Asia–Pacific Abstracts

Papers from Journals Published in Australia, India, China, Korea, and Japan in 1995

Compiled by Prof. M. Koshiba, Division of Electronics and Information Engineering, Hokkaido University, Sapporo, 060 Japan, and Prof. S.-J. Xu, Department of Radio and Electronics, the University of Science and Technology of China, Hefei, Anhui, 230 026 P.R.C.

The periodicals investigated 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*), Inida, 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) *Journal of the Korean Institute of Telematics and Electronics* (*JKITE*), Korea, 12) *Journal of the Korean Institute of Communication Science* (*JKICS*), Korea, 13) *Transactions of the Institute of Electronics, Information and Communication Engineers* (*Trans. IEICE*), Japan, 14) *IEICE Transactions on Communications* (*IEICE Trans. Commun.*), Japan, and *IEICE Transactions on Electronics* (*IEICE Trans. Electron.*), Japan.

The Korean papers published in *JKITE* and *JKICS* have been investigated by Prof. J.-W. Ra, Department of Electrical Engineering, Korean Advanced Institute of Science and Technology, Taejon, 305–701, Korea.

As for the Japanese papers in the *Trans. IEICE* that carry volume numbers J78-B-II and J78-C-I, short English summaries are found in the *IEICE Trans. Commun.*, vol. E78-B and *IEICE Trans. Electron.*, vol. E78-C, issued in the same month. Papers carrying volume numbers E78-B and E78-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 translations 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 1994 issues (no. 5 and no. 6) of the *JIETE* which were not available last year are included in the present Asia-Pacific Abstracts. Also, the 1995 issues (no. 5 and no. 6) of the *JIETE* are not available in Japan at the deadline of the Asia-Pacific Abstracts and will be reported next time.

Publisher Item Identifier S 1051-8207(96)08541-8.

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).

I. Solid-State Microwave Devices and MMIC's

(1) Burst Signal Synchronization Characteristics of Solid-State Microwave Oscillators, by S. Sarkar (Physics Department, Burdwan University, Burdwan 713 104, India): *JIETE*, pp. 113–118, Mar.-Apr. 1995.

The problem of direct synchronization of a solid-state microwave oscillator in the face of a burst like input signal is critically examined. Effects of the intune, the off-tune carrier, and the loaded cavity on the system response are considered. Two methods are suggested to improve the tracking response of the oscillator.

(2) The Dependence of the Input Impedance on the Cavity Parameters of a Resonant Cap Impatt Oscillator in the X Band, by D. Ghoshal and S. K. Roy (Centre of Advanced Study in Radiophysics and Electronics, Calcutta University, Calcutta, 700 009, India): *JIETE*, pp. 201–205, May-June 1995.

Electromagnetic field equations related to the resonant cap structure are solved to obtain the real and imaginary parts of the input impedance at the device plane. It is shown that the resistive part of the input impedance seen by the device remains almost constant with increasing effective cap radius but it increases with increasing cap height. Resistive part decreases with post radius and cap thickness. The reactive part of the input impedance increases with increasing effective cap radius, cap height, and cap thickness while reactance decreases with increasing post radius.

(3) Experimental Study of W-Band Optically Controlled Subharmonic Gunn Diode Oscillator, by X.-W. Zhu, Y.-Y. Chen, and S.-F. Li (Southeast University, Nanjing, P.R.C.): *AES*, vol. 23, pp. 110–112, Feb. 1995.

A W-band optically controlled subharmonic gunn diode oscillator is presented. The semiconductor Si piece is loaded in the cavity of the optically controlled oscillator. The Si piece in the oscillator is illuminated by GsAs/GaAlAs laser emitting at a wavelength of 0.863 μm through optical fiber. The optical turning frequency shift of 7 MHz is observed in experiment.

(4) A Novel Method for Extracting Equivalent Circuit Parameters of Microwave FETs, by X.-J. Xu and C.-Y. Shen

(Southeast University, Nanjing, P.R.C.): *AES*, vol. 23, pp. 13–19, Mar. 1995.

An improved simulated annealing method is presented. The method is based on adjusting and compressing the parameter bounds, following the tracks of optimal point and introducing the uniform experiment into Metropolis procedure. The method is successfully applied to the extraction of the parameters of equivalent circuits of microwave FET's. It is verified by the optimization results that this approach is less time consuming and more efficient than the tree annealing and hybrid gradient descent and tree annealing approach.

(5) A Simulation Study for Improving Low Current Characteristics in Microwave Power Transistors, by X.-L. Lin* and E.-J. Zhu** (*Peking University, Beijing, P.R.C.; **Maipu Microwave Device, Co., Beijing, P.R.C.): *AES*, vol. 23, pp. 36–39, May 1995.

Transit times of silicon microwave power transistors with a novel structure of $N^{+}IP$ emitter are regionally calculated by one-dimensional numerical simulation. The results indicate that its low current characteristics at the cut-off frequency can be obviously improved.

(6) 8 mm Miniature Low Phase Noise Phase-Locked Source, by X.-H. Yun, C.-H. Yun, G.-C. Zhang, and B.-H. Zhou (NUST, Nanjing, P.R.C.): *JIMW*, vol. 14, pp. 381–386, 1995.

A millimeter wave phase-locked source is designed by the principle of miniaturization and low phase noise. Some high-performance components are chosen, and the millimeter wave high density assembly technology and SMT are utilized. The millimeter wave phase-locked source developed possesses a lot of advantages, such as small size, low phase noise, fast locking, and high reliability.

(7) Electrooptic Sampling of Internal Microwave Signals in GaAs Coplanar Waveguides, by G. Jia, M.-B. Yi, W. Sun, J. Cao, J.-G. Sun, J.-S. Wang, L. Qin, and D.-S. Gao (Jilin University, Changchun, P.R.C.): *JE*, vol. 17, pp. 197–200, Mar. 1995.

A coaxial reflection-mode electrooptic sampling system is presented. This system has a temporal resolution less than 20 ps and spatial resolution less than 3 μm. The internal microwave signals in GaAs waveguides are probed by the system. This system will be applied to on-wafer tests of internal characters of GaAs high-speed integrated circuits.

(8) Steady-State Analysis of Microwave MESFET Oscillators by Modified Nonlinear Current Method, by C.-L. Chen, X.-N. Hong, and B.-X. Gao (Tsinghua University, Beijing, P.R.C.): *JM*, vol. 11, pp. 50–55, Mar. 1995.

This paper presents a new technique for nonlinear steady-state analysis of microwave MESFET oscillators by a modified nonlinear current method. The modified nonlinear current method is presented to analyze steady state response of MESFET microwave oscillators. The present method avoids disadvantages of the traditional one and can deal with multi-dimensional nonlinear circuits.

(9) The Design of a Step Recovery Diode (SRD) Multiplier, by H. Chen (no. 54 Research Institute of Ministry of Electronic Industry, Shijiazhuang, P.R.C.): *JM*, vol. 11, pp. 222–227, Sept. 1995.

Resonant and output coupled circuits in SRD multiplier using parallel coupled transmission line are proposed. The C-band multiplier given in the paper can work steadily from 0°C to 40°C.

(10) Microwave Monolithic Integrated Active Inductor, by D.-B. Wei (Beijing University of Aeronautics and Astronautics, P.R.C.): *JM*, vol. 11, pp. 312–315, Dec. 1995.

A new topology of microwave inductor with relatively higher Q value realized by GaAs MMIC is proposed. Its principle circuit is composed of three MESFET's and one capacitor. This kind of active inductor possesses a lot of advantages, such as high working frequency, no limitation on the inductance value to the chip area, and inductance controllability through bias voltage.

(11) An Ultra Low Cost and Miniature 950–2050 MHz GaAs MMIC Downconverter-1: Design Approach and Simulation (Letters), by T.-H. Hsieh*, H. Wang*, T.-H. Wang*, T.-H. Chen**, Y.-C. Chiang**, S.-T. Tseng**, A. Chen**, and E.-Y. Chang** (*National Chiao Tung University, Hsinchu, Taiwan, China; **Hexawave Photonic System, Inc., Hsinchu, Taiwan, China): *JCIE*, vol. 18, pp. 437–444, 1995.

A miniature ultra low cost 950–2050 MHz GaAs MMIC downconverter is designed for satellite TV application using a 1-μm gate-length, ion-implanted GaAs MESFET foundry process. To accurately predict circuit performances, both linear and nonlinear circuit models are developed to characterize the RF and DC behaviors of device. Modeled simulation results show correspondence with the experimental data. This monolithic downconverter is comprised of an RF LNA, a dual-gate MESFET mixer, an IF variable gain amplifier, and a varator turned oscillator. The primary design specifications are 1) 50-dB conversion gain, 2) 4-dB noise figure, 3) more than 40-dB gain controllable range, and 4) 50-dBc third-order intermodulation distortion. The chip size is $1.4 \times 1.5 \times 0.18$ mm^3.

(12) GaAs Metal-Semiconductor-Metal Photodetectors (MSM-PD's) with AlGaAs Cap and Buffer Layers (Letters), by R.-H. Yuang, J.-L. Shieh, R.-M. Lin, and J.-I Chyi (National Central University Chungli, Taiwan, China): *JCIE*, vol. 18, pp. 445–449, 1995.

GaAs metal-semiconductor-metal photodetectors with AlGaAs cap and buffer layers are fabricated and studied. It is shown that the trap-induced effects which result from the GaAs surface trap states can be avoided by adding an AlGaAs cap layer. In addition, an AlGaAs buffer layer is used to reduce the interfacial change effects between the GaAs substrate and the GaAs absorption layer. The dark currents are less than 1 nA and the low frequency internal gain is dramatically improved. The results also show that a complete depletion can occur even at biases below 0.5 V.

(13) Design of MIC Gunn Oscillator Using a Dielectric Resonator, by J. C. Jung*, S. K. Jeon**, S. M. Park*, and M. S. Lee*** (*Agency for Defense Development, Taejon, Korea; **Department of Telecommunication, Tongueong Fisheries Junior College, Chungmu, Korea; ***Department of Research Institute of Automation and Computer Engineering, Gyeongsang University, Jinju, Korea): *JKITE*, vol. 32-A, pp. 281–290, Feb. 1995.

An X-band highly frequency-stabilized MIC Gunn oscillator using a dielectric resonator is fabricated. Resonant frequency is obtained by a variational method and it is studied how the oscillating characteristics can be affected by several factors. By optimizing these factors, we can realize the stabilized oscillator output of 250 mW with 5–7 percent efficiency at 10 GHz.

(14) A Study on the Design and Properties of Ferrite Chip Noise Filter, by C. H. Lee, W. S. Kim, and K. Y. Kim (Ceramic Processing Center, KIST, Korea): *JKITE*, vol. 32-A, pp. 611–618, Apr. 1995.

Three models for the transformation of ferrite chip noise filter that has jagged type of electrode into cylindrical ferrite bead filter are presented. The properties of filters are also calculated based on the proposed models. The measured properties of ferrite chip noise filter with jagged-type electrode fabricated with Ag electrode and Ni-Zn ferrite reveal that the model 3 is the best one to describe the behavior of filters.

(15) The Design and Fabrication of the Drop-in Style 35 GHz Millimeter Wave VCO Utilizing Gunn Diode, by K. W. Yeom (LTI Co., Korea): *JKICS*, vol. 20, pp. 815–823, Mar. 1995.

A novel design of a drop-in style millimeter wave VCO operating at 35 GHz is proposed. Compared with waveguide Gunn oscillators, it makes possible to integrate directly with microstrip style integrated circuits without any difficulty. Furthermore, it will give the better reliability in vibration, mechanical shock, and acceleration.

(16) A Study on the Design of X-Band 4-Bit Phase Shifter Using GaAs MESFETs, by J. S. Kim* and Y. G. Koo** (*Hyundai Electronics, Korea; **Department of Electrical Engineering, Hongik University, Seoul, Korea): *JKICS*, vol. 20, pp. 1344–1353, May 1995.

In this paper an X-band 4-bit phase shifter is designed and fabricated by applying loaded line types to 22.5° phase bit and 180° phase bit, respectively, on microstrip substrate using packaged GaAs MESFET's as switch devices. The GaAs MESFET switch modeling techniques and design techniques for each phase bit are represented. On this basis the switch model parameters are extracted, a 4-bit digital phase shifter circuit is constructed on microstrip substrate, and 16 step phase shifts and insertion losses are measured.

(17) A Study on the Employment of the Voltage Controlled Oscillator Used in 900 MHz Mobile Communication for Higher Frequencies, by K. W. Yeom* and M. S. Lee** (*LTI Co., Korea; **Korea Telecomunication System Development Center, Korea): *JKICS*, vol. 20, pp. 2236–2245, Aug. 1995.

In mobile communication system using 900 MHz frequency spectrum, the VCO circuit composed of two bipolar transistors is widely used because, compared with other VCO circuits, it can be implemented in small area with the surface mountable chip components. Furthermore the implemented circuit gives the merits such as low DC current consumption, low S/N, and low C/N. In this paper, because of the merits of this VCO circuit, the problem of the selection of active device is analyzed in case of the employment of this circuit in higher frequencies.

(18) Integration of a Microstrip Slot Antenna with LNA at 2.45 GHz Band, by Y. C. Noh, N. H. Myung, and S. D. Choi (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKICS*, vol. 20, pp. 2601–2609, Sept. 1995.

In this paper, an active antenna is designed and fabricated by integrating an LNA with a microstrip slot antenna. In the integrating process, an input matching circuit of the LNA is implemented by using the input impedance of the microstrip slot antenna. By doing this, it can reduce the discontinuity of the input matching circuits.

(19) A Design of Injection-Locked Oscillator for Optically Fed Phased-Array Antenna Systems, by S. Y. Lee*, J. Y. Lee*, D. H. Lee*, and U. S. Hong** (*Department of Radio Science Engineering, Kwangwoon University, Seoul, Korea; **Department of Electrical and Communication Engineering, Kwangwoon University, Seoul, Korea): *JKICS*, vol. 20, pp. 2627–2635, Sept. 1995.

In this paper, ILO (injection-locked oscillator) for optically fed phased-array antenna systems is developed. The circuit, which utilizes MESFET and HEMT two-stage wideband amplifier and dielectric resonator for feedback element, is designed at 11 GHz and significantly reduces AM, FM, and PM noise degradation.

(20) A New Design of the GHz VCO Based on the GaAs SCFL and MUX, by J. Y. Kim, K. W. Kim, and B.C. Lee (Department of Electrical Engineering, Yonsei University, Seoul, Korea): *JKICS*, vol. 20, pp. 2838–2845, Oct. 1995.

A GHz VCO based on GaAs SCFL and MUX is successfully designed with HSPICE simulation. The VCO is composed of analog MUX and delay cells. Each elements operate in differential mode, therefore this VCO has high immunity against temperature variations and power supply noise.

(21) Design and Implementation of the 1.8 $\sim$ 1.9 GHz Wireless Digital Tranceiver for DECT, by W. J. Byun, J. W. Yu, and N. H. Myung (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKICS*, vol. 20, pp. 3117–3126, Nov. 1995.

In this paper, a wireless transceiver for personal communications in the frequency of 1.8$\sim$1.9 GHz is designed and implemented. For the system integration, the techniques of direct up conversion for transmitter and single down conversion for receiver are employed.

(22) Performance Degradation Analysis of a DS/CDMA Mobile Station Using the Non-Linear Power Amplifier, by J. I. Oh*, N. Kim*, N. S. Kim**, and J. S. Kim*** (*Department of Information and Communication Engineering, Chungbuk National University, Cheongju, Korea; **Department of Information and Communication Engineering, Cheongju University, Cheongju, Korea; ***Electronics and Telecommunication Research Institute, Taejon, Korea): *JKICS*, vol. 20, pp. 3562–3569, Dec. 1995.

The performance degradation of a DS/CDMA mobile station using a nonlinear power amplifier is analyzed. While a linear modulation scheme requires a linear power amplifier for the spectrum efficiency, a DS/CDMA mobile station uses a nonlinear power amplifier because of the limitation of the power supply.

(23) An Ultra-Broadband Monolithic Lossy Match Power Amplifier Using Pre-Matching Circuits, by Y.

Itoh*, M. Mochizuki**, M. Nii**, Y. Kohno***, and T. Takagi*** (*Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; **Communication Equipment Works, Mitsubishi Electric Co., Kamakura, 247 Japan; ***Opto and Microwave Devices Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 664–676, Dec. 1995.

An ultra-broadband monolithic lossy match power amplifier using pre-matching circuits is developed. It is clearly shown that the band-width can be improved for lossy match power amplifiers by using prematching circuits. A novel constant-resistance network and a parallel resonant circuit are proposed as pre-matching circuits to make input and output impedances of FET's purely resistive. With the use of pre-matching circuits, a two-stage amplifier achieves a linear gain of 10 ± 2.3 dB, a saturated output power of 28.3 ± 1 dBm, and a drain efficiency of $12.6 \pm 2.2\%$ over 5 to 21 GHz.

(24) An Ultra Low Noise 50-GHz-Band Amplifier MMIC Using an AlGaAs/InGaAs Pseudomorphic HEMT (Letters), by T. Kashiwa, T. Katoh, N. Yoshida, H. Minami, T. Kitano, M. Komaru, and N. Tanino (Optoelectronic and Microwave Devices Laboratory, Mitsubishi Electric Co., Itami, 664 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 318–321, Mar. 1995.

A 50-GHz low noise amplifier MMIC using an AlGaAs/InGaAs pseudomorphic HEMT is designed, fabricated, and tested. A noise figure of 1.8 dB with an associated gain of 8.1 dB is achieved at 50 GHz. The noise figure is less than 2.0 dB from 50 GHz to 52.5 GHz.

II. Transmission Lines and Passive Microwave Devices

(1) Analysis of a Novel Elevated Coplanar Waveguide with Finite Metallization Thickness, by S. Raju*, V. Abhaikumar*, and B. N. Nityanandan** (*Department of Electronics and Communication Engineering, Thiagarajar College of Engineering, Madurai 625 015, India; **A K College of Engineering, Krishnan Koil, Tamilnadu, India): *JIETE*, pp. 143–149, Mar.–Apr. 1995.

In this paper a novel elevated coplanar waveguide is proposed and its line parameters are calculated using a modified universal finite element method with a view to highlight the possibility of miniaturized microwave structures. Further, the effects of dielectric layer, substrate, shielding, and finite metallization thickness on the line parameters of the proposed structures are also presented.

(2) Optically Controlled Microwave Attenuator, by D. Chadha, S. Aditya, M. R. Ambe, and G. Bamra (Department of Electrical Engineering, Indian Institute of Technology, New Delhi, 110 016, India): *JIETE*, pp. 151–155, Mar.–Apr. 1995.

Optically controlled microwave attenuators in microstrip configuration are described. Important parameters such as effective photoconductivity and effective plasma depth are calculated and presented for silicon and gallium arsenide. Also presented is the theoretical estimation of CW optically induced attenuation using high resistivity silicon. Experimental results for an attenuator in microstrip configuration fabricated on a silicon substrate are obtained.

(3) The Singular Point of Boundary Integral Equations and the Cutoff Wave Numbers of Waveguide, by Z.-J. Liu and Q.-J. Yang (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 23, pp. 6–8, Mar. 1995.

It is proved that the singular points of the boundary integral equations of the outer scattering fields of a cylindrical conducting surface are equal. A method for solving the cutoff wavenumbers of waveguide is suggested, in which the same program may be used commonly for E and H modes. The cutoff wavenumbers of E mode are also the singular points for the outer scattering problem.

(4) Time Domain Analysis of Multilayer Multiconductor System, by W.-Y. Hao and Z.-W. Chen (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 23, pp. 9–12, Mar. 1995.

The transient response of multilayer multiconductor system is simulated by combining spectral domain approach with waveform iteration in frequency domain. The effects of dispersion and coupling are taken into account. The reliability and the application scope of this method are verified by the calculated results.

(5) Determination of Propagation Constant from Phase Information of Standing Waves, by H.-B. Jiang, M.-Y Sun, and W.-J. Chen (Sichuan University, Chengdu, P.R.C.): *AES*, vol. 23, pp. 36–39, Mar. 1995.

A new method for determining propagation constants from phase information of standing waves is reported. The distinctive feature of this method is that the attenuation constant is the slope of a linear function of the displacement of a probe, providing a new approach for determining small attenuation constant on a transmission line.

(6) Full Wave Analysis of Superconducting Coplanar Waveguide with Method of Lines, by M.-M. Jiang and Y.-Y. Wang (Southeast University, Nanjing, P.R.C.): *AES*, vol. 23, pp. 45–48, Mar. 1995.

Using the method of lines and the Ohm's law in Maxwell's equations, the dispersion and the attenuation characteristics of superconducting coplanar waveguides are calculated for different frequency and temperature. Comparison with the published data verifies the reliability of the calculation.

(7) Modified NILT Method for Time Response Analysis of Transmission Lines, by J.-F. Mao and Z.-F. Li (Jiaotong University, Shanghai, P.R.C.): *AES*, vol. 23, pp. 55–57, Mar. 1995.

A modified NILT method for time response analysis of transmission lines is presented by usage of the extended definition and initial value theorem about Laplace transform. The stepping algorithm and resetting of initial time in this method make it more accurate and efficient than the traditional one.

(8) Characteristic Impedance Calculation of Composite Transmission Lines, by Z.-D. Wu, Z.-J. Zhang, Y. Fang, and X.-H. Tang (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 82–85, Mar. 1995.

A few promising composite transmission lines (microstrip+CPW, shielded microstrip+CPW and microstrip+asymmetric CPW) are proposed for the microwave packaging of the high speed optoelectronic devices. Using the boundary element method, the characteristic impedance is calculated for the lines. Several sets of theoretical curves are given for the engineering design.

(9) Rigorous Analysis of a Cylindrical Cavity Loaded by an Eccentric Dielectric Rod, by L.-Y. Zhang, Y.-C. Jiao, and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 99–103, Mar. 1995.

An analytical study of a cylindrical cavity loaded by an eccentric dielectric rod is proposed. The method is rigorous for arbitrary modes, material properties, and the relative dimensions of the structure. Mode charts are constructed by careful numerical evaluation. The dependence of resonances on material properties and the dimensions of the cavity are discussed.

(10) Time-Domain Analysis of the General Structures in MMIC, by S.-X. Qi, Q.-R. Yang, and J.-H. Xue (Southeast University, Nanjing, P.R.C.): *AES*, vol. 23, pp. 112–114, May 1995.

A three-dimensional nonuniform finite-difference time-domain method is proposed to characterize either air bridges or holes in MMIC. Numerical results show that the new method reduces a lot of CPU time and has high accuracy.

(11) Analysis and Calculation of Bragg Resonator, by J. Qiang, H.-F. Li, and S.-W. Yang (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 46–49, June 1995.

A new method to study Bragg resonator is employed, in which the reflective section is regarded as an axisymmetric varying section waveguide. The characteristic of reflector is studied under the assumption of multiple modes. The calculated results are in agreement with experimental measurements.

(12) The Technique of Non-Equiripple Approximation for Filter Characteristics, by Q.-N. Lin and Y.-Q. Zhang (Tianjin University, Tianjin, P.R.C.): *AES*, vol. 23, pp. 76–79, June 1995.

A technique for nonequiripple approximation for filter characteristics is presented. In the technique the characteristic function is composed of the rational function constructed by Chebyshev polynomial and coefficients related to frequency. Thus the attenuation characteristics close to those of elliptic filter for the same order are obtained. The computing results show that the technique of nonequiripple approximation has advantages over Chebyshev filter and inverse Chebyshev filter.

(13) Application of Microwave Resonator Probe to Measurement Plasma Density, by J.-X. Cao, H.-L. Xu, C.-X. Yu, L. Zeng, H.-B. Zhao, W.-X. Ding, B. Xu, H.-G. Shen, and K. Jin (University of Science and Technology of China, Hefei, P.R.C.): *AES*, vol. 23, pp. 88–90, June 1995.

A microwave resonator probe method for diagnosing local plasma electron density is described, and the measurement principle, design method, and experimental results are included. The experimental results show that the microwave resonator probe is much more reliable than Langmuir probe in the measurement of plasma density due to its completeness. The spatial resolution depends upon the size of microwave resonator probe.

(14) The Twin Wave Mode in Imperfect Coaxial Line and the Approximate Solution of Its Complex Propagation Constant, by Y.-J. Xie and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 111–113, June 1995.

A rigorous analysis of the twin wave modes in imperfect coaxial line is presented, with emphasis on the transmission line mode, EH_{00} mode, and the commonly used EH_{0p} and HE_{0p} modes ($p \geq 1$), and the variational expression of the cut-off frequency is derived. Also, the fomulation of the complex propagation constant is given.

(15) Analysis of Rectangular Waveguide Loaded with Dielectric Walls Propagating Uniform Field, by H. Liu and W.-M. Song (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *AES*, vol. 23, pp. 92–94, Sept. 1995.

A new kind of rectangular waveguide loaded with dielectric walls is presented, in which uniform field is propagated. Its parameters are obtained by numerical evaluation. Futhermore, the influence of treated materials is studied.

(16) Synthetic Method for a Novel Microwave Active Filter, by X.-W. Sun*, Z. Zeng**, J.-S. Luo**, and J.-T. Lin*** (*Xidian University, Xi'an, P.R.C.; **Xian Jiaotong University, Xi'an, P.R.C.; ***Nanjing Electronics Devices Institute, Nanjing, P.R.C.): *AES*, vol. 23, pp. 78–81, Nov. 1995.

A novel topologic construction and the synthetic method of microwave active filter are presented, and the computer simulation is made. The CAD results show that the given microwave active filter does have a good narrow-band filter property. The positive gain of more than 10 dB in passband and the attenuation of more than 30 dB in stopband are achieved.

(17) Matrix Perturbation Theory to Eigen Equation $[A][u] = \lambda[u]$ and Its Application in the Electromagnetic Fields, by T.-J. Cui and C.-H. Liang (Xidian University , Xi'an, P.R.C.): *JCIC*, vol. 16, pp. 103–106, Mar. 1995.

The matrix perturbation theory to eigen equation $[A][u] = \lambda[u]$ is investigated, in which 1–3 order perturbation solutions to eigenvalue and eigenvector are further given. As one of the applications of this theory, a microwave resonant cavity is investigated.

(18) Discussion on the Dyadic Green's Function in the Chiral Media, by G.-Z. Lu (Beijing Broadcasting Institute, Beijing, P.R.C.): *JCIC*, vol. 16, pp. 82–85, May 1995.

The generalized eigenfunctions in the chiral media are discussed. By using the eigenfunctions, the dyadic Green's function (DGF) is presented. The DGF obtained in the early time is lack of the irrotational eigenfunctions. A complete expression for the vector potential DGF is given for the first time, and by using the relation between vector DGF and electric DGF, the electric DGF is obtained.

(19) Analysis of Waveguide Y-Junction Circulator with Off-Centred Circular Ferrite Post, by W.-B. Dou, T. Shen, and Z.-L. Sun (Southeast University, Nanjing, P.R.C.): *JIMW*, vol. 14, pp. 359–365, Oct. 1995.

The characteristics of a waveguide Y-junction circulator with an off-centred circular ferrite post are analyzed by the point-matching method based on coordinate transformation. The influence of the ferrite post displacement from the junction center on the circular performances is discussed.

(20) Analysis of the Millimeter Wave Propagation in a Rectangular Dielectric Waveguide Using FDTD Method, by X.-Y. Wu, D.-M. Xu, Y.-M. Xiao, and S.-P. Zhou (Shanghai University, Shanghai, P.R.C.): *JIMW*, vol. 14, pp. 413–418, Dec. 1995.

Analysis of the millimeter wave propagation in a rectangular dielectric waveguide using the FDTD method is presented. In comparison with other methods, the FDTD method is not restricted in the case of higher or lower permittivity, and good results can be reached even at high permittivity. By using the FDTD method, the propagation constant of each mode as well as its field distribution can be obtained.

(21) Analysis of the Transmission Characteristics for Inhomogeneous Media-Filled Waveguides with the Numerical Mode Matching Method, by J. Pan and Z.-P. Nie (UEST of China, Chengdu, P.R.C.): *JIMW*, vol. 14, pp. 467–470, Dec. 1995.

A full-wave analysis method is presented with the numerical mode matching theory to analyze the hybrid mode waveguide problems filled with inhomogeneous media. The unified dispersion equation and the general electromagnetic field expressions in the waveguides are proposed.

(22) Stopband Shifts of Nonlinear Magnetostatic Surface Wave in Ferromagnetic Slabs with Double Corrugated Surfaces, by J.-L. Shi, Q. Wang, and J.-S. Bao (Shanghai University, Shanghai, P.R.C.): *JIMW*, vol. 14, pp. 475–479, Dec. 1995.

Nonlinear effects of stopband shift downward and widening induced by the magnetostatic surface wave power in ferromagnetic slabs with double corrugated surfaces are investigated. The spatial phase difference between the two surfaces of the slab has significant influence on the width of stopband and weakens the nonlinear effects of the wave power. Under certain conditions it makes the stopband of the system disappear.

(23) Numerical Analysis and Application of Superposed Dielectric Resonators, by J.-H. Wang, J. Dat, and W.-D. Fang (Shanghai University of Science and Technology, Shanghai, P.R.C.): *JAS*, vol. 13, pp. 215–220, June 1995.

This paper analyzes numerically the superposed dielectric resonators by FD method. The numerical results are in very good agreement with the available published results and measured results. With this structure, it is possible to determine the local complex permittivity of MIC substrates.

(24) The Calculation for the Q Factor of an Electromagnetic Open Resonator, by J. Xia* and C.-H. Liang** (*Beijing Institute of Technology, Beijing, P.R.C.; **Xidian University, Xi'an, P.R.C.): *JE*, vol. 17, pp. 103–107, Jan. 1995.

The Q factor of an eletromagnetic open resonator due to the mirror reflection loss, mirror diffraction loss, and coupling aperture loss is analyzed in detail, and more precise formulae for calculating the Q factor are obtained.

(25) The Calculation of Resonant Frequencies in the Large NBS TEM Cell, by Y.-H. Peng and J.-M. Fu (Xi'an Jiaotong University, Xi'an, P.R.C.): *JE*, vol. 17, pp. 108–112, Jan. 1995.

The resonant frequencies of the NBS TEM cell are calculated by the FDTD and irregularly graded transmission-line matrix methods. In the calculating process by the FDTD method a novel processing method for the magnetic wall boundary conditions is developed with which it is possible to treat only one eighth of the whole cell domain to calculate the resonant frequencies. As a result, additional useful resonant frequency data are listed.

(26) EM Reflection and Transmission from Multilayered Nonlinear Slabs, by H.-J. Yin, B.-W. Lu, W.-M. Song, and Y.-Z. Yin (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *JE*, vol. 17, pp. 113–118, Mar. 1995.

The fundamental reflection and transmission of a plane wave from multilayered nonlinear slabs are studied by using the Volterra functional series theory. The first order approximations of reflectivity and transmittivity are derived. The numerical calculations are made to a nonlinear plate and a periodic multilayered slab. The influences of nonlinear medium on the EM propagation are discussed.

(27) Propagation Property of the Surface Wave on Conductor-Backed Lossy Dielectric Plane, by J.-K. Yan, C.-L. Xu, and D.-M. Xu (Shanghai University of Science and Technology, Shanghai, P.R.C.): *JE*, vol. 17, pp. 201–205, Mar. 1995.

The eigenvalue equation, the attenuation constant, and the field distribution function of the surface wave in a conductor-backed lossy dielectric layer are derived.

(28) Study of the Characteristics of Hybrid Modes in Circular Waveguides Partially Filled with Bianisotropic Medium, by W.-Y. Yin* and W.-B. Wang** (*Northwestern Polytechnical University, Xi'an, P.R.C.; **Xi'an Jiaotong University, Xi'an, P.R.C.): *JE*, vol. 17, pp. 276–282, May 1995.

A new kind of bianisotropic waveguide structure is introduced, for which the transverse field components can also be expressed in terms of their longitudinal electric and magnetic fields, and a set of coupled mode equations is derived. The bifurcation effect, dispersion characteristics as well as field distribution of hybrid modes in bianisotropic central loaded-metallic circular waveguide are investigated.

