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan): pp. 145–152.

(2.10) Dynamic Measurement of Nonlinear Constants of PZT Ceramics, by Y. Cho and F. Matsuno (Faculty of Engineering, Yamaguchi University, Ube, 755 Japan): pp. 153–160.

(2.11) The Mobile Communication Systems and Surface Acoustic Wave Devices (Invited), by K. Yamanouchi (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 161–166.

(2.12) A Method of Design Optimization on IIDT-Type Low-Loss SAW Filters for Mobile Radio Communications, by H. Ohnuki*, N. Hosaka*, and J. Yamada** (*Image & Media System Laboratory, Hitachi, Ltd., Yokohama, 244 Japan; **Radio Communication Systems Project Division, Hitachi, Ltd., Tokyo, 100 Japan): pp. 167–174.

(2.13) A Design Method of a Weak Unidirectional SAW Transducer with a Small Acoustical Reflection Characteristics, by H. Satoh* and K. Yoneya** (*Faculty of Engineering, Tamagawa University, Machida, 194 Japan; **Nihon Dempa Kogyo Co., Ltd., Sayama, 350-13 Japan): pp. 175–184.

(2.14) Nanometer-Fabrication Process and GHz-Range Low-Loss SAW Filters (Invited), by K. Yamanouchi and C.-S. Lee (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 185–192.

(2.15) IIDT-Type SAW Filters Using Withdrawal-Weighted Transducers, by H. Yatsuda, T. Inaoka, Y. Takeuchi, and T. Horishima (Japan Radio Co.. Ltd., Kamifukuoka, 356 Japan): pp. 193–200.

(2.16) Narrow-Gap and Multi-Phase Interdigital Transduser Using Anodic Oxidation Technology, by H. Odagawa, T. Meguro, K. Doi, and K. Yamanouchi (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 201–207.

(2.17) Floating-Electrode-Type SAW Unidirectional Transducers Using Leaky Surface Waves and Their Application to Low-Loss Filters, by M. Takeuchi*, K. Murata**, K. Doi***, and K. Yamanouchi* (*Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan; **Matsushita Electric Industrial Co., Ltd., Moriguchi, 570 Japan; ***Tokyo Electric Power Co., Ltd., Fukushima-ken, 979-13 Japan): pp. 208–218.

(2.18) Composite Longitudinal Mode Resonator-Type SAW Filters, by Y. Yamamoto (Second Transmission Division, NEC Co., Ltd., Kawasaki, 211 Japan): pp. 219–226.

(2.19) 900-MHz Range Wideband Double-Mode SAW Filters, by T. Morita, Y. Watanabe, Y. Ogawa, and Y. Nakazawa (Tokyo Communication Equipment Co., Ltd., Kanagawa-ken, 253-01 Japan): pp. 227–235.

(2.20) Experiments of High-Performance SAW Filters for Mobile Radio Transceivers, by M. Hikita*, T. Tabuchi**, N. Shibagaki*, and T. Akagi*** (*Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan; **Yokohama Works, Hitachi, Ltd., Yokohama, 244 Japan; ***Hitachi Video & Information System Ltd., Yokohama, 244 Japan): pp. 236-244.

(2.21) A Low-Loss Band-Pass Filter Using SAW Resonators, by Y. Satoh, O. Ikata, T. Miyashita, T. Matsuda, and T. Nishihara (Fujitsu Laboratories Ltd., Atsugi, 243-01 Japan): pp. 245–252.

(2.22) Unidirectional Dispersive Interdigital Transducers and Efficient Elastic Convolvers, by K. Yamanouchi, J. Ogata, and N. Mihota (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan) pp. 253–259.

(3) *Trans. IEICE*, vol. J76-B-II, no. 5, May 1993, is a special issue on Next Generation Satellite Communications Technologies.

(3.1) Progress of Radio Communication Technologies Towards Next Generation Satellite Systems (Invited), by N. Morinaga (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 326–336.

(3.2) Satellite Communication Applications to B-ISDN, by M. Kawai, K. Nakaya, H. Hojo, and K. Okada (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 337–344.

(3.3) Study on Multibeam Satellites for Mobile Communications Employing Bandwidth-Variable SAW Filter Banks, by H. Shinonaga and Y. Ito (Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan): pp. 345–353.

(3.4) Transmission Power Control for TDMA Satellite Communication Systems, by H. Kazama*, T. Sakata*, T. Sakai**, and S. Kato* (*NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan; **NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 354–362.

(3.5) Proposal of High Accuracy Positioning Service for Terrestrial Mobile Communication Systems by Using GPS Satellites, by H. Ishikawa, H. Kobayashi, and T. Mizuno (Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan): pp. 363–372.

(3.6) The Effect of Compensation for Rain Attenuation on Earth-Satellite Links by Onboard Sharing Using AMeDAS Data, by T. Matsudo, Y. Karasawa, and T. Shiokawa (Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan): pp. 373–381.

(3.7) Satellite Communication Systems with Low-Earth Orbits and the Effect of Doppler Shift, by M. Katayama*, A. Ogawa*, and N. Morinaga** (*Faculty of Engineering, Nagoya University, Nagoya, 464-01 Japan; **Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 382–390.

(3.8) Study of Tracking System Requirement for Space Laser Communication Equipment On-Board LEO Satellites, by Y. Arimoto, M. Fujise, and Y. Furukawa (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 391–398.

(3.9) A Laser Diode Transmitter for Optical Intersatellite Communications, by M. Nohara, K. Inagaki, and M. Fujise (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 399–406.

