Asia–Pacific Abstracts

Papers from Journals Published in Australia, India, China, Korea, and Japan in 1994

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The periodicals inverstigated are 1) *Journal of Electrical and Electronics Engineering* (*JEEE*), Australia, 2) *Australian Telecommunication Research* (*ATR*), Australia, 3) *Journal of the Institution of Electronics and Telecommunication Engineers* (*JIETE*), 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) *KITE Journal of the Electronics Engineering* (*JKEE*), Korea, 14) *Transactions of the Institute of Electronics, Information and Communication Engineers* (*Trans. IEICE*), Japan, 15) *IEICE Transactions on Communications* (*IEICE Trans. Commun.*), Japan, and *IEICE Transactions on Electronics* (*IEICE Trans. Electron.*), Japan.

The Korean papers published in *JKITE*, *JKICS*, and *JKEE* 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 J77-B-II, J77-C-I, and J77-C-II, short English summaries are found in the *IEICE Trans. Commun.*, vol. E77-B and *IEICE Trans. Electron.*, vol. E77-C, issued in the same month. Papers carrying volume numbers E77-B and E77-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 abstracts of these papers are grouped as follows:

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

1) Solid-State Microwave Devices and MMIC's

(1) A 3 mm Wide Band Mixer, by Y.-T. Cao (Purple Mountain Observation, Academia Sinica, China, Nanjing, P.R.C.): *AES*, vol. 22, pp. 95–98, Aug. 1994.

The diode and embedding impedances for different parameters are calculated and analyzed, and a matching guideline is provided. The 3-mm mixers operated at overall wave band are desinged. The minimum noise temprerature of the mixer of 150 °K is obtained at 80–15GHz.

(2) Theory and Algorithm for Analysis of the Harmonic Behavior of Nonlinear Microwave Circuits, by H. Chen*, H.-S. Wu**, and W.-C. Wu** (*University of Electronic Science and Technology of China, Chengdu, P.R.C.; **Xidian University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 7–14, Sept. 1994.

The augmented harmonic balance method (AHBM) is developed for the analysis of general nonlinear microwave circuits. The concepts of differential linearized network and nonlinear adjoint network are introduced so that the formulation, computation, and implementation of AHBM are rather simple and efficient, and the program can be developed straightforwardly based on the existing frequency-domain linear microwave circuits CAD software.

(3) Nonlinear Analysis of 90° Bridge Coupler Power Amplifier/Combiner, by S.-Q. Wang and W.-G. Lin (Applied Physics Institute, University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 22, pp. 44–48, Nov. 1994.

The nonlinear characteristics of 90° bridge coupler power amplifier/combiner are thoroughly analyzed after the dynamic equations at large signal are derived. The formulation of gain at small signal is obtained. The effect of the parameters of each amplifier on the combining results is discussed.

(4) Analysis of Millimeter Wave Harmonic Oscillators Based on Volterra Series Method, by L. Chen and Y.-Y. Wang (Southeast University, Nanjing, P.R.C.): *AES*, vol. 22, pp. 50–56, Dec. 1994.

A new method of analyzing millimeter wave harmonic oscillators via Volterra series and the nonlinear transfer function theory is presented, and determining equations characterizing nonlinearity of the oscillators are given. The oscillation amplitudes and frequencies of the harmonics oscillators are calculated.

(5) The Design of Microwave BJT Ultra-Wideband Low-Noise Amplifer, by Y.-M. Song and Z.-W. Chen (Tsinghua

University, Beijing, P.R.C.): *JCIC*, vol. 15, pp. 46–52, July 1994.

A design method of microwave BJT ultra-wideband low-noise amplifier with bandwidth of 10 to 1600 MHz is given. Based on microwave BJT noise model, the BJT noise parameters are extracted through fitting its noise figure NF_{50} and S-parameters under 50 Ω source impedance, and according to the need of gain, noise, and VSWR, the amplifier is designed with flat-gain and low-noise within the ultrawide bandwidth. The method is verified by the experiment results.

(6) 6 mm Microstrip Gunn Oscillator Using a Dielectric Resonator, by D.-D. Zhao, J.-R. Cao, Y.-M. Deng, H.-G. Qin, B.-Q. Tang, and W.-H. Zhang (Nanjing Electronic Devices Institute, Nanjing, Jiangsu, P.R.C.): *JIMW*, vol. 13, pp. 267–272, Aug. 1994.

A high-perfermance and stable 6-mm full microstrip GaAs Gunn oscillator with a dielectric resonator is reported. A CW output power of 102 mW at 44.6 GHz is obtained, and the frequency stability of 4.8 ppm/C is achieved.

(7) A 75–115 GHz Phase-Locked Solid State Source, by S.-H. Chen, Z.-C. Xu, and G.-P. Yan (Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing, Jiangsu, P.R.C.): *JIMW*, vol. 13, pp. 273–277, Aug. 1994.

A W-band phase-locked system using Gunn VCO is developed. This system is used as a local oscillator for the 13.7-m millimeter-wave radio telescope of PMO. Its operating frequency range is 75–115 GHz and the output power is greater than 5 mW. By using the output signal of a servo amplifier to control the bias voltage of the Gunn oscillator, a lock-in bandwidth of more than 100 GHz is achieved.

(8) Modeling S Parameters and Noise Behavior of HEMT Devices in MMW Band, by H. Chen, X.-F. Huang, and J.-F. Zhu (University of Electronic Science and Technology of China, Chengdu, Sichuan, P.R.C.): *JIMW*, vol. 13, pp. 289–294, Aug. 1994.

An effcient and accurate method for extracting the equivalent circuit elements of a HEMT from its S parameter measurements in the microwave and millimeter wave bands is proposed. Based on the equivalent circuit model, the noise analysis procedure of the HEMT device is given. The Van der Ziel parameters are used for characterizing the noise behavior of the device and are extracted from the measured minimum noide figures of the devices.

(9) Development of Broad-Band Finline Integrated Circuit Mixers at 4 mm, by B. Wang, B.-Q. Zhou, and L.-X. Bai (Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai, P.R.C.): *JIMW*, vol. 13, pp. 305–308, Aug. 1994.

The broad-band finline integrated circuit mixers at 4 mm are developed successfully. The conversion loss of 8.6 to 11 dB for 12-GHz instantaneous IF bandwidth is achieved with the LO at 67 GHz and the RF from 68 to 80 GHz.

(10) A Digital Phase-Locked 8-mm Solid State Source, by H. Ye, Y.-J. Lou, Z.-C. Lin, and G.-X. Luo (Zhongshan University, Guangzhou, P.R.C.): *JIMW*, vol. 13, pp. 317–320, Aug. 1994.

The working parameters of a third-order loop are deduced based on the analysis of a millimeter band digital phase-locked loop. A digital phase-locked 8-mm Gunn oscillator with a heterodyne-loop structure is designed. It is shown by the measurements that the performance of this loop is quite satisfactory. It has the characteristics of being easily locked and having a pure spectrum.

(11) Optimum Design of Short-Slot Hybrid Power Combiner, by S.-Q. Wang*, W.-G. Lin*, and M. Zhang** (*University of Electronic Science and Technology of China, Chengdu, P.R.C.; **Guangdong Institute of Technology, Guangzhou, P.R.C.): *JE*, vol. 16, pp. 198–202, Mar. 1994.

A new idea of representing the mutual injection locking phenomena in the short-slot hybrid power combiner by a model of negative nonlinear network is proposed. This model thoroughly represents the nonlinear characteristic of the combiner. After the nonlinear equations of the combined system are derived, a method of optimizing the parameters of the combined oscillators to achieve a maximum power combining efficiency is given. The optimum results agree with experimental ones quite well.

(12) A Broadband GaAs MMIC SPDT Switch, by G.-J. Hao, X.-Q. Xiam, and J.-P. Li (Nanjing Electronic Equipment Institute, Nanjing, P.R.C.): *JM*, no. 4, pp. 40–44, Oct. 1994.

A momolithic microwave broadband single pole double throw (SPDT) switch empolying series and shunt GaAs FET's is present. The chip size is 0.97 × 1.23 mm. In DC to 10 GHz frequency range, insertion loss better than 2.2 dB, 32 dB isolation, and 12 dB return loss are achived. The switch demonstates a power handling capacity of better than 20 dBm at 5 GHz and a switching time less than 1 ns.

(13) Q-Band Beam-Lead Single-Ended Mixer, by C. H. Lee and S. T. Han (Korea Astronomy Observatory, Taejon, Korea): *JKITE*, vol. 31, pp. 26–32, May 1994.

Using a newly developed GaAs Schottky beam-lead diode from Marconi company, a waveguide type single-ended mixer at Q-band is designed. The Q-band mixer with 1.4 GHz/400 MHz IF frequency exhibits an average conversion loss of 5.3 dB over 33–50 GHz bandwidth.

(14) A Study on the Improvement of Intermodulation Distortion for Multistage Microwave Two-Port Networks, by E. J. Park (Department of Electrical Engineering, Kumoh National University of Technology, Kumi, Korea): *JKITE*, vol. 31, pp. 50–57, May 1994.

An analysis of the two-tone intermodulation distortion of multistage two-ports with gain and mismatching losses is presented with simplified two-port analyses and statistical viewpoint.

(15) Development of a 2.8-GHz Local Oscillator for the Communication Satellite, by S. J. Kweon, S. K. Lim, J. I. Choi, S. W. Lee, S. T. Kim, and K. W. Ra (Electronic Signal Processing Laboratory, Institute for Advanced Engineering, Kumi, Korea): *JKITE*, vol. 31, pp. 58–67, May 1994.

A 2.8-GHz local oscillator is designed that converts 14.5–14.8 GHz uplink frequency to 11.7–12.0 GHz downlink frequency by the receiving mixer on the communication satellite transponder according to the rating of domestic satellite.

(16) A Study on Predistortor Using the Feedforward Type, by W. W. Lee, K. R. Park, Y. C. Jeong, S. W. Yun, and I. S. Jang (Department of Electrical Engineering, Korea Military Academy, Seoul, Korea): *JKITE*, vol. 31, pp. 68–75, May 1994.

Using IMD (intermodulation distortion) of drive amplifier, as feedforward type, the inverse IMD is coupled to the main loop with variable attenuators, phase shifters, and sub-amplifiers well designed to overcome the nonlinearity of HPA.

(17) Design of a Microwave PIN Diode 4-Bit Phase Shifter, by T. M. Roh*, C. H. Kim**, J. C. Chun*, W. S. Park*, and B. M. Kim* (*Department of Electrical Engineering, Pohang University, Pohang, Korea; **Agency for Defense Development, Taejon, Korea): *JKITE*, vol. 31, pp. 45–52, June 1994.

A microwave PIN diode 4-bit phase shifter is designed in X-band. A loaded-line type is used for the 22.5° and 45° bits, and a switched-line type for the 90° and 180° bits. The measured results show that the phase error and average insertion loss are less than ±5.4° and 7.2 dB, respectively, over 9.75–10.25 GHz frequency band.

(18) Design and Fabrication of the Wide-Band YIG Tuned Oscillator, by M. Q. Lee*, K. W. Yeom**, and S. W. Nam* (*Department of Electrical Engineering, Seoul National University, Seoul, Korea; ** LTI, Seoul, Korea): *JKICS*, vol. 19, pp. 1710-1718, Sept. 1994.

A broadband tunable YIG oscillator is designed and fabricated. The YTO (YIG tuned oscillator) has the wide oscillation range from 1.4–4 GHz, and its linearity is 0.5% in the oscillation range.

(19) A Design and Construction of Phase-Locked Dielectric Resonator Oscillator for VSAT, by K. K. Ryu*, D. H. Lee*, and U. S. Hong** (*Department of Electronic Communication Engineering, Kwang Woon University, Seoul, Korea; **Department of Radio Science and Engineering, Kwang Woon University, Seoul, Korea): *JKICS*, vol. 19, pp. 1973–1981, Oct. 1994.

A PLDRO (phase-locked dielectric resonator oscillator) in Ku-band is designed with the feedback property of PLL. A series feedback type DRO is developed, and VCDRO (voltage controlled dielectric resonator oscillator) using a varactor diode as a voltage-variable capacitor is implemented.

(20) A Study on the Design and Implementation of Ku-Band Frequency Synthesizer by Using PLL, by I. K. Lee*, K. I. Min*, D. S. An**, and S. H. Oh* (*Department of Electrical Engineering, Chung-Nam National University, Taejon, Korea; **Korea Electronics and Telecommunications Research Institute, Taejon, Korea): *JKICS*, vol. 19, pp. 1872–1879, Oct. 1994.

The design and implementation of Ku-band frequency synthesizer is accomplished using the PLL and frequency multiple method. By connecting frquency doubler and frequency eighth multiplier to the designed PLL circuit in series, Ku-band frequency is synthesized.

(21) Analysis of the Microwave Amplifier Ultra-Wideband Characteristics with Feedback Amplifier Module, by Y. J. Kim* and Y. C. Rhee** (*Department of Electrical Engineering, Dong-Eui University, Pusan, Korea; **Department of Electrical Engineering, Kyung Nam University, Masan, Korea): *JKICS*, vol. 19, pp. 2238–2248, Nov. 1994.

A microwave amplifier ultra-wideband characteristic is analyzed and applied to multi-giga b/s optical receiver preamplifier in high speed optical communication system. Simulation results show 6.36–6.87 dB and 9.1–10.3 dB gains and excellent gain flatness at 0.5–12 GHz.

(22) Realization of a 7.7–8.5 GHz 10 W Solid-State Power Amplifier, by H. D. Park and Y. K. Kim (Department of Electrical Engineering, Inha University, Inchon, Korea): *JKICS*, vol. 19, pp. 2489–2497, Dec. 1994.

This paper presents the development of a 10-W solid-state hybrid power amplifier, operating over 7.7–8.5 GHz. The fabrication and measurement of this amplifier are performed with three sections, such as the front one for high gain, the middle one for driving, and the high power one.

(23) A Branch-Line-Type Eight-Port Hybrid, by T. Kawai, K. Ito, and I. Ohta (Faculty of Engineering, Himeji Institute of Technology, Himeji, 671-22 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 71–80, Feb. 1994.

A novel transmission-line-type eight-port hybrid is proposed and investigated theoretically and experimentally. First, a relation among the characteristic admittances of the line sections for satisfying the matching and equal-power dividing conditions are derived, and the frequency characteristics are calculated. Next, the design of the matching circuit is investigated to broaden the bandwidth. As a result, a relative bandwidth of about 20% is obtained.

(24) Frequency Stabilization of NRD Guide Gunn Oscillator at 60 GHz, by Y. Suzuki, F. Kuroki, and T. Yoneyama (Research Institute of Electrical Communication, Tohoku University, Sendai, 980-77 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 461–467, Aug. 1994.

Frequency stability of a 60-GHz NRD-guide InP Gunn oscillator is improved based on the phase locked loop technique. All millimeter wave circuit components such as harmonic mixer, coupler, circulator, and Gunn oscillator are fabricated by using the NRD guide and the laterally shielded co-planar waveguide in part, and are integrated within a compact housing of 4 cm × 6 cm in area. Frequency stability of the order of 2.1×10^{-10} (13 Hz/60GHz) is obtained, and the phase noise is suppressed significantly below −48 dBc/Hz.

(25) A Loaded-Line Phase Shifter with Series Transformers, by M. Matsunaga and T. Katagi (Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 542–550, Oct. 1994.

A design method and experimental results of a new type phase shifter named the loaded-line phase shifter with series transformers are described. By introducing the series transformers, the loss balance of the two phase states and the frequency dependence of the phase shift as well as the amount of the phase shift can be considered. The validity of the design method is verified by measuring the experimental 90° phase shifter at L-band.

(26) 12-GHz Low-Noise MMIC Amplifier with GaAs Pulse-Doped MESFET's, by N. Shiga, S. Nakajima, N. Kuwata, K. Otobe, T. Sekiguchi, K. Matsuzaki, and H. Hayashi (Optoelectronics R & D Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1500–1506, Sept. 1994.

A monolithic four-stage low-noise amplifier (LNA) is demonstrated for direct broadcast satellite down-converters using 0.3-μm gate pulse-doped GaAs MESFET's. The key feature of the research is a detailed demonstration of the difference between a noise figure of the four-stage LNA and an optimal noise figure of an employed FET.

2) Transmission Lines and Passive Microwave Devices

(1) Approximate Method of Optical Waveguide with Exponential Models, by B.-R. Shi and J. Liu (Changchun College of Optics and Fine Mechanics, Changchun, P.R.C.): *AES*, vol. 22, pp. 92–95, Feb. 1994.

The wave equation is solved by means of first-order perturbational method, and for the planar optical waveguide with exponential index profile the analytical solution of mode fields and mode dispersion equations are obtained in terms of Airy functions. The propagation constants are calculated by the first-order approximation.

(2) Eigenmode Sequence for an Elliptic Waveguide with Arbitrary Eccentricity, by S.-J. Zhang and Y.-C. Shen (Nanjing University, Nanjing, P.R.C.): *AES*, vol. 22, pp. 86–89, Mar. 1994.

Eigenmode sequence for an elliptic waveguide with arbitrary eccentricity is studied by directively calculating modified Mathieu functions and their derivatives of the first kind. The normalized cutoff wavelegths of the lowest 100 successive modes are presented, and the curvefitting expressions for the determination of the cutoff wavelength of the 10 lowest-order modes are given, which are valid for the eccentricity ranging from 0–1.0.

(3) Calculating the Scatter Parameter of the Complex Resonant System, by R.-Q. Li and B.-X. Gao (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 22, pp. 56–63, June 1994.

In calculating the scatter parameter of the complex system, there may be matrix of unfilled rank which results in interruption of the CAD process. The source of this singularity is analyzed, and it is pointed out that such case corresponds to the resonance of some sub-network. The algorithm to deal with such case is given.

(4) The Dyadic Green's Theory of Spherical Multilayered Chiral Media and Its Applications, by W.-Y. Yin and P. Li (Northwestern Polytechnical University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 64–71, June 1994.

The dyadic Green's functions of an electric current source in spherical multilayered chiral media are derived using the method of scattering superposition. The radiated fields and normalized radiation resistance are studied for a point dipole antenna located at the center of a chiral spherical shell. The effect of chirality admittance on the transmittance properties of a chiral spherical shell is also investigated using the plane-slab approximation.

(5) Automatic Division Technique for 3-D Finite-Element, by S.-J. Xu and X.-Q. Sheng (University of Science and Technology of China, Hefei, P.R.C.): *AES*, vol. 22, pp. 79–82, June 1994.

A computer automatic division technique for 3-D finite element method is proposed to facilitate the development of the general computer program. By combing the automatic division with the sparse matrix techinques, the solution procedure of 3-D finite element is significantly simplified, and the solution efficiency is raised.

(6) The Analysis of Dispersion of Cylindrical Microstrip Lines and Coupling Line, by G.-W. Zheng and K.-S. Chen (Zhejiang University, Hangzhou, P.R.C.): *AES*, vol. 22, pp. 92–95, June 1994.

The dispersions of cylindrical microstrip lines and coupling lines are simulated by using the two-dimensional FD-TD method in cylindrical coordinate system. The dispersive characteristics of cylindrical microstrip lines with different metal strip width and coupling lines with different coupling gap or coupling strip are obtained.

(7) The Study of Laser Controlled Semiconductor Loaded Waveguide Switch, by X.-W. Li*, D.-M. Xu**, K.-Q. Wu**, L.-P. Song**, and X.-Y. Wu** (*Shanghai Jiaotong University, Shanghai, P.R.C.; **Shanghai University of Science and Technology, Shanghai, P.R.C.): *AES*, vol. 22, pp. 73–76, Aug. 1994.

A kind of laser-controlled semicoductor-loaded E-plane waveguide switch is presented. The on/off ratios and insertion losses are given under laser illumination. The on/off ratio reaches 38.5 dB, the front frige time of the switch is about 0.05 ms, and the insertion loss is only 0.16 dB at 37.1 GHz.

(8) Analysis of Rotative Symmetric Multi-Port Junction by Use of Generalized Intrinsic Mode, by Z.-H. Feg (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 22, pp. 21–27, Sept. 1994.

A method of analyzing rotative symmetric multi-port junction by the use of generalized mode is described. The mapping relation of mechanical structure electromagnetic field distribution and network parameters from minimum elemental structure is built by a rotative operator. The generalized intrinsic mode and impedance of the elemental structure are calculated by network-boundary element method.

(9) Numerical Modeling for Microwave Heating of Materials Having Temperature Dependent Parameters, by S.-Z. Zhu (East China Normal University, Shanghai, P.R.C.): *AES*, vol. 22, pp. 28–34, Sept. 1994.

A nonlinear modeling for microwave heating is proposed. The modeling is based on an alternate iteration approach to solve a set of coupled nonlinear electrical and thermal differential equations. Numerical examples show that the method is a powerful tool for accurate analysis of microwave heating.

(10) Analytic Study of Spherical Cavity Loaded by an Eccentric Dielectric Sphere, by L.-Y. Zhang, Y.-C. Jiao, and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 54–61, Sept. 1994.

An analytic study of a perfectly conducting spherical resonant cavity loaded by an eccntric dielectric sphere is proposed. The method employed is rigorous for arbitrary modes, relative dimensions of the structure, as well as dielectric properties. TE, TM, and hybrid modes are carefully evaluated, and their dependence on geometric parameters and material properties is specifically illustrated. Field distributions of some modes are obtained.

(11) Study of the Stripline, Microstrip Line and Coaxial Line of Elliptic Cone, by N.-C. Yuan, C.-L. Ruan, and W.-G. Lin (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 22, pp. 8–13, Dec. 1994.

The expressions of the characteristic impedance of three new kinds of transmission lines-elliltic cone stripline, microstrip line and coaxial line are derived. The formulas are based on the TEM or quasi TEM modes assumption. The sphero-conal coordinate system can be transformed into plane coordinate system. With the aid of the known results for stripline and microstrip line, the characteristic impedance of the three kinds of transmission lines are obtained.

(12) Eigenmodes and Angular Propagation Constants in Curved Waveguides, by G.-X. Fan and Q.-J. Yang (Tsinghua University, Beijing, P.R.C.): *AES*, vol. 22, pp. 57–63, Dec. 1994.

The fields in continuously curved waveguides of rectangular cross section are represented in terms of the exact eigenmodes. The problem of computing eigenmodes and their angular propagation constants in curved waveguides of arbitrary curvature is solved. Typical numerical results are given. It is shown that there is a one-to-one correspondence between the eigenmodes in curved guide and the corresponding modes in staight guide.

(13) The Measurement of the Complex Permittivity of Double Layers Dielectric Speciments by Means of an Electromagnetic Open Resonator, by J. Xia and C.-H. Liang (Xidian University, Chengdu, P.R.C.): *JCIC*, vol. 15, pp. 46–58, Jan. 1994.

A new technique for the measurement of the complex permittivity of double layers of dielectric specimens at microwave and millimeter frequencies using an electromagnetic open resonator is proposed. At 8-mm band, a set of electromagnetic open resonator automatic measurement system set up, and a number of double layers of dieletric specimens are measured.

(14) Electromagnetic Scattering Planes in Microwave Radio Relays, by Q.-T. Lu (Communication, Telemetry and Telecontrol Research Institute, Shi Jia Zhuang, P.R.C.): *JCIC*, vol. 15, pp. 59–61, Jan. 1994.

Electromagnetic wave propagation parameters of passive scattering planes used in microwave radio relays are given by applying the method of solving the radar cross-section. These parameters are very useful in the design, installation, and estimation of capability for microwave passive radio relays.

(15) Efficient Numerical Analysis of Planar Transmission Line Multiport Connectors, by B. Song and J.-M. Fu (Xi'an Jiaotong University, Xi'an, P.R.C.): *JCIC*, vol. 15, pp. 112–115, Mar. 1994.

A numerical method, which is a combination of the equivalent waveguide model and the boundary-element method, is presented for the investigation of planar transmission line multiport connectors. The multimode 5-parameters are calculated with good accuracy from a simple identification in the system of equations given by boundary-element approach.

(16) A New Method of Calculating Complex Argument Fresnel Integral, by Y.-J. He, Q.-R. Yang, and Y.-Y. Chen (Southeast University, Nanjing, P.R.C.): *JCIC*, vol. 15, pp. 112–115, July 1994.

The complex argument Fresnel integral is transfered into the real argument Fresnel integral using the integral transformation and successfully calculated using the numerical method of the real argument Fresnel integral. It is of importance to the problem of diffraction in a lossy medium and complex rays.

(17) Analysis and Optimized Design of Hair-Pin Band-Pass Filter Using GCM Method, by M.-M. Jiang and Y.-Y. Wang (Southeast University, Nanjing, P.R.C.): *JCIC*, vol. 15, pp. 47–50, Sept. 1994.

An accurate analysis of hair-pin line bandpass filter using generalized coupling model (GCM) is applied to a coupled problem between unequal width microstrip lines. Numerical results and experimental data are in good agreement. Then the optimized design results for a three-pole hair-pin line bandpass filter are presented.

(18) Research for Shielding Characteristics of Rectangular Cavity with Small Apertures, by Y. Qiu, S.-P. Wang, D.-S. Zhao, and Y.-L. Song (Xidian University, Xi'an, P.R.C.): *JCIC*, vol. 15, pp. 75–81, Sept. 1994.