(29) The Solution of the Characteristic Impedance of Arbitrarily Shaped Coaxial Transmission Lines by Using the Optimized Simulated Image-Conformal Mapping Method, by X.-Y. She and H.-P. Fang (Nanjing Research Institute of Electronic Technology, Nanjin, P.R.C.): *JE*, vol. 17, pp. 283–290, May 1995.

A new method, the optimized simulated image method in combination with comformal mapping, is introduced to calculate the characteristic impedance of arbitrarily shaped coaxial transmission lines. It is of small calculating amount and high accuracy, and the error range can also be estimated.

(30) Development of Two Way Rotary Joint with Wide Frequency Band, by L.-S. Yin, G. Hua, and J. Yin (Nanjin Research Institute of Electronic Technology, Nanjin, P.R.C.): *JE*, vol. 17, pp. 291–297, May 1995.

A wide frequency band two-way rotary joint is described. Its VSWR is less than 1.3 over the frequency range from 0.7 GHz to 1.4 GHz, its insertion loss is less than 0.50 dB, and its isolation is better than 40 dB. The rotary joint uses two symmetric excitation points and muff structure, and its length is shorter than $\lambda/4$. The structure is simple, and its fabrication and adjustment are easy.

(31) Full-Wave Analysis of the High-Speed Integrated Transmission Line Discontinuities, by S.-X. Qi and Q.-R. Yang (Southeast University, Nanjing, P.R.C.): *JE*, vol. 17, pp. 378–384, July 1995.

A new FDTD method with variable grids of high accuracy is derived by the polynomial approximation, and applied to analyze the variable-angle transmission line discontinuities. The method has the advantages of comparatively less memory space and CPU time, and is much simpler than other techniques. Test results are in good agreement with published data.

(32) Improved Mode-Matching and Network Analysis of E-Plane Waveguide Branch Directional Couplers, by S.-J. Xu and F. Wang (University of Science and Technology of China, Hefei, P.R.C.): *JE*, vol. 17, pp. 438–442, July 1995.

The E-plane waveguide branch directional couplers are analyzed by a method which combines the multimode network theory with rigorous mode matching approach. The electromagnetic field components are expanded by the superposition of LSE modes rather than TE and TM modes in the mode matching procedure. Meanwhile, the electromagnetic problem is transferred into the network problem through the mode matching treatment. It is shown that the present method has the advantages of simplicity and less computation with unaffecting the accuracy of the calculation.

(33) The Reflection and Transmission of Harmonic Waves at a Plane Interface between Linear and Nonlinear Media, by H.-J. Yin, B.-W. Lu, W.-M. Song, and Y.-Z. Yin (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *JE*, vol. 17, pp. 623–630, Nov. 1995.

The laws of reflection and refraction of harmonic waves at a plane interface between linear and nonlinear media are carefully analyzed. The exact expressions of the reflective and transmissive fields are derived. The further discussions are made to the fields under the conditions of vertical incidence and phase-matching.

(34) An Efficient Method of Analyzing Double Layer and Multiconductor Microstrip Transmission Lines, by H.-Q. Zhu, Y. Long, and D.-G. Fang (Nanjing University of Science and Technology, Nanjing, P.R.C.): *JM*, vol. 11, pp. 182–186, Sept. 1995.

This paper analyzes double layer and multiconductor microstrip transmission lines by using method of lines with periodic boundary conditions. The eigenvalues and eigenvectors of the difference matrix possess the same closed forms for each layer. In the mean time, the fast Fourier transform may be used to calculate the impedance matrix elements. Consequently, the computing time is reduced significantly.

(35) A New FDTD Scheme for Introducing Incident Fields, by D.-B. Ge, S.-Y. Shi, and Z.-W. Zhu (Xidian University, Xi'an, P.R.C.): *JM*, vol. 11, pp. 187–190, Sept. 1995.

This paper presents a new method for introducing incident waves to the FDTD region. The one-dimensional FDTD algorithm is used instead of an analytical expression to produce the plane wave, so that the leakage of incident wave into the scattered field region is greatly suppressed and the homogeneity of incident field distribution in the total field region is improved.

(36) Speed Up SPICE in the 3-D Electromagnetic Analysis, by J.-S. Zhao, B.-X. Gao, and R.-S. Liu (Tsinghua University, Beijing, P.R.C.): *JM*, vol. 11, pp. 252–258, Dec. 1995.

This paper applies the generalized minimal residual as a solver for large scale densely coupled linear equations to replace LU factorization in SPICE with the introduction of initial value prediction. Computations demonstrate the conspicuous speed improvement.

(37) Error Analysis of Diakoptic Method, by C.-F. Wang and D.-G. Fang (Nanjing Research Institute of Electronic Technology, Nanjing, P.R.C.): *JM*, vol. 11, pp. 259–265, Dec. 1995.

This paper presents the error estimation of diakoptic method and gives the optimum number of triangle basis functions under the transform from pulse base functions to triangle basis functions. The numerical experiments support the analysis.

(38) Optimum Design of Broadband RAM's (Radar Absorbing Material) Using Multi-Layer Dielectrics, by N. G. Jin and S. S. Lee (Department of Electrical Communications, Hanyang University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 70–78, Jan. 1995.

In order to implement broadband RAM's (radar absorbing materials) made up of multiple dielectric layers, the design variables such as the dielectric constants, the depths, and the loss tangents of dielectric are optimized. The wave impedances regarding the reflective wave are found in dielectrics, and input impedances and reflection coefficients with multiple dielectric layers are derived from the transmission line circuit theory.

(39) Pulse Propagation Analysis of High Speed Transmission Lines Using the Phenomenological Loss Equivalence Method, by J. K. Hong*, H. Y. Lee*, and H. B. Min** (*Department of Electrical Engineering, Ajou University, Suwon, Korea; **Department of Electrical Engineering, Sungkyunkwan University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 418–430, Mar. 1995.

The phenomenological loss equivalence method incorporated into the wideband lossy transmission line model is applied to the characterization of high density digital transmission lines. The pulse propagation characteristics are analyzed using the calculated frequency characteristics and the discrete Fourier transformation.

(40) Analysis of the Shielded Suspended Substrate Coplanar Waveguide, by K. E. Ahn and S. S. Lee (Department of Electronic Communication Engineering, Hanyang University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 594–600, Apr. 1995.

The characteristics of the shielded suspended substrate coplanar waveguide (SSCPW) are analyzed by applying the point matching method to the quasi-TEM mode approximation. The characteristic impedance and the effective dielectric constants are also calculated by changing the height of air and dielectric layer, and the strip width of SSCPW.

(41) A Study on the Thickness Correction for Symmetrical Inductive Irises with Rounds in Rectangular Waveguides, by K. W. Yu, K. R. Park, and J. M. Kim (Electrical and

Telecommunication Research Institute, Taejon, Korea): *JKITE*, vol. 32-A, pp. 759–767, June 1995.

The structures of inductive irises are used commonly in waveguide filter, especially at higher frequencies, due to low loss and high temperature stability. However, the iris thickness cannot be neglected, as it could be at the lower frequencies. Approximate models assuming zero thickness fail to predict the exact behavior of the filter. Current thickness correction is introduced which is valid in the case of thick irises only.

(42) Design and Implementation of Dual-Mode Narrow-Band Waveguide Channel Filter Using Measured Iris Transmission Loss Data, by K. W. Chung and J. H. Lee (Electrical and Telecommunication Research Institute, Taejon, Korea): *JKITE*, vol. 32-A, pp. 777–786, June 1995.

In this paper, measured iris transmission loss data and simulated data obtained by the three-dimensional full-wave analysis are presented and compared with Marcuvitz's theory. And by using measured iris data, dual-mode narrow-band channel filters can be successfully implemented.

(43) Implementation of Waveguide Manifold Multiplexer for Ku-Band Satellite Transponder, by K. W. Chung and J. H. Lee (Electrical and Telecommunication Research Institute, Taejon, Korea): *JKITE*, vol. 32-A, pp. 787–798, June 1995.

An E-plane T-junction manifold multiplexer having low insertion loss is implemented for output multiplexer of Ku-band satellite transponder. Manifold multiplexer implemented here is composed of two channel filters, T-junctions, half-wave waveguide connecting channel filters and manifold, and manifold itself. Considering the mass and volume of the satellite transponder, the channel filters are designed to dual-mode.

(44) Synthesis of Lossy Tapered Transmission Line, by E. J. Park (Department of Electrical Engineering, Kumoh National University of Technology, Gumi, Korea): *JKITE*, vol. 32-A, pp. 1046–1053, Aug. 1995.

A new method is presented for the synthesis of lossy tapered transmission line having prescribed frequency characteristic in the passband. A special optimization process based on the Fourier transform pair and generalized Taylor's procedure is proposed for exact designs of frequency-dependent and distance-dependent lossy tapered line.

(45) Design and Fabrication of Slot-Coupled H-Plane T-Junction Duplexers Using E-Plane Channel Filter, by Y. S. Jang*, D. S. Kim**, and H. K. Park* (*Department of Electrical Engineering, Yonsei University, Seoul, Korea; **Department of Electrical Engineering, Dongyang Technology College, Seoul, Korea): *JKICS*, vol. 20, pp. 459–468, Feb. 1995.

In this paper, a quasiplanar microwave duplexer utilizing printed metal strip inserted E-plane filter with high Q factor and low insertion loss is designed. The duplexer has low loss, and good channel separation characteristics, which provides an opportunity to be harnessed in MDR (microwave digital relay) systems. The H-plane T-junction feeder structure is used to connect channel filters without interference.

(46) A Design of Directional Coupler on a Two-Layer Substrate Structure, by I. Y. Jeoung*, S. G. Jang**, S. S. Nam***, and Y. K. Chin** (*LG Information and Communications, Ltd., Anyang, Korea; **Department of Electrical Engineering, Dankook University, Seoul, Korea; ***Electrical and Telecommunication Research Institute, Taejon, Korea): *JKICS*, vol. 20, pp. 1381–1390, May 1995.

Edge-coupled microstrip directional coupler is widely used in microwave circuits, but its directivity is degraded because of the differences in the even- and odd-mode phase velocities. In order to solve this problem, a method of using a two-layer substrate is presented. The moment method is used to analyze coupled microstrip lines on a single-layer and a two-layer substrate structures, and 10-dB directional couplers are fabricated on a single-layer and a two-layer substrates. It is shown that a directional coupler on the two-layer substrate structure leads to better directivity than a directional coupler on the single-layer substrate structure.

(47) Duplexer Design for the PCS Application, by J. S. Lim* and D. C. Park** (*Department of Electronics Engineering, Chungnam National University, Taejon, Korea; **Department of Radio Science and Engineering, Chungnam National University, Taejon, Korea); *JKICS*, vol. 20, pp. 1741–1747, June 1995.

This paper describes a duplexer design method for the application of PCS (personal communications services). Two bandpass filters of normal Chebyshev response are modified by adding attenuation poles in stopbands, and are connected to the antenna port through a branch circuit. The transmission characteristics of these modified bandpass filters are pseudo-elliptic, and the attenuation poles are located to obtain the maximum attenuation in stopbands. A duplexer designed for FCC-allocated Block-A, B, C is composed of a 3-resonator transmitting filter and a 4-resonator receiving filter, and isolation levels of more than 100 dB in the transmitting band and 65 dB in the receiving band are achieved.

(48) A Study on Modeling of MIM Capacitor in Microstrip Line, by D. S. Ahn, D. P. Jang, and S. H. Oh (Electrical and Telecommunication Research Institute, Taejon, Korea): *JKICS*, vol. 20, pp. 2620–2626, Sept. 1995.

MIM capacitor models for microstrip line are proposed by many people, but those are not based on direct writing process. In this paper MIM capacitors are fabricated by micro-pen direct writing equipment, or attached by wire bonding on teflon and alumina substrates.

(49) Design of Narrow-Band Waveguide Bandpass Filters for the MDR System, by J. B. Lim*, J. S. Park*, and C. D. Kim** (*Department of Electrical Engineering, Kukmin University, Seoul, Korea; **Samsung Electronics Communication Research Institute, Seoul, Korea): *JKICS*, vol. 20, pp. 3600–3611, Dec. 1995.

In this paper, narrow-band waveguide bandpass filters for MDR system are developed using single E-plane structures which are considered for the good yield and the good temperature characteristics. One section of the bandpass filters is reduced by replacing the waveguide-to-coaxial adaptor with the series capacitance coupling structure.

(50) High Frequency Impedance of Wire Caused by Mounting Ferrite Core (Letters), by O. Fujiwara and K. Takamoto (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 265–266, Apr. 1995.

The high-frequency impedance of wire caused by mounting a ferrite core is theoretically derived. The load effect of the ferrite core on the wire is explained by a parallel circuit of resistance and inductance, which is confirmed experimentally.

(51) On the Estimation of Higher Order Modes Using Prony's Method in the FD-TD Method, by K. Hyodo, M. Sasaki, T. Kashiwa, and H. Tagashira (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,*, vol. J78-C-I, pp. 29–35, Jan. 1995.

In order to estimate frequency-dependent characteristics in a region in which higher-order modes are generated, a new technique using Fourier transform and Prony's method is introduced into the FD-TD analysis.

(52) Vector Finite-Element Method Based on Use of Hybrid Edge Elements and Its Application to Three-Dimensional Electromagnetic Waveguide-Discontinuity Problems, by Y. Nomura, M. Tsuji, and H. Shigesawa (Faculty of Engineering, Doshisya University, Kyoto-fu, 610-03 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 36–44, Jan. 1995.

This paper proposes a novel vector finite-element method with triangular-prism edge elements, which enables the hybrid use of different types of the edge element to perform the division into the elements with high efficiency in the finite element analysis. Some numerical examples are shown for three-dimensional waveguide-discontinuity problems.

(53) Analysis of Electromagnetic Fields Using the FD-TD Method in a Microwave Oven Loaded with High Loss Dielectric, by K. Iwabuchi*, T. Kubota*, T. Kashiwa**, and H. Tagashira** (*Hitachi Hometec, Ltd., Kashiwa, 277 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 65–72, Feb. 1995.

A three-dimensional finite-difference time-domain method is applied to the analysis of electromagnetic fields in a microwave oven loaded with high-loss dielectric on a turntable. It is confirmed that the turntable is effective for reducing uneven heating.

(54) Design of Bandpass Filters Using Triple-Mode Dielectric Rod Resonators, by S. Komatsu and Y. Kobayashi (Faculty of Engineering, Saitama University, Urawa, 338 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 96–103, Feb. 1995.

Triple-mode dielectric rod resonators which are available to reduce filter size and weight are designed using the mode-matching method. A three-stage Chebyshev and a six-stage elliptic function bandpass filters with bandwidths of about 0.3% are designed using these resonators operating at 8.5 GHz.

(55) Complex Permittivity Measurements of Dielectric Plates Using a Dielectric Loaded Cavity Resonator in UHF Band, by J. Yu and Y. Kobayashi (Faculty of Engineering, Saitama University, Urawa, 338 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 104–111, Feb. 1995.

A method of measuring complex permittivity (ε_s and $\tan\delta_s$) of a dielectric plate sample with a size of 50 × 50 mm^2 in 1–2 GHz is proposed. In this method a resonator is used, where a dielectric loaded cavity including two high-permittivity, low-loss dielectric rods is divided into two in the center, and the dielectric plate is placed between these two halves. The present method is valid for the measurement of plate samples with $\varepsilon_s = 2$ to 20, $\tan\delta_s = 10^{-3}$ to 10^{-4}, and the thickness of 0.3 to 2 mm, in the UHF band.

(56) Propagation Characteristics of the Magnetostatic Surface Wave in the Composite Structure of YIG Film and YBCO, by T. Fukusako and M. Tsutsumi (Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 180–186, Mar. 1995.

This paper describes propagation characteristics of the magnetostatic surface wave (MSSW) in a composite structure of YIG film and YBCO. It is shown theoretically that the MSSW operates on a strong nonreciprocity within 2.4 GHz bandwidth and with the low loss propagation in the structure. The nonreciprocity and delay characteristics are examined experimentally under liquid nitrogen temperature and also compared with the loading of the copper.

(57) Analysis of Curved Microstrip Bends by Non-Uniform Transmission Line Model (Letters), by K. Akikawa, Y. Hayashi, K. Hirayama, and Y. Hayashi (Department of Electrical and Electronic Engineering, Kitami Institute of Technology, Kitami, 090 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 249–251, May 1995.

A microstrip bend is analyzed by applying the moment method to the boundaries between straight and bend regions. Electromagnetic fields in the bend region are obtained from nonuniform transmission line equations.

(58) Novel Two-Mode Cutoff-Waveguide Filters and Its New Design Method, by K. Iguchi, M. Tsuji, and H. Shigesawa (Faculty of Engineering, Doshisya University, Kyoto-fu, 610-03 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 297–304, June 1995.

A new method of constructing evanescent-mode bandpass filters with attenuation pole is proposed. Negative coupling for producing an attenuation pole is realized by using the interaction between the TE_{101} and TE_{201} modes in an asymmetrically coupled cavity resonator. This idea doesn't need to use physical two-path waveguides or degenerate modes to produce an attenuation pole, so that the structure becomes very simple. Experiments are made for both cavity resonator and dielectric resonator filters.

(59) Theoretical Determination of Equivalent Circuit Parameters for Natural Single-Phase Unidirectional SAW Transducers, by K. Inagawa*, K. Hasegawa**, and M. Koshiba*** (*Tomakomai National College of Technology, Tomakomai, 059-12 Japan; **Kushiro National College of Technology, Kushiro, 084 Japan; ***Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 305–313, June 1995.

An equivalent network approach is applied to the analysis of a natural single phase unidirectional transducer (NSPUDT) for surface acoustic waves. Circuit parameters can be theoretically determined by applying the finite element method to an infinite short-metal-strip array corresponding to an electrically shorted NSPUDT and an infinite open-metal-strip array corresponding to an electrically opened NSPUDT. To show the validity and usefulness of this approach, the dependence of circuit parameters and excitation characteristics on electrode thickness is computed for an NSPUDT on an ST-25°X quartz substrate.

(60) Whispering Gallery Mode Resonance on an Elliptical Dielectric Cylinder, by M. Matsubara*, Y. Tomabechi**, Y. Kogami*, and K. Matsumura* (*Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan; **Faculty of Education, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 360–365, Aug. 1995.

A theoretical analysis of resonance characteristics of a whispering gallery mode on a dielectric elliptic cylinder is presented. The resonant frequencies are obtained numerically from the solutions of eigenvalue equations. The equations are derived from the field expression presented by series of the Mathieu functions of large order and boundary conditions.

(61) On a Reduced-Size Branch-Line Hybrid-Ring Using Coupled Lines, by S. Nagamine and I. Sakagami (Muroran Institute of Technology, Muroran, 050 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 373–380, Aug. 1995.

A design method for miniaturizing a hybrid ring by replacing the quarter wavelength transmission lines with networks consisting of a coupled section and two single lines is presented. The equal power split is achieved by the proper selection of the coupled-line length and its coupling coefficient.

(62) Band-Pass Filters Mounted with Cubic Dielectric Resonators in Cutoff Waveguides (Letters), by S. Toyoda and T. Murakami (Faculty of engineering, Osaka Institute of Technology, Osaka, 535 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 384–386, Aug. 1995.

New bandpass filters mounted with cubic dielectric resonators in a cutoff waveguide are proposed and tested. The height of the cutoff waveguide is 5 mm. The input and output sides of this cutoff waveguide are connected to tapered waveguides which taper gradually from the rectangular waveguide of standard dimensions. The operating frequency is in 10-GHz band.

(63) A High-Pass/Low-Pass Phase Shifter with Resistive Matching Networks, by Y. Iyama*, N. Andoh**, A. Iida*, O. Ishida*, and S. Urasaki* (*Information Technology R & D Center, Mitsubishi Electric Co., Kamakura, 247 Japan; **Optoelectronic and Microwave Devices R & D Laboratory, Mitsubishi Electric Co., Itami, 664 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 409–417, Sept. 1995.

This paper describes a novel high-pass/low-pass phase shifter using resistive matching networks. The relationship between the reflection of the single pole double throw switch in the phase shifter and its phase shift errors is discussed. The reflection is related to the parasitic resistance of switching elements, and a broadband design of the phase shifter to reduce the reflection is presented.

(64) Complex Permittivity Measurement of Dielectric Materials Using NRD Guide at Millimeter Wave Length, by Y. Ishikawa*, T. Tanizaki*, A. Saitoh*, and T. Yoneyama** (*Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan; **Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 418–429, Sept. 1995.

A measurement method of the complex permittivity of dielectric materials at millimeter wave length is proposed. The $TE_{0m\delta}$ mode resonator open-circuited at both ends by two parallel conducting plates of NRD guide is used. In order to evaluate the surface resistance of the conducting plates, a pair of TE_{0ml} mode resonators coupled each other is used.

(65) Design of Dielectric Multi-Layer Bandpass Filters Using Fundamental Thickness of Layers, by I. Wakabayashi and K. Miyauchi (Faculty of Engineering, Science University of Tokyo, Tokyo, 162 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 677–686, Dec. 1995.

A general design principle of dielectric multilayer bandpass filters is applied to the case using only dielectric layers of standard thickness. A design example is given, and the design error is discussed.

(66) Low Profile Filter Using Open Disk Dual Mode Dielectric Resonators, by Y. Ishikawa, S. Hidaka, T. Ise, and N. Natsui (Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 687–694, Dec. 1995.

This paper presents a low profile bandpass filter using open disk dual mode dielectric resonators for mobile communication base station. The resonator consists of two dielectric disks with electrodes on both sides. The disks are laid coaxially in a cylindrical cavity. The center electrode is equipped with torus electrode around it. A six stage bandpass filter with the center frequency of 985 MHz and the band width of 20 MHz is fabricated. The insertion loss of the filter is 1.3 dB at the center frequency. The dimensions of the filter are $158 \times 54 \times 23.5$ mm^3.

(67) Resonance Frequency of Whispering Gallery Mode on an Elliptical Dielectric Disk (Letters), by M. Matsubara*, Y. Tomabechi**, Y. Kogami*, and K. Matsumura* (*Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan; **Faculty of Education, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 708–710, Dec. 1995.

A new analytical method for evaluating resonance frequencies of whispering gallery modes in an elliptic dielectric disk is presented. The results are in good agreement with those of X-band experiment.

(68) Scattering from a Folded Short in Parallel-Plate Waveguides (Letters), by J. W. Lee and H. J. Eom (Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, 373-1 Kusong Dong, Yusung Gu, Taejon, Korea): *IEICE Trans. Commun.,* vol. E78-B, pp. 1424–1426, Oct. 1995.

A folded short in a parallel-plate waveguide is investigated using the Fourier transform and the mode-matching. A fast-converging series solution for scattering from the folded short is obtained and its characteristics are presented.

(69) Modeling of Curved Conductor Surface in Analysis of Cavity Resonators by Spatial Network Method, by Y. Iida* and M. Morita** (*Faculty of Engineering, Kansai University, Suita, 564 Japan; **Institute of Industrial Technology, Kansai University, Suita, 564 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 193–200, Feb. 1995.

This paper describes the modeling of curved conductor surfaces by applying the contour path method to the transmission-line network of the spacial network method. To compare exact solutions with computed values, a cylindrical closed cavity resonator is analyzed.

(70) Reflection and Transmission Phase Characteristics of Inductive Discontinuities of Finite Thickness in Rectangular Waveguides (Letters), by T. Shibazaki*, T. Kinoshita**, and R. Shin'yagaito** (*Department of Electric Engineering, Tokyo Metropolitan College of Technology, Tokyo, 140 Japan; **Faculty of Engineering, Tokyo Institute of Polytechnics, Atsugi, 241-02 Japan): *IEICE Trans. Electron.*, vol. E78-C, pp. 204–207, Feb. 1995.

The precise phase characteristics of reflected and transmitted waves are obtained for electromagnetic scattering by inductive discontinuities of finite thickness located in rectangular waveguides.

III. Microwave Antennas

(1) Commutated Scanning Beams: The Interscan Technology of the 1970s Revisited, by B. F. C. Cooper (CSIRO Division of Radiophysics, PO Box 76 Epping NSW 2121, Australia): *JEEE*, pp. 87–99, Mar.-Apr. 1995.

During the 1970s number of commutated scanning-beam antennas were developed in the CSIRO Division of Radiophysics and put forward collectively as the Interscan Microwave Landing System. Subsequent commercial development has veered toward phased-array technology but the key principle of Interscan, namely, encoding the angle information by time-referenced scanning beams, remains embodied in the systems that are now coming into operational use. Many novel techniques were developed for the commutated antennas but they were not extensively described in the open literature. Here a review is presented of some important aspects of the commutation techniques.

(2) Generation of Predominantly Electric or Magnetic Field in Free Space, by A. L. Das*, B. K. Sinha*, and B. N. Das** (*SAMEER-Centre for Electromagnetics, CIT Campus, 2nd Cross Road, Taramani, Madras 600 113, India; **Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur 721 302, India): *JIETE*, vol. 40, pp. 209–213, Sept.–Dec. 1994.

The paper presents evaluation of electromagnetic field distribution and wave impedance variation of electromagnetic field between two antennas excited from coherent sources, taking space attenuation, impedance mismatch, and multiple reflections between two sources into account. The variations of electric and magnetic field distribution and wave impedance as a function of position between two antennas are evaluated.

(3) Electroacoustic Radiation Characteristics of Circular Sector Microstrip Antenna (CSECMA), by A. Dinesh, J. Singh, C. L. Arora, and R. K. Gupta (Department of Electrical Engineering, Malaviya Regional Engineering College, Jaipure 302 017, India): *JIETE*, vol. 40, pp. 215–221, Sept.–Dec. 1994.

Radiation characteristics like radiation pattern, radiation conductance, and directive gain of the circular sector microstrip antenna (CSECMA) are studied in the warm plasma medium for two different sector angles and the effect of electroacoustic waves is observed. The current distribution on the patch is determined by using cavity model and image theory.

(4) Finite-Difference Time-Domain Approach to the Analysis of Transient Electromagnetic Fields of Tapered Slot Antennas, by Q. Zhou, K.-Z. Guo, and X.-Q. Li (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *AES*, vol. 23, pp. 49–54, Mar. 1995.

The FDTD method is used to analyze the tapered slot antennas, where a special treatment for modeling the thin dielectric sheets and the fields on narrow slot or near slot edge of the antennas is employed. By means of transformation from near zone to far zone the transient radiation fields are calculated. A set of computed radiation patterns and transient pulse wave forms of the tapered slot antennas are presented, and they are in good agreement with the experimental results reported elsewhere.

(5) Generalized Sommerfeld Integrals for Antenna Problems in Half Lossy Space, by J. Wang, K. Lan, and Z.-Q. Peng (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 104–107, Mar. 1995.

The process of calculating generalized Sommerfeld integrals using Prony's method is detailed. The near-zone radiation field due to horizontal electric dipoles near a ground surface is also described. It is demonstrated that the results of Prony's method agree well with those of numerical integration method if approach path and adjustable parameters are chosen validly, so that the optimized procedure can be given up.

(6) Electrical Design Study for Offset Shaped Compact Antenna Test Range, by G.-Y. He, X.-Z. Jiang, Z.-N. Dai, and Q. Luo (Beijing University of Aeronautics and Astronautics, Beijing, P.R.C.): *AES*, vol. 23, pp. 1–5, June 1995.

A design of offset feed shaped compact antenna test range is studied systematically. A new method of the geometrical optical synthesis of dual offset shaped reflector antenna is developed. A new technique used to calculate the cross polarization of compact antenna range is developed. Several universal conclusions are obtained for cross polarization.

(7) Real Phase-Only Closed Loop Algorithm of Pattern Nulling Synthesis for Phased Array Antennas, by T. Gao, Y.-C. Guo, and N.-H. Fang (Nanjing Research Institute of Electronics Technology, Nanjing, P.R.C.): *AES*, vol. 23, pp. 6–10, June 1995.

A novel algorithm of real phase-only nulling synthesis for phased array antennas is proposed, which is based on the element null vector and Gram-Schmidt orthogonalization. It is effective to set wide null and low notch. Also, the rise of notch level due to the phase quantization is investigated.

(8) Analysis of an Planar Element with Mixture Structure Using Spectral Domain and Eigenfunction Approach, by R.-H. Jin and Y.-H. Qiu (Shanghai Jiaotong University, Shanghai, P.R.C.): *AES*, vol. 23, pp. 11–14, June 1995.

An element with mixture structure of waveguides and planar dielectric layers is analyzed using spectral domain approach and eigenfunction technique. The small element has a higher gain than that of a horn. The computational results of pattern, gain, and VSWR are agreeable to the experimental ones.

(9) Far Fields due to a Loop Antenna in a Three-Layered Conducting Medium, by Y.-L. Long*, H.-Y. Jiang*, and Z.-Q. Peng** (*Zhongshan University, Guangzhou, P.R.C.; **Institute of Remote Sensing Information, Beijing, P.R.C.): *AES*, vol. 23, pp. 15–19, June 1995.

The closed-form expressions of far field of a loop antenna in a three-layered conducting medium are obtained by using a new technique to evaluate Sommerfeld-type integral with the aid of the complex image theory. The present approach can so be used to get the far field formulas of other similar cases.

(10) Two-Dimensional Separable Multi-Step Amplitude Quantization Low Sidelobe Aperture Synthesis with Exponent Restraint for Airborne Solid-State Active Phased Arrays, by T. Gao and S.-Z. Chen (Nanjing Research Institute of Electronics Technology, Nanjing, P.R.C.): *AES*, vol. 23, pp. 1–5, Sept. 1995.

A designing technique of two-dimensional separable multi-step amplitude quantization low sidelobe aperture distribution with exponent restraint for airborne solid-state active phased arrays is proposed. It is shown that this method is effective to reduce the peak sidelobe levels in horizontal plane.

(11) Performance of Airborne Radar Displaced Phase Center Antenna System, by Y.-H. Gong (University of Electronic and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 24–27, Sept. 1995.

This paper presents analysis of the clutter correlation matrix, optimal improvement factor, and effects of parameters of an airborne radar displaced phase center antenna system.

(12) Investigation on the Side Fed H Shaped Antenna of YBCO Superconducting Film, by A.-S. He*, B.-S. Cao**, X.-X. Zhang**, G.-S. Cheng***, B.-C. Yang****, and X.-P. Wang**** (*North University of Technology, Beijing, P.R.C.; **Tsinghua University, Beijing, P.R.C.; ***Henan Normal University, Xinxiang, P.R.C.; ****General Research Institute of Non-Ferrous Metals, Beijing, P.R.C.): *AES*, vol. 23, pp. 75–77, Sept. 1995.

The side fed H shaped antenna is fabricated using YBCO/YSZ superconducting thin film. The relative efficiency of this superconducting antenna to the silver antenna is 9.3 dB in the x-polarized direction and 13.6 dB in the y-polarized direction.

(13) Moment Method Analysis of Multigroove and Multimode Coaxial Radiators, by Z.-Z. Wu and W. Cao (Nanjing University of Posts and Telecommunications, Nanjing, P.R.C.): *AES*, vol. 23, pp. 78–81, Sept. 1995.

The method of moments is employed in conjuction with the equivalent-source technique and the modal expansion theory to analyze the multigroove and multimode coaxial radiators. In the analysis no restriction is imposed on the number, width, and depth of grooves, so that the theoretical method and the analytical formulation are applicable to the analysis and design of wide-ranging coaxially grooved radiators.

(14) Study of the Low-Profile Omnidirectional Broad-Band Monopoles, by L. Xu, S.-Y. Shi, Y.-C. Jiao, and Y.-L. Dong (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 89–92, Dec. 1995.

Calculations are made for rotationally symmetric monopole antennas with different shapes by the moment method. By comparing VSWR, gain, and volume of the antenna, an ideal configuration is obtained. The curves of the low cut-off frequency and the frequency at which the maximum direction of the radiation pattern begins to turn upwards versus the antenna height are given.

(15) A Novel Microstrip Antenna with Large Bandwidth, by H.-L. Zheng, Y.-Z. Yin, and X.-H. Li (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 95–97, Dec. 1995.