(3.10) Multidimensional Coding Schemes in Combined Satellite and Terrestrial Channels, by T. Tsujioka, I. Oka, C. Fujiwara, and T. Okumoto (Faculty of Engineering, Osaka-City University, Osaka, 558 Japan): pp. 407–414.

(3.11) A Mode-Switching Type Burst Demodulator AFC, by K. Enomoto*, S. Kubota*, M. Umehira**, and S. Kato* (*NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan; **Network Systems Development Center, NTT, Yokosuka, 238-03 Japan): pp. 415–421.

(3.12) A Multicast Hybrid ARQ Scheme with Stored Error Recovery, by K. Sakakibara* and M. Kasahara** (*College of Industrial Technology, Amagasaki, 661 Japan; **Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): pp. 422–432.

(3.13) Multicast Data Link Control Protocol for Satellite Channels, by A Fujii*, Y. Nemoto**, and S. Noguchi* (*Research Center for Applied Information Science, Tohoku University, Sendai, 980 Japan; **Computer Center, Tohoku University, Sendai, 980 Japan): pp. 433–441.

(3.14) Development of Multibeam Phased Array Antenna on ETS-VI for S-Band Intersatellite Communications, by M. Tanaka*, S. Kimura*, T. Teshirogi*, Y. Matsumoto**, T. Itoh**, A. Akaishi***, H. Mizutamami***, and S. Okubo**** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **National Space Development Agency of Japan, Tokyo, 105 Japan; ***Mitsubishi Electric Co., Kamakura, 247 Japan; ****Fukui National College of Technology, Sabae, 916 Japan): pp. 442–451.

(3.15) Design and Performance of Millimeter Wave Band Transponder on ETS-VI, by N. Kadowaki*, M. Shimada*, Y. Suzuki*, A. Inoue**, and T. Saito*** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **NEC Co., Yokohama, 226 Japan; ***Fujitsu Limited, Ohtawara, 329-26 Japan): pp. 452–459.

(3.16) Development of a Breadboard Model for the 22-GHz Band Satellite Broadcasting Multibeam Antenna, by H. Shoki*, K. Kawabata*, H. Nakatsuka*, K. Tokunaga*, T. Orikasa*, A. Tsuzuku**, H. Fukuchi**, and S. Ohmori** (*Toshiba Co., Kawasaki, 210 Japan; **Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 460-467.

(3.17) Study on On-Board Large-Mesh Antenna Reflector with High Surface Accuracy, by M. Ueda, H. Tanaka, Y. Kawakami, and I. Ohtomo (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 468–475.

(3.18) A Modular Cable-Mesh Deployable Structure for Large-Scale Satellite Communication Antennas, by A. Meguro, J. Mitsugi, and K. Ando (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 476–484.

(4) *Trans. IEICE*, vol. J76-C-I, no. 11, Nov. 1993, is a special issue on High-Frequency Technologies on Mobile Communications.

(4.1) Design Method of High-Efficiency UHF Band Monolithic Multistage FET Amplifier Using Harmonic Terminating Technique, by T. Takagi*, Y. Ikeda*, Y. Nakajima**, and T. Hashimoto* (*Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; **Optoelectronic and Microwave Devices R & D Laboratory, Mitsubishi Electric Co., Itami, 664 Japan): pp. 389–398.

(4.2) Optimum Design of Low-Voltage and High-Efficiency GaAs Power Module, by M. Maeda, Y. Ota, and O. Ishikawa (Semiconductor Research Center, Matsushita Electric Industrial Co., Ltd., Moriguchi, 570 Japan): pp. 399–406.

(4.3) A High-Efficiency Linear Power Amplifier Using an Envelope Feedback Method, by H. Kosugi*, T. Matsumoto*, T. Uwano*, and T. Enoki** (*Materials and Components Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kadoma, 571 Japan; **Telecom Research Laboratory, Matsushita Communications Industrial Co., Ltd., Yokohama, 226 Japan); pp. 407–413.

(4.4) Analysis of Phase Characteristics on a GaAs FET Power Amplifier for Digital Cellular Portable Telephones, by T. Ishizaki, H. Ikeda, Y. Yoshikawa, and T. Uwano (Materials and Components Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kadoma, 571 Japan): pp. 414–421.

(4.5) Highly Efficient UHF-Band Si Power MOSFET for RF Power Amplifiers, by I. Yoshida*, M. Katsueda*, S. Ohtaka**, Y. Maruyama**, and T. Okabe** (*Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan; **Semiconductor and Integrated Circuits Division, Hitachi, Ltd., Takasaki, 370-11 Japan): pp. 422–429.

(4.6) Design of a Low-Phase Noise VCO for an Analog Cellular Portable Radio Application, by T. Uwano*, Y. Nakagawa**, T. Nakamura**, and T. Ishizaki* (*Materials and Components Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kadoma, 571 Japan; **Matsushita Nittoh Electric Co., Ltd., Kyoto-fu, 610-03 Japan): pp. 430–436.

(4.7) Twin Counter Digital Loop Preset Frequency Synthesizer (TC-DLPS), by Y. Tarusawa, Y. Yamao, and T. Nojima (NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 437–444.

(4.8) High-Speed Frequency Switching Synthesizer Using Fractional N Phase Locked Loop, by H. Adachi*, H. Kosugi*, T. Uwano*, and K. Nakabe** (*Materials and Components Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kadoma, 571 Japan; **Corporate Engineering Division, Matsushita Communication Industrial Co., Ltd., Yokohama, 226 Japan): pp. 445–452.