A calculation method for far and near electromagnetic shielding of a cavity with apertures is developed. The shielding characteristics of rectangular cavity with apertures is investigated, and the effects of different shape apertures on the shielding effectiveness are discussed. The results obtained from experiment and numberical calculation are quite agreement.

(19) A New Model of Generalized Impedance Transformer and Its Applications, by C.-H. Liang and J. Chen (Xidian University, Xi'an, P.R.C.): *JCIC*, vol. 15, pp. 81–87, Sept. 1994.

A new model of generalized impedance transformer in microwave network synthesis theory is presented. It is a general extension of K (or J) transformer theory. This theory can be used in the design of microwave filter, impedance transformer, and coupler contaning arbitrary complicated discontinuity.

(20) A Simple Method for Calculating Dispersion Characteristics of Printed Multilayer Transmission Lines, by

Y.-Z. Yin, Q.-Z. Liu, and C.-B. Ma (Xidian University, Xi'an, P.R.C.): *JCIC*, vol. 15, pp. 108–112, Sept. 1994.

A simple method for calculating dispersion characteristics of printed multilayer transmission lines is presented. The two-dimensional spectral dyadic green's function is derived by using equivalent circuits of the planar structure determined for the case of transverse electric (TE) and transverse magnetic (TM) waves. The expression for characteristic impedance is also obtained. The numerical results are in excellent agreement with results of more complex methods.

(21) A New High-Order Edge-Element Approach, by S.-J. Xu*, X.-Q. Sheng*, and M. Koshiba** (*University of Science and Technology of China, Hefei, P.R.C.; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *JIMW*, vol. 13, pp. 251–255, Aug. 1994.

A new high-order edge-element approach is discussed. This method not only eliminates the spurious solutions but also possesses the characteristics of simplicity and high effciency. The emphasis is laid on the investigation of the space construction of the second-order edge-element approach, and the related formulations are given. The calculations verify the accuracy and the extensive suitability of the present method.

(22) Extremely Short-Range Radar in 3-MM Wave Band, by X.-G. Li, Y.-M. Tao, X.-Q. Xue, Y.-Q. Qian, and J.-Z. Xu (Nanjing University of Science and Technology, Nanjing, Jiangsu, P.R.C.): *JIMW*, vol. 13, pp. 256–260, Aug. 1994.

A concept of the extremely short-range radar is presented. The formula of the operation distance is derived, and a novel Doppler-based extremely short-range radar in the 3-mm wave band is developed. The result of test indicates that the radar has the advantages of simple structure, low cost, and high accuracy in the range determination within the distance from less than one meter to several meters.

(23) A New Technique for Dielectric Measurement of Double-Layered Dielectric Samples Using a Quasi-Optical Resonator at Millimeter Wave Bands, by J. Xia and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *JIMW*, vol. 13, pp. 285–288, Aug. 1994.

A new technique for dielectric measurement of double-layered dielectric samples using a quasioptical resonator at millimeter wave bands is proposed. At 8-mm band, a set of quasioptical resonator measurement system is set up, and a number of double-layered dielectric samples are measured.

(24) Analysis of GNRD Waveguide Discontinuity of the Gap in Dielectric Strip Using the Double Field-Matching Method, by Z.-J. Liu, L.-L. Xiao, and W.-X. Zhang (Southeast University, Nanjing, Jiangsu, P.R.C.): *JIMW*, vol. 13, pp. 299–304, Aug. 1994.

The gap discontinuity of the dielectric strip in the GNRD is analyzed by employing the field-matching method transversely and longitudinally. The dispersion characteristics of the propagating mode and the evanescent mode are discussed, and the curves of reflectivity with respect to the gap are given.

(25) Computer-Aided Design of Millmeter Wave Diplexer with E-Plane Circuits, by H.-W. Liu* and I. C. Hunter** (*University of Electronic Science and Technology of China, Chengdu, P.R.C.; **University of Bradford, West Yorkshire, BD7 1DP, UK): *JIMW*, vol. 13, pp. 309–312, Aug. 1994.

A simplified CAD technique for millimeter wave diplexer with E-plane circuits, which includes the equivalent circuit of E-T junction is presented. Analysis and optimization of S matrix for the diplexer are given. The test at V band shows that the results of design by this technique agree well with the design requirements.

(26) Analysis of the Electromagnetic Scattering Characteristics from an FSS with Multilayered Dielectric Substrate by the Method of Lines, by W. Hong (Southeast University, Shanghai, P.R.C.): *JAS*, vol. 12, pp. 18–24, Jan. 1994.

Based upon Floquet's theorem, the method of lines is first applied to the analysis of electromagnetic scattering characteristics from a frequency selective surface (FSS) with multilayered dielectric substrates. The formulation is suitable to the FSS with arbitrarily-shaped elements. Numerical results are in agreement with the experimental data.

(27) The Eigen Permeability and Eigen Wave in Unreciprocal Medium, by C.-H. Liang, T.-J. Cui, and R.-Q. Li (Xidian University, Xi'an, P.R.C.): *JAS*, vol. 12, pp. 25–31, Jan. 1994.

The eigen permeabilities and eigen waves of the basic transmission modes are deduced, which play intrinsical roles in the propagation of plane waves in an unreciprocal medium. The eigen permeability corresponds to the propagation coefficient of eigen waves, and all transmission modes can be considered as the linear combinations of these eigen waves. It is also demonstrated that the eigen wave is of elliptical polarization in general.

(28) Microstrip High-Voltage-Shaped Pulse Generator, by K.-Q. Wu*, S.-L. Chen*, J.-S. Bao*, T.-T. Zhi**, L.-R. Chen**, and G.-Q. Gu** (*Shanghai University of Science and Technology, Shanghai, P.R.C.; **Shanghai Institute of Optics and Fine Mechanics, Academy of Sciences of China, Shanghai, P.R.C.): *JAS*, vol. 12, pp. 73–77, Jan. 1994.

The design of the microstrip high-voltage-shaped pulse generator is described, and an integrated system with the high voltage shaped laser pulse generator and the Pockels cell is developed.

(29) Calculation of Transient Response of a Two-Dimensional Conducting Cavity Using Marching-on-in-Frequency Method, by Z.-Q. Peng (Beijing Research Institute of Remote Sensing Information, Beijing, P.R.C.): *JAS*, vol. 12, pp. 113–119, Apr. 1994.

The intergral equation is handled using the method of moments in the complex-frequency domain, the space discretization is fixed for all frequencies, and the resulting matrix equation is solved by the conjugate gradient method. The condition of the system matrix is improved in the complex-frequency domain. Good initial estimates are obtained using an extrapolation scheme based on error minimization, thereby the conjugate gradient method converges very fast. The results of a rectangular cylindrical cavity verify the effectiveness of the new method.

(30) Complex Ray Expansion of Plane Wave, by D.-Z. Yao and Y.-Z. Ruan (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 16, pp. 72–75, Jan. 1994.

Based on the high-frequency approximation theory, the complex ray expansion of plane waves is derived. The results obtained may be regarded as the basis of the numerical expansion of plane waves, which has been used successfully in some problems.

(31) Experimental Study of an Optically Controlled Dielectric Resonator Oscillator, by K.-Z. Guo, L. A. Trinogga, and R.-S. Yang (Institute of Electronics Academia Sinca, Beijing, P.R.C.): *JE*, vol. 16, pp. 86–90, Jan. 1994.

Some new experimental results of optically controlled dielectric resonators (DRO) are presented. A very stable X-band DRO is found to be optically tunable up to 17.5 MHz with modulation rate of 1.17 MHz/mW with red light illumination, and an even higher modulation rate of 2.24 MHz/mW with illumination of violet light is obtained.

(32) Equivalent Statement to the Unitary Condition for Lossless Network, by X.-W. Shi and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *JE*, vol. 16, pp. 158–162, Mar. 1994.

The generalized magnitude-symmetry theorem for a lossless network is extended, and the phase information previously omitted is supplmented. The extended theorem is equivalent to the unitary condition for a lossless network rigorously. Two illustrations are given for the applications of the theorem to analysing the properties of a lossless network.

(33) The Measurement of Complex Permittivity of Anisotropic Dielectrics by Means of an Electromagnetic Open Resonator, by J. Xia and C.-H. Liang (Department of Electromagnetic Field Engineering, Xidian University, Xi'an, P.R.C.): *JE*, vol. 16, pp. 158–162, Mar. 1994.

By applying the perturbation theory and complex-point method, a theoretical research of the measurement of complex permittivity of uniaxial anisotropic materials by means of an electromagnetic open resonator is made, and the double refraction phenomenon due to the anisotropy of measured dielectric materials is quantitatively analyzed. Measurements are made on some single-crystal quartz speciments.

(34) The Dyadic Green's Function Theory for One/Two Cylindrical Layers of Chiral Medium and Its Applications, by W.-Y. Yin and W.-B. Wang (Northwestern Polytechnical University, Xi'an, P.R.C.): *JE*, vol. 16, pp. 163–172, Mar. 1994.

The expression of dyadic Green's function for one and two cylindrical layers of chiral medium is derived by using the method of scattering superposition, for which the electric current sources are placed both inside and outside a chiral cylinder and a cylindrical chirodome. The radiation characteristics of a point dipole antenna on the axis of the chiral cylinder and cylindrical chirodome are analysed. The results show that the polarized states of radiated fields can be changed by choosing the size of chiral cylinder or the thickness of cylindrical chirodome.

(35) An Approximate Solution of Nonlinear Wave Equation, by X.-J. Yuan, G.-M. Wang, and W.-G. Lin (Applied Physics Institute, University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 16, pp. 212–216, Mar. 1994.

A uniformly valid approximate solution of a kind of nonlinear wave equations is studied, and the research results indicate that the solution of this kind of equatiors can be represented by Airy function approximately. The usually used WKB approximation is the first order approximation of the present result in the region far away from the turning point of refractivity. At the turning point of refractivity, the present result is still valid.

(36) The Time Domain Design Method of Microwave Circuits, by W. Wu and Q.-R. Yang (Southeast University, Nanjing, P.R.C.): *JE*, vol. 16, pp. 304–309, Mar. 1994.

The relations between the finite impulse response (FIR) digital filter and some microwave circuits are determined. In accordance with the relations, these microwave circuits can be designed in time domain, and the window function technique can be introduced into the method. The design examples are given to demonstrate that the design method is simple and effective.

(37) Computer Aided Measurement of the Electro-Magnetic Parameters for the Microwave Absorbing Materials, by X.-Y. Shen*, J. Zheng*, L.-D. Gu**, and P.-Z. Li** (*East China Normal University, Shanghai, P.R.C.; **Shanghai Institute of Metallurgy, Academia Sinica, Shanghai, P.R.C.): *JE*, vol. 16, pp. 252–257, May 1994.

A novel method involving multiple impedance measurements and optimization algorithm for the reconstruction of electromagnetic parameters is presented. Computer-aided analysis is used in all processes. Experimental results including teflon and some kinds of microwave absorbing materials are given.

(38) Two Approaches to the Design of Time-Varying Cascaded Filters, by H. Wu and S.-H. Zhang (Electronic Institute, Xidian University, Xi'an, P.R.C.): *JE*, vol. 16, pp. 267–274, May 1994.

Two approaches to the design of the time-varying cascaded filters used in radar clutter rejection are presented. By fitting the cascaded filter to the noncascaded filter, the time-varying cascaded filter behaves just like an optimum clutter filter. It is shown that the frequency response of the second-stage filter in the time-varying cascaded filter is diffcult to express, however, is convenient to be involved in the overall response.

(39) The Numerical Mode Matching Method on 2-D Stratified Media-Matrix Theory and Computation Method for Application, by J. Pan and Z.-P. Nie (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 16, pp. 388–394, July 1994.

A series of general and applicable formulation, including the unified matrix expanding formula suitable for any source excitation is presented. A typical problem in the electromagnetic propagation tool is solved in different ways by using the proposed theory and methods. The present results agree with the ones in the literature.

(40) Phase and Frequency Locking of Microwave and Millimeter Wave Power Combining, by W.-K. Xie and S.-G. Liu (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 16, pp. 416–422, July 1994.

The phase and frequency locking of microwave, millimeter wave power combining are analyzed and summarized in an all-round way. The master/slave phase locking of cavity oscillators, the peer phase locking of mutually coupled oscillators, and the peer phase locking of ring-connected multiple oscillators are investigated. The cavity and space power combining aspects for microwave and millimeter wave are presented.

(41) Study of 3-D Cylindrical Resonators with FD-TD Method, by C. Wang, B.-Q. Gao, and C.-P. Deng (Beijing Institute of Technology, Beijing, P.R.C.): *JE*, vol. 16, pp. 423–427, July 1994.

A program which can calculate resonant frequencies of arbitrary modes by FD-TD method is developed. Several resonators including coaxial resonators, empty cylindrical resonators, dielectric loaded cylindrical resonator, and dielectric resonator are studied. The numerical results are in excellent agreement with the rigorous theoretical solutions and experimental results.

(42) The Radiation Characteristics of Electric Diploe Antenna in Two-Layer Chiral Slabs Bounded by a Perfectly Conducting Plane, 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. 16, pp. 432–438, July 1994.

The formulas of dyadic Green's function for two-layer chiral electric dipole antenna are derived, and using the method of saddle-point integration, the expression of radiation field of electric dipole antenna is given. The effects of chirality admittance on the radiation pattern, maximum fields, and resonance frequencies are examined.

(43) Super-PC-Based SAR Imaging Processor, by H.-L. Peng, M.-H. Zhu, Y.-R. Wu, J.-S. Chong, Q. Zhao, D.-H. Hu, and Y. Feng (Institute of Electronics, Academia Sinica, Beijing, P.R.C.): *JE*, vol. 16, pp. 444–446, July 1994.

A novel super-PC-based SAR imaging processor is presented, and its system configuration and software design are analyzed in detail. The advantages of this processor are sufficiently proved by the experimental results.

(44) Full Multi-Grid Method for Solving Wave Equation, by Q. Ye, D.-G. Fang, C.-F. Wang, and R.-S. Chen (Nanjing University of Science and Technology, Nanjing, P.R.C.): *JM*, no. 3, pp. 16–21, July, 1994.

A new method combining the full multi grid method with the finite difference method is used to solve Helmholtz equation and calculate some actual electromagnetic problems. The good results indicate that the new method can be widely used in the modern computational electromagnetics.

(45) Design of Waveguide Bandpass Filters Using H-Plane Step Discontinuities, by S. H. Nam, K. Y. Kim, S. W. Yun, and C. Ann (Department of Electrical Engineering, Sogang University, Seoul, Korea): *JKITE*, vol. 31, pp. 33-38, Jan. 1994.

Waveguide bandpass filters using H-plane step discontinuities are designed with the field theory analysis. Using this design procedures, waveguide bandpass filters are fabricated and tested at X-band as well as Ka-band.

(46) A Waveguide-Microstrip Transition Using Curvature Variable Taper, by W. S. Cha*, Y. S. Cho**, and C. C. Shin** (*KETI Telecommunication Components Laboratory, Osan, Korea; **Department of Electrical Engineering, Ajou University, Suwon, Korea): *JKITE*, vol. 31, pp. 45–52, Feb. 1994.

A curvature variable taper is proposed for a waveguide-microstip transition and is applied to a ridge waveguide. The results of experiment show that S_{11} is below $-$ 20 dB and S_{21} is about 0.5 dB at 10–15 GHz.

(47) Analysis of the Shielded Suspended Substrate Strip Transmission Line, by J. S. Hwang*, K. H. Baek**, and S. S. Lee** (*Department of Electronic Communication Engineering, Hanyang University, Seoul, Korea; **Department of Electrical Engineering, Hanseo University, Seosan, Korea): *JKITE*, vol. 31, pp. 53–59, Feb. 1994.

The characteristics of the shielded suspended substrate strip transmission (SSSL) are analyzed by the point matching. The characteristic impedance and the effective dielectric constant are studied by increasing the air-layer height of SSSL.

(48) Lumped Element 3-dB 180 (degrees) Hybrid with the Impedances Asymmetrically Terminated, by H. R. Ahn, I. S. Chang, and S. W. Yun (Department of Electrical Engineering, Sogang University, Seoul, Korea): *JKITE*, vol. 31, pp. 18–25, June 1994.

The distributed 3-dB 0/180(degrees) hybrid with the impedances asymmetrically terminated is presented. In the band of UHF and VHF, a new design method of a small-sized hybrid using both lumped and distributed elements is also presented and analyzed.

(49) A Study on the Fine Adjusting Method of Tap-Off for CATV Transmitting Circuits Using Coupled-Line Theory, by D. I. Kim, K. S. Min, and S. M. Chung (Department of Radio Science and Engineering, Korea Maritime University, Pusan, Korea): *JKITE*, vol. 31, pp. 26–33, June 1994.

The reflectivity and the isolation are represented by Z_{oe} and Z_{oo} only, and the fine adjustment of all S-parameters can be performed by controling the elements of Z_{oe} and Z_{oo} only. Furthermore, the validity of the new fine adjustment method proposed here is confirmed by experiments.

(50) Analysis of the Shielded Coplanar Waveguide Resonator, by J. S. Hwang and S. S. Lee (Department of Electronic Communication Engineering, Hanyang University, Seoul, Korea): *JKITE*, vol. 31, pp. 53–60, June 1994.

The resonator using the shielded coplanar waveguide bounded by the rectangular waveguide is designed. The fringing capacitances of the open-ended center strip in the resonator are obtained from the equivalent circuits.

(51) Implementation of a Waveguide Cross Guide Directional Coupler for Ku-Band Using Polynomial Approximations for the Polarizabilities of the Rounded End Slot, by K. W. Yu, J. H. Lee, K. R. Park, and J. M. Kim (Korea Electronics and Telecommunications Research Institute, Taejon, Korea): *JKITE*, vol. 31, pp. 7–15, Aug. 1994.

The directional coupler for Ku-band is designed using the crossguide type. The measured minimum directivity of the coupler, whose apertures are both circles, is about 13 dB.

(52) A Study of Crosstalk in High Speed Digital Signal Transmission Line, by S. Y. Kim, S. G. Jang, S. S. Nam, H. G. Bahg, and Y. K. Chin (Department of Electrical Engineering, Dankook University, Seoul, Korea): *JKITE*, vol. 31, pp. 16–25, Aug. 1994.

Crosstalk curves are shown in terms of characteristic impedance of lines, spacing between lines, and rise time of pulse by using general multiple coupled transmission line equation and harmonic-balance method.

(53) Propagation Mode Analysis of Leaky Coaxial Cable with Periodic Symmetrical Slots, by Y. I. Hong, M. J. Maeng, and J. K. Kim (Department of Electrical Engineering, Chung-Ang University, Seoul, Korea): *JKITE*, vol. 31, pp. 53–63, Sept. 1994.

A leaky coaxial cable having periodic slots in the outer conductor is analyzed to obtain the propagation modes in the various environments using mode matching method and Floquet's theorem. An eccentric cylinder model is used to develop the theory for surface wave propagation on the cable. Numerical results are also included for the propagation constants, field distribution, and current distribution.

(54) Pulse Propagation Characteristics of Multilayer-Multiconductor Transmission Line Network, by H. J. Chang and Y. S. Lim (Department of Electrical Engineering, Chonnam National University, Kwangju, Korea): *JKITE*, vol. 31, pp. 39–47, Oct. 1994.

Pulse propagation characteristics of MMTL network are simulated by modeling the MMTL with the characteristic parameters-effective dielectric constant, eigen modal voltages, characteristic impedances at each mode. Transmission line modeling is performed in frequency domain, then time domain responses are obtained by transforming the frequency domain response using fast Fourier transform.

(55) Time-Domain Analysis of the Propagation Characteristics of Picosecond Pulse on Microstrip Line, by J. Y. Park and E. J. Park (GoldStar Living System Laboratory, Seoul, Korea): *JKITE*, vol. 31, pp. 38–47, Nov. 1994.

Attenuation and dispersion distortions of picosecond electrical pulses on microstrip transmission line are investigated in the time domain using proper conventional models to meet the frequency range of one pulse, accuracy, and microstrip parametric requirements. The phase delay effect due to the conductor loss is illuminated by perturbation method which is used for extracting the dependency of phase constant to conductor loss.

(56) The Characteristic Impedance and the Electric Field Uniformity of a GTEM Cell, by A. K. Lee and K. K. Yang (Korea Electronics and Telecommunications Research Institute, Taejon, Korea): *JKICS*, vol. 19, pp. 523–532, Mar. 1994.

This paper discusses the characteristic impedance of a GTEM cell applicable to both susceptibility and emission measurements. The characteristic impedance of a GTEM cell with the variation of geometrical constructions on cross section is presented; the effect of the opening angle on the characteristic impedance is shown.

(57) Analysis of a Coupled Microstrip-Slot Line in the Spectral Domain, by S. Y. Rhee* and H. K. Park** (*Department of Electronic Communication Engineering, Yosu Fisheries University, Yosu, Korea; **Department of Propagation Engineering, Yonsei University, Seoul, Korea): *JKICS*, vol. 19, pp. 553–559, Mar. 1994.

A coupled microstrip-slot line is analyzed using a full wave method in the spectral domain. The characteristics of the coupled microstrip-slot line are obtained with the Galerkin's method. The characteristics of even mode by microstrip line and odd mode by slot line are calculated.

(58) Calculations of Quasi-Static Parameters in Two-Layer Microstrip Line, by C. H. Seo (Department of Telecommunication Engineering, Soongsil University, Seoul, Korea): *JKEE*, vol. 5, pp. 9–12, June 1994.

This paper presents an analytical method for calculating the line capacitance and the characteristic impedance of the two-layer coupled microstrip lines. The lower and upper bounds of these parameters are derived through the variational method.

(59) Leaky NRD Guide with Broadside Radiation (Letters), by Y. Wagatuma and T. Yoneyama (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 581–583, Oct. 1994.

A leaky NRD guide with broadside radiation, no grating lobe, and minimum reflection is proposed. Radiating notches are created alternately on upper and lower surfaces of the dielectric strip with a half guided wavelength period, and matching notches are placed between the radiating notches.

(60) A Method for Analyzing Properties of Rectangular Waveguides with a Steeply Tapered Height and/or Width, by T. Suga and F. Ishihara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 139–148, Apr. 1994.

A normal mode method for analyzing the properties of steeply tapered rectangular waveguides is described. An extrapolation technique is used for the normal mode analysis of tapered waveguides. The properties extrapolated from a few higher-order modes agree with experimental results.

(61) A Solution Method Based on the Coupled-Mode Theory for Natural Single-Phase Unidirectional SAW-Transducers, by K. Hasegawa*, K. Inagawa**, and M. Koshiba*** (*Kushiro National College of Technology, Kushiro, 084 Japan; **Tomakomai National College of Technology, Tomakomai, 059-12 Japan; ***Faculty of

Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 398–404, June 1994.

A coupled-mode theory is applied to the analysis of a natural single phase unidirectional transducer (NSPUDT) for surface acoustic waves. In order to determine all the coefficients of coupled-mode equations, edge frequencies of a stop band, standing-wave distributions at these frequencies, and static capacitances of a transducer are calculated by using the finite element method. Using this method, NSPUDT's on Al/ST 25° X Quartz are investigated. Our results agree well with the earlier experimental ones.

(62) An Analysis of Striplines with Trapezoidal Conductor Cross Sections, by T. Hasegawa, K. Atsuki, K. Li, and E. Yamashita (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 423–431, July 1994.

An integral equation involving unknown charge distributions on a strip conductor is derived and is numerically solved by the discretization of the integral equation. From the numerical results, influences of trapezoidal conductor cross-sections on the propagation characteristics are demonstrated.

(63) A Decreasing Method of Residual Distortion for Delay Equalizer by Using Characteristics Impedance Constant Type Tapered Waveguide (Letters), by T. Kamei* and F. Ishihara** (*Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan; **Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 432–434, July 1994.

A characteristic-impedance-constant-type taper waveguide is applied to a delay equalizer. By using this taper waveguide, the residual distortion caused by unwanted reflection is reduced.

(64) Double Cylindrical Cavity Multiple Device Structure for Stabilized High Output Power Combiners, by S. Tanaka*, S. Nogi**, K. Fukui**, H. Ohshima**, and K. Ohta** (*Faculty of Engineering, Fukuyama University, Fukuyama, 729-02 Japan; **Faculty of Engineering, Okayama University, Okayama, 700 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 551–561, Oct. 1994.

This paper proposes a double cylindrical cavity multiple-device structure which is a coupled system of an oversized cavity combiner with a dominant mode cavity combiner through a coaxial line. It is analytically shown that the structure is capable of perfect combining of the powers from both the cavities under an enhanced stable operation at the desired mode.

(65) Discussions on Numerical Accuracy of the Vector Finite Element Method Using the Vector Shape Functions, by M. Ohtaka and T. Kobayashi (Faculty of Engineering, Fukui University, Fukui, 910 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 679–685, Nov. 1994.

This paper discusses the numerical accuracy of three vector finite element methods using the same kind of the vector shape functions. Two of the methods use two transverse electromagnetic components and one longitudinal component, and another method uses four transverse components. By the discussions using the numerical results on several waveguides, the physical and numerical equivalence among the former two methods is presented.

(66) Characteristic Analysis and Test Verification of Tapered Waveguides with Finite Wall Surface Resistance, by F. Ishihara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 746–753, Dec. 1994.