A novel microstrip antenna with large bandwidth is studied including the design method and the experiment. Also, the relationship between the input impedance and the structure parameters is discussed. More than 33% measured impedance bandwidth for the antenna with VSWR less than two can be achieved, and the 3-dB beamwidths of the antenna at different frequencies are between 50°C and 70°C.

(16) Mutual Coupling Compensation in Maximum Likelihood Methods for Direction-of-Arrival Estimation, by C. Yang and Y.-Z. Ruan (University of Electronic Science and Technology of China, P.R.C.): *JCIC*, vol. 16, pp. 107–111, Mar. 1995.

The mechanism of performance degradation due to without considering mutual coupling between elements in maximum likelihood method for direction-of-arrival estimation using adaptive circular array is analyzed. A mutual coupling compensation method is proposed.

(17) Analysis of Radiation of the Antenna Array by TLM Method, by Y.-H. Zhang and K.-S. Chen (Zhejiang University, Hangzhou, P.R.C.): *JCIC*, vol. 16, pp. 61–65, May 1995.

The numerical simulations on the radiation patterns of line antenna array are performed under various excitations using TLM method. Numerical results agree well with analytical results. It shows that TLM method can be used to simulate all kinds of antenna arrays conveniently.

(18) A New Method for Determination of Self-Admittance of Waveguides Slot Antenna, by S.-J. Xu*, Y.-J. Zhang*, and J.-S. Yang** (*University of Science and Technology of China, Hefei, P.R.C.; **Xi'an Institute of Space Radio Technology, Xi'an, P.R.C.): *JIMW*, vol. 14, pp. 81–86, Apr. 1995.

A new method is proposed to determine the self-admittance of a slot in a broad wall of the waveguide. By considering the effect of mutual coupling of the slot array, the method transforms the self-admittance measurement into the test of the reflection or transmission coefficient of the slot array and the self-admittance of the single slot is calculated by means of the Newton's iterative method.

(19) Design of Sub-MM Wave Bowtie Antenna, by H.-R. Ye*, G.-Z. Li**, and H.-B. Lin* (*Nanjing University of Science and Technology, Nanjing, P.R.C.; **Kunming Institute of Physics, Kunming, P.R.C.): *JIMW*, vol. 14, pp. 375–378, Oct. 1995.

The theory of bowtie antenna and the antenna pattern in the infinite dielectric space are discussed. Using CAA, the impedance is analyzed and calculated. In addition, this paper gives the result of design of bowtie antenna, which works at 0.337-mm wavelength.

(20) Low Sidelobe Aperture Distribution of Multistep Amplitude Quantization with Pedestal, by T. Gao (Nanjing Research Institute of Electronic Technology, Nanjing, P.R.C.): *JE*, vol. 17, pp. 117–124, Mar. 1995.

A low sidelobe aperture designing method of multistep amplitude quantization with pedestal is proposed, and general analysis and formulas are described.

(21) Analysis of Microstrip Wrap-Around Antenna Based on Dyadic Green's Functions, by C. Yang, Y.-Z. Ruan, and L. Feng (UEST of China, Chengdu, P.R.C.): *JE*, vol. 17, pp. 397–403, July 1995.

The general field expressions for conformal microstrip antennas on cylindrical body are derived based on dyadic Green's functions for concentric-cylindrical layered media. The radiation patterns for various radii, permittivities, and thickness of the dielectric layer of a microstrip wrap-around antenna are obtained using the general field expressions and electric surface current model.

(22) Investigation on the Synthesis of Resonant Frequencies of Microstrip Antenna Using the Extreme Synthesis Method, by C.-L. Lin*, J. Lu**, and Q.-J. Rao*** (*University of Electronic Science and Technology of China, Chengdu, P.R.C.; **Huazhong University of Science and Technology, Wuhan, P.R.C.; ***Guangxi Normal University, Guilin, P.R.C.): *JE*, vol. 17, pp. 463–468, Sept. 1995.

The synthesis of resonant frequencies of microstrip antenna is investigated using the extreme synthesis method. The theoretical and experimental results are in good agreement. These satisfactory results show that the method is feasible for developing the synthesis of resonant characteristics of microstrip antenna.

(23) Measurement of Antenna Three-Dimensional Pattern, by H.-R. Yuan and W.-J. Ge (Nanjing University, Nanjing, P.R.C.): *JE*, vol. 17, pp. 539–542, Sept. 1995.

The fundamental principles and techniques of radioastronomical method by using the sun in the measurement of antenna three-dimensional pattern are described. And a total radiometer is used for measurement system. The aperture and operating wavelength of the measured antenna are respectively 20 m and 17.8 m. Measured level is estimated to be -41 dB, and measured error is about ± 0.6 dB.

(24) Experimental Study of Impulse Subsurface Radar Antenna, by Y.-J. Deng (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 17, pp. 647–651, Nov. 1995.

This paper proposes the design scheme of back-loaded pulsed antenna. A sector antenna and a rectangular antenna are made on the basis of the method. Based on the measured radar data, the differences among the above-mentioned new scheme, a nonreflecting continuously resistive loaded cross dipole antenna and a double diamond antenna are discussed. It results in the confirmation of the superiority of the back-loaded design scheme.

(25) Analysis and Design of UWB Conical TEM Horn Antenna, by K.-C. Liu, J.-G. He, J.-X. Yin, and P.-G. Liu (National University of Defence Technology, Changsha, P.R.C.): *JM*, vol. 11, pp. 66–70, Mar. 1995.

According to a novel design concept and calculation method, a ridged conical TEM horn is designed and fabricated. The experimental results show that its waveform fidelity and impedence performance are excellent, so it is very valuable for the study of transient field and UWB radar.

(26) An Installation of Broad Beam Antenna for Accurate Steering, by H.-F. Song, W. Li, and T.-Y. An (East China Normal University, Shanghai, P.R.C.): *JM*, vol. 11, pp. 71–75, Mar. 1995.

The direction finding theory for broad beam antenna is investigated. A simulation experiment is done at 3-cm wave band to determine the direction of a transmitting source using an open ended waveguide as a scanning broad beam receiving antenna, whose 3-dB beam-width is about 60°. Using the direction finding technique, the angular resolution may be better than 1°.

(27) Calculation for the Pattern Degradation of the Parabolic Reflector Caused by Both the Surface Roughness of the Reflector and the Structural Misalignment, by J. W. Kim, B. S. Kim, S. W. Nam, and C. W. Lee (Department of Electrical Engineering, Seoul National University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 36–44, Jan. 1995.

For a parabolic reflector antenna, a simple method is presented for computing efficiently the average power pattern degradations caused by the surface roughness of the reflector and misalignments between the reflector and the feed. In this procedure, both nonuniform surface errors and nonuniform illuminations are employed.

(28) Improved Analysis Method for the Mutual Coupling in the Rectangular Microstrip Antenna Geometry and its Application to Bandwidth Broadening Techniques, by Y. K. Cho*, C. W. Lee*, J. I. Lee*, H. Y. Li*, G. S. Chae*, and J. P. Hong** (*Department of Electrical Engineering, Kyungpook National University, Taegu, Korea; **Department of Electrical Engineering, Kyungpook Sanup Univ, Taegu, Korea): *JKITE*, vol. 32-A, pp. 61–69, Jan. 1995.

A numerical method for the problem of mutual admittance between two slots is considered by use of conservation of complex power. Calculation of mutual admittance is compared with other results. And mutual admittance obtained by the method is used in the analysis for the broadband rectangular microstrip antenna geometry using E-plane gap coupling.

(29) Analysis of Electrically-Short Dipole in Consideration of Conductor Loss, by Y. G. Kim and H. Y. Lee (Department of Electrical Engineering, Ajou University, Suwan, Korea): *JKITE*, vol. 32-A, pp. 884–891, July 1995.

Electrically-short wire antennas, widely used for mobile communications and EMI measurements, have low radiation efficiency and gain due to the ohmic loss predominant over the radiation power. A very short dipole antenna for wideband EMI measurements is analyzed using the method of moments with the incorporation of the ohmic loss.

(30) Analysis of Periodically Slotted Dielectrically Filled Parallel-Plate Waveguide as a Leaky Wave Antenna: E-Polarization Case, by C. W. Lee and Y. K. Cho (Department of Electrical Engineering, Kyungpook National University, Taegu, Korea): *JKITE*, vol. 32-A, pp. 898–903, July 1995.

Periodically slotted dielectric-filled parallel-plate waveguide as a leaky wave antenna is analyzed for E-polarization case. The homogeneous linear equation whose unknown is the surface current density over the conducting strip is formulated, from which the complex propagation constant is calculated and compared with the previous results.

(31) Design of the Microwave Narrow-Band Waveguide Bandpass Filters for MDR (Microwave Digital Relay) Sys-

tem Using the Modified Double E-Plane Structures, by J. B. Lim and J. S. Park (Department of Electrical Engineering, Kookmin University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 904–910, July 1995.

In this paper, the CAD program for designing the microwave waveguide narrow-band bandpass filters is developed by the passband correction method with filter synthesis for the MDR (microwave digital relay) system. Here, the modified double E-plane structures are employed in the filter structure which is analyzed by the variational method.

(32) A Study of the Field Distribution in Focal Plane for the Shape Deformations of Satellite Antenna, by S. H. Yi (Department of Electrical Engineering, Dae Yeu Technical Junior College, Seongnam, Korea): *JKITE*, vol. 32-A, pp. 1568–1579, Dec. 1995.

The main purpose of this paper is to determine a new focal point and field distribution due to the shape deformation of reflector antenna by numerical method such as geometrical optics and the aperture field method. It is shown that four types of deformations should be added into original shape of parabola antenna and offset antenna: linear, quadratic, cubic, and hybird distortions. These results can be applied to deformed reflector antenna in order to fit a focal point and radiation pattern.

(33) Analysis of Dielectric-Filled-Paralled-Plate Waveguide with Finite Number of Periodic Slots as a Leaky Wave Antenna: E-Polarization, by C. W. Lee, H. I. Lee, L. H. Yun, and Y. K. Cho (Department of Electrical Engineering, Kyungpook National University, Taegu, Korea): *JKITE*, vol. 32-A, pp. 1580–1586, Dec. 1995.

Dielectrically filled parallel-plate waveguide with finite number of periodic slots in its upper plate as a leaky wave antenna is analyzed for E-polarization case. The integro-differential equation whose unknown is the slot equivalent magnetic current over the slot is formulated and solved by use of Galerkin's method. From knowledge of the equivalent magnetic current, the propagation constant and radiation pattern for the finite periodic structure are determined and compared with the results of the infinite case. Good correspondence between them is observed.

(34) The Radiation Characteristics of a Helicopter Antenna Using the Moment Methods, by J. H. Choi (Department of Radio Science Engineering, Hanyang University, Seoul, Korea): *JKICS*, vol. 20, pp. 581–591, Mar. 1995.

Several electromagnetic analysis methods can be applied to analyze the radiation characteristics of an antenna mounted on a complex structure, such as a helicopter. In this paper, two modeling techniques in the moment methods are utilized to analyze the 0.1-m monopole antenna mounted at the bottom of a helicopter body at the operating frequency of 200 MHz.

(35) Analysis of Planar Inverted-F Antenna Properties Using Reaction Integral Equation, by T. W. Kim*, K. W. Cheon**, K. H. Park***, and J. K. Kim* (*Department of Electrical Engineering, Jungang University, Seoul, Korea; **Hyundai Electronics, Icheon, Korea; ***Department of Electrical and Communication Engineering, Pucheon College, Pucheon, Korea): *JKICS*, vol. 20, pp. 2079–2090, Aug. 1995.

In this paper, by using a wire grid method, the characteristics of a PIFA (planar inverted-F antenna) on infinite ground plane are analyzed. The moment method is applied to the reaction integral equation for the wire antenna, and then the reaction integral equation is converted into the matrix equation for the numerical computation.

(36) Integral Nulling for Linearly Constrained Antenna Arrays in the Presence of Random Errors, by B. K. Chang (Department of Electrical Engineering, Incheon University, Incheon, Korea): *JKICS*, vol. 20, pp. 2712–2721, Oct. 1995.

The concept of optimum pattern integral in a linear array with equi-spaced antennas subject to random variations of array weight and antenna position is introduced in a constrained broadband null synthesis problem. To this end, the expected integration of perturbed array factor and its power response with respect to spatial variable are analyzed and used in finding an optimum weight vector to eliminate broadband interferences.

(37) Analysis of the Antenna Using Superimposed Current Method and Modified Expansion Function, by K. W. Jung*, and C. Y. Kim** (*Department of Electrical and Communication Engineering, Gumi College, Gumi, Korea; **Department of Electrical Engineering, Kyungbuk National University, Taegu, Korea): *JKICS*, vol. 20, pp. 3234–3241, Nov. 1995.

A new technique of formulation using superimposed current method is proposed for the fast analysis of an antenna attached to the arbitrarily shaped conducting body. Based on this method, the input impedance, the current distribution, and the radiation pattern are computed and tested for the rectangular and circular bodies.

(38) The Design of the Circular Polarized Antenna Using the Quarter-Wave Plate, by S. H. Oh*, K. I. Min*, Y. L. Choi**, and S.C. Han*** (*Department of Electrical Engineering, Chungnam National University, Taejon, Korea; **Korea Mobile Telecommunication Research Institute, Korea; ***Department of Computer Engineering, Sangji University, Wonju, Korea): *JKICS*, vol. 20, pp. 3367–3374, Dec. 1995.

In this paper, the circular waveguide antenna with the circular polarization is designed. The design method of the quarter-wave plate (circular polarizer) is used. The antenna consists of a circular waveguide and a dielectric slab.

(39) A Design and Fabrication of the GaAs FET Active Single Microstrip Patch Antenna with Injection Locking Technique, by D. H. Lee* and U. S. Hong** (*Department of Electrical Communication Engineering, Kwangwoon University, Seoul, Korea; **Department of Radio Engineering, Kwangwoon University, Seoul, Korea): *JKICS*, vol. 20, pp. 3486–3494, Dec. 1995.

In this paper, the injection-locking active microstrip patch antenna (APMA), which is integrated by the injection-locking oscillator with GaAs FET and the microstrip patch antenna, is designed and fabricated. The optimized circuit design of APMA is simulated by microwave design system. The power spectrum of this injection-locking APMA is much more stable than that of the free-running APMA.

(40) Design Guidance of Contoured Beam Patterns by Using Shaped Reflectors (Letters), by H. Shoki, K. Kawabata, and Y. Suzuki (Research & Development Center, Toshiba Co., Kawasaki, 210 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 30–35, Jan. 1995.

This letter discusses important problems in designing contoured beam patterns by using shaped reflectors: the gain limitation, the suitable aperture shape, the relation between contoured beam patterns and optimized aperture distributions, and the effect of surface error and pointing accuracy.

(41) Spectral Domain Analysis of a Proximity Feed Polarimetric Microstrip Antenna, by T. Miyazaki and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 52–61, Feb. 1995.

The spectral domain method is applied to the analysis of a microstrip patch antenna whose polarization characteristic can be electrically changed. The antenna is composed of a microstrip line and a microstrip patch antenna set closed to the microstrip line on a dielectric substrate and electromagnetically coupled to the microstrip line. The input and polarization characteristics of the antenna as a function of the frequency and feeding stab length are clarified.

(42) Analysis on the Mechanism of a Tuning Stub for Circular-Polarized Annular Microstrip Antenna, by N. Ishii and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 71–78, Feb. 1995.

An annular microstrip antenna with two tuning stubs and a feeding pin is analyzed using the method of eigenfunction expansions and perturbational technique. The ratio of amplitudes of two dominant modes depends on the location and the area of the tuning stub, and therefore, the phase of the input impedance can be controlled.

(43) Design of an Asymmetric Parabolic Cylinder Antenna with High Aperture Efficiency, by K. Asai*, M. Kojima*, H. Misawa*, Y. Ishida*, K. Maruyama*, N. Yoshimi*, M. Wakasa**, and M. Karakida*** (*Solar-Terrestrial environment Laboratory, Nagoya University, Toyokawa, 442 Japan; **Ishikawajima-Harima Heavy Industries Co., Ltd., Chita, 478 Japan; ***Nagoya Shipbuilding & Steel Structures Co., Ltd., Nagoya, 455 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 102–109, Mar. 1995.

This paper reports a design technique used to maximize aperture efficiency of the asymmetric parabolic cylinder antenna which has been constructed for radio astronomy in 1993. This antenna operated at a frequency of 327 MHz is dedicated to measure very faint radio intensity variation such as interplanetary scintillations.

(44) An Analysis of Single-Feed Circularly Polarized Microstrip Antenna Using Boundary Element Method, by H. Ohmine and Y. Sunahara (Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 139–149, Mar. 1995.

An analysis using the boundary element method is presented for single-feed circularly polarized microstrip antennas. This method is applied to microstrip antennas with perturbation element or short pins, and the usefulness and accuracy of the method are shown through comparison with experimental results.

(45) Beam Scanning Characteristics of an Optically Controlled Array Antenna Fed by a Fiber Optic Array, by Y. Konishi, W. Chujo, M. Fujise, and K. Yamada (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 150–159, Mar. 1995.

Microwave aperture distribution characteristics and beam scanning characteristics are discussed for an array antenna whose aperture distribution is generated using optical Fourier transform and optical/electrical conversion when an image mask is offset from an optical axis. The desired aperture distributions for the beam scan are obtained by a mask-offset experiment using a two-laser type model.

(46) Characteristics of Linear Polarized Aperture Array Antenna, by K. Tsukamoto* and H. Arai** (*IBS Research and Development Laboratory, Matsushita Electric Works, Ltd., Kadoma, 571 Japan; **Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 160–166, Mar. 1995.

A new concept of a spectral domain method for the analysis of aperture array antennas with tri-plate structure is presented. This method is established by adapting Maxwell's equations to infinite array, assuming Floquet modes. The working frequency of the antenna and Q value are calculated by this method.

(47) Height Dependence of Antenna Factors of EMI Dipole Antennas (Letters), by T. Tejima, A. Sugiura, H. Masuzawa, and K. Koike (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 416–418, May 1995.

Dipole antennas commonly available for EMI measurements are theoretically investigated with particular interest in the height-dependence of their antenna factors by using the moment method. Antenna dimensions and balun characteristics are found to have little influence on the antenna factor height-patterns.

(48) A Study on Radiation Efficiency Measurement of a Small Antenna Using Wheeler Method, by M. Muramoto, N. Ishii, and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 454–460, June 1995.

The Wheeler method for measuring radiation efficiency of a small antenna is studied and is simulated with a wire-grid model. It is found that the use of a cap larger than the radian sphere as a shielding cap is effective for the Wheeler method.

(49) Rectangular Loop Antenna for Circular Polarization, by Y. Murakami*, T. Nakamura**, A. Yoshida*, and K. Ieda* (*Aisin Seiki Co., Ltd., Kariya, 448 Japan; **Faculty of Engineering, Gifu University, Gifu, 501-11 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 520–527, July 1995.

Circularly polarized radiators made of one-wavelength rectangular loop without loading are presented. The idea for developing this antenna is derived from the fact that the current distribution along the loop can be controlled by the aspect ratio of the rectangle. By decomposing the current distribution along the loop into the forward and backward traveling wave modes, the circular polarization condition is derived on the effective length and the current at midpoint of each segment of the loop.

(50) Tri-Reflector Antennas Eliminating Cross-Polarized Component Based on Beam Mode Analysis, by T. Furuno, S. Urasaki, and T. Katagi (Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 585–592, Sept. 1995.

The condition of no cross-polarized component of a tri-reflector offset antenna taking account of the change of field distributions due to frequency is derived based on the beam mode analysis. According to the results, possible configurations of reflector systems are shown, and a design method of a compact antenna with no cross-polarized component is presented.

(51) Indoor Propagation Calculation Considering Antenna Patterns Using Geometrical Optics Method, by K. Uehara, T. Seki, and K. Kagoshima (NTT Wireless Systems Laboratories, 1-2356 Take, Yokosuka, 238-03 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 593–601, Sept. 1995.

In order to design antennas for high-speed indoor wireless communication systems, indoor delay characteristics are calculated by using an improved geometrical optics algorithm. The algorithm is applied to a three-dimensional room model to demonstrate the ability of narrow-beamwidth antennas in the high-speed digital radio communication.

(52) An ASIC Implementation of a Digital Beam Forming Multibeam Antenna, by T. Tanaka, R. Miura, I. Chiba, and Y. Karasawa (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 602–610, Sept. 1995.

A digital signal processor is implemented in ASIC's using field programmable gate arrays for a digital beam forming antenna (DBF antenna). The DSP can synthesize 16 multibeams and select the strongest power beam in real time. Experimental results in an anechoic chamber demonstrate the function of multibeam formation and the strongest beam selection of the DBF antenna.

(53) Circular Patch Antennas Miniaturized by Shorting Posts, by N. Kuga and H. Arai (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 631–637, Oct. 1995.

A posted circular patch antenna is presented as a small and flat antenna for mobile communications. Its dominant mode is the hybrid mode consisting of a coaxial TM_{01} and TM_{11} mode, and null points are not found in the radiation pattern unlike a monopole mode antenna. The calculated input impedance and radiation pattern agree with measurements. Antenna characteristics such as mode amplitude coefficients and resonant frequencies are also discussed.

(54) Near Field Measurement Method of a Phased Array Antenna: Measurement of Element Amplitude and Phase for Array, by K. Haryu, I. Chiba, S. Mano, and T. Katagi (Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 701–707, Nov. 1995.

This paper describes a measurement method for obtaining the amplitude and the phase of active element fields of a phased array antenna in a near field region. In this method, only the amplitude of the radiated field of each antenna undertest is measured by an array probe, and active element fields are obtained by the rotating element field vector method.

(55) A Method for Arrangement of Auxiliary Antennas to Minimize the Influence of the Incident Directions of Interferences on Suppression Performance in an MSLC, by K. Hirata*, T. Kirimoto**, Y. Tachibana***, and S. Mano* (*Information Technology R & D Center, Mitsubishi Electric Co., Kamakura, 247 Japan; **Kamakura Works, Mitsubishi Electric Co., Kamakura, 247 Japan; ***Kanagawa Institute of Technology, Atsugi, 243-02 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 708-716, Nov. 1995.

This paper shows the relation between phase differences of received waves of two antennas and suppression performance for the case that an multiple sidelobe canceller with two auxiliary antennas receives two interference entries. Also proposed is a method for arrangement of auxiliary antennas to minimize degradation of suppression performance.

(56) Antenna Factors of Half-Wavelength Dipole Antennas with Roberts Balun, by K.-C. Kim* and S. Tokumaru** (*Yeungnam University, Korea; **Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 717–724, Nov. 1995.

Antenna factors of dipole antennas above the ground plane are calculated theoretically for a reference antenna with Roberts balun specified ANSI C63.5 regulation. The field equations are used for calculating the antenna parameters by the method of moments and the mismatch concept is applied for evaluating the balun effects.

(57) Built-in Type Portable Telephone Antenna by a Modified Transmission Line Antenna (Letters), by Y. Kumon and T. Tsukiji (Faculty of Engineering, Fukuoka University, Fukuoka, 814-80 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 725–728, Nov. 1995.

A modified transmission line antenna (MTLA) for a built-in type portable telephone antenna is proposed. It is concluded that the MTLA makes it possible to adjust an operating frequency by changing a size of a part of the portable telephone body.

(58) A Design Method of Free-Array Excitation Coefficients for Array-Fed Reflector Type Reconfigurable Beam Antennas, by I. Naito, I. Chiba, S. Makino, and S. Mano (Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 747–755, Dec. 1995.

An efficient design method of feed-array excitation coefficients for array-fed reflector type reconfigurable beam antennas is proposed. The feed-array is composed of several sub-arrays, and only amplitude between sub-arrays is controlled to achieve reconfigurability. The method is verified by a design example for an international communications satellite application.

(59) Antenna Tracking Mechanism for Mobile Satellite Communication Terminals (Letters), by Y. Hase and R. Suzuki (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 780–783, Dec. 1995.

A new antenna tracking mechanism for the mobile terminals of mobile satellite communication systems is proposed, fabricated, and tested. A feature of this mechanism is an azimuthal tracking function without an expensive rotary joint.

This mechanism will be useful especially for low-cost mobile terminals of L- and S-band mobile satellite systems.

(60) Optical Control of the Printed Dipole Antenna, by K. Nishimura and M. Tsutsumi (Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 173–179, Mar. 1995.

This paper presents various properties of a printed dipole antenna on an optically plasma-induced semiconductor silicon substrate. These properties are analyzed by using the spectral domain moment method. The input impedance and radiation pattern are calculated within the plasma densities of 0 to 2.0×10^{17} m^{-2}. A halfwave-length antenna is fabricated on a high resistivity silicon wafer by aluminum vacuum evaporation.

(61) Enhancement of Band-Edge Gain in Radial Line Slot Antennas Using the Power Divider: A Wide-Band Radial Line Slot Antenna, by T. Yamamoto*, M. Takahashi**, M. Ando*, and N. Goto* (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **Faculty of Engineering, Musashi Institute of Technology, Tokyo, 158 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 398–406, Mar. 1995.

A new wide-band radial line slot antenna is proposed which halves the waveguide length and widens the frequency bandwidth. This paper presents the design and experimental results of a model antenna. A gain of 33.7 dBi is measured at the edge of 800-MHz bandwidth and its high potential is demonstrated.

(62) A Rotating Mode Radial Line Slot Antenna Fed by a Cavity Resonator, by S. Hosono*, J. Hirokawa*, M. Ando*, N. Goto*, and H. Arai** (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 407–413, Mar. 1995.

This paper presents a basic design of a radial line slot antenna (RLSA) composed of concentric slot arrays. The experimental results confirm circularly polarized radiation from the RLSA using a cavity resonator.

(63) Spatial and Temporal Equalization Based on an Adaptive Tapped-Delay-Line Array Antenna, by N. Ishii and R. Kohno (Division of Electrical and Computer Engineering, Yokohama National University, Yokohama, 240 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1162–1169, Aug. 1995.

This paper describes a spatial and temporal multipath channel model which is useful in array antenna environments for mobile radio communications. From this model, a no distortion criterion, that is, an extension of the Nyquist criterion, is derived for equalization in both spatial and temporal domains. An adaptive tapped-delay-line array antenna is used as a tool for equalization in both spatial and temporal domains.

(64) An Improvement in the Standard Site Method for Accurate EMI Antenna Calibration, by A. Sugiura, T. Morikawa, K. Koike, and K. Harima (Kashima Space Research Center, Communications Research Laboratory, Ministry of Posts and Telecommunications, Ibaraki-ken, 314 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1229–1237, Aug. 1995.

An standard site method (SSM) is theoretically analyzed using matrix representations to examine its validity and develop an improved method. It is found that the SSM is not applicable to antennas having height-dependent antenna factors and that the SSM correction factors are theoretically inappropriate. To improve the existing SSM, it is proposed that both transmitting and receiving antennas are placed at the same height during the site attenuation measurements.

IV. Microwave/Lightwave Propagation and Scattering

(1) An Experiment to Study the Effects of Geomagnetic Fluctuations on Ionospheric HF Radio Paths, by F. W. Menk, R. A. Marshall, P. W. McNabb, and I. S. Dunlop (University of Newcastle, 2308, Australia): *JEEE,* vol. 15, pp. 325–332, Dec. 1995.

A simple low cost experiment for the examination of joint magnetic and ionospheric oscillations is described. Although the instrumentation is based on readily available commercial or homemade equipment, a high order of performance is obtained. The characteristics of correlated geomagnetic and ionospheric oscillations recorded over 6 months at low latitude site are described. The Doppler oscillations are clearly a common occurrence, and ULF geomagnetic pulsations must provide a significant contribution to the Doppler clutter spectrum over HF radio paths.

(2) Design and Fabrication of a Compact Solid State HF Receiver for Doppler Studies, by N. P. Dhoptey and G. N. Navaneeth (Department of Physics, Nagpur University, Nagpur 440 010, India): *JIETE,* vol. 40, pp. 267–275, Sept.-Dec. 1994.

A phase coherent receiver for recording the phase path variations of the reflections from discrete region of ionosphere is described. The design considerations, actual design, fabrication, and testing are presented. Some typical data obtained with the receiver is also presented.

(3) A Simple Correction to Physical Optics Solution for the Estimation of the Scattering Components of a Finite Metallic Cone (Letters), by K. T. Selvan, K. G. Thomas, and S. K. Das (SAMEER-Centre for Electromagnetics, 2nd Cross Road, CIT Campus, Taramani, Madras 600 113, India) *JIETE,* vol. 40, pp. 277–282, Sept.-Dec. 1994.

This letter describes the contributions of tip scattering, first-order rim diffraction, and tip-rim interaction to the high-frequency scattering from a finite perfectly conducting right-circular cone. Empirical correction factors are introduced to the classical physical optics approximation.

(4) Microwave Properties of Commercial Petrol over 900 MHz to 9 GHz (Letters), by I. S. Hudiara and J. Singh (Department of Electronics Technology, Guru Nanak Dev University, Amritsar 143 005, India): *JIETE,* vol. 40, pp. 291–292, Sept.-Dec. 1994.

Microwave complex permittivity of commercial petrol is measured over the frequency rage 900 MHz to 9 GHz using coaxial short circuited transmission line method. It is found that the dielectric constant remains constant over the entire frequency range of measurement but the loss factor increases as the frequency increases.

(5) Electromagnetic Scattering of Obliquely Incident Wave by a Multilayered Elliptical Dielectric Cylinder, by J.-X. Ge* and W.-G. Lin** (*Beijing University of Aeronautics and Astronautics, Beijing, P.R.C.; **University of Electronics Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 20–25, Mar. 1995.

Based on elliptical cylindrical harmonic expansion, the electromagnetic scattering of obliquely incident wave by a multilayered elliptical dielectric cylinder is analyzed. By using the addition theorem for Mathieu functions, the analytic equation of electromagnetic scattering of obliquely incident wave is obtained.

(6) The Physical Optics Bistatic Formulae and Matrix from Coated Bodies, by N. Li and C.-W. Su (Northwestern Polytechnical University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 31–35, Mar. 1995.

From the physical optics assumption and Leontovich impedance boundary condition, the bistatic formulae of the electromagnetic field scattered from three dimensional conduct object coated with radar absorbing materials with an arbitrary smooth convex shape are built up. The interrelation of two incident fields between the coated surface and the conducting surface of the same configuration as well as the coated surface electromagnetic current ratio coefficients are also derived.

(7) Analysis and Calculation of Creeping Wave Propagation Constants and Model Impedance for a Dielectric Coated Cylinder, by J.-M. Xiao and M.-G. Wang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 40–44, Mar. 1995.

The electromagnetic characteristics associated with the creeping waves supported by a dielectric coated cylinder are investigated and a simple convenient and effective method for calculating the propagation constants and the model impedance of creeping waves is presented.

(8) Volterra Functional Method for Reconstruction of Conductivity Profiles, by L.-J. Chen, C.-Z. Li, and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 58–61, Mar. 1995.

The Volterra functional method is used for the electromagnetic inverse problems. A generally analytical procedure and symbolic code implementation are successfully constructed, which can provide a new way for the inverse problems. The conductivity profiles, as an example, is reconstructed by the method. The results show that only three terms of expansion give an obvious improvement compared with the former approximations.

(9) Radar Cross-Section of an Impedance Cylinder Embedded in a Nonconcentric Chiroferrite Cylinder, by Z.-X. Shen (Nanjing University of Aeronautics and Astronautics, Nanjing, P.R.C.): *AES*, vol. 23, pp. 68–72, Mar. 1995.

The electromagnetic scattering characteristics of a plane wave incident on an impedance cylinder embedded in a nonconcentric chiroferrite cylinder are investigated by using classical separation of variables technique and the addition theorem for cylindrical functions. Both TE and TM polarized waves incident normally on the cylinder are considered. Numerical results for various values of the parameters are discussed.

(10) The Exact Impedance Boundary Condition (EIBC) on the Faces of an Impedance Wedge, by L.-C. Wu and M.-G. Wang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 90–91, Mar. 1995.