(4.9) Low-Power Quadrature Modulator IC's for Digital Mobile Communications, by Y. Yamao and S. Saito (NTT Mobile Communications Network Inc., Tokyo, 105 Japan): pp. 453–461.

(4.10) A Direct Conversion Receiver Employing a Frequency Multiplied Digital Phase-Shifting Demodulator, by M. Hasegawa, M. Mimura, K. Takahashi, and M. Makimoto (Tokyo Information Systems Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kawasaki, 214 Japan): pp. 462–469.

(4.11) SAW Filters for High-Power Use in Cellular-Radio Portable Phones, by M. Hikita*, N. Shibagaki*, T. Akagi**, and K. Sakiyama*** (*Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan; **Hitachi Video & Information System Ltd., Yokohama, 244 Japan; ***Yokohama Works, Hitachi, Ltd., Yokohama, 244 Japan): pp. 470–478.

(4.12) A Waveguide Band Pass Filter Made of High Permittivity Ceramics, by Y. Dong, H. Kubo, M. Hano, and I. Awai (Faculty of Engineering, Yamaguchi University, Ube, 755 Japan): pp. 479–487.

(4.13) New Compact Bandpass Filters Using $\lambda_{g0}/4$ Coplanar Waveguide Resonators and a Method for Suppressing These Spurious Responses, by Y. Noguchi* and J. Ishii** (*Faculty of Science and Technology, Kinki University, Higashi-Osaka, 577 Japan; **Faculty of Biology-Oriented Science and Technology, Kinki University, Wakayama-ken, 649-64 Japan): pp. 488–494.

(4.14) A Surface-Mountable Ceramic 3-dB Directional Coupler, by A Takasugi*, I. Awai**, M. Hano**, and R. Kitoh* (*Inorganic Materials Research Laboratory, Ube Industries, Ltd., Ube, 755 Japan; *Faculty of Engineering, Yamaguchi University, Ube, 755 Japan): pp. 495–500.

(5) *IEICE Trans. Commun.*, vol. E76-B, no. 2, Feb. 1993, is a special issue on Land Mobile/Portable Propagation.

(5.1) Theoretical Prediction of Propagation for Future Mobile Communications: Reviewing and Looking Forward (Invited), by F. Ikegami (Faculty of Engineering, Takushoku University, Hachioji, 193 Japan): pp. 51–57.

(5.2) An Overview of Recent Propagation Studies for Land Mobile Communications (Invited), by M. Mizuno, E. Moriyama, and T. Manabe (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 58–64.

(5.3) Outdoor Wideband Mobile-Radio Propagation Studies in Europe(Invited), by R.W. Lorenz (Forschungsinstitut Telekom, Postfach 10 00 03, W-6100 Darmstadt, Federal Republic of Germany): pp. 65–77.

(5.4) Performance of Decision Feedback Equalizers in Simulated Urban and Indoor Radio Channels (Invited), by T.S. Rappaport*, W. Huang**, and M.J. Feuerstein*** (*Mobile and Portable Radio Reseach Group, Bradley Department of Electrical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-1110, USA; **COMSEARCH, Reston VA, USA; ***U.S. West Advanced Technologies, Boulder CO, USA): pp. 78–89.

(5.5) The Realities and Myths of Multipath Propagation (Invited), by S. Yoshida* and M. Mizuno** (*Faculty of Engineering, Kyoto University, Kyoto, 606-01 Japan; **Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 90–97.

(5.6) Analysis of Mountain-Reflected Signal Strength in Digital Mobile Radio Communications, by T. Maeyama, F. Ikegami, and Y. Kitano (Faculty of Engineering, Takushoku University, Hachioji, 193 Japan): pp. 98–102.

(5.7) Wideband Propagation Model for the Analysis of the Effect of the Multipath Fading on the Near-Far Problem in CDMA Mobile Radio Systems, by H. Iwai and Y. Karasawa (Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan): pp. 103–112.

(5.8) Bit Error Rate Performances of Orthogonal Multicarrier Modulation Radio Transmission Systems, by M. Okada, S. Hara, and N. Morinaga (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 113–119.

(5.9) Field Trial and Performance of Land Mobile Message Communications Using Ku-Band Satellite, by F. Takahata*, Y. Hoshino**, T. Baba***, H. Komatsu***, and M. Okuda* (*School of Science and Engineering, Waseda University, Tokyo, 169 Japan; **Planning & Administration Department, Japan Satellite Message Planning Co., Ltd., Tokyo, 107-77 Japan; ***Engineering Department, Japan Communications Satellite Company, Inc., Tokyo, 105 Japan) pp. 120–130.

(5.10) Adaptive Equalization with Dual Diversity-Combining, by K. Misaizu*, T. Matsuoka*, H. Ohnishi*, R. Kohno**, and H. Imai** (*Tokyo Information and Communications Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kawasaki, 214 Japan; **Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): pp. 131–138.

(5.11) Performance of Convolutional Coding with Symbol Erasure for QPSK Frequency-Selective Fading Channels, by H. Zhou and R.H. Deng (Department of Electrical Engneering, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511, Republic of Singapore): pp. 139–147.

(5.12) Performance Analysis of the Capacity Controlled System with Adaptive Equalizer, by H.-J. Lee*, T. Omae**, S. Komaki*, and N. Morinaga* (*Faculty of Engineering, Osaka University, Suita, 565 Japan; **NHK, Tokyo, 150 Japan): pp. 148–154.