This paper describes a method for analyzing the characteristics of a tapered waveguide circuit used at and around the cutoff frequency, when the waveguide's internal wall has finite surface resistance. Two types of tapered waveguide circuits for use around the cutoff frequency are designed for verification tests.

(67) A Tunable Oscillator Using Magnetostatic Forward-Volume Wave Resonator with Wide Strip Transducer, by H. Asao, H. Oh-hashi, T. Ohwada, and O. Ishida (Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 754–762, Dec. 1994.

A tunable oscillator free from spurious oscillation is presented, using a magnetostatic forward-volume wave resonator with a wide strip transducer. Unloaded and external quality factors of the resonator are expressed as functions of film dimensions and YIG material constants. Using the expressions of quality factors, conditions for suppression of higher order modes and for selective excitation of the fundamental mode are derived. A 5-GHz tunable oscilltor using the resonator is fabricated.

(68) Right-Angle H-Plane Waveguide Double Bend (Letters), by J. W. Lee*, H. J. Eom*, and K. Uchida** (* Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, 373 1, Kusong Dong, Yusung Gu, Taejon, Korea; ** Department of Communication and Computer Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 1647–1649, Dec. 1994.

A simple solution for the right-angle H-Plane waveguide double bend is obtained in an analytic series form. The simultaneous equations are solved to obtain the transmission and reflection coefficients in fast convergent series forms.

(69) A Study on Magnetostatic Surface Wave Excitation by Microstrip, by T. Omori, K. Yashiro, and S. Ohkawa (Graduate School of Science and Technology, Chiba University, Chiba, 263 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 312–318, Feb. 1994.

An exact analysis for magnetostatic surface wave excitation by a single microstrip is presented. Radiation resistances are obtained by using a proper expansion form of the excitation current on a strip including edge conditions.

(70) Hybrid Modes of Goubau Line (Letters), by K. Sakin* and J. Chiba** (*1-2-3-109 Miwa-midoriyama, Machida, 195 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 322–325, Feb. 1994.

An exact characteristic equation for the hybrid modes in Goubau line is given. By solving the equation numerically, new hybrid modes are found. The propagation and attenuation constants of the hybrid modes are investigated.

(71) An Improved Reflection Wave Method for Measurement of Complex Permittivity at 100 MHz–1 GHz, by A. Nakayama and K. Shimizu (Analysis Center, Kyocera Co., Kokubu, 899-43 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 633–638. Apr. 1994.

An improved reflection wave method is described for the measurement of complex permittivity of low-loss materials over 100 MHz to 1 GHz range. The residual impedance and stray admittance surrounding the test sample, which terminates the transmission line, are evaluated using sapphire as a reference material.

3) Microwave Antennas

(1) Microwave Holography for Antenna Metrology (invited), by M. Kesteven, (National Radio Astronomy Observatory, Australia Telescope National Facility, CSIRO, PO Box, Epping, New South Wales, 2121, Australia): *JEEE*, vol. 14, pp. 85–98, June 1994.

Holography is the technique of choice for the assessment and adjustment of large reflecting microwave antennas. This paper provides an overview of the procedure and a description of the supporting theory. Examples are drawn from an extensive holographic survey of the 25-m antennas of the very large array in New Mexico, USA.

(2) The Performance Analysis of Cancelling Interference in Digtial Beamforming, by L.-G. Xie and X.-F. Jiang (Beijing Institute of Radar Measurement, Beijing, P.R.C.): *AES*, vol. 22, pp. 58–64, Mar. 1994.

The effect of the bandwidth of interference, qualitization noise of A/D converters, and errors of amplitude and phase in channels on the performance of cancelling interference in digtial beamforming is analyzed. The analytic expressions about residual power of the interference which is caused by the factors mentioned above are presented.

(3) Adaptive Beamforming for Phased Array Radar, by D.-N. Liang, T.-S. Kong, and M.-Q. Yuan (National University of Defence Technology, Changsha, P.R.C.): *AES*, vol. 22, pp. 93–97, Mar. 1994.

The machanism of the random flunctuation in the sidelobe region of adaptive beam is investigated. The princples and performances of signal generalized sidelobe canceler (GSC) and Butler net GSC are studied. To simplify the system structure, a cascade scheme for singnal subspace GSC is proposed.

(4) Analysis and Calculation for Conformal Dipole Arrays, by X.-M. Zhang, W.-Y. Wei, and Y.-C. Jiao (Xidian University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 25–29, June 1994.

A dipole antenna array in conformity with a finite hollow cylinder is presented. The method of moments and the inversion of block matrix are adopted, and the element pattern of a dipole in array and its input impedance are calculated.

(5) The Impedance and Radiative Characteristics of Gap-Coupled Microstrip Patch Antennas, by Q. Song* and X.-X. Zhang** (*Beijing Simulation Center, Beijing, P.R.C.; **Tsinghua University, Beijing, P.R.C.): *AES*, vol. 22, pp. 62–69, Sept. 1994.

An antenna array using gap-coupled patches as the elements is proposed. The input impedance characteristics of single patch and gap-couple patches are analysed by making use of dyadic Green's function for a grounded dielectric slab and the moment method. The input impedances of gap-coupled patch array are obtained by combination with the antenna elements and the feeding networks that consist of divider tees, bends, and feed line, and the far field patterns of gap-coupled patch arrays are calculated.

(6) The Slotted-Waveguide Antenna of a Sectorial Cross Section, by S.-W. Lue*, Y. Zhuang*, and S.-C. Li** (*Beijing University of Aeronautics and Astronautics, Beijing, P.R.C.; **no. 014 Center Luoyang, Luoyang, P.R.C.): *AES*, vol. 22, pp. 96–99, Sept. 1994.

The rigorous and approximate solution of the field components for the dominant mode in a sectorial waveguide is investigated. The formula of the resonant conductance for longitudinal shunt slots cut in the curved broad face of the waveguide is derived by using the equivalence principle.

(7) The Study of an Adaptive Array Located on a Conformal Scattering Object, by L. Zhang and S.-Z. Li (Beijing Institute of Technology, Beijing, P.R.C.): *AES*, vol. 22, pp. 100–103, Sept. 1994.

The scattering wave of the object by using the geometrical theory of diffraction is analyzed, and the character of Applebum array in the scattering environment is studied. The results show that the character of the array is good in most time, but when the main lobe of the pattern is affected seriously by the scattering wave of the object, the ratio of S/N of the array will be limited, and the pattern will be bad.

(8) Accurate Computation for Resonant Frequency of Rectangular Microstrip Antennas with Multi-Layer Dielectric, by X.-Y. Wu*, G. Liu*, S.-S. Zhong*, and Y. Zhang** (*Shanghai University, Shanghai, P.R.C.; **no. 14 Research Institute, China Academy of Launch Vehile Tech., Beijing, P.R.C.): *AES*, vol. 22, pp. 22–27, Dec. 1994.

A numerical method for calculating the resonant frequency of multi-dielectric covered microstrip antennas by means of spectral domain immittance approach is described. Two specific method of numerical integrals are proposed to deal with the chief difficulty. A rectangular patch is fabricated and measured. The numerical results of resonant frequency are in good agreement with experimental data.

(9) Some Problems in the Design of Ultralow Sidelobe Phased Arrays, by W.-Y. Wei, X.-M. Zhang, Y.-C. Jiao, X.-G. Liu, and X.-Y. Huang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 28–34, Dec. 1994.

Some problems in the design of ultralow sidelobe phased arrays are presented. The main problems such as element coupling in array, transforming parts between element and feed line, errors of illumination and element location, and the calibration of elemental channels are descussed.

(10) The Effect of Reflector Surface Distortion on the Antenna Radiation Pattern, by W.-T. Wang* and G.-H. Xu** (*Xi'an Institute of Space Technology, Xi'an, P.R.C.; **Xidian University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 46–49, Dec. 1994.

The effect of reflector surface distortion on the antenna radiation pattern is investigated, and some reasonable criteria for reflector antenna structure design are given.

(11) Simulation of Antenna Pattern by Complex Rays, by Y.-Z. Ruan (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JCIC*, vol. 15, pp. 92–96, Jan. 1994.

Based on the complex ray theory, the Gaussian beams emmitted by complex source points are employed to simulate the far-field pattern of antennas. Three methods of simulation are proposed, i.e., mainlobe matching, peak matching, and point-by-point matching. Some calculation results for varieties of patterns are given. Numerical results of the analysis and optimization show that the peak matching method is an accurate and practical approach for antenna pattern simulation.

(12) Studies of Test Field Effects on Large Circular Aperture Antenna Gain Measurement, by S.-Y. Qin and Q.-B. Chen (The Fifty-Fourth Institute of Ministry of Electronics Industry, Shijiazhuang, P.R.C.): *JCIC*, vol. 15, pp. 88–93, Sept. 1994.

The dependence of circular aperture antenna near-field gain on measurement distance is derived using near-zone power equation. Numerical results of near-field gain error correction are calculated for circular aperture general Taylor displacement distribution and exponential distribution, and test examples are reported to verify the correctness of the analysis theory.

(13) Effect of Metallization Thickness on Millimeter Wave Leaky-Wave Antennas, by C.-Q. Gu (Nanjing University of Aeronautics and Astronautics, Nanjing, P.R.C.): *JE*, vol. 16, pp. 53–60, Jan. 1994.

The effect of metallization thickness on a leaky wave antenna based on a metal-strip-loaded dielectric insert waveguide is investigated. The intrinsic equation is set up by the extended version of the network analytical method of electromagnetic field. Numerical results show that the effect of metallization thickness is smaller on the direction of main beam and very noticeable on the beamwidth and aperture efficiency.

(14) Characteristics of a Dipole Antenna on a Dielectric Slab, by D.-F. Yi and W.-B. Liu (Southwest Jiaotong University, Chengdu, P.R.C.): *JE*, vol. 16, pp. 76–80, Jan. 1994.

The problem of a linear dipole antenna mounted on a dielectric slab is investigated theoretically and experimentally. A set of integral equations for the current vector along the dipole and the field in the slab is derived by the concept of polarized current. The equations are solved numerically by moment methods.

(15) Analysis of a Wire Antenna in the Presence of Conducting Sphere by Using OSRC-MM, by Z.-N. Chen*, W.-X. Zhang**, and H.-Q. Du*** (*Institute of Communications Engineering, Nanjing, P.R.C.; **Southeast University, Nanjing, P.R.C.; ***Nanjing University of Science and Technology, Nanjing, P.R.C.): *JE*, vol. 16, pp. 217–220, Mar. 1994.

The vector on-surface radiation condition and the moment method are applied to analyzing the performance of a wire antenna in the presence of a conducting sphere. The results are in good agreement with those obtained by the generalized multipole technique.

(16) A Study on Radiation Characters of Spiral Antennas on an Aircraft, by Q.-Z. Liu and L. Li (Institute of Antenna, Xidian University, Xi'an, P.R.C.): *JE*, vol. 16, pp. 315–320, Mar. 1994.

The radiation fields of the Archimedean spiral antenna are derived by approximating the spiral with a series of semicircles. The formulas are developed to calculate radiation fields of the spiral antennas on an aircraft by applying the GTD. The calculated results agree well with the experimental ones.

(17) Broadband Modified B Sandwich as Radome's Layer Structure, by D.-X. Wang (Nanjing Electronic Equipment Institute, Nanjing, P.R.C.): *JE*, vol. 16, pp. 232–237, May 1994.

An effective broadband modified B sandwich as radome's layer structure is adopted. The power transmission coefficient of this sandwich is over 80% under large incident angle from 0–70° and broadband (0–40GHz). The difference of insertion phase delay between perpendicular polarization and parallel one is very small.

(18) Design and Analysis of Multi-Step Amplitude Quantization Weighted 2-D Solid-State Active Phased Array Antennas, by T. Gao, J.-X. Li, and Y.-C. Guo (Nanjing Research Institute of Electronic Technology, Nanjing, P.R.C.): *JE*, vol. 16, pp. 373–379, July 1994.

An aperture design technique using multi-step amplitude quantization for two-dimensional solid-state active phased arrays to achieve low sidelobe is described. It can be applied to antennas with the arbitrary complex aperture. Also, the gain drop and the sidelobe degradation due to random amplitude, phase errors, and element failures are investigated.

(19) Study on Radiation Field of Antennas on the Truncated Cone-Cylinder, by Q.-Z. Liu*, Y.-Z. Yin*, Y. Zhang**, and H.-N. Wang** (*Xidian University, Xi'an, P.R.C.; **Beijing Special Mechano-Electrical Research Institute, Beijing, P.R.C.): *JE*, vol. 16, pp. 523–528, Sept. 1994.

On the basis of the experimental element pattern and GTD, an efficient numerical method for analyzing 2-D radiation field of antennas on the truncated cone-cylinder is presented. These formulas are also applicable to the truncated cylinder and cone. Examples are given on the calculation of 3-D radiation fields of microstrip antennas on the truncated cone. The results of calculations agree well with the experimental ones.

(20) Research on the Caustic Characteristics of One Dimensional Fresnel Zone Phase Corrected Plate Reflector, by H.-P. Du and Y.-Z. Ruan (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 16, pp. 529–533, Sept. 1994.

One dimensional Fresnel zone phase corrected plate (1-DFP) can be made by a 1/P wavelength phase correcting along one dimension upon the plate. When it is used as a reflector, it gives an alternative to a parabolic cylinder reflector in application on fan-beam antennas. Physical optics is used for analyzing the caustic characteristics of 1-DFP reflector with plane wave illumination.

(21) Antenna Polarization Measurements Using Reflection Arrangement, by T.-J. Chen and T.-H. Chu (National Taiwan University Taipei, Taiwan, China): *JCIE*, vol. 17, pp. 843–848, 1994.

Based on reflection arrangement, two antenna polarization measurement techniques—the absolute polariztion measurement method and the polarization-transfer measurement method— are presented with experimental results. Since the transmitting and receiving antennas are located side by side in the measurement system, the phase reference signal between two antennas can be implemented with a short cable.

(22) Analysis of Rectangular Microstrip Patch Antennas with the Multilayered Structure and the Electromagnetically Coupled Feed Structure, by M. H. Chung and S. W. Nam (Department of Electrical Engineering, Seoul National University, Seoul, Korea): *JKITE*, vol. 31, pp. 18–25, Feb. 1994.

The input impedance of the rectangular microstrip patch antennas with the multilayered structure is analyzed by using the moment method technique in the spectral domain.

(23) Theory and Experiment of the Cylindrical Edge-Slot Antenna with Coaxial Line Feed, by S. K. Yu*, J. P. Hong**, and Y. K. Cho* (*Department of Electrical Engineering, Kyungpook National University, Taegu, Korea; **Department of Electrical Engineering, Kyungpook Sanup University, Taegu, Korea): *JKITE*, vol. 31, pp. 39–44, Feb. 1994.

A theoretical method is presented for a cylindrical edge-slot antenna (circumferential slot antenna). A coupled integral equation for unknown magnetic currents of both the coaxial aperture and the edge slot is solved by the moment method.

(24) Far-Zone Electric Fields Radiated by a Coaxial Cable Through an Aperture in a Perfectly Conduction Ground Plane, by J. H. Choi and H. J. Sung (Korea Telecommunication Satellite Business Group, Seoul, Korea): *JKITE*, vol. 31, pp. 56–62, Apr. 1994.

Far-zone electric fields radiated by a coaxial cable through an aperture in a perfectly conducting ground plane are calculated. The dyadic Green's function and vector wave functions are utilized to obtain an approximate low-frequency solution.

(25) Analysis of a Traveling Wave Antenna Using Rectangular Microstrip Patch Array, by K. J. An, S. W. Yun, and I. S. Chang (Department of Electrical Engineering, Sogang University, Seoul, Korea): *JKITE*, vol. 31, pp. 31–38, Oct. 1994.

The leaky wave radiation characteristics of a microstrip rectangular patch array are presented. A 17-element microstrip patch array at X-band is designed and tested. The radiation characteristics at 10 GHz show about 3° shift in main lobe angle compared with measured results.

(26) Design of the Reflector Profiles for the Ku-Band High Efficiency Shaped Cassegrain Antenna, by K. Y. Kim and S. S. Lee (Department Electronic Communication Engineering, Hanyang University, Seoul, Korea): *JKITE*, vol. 31, pp. 48–53, Oct. 1994.

A cassegrain antenna with high efficiency is designed by using the geometric optics. In order to improve aperture efficiency, the aperture plane of the main reflector is made to be an equiphase. The edge tapering is properly tried in order to get higher spillover efficiency.

(27) Current Calculation of the Probe on Finite Conducting Body, by K. W. Jung and C. Y. Kim (Department of Electronic Communication Engineering, Kumi Junior College, Kumi, Korea): *JKITE*, vol. 31, pp. 62–69, Nov. 1994.

For a monopole antenna on the finite conducting body, the probe current and the induced current density of the body are computed. Based on a new formulation applicable to any shape, this scheme enables us to treat the arbitrary probe configuration, whose usefulness is illustrated on the square plate.

(28) A Study on the Antenna Design for Subsurface CW Radar Above the Earth Surface, by D. K. Park, J. W. Lyu, and J. W. Ra (Information Technology R & D Laboratory, GoldStar Co., Ltd., Seoul, Korea): *JKITE*, vol. 31, pp. 23–30, Dec. 1994.

An antenna for subsurface continuous wave electromagentic probing is presented. Its input impedance and transmission coefficient are calculated and are compared with measured values from laboratory scale-down experiment. The results show that a metallic pipe can be detected, which has 0.8 cm in diameter and is buried at a depth of 5.7 cm in saline solution, in frequency range from 200–1000 MHz.

(29) Theoretical Study on the Radiation Pattern of Cross-Type 5-Patch Rectangular Microstrip Array Antenna, by C. T. P.*, J. P. Hong**, Y. K. Cho***, and H. Son*** (*Department of Electronic Communication Engineering, Changshin Junior College, Masan, Korea; **Department of Electrical Engineering, Kyungpook Sanup University, Taegu, Korea; ***Department of Electrical Engineering, Kyungpook University, Taegu, Korea): *JKICS*, pp. 364–372, Feb. 1994.

Theoretical method for analyzing the radiation pattern of cross-type 5-patch rectangular microstrip antenna is presented. The equivalent circuit of the array antenna is represented by the conventional transmission line model.

(30) A Study on the Radiation Characteristics of the Conical Corrugated Feed Horn Using the Gaussian Beam Mode, by D. S. Chang* and S. S. Lee** (*Department of Electronic Communication Engineering, Kunsan National University, Kunsan, Korea; **Department of Electrical Engineering, Hanyang University, Seoul, Korea): *JKICS*, vol. 19, pp. 515–522, Mar. 1994.

The radiation characteristics of the conical corrugated feed horn are analyzed by the Gaussian beam mode theory. The radiation patterns of the corrugated horn antenna operating over C, Ku, and mm-wave bands are calculated.

(31) A Design of Dual-Polarized Microstrip Antenna Using the Active Devices , by G. J. Lim* and H. B. Yoon** (*Department of Electrical Engineering, Kwan Dong University, Kangneung, Korea; **Department of Electrical Engineering, Dongguk University, Seoul, Korea): *JKICS*, vol. 19, pp. 573–581, Mar. 1994.

A dual-polarization microstrip antenna which is smaller than a feed horn polarizer of FRRS (faraday rotation rotary switch) is designed. The GaAs MESFET switches are inserted for selective reception of RHCP or LHCP.

(32) Analysis and Design of a Spiral Antenna Using Moment Method, by J. S. Han, G. S. Lee, and B. W. Park (Department of Electrical Engineering, Chungbuk National University, Chungju, Korea): *JKICS*, vol. 19, pp. 857–871, May 1994.

Six kinds of spiral antenna, a combination of two types of spiral arm-width, and three types of spiral curvature are analyzed by using the moment method. The spiral arms are divided into N sections, and the current distribution is calculated by Galerkin's method.

(33) A Study on the Feed Network for Microstrip Array Antenna, by K. S. Ahn* and W. Y. Song** (*Department of Computer Science Chung Nam Junior College, Taejon, Korea; **Department of Electrical Engineering, Chung Ju University, Chungju, Korea): *JKICS*, vol. 19, pp. 1739–1747, Sept. 1994.

A feeding method of microstrip patch antennas with different widths as feeding elements is studied to obtain the appropriate radiation patterns of nonuniform array antennas. The radiation patterns of the nonuniform microstrip patch array antenna with 6 and 9 elements are measured.

(34) An Analysis of the Hybrid Finite Element Method for Scattering and Radiation by Microstrip Patch Antennas and Arrays Residing in a Cavity in a Ground Plane, by J. S. Ahn*, D. H. Park**, and H. H. Kwon** (*Department of Electrical Engineering, Chung Ju National University, Chungju, Korea; **Department of Electronic Communication Engineering, Chung Ju National University, Chungju, Korea): *JKICS*, vol. 19, pp. 2468–2478, Dec. 1994.

A hybrid finite element method is presented for the characterization of scattering and radiation of microstrip patch and arrays residing in a cavity in a ground plane. The finite element and boundary integral methods are formulated to obtain the solution.

(35) Self-Diplexing Characteristics of Circularly Polarized N-Element Circular Array Antenna, by H. Iwasaki (Research & Development Center, Toshiba Co., Kawasaki, 210 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 26–34, Jan. 1994.

The isolation between the transmitting port and receiving port of a circular array consisting of linearly polarized N-elements is analyzed. The relationship among element arrangements, directions of polarization, and phases of the feed current to realize infinite isolation are derived. The mechanism of a self-diplexing antenna made of substrates on the same plane is described.

(36) Analysis of Radiation Characteristics of a Polyhedron Approximate Reflector Antenna Using the Aperture Integration Method and the Current Distribution Mehod, by E. Hanayama and T. Takano (Institute of Space and Astronautical Science, Sagamihara, 229 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 35–43, Jan. 1994.

This paper discusses analytical methods and radiation characteristics for a polyhedron approximate antenna whose reflector is composed of many flat facets as in the case of large deployable antennas. The field distributions on the aperture are investigated using the aperture integration method with approximate ray tracing and the current distribution method. A relation between the aperture integration method and the current distribution method for the polyhedron approximate antenna is shown, and the equivalent aperture planes are given.

(37) A Method of Suppressing the Mutual Coupling between Two Inverted-F Antennas (Letters), by N. Kuga and H. Arai (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 44–46, Jan. 1994.

This letter presents a method of suppressing the mutual coupling between two planar inverted-F antennas. The mutual coupling is suppressed by arranging antenna elements whose currents on the board are orthogonal each other.

(38) A Study on Multi-Beam Forming Using Sphere Lens Antenna (Letters), by O. Hashimoto*, K. Hirabayashi*, K. Ikeda*, and T. Yoshida** (*College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan; **Yokogawa Denshi Kiki Co., Ltd., Hadano, 257 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 113–116, Feb. 1994.

In order to form multi-beam patterns, a sphere lens antenna equiped with five rectangular wave guides is fabricated, and its characteristics are measured. As a result, it is experimentally confirmed that the crossing point level is about -6 to -12 dB, and that the side lobe level is -17 to -20 dB for each beam pattern.

(39) Beam Space CMA Adaptive Array Antennas, by I. Chiba, W. Chujo, and M. Fujise (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 130–138, Mar. 1994.

A beam space constant modulus algorithm (BSCMA) adaptive array antenna is proposed. In the BSCMA adaptive array, multiple beams are formed in the multibeam former. At the beam selector, the beams with receiving power that is beyond the threshold level are selected. Only the weights of selected beams are optimized by the CMA adaptive processor.

(40) Optimum Antenna Beam Tilting for Cellular Mobile Radio Systems (Letters), by T. Fujii (NTT Mobile Communications Network Inc., Tokyo, 105 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 166–170, Mar. 1994.

An optimum antenna beam tilting for celluar mobile radio systems is clarified, taking into account both thermal noise and co-channel interference.

(41) An Optically Controlled Array Antenna with a BFN Using Two Laser Sources, by Y. Konishi, W. Chujo, and M. Fujise (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 240–247, May 1994.

Aperture amplitude and phase distributions and radiation characteristics are discussed for an optically controlled array antenna with a beam forming network using two laser sources, whose microwave aperture distribution is generated using Fourier transform and optical/electrical conversion. Beamwidths of the radiation patterns correspond with the theoretical ones.

(42) Circularly Polarized Conical Beam Antennas, by H. Kawakami*, G. Sato*, T. Watanabe**, and R. Wakabayashi*** (*Antenna Giken Co., Ltd., Omiya, 330 Japan; **Sony Co., Ltd., Tokyo, 108 Japan; ***Tokyo Metropolitan College of Aeronautical Engineering, Tokyo, 116 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 376–388, July 1994.

A circularly polarized conical beam antenna is developed for communications between a stationary satellite and mobile stations. Four elements of the antenna are fed by in-phase signals, the distances between elements are set to appropriate lengths, and by providing spatial phase differences of 90°, circularly polarized waves are obtained.

(43) Characteristics of a Slot-Coupled Microstrip Antenna Using High-Permittivity Feed Substrate, by K. Takeuchi, W. Chujo, and M. Fujise (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 389–397, July 1994.

A slot-coupled microstrip antenna with a high-permittivity feed substrate and a low-permittivity antenna substrate is investigated. Both measured and calculated results about the influences of the permittivity of the feed substrate on the relation between the antenna input impedance and the slot length, patch axial length, and substrate thickness are presented in detail. Furthermore, the influence of the permittivity on the back lobe of the antenna pattern is also investigated.