Exact impedance boundary condition on general impedance face is presented, and it is put into use on the faces of an impedance wedge. The expressions of exact impedance boundary condition are deduced in the form of first-order partial differential equations for two cases of perpendicularly incident and obliquely incident plane waves.

(11) A Variational Formulation for Reconstructing Scattering Potential, by X.-W. Shi, Y.-P. Han, C.-H. Liang, and R.-J. Zhao (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 96–98, Mar. 1995.

The reconstruction of scattering potential of one-dimensional Schrodinger equation is studied. A variational formulation is constructed from the famous Gel'fand-Levitan (G-L) equation to reconstruct the scattering potential. Besides its variational property, this formulation has the advantage with which the complete information of the approximation solution of the G-L equation can be fully used. Therefore, it may be used to improve the results of some approximation methods to solve the G-L equation.

(12) A New Method to Improve the Property of Meteorologic Radar for Measuring Rain, by D.-Z. Hu (Qingdao Research Center of CRIRP, Qingdao, P.R.C.): *AES*, vol. 23, pp. 20–23, June 1995.

A new method on inversing rain rate distribution along Earth-Space path by radar-satellite system is presented. A recurrent formula of specific attenuation of rain is derived. A radar-satellite system for measuring rain is given. The typical results of distribution of rainfall rate along Earth-Space path are measured.

(13) Computing RCS of Flyer's Wings Covered with Radar Absorbing Material, by L.-C. Wu and M.-G. Wang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 30–33, June 1995.

The scattering solution for generalized Maliuzhinets method of a half-plane wedge with impedance faces is studied, and the concept of equivalent edge currents is extended to wedges with impedance faces. Based on the constructed equivalent edge currents, the RCS of flyer's wings covered with radar absorbing material is computed and examined.

(14) The Calculation of EM Scattering by Buried Objects in Dispersive Media through FD-TD Method, by G.-Y. Fang*, Z.-Z. Zhang*, and W.-B. Wang** (*China Research Institute of Radiowave Propagation, Henan Xinxiang, P.R.C.; **Xi'an Jiaotong University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 34–38, June 1995.

The electromagnetic scattering by buried objects in dispersive media is calculated by FD-TD Method. The FD-TD formula and the absorbing boundary condition in Debye dispersive media are deduced. The propagation of transient pulses in dispersive media is studied in detail. The scattering pulses and the wiggle traces are given for several typical buried objects.

(15) Modified Steepest Descent Method for Inverting the Impulse Response of Target, by Z.-Y. Pan*, C.-Y. Jiang*, and Q.-J. Yang** (*China Research Institute of Radiowave Propagation, Henan Xinxiang, P.R.C.; **Tsinghua University, Beijing, P.R.C.): *AES*, vol. 23, pp. 39–45, June 1995.

Modified steepest descent method for inverting the impulse response of target and correlation coefficient criterion for estimating the deconvolution error and controlling iteration number of times are presented. The inversion results from the measured transient electromagnetic pulse response of a conducting sphere show that correlation coefficient criterion is a simple and reliable criterion and that modified steepest descent method is an efficient method for inverting the impulse response of target in time-domain and is superior to modified conjugate gradient method.

(16) Scattering of a Conducting Cylinder in Near-Field to Sheet-Current Antennas: 2D Problem, by X.-M. Zhang, D.-M. Fu, and N.-H. Mao (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 63–66, June 1995.

With the method of plane wave spectrum, a two-dimensional electromagnetic scattering problem is studied. The accurate formulas are given.

(17) The Bi-Chirality Structure and Its Behavior of Multilayered Uniaxial Chiral Composites, by W.-Y. Yin (Northwestern Polytechnical University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 67–70, June 1995.

The generalized spectral domain-exponential matrix technique is used to study the reflection and transmission properties of multilayered uniaxial chiral composites which possess bi-chirality structures. Numerical results are presented to demonstrate the influences of the orientation axis, loss, chirality, and nonreciprocity parameters on the reflection and transmission coefficients. Especially, the effect of cross-polarized transformation is considered.

(18) Diffraction over a Flat-Topped Terrain Obstacle with Bevel Edge, by X.-W. Zhao and Y.-X. Xie (China Research Institute of Radiowave Propagation, Henan Xinxiang, P.R.C.): *AES*, vol. 23, pp. 80–83, June 1995.

Based on Fresnel–Kirchhoff principle, a general representation of field diffraction by multiple knife-edge is given under the condition of existence of ground reflection. Meanwhile, a way of solving the diffraction field by a flat-topped obstacle with bevel edge is presented. The formulae given are convenient for practical calculation with clear physical conception.

(19) The Tolerance Method for Computation of Electromagnetic Field, by L.-X. Wan (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 23, pp. 91–94, June 1995.

A new method is discussed, which can enormously reduce the computation of the disturbed electromagnetic field due to the change of the parameter of a local medium or boundary condition. Being different from the disturbance theory, this method gets much less limitations on the size or parameter of the local medium.

(20) Hybrid Solution for EM Scattering from a Finned Cylinder, by S.-M. Cui, M.-G. Wang, and H.-S. Wu (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 108–110, June 1995.

The scattering far field from a perfectly conducting circular cylinder with a fin is calculated using a hybrid method which combines PO (physical optical), FOCK theory, PTD (physical theory of diffraction), GTD (geometrical theory of diffraction) with MM (moment of method). Results are compared to those of MM, Micheali's theoretical calculation, and measured data, and quite good agreement is obtained. The hybrid method is valid for any magnitudes of cylinder radius, any fin width, and any incident angle.

(21) Internal and External Electromagnetic Fields for Multilayered Cylinder at Normal Incidence, by Z.-S. Wu, L.-X. Guo, and S.-M. Cui (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 114–116, June 1995.

A more stable and accurate recursing formula and computing procedure to calculate the scattering coefficients and the internal coefficients are proposed. The numerical calculations and tests based upon the recursive algorithms are presented. The procedure can be used to inhomogeneous cylinders with any complex refractive indices and size parameters.

(22) ISAR Echo Simulation and Imaging of the Target in Orbit, by J.-Y. Zhang and Q.-W. Zhang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 28–31, Sept. 1995.

The ISAR (inverse synthetic aperture radar) echo of an object flying in orbit is simulated by computing the backscattering fields of the object. The simulating and imaging process is discussed and the simulated images with the echoes are presented. In addition, the needed coherent accumulating time for the imaging radar is also investigated.

(23) Scattering of Fundamental Gaussian Beam from a Multilayered Sphere, by Z.-S. Wu and X.-Q. Fu (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 32–36, Sept. 1995.

Based on the generalized Lorentz–Mie theory, the incident fundamental Gaussian beam is expanded in terms of the vector spherical harmonics. The interaction of Gaussian beam with a multilayered sphere located on the propagation axis is analyzed. The modified algorithm for wave beam parameter and the recursive formulas as well as the computing procedure to calculate scattering coefficients are proposed.

(24) Computing Electromagnetic Scattering Field of Dielectric Objects by Time-Domain Integral Equation Technique, by B.-H. Chen and C.-W. Su (Northwestern Polytechnical University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 82–84, Sept. 1995.

The time-domain integral equation technique is presented for computing the response of dielectric objects. Electromagnetic scattering results for sphere and sphere-capped cylinder are obtained by a given incident wave. The consistency with the measured response is seen to be very good.

(25) Using the Mode-Match Method to Solve the Five-Port Waveguide Junction Discontinuity Problems, by W.-A. Ding* and Q.-S. Zhang** (*Air Force Academy of Anti-Aircraft Artillery, Guilin, P.R.C.; **University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 85–87, Sept. 1995.

The mode-match method is presented to obtain the discontinuity parameters and optimize the design of five-port waveguide junction. According to the simulation results, a five-port waveguide junction is designed. The test results are correspondent with the calculated ones.

(26) A Variational Solution of Lossy Model of Waveguide Junctions, by Y.-J. Xie, C.-H. Liang, and J.-J. Zheng (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 95–98, Sept. 1995.

A variational solution of waveguide junctions considering the wall losses on plates of transverse discontinuity is presented, using the E-field matching techniques with enforcement of the conservation of complex power. For example, the discontinuity impedance of a coaxial line terminated in a circular waveguide is calculated and the stability of results is analyzed.

(27) The Application of Wavelet Transform to Time-Frequency Analysis of Transient Electromagnetic Backscatter Signals, by Y.-H. Peng, Y.-X. Liu, Y.-P. Wang, and W.-B. Wang (Xi'an Jiaotong University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 109–111, Sept. 1995.

The Morlet wavelet analysis is applied to analyze the time-frequency properties of electromagnetic backscattered signals from targets. To improve the time and frequency resolution, we construct a related wavelet with instantaneous frequency that increases linearly with time, and make the scale increase properly. Compared with the conventional short-time Fourier transform and Wigner-Ville distribution, the numerical results show that the wavelet time-frequency analysis provides high time resolution in the early-time, high frequency resolution in the late-time, and high detectivity in noises.

(28) Nonuniform Mesh FDTD Method, by W.-J. Zhang, L. Gao, and C.-F. Xie (Shanghai University, Shanghai, P.R.C.): *AES*, vol. 23, pp. 15–17, Dec. 1995.

A new nonuniform mesh FDTD method is presented. The special treatments of calculation are taken at interfaces between little and large lattice, and the problem of accuracy and amount of computation is solved fairly well. The two-dimensional transient scattering by cylindrical targets is considered using this method, and compared with the convensional FDTD method.

(29) Neumann's Series Solutions for Low Frequency Electromagnetic Scattering Problems, by G.-Y. Wen (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 67–70, Dec. 1995.

Neumann's method is used to investigate the low-frequency electromagnetic scattering problems by an infinitely long conducting cylinder. Both E-wave incidence and H-wave incidence are studied and some numerical examples are expounded. The Neumann's series solution has the virtues of fast convergency for low frequency calculations and does not involve the matrix inversion. The surface current distributions are obtained as simple summations, and hence the computational time is greatly saved.

(30) An Uniform Solution of the Diffraction Field over Curve-Linear-Topped Obstacle, by X.-W. Zhao (China Research Institute of Radiowave Propagation, Henan Xinxiang, P.R.C.): *JCIC*, vol. 16, pp. 29–34, Mar. 1995.

The diffraction field of curve-linear-topped obstacles is solved by Fresnel–Kirchhoff principle. Meanwhile, the numerical results of double curve-linear-topped obstacle are also obtained.

(31) The Reduction of Travelling Wave Scattering by Magnetic Dielectric Coating, by Z.-S. Lin and W.-L. Ni (Shanghai University, Shanghai, P.R.C.): *JAS*, vol. 13, pp. 163–168, June 1995.

The polarized currents and conductivity currents are used in the analysis of the scattering from magnetic dielectric coated objects. The relation between the electromagnetic property of the material and the travelling wave is studied. It shows that a thin layer of lossy magnetic coating is effective for reducing travelling wave scattering.

(32) An Original Active Microwave Remote Sensor L-Band Coherent Polarization Scatterometer, by W.-Z. Zhu (Shanghai University, Shanghai, P.R.C.): *JAS*, vol. 13, pp. 488–490, Dec. 1995.

This paper introduces a newly developed L-band coherent polarization scatterometer. The scatterometer can measure simultaneously the amplitude and phase information of different polarizations scattered from objects.

(33) Modeling of FDTD of the Ground Probing Radar, by W.-H. Yu*, L. Ren*, and Z.-Q. Peng** (*Southwest Jiaotong University, Chengdu, P.R.C.; **Beijing Remote Information Research Institute, Beijing, P.R.C.): *JAS*, vol. 13, pp. 491–494, Dec. 1995.

The sine and cosine transforms are applied to transform three-dimensional FDTD to two-dimensional FDTD in layered media. The transmitting boundary condition is employed to eliminate reflections from the boundary of the domain, and the superabsorption technique is used to improve the accuracy of FDTD. The method is applied to the ground probing radar with satisfactory results.

(34) Nonlinear Equation for the Reflection Coefficient of a Lossless Medium and its Novel Inverse Scattering Solution, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *JAS*, vol. 13, pp. 495–498, Dec. 1995.

A nonlinear equation for the reflection coefficient of a lossless medium is derived by using a microwave networking technique, and a novel inverse scattering solution to the permittivity profile is further investigated by considering the discontinuity of the medium.

(35) Numerical Solution of the Parabolic Equation Representing Electromagnetic Wave Propagation in the Troposphere Using Box Method, by J. Fang, W.-G. Lin, and Y.-S. Zhao (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 17, pp. 315–320, May 1995.

An implicit finite-difference scheme of box method is introduced for solving the parabolic equation representing electromagnetic wave propagation in the troposphere. The consistency, stability, and convergence of the box method are demonstrated. More accurate results are obtained while the modified refractivity varies both with the height and the distance.

(36) A Hybrid Method for TE Scattering by a Perfectly Conducting Semicylinder, by S.-M. Cui and M.-G. Wang (Xidian University, Xi'an, P.R.C.): *JE*, vol. 17, pp. 391-396, July 1995.

Bistatic scattering of a perfectly conducting semicylinder is analyzed by using a hybrid method, in which the currents in the close vicinity of edges are represented as unknown coefficients; the first-order currents on the curved face are obtained by Fock theory; the high-order currents are described as the Fock type functions involving two unknown coefficients. The first-order currents on planar surface are physical optical currents and diffraction currents obtained by the uniform geometrical theory of diffraction; the second-order currents are expressed in the GTD form involving two unknown coefficients.

(37) Transient EM Fields Scattering by Underground Objects, by K. Lan, J. Wang, and Z.-Q. Peng (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 17, pp. 434–437, July 1995.

Transient EM field scattering by underground objects is calculated with FDTD, and object's response of an EM pulse related to dielectric parameters and underground structure is presented. Conclusions of this method can be used as theoretical evidences of object detecting and discriminating.

(38) Eyelike Principle for Image Reconstruction of the Scatterer, by K.-Y. Feng*, S.-M. Feng*, and M.-Y. Zhang** (*Institute of Electronics, Academia Sinica, Beijing, P.R.C.; **Mississippi State University, MS39762, U.S.A.): *JE*, vol. 17, pp. 469–475, Sept. 1995.

Within the framework of exact scattering theory and under the wave zone condition, the image reconstruction is studied. It is demonstrated that there is only a two dimensional Fourier dual space in the problem of scattering-inverse scattering. An eyelike principle for the imaging at monofrequency, monoincidence, and small imaging angle is proposed and an interesting complementary relation between the imaging angle and operation wave length for the inverse scattering is revealed.

(39) Analysis of the Field Transition and Caustic Regions of Dielectric Coated Objects, by C.-S. Lin and W.-L. Ni (Shanghai University of Science and Technology, Shanghai, P.R.C.): *JE*, vol. 17, pp. 476–483, Sept. 1995.

The fields in transition and caustic region of dielectric coated objects are obtained by the GTD. In transition region, direct computation is accomplished by modifying the residue series solution. The equivalent currents are extended to deal with the creeping wave in caustic region.

(40) The Analysis of Electromagnetic Scattering Characters of Ocean Surface by Complex Astigmatic Wave, by Y.-Q. Wang and G.-S. Wu (Navy Electronic Engineering College, Nanjing, P.R.C.): *JE*, vol. 17, pp. 652–655, Nov. 1995.

The complex astigmatic wave is used to analyze the electromagnetic scattering characters of ocean surface varying with time. Some numerical results are compared with experimental data, and some factors, such as incident angle, polarization, and frequency, are investigated which influence on electromagnetic scattering characters of ocean surface.

(41) Investigation of the Scattering Characteristic of Complex Objects Using Spatial Decomposition Method, by C.-Y. Yu and W.-B. Wang (Xi'an Jiaotong University, Xi'an, P.R.C.): *JM*, vol. 11, pp. 34–40, Mar. 1995.

Three iterative schemes are introduced. In the case of symmetrical configuration and asymmetrical incidence wave, a processing technique is also presented to reduce the storage quantity and the CPU time. These techniques are applied to the case of a complex object formed by cylinder and plates with the normal incidence of TM wave, the numerical results, storage quantity, and CPU time for each scheme are compared, the scattering characteristics for TM or TE incident wave are shown, and the influence of the incident angle and mutual coupling is also discussed.

(42) An Effective Absorbing Boundary Condition and Its Application in EM Scattering Problems, by J. Chen, W. Hong, and Y.-Y. Chen (Southeast University, Nanjing, P.R.C.): *JM*, vol. 11, pp. 161–169, Sept. 1995.

The finite-difference equation for anisotropic inhomogeneous media cylinder is derived, which is suitable for various media with parameters changed. A new absorbing boundary condition is presented with comparison on CPU time and memory space with the measured equation of invariance and MoM. It shows that the advantages of this method are less CPU time and memory space.

(43) On the Calculation of EM Wave Propagation in Buildings, by C.-Q. Wang and X.-L. Zhu (Peking University, Beijing, P.R.C.): *JM*, vol. 11, pp. 176–181, Sept. 1995.

Using the FDTD method, the EM field distributions in two-dimensional buildings irradiated by plane wave are calculated. The scattering and penetration characteristics of buildings for the plane wave with different incident directions and frequencies are calculated. The propagation characteristics of the EM wave radiated by two-dimensional wire source with sinusoidal wave and Gaussian pulse wave are presented.

(44) Analysis and Simulation of EM Wave Scattering and Propagation in 3-D Space by Using FDTD Method, by B.-H. Li and Z.-H. Dai (Shanghai Jiaotong University, Shanghai, P.R.C.): *JM*, vol. 11, pp. 274–284, Dec. 1995.

The scattering and propagation of EM wave in three-dimensional space are analyzed by FDTD method and simulated on a personal computer. The scatterer may be a three-dimensional body with curved surface, and the transmission structure may be direction-changeable and a branched one with multiple dielectrics. The incidence can be either single frequency sine-wave or arbitrary impulse wave.

(45) An Improved Kirchhoff Approximation for Radar Scattering from Rough Surfaces, by Y. S. Oh (Department of Radio Science Engineering, Hong-Ik University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 45–52, Jan. 1995.

A new Kirchhoff approximation (KA) method is proposed for microwave scattering from randomly rough surfaces. Using the spectral representation of delta function and its sifting theorem, a new KA is formulated directly without any further approximation, and this formulation is used to compute exact backscattering coeffcients.

(46) UTD Analysis of the Subreflector of an Offset Dual Reflector Antenna Mounted on a Satellite, by K. T. Lim and S. S. Lee (Department of Electrical Communication Engineering, Hanyang University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 79–88, Jan. 1995.

A subreflector of an offset dual reflector antenna system mounted on a satellite is analyzed by uniform geometrical theory of diffraction (UTD). In order to get the total electric field at an observation point, the reflected and the diffracted fields obtained by UTD are summed. The reflected and the diffracted points which have to satisfy nonlinear equations are obtained by numerical methods.

(47) Near-Field Diffraction Pattern by a Spherical Air Cavity in a Dielectric Medium, by J. S. Kang and J. W. Ra (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 32-A, pp. 262–273, Feb. 1995.

Diffraction patterns of the copolarized and the crosspolarized total electric fields by a spherical air cavity in a dielectric medium are analyzed in the forward near-field region when the wavelength of the incident plane wave is comparable to one half of the cavity radius. It is shown that double nulls and dips of the copolarized and the crosspolarized total electric fields exist in the measurement plane transverse to the propagationg direction of the incident field, and their dependences on the frequency, the distance of the measurement plane, and the measurement angle are analyzed.

(48) A Ray-Based Approach to Scattering from Inhomogeneous Dielectric Objects, by H. D. Kim (Department of Radio Science and Engineering, Hanyang University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 274–280, Feb. 1995.

A ray-based approach is developed to calculate the scattering from inhomogeneous dielectric objects. This approach is a natural extension of the shooting and bouncing ray technique developed earlier for calculating the radar cross section of cavity structures and complex targets. In this formulation, a dense grid of rays representing the incident field is shot toward the scatterer.

(49) FEM Analysis of Ti:$LiNbO_3$ Optical Modulator's Traveling-Wave Electrodes and Estimation of Modulation Bandwidth, by C. M. Kim and S. P. Han (Department of Electrical Engineering, Seoul City University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 339–353, Feb. 1995.

Traveling-wave electrodes for the high-speed Ti:$LiNbO_3$ modulators are designed. For a solution to the problems of phase-velocity mismatching between the optical wave and the modulating microwave, and the microwave electrode characteristic impedance mismatching, 1-μm thick SiO_2 buffer layer is set between the electrode and the Ti:$LiNbO_3$ substrate.

(50) Electromagnetic Wave Scattering from Multilayered Circular Cylinder: OSRC Approach, by H. C. Lee, D. H. Lee, and B. H. Choi (Department of Electrical Engineering, Inha University, Incheon, Korea): *JKITE*, vol. 32-A, pp. 431–437, Mar. 1995.

The scattered electric field from a multilayered circular dielectric cylinder is calculated. An approximate boundary condition used in on-surface radiation boundary condition method is applied to all the boundary surfaces of multilayered dielectric cylinder. It is assumed that scattered electric field at inner boundary surface in one region is transmitted to the adjacent region at outer boundary surface.

(51) Electromagnetic Wave Diffraction Pattern by a Circular Cylindrical Cavity in the Denser Medium, by T. K. Lee*, S. Y. Kim**, and J. W. Ra*** (*Department of Avionics, Hankuk Avitation University, Goyang, Korea; **Division of Electrical and Information Technology, KIST, Seoul, Korea; ***Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 32-A, pp. 768–776, June 1995.

Diffraction patterns of the electromagnetic field scattered by a circular cylindrical cavity embedded in a dielectric medium are analyzed. When the wavelength of the incident wave is comparable to the radius of the cavity, strong double dips occur at the locations corresponding to the top and the bottom of the cavity. Furthermore, the phase changes abruptly about the dip points.

(52) Characteristic Modes of a Longitudinal Slot in the Outer Conductor of Coaxial Waveguide for Scattering: TE Case, by H .Y. Li and Y. K. Cho (Department of Electrical Engineering, Kyungpook National University, Taegu, Korea): *JKITE*, vol. 32-A, pp. 891–897, July 1995.

A characteristic mode theory for longitudinal slot of arbitrary width in the outer conductor of coaxial waveguide is applied for calculating the characteristic magnetic currents, the characteristic fields, radiation patterns, and the fields everywhere (inside and outside the guide, and in the aperture region). Numerical results of the equivalent magnetic currents and the radiation patterns are compared with those obtained by use of the method of moments.

(53) E-Polarized Electromagnetic Diffraction by a Composite Wedge: Physical Optics Solution, by S. Y. Kim and S. U. Kim (Division of Electronics and Information Technology, KIST, Seoul, Korea): *JKITE*, vol. 32-A, pp. 1023–1036, Aug. 1995.

A complete form of physical optics solution to the E-polarized diffraction by a composite of conducting and dielectric wedges is obtained by sum of geometrical optics solution and edge-diffracted field. The diffraction coefficients of the edge-diffracted field are expressed in series of cotangent functions. The electric field patterns of the physical optics solution are plotted in figures.

(54) Interconnection Structures of Bilevel Microstriplines Using Electromagnetic Coupling, by K. D. Park*, H. J. Lee**, and Y. S. Lim** (*Department of Electrical Engineering, Chonnam National University, Gawngju, Korea; **Department of Electrical Engineering, Dongshin Junior College, Gawngju, Korea): *JKITE*, vol. 32-A, pp. 1037–1045, Aug. 1995.

Proximity-coupled open-end microstrip interconnections in bilevel planar structures are investigated through three-dimensional finite-difference time-domain method. Three types of EMC (electromagnetically coupled) microstriplines are considered: colinear lines, transverse lines, and modified EMC structure. From the analyzed results, it is found that these EMC interconnections have the coupling coefficient enough to interconnect lines in bilevel structures over a broad-band.

(55) Integral Equation Formulation for Electromagnetic Coupling through an Arbitrarily Shaped Aperture into a Parallel-Plate Waveguide, by Y. S. Lee*, C. W. Lee**, Y. K. Cho**, and H. Son** (*Department of Communication Engineering, Kumoh National Institute of Technology, Gumi, Korea; **Department of Electrical Engineering, Kyungpook National University, Taegu, Korea): *JKITE*, vol. 32-A, pp. 1557–1567, Dec. 1995.

An analysis method of electromagnetic coupling through an arbitrarily shaped aperture on the upper wall of parallel-plate waveguide, when excited by an electromagnetic plane wave from outside, is considered. The mixed-potential integral equation, in which Green's functions are expressed in a computationally efficient closed form by using the Prony's method and the Sommerfeld identity, is formulated. Expanding the unknown equivalent magnetic surface current in terms of two-dimensional rooftop-type basis functions and choosing razor testing, the integral equation is reduced to a linear algebraic equation.

(56) Analysis of Scattering Fields by Conductors with Arbitrary Cross-Section in Parallel-Plate Waveguide, by B. S. Jeong, H. J. Kim, E. S. Kim, and K. W. Cho (Living System Research Laboratory, LG Electronics Inc., Korea): *JKITE*, vol. 32-A, pp. 1597–1605, Dec. 1995.

In this paper, a new algorithm which calculates transmission coefficient of electromagnetic wave by numerical analysis of scattered field by conductors with arbitrary cross-sections in parallel-plate waveguide is proposed. Proposed algorithm assumes magnetic current distribution on the boundary of scattering conductors, and applies image theorem to perfect conductor surfaces of parallel-plate waveguide. Integral equations for fictitious magnetic currents on conducting boundary are set up. Magnetic current distributions on the conducting boundary are expanded as exponential basis functions.

(57) Analysis Method for the Annular Slot Radiator in a Metal-Backed Cylindrical Cavity, by Y. K. Cho*, K. H. Yun*, J. I. Lee*, J. P. Hong**, and H. J. Shin*** (*Department of Electrical Engineering, Kyungpook National University, Taegu, Korea; **Department of Electrical Engineering, Kyungpook Sanup University, Taegu, Korea; ***Yeungnam University Medical Center, Taegu, Korea): *JKITE*, vol. 32-A, pp. 1606–1611, Dec. 1995.

A theoretical method is considered for the analysis of an annular slot radiator in a metal-backed cylindrical cavity with coaxial feed. In order to check the validity of the method, theoretical values of the input return loss and radiation pattern are compared with experimental values.

(58) Techniques of Element Scheme of Solving Waveguides and Wave Scattering, by C. Y. Kim*, Y. K. Hahm**, and G. H. Song** (*Department of Electrical Engineering, Kyungpook National University, Taegu, Korea; **Electrical and Telecommunication Research Institute, Taejon, Korea): *JKICS*, vol. 20, pp. 564–568, Feb. 1995.

This paper presents improving techniques of solving waveguides and wave scattering by utilizing element scheme in method of moments. The introduced element scheme expands the expansion function over an element segment instead of a node as done in ordinary moment methods. This scheme can treat junction structures by offering simplified formulation and random node numbering feature as well.

(59) Noise Effects on Inverse Scattering Problems by Legendre Scattering Coefficients Determination, by J. K. Kim and C. S. Bai (Department of Electrical and Communication Engineering, Kwandong University, Gangneung, Korea): *JKICS*, vol. 20, pp. 863–876, Apr. 1995.

The inverse scattering problems, that detect size, number, and nature of spherical particles by determination of Legendre scattering coefficients of scattering phase function, are examined by considering the cases that the particles are not homogeneous spheres or the particles are under multiple scattering effects. Legendre coefficient distributions of various form are determined by applying up to 25% of random noises to scattered intensities from Mie spheres, and the obtained distributions are evaluated for practical applications of the inverse scattering method.

(60) Propagation Characteristics of Bilevel Coupled Mirostriplines, by H. J. Lee* and Y. S. Lim** (*Department of Electronics, Dongshin Junior College, Gawngju, Korea; **Department of Electrical Engineering, Chonnam National University, Gawngju, Korea): *JKICS*, vol. 20, pp. 1030–1040, Apr. 1995.

In this paper, with the normal mode parameters obtained by SDA method, the coupling mechanism of bilevel coupled mirostriplines (BCML) is qualitatively analyzed. And with Gaussian pulse excitation, by formulating the frequency response using normal mode parameters, propagation characteristics of BCML-delay, dispersion, and crosstalk are analyzed according to the configurations of dielectric layers and terminating load condition.

(61) Radio Propagation Path Loss in a Tunnel, by K. J. Kim*, Y. J. Yoon**, and H. K. Park** (*Department of Electronic Engineering, Yonsei University, Seoul, Korea; **Department of Radio Communication Engineering, Yonsei University, Seoul, Korea): *JKICS*, vol. 20, pp. 1723–1729, June 1995.

A prediction of propagation loss in a tunnel is useful when implementing continuous mobile communication. The tunnel is modeled as a rectangular waveguide and the path loss is calculated using the model. The rate of loss of signal strength along a tunnel depends on both frequency and transverse dimensions. Measurements of propagation path loss are made in the 550-m long Kumwha tunnel. This tunnel is 6.8-m high and 8.8-m wide.

(62) Analysis of the Characteristics of Uniplanar Transmission Lines Using the Finite-Difference Time-Domain (FDTD) Method, by I. P. Hong*, B. J. Jang**, Y. J. Yoon***, and H. K. Park*** (*Department of Electrical Engineering, Yonsei University, Seoul, Korea; **LG Electronics, Korea; ***Department of Radio Science Engineering, Yonsei University, Seoul, Korea): *JKICS*, vol. 20, pp. 2304–2315, Aug. 1995.

A full-wave analysis of planar transmission lines such as a microstripline, slotline, coplanar waveguide (CPW) line, and a coplanar strip (CPS) line is performed by the finite-difference time-domain method. The dispersive boundary condition is used for microstripline and CPW line, and the modified dispersive boundary condition is used for slotline and CPS line as the absorbing boundary condition.

(63) A Study on the Prediction of Wave Interference by Multiple Obstacles, by J. K. Park* and U. S. Hong** (*Department of Electrical Communication Engineering, Kwangwoon University, Seoul, Korea; **Department of Radio Science Engineering, Kwangwoon University, Seoul, Korea): *JKICS*, vol. 20, pp. 3199–3206, Nov. 1995.

In this paper, a new algorithm is proposed for predicting field strength on urban area and the effects of wave interference by obstacles. The radio wave propagation in built-up area is an important problem to reduce the quality of radio signals, so it is necessary to analyze the problem and to take proper counterplans. The variation of field intensity is calculated with respect to the effects of diffraction and reflection, and the geometrical structures of multiple obstacles.

(64) Propagation Characteristics of Whistler-Mode Signals from LF Decca Transmitter, by A. Iwata*, Y. Tanaka**, and M. Nishino** (*Education Center for Information Processing, Nagoya University, Nagoya, 464-01 Japan; **Solar-Terrestrial Environment Laboratory, Nagoya University, Toyokawa, 442 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 62–70, Feb. 1995.

85.725-kHz whistler-mode Decca signals are measured at the transmitter's magnetic conjugate point. Around sunset the whistler-mode signals reveal a relatively narrow broadening of Doppler shifted frequency and are right-handed polarized. At night the signals reveal a spectral broadening of the Doppler shift and are weakly right-handed polarized.

(65) Technique for Estimating Electromagnetic Field Distributions in and around Building Using Wire-Grid Approximation, by Y. Maeda, K. Murakawa, H. Yamane, and M. Tokuda (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 110–118, Mar. 1995.

A simulation technique for estimating electromagnetic fields in and around building is presented. The building is approximated by a wire-grid model and the method of moments is applied to evaluate electromagnetic fields distribution. Electromagnetic fields in and around an actual telecommunication center building are calculated.

(66) Computer Simulation on Nonlinear Interaction of Intense Microwave with Space Plasmas, by H. Matsumoto, Y. Hashino, H. Yashiro, N. Shinohara, and Y. Omura (Radio Atmospheric Science Center, Kyoto University, Uji, 611 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 119–129, Mar. 1995.

In order to provide quantitative measure of the nonlinear effects of intense microwave onto space plasmas, computer simulations using an electromagnetic particle code called KEMPO are performed. It turns out that the excited level of the Langmuir waves is smaller than that of the electron cyclotron harmonic waves, so opposed to the theoretical prediction.