(5.13) Feasibility Study on Theoretical Prediction of Mean Field Strength in Small-Cell Mobile Radio Communications (Letters), by T.H. Laksono, F. Ikegami, and Y. Kitano (Faculty of Engineering, Takushoku University, Hachioji, 193 Japan): pp. 155–158.

(5.14) Effects of Antenna Beam Horizonal Rotating and Beam Tilting on Delay Spread Reduction in Mobile Radio (Letters), by T. Tanaka, S. Aoyama, and S. Kozono (NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 159–162.

(5.15) Cascaded Co-Channel Interference Cancelling and Diversity Combining for Spread-Spectrum Multi-Access Over Multipath Fading Channels (Letters), by Y.C. Yoon, R. Kohno, and H. Imai (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): pp. 163–168.

(6) *IEICE Trans. Commun.*, vol. E76-B, no. 4, Apr. 1993, is a special issue on Optical Fiber Cables and Related Technologies.

(6.1) Prospective Operation Technologies for Fiber-Optic Subscriber Loops (Inveited), by Y. Wakui and N. Kashima (NTT Telecommunication Networks Laboratories, Tsukuba, 305 Japan): pp. 329–335.

(6.2) Current Status and Future Prospects of Fiber Optic Local Area Networks (Invited), by M. Takahara (Faculty of Engineering, Yamanashi University, Kofu, 400 Japan): pp. 336–344.

(6.3) Suppression of Stimulated Brillouin Scattering by Intentionally Induced Periodical Residual-Strain in Single-Mode Optical Fibers, by A. Wada, T. Nozawa, T.-O. Tsun, and R. Yamauchi (Fujikura Co., Ltd., Sakura, 285 Japan): pp. 345–351.

(6.4) Relationship of Mechanical Characteristics of Dual Coated Single-Mode Optical Fibers and Microbending Loss, by J. Baldauf, N. Okada, and M. Miyamoto (Fujikura Opto-electronics Laboratory, Sakura, 285 Japan): pp. 352–357.

(6.5) High Density Cable Structure for Optical Fiber Ribbons, by S. Tomita, M. Matsumoto, and T. Tanifuji (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): pp. 358–363.

(6.6) Improvement of Fatigue Behavior of the Spliced Portion on Hermetically Carbon-Coated Fibers, by I. Fujita, M. Hamada, H. Aikawa, H. Ishikawa, K. Osaka, and Y. Asano (Yokohama Research Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): pp. 364–369.

(6.7) Mechanical Optical Switch for Single-Mode Fiber, by M. Shimizu, K. Yoshida, and T. Ohta (Furukawa Electric Co., Ltd., Ichihara, 290 Japan): pp. 370–374.

(6.8) High-Efficiency Erbium-Doped Fibers and High-Performance Optical Components for Optical Fiber Amplifiers, by H. Kanamori, A. Urano, M. Shigematsu, T. Kashiwada, M. Hamada, S. Hirai, H. Suganuma, and M. Nishimura (Yokohama Research Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): pp. 375–381.

(6.9) Brillouin Optical-Fiber Time Domain Reflectometry, by T. Kurashima, T. Horiguchi, H. Izumita, S. Furukawa, and Y. Koyamada (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): pp. 382–390.

(6.10) Optical Cable Network Operation in Subscriber Loops, N. Kashima, T. Kokubun, M. Sao, and Y. Yamamoto (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): pp. 391–401.

(6.11) Optical Fiber Line Surveillance System for Preventive Maintenance Based on Fiber Strain and Loss Monitoring, by I. Sankawa, Y. Koyamada, S. Furukawa, T. Horiguchi, N. Tomita, and Y. Wakui (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): pp. 402–409.

(6.12) Ultrahigh Speed Optical Soliton Communication Using Erbium-Doped Fiber Amplifiers, by E. Yamada, K. Suzuki, H. Kubota, and M. Nakazawa (Telecommunication Field Systems R & D Center, NTT, Ibaraki-ken, 319-11 Japan): pp. 410–419.

(7) *IEICE Trans. Commun.*, vol. E76-B, no. 9, Sept. 1993, is a special issue on Fiber-Optic Microcelluler Radio Communication System and Their Technologies.

(7.1) The New Generation of Wireless Communications Based on Fiber-Radio Technologies (Invited), by K. Morita and H. Ohtsuka (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 1061–1068.

(7.2) Optical Feeder Basic System Design for Microcellular Mobile Radio (Invited), by J. Namiki*, M. Shibutani*, W. Domon*, T. Kanai**, and K. Emura* (*Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan; **C & C Systems Research Laboratory, NEC Co., Kawasaki, 213 Japan): pp. 1069–1977.

(7.3) Microwave and Millimeter-Wave Fiber Optic Technologies for Subcarrier Transmission Systems (Invited), by H. Ogawa (NTT Satellite Communication Systems Laboratories, Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 1078–1090.

(7.4) Optical Fiber-Based Microcelluar Systems: An Overview (Invited), by W. I. Way (Department of Communication Engineering and Center for Telecommunication Research, National Chiao-Tung

University, Hsinchu, Taiwan, Republic of China): pp. 1091–1102.

(7.5) Laser Nonlinearity Compensation for Radio Subcarrier Multiplexed Fiber Optic Transmission Systems (Invited), by N. Tayebi and M. Kavehrad (Department of Electrical Engineering, University of Ottawa, 161 Louis Pasteur Avenue, Ottawa, Ontario, K1N-6N5, Canada): pp. 1103–1114.