(44) A Rapid Analysis Method on Subreflector Radiation Fields by GTD (Letters), by H. Shoki*, T. Morooka**, and K. Kawabata* (*Research & Development Center, Toshiba Co., Kawasaki, 210 Japan; **Communication Systems & Technology Laboratory, Toshiba Co., Kawasaki, 210 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 426–429, July 1994.

In order to apply the geometrical-ray theory of diffraction (GTD) to the calculation of radiated fields from a subreflector of Cassegrain reflector antennas, a new method of searching specular points is presented by using the Newton method.

(45) Dual-Frequency Corner-Reflector Antennas Fed by Elements Connected to Parallel Feed Lines, by T. Maruyama and K. Kagoshima (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 459–466, Sept. 1994.

Two dual-frequency corner-reflector antennas are designed. One is a wide band sector antenna with co-phase feed lines. The other uses anti-phase feed lines, and its beamwidths can be varied by changing the corner angle.

(46) Analysis of Modified Transmission Line Antenna for a Portable Telephone, by Y. Kumon and T. Tsukiji (Faculty of Engineering, Fukuoka University, Fukuoka, 814-01 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 479–486, Sept. 1994.

A new type of the modified transmission line antenna mounted on a rectangular conductiong body of the portable telephone is investigated, and its low VSWR and high gain characteristics are presented. Precise design data of this antenna are given by means of the wire-grid method analysis, and the results are confirmed by experiments.

(47) Development of a Latching System of Assembling Type Space Antenna for Space Station (Letters), by T. Takahashi*, Y. Arimoto*, Y. Suzuki*, T. Iida*, S. Yokota**, and K. Iwasaki*** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **NEC Engineering Ltd., Yokohama, 184 Japan; ***NEC Co., Yokohama, 226 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 506–509, Sept. 1994.

This letter describes a study of a latching system as a key component to establish the technology for assembling a large antenna on the space station, and shows the development of its ground test model.

(48) Single-Reflector Type Wide Beam-Spacing Multibeam Antennas, by I. Naito, S. Makino, T. Furuno, and T. Katagi (Mitsubishi Electric Co., Kamakura, 247 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 528–538, Oct. 1994.

An optimum reflector for a single-reflector type wide beam-spacing multibeam antenna is presented on the basis of wave aberration analysis of defocus-fed reflector without restrictions on reflector symmetry and feed displacement amount.

(49) Surface Error Measurements of Large Reflector Antennas by Phase Retrieval Holography: An Application of Extrapolation Algorithm, by T. Nishibori*, H. Hirabayashi*, H. Kobayashi*, Y. Murata*, Y. Shimawaki**, and T. Nomura*** (*Institute of Space and Astronautical Science, Sagamihara, 229 Japan; **Mitsubishi Electric Co., Amagasaki, 661 Japan; ***Faculty of Science and Technology, Sophia University, Tokyo, 102 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 548–556, Oct. 1994.

This paper presents the experimental verification and the simulation analysis of the Misell algorithm which is one of the iterative restoring algorithms of the antenna surface error without direct phase measurement. Using the predicted aperture distribution calculated by Ray tracing method as an initial value, the estimation error in the algorithm is reduced. To obtain higher resolution on the antenna surface, the extrapolation algorithm is also applied to the Misell algorithm.

(50) Characteristics of Slot Coupling in Dielectric Loaded Radial Line Slot Antenna (Letters), by A. Takagi*, J. Takada*, K. Ito*, and M. Ando** (*Faculty of Engineering, Chiba University, Chiba, 263 Japan; **Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 831–833, Dec. 1994.

This letter presents an analysis model for a dielectric loaded radial line slot antenna and its external model expressed by using a rectangular waveguide with periodic boundary conditions. This model is used for analyzing the characteristics of the slot coupling.

(51) A Pattern Synthesis Method for Multibeam Reflector Antennas, by H. Shoki, K. Kawabata, and T. Morooka (Research & Development Center, Toshiba Co., Kawasaki, 210 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 64–72, Jan. 1994.

A new pattern synthesis method for multibeam reflector antennas is described. The directional constrained minimum power method, which was developed as an adaptive array algorithm, is applied to reflector antennas with cluster feeds. The main objective of this pattern synthesis is to optimize the excitation distribution of the cluster primary feed in order to reduce the sidelobe level and to attain a high main beam gain.

(52) Study on Snow Attaching to the TACAN Antenna, by Y. Kuwahara, N. Oshida, Y. Matuzawa, and M. Kato (NEC Co., Fuchu, 183 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 248–255, Feb. 1994.

Azimuth errors caused by ice/snow attaching to the TACAN antenna surface are estimated using a simple computer simulation. The simulation results are checked against the test results of azimuth errors due to pseudo ice/snow layer (a sheet of wet cloth is used) and the results of measurement in the fields.

(53) A Linearly-Polarized Slotted Waveguide Array Using Reflection-Cancelling Slot Pairs, by K. Sakakibara, J. Hirokawa, M. Ando, and N. Goto (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 511–518, Apr. 1994.

A novel slotted array antenna using reflection-cancelling slot pairs, which can radiate a boresite beam, is proposed. This concept is a general one applicable for realizing slot antennas operating in the traveling wave mode. The design, analysis, and experimental results of the reflection-concelling slot pair array are presented.

(54) A Multiple Sidelobe Canceller Switching over Auxiliary Antennas Arranged in Triangular Order, by T. Kirimoto*, Y. Harasawa*, and A Shimada** (*Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; **Kamakura Works, Mitsubishi Electric Co., Kamakura, 247 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 519–525, Apr. 1994.

A novel multiple sidelobe canceller (MSLC) is proposed, which controls the placement of auxiliary antennas by means of switching over three auxiliary antennas arranged triangularly. A simple switching algorithm using the criterion of minimizing the output power of the MSLC is also given.

(55) A Design Method of a Reconfigurable Direct Radiating Array Antenna, by T. Morooka*, K. Kawabata**, M. Ueno**, Y. Suzuki**, and T. Chiba*** (*Communication Systems & Technology Laboratory, Toshiba Co., Kawasaki, 210 Japan; **Research & Development Center, Toshiba Co., Kawasaki, 210 Japan; ***Miyagi College of Technology, Natori, 981-12 Japan) : *IEICE Trans. Commun.*, vol. E77-B, pp. 663–655, May 1994.

This paper presents a new design method for a reconfigurable direct radiating array antenna which determines the array layout with respect to array shape, number of array elements, and excited distribution, taking account of the beam forming network (BFN). The design philosophy of the study is focused on reducing BFN losses and keeping high spacial isolation among multiple shaped beams for frequency reuse while keeping desired shaped beams.

(56) Study on Mutual Coupling between Two Ports of Dual Slot-Coupled Circular Microstrip Antennas, Y. Murakami, W. Chujo, I. Chiba, and M. Fujise (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 815–822, June 1994.

This paper theoretically and experimentally investigates the mutual coupling between two ports of dual slot-coupled circular microstrip antennas. Presented are the effects of feed configuration, slot length, slot offset from the circular disk center, circular disk radius, and the dielectric constant of the feed substrate on the mutual coupling.

(57) Radiation Pattern Analysis of a GPS Microstrip Antenna Mounted on the Roof of a Car Model, by K. Natsuhara*, M. Ando*, N. Goto*, and G. Yoshida** (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **Mitaka Plant, Japan Radio Co., Ltd., Mitaka, 181 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 823–830, June 1994.

Radiation patterns of a circularly polarized GPS (global positioning system) microstrip disk antenna mounted on the roof of a car are analyzed using the uniform geometrical theory of diffraction. Based upon the excellent agreements between the calculated and the measured results in all the observation directions, the effects of the antenna location upon radiation patterns are discussed in detail.

(58) Pattern Analysis of a GPS Microstrip Antenna on a Rectangular Ground Plane by Using Modified Edge Representation (Letters), by M. Ando, K. Natsuhara, T. Murasaki, M. Oodo, Y. Inasawa, and M. Sato (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 843–846, June 1994.

The effects of finite ground plane upon the patterns of the GPS (global positioning system) patch antennas are analyzed by equivalent edge currents with modified edge representaion. The comparison with the uniform geometrical theory of diffraction and measurements shows that low elevation patterns including axial ratios are successfully predicted.

(59) Analysis of an Open-Ended Waveguide as a Probe for Near Field Antenna Measurements by Using TLM Method, by Y. Fujino* and C.E. Tong** (*Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan; **Harvard-Smithsonian Center for Astrophysics, 60, Garden St., Cambridge, MA 02138, USA): *IEICE Trans. Commun.*, vol. E77-B, pp. 1048–1055, Aug. 1994.

An open ended waveguide used as a near field probe is analyzed using the transmission line matrix (TLM) method.

Frequency dependence of a complex reflection coefficient at the waveguide aperture is derived and is shown to agree with measured values. The radiation pattern of the open ended waveguide with mounting structure is also calculated.

(60) An Analysis of the Rotational Symmetry of the Inner Field of Radial Line Slot Antennas, by M. Takahashi*, M. Ando**, and N. Goto** (*Faculty of Engineering, Musashi Institute of Technology, Tokyo, 158 Japan; **Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 1256–1263, Oct. 1994.

This paper presents a fundamental analysis of the inner field of radial line slot antennas. Inner field perturbation due to spiral arrangement of slots is analyzed. The coupling of the slots in the first few turns of the spiral in the central aperture is analyzed by the method of moment, since they seems to disturb the inner field seriously. The effects of the slot length and the spacings between slot pairs are investigated.

(61) Mapping QR Decomposition on Parallel Computers: A Study Case for Radar Applications, by A. d'Acierno*, M. Ceccarelli*, A. Farina**, A. Petrosino*, and L. Timmoneri** (*Istituto per la Ricerca sui Sistemi Informatici Paralleli, IRSIP-CNR, Via P. Castellino 111, 80131 Naples, Italy; **Alenia, una azienda Finmeccanica, Sistemi Difesa, Via Tiburtina Km. 12.400, 00131 Rome, Italy): *IEICE Trans. Commun.*, vol. E77-B, pp. 1264–1271, Oct. 1994.

The sidelobe canceler in radar systems is a highly computational demanding problem. It can be efficiently tackled by resorting to the QR decomposition mapped onto a systolic array processor. The paper reports several mapping strategies by using massive parallel computers available on the market.

(62) FDTD Analysis of Unit-Radiator for a Circularly Polarized Printed Array Antenna Composed of Strips and Slots, by M. Naito*, S. Matsuzawa**, and K. Ito** (*Graduate School of Science and Technology, Chiba University, Chiba, 263 Japan; **Faculty of Engineering, Chiba University, Chiba, 263 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 1621–1627, Dec. 1994.

This paper describes the FDTD analysis of a strip element and an unit-radiator for a circularly polarized printed array antenna composed of strips and slots (CP-PASS). The basic characteristics of the strip element are demonstrated numerically by using the FDTD method and are compared with experimental results. From the viewpoint of frequency bandwidth, an optimum spacing between the strip and slot is determined.

4) Microwave/Lightwave Propagation and Scattering

(1) Single Station Location of Remote, Low-Power, High Frequency Transmitters, by G. L. Goodwin* and P. T. Middleton** (*School of Applied Physics, University of South Australia, The Levels SA 5095, Australia; **Integra Computer Systems Pty Ltd, Innovation House, Technology Park, The Levels SA 5095, Australia): *JEEE*, vol. 14, pp. 290–299, Dec. 1994.

Experiments affirm the capability of a single station location receiving system to locate the positions of low-power HF transmitters, in particular a 10-W locator beacon, at ranges up to 3000 km. A loop transmitting antenna is shown to be a satisfactory compromise compared with other simple antennas.

(2) Propagation Modeling in Mobile Communications, by A. Kukushkin (CSIRO Division of Radiophysics, PO Box 76, Epping, New South Wales, Australia): *ATR*, vol. 28, pp. 1–14, May 1994.

The most recent developments on the propagation aspects in mobile communications are reviewd. Among the topics considered are the results of the RF measurements and propagation modeling in both land mobile-satellite and in cellular/microcellular systems.

(3) Magnitudes of the Near E-Field Close to Hand-Held GSM Digital Mobile Telephones, by I. P. Macfarlane (Telecom Australia Research Laboratories, 770 Blackburn Road Clayton, Victoria 3168, Australia): *ATR*, vol. 28, pp. 61–71, May 1994.

This paper reports the results of measurements of the free space near E-fields close to a 2-W GSM digital mobile telephone intended for hand-held use. It also provides an indication of the peak near E-fields which will be applied to a hearing aid when the GSM mobile telephone is held to the ear wearing the aid.

(4) The Global Numerical Boundary Condition of Second Kind and Its Applications to Open-Region Electromagnetic Field Problems, by D.-S. Fan and Y.-X. Wang (University of Science and Technology of China, Hefei, P.R.C.): *AES*, vol. 22, pp. 18–22, Mar. 1994.

As the natural development of the eigen-function global numerical boundary condition (GNBC), the noneigen-function GNBC is presented. The GNBC of second kind is deduced from the EM equivelence principle and formally evaluated by moment method solutions of equivelent source integral equations. Three typical application examples to open-region EM problems are given for demonstration.

(5) Application of the Lattice Theory in the TE and TM Wave Scattering from a Conducting Cylinder Covered by Lossy Dielectrics, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *AES*, vol. 22, pp. 65–69, Mar. 1994.

A fundamental method which is utilized to solve the electromagnetic scattering (TE and TM waves) from a conducting cylinder covered by lossy dielectrics is investigated by using the lattice theory. Such cylinder can be regarded as the combination of plane lattice and line lattice, from which one will solve the scattering problem conveniently by studying the self-actions and mutual-actions of these lattices. Some numerical examples are given.

(6) Analysis of Underground Two Dimensional EM Scattering Problems Using Generalized Equivalent Sources Method in Spectral Domain, by C.-H. Cheng and W.-X. Zhang (Southeast Unversity State Key Laboratory of Millimeter Waves, Nanjing, P.R.C.): *AES*, vol. 22, pp. 103–109, Mar. 1994.

A new generalized equivalent sources method in spectral domain is proposed. The scatterer is substituted by a set of appropriate generalized equivalent sources for avoiding the boundary integration, and the Sommerfeld's integrals are simplified by making use of a convergence accelerating technique. The formulations for analyzing the scattering from an underground cylinder are given.

(7) Analysis of EM Wave Scattering on Metallic Periodic Surface with Arbitrary Profile, by K. Liu and W. Hong (Southeast University, Nanjing, P.R.C.): *AES*, vol. 22, pp. 45–50, June 1994.

The method of lines is successfully extended to solve the EM wave scattering problems of two-dimensional metallic periodic surfaces. The method presented possesses the advantage of less computation. The results of groove, comb, and sinusoidal surfaces are presented.

(8) An Analytic Solution of the Electromagnetic Scattering by a Coated Prolate Spheroid and the Calculations of the Far Field Scattering Cross Sections, by X.-G. Zeng, W.-G. Lin, and C.-L. Ruan (University of Electronic Science and Technology of Chengdu, P.R.C.): *AES*, vol. 22, pp. 72–78, June 1994.

By employing the spheroidal vector wave function expansions for the incident and scattered fields and the impedance boundary conditions on the coated surface, an analytic solution of the plane electromagnetic wave scattered by a coated prolate spheroid for axial incidence is derived, and numerical calculations are obtained.

(9) Electromagnetic Scattering by Complex Objects in Two-Medium Half-Spaces , by S. Lu, H.-X. Kang, P.-G. Xu, and M. Chang (Wuhan University, Wuchang, P.R.C.): *AES*, vol. 22, pp. 41–47, Sept. 1994.

The vector wave function expansion combined with the unimoment method is applied to calculate the scattered fields of buried objects of arbitrary shape or of inhomogeneous material. Results of computation bear out the validity of the technique.

(10) Transient Propagation and Scattering in Dispersive Media, by W.-J. Zhang, Y.-L. Zhang, and C.-F. Xie (Shanghai University of Technology, Shanghai, P.R.C.): *AES*, vol. 22, pp. 48–53, Sept. 1994.

A modified FD-TD method for computation of transient propagation and scattering fields is presented. The results obtained are visualable and faithful.

(11) The Electromagnetic Scattering Analysis and Simulation of Complex Aircraft Targets, by B.-F. Wang* and T.-J. Liu** (*Beijing University of Aerounautics and Astronautics, Beijing, P.R.C.; **Beijing Institute of Environmental Features, Beijing, P.R.C.): *AES*, vol. 22, pp. 70–75, Sept. 1994.

A method of analysing and calculating the RCS for complex aircraft targets is presented and verified. The method utilizes a computer program for modeling targets' geometry in terms of surface fitting. The actual exterior surface can be accurately modeled with spline function and divided into a lot of small surface elements. The scattering field calculation is based on the physical optics approximation for standard surface sheet.

(12) The Application of MoM-CGM-FFT to Two-Dimensional EM Scattering, by C.-X, Zhang, W. Hong, Y.-Y. Chen, Y.-H. Qi, and J.-Q. Wang (Southeast University, Nanjing, P.R.C.): *AES*, vol. 22, pp. 74–77, Dec. 1994.

A mixed technique of moment method (MoM), conjugate gradient method (CGM), and fast Fourier transform (FFT) is presented to deal with the electromagentic scattering of cylinders, which have arbitrary cross-sections and are composed of conductor or inhomogeneous dielectric. CGM and FFT techniques are used for reducing storage and CPU time, and therefore, electrically large cylinders of abitrary cross-sections and imhomogeneous permittivity can be handled simply and effectively.

(13) Modified T-Matrix Formulation and Multiple Scattering of EM Waves by a Half-Space of Randomly Distributed Dielectric Spheres, by Z.-L. Wang, L. Hu, and W.-G. Lin (University of Electronic Science and Technology of China, Chengdu, P.R.C.): *AES*, vol. 22, pp. 81–84, Dec. 1994.

A modified T-matrix formulation of a scatterer is derived. The problem of multiple scattering of EM waves by a half-space of randomly distributed dielectric spheres is analyzed by using the modified T-matrix formulas of a sphere. A transcendental equation for determining the effective wavenumber of the random medium is obtained under Foldy's approximation.

(14) Partial Inverse Scattering Method for Three-Dimensional Lossy Biological Bodies by Using a Matrix Perturbation Theory, by T.-J. Cui and C.-H. Liang (Xidian University, Xi'an, P.R.C.): *JCIC*, vol. 15, pp. 54–59, Mar. 1994.

A partial inverse scattering method for a three-dimensional, arbitrarily shaped heterogeneous biological body is presented by using a matrix perturbation theory. When small perturbations in the dielectric characteristics of an a-priori known biological body are occured, a relation between the varied scattering fields and the dielectric characteristics is derived. Reconstruction examples are given to show the vaildity of the method.

(15) The Determination of Space Scattering Properties of Targets from Near-Field Measurements, by D.-M. Fu, J.-H. Zhang, Z.-H. Yan, and N.-H. Mao (Xidian University, Xi'an, P.R.C.): *JCIC*, vol. 15, pp. 25–31, Sept. 1994.

The principles for determining space scattering properties of targets from plane near field scattering measurements are discussed. The calculating formulas are derived in detail. Some simple targets and models are measured, and the obtained back scattering patterns and the space scattering patterns, when the targets are illuminated from various directions, are in good agreement with theoretically computed results.

(16) The Experimental Study of Frequency Selective Fading, by Y.-R. Zhang, X.-W. Zhao, Y.-X. Xie, and G.-W. Han (China Research Institute of Radiowave Propagation, Xinxiang, P.R.C.): *JCIC*, vol. 15, pp. 1–8, Nov. 1994.

The statistic distribution of flat fading, in-band linear amplitude dispersion, in-band maximum amplitude dispersion, and in-band quadratic amplitude dispersion are obtained on basis of experimental data of frequency selective fading. Meanwhile, their correlation coefficients are also obtained. Some valuable conclusions are described by comaring experimental results with computer random simulations.

(17) Computation of EM Scattering from 2-D Asymmetrically Anisotropic Cylindrical Medium by Using Boundary Element Method, by M. Zhang and W.-X. Zhang (Southeast University, Nanjing, P.R.C.): *JAS*, vol. 12, pp. 32–40, Jan. 1994.

The electrical field boundary integral equations for the arbitrary shaped two-dimensional homogeneous asymmetrically anisotropic cylindrical medium are derived based on Green's theorem. By applying the pulse-function expansion and the point-matching technique, the integral equations can be converted into linear algebraical equations. The monostatic and bistatic radar cross sections of asymmetrically anisotropic circular, square, and trianglar cylinders are calculated.

(18) Electromagnetic Wave Propagation in Magnetic Multilayers: Non-Reciprocal Reflections, by Y.-B. Li* and Z.-C. Xu** (*Changsha Railway University, Changsha, P.R.C.; **Huazhong University of Science and Technology, Wuhan, P.R.C): *JE*, vol. 16, pp. 238–243, May 1994.

A theory of EM wave propagation through magnetic multilayers and superlattices is presented based on the propagation matrix of a magnetic film. By using the P matrix, the transmission and reflection coefficients of layered magnetic media are obtained. The numerical results show that the EM modes of a magnetic layer system are excited and manifested as the sharp dips in the S-polarized reflection, and the dispersion curves of magnetic polaritons can be measured by a method similar to attenuated total reflection technique.

(19) Study of the Propagation Behaviors in Nonlinear Dielectric Optical Waveguide , by B.-L. Yu and Z.-Q, Zhu (Henan University, Kaifeng, P.R.C.): *JE*, vol. 16, pp. 310–314, May 1994.

The propagation behaviors of TM mode in nonlinear slab dielectric optical waveguide are studied. By using graphic method, the dispersion equation is resolved.

(20) A New Approach for Scattering Problems of Metallic Disc-Ring Structures Illuminated by Plane Waves, by C.-F. Ye and W.-X. Zhang (Southeast University, Nanjing, P.R.C.): *JE*, vol. 16, pp. 497–504, Sept. 1994.

An integral equation is derived from the electric field integral equation (EFIE) for plane wave illumination onto the metallic circular disc-ring structures by using Fourier transformation and separating the induced charge's contribution from the EFIE. Comparision between RCS by this method and that by analytical solution for a disc shows the effectiveness of this approach. Numerical results are also given for the current distribution and the far radiation patterns of a disc-ring structure.

(21) Radar Cross-Section of an Impedance Cylinder Loaded with a Composite and Anisotropic Chiral Medium Sheath, by Z.-X. Shen (Nanjing University of Aeronautics and Astronautics, Nanjing, P.R.C.): *JE*, vol. 16, pp. 623–630, Nov. 1994.

The problem of scattering of a plane electromagnetic wave incident on an impedance conducting cylinder cladded with a composite and anisotropic chiral medium sheath is solved. The formulas for calculating the electromagnetic fileds in composite and anisotropic chiral media are derived. An analytic expression for the radar cross-section of an impedance cylinder coated with composite and anisotropic chiral material is obtained by application of boundary conditions.

(22) E-Polarized Reflection Coefficient by a Tapered Resistive Strip Grating with Infinite Resistivity at Strip-Edges, by U. J. Yoon and S. I. Yang (Department of Electronic Communication Engineering, Kyungki Junior College, Inchon, Korea): *JKITE*, vol. 31, pp. 60–66, Feb. 1994.

The scattering problem by E-polarized plane wave with oblique incidence on a tapered resistive strip grating with infinite resistivity at strip-edges is analyzed by the method of moments in the spectral domain. The induced surface current density is expanded in a series of ultraspherical polynomials of the zeroth order.

(23) Cross Borehole Tomography Using Improved Inversion and Iterative Scheme, by J. H. Kim, S. G. Kim, C. S. Park, and J. W. Ra (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 31, pp. 27–38, May 1994.

An inversion technique is suggested to reconstruct relative permittivity profiles of cylindrical scatterer. An improved Born inversion and an iterative process are used in cross borehole structue.

(24) Iterative Inversion Using Moment Method and Improved Newton's Algorithm in the Configuration Domain, by C.S. Park, J.H. Kim, and J.W. Ra (Department of Eletrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 31, pp. 39–49, May 1994.

An inversion technique to reconstruct permittivity profiles of 2-D inhomogeneous dielectric objects by iterative process using the moment-method and improved Newton's algorithm is presented. The cell size of inverse scattering is made to be larger than that of forward scattering to reduce the noise effect in the scattered field.

(25) Microwave Imaging of a Perfectly Conducting Cylinder by Using Modified Newton's Algorithm in the Angular Spectral Domain, by S. K. Park, C. S. Park, and J. W. Ra (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 31, pp. 34–44, June 1994.

An iterative inversion method in angular spectral domain is presented for microwave imaging of a perfectly conducting cylinder. Angular spectra are calculated from measured far-field scattered fields. The center and initial shape of an unknown conductor may be obtained by the characteristics of angular spectra and the total scattering cross section. The original shape is reconstructed by the modified Newton algorithm.

(26) A Study on Field Strength Prediction for the Band of Land Mobile Telephone Systems in Cheju Western Area, by M. S. Hong and H. S. Kim (Korea Mobile Telecommunications Corp., Seoul, Korea): *JKITE*, vol. 31, pp. 47–54, July 1994.

The characteristics of radio propagation in Cheju Area are measured for the Seorum transmitter site. The formula of correction with regard to the configuration of the ground is presented, and the predicted values are compared with the measured ones.