(67) Theoretical Analysis of Nonlinear Interaction of Intense Electro-Magnetic Wave and Plasma Waves in the Ionosphere, by H. Matsumoto, H. Hirata, Y. Hashino, and N. Shinohara (Radio Atmospheric Science Center, Kyoto University, Uji, 611 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 130–138, Mar. 1995.

In order to evaluate the possible environmental influence of intense microwave beam used for energy transmission in space, theoretical formulae, which allow one to evaluate the coupling coefficients from the intense microwave to the nonlinearly excited plasma waves, are derived.

(68) Phase Disturbances of Loran-C Waves Near a Huge Bridge, by N. Sato*, Y. Miyazaki**, M. Yamashita***, and Y. Takenaka**** (*Hiroshima National College of Maritime Technology, Hiroshima-ken, 725-02 Japan; **Faculty of Engineering, Toyohashi University of Technology, Toyohashi, 440 Japan; ***Nagoya City College of Child Education, Owari-Asahi, 488 Japan; ****Japan Maritime Safety Academy, Kure, 737 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 175–182, Mar. 1995.

In order to investigate the positioning errors of a ship, the phase measurements of Loran-C waves are carried out near Minami-Bisan Seto-Ohashi bridge. The variations of the phase errors show the sinusoidal wave patterns which result from the interference between the primary and reradiated waves. As the result, it is found that the magnitude of the positioning errors lies in the range of ± 60 m to ± 120 m.

(69) Analysis of the Pyramid Electro-Magnetic Wave Absorber: An Approximated Model and Its Application of TE Wave, by H. Anzai, M. Saikawa, T. Mizumoto, and Y. Naito (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 191–199, Mar. 1995.

As an analytical method of the pyramid absorber for normal incidence, an approximate method is proposed. According to the approximation for normal incidence, the characteristics of the pyramid absorber for oblique incidence are computed. The computed results agree with experimental ones.

(70) An Antenna Diversity Method as a Countermeasure for Reducing Disconnection by Shadowing in Realtime In-Door Radio Communication Systems (Letters), by S. Aikawa and M. Yoshikawa (NTT Wireless Systems Laboratories, Yokosuka, 238-03 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 216–218, Mar. 1995.

This letter proposes a new antenna diversity system as a countermeasure for reducing disconnection by shadowing in in-door radio communication systems. Furthermore, the propagation simulation result shows the effect of this system.

(71) Evaluation of RF Immunity Test Facilities Based on the Scattered Field of a Conductive Sphere, by Y. Akiyama, N. Kuwabara, T. Ideguchi, and M. Tokuda (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 250–256, Apr. 1995.

This paper evaluates the electric field in RF immunity test facilities by comparing the calculated field around a conductive sphere in free space with measured one in the test facility. Among a semi-anechoic chamber, and TEM and GTEM cells, the deviation between the calculated and the measured fields of the semi-anechoic chamber is the smallest.

(72) Measurement Results of Rain Attenuation in VSAT Satellite Channel and Expressing Formula for the Low Cumulative Probability Distribution (Letters), by J. Kang, H. Echigo, K. Ohnuma, S. Nishida, and R. Sato (Faculty of Engineering, Tohoku Gakuin University, Tagajo, 985 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 412–415, May 1995.

This letter shows the partial characteristics of measurement results of rain attenuation for the low cumulative time probability distribution, and the log-cubic expression method proposed by Irie is utilized.

(73) Estimations and Evaluations of Radiation Patterns of Personal Handy Phone Systems by NEC2, by H. Saitoh*, M. Omiya**, and K. Itoh** (*Sendai Research Laboratory, Kokusai Electric Co., Ltd., Sendai, 981-32 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 503–510, July 1995.

This paper shows that the numerical electromagnetics code, NEC2, developed in the Lawrence Livermore National Laboratory is useful for the analysis of radiation patterns of personal handy phone systems (PHS's) in the frequency of 1.9 GHz. Radiation patterns of two kinds of PHS's with a metallic or a plastic housing are measured and analyzed.

(74) Characteristics of Whistler Wave Normal Distributions at the Exit of Low Latitude Duct, by Y. Nakamura (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 511–519, July 1995.

Direction-finding observations of whistlers at low latitudes reveal that whistlers come from narrow regions of the zenith and show the morphology of ionospheric exits. The wave normal distributions at the duct exit are calculated at low latitude to examine the characteristics of VLF waves emitted from the duct exit. Two kinds of upward and downward wave normal distributions appear at the duct exit. The cause of two kinds of distributions can be explained by the duct trapping theory.

(75) Determination of Z-R Relationship for Snowfall and Characteristics of Snow Particles (Letters), by K. Muramoto*, Y. Fujiyoshi**, H. Fujita*, and K. Kitano*** (*Faculty of Engineering, Kanazawa University, Kanazawa, 920 Japan; **Institute for Hydrospheric-Atomospheric Science, Nagoya University, Nagoya, 464-01 Japan; ***INTEC Inc., Toyama, 930 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 568–572, Aug. 1995.

In order to determine the Z-R relationship for snowfall, radar reflective factor (Z) by cloud and snowfall intensity (R) on the ground are measured simultaneously. Effects of the number concentration, diameter, and velocity of snow particles on the Z-R relationship are examined using snowfall data on the ground.

(76) Migration Method for Subsurface Radar Considering Variation Propagation Velocity in Depth Direction, by G.-S. Ho and A. Kawanaka (Faculty of Science and Technology, Sophia University, Tokyo, 102 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 638–645, Oct. 1995.

This paper presents a method in which the F-K migration method is applied to the vertically divided image blocks with local propagation velocity. The propagation velocity of each block is estimated by the maximum value of reflection in the reconstructed image.

(77) A Study on Temperature Dependence of Absorption Characteristics of Wave Absorber (Letters), by O. Hashimoto and M. Funakoshi (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 729–732, Nov. 1995.

A variation of material constants with respect to a temperature is investigated by means of a cavity resonance method. A reflection-loss variation of a wave absorber made from such a material is also shown with a particular interest in its temperature dependence. It is concluded that the reflection-loss tends to decrease significantly with a temperature increase.

(78) Numerical Analysis of Self-Focusing Effect Caused by Inhomogeneity of Microwave Energy Density in Ionosphere, by N. Shinohara*, D. R. Shklyar**, and H. Matsumoto* (*Radio Atmospheric Science Center, Kyoto University, Uji, 611 Japan; **IZMIRAN, Academy of Science of Russia, Moscow): *Trans. IEICE,* vol. J78-B-II, pp. 756–766, Dec. 1995.

This paper examines collisionless plasma effects in the propagation of very intense electromagnetic wave from SPS (solar power station) to the earth, namely, a ponderomotive self-focusing of the wave beam. The occurrence of the self-focusing of the microwave beam is decided by five parameters: the density and the temperature of the plasmas, the frequency and the intensity of the microwave, and its spatial gradient.

(79) A Study on the MM-Wave Resistive Sheet Type Wave Absorber Attained at the Wide Angular Characteristics at V Band (Letters), by Y. Hashimoto*, M. Kaneko**, T. Tanaka*, and O. Hashimoto** (*Electro-Magnetic Wave Division, TDK Co., Ltd.,, Ichikawa, 272 Japan; **College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan); *Trans. IEICE,* vol. J78-B-II, pp. 787–790, Dec. 1995.

A MM-wave resistive-sheet type absorber, which is attained at the wide angular characteristics, is discussed. As a result, the larger reflection loss is obtained between 0° to about 70° of the incident angle.

(80) High Frequency Analysis of Electromagnetic Scattering Due to a Dielectric Cylinder, by T. Sasamori*, T. Uno**, and S. Adachi*** (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Faculty of Technology, Tokyo University of Agriculture and Technology, Koganei, 184 Japan; ***Tohoku Institute of Technology, Sendai, 980 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 9–19, Jan. 1995.

This paper discusses methods for analyzing the high frequency properties of scattering waves due to an infinite dielectric thick cylinder for a normally incident plane wave. The solutions divide into the rays passing outside of the cylinder and going through the cylinder. The result is valid in almost all the region including the transition region adjacent to the shadow boundaries where the pure ray optical solution fails.

(81) Transient Scattering Responses from a Plane Interface between Dielectric Half Spaces, by H. Shirai (Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 125–133, Mar. 1995.

Transient scattering field excited by an impulsive line source near a dielectric interface is treated with the Cagniard-deHoop method. Relations between the wavefront approximation in the time domain and high frequency asymptotic approximation in the frequency domain are discussed in detail.

(82) High Frequency Analysis of Electromagnetic Scattering near the Critical Scattering Angle (Letters), by T. Sasamori*, T. Uno**, S. Adachi***, and K. Sawaya* (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Faculty of Engineering, Tokyo University of Agriculture and Technology, Koganei, 184 Japan; ***Tohoku Institute of Technology, Sendai, 980 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 215–218, Apr. 1995.

A high frequency asymptotic solution for electromagnetic scattering near the critical scattering angle of a dielectric circular cylinder is studied. The solution can be interpreted as the sum of a specular reflection and a lateral wave.

(83) An Analysis of the Electromagnetic Wave Diffraction from a Metallic Fourier Grating by Using the Extended Boundary Condition Method (Letters), by M. Ohki, T. Kurihara, and S. Kozaki (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 219–222, Apr. 1995.

The characteristics of diffracted power by a Fourier grating composed of an imperfect conductor are investigated with the extended boundary condition method. Numerical examples are presented for metallic Fourier gratings.

(84) An Experiment on Metallic Body Detection Covered with Insulators by a Microwave Passive Sensor (Letters), by N. Shimoi, M. Kanoh, Y. Shinoda, and F. Iidaka (4th Research Center, Technical Research and Development Institute, Japan Defense Agency, Sagamihara, 229 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 226–228, Apr. 1995.

This letter shows an experimental result on metallic body detection covered with insulators by using a microwave passive sensor. The insulators are transparent in the microwave region but opaque in visible and infrared region.

(85) Numerical Consideration and Some Improvement of Corner Diffraction Formulas Applicable to Spherical Wave Incidence, by Y. Higa, K. Uchikawa, N. Inagaki, and N. Kikuma (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 255–264, June 1995.

This paper compares numerically the Burnside and Pathak's formula and the Zhang's formula for corner diffraction problems. It also proposes an improved version of the Zhang's formula in which a modified factor is introduced heuristically to obtain uniformly continuous values across shadow boundaries.

(86) Circularly Polarized Absolute Value Ray Vectors in Absorbing Media: Fundamental Relations, by S. Tokumaru (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 323–330, July 1995.

A geometrical optics field in nondispersive absorbing media is proposed using a complex eikonal function. By decomposing this geometrical optics field into circularly polarized fields, right-handed and left-handed circularly polarized ray vectors are defined in the sense of absolute values of circularly polarized electromagnetic energy flux densities.

(87) Response of a Dielectric Sphere for Electromagnetic Pulsed Wave: The Cases of Back- and Forward-Scattering, by A. Itoh* and T. Hosono** (*Tokyo National College of Technology, Hachioji, 193 Japan; **College of Science and Technology, Nihon University, Tokyo, 101 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 331–340, July 1995.

The response of a dielectric sphere excited by electromagnetic pulsed plane waves is analyzed. The waveforms of the far field back- and forward-scattering are shown for the sphere with various permittivity, dielectric losses, and incident waveforms.

(88) Finite Element Analysis of Plane Wave Diffraction from Anisotropic Dielectric Gratings, by Y. Ohkawa, Y. Tsuji, and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 391–399, Sept. 1995.

A unified numerical approach based on the finite element method for solving the diffraction problem of anisotropic dielectric gratings of arbitrary shape is described. Both the TE wave and TM wave incidences are treated. The finite element method is used for the region corresponding to one period of the grating, and analytical relations and periodic conditions are introduced on the boundaries surrounding the one-periodic region.

(89) Transient Impulsive Response from an Interface between Two Media: Spectral Theory of Transients Analysis, by H. Sato*, H. Shirai*, and E. Heyman** (*Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan; **Department of Electrical Engineering, Tel-Aviv University, Tel-Aviv, Israel): *Trans. IEICE,* vol. J78-C-I, pp. 439–447, Oct. 1995.

Transient electromagnetic field excited by an impulsive line source near a dielectric half space is rigorously formulated by spectral theory of transients. Derived field representations are found to coincide with those obtained by Cagniard–deHoop method. The derived field expression is utilized to obtain perspective views of the transient field distribution near an interface between two media.

(90) Analysis of the Grating with an Oblique Incident Waveguide (Letters), by T. Fujisawa and T. Kambayashi (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 459–461, Oct. 1995.

A grating with an oblique incident waveguide is analyzed by using a wide-angle beam propagation method. Also, a wavelength filter, in which the grating and a waveguide lens are integrated monolithically, is proposed.

(91) Analysis and Experiment on Phase Conjugate Reflectivity of CAT Mirror, by H. Yamada*, A. Okamoto*, K. Enbutsu*, 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. J78-C-I, pp. 609–615, Dec. 1995.

Phase conjugate reflectivity of CAT mirror is analyzed. The reflectivity is calculated in consideration of an incident angle and a position of the laser beam. The experiment is performed using $BaTiO_3$ crystal and Ar ion laser.

(92) Oblique Incident Light Characteristics of Optical Phase Modulator with Smectic A Liquid Crystals (Letters), by Y. Kidoh*, Y. Kometani**, M. Sibata**, H. Okada**, and H. Onnagawa** (*Department of Electrical Engineering, Toyama National College of Technology, Toyama-ken, 939, Japan; **Faculty of Engineering, Toyama University, Toyama, 930 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 695-696, Dec. 1995.

Retardation between ordinary and extraordinary light transmitted obliquely through a horizontal-type phase modulator fabricated with smectic A liquid crystals is investigated. Experimental results of the cell with thickness of 8.8 μm and electric field between -2 V/μm and $+2$ V/μm show the retardation of 2π.

(93) Broadband Quasi-Phase-Matched Second-Harmonic-Generation Device Using Chirped Distance between Periodic Structures (Letters), by K. Koyanagi (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 704–707, Dec. 1995.

This letter presents a wideband quasiphase-matched (QPM) second-harmonic-generation (SHG) bulk device using chirped distance between periodic domain-inverted structures. SH intensity as a function of fundamental wavelength is derived and numerical results are given for $LiNbO_3$.

(94) Electromagnetic Waves Reflected between Two Parallel Perfectly Conducting Moving Plates (Letters), by M. Kuroda and H. Miyashita (Faculty of Engineering, Tokyo Engineering University, Hachioji, 192 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 711–713, Dec. 1995.

A numerical procedure of grid generation having a coordinate line coincident with an arbitrarily shaped moving boundary is proposed. By using this technique, the electromagnetic waves between two parallel, perfectly conducting moving plates are analyzed.

(95) Reduction of Surface Clutter by a Polarimetric FM-CW Radar in Underground Target Detection, by T. Moriyama, Y. Yamaguchi, H. Yamada, and M. Sengoku (Faculty of Engineering, Niigata University, Niigata, 950-21 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 625–629, Apr. 1995.

This paper presents an experimental result of polarimetric detection of objects buried in a sandy ground by a synthetic aperture FM-CW radar. Emphasis is placed on the reduction of surface clutter by the polarimetric radar, which takes account of full polarimetric scattering characteristics. Polarimetric enhancement factor, which is defined as a power ratio of two different targets, is employed as a discriminator which theoretically and conceptionally plays an important role in imaging a specific target in a complex featured imagery.

(96) Millimeter Wave Propagation Model and Delay Spread along the Maglev Guideway (Letters), by H. Yamamura and S. Sasaki (Railway Technical Research Institute, Kokubunji, 185 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1204–1207, Aug. 1995.

A multipath model using the ray-tracing method is presented for the millimeter-wave propagation inside a figure U guideway of the maglev (magnetic levitation). The delay spread is exceedingly small, and high speed data transmission more than 100 Mbps is possible without an equalizer.

(97) Numerical Evaluation of Propagation Impairments Due to Man-Made Structures on Digital Microwave Links, by Y. Serizawa (Central Research Institute of Electric Power Industry, Communication & Information Research Laboratory, Komae, 201 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1219–1228, Aug. 1995.

This paper describes a practical method for evaluating the influence of propagation impairments due to man-made structures on digital microwave links and provides some model calculations of those impairments. Propagation distortion, diffraction loss, and cross-polar interference due to reflected and scattered waves from man-made structures such as buildings and conductor structures are evaluated.

(98) A Generalized Surface Echo Radar Equation for Down-Looking Pencil Beam Radar (Letters), by T. Kozu (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1245–1248, Aug. 1995.

A generalized surface scattering radar equation for a near-nadir-looking pencil beam radar, which covers both beam-limited and pulse-limited regions, is derived. This equation is a generalization of the commonly used nadir-pointing beam-limited radar equation taking both antenna beam and pulse waveform weighting functions into account.

(99) Received Signal Level Characteristics for Wideband Radio Channels in Line-of-Sight Microcells, by A. Yamaguchi, K. Suwa, and R. Kawasaki (NTT Wireless Systems Laboratories, Yokosuka, 238-03 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1543–1547, Nov. 1995.

Received signal level characteristics for wideband mobile radio channels in line-of-sight microcells are investigated. The results from urban-area field experiments, where received signal levels for various receiver bandwidths and power delay profiles are measured, show that the depth of fading of the received signal decreases as the normalized RMS delay spread, defined as the product of receiver bandwidth and RMS delay spread, increases.

(100) Blazing Effects of Dielectric Grating with Periodically Modulated Two Layers (Letters), by T. Yamasaki (College of Science and Technology, Nihon University, Tokyo, 101 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 322–327, Mar. 1995.

Blazing effects of a dielectric grating consisting of two adjacent sinusoidally modulated layers which lead to the asymmetric profiles on a substrate are analyzed by using an improved Fourier series expansion method. The influences of the second order of modulation index on the radiation efficiencies and normalized leakage factor are also discussed.

(101) Scattering of Electromagnetic Plane Waves by a Perfectly Conducting Wedge: The Case of E Polarization, by M. Shimoda*, T. Itakura**, and Y. Yamada* (*Department of Electronic Engineering, Kumamoto National College of Technology, Kumamoto-ken, 861-11 Japan; **Department of Engineering and Computer Science, Kumamoto University, Kumamoto, 860 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1298–1305, Sept. 1995.

A two-dimensional scattering problem of electromagnetic waves by a perfectly conducting wedge is analyzed by means of the Wiener–Hopf technique together with the formulation using the partition of scatterers. By deforming the integration path of the Fourier inverse transform, it is found that the representation of the scattered wave is in agreement with the integral representation using the Sommerfeld contours.

V. Microwave Medical/Biological Applications

(1) Analysis of a Sheath Helix in Coaxially Multi-Layered Dielectric Environment, by S. K. Pathak, S. P. Singh, and R. K. Jha (Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): *JIETE*, pp. 183–189, May-June 1995.

This paper presents an appropriate field as well as equivalent circuit descriptions of a helical slow wave structure in coaxially multilayered dielectrics environment including biological media at microwave frequencies. A relatively uniform deposition of energy in different tissue layers of rat's thigh/limb is obtained. The helices described in the analyses here may be used for treating the cancerous growth in thigh/limb of rats.

(2) The Calculation of SAR Distribution for a Water-Cooled Microwave Dipole Applicator Radiating in a Biological Medium, by B.-K. Wan*, S.-Y. Lin**, and W. Wang** (*Tianjin Institute of Technology, Tianjin, P.R.C.; **Tianjin Institute of Cancer and Hospital, Tianjin, P.R.C.): *AES*, vol. 23, pp. 86–89, Mar. 1995.

An insulated, watercooled microwave dipole applicator radiating in a biological tissue, is analyzed with a theoretical electromagnetic mode. The specific absorption rate (SAR) distribution is calculated taking into account the effect of the water flowing inside the applicator. The result suggests that the SAR distribution will be improved on the extension of therapy depth due to the effect of water-cooled and it conforms to the engineering experiments and clinical reality.

(3) Application of a Matrix Perturbation Theory to the Computation of Internal Fields inside a Three-Dimensional Lossy Biological Body, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 23, pp. 112–114, Mar. 1995.

A matrix perturbation theory is presented, and its application to the computation of internal fields inside a three-dimensional lossy biological body is investigated.

(4) Development of Microwave Prostate Therapy, by J. Ge (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *JE*, vol. 17, pp. 210–214, Mar. 1995.

The therapy principle and design of microwave prostate hyperthermia are described. This apparatus uses 915-MHz microwave treatment for the prostate. The solid state microwave source and surface cooling system of special design only heats the prostate. The temperature is measured and monitored automatically, and the measured data are recorded, displayed, and printed in real-time by a microcomputer. The accuracy of thermosensor measurements is $\pm 0.1°$C.

(5) The Protection of HPM and NEMP, by Z.-W. Lai (Chinese Institute of Engineering Physics, Beijing, P.R.C.): *JM*, vol. 11, pp. 1–8, Mar. 1995.

This article presents two important electromagnetic interference source-HPM (high power microwave) and NEMP (nuclear electromagnetic pulse). Their generation mechanisms, main features, effects to electronic and electric systems, and the protection techniques are discussed.

(6) Fuzzy Theory Applied to Microwave Acupuncture, by S.-H. Zhang and L.-S. Yu (Hangzhou Institute of Electronic Engineering, Hangzhou, P.R.C.): *JM*, vol. 11, pp. 215–221, Sept. 1995.

This paper puts forward a method to design the microwave acupuncture set by using fuzzy theory and fuzzy knowledge-engineering.

(7) The Factors of the Experiments for Biological Effects of Electromagnetic Waves, by Z.-Q. Niu (Xidian University, Xi'an, P.R.C.): *JM*, vol. 11, pp. 236–241, Sept. 1995.

The factors of the experiments for biological effects of electromagnetic wave are discussed. The factors mean those which should be controlled in the experiment and given in the experiment report. The factors are important for appraising the reasonableness and reliability of the experimental conclusion.

(8) SAR Characteristics of an Antenna Loaded with Magnetic Rings for Interstitial Hyperthermia (Letters), by K. Iwata*, M.-S. Wu**, K. Ito*, and J. Takada* (*Faculty of Engineering, Chiba University, Chiba, 263 Japan; **Graduate School of Science and Technology, Chiba University, Chiba, 263 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 36-38, Jan. 1995.

An antenna loaded with magnetic rings is proposed to reduce hot-spot (unexpected heating region).

(9) Reduction of SAR in Human Body by Perfect Conducting Shield, by S. Tokumaru and T. Nakamura (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE,* vol. J78-B-II, pp. 200–207, Mar. 1995.

A method of reducing SAR in a human body by a perfect conducting shield is proposed. The SAR characteristics are calculated in a cylindrical human model attached to the shield in the case of plane wave incidence.

(10) Microwave Power Absorption in a Cylindrical Model of Man in the Presence of a Flat Reflector (Letters), by S. Kuwano and K. Kokubun (Department of Electrical Engineering, College of Engineering, Nihon University, Koriyama, 963 Japan): *IEICE Trans. Commun.,* vol. E78-B, pp. 1548–1550, Nov. 1995.

This letter describes the power absorption of a cylindrical man model placed near a flat reflector exposed to the TE microwave. The numerical results show that the absorption is in some cases an order of magnitude or more greater than that of the man model without a reflector.

(11) Basic Analysis on SAR Distribution of Coaxial-Slot Antenna Array for Interstitial Microwave Hyperthermia, by L. Hamada*, M.-S. Wu**, K. Ito*, and H. Kasai* (*Department of Electrical and Electronics Engineering, Chiba University, Chiba, 263 Japan; **Graduate School of Science and Technology, Chiba University, Chiba, 263 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1624–1631, Nov. 1995.

Coaxial-slot antennas for interstitial microwave hyperthermia is studied by using the moment method. The catheter thickness has much effect on the characteristics and must be considered both in designing and in using the antenna. When the array spacing is increased, the effective heating area becomes larger and more uniform. As the insertion depth is increased, the effective heating area is also enlarged.

VI. Lasers and Other Devices

(1) Circuit Modeling of Semiconductor Lasers, by H. A. Tafti*, F. F. Papa*, F. N. Farokhrooz**, and P. R. Vaya**

(*School of Electronics and Communications Engineering, Anna University, Madras 600 025, India; **Department of Electrical Engineering, Indian Institute of Technology, Madras 600 036, India): *JIETE*, pp. 101–112, Mar.-Apr. 1995.

This paper reviews the various techniques employed in the circuit modeling of a semiconductor laser. Principles of static and dynamic modeling are briefly discussed. The rate equations used in the analysis of the semiconductor laser are presented. The circuit modeling technique which is gaining popularity due to its easy implementation using general purpose circuit analysis program is discussed in detail. The paper also reports some recent developments in the field of circuit modeling of semiconductor laser diodes that are applicable to advanced laser configurations.

(2) Analysis and Experiment of A-LOC GaAlAs/GaAs Laser, by X.-L. Kang, X.-H. Li, L.-J. Zhu, and N.-X. Song (Zhejiang University, Hangzhou, P.R.C.): *AES*, vol. 23, pp. 65–67, Feb. 1995.

The advantages of asymmetric large optical cavity (LOC) structure to raise the output optical power of GaAlAs/GaAs laser are analyzed. The parameters of A-LOC, which are used to get the maximum output optical power and fundamental transverse mode, are calculated. Based on the analysis, the A-LOC GaAlAs/GaAs laser is fabricated. The output optical power (CW) without coating is above 85 mW.

(3) A Novel InGaAsP/InP Frequency Divider Using Electronic Tuning, by B.-R. Cai, Y.-Z. Liu, T. Pang, and Y.-T. Ye (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 68–70, Feb. 1995.

A novel frequency divider with four frequencies using electronic tuning is proposed. The device structure is composed of an InGaAsP/InP double hetero-structure ridge waveguide, a distributed Bragg reflector configuration, and a pair of electrodes. The frequency division is demonstrated by the waveguide refractive index change induced by electro-optical effect. At 1.55-μm wavelength, when the frequency division gap is 8 GHz, the external bias voltages for four frequencies are about 0, 4, 8, and 12 V, respectively.

(4) A Surface Correction Formula for Minority Lifetime Measurement of Silicon Crystals, by D.-L. Que*, X.-Z. Chen*, and D.-L. Xu** (*Zhejiang University, Hangzhou, P.R.C.; **Emei Institute of Semiconductor Materials, Emei, P.R.C.): *AES*, vol. 23, pp. 71–73, Feb. 1995.

Based on both numerical analysis and experimental data, a surface correction formula for minority lifetime measurement of silicon crystals is proposed using high frequency photoconductive decay stimulated by monochromatic light.

(5) Kinetic Theory of the Ion-Ripple Laser in Consideration of Longitudinal Momentum Spread, by P.-K. Liu*, S.-J. Qian*, C.-J. Tang**, and S.-G. Liu** (*Southeast Institute of Physics, Chengdu, P.R.C.; **University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 1–5, Mar. 1995.

Ion-ripple laser (IRL), which is a new form of free-electron laser, is investigated using the kinetic theory. By considering the finite spread in beam longitudinal momentum and the effect of finite space-charge field of the electron beam, the dispersion relation of IRL instability is derived, and the growth rate of IRL wave and the linear damping rate of the space-charge wave are also got.

(6) Kinetic Theory of EM-FEL Sideband Instability, by L. Meng and S.-G. Liu (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 26–30, Mar. 1995.

Kinetic theory of sideband instability for an electromagnetic pump free-electron laser (EM-FEL) without a guided magnetic field is developed by applying Vlasov-Maxwell equations and integration along the unperturbed orbit. The properties of electron motions in the equilibrium distribution are discussed and the general dispersion equation is derived. The maximum linear growth rates and the relevant frequencies of sideband for step distribution are obtained. The properties of the EM-FEL sideband instability are discussed in detail.

(7) Travelling Wave Treatment of Two-Segment Bistable Semiconductor Lasers, by B. Luo*, H.-C. Lu*, and J.-G. Chen** (*Southwest Jiaotong University, Chengdu, P.R.C.; **Sichuan University, Chengdu, P.R.C.): *AES*, vol. 23, pp. 32–35, May 1995.

Travelling wave rate equations are used to study the optical bistability of the two-segment laser diodes. Closed form solutions for photon flux inside the cavity are deduced and some aspects of the bistable lasers are discussed.

(8) Comprehensive Analysis of Noise Characteristics of EDFA, by J.-X. Gu and C.-H. Xu (Peking University, Beijing, P.R.C.): *AES*, vol. 23, pp. 54–57, May 1995.

A comprehensive analysis of noise figure of erbium-doped fiber amplifier (EDFA) is carried out by including signal shot noise, amplified spontaneous emission (ASE) shot noise, as well as signal-ASE beat noise and ASE-ASE beat noise. Through numerical simulation, some useful results under different input signal power and pump power level are given. It is believed that these results will be a major advantage in determining the EDFA's operation condition and design.

(9) Theoretical Analysis of the Effect of External Optical Feedback on Strongly Coupled External Cavity Semiconductor Lasers, by Y.-J. Chai, H.-Y. Zhang, S.-Z. Xie, and B.-K. Zhou (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 23, pp. 80–83, May 1995.

Effect of external optical feedback on strongly coupled external cavity semiconductor laser is theoretically analyzed for both coherent and incoherent external optical feedback. The results show that the critical tolerable level of external optical feedback can be greatly increased by about 20 dB for strongly coupled external cavity semiconductor laser compared to solitary laser diode. It is also obtained that long external cavity length and strong external cavity coupling are beneficial to resist feedback for external cavity semiconductor lasers.

(10) Gain Characteristics of EDFA and Optimization of EDF Parameters, by M.-D. Zhang, G.-L. Yin, J.-S. Wang, and X.-L. Yang (Southeast University, Nanjing, P.R.C.): *AES*, vol. 23, pp. 84–87, May 1995.

Based on the rate equation theory of erbium-doped fiber amplifier, the relationships between parameters of erbium-doped fibers and gain characteristics of EDFA are analyzed and calculated. The analytic expressions for cutoff wavelengths of the erbium-doped fiber are obtained for the first time.

(11) The Lower Limit of the Frequency Detuning for an Injection-Locked Semiconductor Laser, by L.-L. Li (Zhengzhou University, Zhengzhou, P.R.C.): *AES*, vol. 23, pp. 88–90, May 1995.

A modified formula for the locking bandwidth in an injection-locked semiconductor laser is presented by consideration of the influence of nonlinear gain. The lower limit of the frequency detuning for the laser stably operating will be reduced by this influence, especially for a laser with large bias current or with large nonlinear gain coefficient.

(12) Measurements on Electronic Field Distribution for New Types of Electron-Optic Source Device, by X.-P. Wu and Z.-H. Zhu (Zhejiang University, Hangzhou, P.R.C.): *AES*, vol. 23, pp. 91–93, May 1995.

Based on a new nondestructive method (continuous wave electro-optic probing), the electric field distributions for GaAs/AlGaAs LD, LD array, and LED array, are detected. The features of the electric field, injected current distribution in different layer, and the optic homogeneity for arrays are presented.

(13) The Auger Compound Analysis of DH Laser, by R.-D. Xia*, Y. Chang*, and W.-H. Zhuang** (*Capital Normal University, Beijing, P.R.C.; **Institute of Semiconductor, Academia Sinica, Beijing, P.R.C.): *AES*, vol. 23, pp. 112–115, Aug. 1995.

The experiment data about 0.95-μm wavelength high energy luminous peak in 1.55-μm InGaAsP/InP laser are analyzed. The results prove that the Auger compound of InGaAsP active region is the major cause of carrier leakage toward the two sides of InP restricted layer.

(14) Time-Domain Finite Difference Approach to 3D Analysis of GaAs Bulk Photoconductive Switches, by J. Ma and K.-Z. Guo (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *AES*, vol. 23, pp. 20–25, Nov. 1995.

A three-dimensional full-wave analysis for transient EM problem of photoconductive semiconductor switches (PCSS) is implemented by employing both FDTD and superabsorption technique. Three-dimensional pictures given may be helpful to understand transient phenomena in PCSS and the computer program may be useful for practical calculation. A discussion about the effect of static field components on numerical results is also given.