(7.6) A Centralized Control Microcell Radio System with Spectrum Delivery Switches, by H. Ichikawa and M. Ogasawara (Radio Systems Laboratories, NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 1115–1121.

(7.7) A Fiber-Optic Passive Double Star Network for Microcelluar Radio Communication Systems Applications, by K. Kumozaki (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): pp. 1122–1127.

(7.8) Performance Analysis of Fiber-Optic Millimeter-Wave Band Radio Subscriber Loop, by H. Harada, H.-J. Lee, S. Komaki, and N. Morinaga (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 1128–1135.

(7.9) Major Factors Affecting Fiber-Optic Transmission System Design for Radio Base Stations, by T. Tsuchiya*, T. Shiraishi**, and J. Arata** (*NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan: **NTT Network Systems Development Center, , Tokyo, 150 Japan): pp. 1136–1144.

(7.10) Performance Improvement in Optical Fiber Feeders for Microcellular Mobile Radio Systems, by M. Shibutani, W. Domon, and K. Emura (Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 1145-1151.

(7.11) Performance of FM Double Modulation for Subcarrier Optical Transmission, by R. Ohtomo and H. Ohtsuka (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 1152–1158.

(7.12) A Novel Optical Receiver for AM/QAM/FM Hybrid SCM Video Distribution Systems, by S. Matsui, K. Suto, K. Kikushima, and E. Yoneda (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): pp. 1159–1168.

(7.13) Atmospheric Optical Communication System Using Subcarrier PSK Modulation, by W. Huang*, J. Takayanagi*, T. Sakanaka**, and M. Nakagawa* (*Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **Information System Research Center, Cannon Inc., Kawasaki, 211 Japan): pp. 1169–1177.

(7.14) A New Frequency Switching/IM3 Reduction Method in Fiber-Optic Microcellular System, by T. Okuno, H. Mizuguchi, S. Komaki, and N. Morinaga (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 1178–1185.

(8) *IEICE Trans. Commun.*, vol. E76-B, no. 10, Oct. 1993, is a special issue on Radar Technology.

(8.1) Suppression of Weibull Radar Clutter (Invited), by D. Fernandes* and M. Sekine** (*Centro Técnico Aerospacial Instituto Technológico de Aeronáutica, 12228-900 São José dos Campos, S.P., Brazil; **Graduate School at Nagatsuta, Tokyo Institute of Technology, Yokohama, 227 Japan): pp. 1231–1235.

(8.2) Recent Progress in Borehole Radars and Ground Penetrating Radars in Japan (Invited), by M. Sato* and T. Suzuki** (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): pp. 1236–1242.

(8.3) Cylindrical Active Phased Array Antenna, by M. Sato, M. Sugano, K. Ikeba, K. Fukutani, A. Terada, and T. Yamazaki (Radio Application Division, NEC Co., Fuchu, 183 Japan): pp. 1243–1248.

(8.4) An X-Band Phased Array Antenna with a Large Elliptical Aperture, by Y. Kuwahara, T. Ishita, Y. Matsuzawa, and Y. Kadowaki (NEC Co., Fuchu, 183 Japan): pp. 1249–1257.

(8.5) Radar Image Cross-Range Scaling Method: By Analysis of Picture Segments, by M. Akei, M. Niwa, M. Shinonaga, H. Miyauchi, and M. Matsumura (Komukai Works, Toshiba Co., Kawasaki, 210 Japan): pp. 1258-1262.

(8.6) Multi-Beam Airborne Pulsed-Doppler Radar System and Its PRF Tuning Effect for Clutter Rejection, by M. Kondo, S. Ishikawa, T. Fujisaka, T. Kirimoto, and T. Hashimoto (Electro-Optics & Systems Development Laboratories, Mitsubishi Electric Co., Kamakura, 247 Japan): pp. 1263–1270.

(8.7) Synthetic Aperture Radar Data Processing Using Nonstandard FFT Algorithm: JERS-1, a Case Study, by R. Lanari* and H. Hirosawa** (*IRECE-CNR, via Diocleziano 328, 80124 Napoli, Italy; **Institute of Space and Astronautical Science, Sagamihara, 229 Japan): pp. 1271–1278.

(8.8) Resolution Enhancement of Pulse Radar by Inversion Method, by X. Wu, I. Arai, K. Kusama, and T. Suzuki (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): pp. 1279–1284.

(8.9) Statistical Property and Signal Processing of Received Wave of Subsurface Radar, by K. Taketomi* and Y. Miyazaki** (*Gifu National College of Technology, Gifu-ken, 501-04 Japan; **Faculty of Engineering, Toyohashi University of Technology, Toyohashi, 440 Japan): pp. 1285–1289.

(8.10) Single-Unit Underground Radar Utilizing Zero-Crossed Synthetic Aperture, by Y. Nagashima*, H. Yoshida*, J. Masuda*, and R. Arioka** (*NTT Technical Assistance and Support Center, Musashino, 180 Japan; **NTT Electronics Technology Inc., Mitaka, 181 Japan): pp. 1290–1296.

(8.11) Detection of Objects Buried in Sandy Ground by a Synthetic Aperture FM-CW Radar, by Y. Yamaguchi and M. Sengoku (Faculty of Engineering, Niigata University, Niigata, 950-21 Japan): pp. 1297–1304.

(8.12) High-Resolution Radar Image Reconstruction Using an Arbitrary Array, by T. Wakayama, T. Sato, and I. Kimura (Faculty of Engineering, Kyoto University, Kyoto, 606-01 Japan): pp. 1305–1312.