(27) Propagation Mode Analysis of Leaky Coaxial Cable with Periodic Symmetrical Slots, by Y. I. Hong, M. J. Maeng, and J. K. Kim (Department of Electrical Engineering, Chung-Ang University, Seoul, Korea): *JKITE*, vol. 31, pp. 53–63, Sept. 1994.

A leaky coaxial cable having periodic slots in the outer conductor is investigated to obtain the propagation modes in the various environments. An eccentric cylindrical model is used to develop the theory for surface-wave propagation on the cable.

(28) UTD-Supplemented Mode-Matching Method Analysis of High-Frequency Wave Coupling into Large Parallel Plate Waveguides, by D.H. Kwon, Y.S. Sun, and N.H. Myung (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 31, pp. 48–53, Oct. 1994.

The problem of a plane wave impinging upon a semi-infinite parallel-plate waveguide is investigated. The interior fields can be analyzed by converting the initial field into waveguide modes. Kirchhoff approximation is usually made at the waveguide aperture in the literature. A modified approximation is made using the uniform geometrical theory of diffraction.

(29) Analysis of Scattering by a Conducting Screen Perforated Periodically with Apertures of Finite Thickness, by J. Y. Lee and N. H. Myung (Department of Electrical Engineering, KAIST, Taejon, Korea): *JKITE*, vol. 31, pp. 54–61, Nov. 1994.

The power transmitted through a conducting screen perforated periodically with rectangular apertures of finite thickness (grating structure) is calculated in the case of H-polarized plane wave incidence by using the spectral moment method and the generalized scattering matrix technique.

(30) E-Polarized Reflection Coefficient by a Tapered Resistive Strip Grating with Zero Resistivity at Strip-Edges, by U. J. Yoon* and S. I. Yang** (*Department of Electronic Communication Engineering, Kyungki Junior College, Inchon, Korea; **Department of Electrical Engineering, Soongsil University, Seoul, Korea): *JKICS*, vol. 19, pp. 331–337, Feb. 1994.

Scattering by E-polarized plane wave with oblique incidence on a tapered resistive strip grating of perfect conductor is analyzed by the method of moments in the spectral domain.

(31) A Study on the Numerical Wave Propagation Properties of the Finite Difference-Time Domain (FD-TD) Method for EM Wave Problems, by I. S. Kim (Department of Electrical Engineering, Kyung Hee University, Seoul, Korea): *JKICS*, vol. 19, pp. 1595–1611, Aug. 1994.

The leap-frog approximation of Maxwell's curl equations in time-space is used to simulate EM wave propagation. The numerical dispersion error due to the leap-frog approximation is described.

(32) A Theoretical Study on the Two Layered Wide Band Microwave Absorber Using Epoxy-Modify Uretane Rubber Mixed Carbon Particles (Letters), by O. Hashimoto and A. Tsujimura (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 47–49, Jan. 1994.

Many kinds of design charts for two-layered wide band wave absorbers, which achieve the absorption loss more than 20 dB for normal and oblique incident waves (8–12 GHz), are presented, and wide band characteristics of absorbers designed using these charts are described.

(33) A Study on the Wide-Band Wave Absorber Coating Cylinder (Letters), by O. Hashimoto and S. Motoyoshi (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 107–112, Feb. 1994.

A design chart of a two-layered wave absorber coating a cylinder using a point frequency matching method is given. The design chart enables us to make an absorber at X-band or Ku-band frequencies.

(34) Scattering Center Estimation of a Conductive Sphere Using a Superresolution Technique, by H. Yamada*, Y. Ogawa**, and K. Itoh** (*Faculty of Engineering, Niigata University, Niigata, 950-21 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 139–148, Mar. 1994.

A superresolution technique to detect the scattering centers is investigated. Especially, applicability of the method to the back scattering measurement of a conductive sphere is described. Furthermore, simulation results show that data calibration utilizing time-domain gating can improve a signal-to-noise ratio, and that the method is available for a few snapshot data. The resolution capability of the technique is also verified with experiments.

(35) A Study on Equivalent Impedance of the Building Columns and Girders against the Lightning Surges, by M. Sato and S. Kuramoto (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 149–158, Mar. 1994.

An impedance of the columns and girders in the reinforced concrete building and steel-frame building is experimentally studied using scaled down column models at the frequencies of lightning surges. As a result, it is shown that the impedance can be evaluated from the surface area of the steel rods and frames in the columns and girders using the equations of resistance and inductance of the cylindrical model which has the same surface area.

(36) Multipath Propagation Measurements in Areas Surrounded by Mountains (Letters), by M. Kimura*, T. Iwamura**, and S. Kozono*** (*NTT Telecommunications Software Headquaters, Chiba, 261 Japan; **NTT Kanagawa Plant Engineering Center, Kawasaki, 210 Japan; ***Chiba Institute of Technology, Narashino, 275 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 171–174, Mar. 1994.

Multipath propagation measurements in areas surrounded by mountains are performed, and the reflection loss on mountain surface and the delay spread characteristics are given.

(37) Disturbances of Decca 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. J77-B-II, pp. 202–209, Apr. 1994.

Disturbances of electric fields caused by Minami-Bisan Seto-Ohashi bridge are recorded through continuous experiments using Decca waves. Electric fields of the primary waves as well as the secondary waves reradiated from the two vertical towers are derived theoretically. It is shown that some aspects of the experimental results are reasonably interpreted by using the models of a couple of vertical antennas.

(38) Polarization Discriminating Characteristics of Three-Layered Conducting Strips with Two Dielectric Slabs (Letters), by T. Noda, K. Uchida, and T. Matsunaga (Faculty of Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 227–229, Apr. 1994.

This letter is concerned with polarization discriminating characteristics of three-layered conducting strips with two dielectric slabs. The analytical method is based on the spectral domain method combined with the sampling theorem.

(39) Asymptotic Analysis of Transient Electromagnetic Fields in Semicylindrical Concave Conducting Boundary, by K. Goto, K. Yukutake, and T. Ishihara (Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 248–258, May 1994.

Electromagnetic pulse propagation in semicylindrical cocave conducting boundaries is described. Waveform arizing from multiply reflected rays is expressed by integral-type interference wave and lowest-order whispering gallery (WG) modes. A relation between rays and WG modes is clarified based on numerical calculations.

(40) A Design Chart of the Two Layered Wave Absorber for the Both TE and TM Waves (Letters), by Y. Shimizu*, O. Hashimoto**, A. Tsujimura**, and T. Kimura ** (*The Center for Research and Development of Educational Technology, Tokyo Institute of Technology, Tokyo, 152 Japan; **College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 268–271, May 1994.

Design charts which are useful for the both TE and TM waves are presented, and the effectiveness of these charts is confirmed theoretically.

(41) Multipath Characteristics Measured in a Residential Area for Micro-Cellular Systems (Letters), by E. Moriyama (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 272–274, May 1994.

Multipath measurement is conducted with the base station antenna mounted on a pedestrian bridge over an intersection to transmit 2.6 GHz sounding signals along both intersecting streets. Over 90% of the measurement area the rms delay spread is less than 128 ns.

(42) Prediction of Urban Propagation Characteristics for Low Base-Station Antennas, by T. Iwama and M. Mizuno (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 317–324, June 1994.

A predicting method for propagation characteristics in urban microcellular systems when a base-station antenna is mounted below surrounding building heights (low base-station antenna) is investigated. A comparison between measured and predicted propagation losses is made. The reasonable agreement is obtained both in a line-of-sight environment and in a shadowed environment on the roads crossing with the line-of-sight road.

(43) Electric Field Specification Method Below 80 cm for Radiation Immunity Test, by Y. Akiyama, N. Kuwabara, and T. Ideguchi (NTT Telecommunication Networks Laboratories, Musashino, 180 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 334–342, June 1994.

This paper proposes an electric field specification method below 80 cm for radiating immunity testing by using the calculated height pattern radiated from the very far radiation source. This specified field simulates an actual electromagnetic environment and is moreover independent of frequency.

(44) Measurement of Polarization Characteristics of VHF Radio Waves Reflected by the E_s Layer, by M. Ichinose and S. Kainuma (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 398–405, July 1994.

The polarization of VHF-TV radio waves propagated with the one-hop-E_s mode was measured in Tokyo during the summer of 1992. The result shows that in most cases the polarization axis varies quickly and randomly within the small angle range between about 40° to 90 °. However, in a few cases the axis varies very slowly over a wide range from +90° to −90°. These polarization rotation characteristics are explained as a Faraday rotation effect caused by the electron content in the E and sporadic-E layers.

(45) A Design of Multi-Layer Wave-Absorber for Oblique Incidence by Point Frequency Matching Method, by T. Aoyagi and Y. Shimizu (CRADLE, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 414–421, July 1994.

Multi-layer wave absorbers are theoretically designed to obtain the better characteristics for oblique incidence by the point frequency matching method. The results shows that wave absorbers for wide frequency range can be designed by the point frequency matching method when the polarization, the incident angle, and the permissive reflection coefficient are given.

(46) Approximate Formula of Shielding Effectiveness from Transmission Line Analogy of a Plane Sheet Compared with That from Electromagnetic Field Theory (Letters), by Y. Amemiya and T. Yamaguchi (Department of Electronics Engineering, Kanazawa Institute of Technology, Ishikawa-ken, 921 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 422–425, July 1994.

Approximate formulas of shielding effectiveness of a plane sheet are derived from the electromagnetic field theory for plane waves as well as for magnetic dipole fields. Discrepancies are studied between the formula from the so-called transmission line analogy and that from the electromagnetic field theory.

(47) Very Low Latitude Whistlers with Effect of the Earth-Ionosphere Waveguide Propagation, by K. Ohta*, A. Shimizu*, M. Hayakawa**, and S. Shimakura*** (*Faculty of Engineering, Chubu University, Kasugai, 487 Japan; **Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan; ***Faculty of Engineering, Chiba University, Chiba, 263 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 437–444, Aug. 1994.

The characteristics of the Earth-ionosphere waveguide propagation of whistlers are investigated by means of both digital spectral analysis with high resolution and field-analysis direction finding measurement for very low latitude whistlers. It is found that very low latitude whistlers propagated over the distance of 1000 km with waveguide mode exhibit very clear dispersion effects near the cutoff frequencies of the subionospheric 1st, 2nd, and higher-order modes.

(48) Coupled Mode Analysis of the Electromagnetic Wave Propagation in a Laterally Non-Uniform Duct in Altitude with an Even Power N Profile, by Y. Kawaguchi and E. Oka (School of Science and Technology, Meiji University, Kawasaki, 214 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 467–478, Sept. 1994.

Using the method of coupled mode analysis, the propagation characteristics of electromagnetic waves in a laterally nonuniform atmosphere, which consists of an inverted layer with an even power profile under a standard atmosphere and the lowest layer with a linear profile, are analyzed. Coupling coefficients at a junction between two laterally uniform sections are considered.

(49) Electromagnetic Environmental Measurement System Employing Frequency Level Selective Process, by M. Masugi*, K. Takagi*, M. Satoh**, and T. Ideguchi* (*NTT Telecommunication Networks Laboratories, Musashino, 180 Japan; **NTT Technical Assistance and Support Center, Musashino, 180 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 496–505, Sept. 1994.

This paper proposes a measurement system that can measure quasistationary waves by setting trigger lines in a specific frequency domain. The electromagnetic interference waves can be effectively detected using a spectrum analyzer which has high resolution performance. Measurements for citizen-band waves are carried out in the urban area when audible noises are generated.

(50) Asymptotic Analysis of Whispering-Gallery Mode Radiation from the Aperture of Cylindrical Concave Conducting Boundary, by K. Goto and T. Ishihara (Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 539–547, Oct. 1994.

Asymptotic representations of beam fields excited by whispering-gallery (WG) modes incident on the aperture of cylindrical concave conducting boundaries are investigated. By applying the residue theorem and the asymptotic analysis to the integral obtained from the techniques analogous to those in the half-plane problem, the beam field representation consisting of the geometrical ray and the edge diffracted wave is derived.

(51) Design of Super Wide-Band Electromagnetic Wave Absorber and Its Characteristics, by Y. Naito, H. Anzai, and T. Mizumoto (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 557–563, Oct. 1994.

Grid ferrite absorbers and multi-layered ferrite absorbers with rubber ferrite as the ferrite absorber are designed. Thickness of the lossy dielectric layer is determind on the condition that return loss is higher than 20 dB at any frequency above 30 MHz. As a result, the thickness of the lossy dielectric layer attached to ferrite absorbers becomes thinner than that in conventional single-ferrite absorbers.

(52) Source-Radiation Field Analysis in Scalar Waves: Electromagnetic Scattering in Conducting Circular Cylinder, by S. Tokumaru and K. Ohgake (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 780–787, Dec. 1994.

In order to extend integral equation methods in electromagnetic field problems, a new method called the source-radiation field analysis is proposed for scalar wave problems, in which both source problems and radiation problems are to be analyzed at the same time by solving a couple of integral equations having the equivalent sources and the radiation field as unknown functions. As a fundamental example, electromagnetic scattering by a conducting circular cylinder is successfully solved for TE- and TM-plane wave incidence.

(53) Geometrical Optics in Dissipative Media: Uniform Plane Wave Approximation, by S. Tokumaru (Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 788–795, Dec. 1994.

Geometrical optics approximation, including representation of circularly polarized fields, is extended to slightly dissipative, inhomogeneous media, where the geometrical optics field is assumed to propagate as a uniform plane wave. The complex eikonal having the complex index of refraction is introduced, whose wave normal vector is shown to be real. It is shown that Fermat's principle is hold in the slightly dissipative, inhomogeneous media.

(54) Errors and Correction Factors for Schelkunoff's Shielding Effectiveness Formula, by H. Nagao, A. Nishikata, and Y. Shimizu (CRADLE, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 804–812, Dec. 1994.

The approximate shielding effectiveness of a plane shield with a dipole source closely placed can be calculated either from Schelkunoff's formula or resistive sheet approximation. By comparing them with the exact solution, the errors of those approximations are evaluated in connection with the condition of input parameters. The correction factors for those approximated formulas are systematically derived. By using these correction factors, the rigorous shielding effectiveness, which involves complex integral, can be easily calculated with good accuracy from Schelkunoff's formula or resistive sheet approximation.

(55) Equivalent Permittivity Analysis for Periodic Wedge-Type Absorber Using Transmission Mode Approximation, by T. Aoyagi, A. Nishikata, and Y. Shimizu (CRADLE, Tokyo Institute of Technology, Tokyo, 152 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 813–820, Dec. 1994.

The equivalent permittivity of the wedge structure is calculated by using the transmission mode approximation which takes into account the periodic length of wedge structure. The difference of equivalent permittivities between the present approximation and the previous uniform approximation is noticeable even at frequency that the wavelength is shorter than periodic length of the structure.

(56) Indoor Propagation Model Based on Ray Tracing and Integral Equations (Letters), by M. Kominami, A. Hirata, L. Chen, and H. Kusaka (College of Engineering, University of Osaka Prefecture, Sakai, 593 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 828–830, Dec. 1994.

A simple model for estimation of the multipath characteristics for indoor radio channels is proposed. Wave interactions over the propagation path are described by the Green's function of integral equations and ray tracing.

(57) Multipath Characteristics for Shielded Building (Letters), by E. Moriyama (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 834–837, Dec. 1994.

This letter shows that the delay profile as well as the cumulative distribution of the delay spread in a shielded building can be simulated based on a multiple reflection model using Fresnel's formula. The simulation based on the power reflection coefficient employed so far to estimate delay profile is shown to give incorrect results.

(58) FDTD Analysis of the Reflection Characteristics of Optical Wave from Lossy Anisotropic Dielectric Layer (Letters), by M. Nishimura* and H. Shigesawa** (*Maizuru National College of Technology, Maizuru, Kyoto, 625 Japan; **Faculty of Engineering, Doshisya University, Kyoto, 602 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 27–29, Jan. 1994.

Reflection characteristics of an optical plane wave from a lossy anisotropic dielectric layer are calculated by using the FDTD method. The maximum rotation of polarization angle of the reflected wave occurs, strongly depending on both the thickness and material constants.

(59) Reflectivity of Self-Pumped Phase Conjugator with Reflection Grating (Letters), by Y. Takayama, A. Okamoto, and T. Mishima (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 30–32, Jan. 1994.

An equation for describing reflectivity of a self-pumped phase conjugator with a reflection grating is derived. The reflection property of the grating is shown as a function of the reflectivity of two external mirrors.

(60) Diffraction of Electromagnetic Waves from a Line Source by a Conducting Strip, by T. Kinoshita (Faculty of Engineering, Tokyo Institute of Polytechnics, Atsugi, 243-02 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 131–138, Apr. 1994.

Two dimensional diffraction of electromagnetic waves from an electric or magnetic line source by an infinitely thin, conducting strip is investigated according to the method of spectral domain. The expansion functions of the electric current on the strip which satisfy the edge conditions are used. Expansion coefficients, electric current on the strip, and far-field pattern are numerically evaluated.

(61) Analysis and Experiment on Temporal Response of Four-Wave Mixing in Photorefractive Crystal, by Y. Takayama*, A. Okamoto*, K. Sato**, T. Mishima*, and I. Sakuraba** (*Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan; **Faculty of Engineering, Hokkai-Gakuen University, Sapporo, 064 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 481–489, Sept. 1994.

Temporal variation of coupling strength by four-wave mixing in a photorefractive crystal is derived. The time dependent coupling strength is applied to the phase conjugate reflectivity in case of the transmission grating. Calculation of the reflectivities is made, and the reflection properties are shown as a function of time.

(62) Acceptance Angle of Optical Phase Conjugation by Forward Four-Wave Mixing (Letters), by A. Okamoto, H. Kaneko, H. Yamada, and T. Mishima (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 576–579, Oct. 1994.

Conversion efficiency of an optical phase conjugator by forward four-wave mixing is studied for large incident angles of the probe beam. The relation between the probe and the conjugate beam angle is derived, and the acceptance angle is obtained by calculating angular dependence of conversion efficiency.

(63) Analysis of Light-Beam Scattering and Detected Signal Characteristics from Three-Dimensional Pit Models of Optical Discs by the Boundary-Element Method, by T. Kojima, Y. Morikawa, and K. Yoshida (Osaka Electro-Communication University, Neyagawa, 572 Japan): *Trans. IEICE*, vol. J77-C-II, pp. 453–461, Oct. 1994.

The present paper deals with the three-dimensional analysis of the light-beam scattering from pit models of optical discs by the boundary-element method based on the integral equations. The results indicate that the existence of the adjacent pits and pregrooves have significant influences on the scattering characteristics including the detected signal characteristics of focusing and tracking errors.

(64) Electromagnetic Fields of Dipoles Effected by a Semi-Infinite Media, by A. Yokoyama (Kumamoto Institute of Technology, Kumamoto, 860 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 56–63, Jan. 1994.

Expressions for electromagnetic fields generated by vertical and horizontal electric dipoles located in air or in a lossy half-space near its boundary with air are obtained from Hertz vectors by the method of operators.

(65) Fundamental Study on Synthetic Aperture FM-CW Radar Polarimetry, by Y. Yamaguchi*, T. Nishikawa*, M. Sengoku*, W.-M. Boerner**, and H.J. Eom*** (*Faculty of Engineering, Niigata University, Niigata, 950-21 Japan; **Department of Electrical Engineering and Computer Science, University of Illinois, Chicago, IL 60607-7018 USA; ***Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, Teajon, 305-701 Korea): *IEICE Trans. Commun.*, vol. E77-B, pp. 73–80, Jan. 1994.

The principle of radar polarimetry for the monochromatic wave is given, which is the basis for polarimetric detection and imaging. The principle of synthetic aperture FM-CW radar is also described.

(66) Frequency Characteristics of the Radiation Boundary Condition in Finite-Difference Time-Domain Method and Its Improvement (Letters), by M. Kodama and M. Kuninaka (Faculty of Engineering, University of the Ryukyus, Okinawa, 903-01 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 81–85, Jan. 1994.

This letter examines how reflection characteristics of the radiation boundary condition (RBC) used in the finite-difference time-domain method are affected by frequencies and presents the coefficients included in the RBC which give expected reflection characteristics for a frequency.

(67) Ice Depolarization Characteristics on Ka-Band Satellite-to-Ground Path in Stratus Type Rainfall Events, by Y. Maekawa, N.-S. Chang, and A. Miyazaki (Osaka Electro-Communication University, Neyagawa, 572 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 239–247, Feb. 1994.

Both amplitude and phase of the mean ice depolarizations are, for the first time, evaluated in each rainfall event subtracting such theoretical rain depolarizations vectorially. Nature of the ice depolarizations in the stratus type rainfall events is then discussed in the light of the radar echoes detected above the bright band.

(68) Application of DBF Technique to Radar Systems, by S. Takeya*, M. Shinonaga*, Y. Sasaki*, H. Miyauchi*, M. Matsumura*, and T. Morooka** (*Komukai Works, Toshiba Co., Kawasaki, 210 Japan; **Communication Systems & Technology Laboratory, Toshiba Co., Kawasaki, 210 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 256–260, Feb. 1994.

This paper describes a DBF (digital beamforming) technique as a spatial filtering in the radar systems. DBF's for a beamformer and an adaptive processor are discussed. An architecture for the beamformer is proposed. The beamformer discussed consists of systolic arrays that can form beams arbitrarily. Antenna radiation patterns measured in an open site are shown.

(69) A Yearlong Performance of Satellite Broadcasting Receiving Systems, by Y. Purwanto, Y. Ogawa, M. Ohmiya, and K. Itoh (Faculty of Engineering, Hokkaido University. Sapporo, 060 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 808–814, June 1994.

A study on weather effects to three types of satellite broadcasting receiving antennas, a planar antenna, a center-fed parabolic reflector antenna, and an offset parabolic reflector antenna, is presented. The performance of receiving antenna systems is evaluated by a parameter G/T, where G denotes an antenna gain and T denotes equivalent noise temperature at an antenna output port.

(70) Frequency Domain Migration for Subsurface Radar Considering Variations in Propagation Velocity, by G. Ho*, A. Kawanaka*, and M. Takagi** (*Faculty of Science and Technology, Sophia University, Tokyo, 102 Japan; **Institute of Industrial Science, The University of Tokyo, Tokyo, 106 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 1056–1063, Aug. 1994.

A block migration method, in which the F-K method is applied to the divided image blocks with local propagation velocity, is proposed. In order to solve a problem concerning the connection between the contiguous blocks, two approaches, which are the processings using the overlapped regions and the lapped orthogonal transform, are described.

(71) Computer Error Analysis of Rainfall Rates Measured by a C-Band Dual-Polarization Radar, by Y. Ohsaki (Okinawa Radio Observatory, Communications Research Laboratory, Okinawa-ken, 901-24 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 1162–1170, Sept, 1994.

This paper evaluates rainfall rate errors caused by signal fluctuation. Computer simulation based on a physical raindrop model is used to investigate the standard deviation of rainfall rate. The simulation considers acquisition time, and uses both simultaneous and alternate sampling of horizontal and vertical polarizations for square law and logarithmic estimators at various rainfall rates and elevation angles.

(72) Applicability of Specific Rain Attenuation Models at Millimeter Wavelengths (Letters), by T. Ihara (Communications Research Laboratory, Koganei, 184 Japan): *IEICE Trans. Commun.*, vol. E77-B, pp. 1275–1278, Oct. 1994.

As a result of examination based on a newly available data set of millimeter-wave rain attenuation measured in the UK, it is found that the ITU-R specific rain attenuation model tends to appreciably underestimate millimeter-wave rain attenuation at frequencies above about 60 GHz for the UK rain climate. This tendency is very similar to that previously reported for the Japanese experimental data at frequencies up to 245 GHz.

(73) Wiener-Hopf Analysis of the Diffraction by a Parallel-Plate Waveguide Cavity with Partial Material Loading, by S. Koshikawa and K. Kobayashi (Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 975–985, June 1994.

The plane wave diffraction by a two-dimensional parallel-plate waveguide cavity with partial material loading is rigorously analyzed for both the E and H polarization using the Wiener-Hopf technique. Introducing the Fourier transform for the scattered field and applying boundary conditions in the transform domain, the problem is formulated in terms of the simultaneous Wiener-Hopf equations satisfied by the unkn own spectral functions.

(74) Errors of Physical Optics in Shadow Region: Fictitious Penetrating Rays, by M. Oodo, T. Murasaki, and M. Ando (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 995–1004, June 1994.

In order to extract the errors of PO (physical optics) in two-dimensional problems, the uniform and accurate expressions of EEC's (equivalent edge currents) for PO, which are in symmetrical forms analogous to the uniform version of EEC's for the geometrical theory of diffraction, are proposed. PO errors are easily extracted by comparing the uniform and explicit fields in terms of these currents.

(75) RCS of a Parallel-Plate Waveguide Cavity with Three-Layer Material Loading, by S. Koshikawa, T. Momose, and K. Kobayashi (Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1514–1521, Sept. 1994.

A rigorous radar cross-section (RCS) analysis of a two-dimensional parallel-plate waveguide cavity with three-layer material loading is carried using the Wiener-Hopf technique. Introducing the Fourier transform for the scattered field and applying boundary conditions in the transform domain, the problem is formulated in terms of the simultaneous Wiener-Hopf equations satisfied by the unknown spectral functions.