(15) Extraction of Equivalent Parameter of High Speed Semiconductor Laser Diode, by Z.-D. Wu, Z.-J. Zhang, Y. Fan, and X.-H. Tang (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 23, pp. 70–73, Nov. 1995.

After overcoming the bad effect of the resonance phenomena on the background CPW, a nonmatching microwave package is developed for the laser diode (LD) made in China. Its frequency response to the direct modulation is measured. Then the equivalent parameters of LD are extracted.

(16) A New Configuration of Erbium-Doped Fiber Amplifier with Bragg Grating to Improve Pumping Efficiency, by J.-X. Gu and C.-H. Xu (Peking University, Beijing, P.R.C.): *AES*, vol. 23, pp. 74–76, Nov. 1995.

A new configuration of an erbium-doped fiber amplifier is proposed to improve the pumping efficiency and saturated output power. For 1.48-μm pumping, this configuration can double the pumping efficiency with the same fiber length. The maximum value of small signal gain is 3 dB larger, and the saturated output power of this configuration is 1.5 dBm higher than those of the normal type.

(17) Interaction of Raman Processes in Optically Pumped Submillimeter Wave Laser, by X.-S. Zheng, Y. Li, X.-Z. Luo, M. Liu, and Y.-K. Lin (Zhongshan University, Guangzhou, P.R.C.): *AES*, vol. 23, pp. 10–14, Dec. 1995.

In miniature optically pumped NH_3 submillimeter wave lasers, interaction of Raman processes becomes an important effect, which dominates the laser output intensity and spectral characteristics. As CO_2-9R(16) laser line pumps NH_3, two Raman processes $s \rightarrow a$ P(7,0) and $s \rightarrow a$ P(7,1) interact and enhance each other, while CO_2-9R(30) line pumping, competition among the Raman processes appears.

(18) The Velocity-Matching and Evaluation of High Order Modes in the Optical Waveguide Modulator with the Finline Configuration, by S.-Q. Chen and P.-D. Ye (Beijing University of Posts and Telecommunications, Beijing, P.R.C.): *JCIC*, vol. 16, pp. 26–31, May 1995.

The calculations for optimal design (to fulfill velocity-match) of the lithium niobate ($LiNbO_3$) optical waveguide modulator in finline are made based on the spectrum domain method and the spectrum domain immittance approach, including the width of the lithium niobate plate which is used as the substrate of the finline, slot width of the finline, and position of the optical waveguide. The high-order modes of this finline are also calculated.

(19) The Study of InGaAsP Single Quantum Well Semiconductor Microdisk Lasers, by B. Zhang, R.-P. Wang, X.-M. Ding, Z.-J. Yang, L. Dai, X.-M. Cui, and S.-M. Wang (Peking University, Beijing, P.R.C.): *JIMW*, vol. 14, pp. 253–256, Aug. 1995.

The InGaAsP single quantum well microdisk lasers are successfully fabricated by using the conventional liquid phase epitaxy and microfabrication techniques for the first time. The single mode oscillation in the condition of much lower threshold than that of conventional laser diode is observed experimentally. It demonstrates strong mode-selection capability of the microdisk, reflecting the character of a microcavity.

(20) Characteristic Analysis of Suspended Slot Line for Traveling Wave Optical Phase Modulator, by Y.-X. Guo and Y. Li (Shanghai University, Shanghai, P.R.C.): *JIMW*, vol. 14, pp. 347–352, Oct. 1995.

A novel structure for integrated optical waveguide traveling wave phase modulator is presented. It makes use of the suspended slot line as the modulating circuit, and is capable of decreasing the mismatch between optical wave and modulating wave, so the bandwidth of the modulator can be greatly increased. The transmission characteristics of the suspended slot line are analyzed by using the spectral domain technique.

(21) Ion-Channel Electron Cyclotron Maser, by C.-J. Tang*, P.-K. Liu**, and S.-G. Liu** (*Chengdu University of Science and Technology, Chengdu, P.R.C.; **University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JIMW*, vol. 14, pp. 407–412, Dec. 1995.

A new high-power plasma millimeter-wave radiation system ICECM (ion-channel electron cyclotron maser) is studied. The electromagnetic instability of the system is analyzed, and compared with other electron cyclotron masers. Through the present three-dimensional linear theory analysis, the basic features of ICECM are shown.

(22) Modeling Analysis of Asymmetric SOI Optical Waveguide Switch Based on Total Internal Reflection, by C.-Z. Zhao, G.-Z. Li, Y.-L. Liu, E.-K. Liu, and X.-D. Liu (Xi'an Jiaotong University, Xi'an, P.R.C.): *JIMW*, vol. 14, pp. 435–440, Dec. 1995.

Transmission characteristic of X type crossing waveguide structures constructed by a large cross-section single-mode ridge-shaped SOI waveguide is analyzed by using the effective index method and the beam propagation method. When the crossing angle of the crossing waveguides is between $1.5°$ and $2°$, their crosstalks are below -25 dB. The propagation and reflection characteristics of the guided mode in an asymmetric total internal reflection optical waveguide switch are investigated by using the wave optics principle.

(23) Characteristic Study of a Free Electron Laser with Linearly Polarized Wiggler and Rectangular Waveguide, by Y.-Z. Yin (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *JE*, vol. 17, pp. 385–390, July 1995.

The characteristics of coherent radiation produced by a cylindrical electron beam passing through a rectangular waveguide and linearly polarized wiggler are studied. The instability analysis is based on the linearized Vlasov-Maxwell equations for the perturbations about a self-consistent beam equilibrium. The dispersion equation of TM_{mn} mode is deduced and the radiation frequency and growth rate as a function of electron beam energy and radius, axial magnetic field, wiggler field, and wavelength are presented and discussed.

(24) An Experimental Study on Photoconductive Semiconductor Switches, by K.-Z. Guo*, Q. Zhou*, J. Ma*, B.-Z. Yang**, and W. Zhao** (*Institute of Electronics, Academia Sinica, Beijing, P.R.C.; **Xi'an Institute of Optics and Precision Mechanics, Academia Sinica, Xi'an, P.R.C.): *JE*, vol. 17, pp. 421–425, July 1995.

By using the apparatus given in this paper the experiment on photoconductive switches is conducted to investigate the affection of both the laser energy and bias voltage on switch output. By means of the same set-up, the carrier lifetime of Cr:GaAs used is measured to be as 1.8 ns, and the possibility of the set-up to be utilized as a high speed photodetector is demonstrated.

(25) Mode Locking of AlGaAs Semiconductor Laser Traveling Wave Amplifiers, by C. H. Lee*, S. G. Kang*, K. W. Jeong**, S. J. Leem**, and T. K. Yoo** (*Korea Electrical and Telecommunication Research Institute, Taejon, Korea; **Central Research Laboratory, Goldstar, Korea): *JKITE*, vol. 32-A, pp. 119–128, Jan. 1995.

Hybrid and passive mode-locking results of tilted-stripe AlGaAs semiconductor laser traveling wave amplifiers with saturable absorbers are reported. Dependence of the pulse width on the mode locking frequency, the bandwidth of spectral filters, and the bias current of the laser amplifier is investigated.

(26) Design and Fabrication of Laser Diode Integrated with Peltier Cooler, by S. I. Lee and J. H. Park (Department of Electrical Engineering, Korea University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 159–165, Jan. 1995.

A double-heterostructure mesa-stripe-geometry laser diode integrated with thermoelectric Peltier cooler is designed and fabricated. Epi-layers are grown by metal organic chemical vapor deposition method.

(27) Effect of Grating Structures and Mirror Positions on Characteristics of 1.55 μm DFB Laser-II, by K. Y. Kwon (Department of Electronics Engineering, Kongju National University, Kongju, Korea): *JKITE*, vol. 32-A, pp. 291–299, Feb. 1995.

The operating characteristics, such as the threshold gain, lasing frequency, and longitudinal intensity profile, etc., of 1.55-μm DFB laser diode with index and/or gain grating structures and with one side AR-coated mirror, are analyzed.

(28) Fabrication of 1.55 μm RWG-DFB-LD's and Evaluation of Its Optical Characteristics, by J. K. Lee*, S. W. Lee*, H. S. Cho*, D. H. Jang*, K. H. Park*, J. S. Kim*, I. D. Hwang*, H. M. Kim*, H. M. Park*. and T. H. Hong** (*Compound Semiconductor Division, ETRI, Taejon, Korea; **Department of Electrical and Communication Engineering, Korea Maritime University, Pusan, Korea): *JKITE*, vol. 32-A, pp. 316–323, Feb. 1995.

The 1.55-μm RWG-DFB-LD is fabricated and its electrical and optical characteristics are measured. Interference fringe of optical beams is used for grating formation and epi layers are grown by lower-temperature LPE. The fabricated RWG-DFB-LD operates in a single longitudinal mode with more than 30-dB SMSR at 1543-nm emitting wavelength and its threshold current is 40 mA.

(29) Theoretical Analysis of the Spontaneous Emission Spectrum of a Device Using DFB Structures, by B. G. Kim*, J. Y. Choi*, K. S. Jeung*, S. C. Cho*, and B. Y. Lee** (*Department of Electrical Engineering, Soongsil University, Seoul, Korea; **Korea Telecom Research Laboratory, Korea): *JKITE*, vol. 32-A, pp. 438–450, Mar. 1995.

Analytic expressions for the spontaneous emission spectrum of a device are derived by using DFB structures including the effects of both facet reflections and the phase of a grating. In the derivation, the transfer matrix and multiple reflection methods are used for the solution of coupled mode equations.

(30) Comparison of Linewidth Enhancement Factor and Differential Gain of DFB-LD's with Various Active Layer Structures, by K. H. Park, H. S. Cho, D. H. Jang, J. K. Lee, J. S. Kim, S. W. Lee, H. M. Kim, and H. M. Park (Compound Semiconductor Department, ETRI, Taejon, Korea): *JKITE*, vol. 32-A, pp. 1076–1083, Aug. 1995.

Linewidth enhancement factor, linewidth, chirping, and differential gain characteristics are measured and compared for each DFB-LD's containing active layers composed of bulk, MQW, and S-MQW, respectively. Linewidth enhancement factor of 6, 4, and 3.2 and chirping measured under 2.5-Gbps modulation of 1.29 nm, 0.67 nm, and 0.48 nm are given for DFB-LD's of bulk, MQW, and S-MQW active layers, respectively.

(31) Electrode Analysis and Design of $LiNbO_3$ Optical Modulator with Coplanar Waveguide Type, by S. K. Kim*, H. D. Yoon*, D. W. Yoon*, and Y. T. Yoo** (*Korea Electrical Technology Institute, Korea; **Department of Electrical Engineering, Chonnam National University, Kwangju, Korea): *JKITE*, vol. 32-A, pp. 1612–1622, Dec. 1995.

Methods of designing CPW (coplanar waveguide) traveling-wave electrodes are described and their properties are discussed. Especially, the effects of buffer layer thickness on the microwave characteristics of the CPW electrodes are studied in detail. The trade-off relationships between buffer layer thickness and eletro-optical properties of the devices are clearly revealed. The microwave characteristics and driving voltage can be further improved by using selected parameters suggested in this paper. To reduce time and effort in designing CPW electrode structure, exact analytical models are proposed.

(32) An Analysis of the Lateral First-Order Mode Characteristics for the Semiconductor Laser Diodes, by H. R. Kim and K. D. Kwack (Department of Electrical Engineering, Hanyang University, Seoul, Korea): *JKITE*, vol. 32-A, pp. 1623–1632, Dec. 1995.

This paper represents the lateral first-order mode characteristics for the semiconductor laser diodes using a two-dimensional numerical simulator. In order to analyze the lateral first-order mode characteristics, Helmholtz wave equation is solved twice for the lateral fundamental and the first-order mode considering the mode gain, total losses, and the recombination rate due to the stimulated emission radiation for each mode independently.

(33) Design of the Antireflection Coatings on Laser Diode Facets, by B. G. Kim, H. S. Kim, and Y. G. Kim (Department of Electrical Engineering, Soongsil University, Seoul, Korea): *JKICS*, vol. 20, pp. 545–555, Feb. 1995.

For the design of antireflection coatings, the results of the four simplified methods are compared to those of the rigorous method. The optimum antireflection coating parameters obtained by the three simplified methods agree very well to those obtained by the rigorous method. The tolerance maps of coating parameters for both TE and TM modes are presented, which are important for the fabrication of antireflection coatings.

(34) Design and Analysis of Microwave Frequency Synthesizer of DAMA-SCPC System, by C. S. Pyo and S. Y. Eom (Electrical and Telecommunication Research Institute, Taejon, Korea): *JKICS*, vol. 20, pp. 1273–1292, May 1995.

This paper presents the design and analysis on a microwave frequency synthesizer with low phase noise characteristic utilized in DAMA-SCPC system which shall provide telephone service and data service with low transmission rate through the KOREASAT.

(35) Implementation of Arbitrary Beam Pattern Generator Using Spatial Light Modulator, by D. J. Lee*, B. H. Yoon*, N. Kim*, and S. H. Jeon** (*Department of Computer and Communication Engineering, Chungbuk National University, Chungjoo, Korea; **Department of Electronic Engineering, University of Inchon, Inchon, Korea): *JKICS*, vol. 20, pp. 1595–1603, June 1995.

Nonseparable, stripe geometry phase gratings are designed for real-time optical interconnection using spatial light modulator. This gratings generate 5×5 spot array, OIP, and car-shaped spot patterns which have their diffraction efficiencies over 60%. Spatial light modulator is the liquid-crystal device of Philips viewfinder whose phase delay is controlled by a computer at high speed. Experimental results show that the liquid-crystal spatial light modulator has the same qualitative diffraction characteristics as those of computer simulations and real-time interconnection is possible in free space.

(36) Modulation Bandwidth Reduction in Broadband High Speed Semiconductor Lasers Due to Optical Confinement Factor Variation, by S. Y. Shin (Department of Information and Communications, Myongji University, Yongin, Korea): *JKICS*, vol. 20, pp. 2722–2732, Oct. 1995.

A reduced effective differential gain is shown for the first time to arise in diode lasers by including the variation of the confinement factor with carrier density. This effective differential gain is the parameter which actually determines the resonance frequency and therefore the modulation bandwidth of diode lasers.

(37) Fiber-Optic Delay Line Matched Filters for the Detection of Ultrafast Optical Packet Addresses, by J. D. Shin*, M. Y. Jeon**, and C. S. Kang*** (*Department of Information and Communications, Sungsil University, Seoul, Korea; **Electronics and Telecommunication Research Institute, Taejon, Korea; ***Department of Electrical Engineering, Hannam University, Taejon, Korea): *JKICS*, vol. 20, pp. 2952–2961, Oct. 1995.

Fiber-optic delay line matched filters for the detection of ultrafast optical packet addresses are fabricated by directly depositing metal films on fiber delay line ends. Average reflectance of Cr/Au film coated on fiber ends is measured to be 88% in the wavelength region of 1400 to 1600 nm.

(38) A Study Dynamic Characteristics for Phase Considered Tunable Three Section DFB-LD, by K. M. Youn*, S. H. Ahn**, and J. S. Eom** (*Korea Electrical and Telecommunication Research Institute, Taejon, Korea; **Department of Electrical Engineering, Kangwon National University, Wonju, Korea): *JKICS*, vol. 20, pp. 3097–3107, Nov. 1995.

Modeling of a tunable three section DFB-LD with continuous phase is performed using the coupled-wave equation. A new modeling method for $\lambda/4$ phase shifted one is proposed. The characteristics of oscillation wavelength, gain, and photon density profiles are presented.

(39) Ultra-High Speed Photodetector Using a-Ge:H Thin Film Photoconductor for Picosecond Optical Signal at 0.8 μm Wavelength, by K. N. Choi (Department of Communications, Incheon College, Incheon, Korea): *JKICS*, vol. 20, pp. 3627–3634, Dec. 1995.

Hydrogenated amorphous germanium photoconductors which respond to picosecond light signal are fabricated using magnetron sputtering method. These photoconductors are characterized by measuring the spectral response, the responsivity, the photoconductivity, and the photoresponse to the picosecond light pulse.

(40) Analysis of Characteristics of a Cherenkov Laser via Particle Simulation, by K. Horinouchi, M. Sanda, H.

Takahashi, and T. Shiozawa (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 1-8, Jan. 1995.

With the aid of particle simulation, nonlinear characteristics are investigated for Cherenkov laser composed of a dielectric-loaded parallel plate waveguide and a planar relativistic electron beam immersed in an infinite magnetostatic field. In the first stage of the interaction with an electron beam, the amplitude of an electromagnetic wave increases exponentially as the linear theory predicts. Then, as the more electrons in the electron beam get caught in the electric field of the growing wave, a strong nonlinear effect develops, causing saturation in the growth of the electromagnetic wave.

(41) Evaluation Method of Facet and Bulk Degradation in Semiconductor Lasers, by T. Fukushima, A Furuya, Y. Kito, H. Sudo, M. Sugano, and T. Tanahashi (Fujitsu Laboratories Ltd., Atsugi, 243-01 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 73–79, Feb. 1995.

A new evaluation method to distinguish between the facet degradation and the bulk degradation in semiconductor lasers is proposed. This method is applied to AlGaInP visible semiconductor lasers, and an as-cleaved laser and an AR-HR coated laser are tested.

(42) Spontaneous Emission Behavior and Its Injection Level Dependence in 3D Microcavity Surface Emitting Lasers, by T. Hamano*, T. Baba**, and K. Iga* (*Precision and Intelligence Laboratory, Tokyo Institute of Technology, Yokohama, 226 Japan; **Division of Electrical and Computer Engineering, Yokohama National University, Yokohama, 240 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 80–87, Feb. 1995.

This paper investigates spontaneous emission behavior and injection level dependence of three-dimensional microcavity surface emitting lasers. First, mode density distributions in planar and three-dimensional microcavities, under various boundary conditions, are discussed. Next, the injection level dependence of spontaneous emission factor is discussed.

(43) A Study on Degradation of Spatial Resolution in FMCW Reflectometry Due to Nonlinear Optical Frequency Sweep, by L.-T. Wang, K. Iiyama, and K. Hayashi (Faculty of Technology, Kanazawa University, Kanazawa, 920 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 166-172, Mar. 1995.

This paper describes the degradation of spatial resolution in FMCW reflectometry due to nonlinear optical frequency sweep when a semiconductor laser is used as a light source. The interference signal in the FMCW reflectometry is analyzed by using the measured response of the optical frequency change. It is found that the interference spectrum spreads out toward the low frequency region, and consequently, the spatial resolution is degraded.

(44) High-Power AlGaAs Single-Stripe Laser Diode with Window Grown on Facets, by M. Matsumoto*, K. Sasaki*, M. Kondo*, T. Ishizumi**, T. Takeoka*, and S. Yamamoto* (*Optical-Device Laboratory, Sharp Co., Tenri, 632 Japan; **Opto-Electronics Devices Division, Sharp Co, Yamatokoriyama, 639-11 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 207–214, Apr. 1995.

In order to achieve high-power operation of an AlGaAs laser diode, a novel window structure laser with window grown on facets (WGF) is developed. Because of the window effects of the WGF laser, highly reliable operation is attained both at 830 nm under 100 mW at 50°C beyond 10 000 hours and at 780 nm under 70 mW at 60°C beyond 4000 hours. Experimental results show that the window effects are strongly dependent on an Al composition ratio of the window regions.

(45) Optical Design for Large Scale Free-Space Optical Switching Modules, by S. Shirai and T. Serikawa (NTT Interdisciplinary Research Laboratories, Musashino, 180 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 231–237, May 1995.

A microlens configuration for long-span beam propagation consisting of collimating lenses and relay lenses with long focal length is proposed. The long focal length microlenses fabricated by a sputter-liftoff method are very useful for large scale free-space optical switching modules.

(46) Design of Spatial Light Modulator by Using Photo Conductive Element (Letters), by K. Nakaki, T. Tanaka, and K. Tamano (Faculty of Engineering, Hiroshima Institute of Technology, Hiroshima, 731-51 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 317–319, June 1995.

A new driving method for a spatial light modulator is proposed, which consists of a photoconductive layer connected in series to a liquid crystal layer. Using CdS for the photoconductive layer, the electric resistance change of about 3 MΩ is realized.

(47) Optimum Design Technique for Optoelectronic Devices Using Simulated Annealing, by K. Hara, T. Iwamoto, and K. Kyuma (Semiconductor Research Laboratory, Mitsubishi Electric Co., Amagasaki, 661 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 341–349, July 1995.

An optimum design technique for optoelectronic devices is proposed. Introduction of cost and search of a global minimum using simulated annealing enable an automatic optimization in consideration of various requirements on device characteristics. The obtained results are of benefit to application of the design method to any optoelectronic devices.

(48) Efficiency Enhancement in a Cherenkov Laser by Varying Permittivity: With Consideration of Mode Scattering, by M. Sata, H. Kamata, and T. Shiozawa (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 353–359, Aug. 1995.

For a model of the Cherenkov laser composed of a planar relativistic electron beam and a parallel plate waveguide loaded with a dielectric sheet, this paper shows by numerical simulation that the efficiency in energy transfer from the electron beam to the electromagnetic wave is greatly enhanced by varying adiabatically the permittivity of the dielectric sheet along the waveguide to maintain the synchronism between the electron beam and the electromagnetic wave. The effects of mode scattering or reflection and mode conversion to higher-order modes due to varying permittivity of the dielectric sheet are found negligibly small for a moderate change in the permittivity.

(49) Bulk-Type Domain Reversal Grating of $LiTaO_3$ Crystal Fabricated by Direct Electric Field, by M. Sato, M. Ohashi, K. S. Abedin, C. Takyu, and H. Ito (Research Institute of Electrical Communication, Tohoku University, Sendai, 980-

77 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 366–372, Aug. 1995.

Bulk-type domain reversal gratings of $LiTaO_3$ fabricated by means of a direct electrical field at room temperature are characterized with the SHG experiment using the quasiphase matching. The domain reversal is achieved for the entire region of the crystal thickness of 500 μm. The domain period down to 7.5 μm is successfully formed. The results reveal that the bulk-type domain reversal grating by the direct electrical field application is very useful for the nonlinear optical processes of the high efficiency.

(50) Quasi-Phase-Matched Second Harmonic Generation in a Nonlinear Crystal with Bent Periodic Domain-Inverted Structure (Letters), by T. Fujita, K. Koyanagi, and H. Mishima (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 430–433, Sept. 1995.

A characteristic of quasiphase-matched second harmonic generation in a nonlinear crystal with bent periodic domain-inverted structure is presented.

(51) Tuning and Wideband Intensity Modulation of Noncollinear Quasi-Phase-Matched Second-Harmonic-Generation Using Pockels Effect, by K. Koyanagi*, 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. J78-C-I, pp. 448–458, Oct. 1995.

This paper presents a new tuning method for quasiphase-matched second-harmonic-generation (QPM-SHG) in a nonlinear bulk crystal with a periodic domain-inverted structure. The residual mismatch caused by fabrication errors or by the shift of the wavelength is easily compensated by both readjusting the fundamental incident angles and applying electric field. A wideband noncollinear QPM-SHG using automatic incident angle tuning obtained with wavelength dispersion is proposed and analyzed.

(52) Analysis of Operating Mechanism in Semiconductor Optical Modulator with Electron Depleting Absorption Control, by Y. Kuwamura, M. Yamada, and S. Hashimoto (Faculty of Engineering, Kanazawa University, Kanazawa, 920 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 616–625, Dec. 1995.

Mechanisms of the electron depleting absorption control in a semiconductor optical modulator are theoretically and experimentally examined. Optical absorption in an impurity doped direct-transition-type semiconductor material is enhanced by depleting the carriers, through three physical phenomena induced in the depleting region: 1) a decrease in the number of electrons (or holes) located in the conduction (or valence) band resulting in increase of the band-to-band and band-to-impurity atom transition probabilities, 2) a decrease in the screening effect on the ionized-impurity atoms resulting in shift of the impurity energy levels, and 3) an increase in the electric field in the depletion layer inducting Franz–Keldysh effect.

(53) The Analysis of Polarization-Insensitive Characteristics for Semiconductor Optical Amplifiers with Tensile Strained Multiple Quantum Wells, by H. Takaya and T. Kambayashi (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 626–634, Dec. 1995.

A design rule for polarization-insensitive semiconductor optical amplifiers with tensile strained multiple quantum wells in active region is given. To equalize TE and TM modal gains at 1.55 μm, the tolerance of well layer thickness and Ga content is investigated, and it is found that the fluctuation of Ga content is more serious than that of well thickness.

(54) Vertical Cavity Surface-Emitting Laser Array for 1.3 μm Range Parallel Optical Fiber Transmissions (Letters), by T. Baba*, Y. Yogo**, K. Suzuki**, T. Kondo*, F. Koyama**, and K. Iga** (*Division of Electrical and Computer Engineering, Yokohama National University, Yokohama, 240 Japan; **Precision and Intelligence Laboratory, Tokyo Institute of Technology, Yokohama, 227 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 201–203, Feb. 1995.

Long-wavelength 1.3-μm GaInAs/InP vertical cavity surface-emitting lasers (VCSEL's) are demonstrated in an array configuration. With the strong current confinement by a buried heterostructure and the efficient optical feedback by a dielectric cavity, five VCSEL elements in a 2×4 array operate at room temperature with 5-mW total power output and the wavelength error is within $\pm 5\%$.

(55) Optical Information Processing by Synthesis of the Coherence Function: Photonic/Video Hybrid System, by T. Okugawa and K. Hotate (Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, 153 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1286–1291, Sept. 1995.

A photonic/video hybrid system for optical information processing by synthesis of the coherence function is proposed. Optical coherence function can be synthesized to have delta-function-like shape of notch shape by using direct frequency modulation of a laser diode with an appropriate waveform.

(56) Optical Constants of Magnetic Fluids and Their Application to Optical Switches, by M. Saito, M. Takakuwa, and M. Miyagi (Department of Electrical Communications, Tohoku University, Sendai, 980 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1465–1469, Oct. 1995.

The complex refractive indices of typical magnetic fluids are evaluated for the sake of utilizing them as optical materials. Transmission and reflection spectra are measured in the wavelength range of 0.6 to 1.6 μm by using monochromators. Preliminary experiment of optical switching is also demonstrated by utilizing the mobility of a magnetic fluid.

(57) Relative Intensity Noise of DFB LD's with Near and Far End Reflections, by T. Kawai*, A. Rahwanto*, K. Kitajima*, M. Mori*, T. Goto*, and A. Miyauchi** (*School of Engineering, Nagoya University, Nagoya, 464-01 Japan; **Lightwave Technology Development Division, Fujitsu Ltd., Kawasaki, 211 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1779–1786, Dec. 1995.

The relative intensity noise (RIN) spectra of DC driven 1.3-μm distributed feedback laser diodes under the influence of external reflections are measured for various currents and reflection lengths. The enhanced noise is observed when the relaxation oscillation frequency coincides with the external cavity frequency. It is also observed that the RIN spectra with the near end reflections differ from those with the far end reflections.

VII. Optical Fibers/Waveguides

(1) Design of a Multimode Fixed Optical Coupler Using Simplified Formula (Letters), by D. Guha and D. Engles (Department of Electronics Technology, Guru Nanak Dev Universtiy, Amritsar 143 005, India): *JIETE*, pp. 157–158, Mar.–Apr. 1995.

A theoretical design is done for a multimode fiber coupler. The optimum coupling length is calculated based on the numerical aperture. It is suggested that to design a coupler of a given coupling efficiency, the numerical aperture be varied keeping a fixed coupling length. This can be done by varying the refractive index of the cladding.

(2) Comparative Aspects of a Metal Loaded Triangular Waveguide with Uniform and Non-Uniform Distribution of Goell's Matching Points (Letters), by P. K. Shukla, P. Khastgir, S. P. Ojha, and P. K. Choudhury (Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): *JIETE*, pp. 217–220, May–June 1995.

Using Goell's point matching method, a numerical analysis is made of a metal loaded triangular waveguide with a nonuniform distribution of matching points, some of which are crowded near the corners of the triangle, and the results are compared with those reported earlier for the metal loaded triangular waveguide with the matching points distributed in a uniform manner.

(3) The Electromagnetic Field Theory Analysis about a Rotation Optical Fiber, by Z. W. Bao and L-F. Huang (Tianjin University, Tianjin, P.R.C.): *AES*, vol. 23, pp. 47–51, Sept. 1995.

The wave equations are obtained in rotation dielectric under the condition of longitudinal direct current magnetic field. The concept of twin scalar quantity waves is putforward because electric and magnetic waves are coupled from each other, and it is proved that the scalar quantity waves meet Helmholtz equation. The expression of the scalar quantity waves, propagation constants, eignvalue equation, and the expressions of field components are obtained, and the rotation character is discussed in a rotation optical fiber.

(4) Optical Solition Transmission at 2.5 GHz, by B.-X. Xu, J.-H. Li, X. Jiang, S. Zhong , M.-Y. Yao, C.-Y. Lou, C.-S. Wu, Y. Li, J.-D. Peng, C.-C. Fan, Y.-Z. Gao, and B.-K. Zhou (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 23, pp. 38–41, Nov. 1995.

The optical solition transmission at 2.5 GHz by using semiconductor optical solition sources and EDFA's is achieved. In addition, numerical simulation is done according to a simplified theoretical model including generation and transmission of semiconductor optical solition. The results agree well with experimental data.

(5) Model Research of the Fused Tapered Optical Fiber Couples, by B.-S. Gu, J.-L. Zhang, W.-D. Shen, and Q.-N. Li (Shanghai University, Shanghai, P.R.C.): *JAS*, vol. 13, pp. 14–20, Mar. 1995.

It is proved theoretically that the weak guiding and the weak coupling approximation must be utilized when the approximated waveguide model takes the original model of the fused tapered wide band coupler. And it is shown that the fused tapered wide band coupler with a shape of dumb-bell satisfies the weak guiding and weak coupling conditions.

(6) Local Field in a Single-Mode Helical Fiber, by G.-S. Chen (Shanghai University, Shanghai, P.R.C.): *JAS*, vol. 13, pp. 184–188, June 1995.

A single-mode herical fiber with a circular cross section and step profile of the refractive index is analyzed in the local coordinate system. With the perturbation method, the analytical expressions of the fundamental mode field and the propagation constant are given. Two results are brought about: 1) the fundamental mode in a single-mode helical fiber is right-rotated and left-rotated circularly polarized modes, and 2) the difference of propagation constants between the two modes is two.

(7) Study of Propagation Behaviors of Nonlinear Slab Optical Waveguide in Moving, by B.-L. Yu*, H.-M. Wang**, and N.-Q. Hu** (*Nankai University, Tianjin, P.R.C.; **Henan University, Kaifeng, P.R.C.): *JE*, vol. 17, pp. 321–323, May 1995.

By using electromagnetism relatively transformation method, the propagation properties of EM mode of nonlinear slab optical waveguide in moving are studied. The results in moving reference system and in laboratory reference system are compared.

(8) Graphic Method for Metal-Clad Planar Optical Waveguides, by E.-P. Jin (Harbin Institute of Technology, Harbin, P.R.C.): *JE*, vol. 17, pp. 424–429, July 1995.

A simple graphic method for obtaining the real and imaginary parts of propagation constant of the metal-clad planar optical waveguides is presented. This method is straightforward, accurate, and valuable.

(9) Variational Solutions of Axisymmetrical Field in a Nonlinear Longitudinally Inhomogeneous Self-Focusing Fiber, by D.-M. Hong, and Z.-H. Chen (Fujian Normal University, Fuzhou, P.R.C.): *JE*, vol. 17, pp. 430–433, July 1995.

This paper gives the analytic solutions of axisymmetrical field in a nonlinear longitudinally inhomogeneous self-focusing fiber by using the variational method. The variational solutions are in good agreement with the results of the other references in the case of linear condition.

(10) Analysis on Gaussian Beam to Fiber Coupling with Microlenses, by H. Li, Y. Li, Z.-M. Huang, F. Wu, and C.-L. Wei (Shanghai University of Science and Technology, Shanghai, P.R.C.): *JM*, vol. 11, pp. 41–49, Mar. 1995.