(8.13) Laser Radar System for Automobiles, by H. Fukuhara*, T. Yasuma**, and H. Endo*** (*Electronics Research Laboratory, Nissan Motor Co., Ltd., Yokosuka, 237 Japan; **Cab Design Department, Nissan Diesel Motor Co., Ltd., Ageo, 362 Japan; ***Safety System Development Department, Kansei Co., Omiya, 331 Japan): pp. 1313–1317.

(8.14) A Microwave Doppler Radar System for Noncontact Measurement of Head and Finger Movements in Clinical Use, by I. Arai, K. Motomura, and T. Suzuki (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): pp. 1318–1324.

IEICE Trans. Commun., vol. E76-B, no. 12, Dec. 1993, is a special issue on the 1992 International Symposium on Antennas and Propagation.

(9.1) Radio Holographic Metrology with Best-Fit Panel Model of the Nobeyama 45-m Telescope, by H. Deguchi*, M. Masuda*, T. Ebisui*, Y. Shimawaki*, N. Ukita**, K.M. Shibata**, and M. Ishiguro** (*Mitsubishi Electric Co., Kamakura, 247 Japan; **Nobeyama Radio Observatory, National Astronomical Observatory, Nagano-ken, 384-13 Japan): pp. 1492–1499.

(9.2) A Multiple-Shaped Beam Antenna Using a Single-Shaped Reflector, by H. Shoki and K. Kawabata (Research & Development Center, Toshiba Co., Kawasaki, 210 Japan): pp. 1500–1507.

(9.3) Fundamental Experiment of a Rectenna Array for Microwave Power Reception, by T. Itoh, Y. Fujino, and M. Fujita (Communications Research Laboratory, Koganei, 184 Japan): pp. 1508–1513.

(9.4) An Omnidirectional Broad Bandwidth Microstrip Antenna Using a Parasitic Cylinder, by M. Karikomi, T. Matsuoka, and L.W. Chen (Antenna Division, Nihon Dengyo Kosaku Co., Ltd., Tokyo, 179 Japan): pp. 1514–1517.

(9.5) A Consideration of the Thin Planar Antenna with Wire-Grid Model, by N. Ishii and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 1518–1525.

(9.6) Effect of Dimension of Conducting Box on Radiation Pattern of a Monopole Antenna for Portable Telephone, by R. Yamaguchi*, K. Sawaya*, Y. Fujino**, and S. Adachi* (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Communications Research Laboratory, Koganei, 184 Japan): pp. 1526–1531.

(9.7) A Superresolution Technique for Antenna Pattern Measurements, by Y. Ogawa*, T. Nakajima**, H. Yamada***, and K. Itho* (*Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan; **Research & Development Center, Toshiba Co., Kawasaki, 210 Japan; ***Faculty of Engineering, Niigata University, Niigata, 950-21 Japan): pp. 1532–1537.

(9.8) Simultaneous Reconstruction for the Telegraph Equation in a Stratified Half-Space Using 3-D Reflectivity, by S. He*, R. Hellberg*, and V. H. Weston** (*Department of Electromagnetic Theory, Royal Institute of Technology, S-100 44 Stockholm, Sweden; **Department of Mathematics, Purdue University, West Lafayette, IN 47907 USA): pp. 1538–1545.

(9.9) Two-Dimensional Active Imaging of Conducting Objects Buried in a Dielectric Half-Space, by Y. He*, T. Uno*, S. Adachi*, and T. Mashiko** (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **NTT Basic Research Laboratories, Musashino, 180 Japan): pp. 1546–1551.

(9.10) Analysis of Abrupt Discontinuties in Weakly Guiding Waveguides by a Modified Beam Propagation Method, by M. Hotta*, M. Geshiro*, and S. Sawa** (*Faculty of Engineering, Ehime University, Matsuyama, 790 Japan; **Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): pp. 1552–1557.

(9.11) Ray Mode Coupling Analysis of Plane Wave Scattering by a Trough, by H. Shirai* and K. Hirayama** (*Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan; **Hino Works, Toshiba Co., Hino, 191 Japan): pp. 1558–1563.

(9.12) Rain Depolarization Characteristics Related to Rainfall Types on Ka-Band Satellite-to-Ground Path, by Y. Maekawa, N. S. Chang, and A. Miyazaki (Osaka Electro-Communication University, Neyagawa, 572 Japan): pp. 1564–1570.

(9.13) Full-Wave Analysis of the Australian Omega Signal Observed by the Akebono Satellite, by I. Nagano*, P. A. Rosen**, S. Yagitani*, M. Hata*, K. Miyamura***, and I. Kimura**** (*Faculty of Engineering, Kanazawa University, Kanazawa, 920 Japan; **Jet Propulsion Laboratory, Pasadena, CA 91109 USA; ***PFU, Unokemachi, 929-11 Japan; ****Faculty of Engineering, Kyoto University, Kyoto, 606-01 Japan): pp. 1571–1578.

(9.14) Circularly Polarized Slot FED Patches and Conical Beam Array (Letters), by M. Himdi*, J.-P. Daniel* and K. Itoh** (*Laboratoire Structures Rayonnantes. U.R.A. 834, University of Rennes I, France; **Faculty of Engineering, Chiba University, Chiba, 260 Japan): pp. 1579–1582.

(9.15) FDTD Analysis of a Monopole Antenna Mounted on a Conducting Box Covered with a Layer of Dielectric (Letters), by L. Chen*, T. Uno*, S. Adachi*, and R. J. Luebbers** (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Department of Electrical Engineering, The Pennsylvania State University, Univ. Park, PA 16802 USA): pp. 1583–1586.