(76) Exact Analytical Solutions for Stationaty Input-Output Characteristics of a Nonlinear Fabry-Perot Resonator with Reflection Coatings (Letters), by K. Ogusu (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1522–1525, Sept. 1994.

Exact analytical solutions for the steady-state transmission and reflection characteristics of a nonlinear Fabry-Perot resonator applicable to bistable optical devices are derived. The resonator consists of a Kerr-like nonlinear film sandwiched by reflection mirrors made of a quarter-wave dielectric stack.

(77) Electromagnetic Plane Wave Scattering by a Loaded Trough on a Ground Plane, by R. Sato and H. Shirai (Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1983–1989, Dec. 1994.

Electromagnetic plane wave scattering by a loaded trough on a ground plane is analyzed by Kobayashi and Nomura's method. The field in each region is expressed in terms of appropriate eigen functions, whose excitation coefficients are determined by the continutiy condition across the aperture of the trough. Scattering far field patterns and radar cross section are calculated and compared with those obtained by other methods.

5) Microwave Medical/Biological Applications

(1) Experimental Researches on Human-Equivalent Antenna, by B.-Q. Gao* and J.-Y. Chen** (*Beijing Institute of Technology, Beijing, P.R.C.; **University of Science and Technology of China, Hefei, P.R.C.): *AES*, vol. 22, pp. 110-112, Mar. 1994.

A type of antenna of equivalent human body is presented. The experimental researches show that there is an approximate induced grounded current between human body and its equivalent antenna illuminated by a plane wave in the frequency band 7–100 MHz.

(2) Research on Interaction of Pulse Electromagnetic Wave with Human Body, by C.-Q. Wang and X.-L. Zhu (Peking University, Beijing, P.R.C.): *AES*, vol. 22, pp. 83–87, June 1994.

The interaction of the pulse electromagnetic field with human body by using the FD-TD method and the inhomogeneous block human body model is discussed. The currents induced in 2-D and 3-D inhomogeneous block human body models under the exposure of unclear EM pulse and the current versus time and the current distribution of the whole body model are calculated.

(3) A New System for Studying Biological Effect of Millimeter Wave on Cells , by B.-M. Wang (Tianjin Medical College, Tianjin, P.R.C.): *JIMW*, vol. 13, pp. 313–316, Aug. 1994.

For studying the biological effect of millimeter wave on yeast cells a new system, of which the long-time output frequency stability (10 kHz) can be achieved by using the phase locked technique, is introduced. In this system, a thermostat irradiation chamber is used which has a radiating slot (0.4 mm $\times$ 1.7 mm) with a definte field intensity distribution. The field effect on single cells can be exactly controlled, and the growth parameters of the scanned cells can be automatically observed and recorded.

(4) The Analysis of the Mechanisms for Microwave Auditory Effects, by Z.-Q. Niu (Xidian University, Xi'an, P.R.C.): *JM*, no. 3, pp. 22–27, July 1994.

The mechanism of microwave auditory effects is advanced which is based on the electric field stress. In order to analyse the electric field stress exerted on the two surfaces of human or animal skull, the model is established on the basis of the system consisting of three biological tissues.

(5) Microwave Power Deposition in Lossy Dielectric Spheres, by D. H. Lee and S. I. Yang (Department of Control and Instrumentation Engineering, Hanyang University, Seoul, Korea): *JKEE*, vol. 5, pp. 13–17, June 1994.

This paper presents analytical and experimental study of power deposition of lossy dielectric spheres at 2.45 GHz.

(6) Analysis of Current Densities Induced Inside Human Model Exposed to A.C. Electric Field, by A. Chiba*, K. Isaka**, and Y. Onogi*** (*Yonago National College of Technology, Yonago, 683 Japan; **Faculty of Engineering, Tokushima University, Tokushima, 770 Japan; ***Hiroshima

Institute of Technology, Hiroshima, 731-51 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 93–100, Feb. 1994.

A scalar potential method of integral equation is described for the analysis of the induced current density inside the heterogeneous human model of a realistic shape. The validity of the analysis method is verified by experimental results of the metallic human model.

(7) Analysis of SAR Distribution Produced by a Coaxial-Slot Antenna for Hyperthermia Considering the Effect of Boundary Surface, (Letters), by K. Ito*, K. Furuya**, J. Takada*, and H. Kasai* (*Faculty of Engineering, Chiba University, Chiba, 263 Japan; **Graduate School of Science and Technology, Chiba University, Chiba, 263 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 162–165, Mar. 1994.

SAR distributions produced by the coaxial-slot antennas for hyperthermia are analyzed by making use of the Sommerfeld integral that includes the effects of a boundary surface between free-space and a half infinite lossy medium as the human body. Dominant electric field components for desirable heat generations and hot spots are specified analytically.

(8) A Method for Observing the Three-Dimensional Patterns of Electromagnetic Power Absorbed by the Human Body: On the Gel Phantom of the Human Body Used for Studies of Electromagnetic Environmental Problem, by M. Miyakawa, N. Takahashi, and S. Hoshina (Faculty of Engineering, Niigata University, Niigata, 950-21 Japan): *Trans. IEICE*, vol. J77-B-II, pp. 487–495, Sept. 1994.

This paper is concerned with high molecular gel phantoms of the human body that are made from polyacrylamide or gellan gum containing a nonionic surface active agent. These phantoms can be used to visualize the 3-D pattern of electromagnetic power absorbed by the human body by making use of its temperature-dependent cloudiness.

6) Lasers and Other Devices

(1) Untrashort Pulse Amplification in Semiconductor Laser Amplifiers: Theory and Experiment, by K. Qiu* and Y.-Z. Ga** (* University of Electronic Science and Technology of China, Chengdu, P.R.C.; **Tsinghua University, Beijing, P.R.C.): *AES*, vol. 22, pp. 85–88, Feb. 1994.

The theoretical analysis and experimental study on ultrashort optical pulse amplification in semiconductor laser amplifiers are presented. The experimental result is in good agreement with that of the numerical solution.

(2) A New Circuit of Optically Tuned DRO, by Z.-F. Jiang*, K.-Z. Guo*, and L.A. Tirnogga** (*Institute of Electronics, Academia Sincia, Beijing, P.R.C.; **Leeds Metropolitan University, Leeds, UK): *AES*, vol. 22, pp. 88–91, June 1994.

A new method and an novel circuit of the optically tuned DRO are presented. The optical input changes the conductance of a GaAs photosensitive sample which causes the inverse voltage of the varactor diodes to be regulated, resulting in a shift of the central frequency of the DRO. The optical tuning range 32 MHz in 3.4 GHz is obtained with a little change in output power of the DRO.

(3) Circuit Modeling of Nonlinear Distortion of Single-Mode Semiconductor Laser Diode, by X.-G. Ren, G.-P. Xu, and T.-L. Dong (Huazhong University of Science and Technology, Wuhan, P.R.C.): *AES*, vol. 22, pp. 47–53, Aug. 1994.

A nonlinear circuit model based on the small signal equivalent circuit of semiconductor laser is presented. This model enables the modulation response and nonlinear distortion of LD and other relevant circuir to be analyzed in a unified manner using any general circuit analytical software. The second harmonic and third order intermodulation distortions of a single mode LD are predicted by using the established model.

(4) A 1551-nm Experimental PSK Homodyne Optical Phase-Locked Receiver, by Q. Li, X.-P. Zhang, and P.-D. Ye (Beijing University of Posts and Telecommunications, Beijing, P.R.C.): *JCIC*, vol. 15, pp. 79–82, Mar. 1994.

A 1551-nm PIN-diodes-balanced optical phase-locked loop, which has external cavity semiconductor lasers as the signal source and the local laser, is studied. The phase error of the loop is smaller than 3.6°, and steady locked time is longer than 30 minites. With the loop, a PSK homodyne receiver is researched.

(5) Optimization of Microwave Bandpass Modulators, by Z. Yi and Y.-X. Chen (Shanghai Jiao Tong University, Shanghai, P.R.C.): *JCIC*, vol. 15, pp. 104–111, Mar. 1994.

The performance of traveling-wave type guided-wave light modulators with polarity reversed electrodes is studied theoretically. Two kinds of electrodes, asymmetric strip line and coplanar waveguide, are applied to the polarity reversed structure. Design examples of modulators are also given, and the advantages of the use of asymmetric strip line is shown.

(6) Theoretical Analysis of the Properties in Polarization-Dependent Optical Isolator, by H.-D. Song and G.-Q. Liu (Shanghai Jiao Tong University, Shanghai, P.R.C.): *JCIC*, vol. 15, pp. 62–66, July 1994.

The properties of polarization-dependent optical isolators are analyzed in a systematic way, and the influence of the precision of processed components is analyzed. The reflection of surfaces, the coupling of fibers, and others on the properties of optical isolator are discussed. The pig-tailed optical isolators in wavelength 1.55 and 1.3 μm are successfully developed. The isolation is larger than 40 dB, and the forward loss is less than 1.5 dB.

(7) Optical Waveguide Having the Functions of Wavelength Division Multiplexer and Optical Switch, by Z.-Y. Lin and Y. Xu (Southeast University, Nanjing, P.R.C.): *JAS*, vol. 12, pp. 387–394, Dec. 1994.

A new type of optical waveguide having the functions of the wavelength division multiplexer and optical switch is presented. The characteristics of this device are analyzed and calculated numerically by employing the beam propagation method. The results of preliminary experiments indicate that this device has the good performance.

(8) Development of Photoconductive Switches and Its Applications, by N.-C. Yuan, C.-L. Ruan, and W.-G. Lin

(University of Electronic Science and Technology of China, Chengdu, P.R.C.): *JE*, vol. 16, pp. 518–522, Sept. 1994.

The picosecond photoconduction switches are developed and used to detect the pulse laser waveform. By using the photoconductive swiches, a novel model of a ultrawide band (UMB) radar is also developed. The experimental results are given to show the performances of the switches and the UWB radar.

(9) Experimental Study of Arterial Pulse Detector with Optic Fiber Sensor, by F.-Q. Jiang, S.-H. Guo, T.-Q. Zhang, and X.-G. Shen (Jilin University of Technology, Jilin, P.R.C.): *JE*, vol. 16, pp. 655–659, Nov. 1994.

A new arterial pulse detector using an optic fiber sensor is proposed, and the theory, experimental set-up, and experimental results of the apparatus are described. The optic fiber sensor is the detecting part that can detect the arterial pulse, and the image of arterial pulses is displayed on an oscilloscope.

(10) Fundamental Second-Order and Third-Order Nonlinear Distortions in Semiconductor Lasers, by K. S. Lee and Y. S. Moon (Department of Electrical Engineering, Sungkyunkwan University, Seoul, Korea): *JKITE*, vol. 31, pp. 18–26, May 1994.

The fundamental second-order and third-order harmonic distortions and intermodulation distortions are obtained in terms of the laser parameters. The fundamental nonlinear distortions are strongly affected by the spontaneous emission to lasing mode as well as the gain compression damping in the low frequency region.

(11) Gain Characteristics of Pr^{3+}-Doped Fluoride Fiber Amplifier, by M. Yamada*, M. Shimizu*, Y. Ohishi*, J. Temmyo**, T. Kanamori*, and S. Sudo* (*NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan; **NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 17–26, Jan. 1994.

Noise characteristics and temperature dependencies of the high gain Pr^{3+}-doped fluoride fiber amplifier are reported in detail. The noise figure in the wavelength region of shorter than 1.31 μm is 3.4 dB. When the fiber temperature is decreased, the signal gain increases, and the noise figure in longer than 1.31 μm and the saturation output power decrease.

(12) Characteristics of a Cherenkov Laser Improved by Loading a Kerr-Like Medium, by T. Shiozawa, E. Utsunomiya, and T. Ueda (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 41–47, Feb. 1994.

With the use of the finite element method, it is investigated how the amplification characteristics of a Cherenkov laser are improved by loading a Kerr-like medium on it. The numerical simulation shows that the proper choice of a nonlinear parameter of a Kerr-like medium keeps the electromagnetic wave propagating along the electron beam synchronized with it, thus enhancing greatly the amplification characteristics for the electromagnetic wave.

(13) Integrated Coupling Device between a Laser Diode and an Optical Fiber Using a Microlens, by J. Shimada, O. Ohguchi, R. Sawada, H. Tanaka, and A. Watabe (NTT Interdisciplinary Research Laboratories, Musashino, 180 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 390–397, June 1994.

An efficient coupling device between a GaAs/AlGaAs laser diode and an optical fiber using a microlens is described. The microlens converts the diverging beam emitted from the laser diode into a collimated beam and couples it to the optical fiber. It is experimentally demonstrated that the coupling efficiency is 26% for single mode fiber coupling and the alignment tolerance is 19 μm in the axial direction.

(14) Single-Mode Operation of a Compact D_2O Laser for Injection Locking and Oscillator-Amplifier Systems (Letters), by N. Takada*, K. Sasaki*, O. Takahashi*, M. Nagatsu*, and T. Tsukishima** (*School of Engineering, Nagoya University, Nagoya, 464-01 Japan; **Aichi Institute of Technology, Toyota, 470-03 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 408–411, June 1994.

Conditions required for single-mode operation are examined in a compact D_2O laser for two types of resonators having a length of 800 mm. An output power spectrum in single-mode operation has the extremely narrow linewidth of about 3 MHz. Its suitability as a master oscillator for injection locking and oscillator-amplifier systems is described.

(15) Reproduction of Optical Reflection-Intensity-Distribution Using Multi-Mode Laser Coherence, by N. Tanno and T. Ichimura (Faculty of Engineering, Yamagata University, Yonezawa, 992 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 415–422, July 1994.

A novel reflectometry for measuring optical images is presented by using multi-mode laser coherence. The proposed systems composed of a free-running multi-mode laser diode, an optical spectrometer, and a computing system for FFT can easily provide the potential for ultrahigh resolution on the order of 10 μm without scanning frequencies as in frequency domain reflectometers of either the continuously or stepwise swept variety.

(16) Effects of Space Charge and Multiple Scattering on the Gain of an X-Ray Free Electron Laser Using Stimulated Transition Radiation, by S. Yoshimori and M. Kawamura (Faculty of Engineering, Takushoku University, Hachioji, 193 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 473–480, Sept. 1994.

The gain of an X-ray free electron laser using stimulated resonance transition radiation is investigated, where the space charge effect of high-speed electron beam is solely considered, only the multiple scattering effect which occurs when the electron beam passes through periodically loaded thin metalic or polymer films exists, and the space charge and multiple scatering effect are simultaneously taken into account.

(17) Design of Receptacle Laser Diode Modules with Low Reflection, by M. Shimaoka*, Y. Yagiu*, T. Kumazawa*, S. Takahashi**, and A. Sasayama** (*Mechanical Engineering Research Laboratory, Hitachi, Ltd., Tsuchiura, 300 Japan; **Semiconductor and Integrated Circuits Division, Hitachi, Ltd., Nagano-ken, 384 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 695–702, Nov. 1994.

This paper describes the design of low-reflection receptacle laser diode modules for local area networks. Six low-reflection models of the fiber end face are discussed. It is possible to reduce back reflection by using a glass plate contacted with the PC-FC single-mode connector head physically.

(18) Grating-Assisted Directional Coupler Type Active Filters Using Gain Modulation (Letters), by H. Hatori and T. Kambayashi (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 713–715, Nov. 1994.

Three-divided gain modulation is introduced to InGaAsP/InP grating-assisted directional coupler type active filters, and its characteristics are analyzed. This structrure is useful for improvement of band-pass characteristics and tuning of band-pass wavelength.

(19) Optical Intersecting Waveguide Switches with Curved Electrodes, by J. Nayyer*, H. Hatami-Hanza**, and S. Safavi-Naeini*** (*Central Opto-electonics Research Laboratories, Sumitomo Cement Co., Ltd., Funabashi, 274 Japan; **Optical Communications Group, School of Electrical Engineering, The University of New South Wales, P.O. Box 1, Kensington 2033, Australia; ***Institute of Electrical Engineering, Tehran University, North Karegar Avenue, Tehran, Iran): *IEICE Trans. Electron.*, vol. E77-C, pp. 69–76, Jan. 1994.

Reflection type optical switches with intersecting waveguides and curved electrodes are newly proposed. The guided incident mode is expanded into an infinite spectrum of plane wavelets. The effects of light tunneling into the transmission port is taken care of by treating the three-layer structure and using its reflection and transmission coefficients in estimation of the extinction ratios. It is found that the electrode curved in the form of an exponential spiral provides remarkably improved power reflectivity.

(20) Taper-Shape Dependence of Tapered-Waveguide Traveling Wave Semiconductor Laser Amplifier (TTW-SLA), by S. El. Yumin*, K. Komori*, S. Arai*, and G. Bendelli** (*Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan; **Department of Electronics, Pavia University, Italy): *IEICE Trans. Electron.*, vol. E77-C, pp. 624–632, Apr. 1994.

Operation characteristics of GaInAsP/InP tapered-waveguide traveling wave semiconductor laser amplifiers are analyzed, and their dependences on the taper shape for typical cases of exponential, linear, quadratic, and Gaussian functions are investigated. The quasi adiabatic single mode propagation, signal gain and saturation output power, device efficiency property, and amplified spontaneous emission power are calculated for each type of taper shape.

(21) Design of a 1 W, Single-Filament Laser Diode, by I. B. Petrescu-Prahova, M. Buda, and T. G. van de Roer (Eindhoven University of Technology, P.O. Box 513-EEA, NL-5600 MB Eindhoven, The Netherlands): *IEICE Trans. Electron.*, vol. E77-C, pp. 1472–1478, Sept. 1994.

A design of a high power laser structure is presented which is based on an increase of the cavity length as well as a maximization of the stripe width. A variant for all design parameters needed to reach 1 W emission in the fundamental lateral mode is given.

(22) Analysis of Modes in a Vertical Cavity Surface Emitting Laser with Multilayer Bragg Reflectors, by S. Mukai, M. Watanabe, and H. Yajima (Electrotechnical Laboratory, Tsukuba, 305 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1479–1488, Sept. 1994.

A numerical method is introduced which is suitable for the mode analysis of an optical resonator with complicated refractive-index variations such as vertical cavity surface emitting lasers. It is found that TE modes have lower thresholds than TM modes, and that the laser beam can be steered by tailoring the gain distribution as with edge-emitting lasers.

7) Optical Fibers/Waveguides

(1) Stabilization and Sensitivity Improvement of Periodic Microbend Bare Fiber Sensor, by S. Kumar and H. K. Dixit, (J K Institute of Applied Physics and Technology, University of Allahabad, Allahabad 211 002, India): *JIETE*, vol. 40, no. 4, pp. 197–201, July/Aug. 1994.

The spectral microbending loss and length dependence of microbending sensitivity for bare fibers and black painted fibers are studied. The results show that microbending sensitivity is highly length dependent, and that it is more stabilized and substantially improved with black painted fiber, which suggests that black painted fiber is a better periodic microbend sensing fiber.

(2) Single-Mode Fiber Mode-Field Distribution Measurement by Optical Processing Method, by D.-R. Yangm, H.-M. Chen, and J.-C. Du (Nanjing Institute of Posts and Telecommunications, Nanjing, P.R.C.): *JCIC*, vol. 15, pp. 88–91, Jan. 1994.

A new method for field distribution measurement in single-mode fibers is presented. A matched spatial filter made by computer-generated hologram with Gauss-Laguerre (G-L) function is used for optical information processing, which is different from both the near and far-field approach. Coefficients of the G-L expansion are measured to fit the real field distribution, which directly leads to the analytical expression of G-L approximation.

(3) Novel Fast-Flow Coaxial Carbon-Monoxide Laser, by J. Zhang, N.-L. Wu, J.-W. Wang, J. Zhao, and Y.-Z. Yu (Tsinghua University, Beijing, P.R.C.): *JIMW*, vol. 13, pp. 461–466, Dec. 1994.

A new-type device, which has the strong points of both coaxial and transverse CW CO lasers, is reported. The fast-flow and relatively good cooling systems lead to 100 W of laser output power, and the circulating-flow technique results in great reduction of the consumption of working gases.

(4) Study of the Relationship between the Polarization and the Perturbation Power Spectrum with Mode Coupling in a Single-Mode Fiber, by Z.-P. Zhou, K.-B. Xiao, and Y.-X. Mai (South China University of Technology, Guangzhou, P.R.C.): *JIMW*, vol. 13, pp. 467–470, Dec. 1994.

The method to determine the mode-coupling coefficients by measuring the coupling ratio is proposed, and the relationship between the birefringence and the perturbation power spectrum is obtained, from which the information about perturbation in the process of making fibers is given.

(5) Research on Coupling Loss between the Single Mode Optical Fiber and the $LiNbO_3$ Waveguide, by Q.-S. Shen, X.-C. Gong, and W.-Y. Qu (Shanghai Jiao Tong University, Shanghai, P.R.C.): *JAS*, vol. 12, pp. 218–222, Sept. 1994.

The influence of mismatch between the fiber and waveguide modes on the fiber-waveguide coupling loss is investigated. The waveguide mode width and depth versus the metal Ti strip width are measured. By determining the appropriate waveguide parameters, it is found that the coupling loss between the fiber and waveguide is very low.

(6) Production and Growth of Modulation Instability in Mono-Mode Optical Fibers with High-Order Nonlinearity, by Y. Zhao and S.-W. Yang (Advanced Technology Research Center, Shenzhen University, Shenzhen, P.R.C.): *JE*, vol. 16, pp. 258–266, May 1994.

The productions and frequecy domains of the modulation instability in monomode optical fibers with high-order nonlinearity are given in normalized form. The requirements of group velocity dispersion for the existence of maximal modulation growth are obtained. Some new results, which are useful in practical applications of the modulation instability, are demonstrated by the numerical examples.

(7) The Axial Strain-Induced Stresses in Double-Coated Optical Fibers, by S.-T. Shiue (Feng Chia University, Taichung, Taiwan, China): *JCIE*, vol. 17, pp. 143–149, Jan. 1994.

The axial strain-induced stresses in double-coated optical fibers are analyzed. The lateral pressure, radial stress, tangential stress, and axial stress in the optical fiber are derived. The normal stresses in the optical fiber are proportional to the axial strain, and are determined by the material properties of the primary coating and secondary coating, and their thicknesses.

(8) The Hydrostatic Pressure-Induced Stresses in Double-Coating Optical Fibers, by S.-T. Shiue (Feng Chia University, Taichung, Taiwan, China): *JCIE*, vol. 17, pp. 593–599, July 1994.

Hydrostatic pressure-induced stresses in double-coated optical fibers are analyzed. The lateral pressure, radial stress, tangential stress, and axial stress in the optical fiber are found. The normal stresses in the optical fiber are proportional to the hydrostatic pressure, and are determined by the material properties of the primary and secondary coating, and their thicknesses.

(9) Repeaterless Transmission of 2.5-Gbps Signal Over 92-km Optical Fibers, by T.Y. Yun, J.H. Han, C.H. Lee, and C.S. Shim (Optical Transmission Section, Korea Electronics and Telecommunications Research Institute, Taejon, Korea): *JKITE*, vol. 31, pp. 26–38, Feb. 1994.

A repeaterless transmission of 2.5-Gbps digital signal over 98-km optical fibers is designed and implemented using a distributed feedback laser and an InGaAs avalanche photodiode, a preamplifier, an automatic gain control amplifier, and a clock/data regenerator. The best sensitivity is -35.5 dBm and the overload power is -9 dBm.

(10) Numerical Analysis of Optical Soliton Transmission in Fibers with Periodically Compensated Loss, M. W. Lee*, R. S. Kim**, and D. S. Seo* (*Department of Electrical Engineering, Myong Ji University, Yongin, Korea; **Korea Telecom Research Center, Seoul, Korea): *JKICS*, vol. 19, pp. 1191-1202, July 1994.

A stable propagation regime of soliton pulse trains in fibers with periodically compensated loss by lumped optical amplifiers is obtained. The allowable ranges of the soliton amplitude and amplifier gain are inversely proportional to the amplifier period.

(11) Finite-Element Analysis of Two-Dimensional Chirowaveguides, by S. Maruyama and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 12–16, Jan. 1994.

A numerical approach based on the finite element method is described for the analysis of two-dimensional chirowaveguides. Numerical results are shown for homogeneous chirowaveguides and chirowaveguides with graded chirality admittance profiles.

(12) Transparent Boundary for Finite-Element Beam-Propagation Method, by A. Maruta, Y. Arai, and M. Matsuhara (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 35–40, Feb. 1994.

A transparent boundary for the finite-element beam-propagation method to analyze a beam propagation in a finite computational window is proposed. In this method, a transparent boundary condition is derived by assuming a beam to be an outgoing wave in the vicinity of a virtual boundary, which eliminates undesirable reflections from a virtual boundary.

(13) Numerical Analysis of Scattering from the Edge-Type Scatterer in a Rectangular Waveguide by the Yasuura Method, by R. Ogata and T. Itakura (Faculty of Engineering, Kumamoto University, Kumamoto, 860 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 48–56, Feb. 1994.

A two-dimensional edge-type scattering problem in a rectangular waveguide is analysed by using the Yasuura method. Numerical results obtained by taking the singularities at the edge point into consideration show that the reflection properties of the triangular obstacle mainly depend on its front slope.

(14) Coupling Characteristics of Nonparallel Dielectric Waveguides, by Y. Tomabechi* and K. Matsumura** (*Faculty of Education, Utsunomiya University, Utsunomiya, 321 Japan; **Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 57–63, Feb. 1994.