The design and theoretical calculation of ideal microlenses coupling between semiconductor laser and fiber are discussed. Properly coated for reflections, the asymmetric microlenses of the new design can collect the greater part of the radiated energy of a modal-elliptical laser sources; meanwhile the symmetric microlenses of the relevant design can theoretically collect 100% of the radiated energy of a modal-symmetric laser source.

(11) Temperature and Voltage Sensings by Mode-Mode Interference in Polarization-Maintaining Optical Fibers, by C.-N. Chang, P.-Y. Chien, and Y.-C. Lee (National Taiwan

Institute of Technology, Taipei, Taiwan, China): *JCIE*, vol. 18, pp. 625–632, 1995.

Two optical fiber sensing systems for temperature and voltage are developed which utilize the mode-mode interference of the two orthogonally polarized modes in two commercial polarization-maintaining fibers (bow-tie and elliptical core fibers). A package of controlled programs in a Macintosh computer, which can record and process all related data automatically, is established for temperature sensing. The signal drifting problem in voltage sensings is investigated, and the elimination of signal drifting is obtained by phase tracking with direct current technology.

(12) Passive Polarization Converter Fabricated by Controlling Optic Axis of Poled Polymer Waveguides, by M. C. Oh and S. Y. Shin (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 32-A, pp. 1698–1704, Dec. 1995.

A novel passive TE/TM polarization mode converter is fabricated by using poled polymer waveguides. The optic axis of the poling induced waveguide is slowly rotated by using a slowly varying structure of poling electrodes. Thus the polarization conversion is achieved as the guided mode propagates through the waveguide. The proposed device is simulated by a full vectorial beam propagation method for anisotropic medium.

(13) Blue Light Generation in a Quasi-Phase-Matched $LiTaO_3$ Optical Waveguide, by S. Y. Yi*, S. Y. Shin*, and Y. S. Jin** (*Department of Electrical Engineering, KAIST, Taejon, Korea; **Devices and Materials Laboratory, LG Electrical Research Center, Korea): *JKITE*, vol. 32-A, pp. 1705–1715, Dec. 1995.

Blue light of 0.15 mW at 417.6 nm is generated in a quasiphase-matched $LiTaO_3$ optical waveguide. A new heat-treatment technique using a metal-oxide mask is proposed to fabricate the periodic domain-inverted grating with less degraded optical properties. The mask promotes the proton indiffusion by inhibition of the proton outdiffusion during the heat treatment.

(14) A Study on the Optical Coupling Characteristics between Low Loss Optical Waveguide and Optical Fiber, by S. D. Kim*, S. B. Park**, J. G. Lee***, and J. B. Kim*** (*Department of Computer Science and Information Proceeding, Dong-A College, Pusan, Korea; **Department of Information and Communication Engineering, Dongshin University, Gawngju, Korea; ***Department of Electrical Engineering, Chosun University, Gawngju, Korea): *JKICS*, vol. 20, pp. 750–758, Mar. 1995.

The PSG of guided thin films are fabricated by LPCVD method on a Si substrate. Cr mask is fabricated by laser lithography method. The rib type optical waveguide is fabricated by RIE process after waveguide pattern is fabricated by photolithography method.

(15) Analysis of the Relative Intensity Noise at the Output of a Dispersive Fiber, by B.G. Kim (Department of Electrical Engineering, Sungsil University, Seoul, Korea): *JKICS*, vol. 20, pp. 3406–3412, Dec. 1995.

A rigorous equation for a fiber dispersion necessary for minimizing the relative intensity noise at the fiber output is derived as a function of frequency and linewidth enhancement factor using the transfer matrix. The rigorous equation is the same as the approximate equation already published at the relaxation resonance frequency when the linewidth enhancement factor is much larger than one, and the relaxation resonance frequency is nearly equal to the damping rate.

(16) Analysis of Frequency Characteristics of Dielectric Waveguide Discontinuities Using FD-TD Method, by M. Taira and N. Morita (Chiba Institute of Technology, Narashino, 275 Japan): *Trans. IEICE*, vol. J78-C-I, pp. 20–28, Jan. 1995.

Frequency characteristics are investigated numerically by means of the FD-TD method for several types of discontinuities of dielectric slab waveguides. The excitation method of incident mode fields appropriate for FD-TD analysis is presented, and the accuracy of this method is examined. For several discontinuities such as step, gap, slope, crank, axis shift, and sharp bend, frequency characteristics of transmission coefficients are investigated. Furthermore, transmission characteristics of a digital phase modulated wave passing through the discontinuities are numerically examined.

(17) A Scalar Finite Element Analysis of Nonlinear Optical Channel Waveguides Using Isoparametric Elements, by A. Niiyama, M. Koshiba, and Y. Tsuji (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J78-C-I, pp. 88–95, Feb. 1995.

A numerical approach based on the scalar finite element method is described for the analysis of nonlinear optical channel waveguides. In order to obtain accurate results, isoparametric triangular elements are used and numerical integration formulae derived by Hammer and his co-workers are introduced. Numerical examples are shown for nonlinear optical fibers and graded-index nonlinear optical channel waveguides.

(18) Optimum Design for Polarization Crosstalk Reduction in a Polarization-Maintaining Optical Fiber of PANDA Profile, by F. Kitamura and Y. Sasaki (Faculty of Engineering, Ibaraki University, Hitachi, 316 Japan): *Trans. IEICE*, vol. J78-C-I, pp. 150–156, Mar. 1995.

The optimum design on the stress-applying parts (SAP's) of the polarization-maintaining optical fiber (PMF) of PANDA profile is theoretically presented by the analysis dealing with the off-diagonal terms of the permittivity tensor arising from the shear stress inherently caused by the SAP's. PANDA fibers can bring about the polarization crosstalk improvement of 20 to 35 dB.

(19) Optical Soliton Switching and Coupled-Soliton Propagation in Three-Core Fiber Nonlinear Directional Couplers, by H. Sotobayashi and Y. Fujii (Institute of Industrial Science, The University of Tokyo, Tokyo, 106 Japan): *Trans. IEICE*, vol. J78-C-I, pp. 157–165, Mar. 1995.

The propagation and switching properties of fiber-optic soliton in three-core nonlinear optical fiber couplers are numerically analyzed. A new concept of the coupled-soliton, the waveform of which is unchanged in the coupled two and three fibers, is also proposed. These properties are dependent on the relative phase-difference between two input solitons. Using this property, the phase controlled switching is realized.

(20) Accurate Measurement of Nonlinear Refractive Index in Optical Fiber by Cross Phase Modulation Method

Using Depolarized Pump Light (Letters), by T. Kato, Y. Suetsugu, M. Takagi, E. Sasaoka, and M. Nishimura (Yokohama Research Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): *Trans. IEICE*, vol. J78-C-I, pp. 194–196, Mar. 1995.

The use of depolarized pump light is proposed in measurements of nonlinear refractive index in optical fiber by cross-phase-modulation method. The nonlinear refractive index is determined for the dispersion shifted fiber, standard SM fiber, and pure silica-core SM fiber as $3.35 \times 10^{-20}, 2.96 \times 10^{-20}$, and 2.79×10^{-20} m^2/W at 1.55 μm, respectively.

(21) Fabrication of Ferroelectric-Domain-Inverted Gratings for $LiNbO_3$ SHG Devices by Applying Voltage, by K. Kintaka, M. Fujimura, T. Suhara, and H. Nishihara (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 238–245, May 1995.

The characteristics of the ferroelectric-domain-inverted grating with the period of about 3 μm formed by applying voltage at room temperature in $LiNbO_3$ (0.5-mm thickness) are examined for waveguide quasiphase-matching second-harmonic-generation devices. Ladder and corrugation electrodes are adopted as periodic electrodes. The optimum structure is obtained by applying a voltage pulse of approximately 10 kV and 1 to 40 ms through a ladder electrode in vacuum, and through a corrugation electrode in insulation oil.

(22) Wavelength Characteristics of 2-Wavelength Oscillation Using an Erbium Doped Fiber Ring Laser (Letters), by K. Isawa, M. Kurihara, and M. Kurono (Central Research Institute of Electric Power Industry, Communication & Information Research Laboratory, Komae, 201 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 246–248, May 1995.

This letter shows the allowable cavity-loss for 2-wavelength oscillation of an erbium doped fiber ring laser and the output power against the oscillation wavelength.

(23) Characteristics of Polarization Splitters Constructed from a Circular Hollow Pit outside the Cores, by K. Kameda and T. Hosono (College of Science and Technology, Nihon University, Tokyo, 101 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 273–281, June 1995.

This paper presents an optimization method for a polarization splitter constructed from a single core fiber and a fiber with a circular hollow pit outside a core. Corresponding to the extraction method of the linearly polarized x- and y-polarizations, two types of polarization splitters are designed and are discussed for the splitter length, the extinction ratio, and the bandwidth.

(24) High-Power Polymer Optical Fiber Amplifier, by T. Yamamoto, K. Fujii, A. Tagaya, S. Teramoto, E. Nihei, Y. Koike, and K. Sasaki (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 282–288, June 1995.

Amplification characteristics of graded-index type organic dye doped polymer optical fiber amplifiers (POFA's) are discussed. As an organic dye for optical amplification, Rhodamine 6G, Rhodamine B, Perylene Red are doped in the core region of POF's. POFA's are promising for extraordinary high power optical amplification in comparison with rare-earth ions doped silica fiber amplifier.

(25) Long-Term Reliability of Er-Doped Fibers in Hydrogen Environments, by Y. Koyano, M. Kakui, T. Kashiwada, M. Onishi, M. Shigematsu, H. Kanamori, and M. Nishimura (Yokohama Research Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 289–296, June 1995.

Accelerated hydrogen aging tests of erbium-doped fibers (EDF's) with different aluminum (Al) content levels (0, 1, and 3 wt%) are made, and long-term reliability with regard to transmission loss and gain in hydrogen environment is predicted. The predicted loss increases at 1.55 μm in 0.001 atm of hydrogen at 40°C after 25 years for EDF's with 0, 1, and 3 wt% Al content levels are 0 dB/20 m, 0.04 dB/20 m, and 0.08 dB/20 m, respectively.

(26) Analysis of an Asymmetric Optical Y Junction with a Nonlinear Dielectric Region (Letters), by H. Yokota and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 314–316, June 1995.

An asymmetric optical Y junction with a nonlinear dielectric region is proposed. Utilizing the iterative finite difference beam propagation method, the transmission characteristics are investigated.

(27) Transmission Characteristics of Planar Optical Waveguides with Inhomogeneous Refractive Index Profile (Letters), by T. Sasaki, M. Ohki, and S. Kozaki (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 434–435, Sept. 1995.

The dispersion characteristics of Ti-diffused $LiNbO_3$ waveguides with Gaussian refractive profile is analyzed by using a modified WKB method.

(28) Improved Operation of Logic Devices Constructed by Asymmetric Nonlinear Optical Fiber Couplers Using Bandwidth Limited Amplification, by T. Kojima*, M. Koshiba*, Y. Tsuji*, and M. Eguchi** (*Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan; **Muroran Institute of Technology, Muroran, 050 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 642–649, Dec. 1995.

Effects of perturbations including third-order dispersion on the operation of logic devices constructed by asymmetric nonlinear optical fiber couplers are investigated by using the beam propagation method. In contrast to the unperturbed case, the radiation is stimulated, and consequently the operation of logic devices is degraded. In order to remove the influence of perturbations, the bandwidth limited amplification is introduced. In a distributed gain medium with a finite bandwidth, the radiation caused by third-order dispersion may be suppressed, and the operation of logic devices is improved.

(29) Analysis of a Novel Intersection Waveguide Type Optical Polarization Splitter Using Birefringence of GaInAsP/InP Superlattice, by T. Kambayashi and K. Nakasendou (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 650–657, Dec. 1995.

A novel intersection waveguide type polarization splitter which is based on total reflection using birefringence of a GaInAsP/InP superlattice waveguide is proposed. Results of the semivectorial FD-BPM calculation predict excellent polarization splitting properties with a crosstalk of −37 dB and an insertion loss less than 0.4 dB for both TE and TM modes at wavelength of 1.55 μm under the condition that the intersecting angle is 5° and that the device length is about 0.9 mm.

(30) Fabrication of Dispersive Fibers and Their Application to Long-Wavelength-Pass Filters, by J. Nishimura, Y. Ueda, and K. Morishita (Graduate Course of Electronics and Applied Physics, Osaka Electro-Communication University, Neyagawa, 572 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 658–663, Dec. 1995.

Dispersive fibers whose core-cladding index difference changes largely against wavelength are fabricated. In order to provide the characteristics of long-wavelength-pass filters, the core and the cladding glasses are chosen so that the chromatic refractive index of the core becomes lower than that of the cladding in shorter wavelength region. The passband of the filters can be changed by bending the dipersive fibers.

(31) Impedance Matching Circuit for an Optical-Fiber Phase Modulator (Letters), by S. Satoh*, K. Hori**, and M. Imai* (*Faculty of Engineering, Muroran Institute of Technology, Muroran, 050 Japan; **NTT Mobile Communications Network Inc., Tokyo, 105 Japan): *Trans. IEICE,* vol. J78-C-I, pp. 700–703, Dec. 1995.

In order to suppress the electrical reflection at the interface of the fiber phase modulator and the 50-Ω strip line and to increase an effective voltage applied to the electrodes of the modulator, an impedance matching circuit is introduced. The electrical characteristics of the circuit and the enhanced optical phase sensitivity at 100-MHz region are investigated experimentally and theoretically.

(32) Analysis of Highly-Birefringent Fibers with a Hollow Layer outside an Elliptical Core, by Z. Krasiński*, T. Hinata*, S. Yamashita*, and A. Majewski** (*College of Science and Technology, Nihon University, Tokyo, 101 Japan; **Institute of Electronics Fundamentals, Warsaw University of Technology, Nowowiejska 15/19, 00-665 Warsaw, Poland): *IEICE Trans. Electron.,* vol. E78-C, pp. 111-116, Jan. 1995.

An improved point-matching method with Mathieu function expansion for the accurate analysis of a W-type elliptical fiber with layers of any ellipticity is proposed. Numerical results are presented for the highly-birefringent fibers with a hollow layer outside an elliptical core. It is found that such fibers can realize a large value of the modal birefringence and that they can be suitable for the single-mode and single-polarization transmission.

(33) All-Optical Switching Property of an MQW-Sandwich Nonlinear Directional Coupler with Nonlinear Losses, by N. Okamoto*, X. J. Meng**, and O. Sugihara* (*Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan; **Fujikura Co., Ltd., Sakura, 285 Japan): *IEICE Trans. Electron.,* vol. E78-C. pp. 299–303, Mar. 1995.

All-optical switching properties of a nonlinear directional coupler (NLDC) having an MQW coupling layer with both nonlinear and linear losses are analyzed, and the effects of nonlinear losses are examined. The propagation loss along the strongly-coupled NLDC decreases with increasing nonlinear absorption coefficient due to saturation in absorption. A propagation loss of 8.18 dB or 2.38 dB in the bar state or the cross state is much smaller than the bulk loss of MQW structure which exceeds 50 dB.

(34) Effects of the Loop Birefringence on Fiber Loop Polarizers Using a Fused Taper Coupler (Letters), by K. Morishita (Osaka Electro-Communication University, Neyagawa, 572 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 311–314, Mar. 1995.

Optical characteristics of a fiber loop polarizer are investigated considering the birefringence in the fiber loop. The extinction ratio and the insertion loss of the fiber polarizer are improved for practical use.

(35) Fiber Optic Temperature Sensor Using Two Modes by Holographic Filter (Letters), by M. Yoshikawa and K. Asakawa (Faculty of Science, Yamaguchi University, Yamaguchi, 753 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 885–886, July 1995.

A fiber optic temperature sensor using a conventional graded index multimode optical fiber is proposed. The multimode fiber is excited by two selected modes using a computer-generated holographic filter. A clear periodic signal created by interference between two modes is observed.

(36) Reduction of Critical Power in All-Optical Switching with Series-Tapered Nonlinear Directional Coupler (Letters), by G. Pu, T. Mizumoto, K. Ito, Y. Higashide, and Y. Naito (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1315–1318, Sept. 1995.

A novel series-tapered nonlinear directional coupler is proposed to improve all-optical switching characteristics. Its switching characteristics are analyzed by using a beam propagation method based on the Galerkin's finite element technique.

(37) Eigenmode Analysis of Whispering Gallery Modes of Pillbox-Type Optical Resonators Utilizing the FE-BPM Formulation, by A. Ahmed, R. Koya, O. Wada, M. Wang, and R. Koga (Faculty of Engineering, Okayama University, Okayama, 700 Japan): *IEICE Trans. Electron.,* vol. E78-C, pp. 1638–1645, Nov. 1995.

To evaluate the radial eigenmode field distributions and the resonance wavelengths of axially symmetric pillbox resonators, a numerical method is described which is based on the FE-BPM expression in cylindrical coordinates. By varying the separation distance between the pillbox and the outer curved waveguide, the power transfer due to coupling is determined near the resonance wavelength of 0.9 μm. This coupled structure has a good prospect to be used as an optical wavelength filter.

VIII. SUPERCONDUCTIVE DEVICES

(1) High Temperature Oxide Supercoductors Field Effect Transistor Using Gate Controlled Critical Temperature T_c, by J.-F. Jiang, Y.-S. Tang, and Q.-Y. Cai (Shanghai Jiaotong University, Shanghai, P.R.C.): *AES*, vol. 23, pp. 15–19, Aug. 1995.

The principle of high temperature oxide superconductors field effect transistor using gate controlled critical temperature

T_c is presented. A T_c-equation is established by gate voltage control and device characteristics are analyzed.

(2) Frequency-Dependent Finite-Difference Time-Domain Analysis of High-T_c Superconducting Asymmetric Coplanar Strip Line, by M. Hira, Y. Mizomoto, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *IEICE Trans. Electron.*, vol. E78-C, pp. 873–877, July 1995.

This paper describes analytical results of high-T_c superconducting asymmetric coplanar strip lines using the frequency-dependent finite-difference time-domain method. Propagation constants of a $YBa_2Cu_3O_{7-x}$ asymmetric coplanar strip line fabricated on a $LiNbO_3$ substrate are presented. The effect of a SiO_2 buffer layer is also investigated.

IX. Special Issues Related to Microwave Theory and Techniques

(1) *JEEE,* no. 1, Mar. 1995, is a special issue on Recent Australian Antenna Research & Development.

(1.1) Design of an HF Antenna System for Radio Vanuatu, by D. Morris (AWA Defence Industries Pty Ltd., 15 Talavera Road, North Ryde NSW 2113, Australia): pp. 1–6.

(1.2) Quasi-Optical Antennas for Gyrotrons at Near-Millimeter Wavelengths, by G. E. Brand and G. P. Timms (School of Physics, University of Sydney, NSW 2006, Australia): pp. 7–13.

(1.3) Synthesis of Broadband Nulls in Linear Arrays, by T. B. Vu (School of Electrical Engineering, University of New South Wales, NSW 2052, Australia): pp. 15–22.

(1.4) Performance of Field Matching and Finite Element Methods on Analyzing Coaxial-to-Waveguide Transitions, by P. W. Davis and M. E. Bialkowski (Department of Electrical and Computer Engineering, The University of Queensland, St Lucia Qld 4072, Australia): pp. 23–29.

(1.5) Impulse-Optimized TEM Horn Antenna, by M. J. Lesha and F. J. Paolon (Department of Electrical and Computer Engineering, University of Wollongong, Wollongong NSW 2522, Australia): pp. 31–37.

(1.6) Subreflector Spillover in a Dual-Reflector Antenna, by J. D. Cashman* and A. Bish** (*University College, University of NSW, Campbell ACT NSW 2600, Australia; **Australia Telescope National Facility, Narrabri NSW 2390, Australia): pp. 39–43.

(1.7) The Use of Method CLEAN and the Successive Projections Algorithm to Speed Antenna Measurements, by A. P. Whichello (Electrical Engineering Department, Sydney University, NSW 2006, Australia): pp. 45–54.

(1.8) Analysis of the Impedance, Attenuation and Power-Handling Capability of a Rectangular Waveguide with Two Symmetrically-Placed Double L-Septa, by H. Z. Zhang, A. S. Mohan, G. E. Beard, and W. R. Belcher (School of Electrical Engineering, University of Technology, Sydney, Broadway NSW 2007, Australia): pp. 55–62.

(1.9) Finite-Difference Time-Domain Analysis of a Rectangular Dielectric-Resonator Antenna, by K. P. Esselle (Electronics Department, Macquarie University, Building E6A, Sydney, NSW 2109, Australia): pp. 63–70.

(1.10) Empirical Model of the Ring-Slot Antenna Including Finite Ground-Plane Effects, by N. Nikolic (CSIRO Division of Radiophysics, PO Box 76 Epping NSW 2121, Australia): pp. 71–76.

(1.11) Electromagnetic Scattering from Conducting Terrain Using PO/PTD, by A. S. Mohan* and K. L. N. Rao** (*School of Electrical Engineering, University of Technology, Sydney, Broadway NSW 2007, Australia; **Department of Elec & Computer Engineering, University of Southwestern Louisiana, Lafayette, USA): pp. 77–86.

(2) *JEEE,* no. 2, June 1995, is a special issue on Mobile Communications.

(2.1) Trends in Mobile Communications and Research Opportunities for Australia, by R. Coutts* and B. MacA. Thomas** (*Centre for Telecommunications Information Networking, University of Adelaide, 33 Queens Street, Thebarton SA 5031, Australia; **CSIRO Australia Telescope National Facility, PO Box 76, Epping NSW 2121, Australia): pp. 125–132.

(2.2) GMS: A Telecom Australia Perspective, by I. Swinson (Mobile Communications Services, Telecom Australia, 181-190 Victoria Road, Collingwood, Vic 3066, Australia): pp. 133–136.

(2.3) Monolithic Integrated Antenna Design for Millimeter-Wave Wireless Local Area Network Systems, by A. J. Parfitt, D. W. Griffin, and P. H. Cole (Department of Electrical and Electronic Engineering, The University of Adelaide, Adelaide SA 5005, Australia): pp. 137–144.

(2.4) Aspects of Antenna Design for Indoor Wireless Millimeter-Wave Systems, by J. S. Kot, N. Nikolic, R. A. Sainati, and T. S. Bird (CSIRO Division of Radiophysics, PO Box 76, Epping NSW 2121, Australia): pp. 145–150.

(2.5) Performance and Power Control in CDMA Cellular Mobile Communications, by D. Everitt and J. Grozev (Department of Electrical and Electronic Engineering, The University of Melbourne, Parkville, Vic 3052, Australia): pp. 151–160.

(2.6) The Telstra CDMA Cellular Radio Trial, by A. J. Guy (Telecom Research Labs, Radio and Satellite Networks, 770 Blackburn Road, Clayton Vic 3188, Australia): pp. 161–168.

(2.7) Practical Aspects of Discrete Fourier Transform-Based Frequency Division Multiplexing for Data Transmission, by D. J. Skellern, L. H. C. Lee, and T. Wong (School of Mathematics, Physics, Computing and Electronics, Macquarie University, Sydney NSW 2109, Australia): pp. 169–178.

(3) *JEEE,* no. 3, Sept. 1995, is a special issue on Information Superhighway.

(3.1) Optical Fiber in the Customer Access Network: Part 1–Telstra's Current Applications and Fiber Trials, by R.-C. Hsieh, G. Lampard, and B. Clarke (Telstra Research Laboratory, 770 Blackburn Road, Clayton 3168, Australia): pp. 219–228.

(3.2) Optical Fiber Cable in the Customer Access Network: Part 2–Architectures for the Broadband Future, by B. Clarke, G. Lampard, and R.-C. Hsieh (Telstra Research Laboratory, 770 Blackburn Road, Clayton 3168, Australia): pp. 229–236.

(3.3) 10 Gb/s Transmission over 259 km with a Single In-Line Amplifier, by F. Rühl and J. Gillies (Telstra Research Laboratory, 770 Blackburn Road, Clayton 3168, Australia): pp. 237–241.

(3.4) A Macro-Model of Semiconductor Lasers in IM/DD Optical Systems, by K. Hinton (Telstra Research Laboratory, 770 Blackburn Road, Clayton 3168, Australia): pp. 243–253.

(3.5) Influence of Optical Fiber Amplifiers on Future Optical Communications Systems, by S. Poole (Optical Fiber Technology Centre, University of Sydney, NSW 2006, Australia): pp. 255–260.

(3.6) Bandwidths of Optical Fiber Directional Couplers, by K. S. Chiang (Department of Electronic Engineering, City University of Hong Kong, Hong Kong): pp. 261–265.

(3.7) Applications of Chirped Grating Filters in Broadband Optical Fiber Systems, by G. Town*, J. Chow**, K. Sugden***, I. Benninon***, and M. Romagnoli**** (*Department of Electrical Engineering, University of Sydney, NSW 2006 Australia; **Optical Fiber Technology Centre, University of Sydney, NSW 2006 Australia; ***Department of Electronic Engineering and Applied Physics, Aston University, Aston Triangle, Birmingham B4 7ET, United Kingdom; ****Fondazione Ugo Bordoni, Via B. Castiglione 59, 00142 Rome Italy): pp. 267–276.

(3.8) Principle of Fast Soliton-Based Nonlinear Coupled Fiber Devices, by N. Akhmediev and A. Ankiewicz (Institute of Advanced Studies, The Australian National University, Canberra, ACT 0200, Australia): pp. 277–287.

(3.9) Fabrication and Characterization of Polymer Optical Fibers, by G. D. Peng, P. L. Chu, X. Lou, and R. A. Chaplin (School of Electrical Engineering, University of New South Wales, Kensington, NSW 2052, Australia): pp. 289–296.

(4) *JIETE*, no. 1, Jan–Feb. 1995, is a special issue on Millimeter-Wave Integrated Circuits.

(4.1) A Fast FDTD Analysis of Guided Wave Structures Using a Continuously Variable Mesh with Second Order Accuracy, by S. Xiao and R. Vahldieck (Laboratory for Lightwave Electronics, Microwave and Communications, Department of Electrical and Computer Engineering, University of Victoria, Victoria, BC, Canada, V8W 3P6): pp. 3–14.

(4.2) Three Dimensional Electromagnetic Microwave and Millimeter Wave Structures Employing Complex Media, by C. M. Krowne (Code 6850-3, Microwave Technology Branch, Electronics Science & Technology Division, Naval Research Laboratory, Washington, DC 20375-5347, USA): pp. 15–19.

(4.3) Characterization of Impedance Step Discontinuity in Suspended Substrate Line Variants for Millimeter-Wave Applications, by A. S. B. Ghouth* and S. K. Koul** (*University of Aden, Republic of Yemen; **Centre for Applied Research in Electronics, Indian Institute of Technology, New Delhi 110 016, India): pp. 21-29.

(4.4) Double-Dielectric Finline with Slots Periodically Loaded with Inductive Strips, by M. Fardis, B. Bhat, and S. K. Koul (Centre for Applied Research in Electronics, Indian Institute of Technology, New Delhi 110 016, India): pp. 31–38.

(4.5) Integrated Computer Aided Design Practices as Demonstrated on a Fin-Line Device, by J. A. Molnar (Information Technology Division, Naval Research Laboratory, 4555 Overlook Ave, SW, Washington DC USA 20375-5337): pp. 39–44.

(4.6) Millimeter Wave Integrated Circuit Power Sources, by R. S. Tahim and B. Dutt (Research & Development Laboratories, 5800 Uplander Way, Culver City, California 90230, USA): pp. 45–51.

(4.7) Leaky NRD Guide Fed Plannar Antennas, by T. Yoneyama (Research Institute of Electrical Communication, Tohoku University, Sendai, 980-77 Japan): pp. 53–58.

(4.8) Low Noise Millimeter Wave Integrated Circuit Mixers, by R. S. Tahim and B. Dutt (Research & Development Laboratories, 5800 Uplander Way, Culver City, California 90230, USA): pp. 59–69.

(4.9) Batch Fabrication of Millimeter-Wave Silicon Impatts, by S. Ahmad, A. S. V. Sarma, J. Akhtar, R. Gopal, I. Ahmad, and M. Kumar (MM-Wave Devices Laboratory, Central Electronics Engineering Research Institute, Pilani 333 031, India): pp. 71-75.

(4.10) Double Diode Pulsed Impatt Resonant Cavity Combiner at Ka Band, by R. P. Dixit and D. Singh (Defence Electronic Applications Laboratory, Dehradun 248 001, India): pp. 77-79.

(4.11) Three Stage Injection Locked Millimeter Wave Source at Ka Band, by S. S. Sarin, S. K. Verma, D. Kumar, and D. Singh (Defence Electronic Applications Laboratory, Dehradun 248 001, India): pp. 81–83.

(4.12) Injection Locked Pulsed Impatt Hybrid Coupled Combiner at Ka Band, by D. Kumar, R. P. Dixit, V. Nautiyal, and D. Singh (Defence Electronic Applications Laboratory, Dehradun 248 001, India): pp. 85–87.

(4.13) Studies on Rain Induced Attenuation Phase Shift and Scattering Coefficient at Millimeter Wavelengths During Tropical Rainfall, by R. Bhattacharya*, P. K. Karmakar*, A. Maitra*, A. K. Sen*, and A. B. Bhattacharya** (*Centre of Advanced Study in Radio Physics & Electronics, University of Calcutta, 92 APC Road, Calcutta 700 009, India; **Department of Physics, Kalyani University, Kalyani 741 235, India): pp. 89–93.

(5) *Trans. IEICE,* vol. J78-C-I, no. 11, Nov. 1995, is a special issue on Piezoelectric Devices.

(5.1) Elastic Wave Energy Trapping and Its Application to Piezoelectric Devices (Invited), by K. Nakamura (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): pp. 466–473.

(5.2) Mutual Relationships among Various Equivalent Circuits of Thickness Mode Piezoelectric Transducer (Invited), by N. Chubachi* and H. Kamata** (*Faculty of Engineering, Tohoku University, Sendai, 980-77 Japan; **Research & Development Group, Oki Electric Industry Co., Ltd., Numazu, 410 Japan): pp. 474–480.

(5.3) Two-Dimensional Transient Analysis of Contour Vibrations in a Piezoelectric Ceramic Rectangular Plate, by M. Sato (Akita National College of Technology, Akita, 011 Japan): pp. 481–487.

(5.4) Effects of Sample Shape on Measurements of Electromechanical Coupling Factor: In the Case of Inclined Electrode Plane, by Y. Adachi and Y. Takenaka (Faculty of Science and Technology, Science University of Tokyo, Noda, 278 Japan): pp. 488–493.

(5.5) Lamé-Mode Piezoelectric Resonators Using $LiNbO_3$ Crystals, by K. Nakamura* and K. Kumasaka** (*Faculty of Engineering, Tohoku University, Sendai, 980 Japan; **Product Development Laboratory, Tokin Co., Sendai, 980 Japan): pp. 494–499.

(5.6) BGS Wave Resonators Using Ceramic Substrates and Its Applications, by K. Morozumi and M. Kadota (Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan): pp. 500-506.

(5.7) Temperature Compensated Crystal Oscillator (Invited), by Y. Ueno (SHOWA CRYSTAL Co., Ltd., Funabashi, 274 Japan): pp. 507–519.

(5.8) An Analysis of Resonance Frequency for Stepped, Clamped-Free Torsional Mode Resonators and Its Application to Quartz Crystal Tuning Fork, by H. Kawashima (Seiko Instruments Inc., Matsudo, 271 Japan): pp. 520–526.

(5.9) Precise Measurement of Drive Level Dependence of Crystal Units for OCXO's Using an Oscillation Circuit, by M. Koyama*, Y. Watanabe**, H. Sekimoto**, and Y. Oomura** (*Nihon Dempa Kogyo Co., Ltd., Sayama, 350-13 Japan; **Faculty of Technology, Tokyo Metropolitan University, Hachioji, 192-03 Japan): pp. 27–532.

(5.10) Voltage Controlled S-TCXO's Using NS-GT Cut Quartz Crystal Resonators, by H. Kawashima and K. Sunaga (Seiko Instruments Inc., Matsudo, 271 Japan): pp. 533–540.