(9.16) Spectral Domain Analysis for Scattering Properties of Periodic Arrays on Dielectric Substrates (Letters), by H. Wakabayashi*, M. Kominami*, H. Kusaka*, and H. Nakashima** (*Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan; **Technical Center, Central Glass Co., Ltd., Matsusaka, 515 Japan): pp. 1587–1589.

(9.17) Effects of Integration Time on Rain Attenuation Statistics at 20 GHz (Letters), by H. Fukuchi (Communications Research Laboratory, Koganei, 184 Japan): pp. 1590–1592.

(9.18) Tropospheric Propagation Characteristics at Ku-Band for Satellite-to-Ground and LOS Paths in Surabaya, Indonesia (Letters), by G. Brussaard, J. Dijk, K. Liu, and J. Derksen (Eindhoven University of Technology, EH 11.03, P.O.Box 513, 5600 MB Eindhoven, The Netherlands): pp. 1593–1597.

(10) *IEICE Trans. Electron.*, vol. E76-C, no. 1, Jan. 1993, is a special issue on Opto-Electronics and LSI.

(10.1) Photonic LSI: Merging the Optical Technology into LSI(Invited), by Y. Mizushima (Hamamatsu Photonics, Hamamatsu, 435 Japan): pp. 4–12.

(10.2) Sub-Half Micron Exposure System with Optimized Illumination (Invited), by A. Suzuki and M. Noguchi (Semiconductor Production Equipment Group, Canon Inc., Kawasaki, 211 Japan): pp. 13–18.

(10.3) Phase-Shifting Technology for ULSI Patterning (Invited), by T. Terasawa and S. Okazaki (Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): pp. 19–25.

(10.4) Recent Progress in KrF Excimer Laser Lithography (Invited), by M. Nakase (Research & Development Center, Toshiba Co., Kawasaki, 210 Japan): pp. 26–31.

(10.5) Application of Photoexcited Reaction to VLSI Process (Invited), by Y. Horiike (Faculty of Engineering, Hiroshima University, Higashi-Hiroshima, 724 Japan): pp. 32–40.

(10.6) Electrical Characteristics of Silicon Devices After UV-Excited Dry Cleaning, by Y. Sato, R. Sugino, M. Okuno, T. Nakanishi, and T. Ito (Fujitsu Laboratories Ltd., Atsugi, 243-01 Japan): pp. 41–46.

(10.7) Synchrotron Radiation Induced Direct Projection Patterning of Aluminum on Si and SiO_2 Surfaces, by F. Uesugi and I. Nishiyama (Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 47–54.

(10.8) Measurement of High-Speed Devices and Intergrated Circuits Using Electrooptic Sampling Technique, by T. Nagatsuma (NTT LSI Laboratories, Atsugi, 243-01 Japan): pp. 55–63.

(10.9) A High-Speed Flat Panel In-Process Test System for TFT Array Using Electrooptic Effects (Invited), by F. Henley*, Y.-M. Liu*, and K. Otsuka** (*Photon Dynamics, Inc., 1504 McCarthy Blvd. Milpitas, CA 95035 USA; **Photon Dynamics, Inc., Tokyo, Japan): pp. 64–67.

(10.10) Integrated Circuits for Ultra-High-Speed Optical Fiber Transmission Systems (Invited), by K. Hohkawa, S. Matsuoka, K. Hagimoto, and K. Nakagawa (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): pp. 68–77.

(10.11) High-Definition Television (HDTV) Solid State Image Sensors (Invited), by S. Manabe and N. Harada (ULSI Research Center, Toshiba Co., Kawasaki, 210 Japan): pp. 75–85.

(10.12) Low-Temperature Poly Si TFT and Liquid Crystal Polymer Composite for Brighter Video Projection System (Invited), by M. Yuki (Research Center, Asahi Glass Co., Ltd., Yokohama, 221 Japan): pp. 86–89.

(10.13) Optical Interconnections as a New LSI Technology (Invited), by A. Iwata* and I. Hayashi** (*NTT LSI Laboratories, Atsugi, 243-01 Japan; **Optoelectronics Technology Research Laboratory, Tsukuba, 300-26 Japan): pp. 90–99.

(10.14) Optical Semiconductor Devices for Interconnection Approach from Optical Transmission Scheme (Invited), by

H. Imai (Fujitsu Laboratories Ltd., Atsugi, 243-01 Japan): pp. 100–105.

(10.15) Optoelectronic Integrated Circuits Grown on Si Substrates (Invited), by T. Egawa, T. Jimbo, and M. Umeno (Department of Electrical and Computer Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): pp. 106–111.

(10.16) A Complementary Optical Interconnection for Inter-Chip Networks, by H. Furuyama and M. Nakamura (Research & Development Center, Toshiba Co., Kawasaki, 210 Japan): pp. 112–117.

(10.17) Proposed Optoelectronic Cascadable Multiplier on GaAs LSI, by K. Nakajima and Y. Mizushima (Hamamatsu Photonics, Hamamatsu, 435 Japan): pp. 118–123.

(11) *IEICE Trans. Electron.*, vol. E76-C, no. 2, Feb. 1993, is a special issue on Optical/Microwave Interaction Devices, Circuits and Systems.

(11.1) Optical Control of Millimeter Waves in the Semiconductor Waveguide (Invited), by M. Tsutsumi and A. Alphones (Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): pp. 175–182.