A coupling system consisting of two dielectric disk waveguides with different diameters is analyzed. Eigen values of whispering gallery modes propagating along the disk are complex numbers because of radiation and dielectric losses. Electric field distributions and coupling coefficients of the coupling system are obtained numerically.

(15) A Step-Shape Characteristic Calculation Method in Rectangular Waveguide Using a Transmission Equation, by T. Suga and F. Ishihara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 64–70, Feb. 1994.

An efficient step-shape characteristic calculation method using a transmission equation is proposed. Assuming a step shape, it is shown that frequency dependency in the transmission equation can be eliminated, and assuming cross sections of similar shape, it is shown that scale dependency can also be eliminated.

(16) Finite-Element Analysis of Three-Dimensional Waveguide Transfer Problem: Application to Coaxial Line System, by H. Urano, A Maruta, and M. Matsuhara (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 95–100, Mar. 1994.

A finite-element solution of the three-dimensional waveguide transfer problem is proposed, in which the electromagnetic field in the discontinuity is represented by the finite-element method and that in the waveguide is expanded by the eigenmodes. The fields that are represented by the two different methods on the junctions between the discontinuity and the waveguides are connected by the Galerkin method using the eigenmode functions of the waveguide as the weighting functions. This method is applied to an axisymmetric discontinuity on a coaxial line system.

(17) Analytical Solutions of the Scattering Properties of H-Plane Junctions in Rectangular Waveguides, by A. Widarta, S. Kuwano, and K. Kokubun (College of Engineering, Nihon University, Koriyama, 963 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 375–382, June 1994.

Scattering properties of a rectangular waveguide H-plane cross junction, a T-junction, and a right-angle bend are analyzed. The electromagnetic field of each junction, which is expanded by the cylindrical mode function of integer order, is matched with the scattering electromagnetic field of respective rectangular waveguides at all boundaries.

(18) Analysis of Dielectric Optical Waveguides Using the Nonorthogonal FD-TD Method, by M. Araki, T. Kashiwa, and H. Tagashira (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 446–452, Aug. 1994.

Dielectric optical waveguides are analyzed by using the nonorthogonal FD-TD method. First, tapered optical waveguides are analyzed, and the results are compared with those obtained by the FFT-BPM. Next, optical directional couplers are analyzed, and the optimal shape parameters to exchange power between two waveguides are obtained.

(19) FFT Beam-Propagation Mehod Using Padé Approximate Operators, by J. Yamauchi, J. Shibayama, and H. Nakano (College of Engineering, Hosei University, Koganei, 184 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 490–495, Sept. 1994.

A Padé approximate operator is applied to the FFT beam-propagation method. It is found that the Padé operator is nondissipative in contrast to the wide-angle operator, even when the transverse sampling grid is extremely small.

(20) Calculation of Q-Factor and Treatment of Curved Conducting Wall in Cavity Analysis by FD-TD Method, by Y. Iida* and M. Morita** (*Faculty of Engineering, Kansai University, Suita, 564 Japan; **Institute of Industrial Technology, Kansai University, Suita, 564 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 496–503, Sept. 1994.

A method of calculating cavity Q is proposed. It is shown that for high-Q cavity Q-factor can be obtained with an accuracy of about 1 5.

(21) An Examination of the Equivalent Characteristic Impedance of Waveguides (Letters), by F. Ishihara (Faculty of Engineering, Tamagawa University, Machida, 194 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 504–506, Sept. 1994.

This letter discusses the characteristic impedance of waveguides based on a transmission equation that expresses nonuniform waveguide characteristics, and theoretically shows that the equivalent characteristic impedance having a one-to-one correspondence with the reflection coefficient can be defined.

(22) Finite Element Analysis of Three-Dimensional Chirowaveguides Using Hybrid Edge/Nodal Elements, by S. Maruyama and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 511–518, Oct. 1994.

A numerical approach based on the vector finite element method in terms of full components of electric or magnetic field using hybrid edge/nodal elements is described for the analysis of three-dimensional chirowaveguides. To show the validity and usefulness of the present formulation, computed results are shown for chiral-loaded circular waveguides and circular chirowaveguides, and the numerical accuracy is checked in detail.

(23) Iterative Finite Difference Beam Propagation Method Analysis of Nonlinear Optical Waveguide Excitation Problem, by H. Yokota, M. Hira, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 529–535, Oct. 1994.

To analyze third order nonlinear optical waveguides, the Crank-Nicolson finite difference beam propagation method with iterative calculation to converge the solution is proposed. Utilizing this method, a TE dominant mode excitation problem in dielectric slab waveguides with Kerr-like nonlinear cladding is analyzed.

(24) Tuning Bandwidth Enhancement in Waveguide Optical Second Harmonic Generation Device Using Phase-Reversed Quasi-Phasematching Grating, by M. Fujiwara*, M. L. Bortz**, M. M. Fejer**, T. Suhara*, and H. Nishihara* (*Faculty of Engineering, Osaka University, Suita, 565 Japan; **E. L. Ginzton Lab., Stanford University, Stanford, CA94305 USA): *Trans. IEICE*, vol. J77-C-I, pp. 536–541, Oct. 1994.

Waveguide quasiphasematched second harmonic generation (QPM-SHG) devices have narrow phasemismatch acceptance bandwidth. This paper demonstrates a technique for bandwidth enhancement while maintaining high efficiency. Partial phase-reversal of nonlinear polarization wave can modify the dependence of the SHG efficiency on the phasemismatch.

(25) Directional-Coupler Type TE-TM Mode Splitter Using Dielectric Multilayered Waveguide (Letters), by K. Matsubara and H. Yajima (Electrotechnical Laboratory, Tsukuba, 305 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 572–575, Oct. 1994.

A channel waveguide type TE-TM mode splitter is designed in directional-coupler style. This splitter uses the multilayered medium as one waveguide of the directional-coupler. As this multilayered guide is designed to hold only TE mode, parameters of the directional-coupler can be easily determined concerning only TE mode.

(26) Analysis of Optical Directional Coupler with Nonparallel Transition Sections, by K. Yasumoto, N. Shimoyama, and T. Hirata (Faculty of Engineering, Kyusyu University, Fukuoka, 812 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 686–694, Nov. 1994.

Coupled-mode equations for symmetric optical directional couplers with nonparallel transition sections are derived, which are based on the local normal modes and take into account the coupling between the guided modes and the radiation modes. The coupled-mode equations are numerically solved for the case of transition sections described by the linear, cosine, and hyperbolic tangent functions. Numerical results show that the transition sections of hyperbolic tangent function reduce significantly the radiation losses.

(27) Analysis of an Intersectional Optical Switch by the Finite Difference Beam Propagation Method, by H. Kinoshita and T. Kambayashi (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 703–709, Nov. 1994.

Three-dimensional analysis of an intersecting optical switch is performed by using the finite-difference beam propagation method. The influence of index difference, intersecting angle, and normalized frequency on the extinction ratio and power attenuation are evaluated.

(28) Analysis of Coupling Efficiency between Step-Index Optical Fibers through a Gap Utilizing Modified Beam Propagation Methods (Letters), by M. Hotta*, M. Geshiro**, and T. Tomimoto* (*Faculty of Engineering, Ehime University, Matsuyama, 790 Japan; **College of Engineering, University of Osaka Prefecture, Sakai, 593 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 710–712, Nov. 1994.

Coupling efficiency between butt-jointed single-mode optical fibers through a gap is evaluated with newly modified beam propagation methods in which the effects of reflection are taken into consideration. Numerical results obtained with these methods are compared with experimental and theoretical results which have been already reported.

(29) Laminated Polarizer with Ultrathin Germanium for the Shorter Wavelength with Emphasis on Modeling the Transition Layer at the Boundaries, by J. Matsuda, T. Uchida, and S. Kawakami (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 727–733, Dec. 1994.

High performance laminated polarizers (LAMIPOL's) with ultrathin germanium for the wide wavelength region, 0.6 μm $< \lambda <$ 1 μm, are fabricated. The wavelength dependence of LAMIPOL's with germanium film of more than 30 Å thickness is accurately calculated.

(30) An Analysis of Periodic Waveguides by Coupled-Mode Theory and Finite Element Method, by Y. Ohkawa*, M. Koshiba*, and K. Hirayama ** (*Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan; **Kitami Institute of Technology, Kitami, 090 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 734–739, Dec. 1994.

A numerical approach is proposed for the analysis of reflection characteristics of periodic waveguides. This approach is a combination of the coupled-mode theory (CMT) and the finite element method (FEM), and is called the CMT-FEM. FEM is used to calculate the upper and lower cutoff frequencies of the stopband and the standing wave distributions at these frequencies that determine the values of coupling coefficients included in coupled-mode equations.

(31) Finite-Difference Beam Propagation Method Using the Oblique Coordinate System, by J. Yamauchi, J. Shibayama, and H. Nakano (College of Engineering, Hosei University, Koganei, 184 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 740–745, Dec. 1994.

To eliminate quantization error caused by a stepped approximation of the waveguide bend geometry, the finite-difference beam propagation method (FD-BPM) using oblique coordinate system is proposed. It is found that the mode-mismatch loss observed for the oblique coordinates is much smaller than that for the rectangular coordinates. The present method can avoid a redundant calculation region which is required when the waveguide bend is analyzed using the rectangular coordinates.

(32) TE Waves along Square-Law-Index Type Slab Waveguide with Nonlinear Cladding (Letters), by K. Ono, H. Kodama, and M. Hotta (Faculty of Engineering, Ehime University, Matsuyama, 790 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 767–770, Dec. 1994.

Propagation characteristics of a nonlinear TE waves along slab waveguides consisting of a square-law-index type film and a nonlinear cladding are analyzed by the multilayer matrix method. The power dependence of the propagation constant and field distribution of the normal mode are compared with those of a waveguide including a step-index type film.

(33) Numerical Analysis of a Symmetric Nonlinear Directional Coupler, by H. Maeda and K. Yasumoto (Faculty of Engineering, Kyusyu University, Fukuoka, 812 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 298–302, Feb. 1994.

The power transfer characteristics of a symmetric nonlinear directional coupler (NLDC) are analyzed rigorously using the beam propagation method based on the finite difference scheme. The NLDC consists of two linear waveguides separated by a Kerr-like nonlinear gap layer. The change of nonlinear refractive index along the coupler is precisely evaluated by making use of the second-order iteration procedure with respect to a small propagation length.

(34) Numerical Synthesis of Multilayer Cladding Optical Waveguides by a Random Sampling Method, by S. Asakawa and Y. Kokubun (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 303–311, Feb. 1994.

A novel method of numerical synthesis of optical waveguides, which consists of the endless loop of the random sampling of waveguide parameters, numerical analysis, and the judgement of calculated result, is developed. This loop is repeated until some objective solutions satisfying required characteristics are discovered. When the structural condition is almost unknown and there is no clue to search it, this method is useful for discovering new-type waveguides, and this concept is applicable to any other devices.

(35) Effects of Trench Location on the Attenuation Constant in Bent Step-Index Optical Waveguides (Letters), by J. Yamauchi, T. Ando, M. Ikenaga, and H. Nakano (College of Engineering, Hosei University, Koganei, 184 Japan: *IEICE Trans. Electron.*, vol. E77-C, pp. 319–321, Feb. 1994.

Pure bend loss of a fiber with a trench section is calculated by the alternating-direction implicit finite-difference method. The dependence of the loss on the trench location is evaluated. The mechanism of the oscillatory behavior of the loss is discussed in terms of a modal approach in a dielectric slab waveguide.

(36) Modified Numerical Technique for Beam Propagation Method Based on the Galerkin's Technique, by G. Pu, T. Mizumoto, and Y. Naito (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 510–514, Mar. 1994.

A modified beam propagation method based on the Galerkin's technique has been implemented and applied to the analysis of optical beam propagation in a tapered dielectric waveguide. It is based on a new calculation procedure using nonuniform sampling spacings along the transverse coordinate.

(37) Ray-Optical Techniques in Dielectric Waveguides, by M. Hashimoto* and H. Hashimoto** (*Department of Applied Electronics, Osaka Electro-Communication University, Neyagawa, 572 Japan; **Graduate School of Engineering, Osaka Electro-Communication University, Neyagawa, 572 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 639–646, Apr. 1994.

A geometrical optics approach for the analysis of dielectric tapered waveguides is described. The method is based on the ray-optical treatment for wave-normal rays defined newly to waves of light in open structures. Geometrical optics fields are represented in terms of two kinds of wave-normal rays: leaky rays and guided rays.

(38) Beam Tracing Frame for Beam Propagation Analysis (Letters), by I. Takakuwa, A. Maruta, and M. Matsuhara (Faculty of Engineering, Osaka University, Suita, 565 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1009–1011, June 1994.

A beam tracing frame which shifts together with either the guided structure or the beam propagation in optical circuits is proposed. This frame is adaptive to the beam propagation analysis based on the finite-element method and can reduce the computational window size.

(39) Amplification Characteristics of Waveguide Type Optical Amplifier Using Nd Doped Garnet Thin Film, by M. Wada and Y. Miyazaki (Faculty of Engineering, Toyohashi University of Technology, Toyohashi, 440 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1138–1145, July 1994.

A waveguide type optical amplifier is proposed which is constructed in Nd doped yttrium gallium garnet thin films deposited on yttrium aluminum garnet substrates by using RF sputterring. For the wavelength of 1061.5 nm, a maximum gain of 4.4 dB and a S/N ratio of 12.6 dB are obtained at a signal power of 10 μW and the pump power of about 14 mW. The pump efficiency is more than 0.3 dB/mW.

(40) Numerical Analysis of Optical Switching Characteristics of Tapered Nonlinear Directional Coupler, by G. Pu, T. Mizumoto, Y. Sato, K. Ito, and Y. Naito (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1489–1495, Sept. 1994.

A novel nonlinear directional coupler consisting of tapered and uniform waveguides with self-focusing or self-defocusing nonlinear materials 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.

(41) Single-Mode Separation for Mode-Division Multiplexing by Holographic Filter (Letters), by M. Yoshikawa and K. Kameda (Faculty of Science, Yamaguchi University, Yamaguchi, 753 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1526–1527, Sept. 1994.

Mode separation of multiplexed modes in a mode-division multiplexing system is studied. The clear, desired single-mode pattern, which is separated from the multiplexed modes by using a holographic filter, is observed in the experiment.

(42) Theoretical Models of Two-Channel Erbium-Doped Fiber Amplifier (Letters), by S. Seikai and T. Tohi (Technical Research Center, Kansai Electric Power Co., Inc., Amagasaki, 661 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1702–1705, Oct. 1994.

In order to explain experimental optical gain characteristics of an erbium-doped fiber amplifier, modified simple laser schemes including cross relaxation among degenerate levels are proposed, and the optical gain dependence on the input signal power and on the erbium-doped fiber length is investigated.

(43) Theory of Chemical Waveguides (Letters), by K. Hayata and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1706–1709, Oct. 1994.

This letter predicts that chemical waves can propagate as a guided mode in a reaction-diffusion system that consists of two regions with different wave speeds. In comparison with electromagnetic waveguides, unique features of the guided chemical waves can be seen in their dispersion characteristics. Conditions for supporting lowest-loss guided waves are discussed.

(44) Statistical Analysis on Connection Characteristics of Optical Fiber Connectors, by Y. Ando*, S. Iwano**, K. Kanayama***, and R. Nagase** (*NTT Intellectual Property Department, Tokyo, 100 Japan; **NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan; ***Human Interface Laboratories, Musashino, 180 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1970–1982, Dec. 1994.

The statistical properties of insertion losses and return losses for optical connectors are investigated theoretically using the probability theory and the Monte Carlo simulation. It is demonstrated that the method can significantly improve insertion losses, and that an adjusting operation angle of 90° is sufficient to realize an insertion loss of less than 0.5 dB with 99% cumulative probability.

(45) A Beam Adaptive Frame for Finite-Element Beam Propagation Analysis (Letters), by I. Takakuwa*, and A. Maruta*, and M. Matsuhara** (*Faculty of Engineering, Osaka University, Suita, 565 Japan; **Faculty of Engineering, Okayama University of Science, Okayama, 700 Japan): *IEICE Trans. Electron.*, vol. E77-C, pp. 1990–1992, Dec. 1994.

A beam adaptive frame for finite-element beam-propagation analysis is proposed. The width of the frame can be adapted itself to either the guiding structure or the propagating beam in optical circuits, so the size of the computational window can be reduced.

8) Superconductive Devices

(1) Study on $YBa_2Cu_3O_{7-\delta}$ Superconducting Photodetectors, by J.-H. Hao*, F.-Q. Zhou*, H.-D. Sun*, X.-R. Zhao*, Z.-H. Mai*, X.-J. Yi*, and Z.-G. Li** (*Huazhong University of Science and Technology, Wuhan, P.R.C.; **National Laboratry of Laser Technology, Wuhan, P.R.C.): *AES*, vol. 22, pp. 41–46, Aug. 1994.

Both bolometric and optically induced nonequilibrium mechanisms for the superconducting photodetector are theoretically analysed. Formulas of responsibility for the device are shown. Characteristics of photodetectors based on the granular and epitaxial films are measured. High T_c superconducting $YBa_2Cu_3O_{7-\delta}$ film photodetectors with good performances are developed.

(2) Analysis of the High-T_c Superconducting Coplanar Waveguides Using the Frequency-Dependent Finite-Difference Time-Domain Method, by M. Taira, T. Kubo, T. Kitamura, and S. Kurazono (Faculty of Engineering, Osaka University, Suita, 565 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 81–87, Feb. 1994.

An analysis of high-T_c superconducting coplanar waveguide structures using the frequency-dependent finite-difference time-domain method is presented. The two-fluid model is used to describe the complex conductivity of the superconductor. Results on propagation constants of $YBa_2Cu_3O_{7-x}$ coplanar waveguides fabricated on $LaAlO_3$- or $LiNbO_3$-substrates are reported.

(3) Scattering Cross-Section for Superconductive Sphere (Letters), by K. Ohshima, S. Kitajyou, and M. Kuribayashi (Oyama National College of Technology, Oyama, 323 Japan): *Trans. IEICE*, vol. J77-C-I, pp. 763–766, Dec. 1994.

The equivalent permittivity for a superconductive medium is formulated by considering the complex conductivity of superconductor. Forward and backward scattering cross-sections for a superconductive sphere are presented.

9) Special Issues Related to Microwave Theory and Techniqes

(1) *JIETE*, vol. 40, no. 5, is a special issue on Microwave and MM wave sources and Applications–Part II.

(1.1) A Review on Some Aspects of a Gyro-TWT, by P. K. Jain and B. N. Basu (Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): pp. 3–9.

(1.2) One Dimensional Large Signal Analysis for Helix TWT's and Multicavity Klystrons, by E. V. R. Narasimha Rao and D. S. Venkateswarlu (Department of Electronics Engineering, Banaras Hindu University, Varanasi 221 005, India): pp. 11–15.

(1.3) Impregnated Dispenser M-Type Cathodes for MW Tubes: An Overview, by A. K. Chopra (Central Electronics Engineering Research Institute, Pilani 333 031, India): pp. 17–24..

(1.4) Design and Development of an S-Band Helix Travelling Wave Tube, by L. Kumar, S. M. Sharma, R. S. Raju, V. Srivastava, R. K. Gupta, S. K. Sharma, R. Verma, A. K. Sinha, S. Kapoor, S. S. Gupta, R. K. Sharma, S. S. S. Agarwala, and S. N. Joshi (Central Electronics Engineering Research Institute, Pilani 333 031, India): pp. 25–30.

(1.5) Effect of Enhanced Leakage Current on the Microwave Negative Resistance of High Efficiency GaAs Double Drift Region IMPATT Diode, by N. Mazumder and S. K. Roy (Centre of Advanced Study in Radio Physics & Electronics, University of Calcutta, 1, Girish Vidyaratna Lane, Calcutta 700 009, India): pp. 31–34.

(1.6) Theory of the MM Wave IMPATT Diode: A Review, by B. B. Pal, R. U. Khan, and P. Chakrabarti (Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): pp. 35–42.

(1.7) Application of Microwave Remote Sensing in the Detection of Buried Objects, by P. K. Mukherjee, S. K. Sharma, and K. P. Singh (Remote Sensing Laboratory, Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): pp. 43–47.

(1.8) Computer Aided Design of Dual Mode Electron Gun (Letters), by T. Tiwari, V. N. Tiwari, and R. K. Jha

(Centre of Research in Microwave Tubes, Department of Electronics Engineering, Institute of Technology, Banaras Hindu University, Varanasi 221 005, India): pp. 49–52.

(1.9) Substrate Thinning for Fabrication of IMPATT Diodes (Letters), by A. Ganguly*, S. K. Roy*, and J. P. Banerjee** (*Institute of Radiophysics & Electronics, Calcutta University, Calcutta 700 009, India; **Department of Electronics Engineering Science, Calcutta University, Calcutta 700 009, India): pp. 53–54.

(2) *Trans. IEICE*, vol. J77-C-I, no. 5, is a special issue on Integrated Photonics Technology.

(2.1) Design and Simulation of Optical Integrated Circuits (Invited), by M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 159–167.

(2.2) Modeling of Anisotropic Graded-Index Channel Waveguides, by K. Matsumae and M. Koshiba (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 168–174.

(2.3) Precise Formula for Calculating Spot Size in Optical Waveguides and Its Accuracy, by Y. Kokubun and S. Tamura (Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan): pp. 175–183.

(2.4) Planar Lightwave Circuits Based on Silica Waveguides on Silicon (Invited), by S. Suzuki and M. Kawachi (NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan): pp. 184–193.

(2.5) $LiNbO_3$ Optical Waveguide Devices (Invited), by M. Minakata (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 194–205.

(2.6) A Quasi-Phasematched Waveguide for the Blue Second-Harmonic-Generation (Invited), by M. Yamada, N. Nada, T. Yamaguchi, M. Saitoh, and K. Watanabe (Corporate Research Laboratories, Sony Co., Tokyo, 141 Japan): pp. 206–213.

(2.7) Er-Doped Silica-Based Planar Ring Resonator, by K. Hattori, T. Kitagawa, M. Oguma, Y. Hibino, Y. Ohmori, and M. Horiguchi (NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan): pp. 214–221.

(2.8) Integrated-Optic Grating-Scale-Displacement Sensor Using Linearly Focusing Grating Couplers, by S. Ura, M. Shinohara, T. Endoh, T. Suhara, and H. Nishihara (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 222–228.

(2.9) Fabrication and Characterization of Traveling-Wave Optical Modulators of $LiNbO_3$ Thin Film Waveguides Grown by Liquid Phase Epitaxy, by K. Ohno*, T. Kouyama*, M. Tsuji*, M. Nakamura*, and M. Izutsu** (*Ibiden Co., Ltd., Gifu-ken, 501-06 Japan; **Faculty of Engineering Science, Osaka University, Toyonaka, 560 Japan): pp. 229–237.

(2.10) Semiconductor Photonic Integrated Devices (Invited), by K. Tada and Y. Nakano (Faculty of Engineering, The University of Tokyo, Tokyo, 113 Japan): pp. 238–249.

(2.11) Quantum Energy Control of Multiple Quantum Well Structures by Selective Area MOCVD and Its Application to Photonic Integrated Devices, by M. Aoki, M. Suzuki, H. Sano, T. Taniwatari, T. Tsutsui, and T. Kawano (Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): pp. 250–259.

(2.12) Cl_2-ECR Plasma Etching of III/V Semiconductor and Its Application to Photonic Devices, by T. Yoshikawa, S. Kohmoto, Y. Sugimoto, and K. Asakawa (Opto-Electronics Research Laboratories, NEC Co., Tsukuba, 305 Japan): pp. 260–267.

(2.13) High-Speed (20Gbit/s) PLow-Drive-Voltage (2V $_{p-p}$) Strained-InGaAsP MQW Modulator/DFB Laser Light Source, by I. Kotake*, K. Sato*, K. Wakita*, M. Yamamoto*, and T. Kataoka** (*NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan; **NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): pp. 268–275.

(2.14) Noise Characteristics of Longwavelength Monolithically Integrated pin-FET's, by Y. Akahori, M. Ikeda, A. Kouzen, and Y. Itaya (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 276–284.

(2.15) Fabrication of pin/HEMT Receiver OEIC's for Gbit/s Lightwave Systems on 3-inch Diameter InP Substrate, by H. Yano, K. Doguchi, M. Murata, N. Nishiyama, G. Sasaki, and H. Hayashi (Optoelectronics R & D Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): pp. 285–292.

(2.16) Surface Operating Optoelectronic Devices and Applications to Optical Parallel Processing (Invited), by K. Hara, J. Ohta, Y. Nitta, and K. Kyuma (Semiconductor Research Laboratory, Mitsubishi Electric Co., Amagasaki, 661 Japan): pp. 293–302.

(2.17) $LiNbO_3$ Waveguide Etalon Array for Frequency Reference, by Y. Sakai, H. Miyazawa, O. Mitomi, and T. Kaino (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 303–310.

(2.18) Four-Wavelength DBR Laser Array Using Selective MOCVD Growth, by Y. Katoh, T. Kunii, Y. Matsui, H. Wada, T. Kamijoh, and Y. Kawai (Research & Development Group, Oki Electric Industry Co., Ltd., Hachioji, 193 Japan): pp. 311–316.