(5.11) Low Drive Level Characteristics of AT-Cut Resonators with Cylindrical Capsules, by E. Momosaki* and Y. Oomura** (*SEIKO EPSON Co., Suwa, 392 Japan; **Faculty of Engineering, Tokyo Metropolitan University, Tokyo, 192-03 Japan): pp. 541–546.

(5.12) Angular Rate Sensor of Piezoelectric Vibratory Gyroscope (Invited), by M. Konno, S. Sugawara, and S. Kudo (Faculty of Science and Technology, Ishinomaki Senshu University, Ishinomaki, 986 Japan): pp. 547–556.

(5.13) Coupling Vibration between Flexural and Longitudinal Modes by Controlling Elastic Constants (Letters), by T. Iijima*, Y. Nakagawa**, and H. Ito** (*NISCA Co., Kofu, 400-05 Japan; **Faculty of Engineering, Yamanashi University, Kofu, 400 Japan): pp. 577-559.

(5.14) Ultrasonic Rotary Motor Using Longitudinal and Bending Mode-Coupled Vibration of Diagonally Symmetrical Piezo-Ceramic Plate, by M. Aoyagi and Y. Tomikawa (Faculty of Engineering, Yamagata University, Yonezawa, 992 Japan): pp. 560–566.

(5.15) Vibration Mode Analysis of Piezoelectric-Ceramic Cylinder Vibratory Gyroscopes with Interdigital Electrodes, by H. Abe*, T. Yoshida*, and K. Nakamura** (*Product Development Laboratory, Tokin Co., Sendai, 980 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980 Japan): pp. 567–572.

(5.16) Surface Acoustic Wave Microsensors (Invited), by S. Shiokawa and J. Kondoh (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): pp. 573–579.

(5.17) Properties of ZnO Films Deposited by an RF-Magnetron Mode ECR Sputtering System, by M. Kadota* and M. Minakata** (*Murata Manufacturing Co., Ltd., Nagaokakyo, 617 Japan; **Research Institute of Electronics, Shizuoka University, Hamamatsu, 432 Japan): pp. 580–586.

(5.18) Propagation Properties of Love-Wave Type Surface-Acoustic-Wave on α-Quartz, by A. Isobe, M. Hikita, and K. Asai (Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): pp. 587–592.

(5.19) New Microscope for Measuring the Distribution of Nonlinear Dielectric Properties, by Y. Cho, A. Kirihara, and T. Saeki (Faculty of Engineering, Yamaguchi University, Ube, 755 Japan): pp. 593–598.

(5.20) Enzyme Biosensor Based on Surface Acoustic Wave Device, by J. Kondoh, T. Imayama, Y. Matsui, and S. Shiokawa (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): pp. 599–605.

(6) *IEICE Trans. Commun.*, vol. E78-B, no. 2, Feb. 1995, is a special issue on Electromagnetic Compatibility.

(6.1) Methodology for Electromagnetic Interference Measurements (Invited), by M. Kanda (Electromagnetic Fields Division, National Institute of Standards and Technology, Boulder, Colorado, U.S.A.): pp. 88–108.

(6.2) Roles and Problems of LISN in Noise Measurement (Invited), by S. Nitta (Faculty of Technology, Tokyo University of Agriculture and Technology, Koganei, 184 Japan): pp. 109–119.

(6.3) Electromagnetic Environments Generated by Power Transmission System (Invited), by S. Tomita (Central Research Institute of Electric Power Industry, Komae Research Laboratory, Komae, 201 Japan): pp. 120–126.

(6.4) Composite Noise Generator (CNG) as a Noise Simulator and Its Application to Noise Immunity Test of Digital Systems and TV Picture (Invited), by T. Takagi (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): pp. 127–133.

(6.5) EMI Dipole Antenna Factors (Invited), by A. Sugiura, T. Morikawa, T. Tejima, and H. Masuzawa (Communications Research Laboratory, Ministry of Posts and Telecommunications, Ibaraki-ken, 314 Japan): pp. 134–139.

(6.6) Approximation of Surface-SAR in a Realistic Head Model for Microwave Exposure Using External Magnetic Near-Field, by O. Fujiwara and M. Nomura (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): pp. 140–144.

(6.7) A Multielement Flexible Microstrip Patch Applicator for Microwave Hyperthermia, by Y. Nikawa* and M. Yamamoto** (*School of Electrical Engineering, The National Defense Academy, Yokosuka, 239 Japan; **Department of Electric and Electrical Engineering, Kanto Gakuin University, Yokohama, 236 Japan): pp. 145–151.

(6.8) Digital Analytical Method for Propagation Characteristics on Mutually Coupling Lines, by Y. X. Dong and K. Okamoto (Department of Electrical Engineering, Meisei University, Hino, 191 Japan): pp. 152–158.

(6.9) Estimation of Electromagnetic Interference Field Emitted from Telecommunications Line, by F. Amemiya*, N. Kuwabara**, and T. Ideguchi** (*NTT Technical Assistance & Support Center, Musashino, 180 Japan; **NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): pp. 159–167.

(6.10) An Experimental Study of Subjective Evaluation of TV Picture Degradation by Electromagnetic Noise: Opinion Tests on Still and Motion Pictures, by M. Tanaka*, H. Inoue*, and T. Takagi** (*Mining College, Akita University, Akita, 010 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980-77 Japan): pp. 168–172.

(6.11) Radiated Emission Estimation of a Metallic Enclosure Model Source by Inverse-Forward Analysis, by S. Hayashi, K. Masuda, and K. Hatakeyama (Resources & Environment Protection Research Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 173–180.

(6.12) Prediction of Peak Frequencies on Electromagnetic Emission from a Signal Line on a Printed Circuit Board, by T. Miyashita*, O. Wada*, R. Koga*, and H. Sano** (*Faculty of Engineering, Okayama University, Okayama, 700 Japan; **Faculty of Engineering, Fukuyama University, Fukuyama, 729-02 Japan): pp. 181–187.

(6.13) Computation of Potential Attenuation Process for Charged Human Body Using Numerical Inverse Laplace Transform, by O. Fujiwara and H. Endoh (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): pp. 188–192.

(6.14) New Lightning-Surge Test Method for Subscriber Telecommunication Equipment Considering Nearby Lightning Return Strokes, by H. Yamane*, M. Sato**, T. Ideguchi*, and M. Tokuda* (*NTT Telecommunication Networks Laboratories, Musashino, 180 Japan; **NTT Technical Assistance & Support Center, Musashino, 180 Japan): pp. 193–198.

(6.15) Measurements of Fast Transient Fields in the Vicinity of Short Gap Discharges, by S. Ishigami, R. Gokita, Y. Nishiyama, I. Yokoshima, and T. Iwasaki (Department of Electronics Engineering, University of Electro-Communications, Chofu, 182 Japan): pp. 199–206.

(6.16) Electromagnetic Shielding Effectiveness: Effects due to Gap Size and Angle of Cut, by B. D. Mottahed* and S. Manoochehri** (*AT & T Bell Laboratories, Whippany, New Jersey, U.S.A.; **Mechanical Engineering Department, Stevens Institute of Technology, Hoboken, New Jersey, USA): pp. 207–211.

(6.17) Attenuation of Electrical Field by Small Reinforced Concrete Building: Measured and Computed Results, by A. Orlandi (Department of Electrical Engineering, University of L'Aquila, Poggio di Roio, 67040, L'Aquila, Italy): pp. 212–217.

(6.18) An Equivalent Transmission Line Model for Electromagnetic Penetration through Reinforced Concrete Walls, by S. Cristina and A. Orlandi (Department of Electrical Engineering, University of L'Aquila, Poggio di Roio, 67040, L'Aquila, Italy): pp. 218–229.

(6.19) Analysis of the Shielding Properties of Chiral Slabs, by R. E. Zich (Dipartimento di Elettronica, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10 129 Torino, Italy): pp. 230–237.

(6.20) Analysis of the Shielding Properties of Planar Wire-Mesh Shields, Loaded by General Stratified Structures, by R. E. Zich (Dipartimento di Elettronica, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10 129 Torino, Italy): pp. 238–245.

(6.21) Design and Manufacturing of Resistive-Sheet Type Wave Absorber at 60 GHz Frequency Band, by O. Hashimoto*, T. Abe*, R. Satake*, M. Kaneko*, and Y. Hashimoto** (*College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan; **Electro-Magnetic Wave Division, TDK Co., Ltd., Ichikawa, 272 Japan): pp. 246–252.

(6.22) Design of TCM Signals for Class-A Impulsive Noise Environment, by S. Miyamoto*, M. Katayama**, and N. Morinaga* (*Faculty of Engineering, Osaka University, Suita, 565 Japan; **Faculty of Engineering, Nagoya University, Nagoya, 464-01 Japan): pp. 253–259.

(6.23) Measurement of Antenna Factor of Dipole Antennas on a Ground Plane by 3-Antenna Method, by H. Iida, S. Ishigami, I. Yokoshima, and T. Iwasaki (Department of Electronics Engineering, University of Electro-Communications, Chofu, 182 Japan): pp. 260–267.

(6.24) Evaluation of Antenna Factor of Biconical Antennas for EMC Measurements, by K. Gyoda, Y. Yamanaka, T. Shinozuka, and A. Sugiura (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan) pp. 268–272.

(6.25) An Engineering Design Approach of a Triple-TEM Cell Using Finite Element Method, by X.-D. Cai and G. I. Costache (Department of Electrical Engineering, University of Ottawa, Ottawa, Ontario, KIN 6N5, Canada): pp. 273–278.

(6.26) Measurements on Low Frequency Phase and Amplitude Fluctuation and Its Application to Reduce the Noise in Bipolar Transistor Circuits (Letters), by K. Takagi (Faculty of Engineering, Kyusyu Institute of Technology, Kitakyushu, 804 Japan): pp. 279–280.

(7) *IEICE Trans. Commun.*, vol. E78-B, no. 11, Nov. 1995, is a special issue on Adaptive Signal Processing Technology in Antennas.

(7.1) High-Resolution Techniques in Signal Processing Antennas (Invited), by Y. Ogawa* and N. Kikuma** (*Division of Electronics and Information Engineering, Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan; **Department of Electrical and Computer Engineering, Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): pp. 1435–1442.

(7.2) Estimation of Arrival Waves Using an Extended Kalman Filter, by J. Wang*, T. Takano*, and K. Hagino** (*Institute of Space and Astronautical Science, Sagamihara, 229 Japan; **University of Electro-Communications, Chofu, 182 Japan): pp. 1443–1449.

(7.3) High-Resolution Analysis of Indoor Multipath Propagation Structure, by Y. Ogawa, N. Hamaguchi, K. Ohshima, and K. Itoh (Division of Electronics and Information Engineering, Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 1450–1457.

(7.4) Eliminating the Quantization Problem in Signal Subspace Techniques, by I. Dacos* and A. Manikas** (*Imperial College of Science, Technology and Medicine, University of London, UK; **Department of Electrical and Electronic Engineering, Imperial College of Science, Technology and Medicine, University of London, UK): pp. 1458–1466.

(7.5) An ASIC Implementation Scheme to Realize a Beam Space CMA Adaptive Array Antenna, by T. Tanaka, R. Miura, I. Chiba, and Y. Karasawa (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 1467–1473.

(7.6) The Choice of the Initial Condition of CMA Adaptive Arrays, by K. Takao and H. Matsuda (Faculty of Engineering, Kyoto University, Kyoto, 606-01 Japan): pp. 1474–1479.

(7.7) The Differential CMA Adaptive Array Antenna Using an Eigen-Beamspace System, by K. Nishimori, N. Kikuma, and N. Inagaki (Nagoya Institute of Technology, Nagoya, 466 Japan): pp. 1480–1488.

(7.8) A Spatially and Temporally Optimal Multi-User Receiver Using an Array Antenna for DS/CDMA, by M. Nagatsuka and R. Kohno (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): pp. 1489–1497.

(7.9) Tap Selectable Viterbi Equalizer Combined with Diversity Antennas, by N. Ishii and R. Kohno (Division of Electrical and Computer Engineering, Yokohama National University, Yokohama, 240 Japan): pp. 1498–1506.

(7.10) Radar Sidelobe Canceller Characteristics in High Power Interference, by K. Abe*, K. Hirasawa*, and H. Watanabe** (*Institute of Information Sciences and Electronics, University of Tsukuba, Tsukuba, 305 Japan; **2nd Research Center of Japan Defense Agency, Tokyo, 154 Japan): pp. 1507–1512.

(7.11) A Novel Spatial Smoothing Technique for the MUSIC Algorithm (Letters), by F. Taga and H. Shimotahira (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 1513–1517.

(8) *IEICE Trans. Commun.*, vol. E78-B, no. 12, is a special issue on Satellite Remote Sensing.

(8.1) ILAS, the Improved Limb Atmospheric Spectrometer, on the Advanced Earth Observing Satellite (Invited), by M. Suzuki*, A. Matsuzaki**, T. Ishigaki***, N. Kimura***, N. Araki***, T. Yokota*, and Y. Sasano* (*Global Environment Division, National Institute for Environmental Studies, Tsukuba, 305 Japan; **Department of Engineering, Mie University, Tsu, 514 Japan; ***Matsushita Research Institute Tokyo, Inc., Kawasaki, 214 Japan): pp. 1560–1570.

(8.2) Polarimetric Enhancement in Radar Channel Imagery, by Y. Yamaguchi*, Y. Takayanagi*, W.-M. Boerner**, H. J. Eom***, and M. Sengoku* (*Niigata University, Niigata, 950-21 Japan; **University of Illinois at Chicago, IL, 60607-7018, USA; ***Korea Advanced Institute of Science and Technology, Taejon, 305-701 Korea): pp. 1571–1579.

(8.3) Footprints of Storms on the Sea in the JERS-1 SAR Image, by T. Iguchi*, D. Atlas**, K. Okamoto*, and A. Sumi*** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **NASA Goddard Space Flight Center, Greenbelt, Maryland 20771 USA; ***Center for Climate System Research, The University of Tokyo, Tokyo, 153 Japan): pp. 1580–1584.

(8.4) Data Reduction Method for the Laser Long-Path Absorption Measurement of Atmospheric Trace Species Using the Retroreflector in Space, by N. Sugimoto* and A. Minato** (*National Institute for Environmental Studies, Japan Environment Agency, Tsukuba, 305 Japan; **Faculty of Engineering, Ibaraki University, Hitachi, 316 Japan): pp. 1585–1590.

(8.5) Estimation of Land Surface Bidirectional Reflectance Distribution Function by Using Airborne POLDER Image Data, by K. Takemata* and Y. Kawata** (*Department of Electrical Engineering, Kanazawa Technical College, Kanazawa, 921 Japan; **Environmental Information Research Laboratory, Kanazawa Institute of Technology, Ishikawa-ken, 921 Japan): pp. 1591–1597.

(8.6) Physical and Optical Parameter Retrieval from Airborne POLDER Data, by A. Yamazaki and Y. Kawata (Environmental Information Research Laboratory, Kanazawa Institute of Technology, Ishikawa-ken, 921 Japan): pp. 1598–1603.

(8.7) Principal Component Analysis for Remotely Sensed Data Classified by Kohonen's Feature Mapping Preprocessor and Multi-Layered Neural Network Classifier, by H. Murai*, S. Omatu**, and S. Oe*** (*Faculty of Management and Information Science, Shikoku University, Tokushima, 771-11 Japan; **College of Engineering, Osaka Prefecture University, Sakai, 593 Japan; ***Faculty of Engineering, Tokushima University, Tokushima, 770 Japan): pp. 1604–1610.

(8.8) A Method for Detection and Analysis of Change between Multitemporal Images, by H. Hanaizumi*, S. Chino*, and S. Fujimura** (*College of Engineering, Hosei University, Koganei, 184 Japan; **Graduate School of Engineering, The University of Tokyo, Tokyo, 113 Japan): pp. 1611–1616.

(8.9) JERS-1 SAR Image Analysis by Wavelet Transform (Letters), by Y. Yamaguchi, T. Nagai, and H. Yamada (Faculty of Engineering, Niigata University, Niigata, 920-21 Japan): pp. 1617–1621.

(9) *IEICE Trans. Electron.*, vol. E78-C, no. 1, Jan. 1995, is a special issue on Ultrafast Optoelectronics.

(9.1) Soliton Transmission Control for Ultra High Speed System (Invited), by H. Kubota and M. Nakazawa (NTT Access Network Systems Laboratories, Ibaraki-ken, 319-11 Japan): pp. 5–11.

(9.2) Long-Distance Soliton Transmission up to 20 Gbit/s Using Alternating-Amplitude Solitons and Optical TDM (Invited), by M. Suzuki, N. Edagawa, H. Taga, H. Tanaka, S. Yamamoto, Y. Takahashi, and S. Akiba (Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan): pp. 12–21.

(9.3) A Multiple Wavelength Vertical-Cavity Surface-Emitting Laser (VCSEL) Array for Optical Interconnection (Invited), by I. Ogura, K. Kurihara, S. Kawai, M. Kajita, and K. Kasahara (Opto-Electronics Research Laboratories, NEC Co., Tsukuba, 305 Japan): pp. 22–27.

(9.4) Polarization Dependence of Soliton Interactions in Femtosecond Soliton Transmission, by T. Sugawa, K. Kurokawa, H. Kubota, and M. Nakazawa (NTT Access Network Systems Laboratories, Ibaraki-ken, 319-11 Japan): pp. 28–37.

(9.5) Stable Light-Bullet Formation in a Kerr Medium: A Route to Multidimensional Solitons in the Femtosecond Regime, by K. Hayata, H. Higaki, and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 38–42.

(9.6) 10-Gb/s Repeaterless Transmission Using Standard Single-Mode Fiber with Pre-Chirping and Dispersion Compensation Techniques, by G. Ishikawa, M. Sekiya, H. Onaka, T. Chikama, and H. Nishimoto (Fujitsu Laboratories Ltd., Kawasaki, 211 Japan): pp. 43–49.

(9.7) Short Optical Pulse Generation and Modulation by a Multi-Section MQW Modulator/DFB Laser Integrated Light Source, by K. Wakita, K. Sato, I. Kotaka, Y. Kondo, and M. Yamamoto (NTT Opto-electronics Laboratories, Atsugi, 01 Japan): pp. 50–54.

(9.8) Band Operation of Guided-Wave Light Modulators with Filter-Type Coplanar Elctrodes, by M. Izutsu, T. Mizuochi, and T. Sueta (Faculty of Engineering Science, Osaka University, Toyonaka, 560 Japan): pp. 55–60.

(9.9) Numerical Analysis of an Optical X Coupler with a Nonlinear Dielectric Region, by H. Yokota, K. Kimura, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 61–66.

(9.10) Highly Sensitive Real Time Electro-Optic Probing for Long Logic Pattern Analysis, by H. Takahashi, S. Aoshima, K. Wakamori, I. Hirano, and Y. Tsuchiya (Hamamatsu Photonics K.K., Hamamatsu, 434 Japan): pp. 67-72.

(9.11) Electrooptic Vector Sampling: Measurement of Vector Components of Electric Field by the Polarization Control of Probe Light, by T. Itatani*, T. Nakagawa*, F. Kano**, K. Ohta*, and Y. Sugiyama* (*Electrotechnical Laboratory, Tsukuba, 305 Japan; *Oyama National College of Technology, Oyama, 323 Japan): pp. 73-80.

(9.12) Optical Switching Networks Using Free-Space Wavelength-Division Multiplexing Interconnections, by S. Kawai*, H. Kurita*, and I. Ogura** (*Optoelectronics NEC Laboratory, Real World Computing Partnership, Kawasaki, 216 Japan; **Opto-Electronics Research Laboratories, NEC Co., Tsukuba, 305 Japan): pp. 81–84.

(9.13) Low-Threshold Self-Mode-Locked Ti:Sapphire Laser (Letters), by K. Torizuka, H. Takada, and K. Miyazaki (Electrotechnical Laboratory, AIST, Tsukuba, 305 Japan): pp. 85–87.

(9.14) FM Laser Operation of a Ti:Sapphire Laser (Letters), by A. Morimoto, T. Okimoto, A. Soga, and T. Kobayashi (Faculty of Engineering Science, Osaka University, Toyonaka, 560 Japan): pp. 88–90.

(9.15) High-Speed Modulation with Low-Threshold 1.3 μm-Wavelength MQW Laser Diodes (Letters), by K. Tanaka, K. Nakajima, T. Odagawa, H. Nobuhara, and K. Wakao (Fujitsu Laboratories Ltd., Atsugi, 243-01 Japan): pp. 91–93.

(10) *IEICE Trans. Electron.*, vol. E78-C, no. 8, Aug. 1995, is a special issue on Microwave and Millimeter-Wave Technology.

(10.1) Millimeter Waves and Beyond (Invited), by T. Yoneyama (Research Institute of Electrical Communication, Tohoku University, Sendai, 980-77 Japan): pp. 893–901.

(10.2) Review of Recent Developments in Microwave Research in Australia (Invited), by J. Ceremuga (Department of Electrical and Computer Engineering, James Cook University of North Queensland, Townsville, Q4811, Australia): pp. 902–906.

(10.3) A WSiN-Gate GaAs HMESFET with an Asymmetric LDD Structure for MMICs, by K. Nishimura, K. Onodera, K. Inoue, M. Tokumitsu, F. Hyuga, and K. Yamasaki (NTT LSI Laboratories, Atsugi, 243-01 Japan): pp. 907–910.

(10.4) Novel Architecture and MMIC's for an Integrated Front-End of a Spectrum Analyzer, by T. Takenaka, A. Miyazaki, and H. Matsuura (TERATEC Co., R & D Department 1, Musashino, 180 Japan): pp. 911–918.

(10.5) Three-Dimensional MMIC and Its Application: An Ultra-Wideband Miniature Balun, by I. Toyoda, M. Hirano, and T. Tokumitsu (NTT, Yokosuka, 238-03 Japan): pp. 919–924.

(10.6) An 11-GHz-Band Subharmonic-Injection-Locked Oscillator MMIC, by K. Kamogawa*, I. Toyoda**, and T. Tokumitsu* (*NTT Wireless Systems Laboratories, Radio Systems Laboratory, Yokosuka, 238-03 Japan; **NTT Electronics Technology Co., Yokosuka, 238-03 Japan): pp. 925–930.

(10.7) A GaAs Single Voltage Controlled RF Switch IC, by K. Miyatsuji and D. Ueda (Electronics Research Laboratory, Matsushita Electronics Co., Takatsuki, 569 Japan): pp. 931–935.

(10.8) Analysis of High Power Amplifier Instability due to $f_0/2$ Loop Oscillation, by T. Takagi*, M. Mochizuki**, Y. Tarui**, Y. Itoh**, S. Tsuji***, and Y. Mitsui* (*Optoelectronic and Microwave Devices Laboratory, Mitsubishi Electric Co., Itami, 664 Japan; **Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; ***Kitaitami Works, Mitsubishi Electric Co., Itami, 664 Japan): pp. 936–943.

(10.9) High F_{max} AlGaAs/GaAs HBT's with Pt/Ti/Pt/Au Base Contacts for DC to 40 GHz Broadband Amplifiers, by T. Sugiyama, Y. Kuriyama, N. Iizuka, K. Tsuda, K. Morizuka, and M. Obara (Toshiba Research & Development Center, Kawasaki, 210 Japan): pp. 944-948.

(10.10) Fabry-Perot Multiple-Device Oscillator Using an Axially Symmetric Mode, by M. Sanagi, S. Nogi, K. Fukui, and K. Watanabe (Faculty of Engineering, Okayama University, Okayama, 700 Japan): pp. 949–956.

(10.11) Microstrip Active Filters Using GaAs FET Negative Resistance Circuits for Loss Compensation, by U. Karacaoglu*, I. D. Robertson*, and M. Guglielmi** (*Communications Research Group, Department of Electronic Engineering, King's College London, Strand, London, UK, WC2R 2LS; **European Space Research and Technology Center, Noordwijk, The Netherlands): pp. 957–964.

(10.12) A Novel Noise Parameters Extraction Technique for Microwave Packaged BJT and FET, by K. Gu and S. Le-

cal and Computer Engineering, James Cook University of North Queensland, Townsville, Australia; **Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland; ***National Institute of Standard and Technology, Electromagnetic Fields Division, Boulder USA; ****Warsaw University of Technology, Institute of Radioelectronics, Warsaw, Poland): pp. 1106–1110.

(10.34) Fundamental Time Domain Solutions for Plane TEM-Waves in Lossy Media and Applications, by M. Schinke and K. Reiss (Institut für Theoretische Elektrotechnik und Meßtechnik, Universität Karlsruhe, Kaiserstr. 12, D-76128, Karlsruhe, Germany): pp. 1111–1116.

(10.35) Efficient Fullwave Analysis of a Waveguide T-Junction with an Inductive Post, by Z. Ma and E. Yamashita (University of Electro-Communications, Chofu, 182 Japan): pp. 1117–1124.

(10.36) Dielectric Measurements in the 60-GHz Band Using a High-Q Gaussian Beam Open Resonator, by P. Coquet, T. Matsui, and M. Kiyokawa (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 1125–1130.

(10.37) Radiation from a Parallel-Plate-Fed Slit in a Thick Conducting Screen, by H. J. Eom and T. J. Park (Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, 373-1, Kusong Dong, Yusung Gu, Taejon, Korea): pp. 1131–1133.

(10.38) A Ku-Band Transversal Filter Using Directional Couplers Made of a Multilayer Ceramic (Letters), by T. Hiratsuka, Y. Ida, N. Imai, and E. Ogawa (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 1134–1138.

(10.39) Narrowband Experimental Study for Indoor Propagation Characteristics in the 60 GHz Band (Letters), by K. Taira*, K. Fujiwara**, T. Manabe*, M. Mizuno*, and Y. Kasashima*** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **Graduate School of Information Systems, University of Electro-Communications, Chofu, 182 Japan; ***Kajima Technical Research Institute, Choufu, 182 Japan): pp. 1139–1145.

(10.40) Field Matching Analysis of a Hybrid Structure Including a Radial Cavity and H-Plane Coupled Rectangular Waveguides (Letters), by M. E. Bialkowski, V. P. Waris, and P. W. Davis (Department of Electrical and Computer Engineering, The University of Queensland, Queensland 4072, Australia): pp. 1146–1150.

(11) *IEICE Trans. Electron.*, vol. E78-C, no. 10, Oct. 1995 is a special issue on Electromagnetic Theory.

(11.1) The Vector Nature of Electromagnetic Field: To What Results It Leads in the Theory of Dielectric Waveguides? (Invited), by B. Z. Katsenelenbaum (Institute of Radioengineering and Electronics, Russian Academy of Sciences, Ulitsa Mokhovaya, 11, Moscow, 103907, Russia): pp. 1323–1330.

(11.2) Discrete Higher-Order Leaky-Wave Modes and the Continuous Spectrum of Stripline (Invited), by D. P. Nyquist and D. J. Infante (Department of Electrical Engineering, Michigan State University, East Lansing, Michigan 48824, USA): pp. 1331–1338.

(11.3) Principles of Radar Polarimetry (Invited), by E. Lüneburg (German Aerospace Research Establishment, Institute for Radio Frequency Technology, P.O. Box 1116, D-82230 Oberpfaffenhofen, Germany): pp. 1339–1345.

(11.4) Generalized Ray Expansion with Elliptic Ray Tubes in Hybrid Analysis of EM Scattering by Open Cavities (Invited), by R. J. Burkholder*, P. H. Pathak*, H.-T. Chou*, and D. Andersh** (*ElectroScience Laboratory, Department of Electrical Engineering, The Ohio State University, 1320 Kinnear Road, Columbous, Ohio 43212 USA; **Wright Laboratory, Target Recognition Technology Branch, Wright-Patterson AFB, Ohio, USA): pp. 1346–1356.

(11.5) Electromagnetic Wave Scattering in Media Whose Particles are Randomly Displaced from a Uniformly Ordered Spatial Distribution (Invited), by M. Tateiba (Faculty of Engineering, Kyusyu University, Fukuoka, 812-81 Japan): pp. 1357–1365.

(11.6) Three-Dimensional Analytical Electrostatic Green's Functions for Shielded and Open Arbitrarily Multilayered Medium Structures and Their Application to Analysis of Microstrip Discontinuities, by K. Li and K. Atsuki (Department of Electronic Engineering, University of Electro-Communications, Chofu, 182 Japan): pp. 1366–1372.

(11.7) Low Loss Optical Waveguide Bends Consisting of Uniaxial Crystalline Material, by S. Sawa, T. Kitamura, M. Geshiro, and T. Yoshikawa (College of Engineering, Osaka Prefecture University, Sakai, 593 Japan): pp. 1373–1377.

(11.8) Analysis of 3-Line Tapered Velocity Couplers with a Nonlinear Waveguide, by T. Kitamura, M. Geshiro, S. Sawa, and M. Sasaki (College of Engineering, Osaka Prefecture University, Sakai, 593 Japan): pp. 1378–1382.

(11.9) Material Effects in Bi-Anisotropic Electromagnetics, by A. H. Sihvola and I. V. Lindell (Electromagnetics Laboratory, Helsinki University of Technology, Otakaari 5A, FI-02 150 Espoo, Finland): pp. 1383–1390.

(11.10) Spatial Electromagnetic Fields in Chiral Integrated Structures via Sommerfeld Integrals, by L. Vegni and A. Toscano (Third University of Rome, Department of Electronic Engineering, Italy): pp. 1391–1401.

(11.11) Numerical Analysis of Dielectric Rod Waveguide with Corrugation of Nonintegral-Ratio Period Waves, by H. Kubo, K. Fukushima, and I. Awai (Department of Electrical and Electronic Engineering, Yamaguchi University, Ube, 755 Japan): pp. 1402–1408.

(11.12) Determination of Diffusion-Parameter Values in K^+-Ion Exchange Waveguides Made by Diluted KNO_3 in Soda-Lime Glass, by K. Kishioka (Department of Applied Electronics, Osaka Electro-Communication University, Neyagawa, 572 Japan): pp. 1409–1418.

(11.13) Exact Solution of Propagation Constant of Cylindrical Waveguide with Finite Conductivity, by W.-D. Wang, M. Abe, and T. Sekiguchi (Musashi Institute of Technology, Tokyo, 158 Japan): pp. 1419–1426.

(11.14) Analysis of a Cherenkov Laser Loaded with a Kerr-Like Medium by Multilayer Approximation Method, by T. Nishimura, T. Ueda, and T. Shiozawa (Department of Communication Engineering, Osaka University, Suita, 565 Japan): pp. 1427–1432.

(11.15) PO Diffraction Coefficients for the Surface of Strips on a Grounded Dielectric Slab, by S. Chen, M. Oodo, M. Ando, and N. Goto (Department of Electrical and Electronic Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): pp. 1433–1439.

(11.16) Surface Potential Method in the Wave Scattering from Localized Inhomogeneities of a Planar Dielectric Waveguide, by A. G. Yarovoy (Department of Radiophysics, Kharkov State University, Svobody Sq., 4, Kharkov, 310077, Ukraine): pp. 1440–1446.

(11.17) Diffraction Characteristics of a Finite Metal-Strip Grating Integrated with a Planar Dielectric Waveguide, by V. I. Kalinichev (Department of Radio Engineering, Moscow Power Engineering Institute, Ulitsa Krasnokazarmennaya, 14, Moscow, 111250, Russia): pp. 1447–1452.

(11.18) Scattering by Two-Dimensional Rectangular Resistive Plane Gratings with Anisotropic Slab, by M. Asai*, J. Yamakita**, S. Sawa***, and J. Ishii* (*Faculty of Biology-Oriented Science and Technology, Kinki University, Wakayama-ken, 649-64 Japan; **Faculty of Computer Science and System Engineering, Okayama Prefectural University, Sosha, 719-11 Japan; ***Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): pp. 1453–1459.

(11.19) A 3-D Boundary Element Analysis of EM Wave Scattering by a Perfectly Conducting Body with Edges and Corners (Letters), by K. Manabe* and Y. Miyazaki** (*Takuma National College of Technology, Kagawa-ken, 769-11 Japan; **Toyohashi University of Technology, Toyohashi, 441 Japan): pp. 1460–1464.