(11.2) High-Speed Ti:$LiNbO_3$ and Semiconductor Optical Modulators (Invited), by K. Kawano (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 183–190.

(11.3) Hybrid Photonic-Microwave Systems and Devices (Invited), by P. R. Herczfeld (Center for Microwave-Lightwave Engineering, Drexel University, Philadelphia, PA 19014 USA): pp. 191–197.

(11.4) Optical Technologies for Phased-Array Antennas (Invited), by A. Seeds (Department of Electronic and Electrical Engineering, University College London, Torrington Place, London, WC1E 7JE, England): pp. 198–206.

(11.5) Selective Mode-Control with Optically Induced Plasma on Coupled Microstrip Lines with a Tuning Slot, by Y. Horii, T. Nakamura, T. Nakagawa, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 207–213.

(11.6) Design of Ultrawide-Band, High-Sensitivity p-i-n Protodetectors, by K. Kato, S. Hata, K. Kawano, and A. Kozen (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 214–221.

(11.7) Optical Sampling of Electrical Signals in Poled Polymeric Media, by M. Yaita and T. Nagatsuma (NTT LSI Laboratories, Atsugi, 243-01 Japan): pp. 222–228.

(11.8) Characterization of Inverted Slot Line for Travelling-Wave Optical Modulator, by T. Yoneyama and T. Iwasaki (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 229–237.

(11.9) Improvement of the Performance of a Shielded Velocity-Matched Ti:$LiNbO_3$ Optical Modulator by Using a Ridge Structure, by K. Kawano (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 238–243.

(11.10) Simplified Analysis of Coplanar Waveguide for $LiNbO_3$ Optical Modulator by Variational Method, by T. Kitazawa*, D. Polifko**, and H. Ogawa** (*Faculty of Engineering, Ibaraki University, Hitachi, 316 Japan; **ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 244–250.

(11.11) Fiber-Optic Microwave Subcarrier Transmission Links Using Laser Diodes as Receiving Mixer, by H. Ogawa, H. Kamitsuna, and D. Polifko (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 251–256.

(11.12) Comparison of Traveling-Wave External Modulator Microwave Mixers, by D. Polifko and H. Ogawa (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 257–263.

(11.13) Fiber-Optic Microwave Links Using Balanced/Image Canceling Photodiode Mixing, by H. Kamitsuna and H. Ogawa (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 264–270.

(11.14) Performance Analysis of Optical Fiber Link for Microcellular Mobile Communication Systems, by H. Mizuguti, T. Okuno, S. Komaki, and N. Morinaga (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 271–278.

(11.15) Fiber-Optic Microcell Radio System with a Spectrum Delivery Switch, by H. Ichikawa, H. Ohtsuka, and T. Murase (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 279–286.

(11.16) Reflection-Induced Degradations in Optical Fiber Feeder for Microcellular Mobile Radio Systems, by M. Shibutani, W. Domon, and F. Emura (Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 287–292.

(11.17) The Effects of Laser Phase Noise on Optical Coherent Coded Subcarrier Multiplexing System with Distributing Local Oscillator in Local Loop, by T. Ohtsuki, I. Sasase, and S. Mori (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): pp. 293–300.

(11.18) Reflection Characteristics of Optically-Controlled Microwave Through an Open-Ended Microstrip Line (Letters), by H. Shimasaki and M. Tsutsumi (Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): pp. 301–304

(11.19) Optical Waveguide Phase Controller for Microwave Signals Generated by Heterodyne Photodetection (Letters), by Y. Kamiya*, W. Chujo**, and M. Fujise** (*Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan; **ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 305–307.

(12) *IEICE Trans. Electron.*, vol. E76-C, no. 6, June 1993, is a special issue on Microwave and Millimeter-Wave Technology for Advanced Functions and Size-Reductions

(12.1) AlGaAs/GaAs Heterojunction Bipolar Transistor IC's for Optical Transmission Systems, by N. Nagano*, T. Suzaki**, M. Soda**, K. Kasahara*, and K. Honjo* (*Microwave Research Laboratories, NEC Co., Tsukuba, 305 Japan; **Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 883–890.

(12.2) Focused Ion Beam Trimming Techniques for MMIC Circuit Optimization, by T. Ishikawa, M. Komaru, K. Itoh, K. Kosaki, Y. Mitsui, M. Otsubo, and S. Mitsui (Optoelectronic and Microwave Devices Laboratory, Mitsubishi Electric Co., Itami, 664 Japan): pp. 891–900.

(12.3) A High-Power-Added Efficiency GaAs Power MESFET and MMIC Operating at a Very Low Drain Bias for Use in Personal Handy Phones, by S. Murai, T. Sawai, T. Yamaguchi, and Y. Harada (Semiconductor Research Center, Sanyo Electric Co., Ltd., Hirakata, 573 Japan): pp. 901–906.

(12.4) Recessed-Gate Doped-Channel Hetero-MISFET's (DMT's) for High-Speed Laser Driver IC Application, by Y. Suzaki*, H. Hida*, T. Suzuki**, S. Fujita**, and A. Okamoto* (*Microelectronics Research Laboratories, NEC Co., Tsukuba, 305 Japan; **Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 907–911.

(12.5) Microwave Characteristics of Alumina-Glass Composite Multi-Laser Substrates with Co-Fired Copper Conductors, by Y. Taguchi, K. Miyauchi, K. Eda, and T. Ishida (Materials and Components Research Laboratory, Matsushita Electric Industrial Co., Ltd., Kadoma, 571 Japan): pp. 912–918.

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