(2.19) Lossless and Low Crosstalk 4×4 Optical Switch Array, by T. Kirihara, M. Ogawa, H. Inoue, and K. Ishida (Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): pp. 317–324.

(2.20) Optical Neurochip for Image Processing, by Y. Nitta, J. Ohta, S. Tai, and K. Kyuma (Optoelectronics Mitsubishi Laboratory, RWCP, Amagasaki, 661 Japan): pp. 325–333.

(2.21) Vertical Photonics: A New Approach to Integrate Photonic Devices into Optical Fibers (Invited), by S. Kawakami and O. Hanaizumi (Research Institute of Electrical

Communication, Tohoku University, Sendai, 980 Japan): pp. 334–339.

(2.22) Hybrid Optical Integration Techonology (Invited), by M. Kobayashi* and K. Kato** (*Yokohama Development Center, Teijin Seiki Co., Ltd., Yokohama, 223 Japan; **NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan): pp. 340–351.

(2.23) Advanced Optical Packaging Technology toward Practical Integrated Photonic Modules (Invited), by H. Nakajima (Multimedia Systems Laboratories, Fujitsu Laboratories Ltd., Kawasaki, 211 Japan): pp. 352–362.

(2.24) Mode-Field-Converting Fiber for Coupling to Photonic Devices, by H. Yanagawa, T. Ono, and A. Oyobe (Opto-Technology Laboratory, Furukawa Electric Co., Ltd., Ichihara, 290 Japan): pp. 363–370.

(3) *Trans. IEICE*, vol. J77-C-I, no. 11, Nov. 1994, is a special issue on MM-Wave Technology and Its Applications.

(3.1) A Fin Line Diode Switch with Coupled Strip Conductors, by M. Matsunaga (Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan): pp. 585–591.

(3.2) NRD-Guide FM Gunn Oscillator at 60 GHz Band, by F. Kuroki, J. Baba, H. Furuya, and T. Yoneyama (Research Institute of Electrical Communication, Tohoku University, Sendai, 980-77 Japan): pp. 592–598.

(3.3) A Printed 2-Arm Spiral Antenna Operating at the 90 GHz-Band, by T. Fukutomi*, S. Kawasaki**, S. Ito***, and Y. Yasuoka* (*Department of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan; **Technical Research and Development Institute, Japan Defense Agency, Tachikawa, 190 Japan; ***R & D Center, TOKIMEC Inc., Tokyo, 144 Japan): pp. 599–606.

(3.4) Millimeter-Wave Active Integrated Antennas Utilizing Harmonics, by S. Kawasaki* and T. Itoh** (*Faculty of Engineering, Tokai University, Hiratsuka, 259-12 Japan; **Department of Electrical Engineering, UCLA, Los Angeles, California 90024-1594 USA): pp. 607–616.

(3.5) Multilayer MMIC Directional Coupler Using Thin Dielectric Layers and Its Applications to Millimeter-Wave Circuits, by S. Banba, A. Minakawa, T. Imaoka, and N. Imai (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 617–624.

(3.6) A Design and Fabrication of Millimeter-Wave Microstrip Antenna with MMIC, by H. Ohmine and M. Matsunaga (Mitsubishi Electric Co., Kamakura, 247 Japan): pp. 625–632.

(3.7) Millimeter Wave AlGaAs/InGaAs Heterojunction FET MMIC Oscillators, by M. Funabashi*, K. Ohata*, T. Inoue**, K. Onda*, K. Hosoya**, K. Maruhashi**, and M. Kuzuhara** (*Advanced Millimeter Wave Technologies Co., Ltd., Otsu, 520 Japan; **Kansai Electronics Research Laboratory, NEC Co., Otsu, 520 Japan): pp. 633–639.

(3.8) Millimeter-Wave Indoor High-Capacity Transmission Characteristics, by Y. Nakayama, A. Sato, and T. Yoshida (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 640–648.

(3.9) Optical TDM Scheme for Fiber-Optic Millimeter-Wave Radio System, by H. Harada, K. Tsukamoto, S. Komaki and N. Morinaga (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 649–658.

(3.10) Fiber-Optic Millimeter-Wave Subcarrier Transmission Links Using HBT's as Photodetectors, by E. Suematsu and N. Imai (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 659–670.

(3.11) Optical Control of Active Integrated Antennas Using Microwave-Optical Interaction, by S. Kawasaki* and T. Itoh** (*Faculty of Engineering, Tokai University, Hiratsuka, 259-12 Japan; **Department of Electrical Engineering, UCLA, Los Angeles, California 90024-1594 USA): pp. 671–678.

(4) *IEICE Trans. Commun.*, vol. E77-B, no. 2, is a special issue on Photonic Switching Technologies.

(4.1) Impact of Photonic Technology on the Future Communication (Invited), by H. Terada (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 96–99.

(4.2) Ultra Optoelectronic Devices for Photonic ATM Switching Systems with Tera-bits/sec Throughput (Invited), by T. Ozeki (Faculty of Science and Technology, Sophia University, Tokyo, 102 Japan): pp. 100–109.

(4.3) Photonic Space-Division Switching Technologies for Broadband Networks (Invited), by M. Fujiwara* and Sawano** (*Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan; **Switching Division, NEC Co., Abiko, 270-11 Japan): pp. 110–118.

(4.4) Overview of Photonic Switching Systems Using Time-Division and Wavelength-Division Multiplexing (Invited), by K. Murakami and S. Kuroyanagi (Fujitsu Laboratories Ltd., Kawasaki, 211 Japan): pp. 119–127.

(4.5) Recent Free-Space Photonic Switches (Invited), by M. Yamaguchi and K. Yukimatsu (NTT Communication Switching Laboratories, Musashino, 180 Japan): pp. 128–138.

(4.6) RookNet: A Switching Network for High Speed Communication, by Y. Oie*, Y. Sasaki**, and H. Miyahara*** (*Faculty of Computer Science and Systems Engineering, Kyusyu Institute of Technology, Iizuka, 820 Japan; **Cummunication Systems Laboratories, Mitsubishi Electric Co., Kamakura, 247 Japan; ***Faculty of Engineering Science, Osaka University, Toyonaka, 560 Japan): pp. 139–146.

(4.7) Comparison of a Novel Photonic Frequency-Based Switching Network with Similar Architectures, by H.-H. Witte (Corporate Research and Development, Siemens A. G., Otto Hahn Ring 6, 81739 Muenchen, Germany): pp. 147–154.

(4.8) Photonic Inter-Module Connector Using 8×8 Optical Switches for Near-Future Electronic Switching Systems, by A. Himeno*, R. Nagase*, T. Ito*, K. Kato**, and

M. Okuno** (*NTT Communication Switching Laboratories, Musashino, 180 Japan; **NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan): pp. 155–162.

(4.9) Analog Free-Space Optical Switch Structure Based on Cascaded Beam Shifters, by M. Yamaguchi*, T. Matsunaga*, S. Shirai**, and K. Yukimatsu* (*NTT Communication Switching Laboratories, Musashino, 180 Japan; **NTT Interdisciplinary Research Laboratories, Musashino, 180 Japan): pp. 163–173.

(4.10) A Proposal of a New Photonic FDM Switching System FAPS: Frequency Assign Photonic Switching System, by T. Yasui and A. Uemura (Mitsubishi Electric Co., Kamakura, 247 Japan): pp. 174–183.

(4.11) Demand Assign Wavelength Division Multiple Access (DA-WDMA) Hybrid Optical Local Area Network Using Optical Add-Drop Multiplexers, by T. Shiozawa*, S. Takahashi*, M. Eda**, A.P. Yazaki*, and M. Fujiwara* (*Opto-Electronics Research Laboratories, NEC Co., Kawasaki, 216 Japan; **Switching Division, NEC Co., Abiko, 270-11 Japan): pp. 184–189.

(4.12) A Modular Tbit/s TDM-WDM Photonic ATM Switch Using Optical Output Buffers, by W.D. Zhong, Y. Shimazu, M. Tsukuda, and K. Yukimatsu (NTT Communication Switching Laboratories, Musashino, 180 Japan): pp. 190–196.

(4.13) Electrocapillarity Optical Switch, by M. Sato (NTT Telecommunication Field Systems R & D Center, Ibaraki-ken, 319-11 Japan): pp. 197–203.

(4.14) 8×8 Ti:$LiNbO_3$ Waveguide Digital Optical Switch Matirx, by H. Okayama and M. Kawahara (Research & Development Group, Oki Electric Industry Co., Ltd., Hachioji, 193 Japan): pp. 204–208.

(4.15) Supply and Removal Characteristics of Oil in Optical Waveguide for Automated Optical Main-Distributing-Frame System, by N. Tamaru, M. Makihara, S. Inagaki, A. Nagayama, and K. Sasakura (NTT Interdisciplinary Research Laboratories, Musashino, 180 Japan): pp. 209–217.

(5) *IEICE Trans. Commun.*, vol. E77-B, no. 4, is a special issue on Fiber Amplifiers and Their Applications to Lightwave Communications.

(5.1) Praseodymium-Doped Fiber Amplifiers at 1.3 μm , by Y. Ohishi*, T. Kanamori*, M. Shimizu*, M. Yamada*, Y. Terunuma*, J. Temmyo**, M. Wada**, and S. Sudo* (*NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan; **NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 421–440.

(5.2) 100 Gbit/s Transmission Using All Optical Circuits, by S. Kawanishi and M. Saruwatari (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): pp. 441–448.

(5.3) Suppression of Gain Bandwidth Narrowing in a 4 Channel WDM System Using Unsaturated EDFA's and a 1.53 μm ASE Rejection Filter, by M. Suyama*, T. Terahara*, S. Kinoshita*, T. Chikama*, and M. Takahashi** (*Optoelectronic Systems Laboratory, Fujitsu Laboratories Ltd., Kawasaki, 211 Japan; **Fujitsu Limited, Kawasaki, 211 Japan): pp. 449–453.

(5.4) Studies on Optimization of an Erbium-Doped Fiber Amplifier Suitable for an Optical Transmission Line Containing an Amplifier Repeater, by S. Seikai, S. Shimokado, T. Fukuoka, and T. Tohi (Technical Research Center, Kansai Electric Power Co., Inc., Amagasaki, 661 Japan): pp. 454–461.

(5.5) Reduction of Timing Jitter Due to Gordon-Haus Effect in Ultra-Long High Speed Optical Soliton Transmission Using Optical Bandpass Filters, by S. Kawai, K. Iwatsuki, K. Suzuki, S. Nishi, and M. Saruwatari (NTT Transmission Systems Laboratories, Yokosuka, 238-03 Japan): pp. 462–468.

(6) *IEICE Trans. Commun.*, vol. E77-B, no. 5, is a special issue on Adaptive Signal Processing in Mobile Radio Communications.

(6.1) Adaptive Signal Processing for Optimal Transmission in Mobile Radio Communications (Invited), by H. Suzuki (NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 535–544.

(6.2) Blind Equalization and Blind Sequence Estimation (Invited), by Y. Sato (Faculty of Science, Toho University, Funabashi, 274 Japan): pp. 545–556.

(6.3) A Fast Tracking Adaptive MLSE for TDMA Digital Cellular Systems, by K. Okanoue*, A. Ushirokawa*, H. Tomita**, and Y. Furuya** (*C & C Research Laboratories, NEC Co., Kawasaki, 213 Japan; **Personal C & C Development Laboratories, NEC Co., Kawasaki, 216 Japan): pp. 557–565.

(6.4) A Novel Selection Diversity Method with Decision Feedback Equalizer, by H. Ishikawa and H. Kobayashi (Research & Development Laboratories, Kokusai Denshin Denwa Co., Ltd., Kamifukuoka, 356 Japan): pp. 566–572.

(6.5) Adaptive Receiver Consisting of MLSE and Sector-Antenna Diversity for Mobile Radio Communications, by H. Murata, S. Yoshida, and T. Takeuchi (Faculty of Engineering, Kyoto University, Kyoto, 606-01 Japan): pp. 573–579.

(6.6) Blind Interference Cancelling Equalizer for Mobile Radio Communications, by K. Fukawa and H. Suzuki (NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 580–588.

(6.7) Coherent Hybrid DS-FFH CDMA with Adaptive Interference Cancelling for Cellular Mobile Communications, by S. Tomisato, K. Fukawa, and H. Suzuki (R & D Department, NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 589–597.

(6.8) Spectral Efficiency Improvement by Base Station Antenna Pattern Control for Land Mobile Cellular Systems, by T. Ohgane (ATR Optical and Radio Communications Research Laboratories, Kyoto-fu, 619-02 Japan): pp. 598–605.

(6.9) Analysis of a Distributed Antenna System and Its Performance under Frequency Selective Fading, by K. Tokuda, S. Sato, Y. Shiraki, and A. Fukasawa (Communication Systems Laboratory, Oki Electric Industry Co., Ltd., Tokyo, 108 Japan): pp. 606–623.

(6.10) Adaptive Array Antenna Based on Spatial Spectral Estimation Using Maximum Entropy Method, by M. Nagatsuka*, N. Ishii*, R. Kohno*, and H. Imai** (*Faculty of Engineering, Yokohama National University, Yokohama, 240 Japan; **Faculty of Engineering, The University of Tokyo, Tokyo, 113 Japan): pp. 624–633.

(6.11) Multicarrier 16 QAM System in Land Mobile Communications, by Y. Omori* and H. Sasaoka** (*Faculty of Science and Engineering, Chuo University, Tokyo, 112 Japan; **Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 634–640.

(6.12) Predictive Antenna Selection Diversity (PASD) for TDMA Mobile Radio, by Y. Yamao and Y. Nagao (Research and Development Department, NTT Mobile Communications Network Inc., Tokyo, 105 Japan): pp. 641–646.

(6.13) An Adaptive Equalizer Equipped with a Neural Network and a Viterbi Decoder (Letters), by K. Iwasaki (Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 647–649.

(7) *IEICE Trans. Commun.*, vol. E77-B, no. 6, is a special issue on Biological Effects of Electromagnetic Fields.

(7.1) Biological Effects of ELF Electric Fields: Historical Review on Bioengineering Studies in Japan (Invited), by G. Matsumoto* and K. Shimizu** (*Department of Applied Electronics, Hokkaido Institute of Technology, Sapporo, 006 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 684–692.

(7.2) Researches on Biological and Electromagnetic Environments in RF and Microwave Regions in Japan (Invited), by Y. Amemiya (Department of Electronics Engineering, Kanazawa Institute of Technology, Ishikawa-ken, 921 Japan): pp. 693–698.

(7.3) Measurements of Power Frequency Electromagnetic Environments and Consideration into Exposure Evaluation (Invited), by K. Isaka, N. Hayashi, M. Okamoto, and Y. Yokoi (Faculty of Engineering, Tokushima University, Tokushima, 770 Japan): pp. 699–707.

(7.4) An Experimental SAR Estimation of Human Head Exposure to UHF Near Fields Using Dry-Phantom Models and a Thermograph (Invited), by T. Nojima*, S. Nishiki*, and T. Kobayashi ** (*NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan; **NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 708–713.

(7.5) Development of a Technique to Evaluate Human Exposure to Ion-Current Fields Using Boundary Element Method: For Environmental Assessment of High Voltage Transmission Lines, by M. Yamashita*, K. Shimizu**, and G. Matsumoto* (*Department of Applied Electronics, Hokkaido Institute of Technology, Sapporo, 006 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 714–718.

(7.6) Fundamental Analysis on Perception Mechanism of ELF Electric Field, by H. Odagiri*, K. Shimizu**, and G. Matsumoto* (*Department of Applied Electronics, Hokkaido Institute of Technology, Sapporo, 006 Japan; **Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 719–724.

(7.7) Frequency Characteristics of Energy Deposition in Human Model Exposed to Near Field of an Electric or a Magnetic Dipole, by S. Watanabe*, M. Taki*, and Y. Kamimura** (*Faculty of Technology, Tokyo Metropolitan University, Hachioji, 192-03 Japan; **Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): pp. 725–731.

(7.8) Computation of SAR Inside Eyeball for 1.5-GHz Microwave Exposure Using Finite-Difference Time-Domain Technique, by O. Fujiwara and A. Kato (Faculty of Engineering, Nagoya Institute of Technology, Nagoya, 466 Japan): pp. 732–737.

(7.9) A Noninvasive Method for Dielectric Property Measurement of Biological Tissues, by J. Wang and T. Takagi (Faculty of Engineering, Tohoku University, Sendai, 980 Japan): pp. 738–742.

(7.10) Penetration Characteristics of Submillimeter Waves in Tissues and Aqueous Solution of Protein, by T. Fuse*, M. Taki**, and O. Yokoro*** (*Department of Electrical Engineering, Faculty of Engineering, Shonan Institute of Technology, Fujisawa, 251 Japan; **Department of Electronics and Information Engineering, Faculty of Technology, Tokyo Metropolitan University, Hachioji, 192-03 Japan; ***Department of Electrical Engineering, Faculty of Technology, Tokyo Metropolitan University, Hachioji, 192-03 Japan): pp. 743–748.

(7.11) Estimation of Electric Field Intensity in the Fresnel Region of Colinear Array Antennas, by T. Kobayashi* and T. Nojima** (*NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan; **NTT Mobile Communications Network Inc., Yokosuka, 238-03 Japan): pp. 749–753.

(7.12) An Analysis of Dose in Tissue Irradiated by Near Field of a Circular Loop Antenna, by H. Terada*, F. Kitagawa*, N. Okamoto**, S. Watanabe***, M. Taki***, and M. Saito**** (*Health Science Research Laboratory, Matsushita Electric Works, Ltd., Kadoma, 571 Japan; **Faculty of Science and Technology, Kinki University, Higashi-Osaka, 577 Japan; ***Faculty of Technology, Tokyo Metropolitan University, Hachioji, 192-03 Japan; ****Faculty of Medicine, The University of Tokyo, Tokyo, 113 Japan): pp. 754–761.

(7.13) Effect of 2.45 GHz Microwave Irradiation on Monkey Eyes (Letters), by Y. Kamimura*, K. Saito**, T. Saiga***, and Y. Amemiya**** (*Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan; **Nippon

Veterinary and Animal Science University, Musashino, 180 Japan; ***Nippon Medical School, Tokyo, 113 Japan; ****Department of Electronics Engineering, Kanazawa Institute of Technology, Ishikawa-ken, 921 Japan): pp. 762–765.

(7.14) Electromagnetic Wave Absorption in Multilayered Anisotropic Models of Tissue (Letters), 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 Unversity, Sojya, 719-11 Japan; ***Faculty of Engineering, University of Osaka Prefecture, Sakai, 591 Japan): pp. 766–769.

(8) *IEICE Trans. Commun.*, vol. E77-B, no. 7, is a special issue on Personal, Indoor and Mobil Radio Communications.

(8.1) High-Performance, Fair Access Control Method for Wireless LAN's, by Y. Takiyasu and E. Amada (Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): pp. 855–861.

(8.2) Semi-Autonomous Synchronization among Base Stations for TDMA-TDD Communication Systems, by H. Kazama*, S. Nitta*, M. Morikura**, and S. Kato* (*NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan); pp. 862–867.

(8.3) Full-Duplex Asynchronous Spread Spectrum Modem Using a SAW Convolver for 2.4-GHz Wireless LAN, by H. Nakase, A. Namba, K. Masu, and K. Tsubouchi (Research Institute of Electrical Communication, Tohoku University, Sendai, 980 Japan): pp. 868–875.

(8.4) Performance Evaluation of Slow-Frequency-Hopping Spread Spectrum Transmission in Rayleigh Fading Indoor Channels, by T. Ishifuji and E. Amada (Central Research Laboratory, Hitachi, Ltd., Kokubunji, 185 Japan): pp. 876–882.

(8.5) A Study on the Performance Improvements of Error Control Schemes in Digital Cellular DS/CDMA Systems, by I.-W. Lee and D.-H. Cho (Department of Computer Engineering at Kyung Hee University, #1 Seochunri Yonginkun Kyungkido, Korea, 449-701): pp. 883–890.

(8.6) Performance Evaluation of Slow-Frequency Hopped/Joint Frequency-Phase Modulation in Broadband and Partial-Band Noise Jamming, by I. Ghareeb and A. Yongacoglu (Department of Electrical Engineering, University of Ottawa, Ontario, Canada KIN 6N5): pp. 891–899.

(8.7) Multi-Carrier CDMA in Indoor Wireless Radio Networks, by N. Yee*, J.-P.M.G. Linnartz*, and G. Fettweis** (*Department of Electrical Engineering and Computer Science, University of California, Berkeley, 94720 USA; **Teknekron Communications Systems, Inc., Berkeley, CA 94704 USA): pp. 900–904.

(8.8) A Group Demodulator Employing Multi-Symbol Chirp Fourier Transform, by K. Kobayashi, T. Kumagai, and S. Kato (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 905–910.

(8.9) Field Experiments on 16 QAM/TDMA and Trellis Coded 16QAM/TDMA Systems for Digital Land Mobile Radio Communications, by N. Kinoshita*, S. Sampei**, E. Moriyama***, H. Sasaoka***, Y. Kamio***, K. Hiramatsu*, K. Miya*, K. Inogai*, and K. Homma* (*Matsushita Communication Industrial Co., Ltd., Yokohama, 226 Japan; **Faculty of Engineering, Osaka University, Suita, 565 Japan; ***Communications Research Laboratory, Ministry of Posts and Telecommunications, Koganei, 184 Japan): pp. 911–920.

(8.10) A New Fully-Digitalized π/4-Shift QPSK Modulator for Personal Communication Terminals, by T. Sakata, K. Seki, S. Kubota, and S. Kato (NTT Radio Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 921–926.

(8.11) A New Burst Coherent Demondulator for Microcellular TDMA/TDD Systems, by Y. Matsumoto, S. Kubota, and S. Kato (NTT Radiò Communication Systems Laboratories, Yokosuka, 238-03 Japan): pp. 927–933.

(8.12) Performace Analysis of Road Traffic Data Collection System, by J.-P.M.G. Linnartz* and M. Westerman** (*Department of Electrical Engineering and Computer Science, University of California, Berkeley, 94720 USA; **Department of Transportation Planning and Highway Engineering, Delft University of Technology, The Netherlands): pp. 934–938.

(8.13) Integration of Voice and Data in Wireless Information Networks with Data Steal into Voice Multiple Access, by G. Wu, K. Mukumoto, and A. Fukuda (Faculty of Engineering, Shizuoka University, Hamamatsu, 432 Japan): pp. 939–947.

(8.14) Voice Activity Detection and Transmission Error Control for Digital Cordless Telephone System, by S. Sasaki, I. Matsumoto, O. Watanabe, and K. Urabe (Sendai Laboratory, Kokusai Denshin Denwa Co., Ltd., Sendai, 981-31 Japan): pp. 948–955.

(8.15) A New Structure of Antenna System in a Handset Enhancing Antenna Gain by Passive Loading: The Case for $\lambda/4$ Monopole Antenna, by M. Hirose and M. Miyake (Hamura Technical Center, Casio Computer Co., Ltd., Hamura, 205 Japan): pp. 956–961.

(8.16) Signal Strength Prediction and Distribution Characteristics in Indoor Radio Propagation at 2.5 GHz Band, by H. Furukawa*, K. Oosaki*, Y. Akaiwa*, and H. Shimizu** (*Faculty of Computer Science and Systems Engineering, Kyusyu Institute of Technology, Iizuka, 820 Japan; **Mobile Communication System Research Co., Ltd., Tokyo, 103 Japan): pp. 962–970.

(8.17) Average Channel Capacity in a Mobile Radio Environment with Rician Statistics (Letters), by F. Lazarakis*, G. S. Tombras**, and K. Dongakis* (*Institute of Informatics and Telecommunications, N.C.S.R. "Demokritos", GR-153

10, Aghia Paraskevi, Athens, Greece; **Laboratory of Electronics, Department of Physics, University of Athens, TYPA Buildings, Ilisia, GR-157 71 Athens, Greece): pp. 971–977.

(8.18) A Proposal of a Mobile Radio Channel Database and Its Application to a Simple Channel Simulator (Letters), by T. Takeuchi (Faculty of Engineering, Kyoto Sangyo University, Kyoto, 603 Japan): pp. 978–980.

(9) *IEICE Trans. Electron.*, vol. E77-C, no. 1, is a special issue on Optical Interconnection.

(9.1) Optical Interconnections in Switching System (Invited), by K. Yukimatsu and Y. Shimazu (NTT Communication Switching Laboratories, Musashino, 180 Japan): pp. 2–8.

(9.2) Parallel Photonic Devices and Concepts Good for Optical Interconnects (Invited), by K. Iga (Faculty of Engineering, Tokyo Institute of Technology, Yokohama, 227 Japan): pp. 9–14.

(9.3) Interconnection Architecture Based on Beam-Steering Devices (Invited), by H. Itoh, S. Mukai, and H. Yajima (Optoelectronics Division, Electrotechnical Laboratory, Tsukuba, 305 Japan): pp. 15–22.

(9.4) Four-Channel Receiver Optoelectronic Integrated Circuit Arrays for Optical Interconnections, by H. Hayashi, G. Sasaki, H. Yano, N. Nishiyama, and M. Murata (Optoelectronics R & D Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, 244 Japan): pp. 23–29.

(9.5) Pure Optical Parallel Array Logic System: An Optical Parallel Computing Architecture, by T. Konishi, J. Tanida, and Y. Ichioka (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 30–34.

(9.6) Optical Parallel Interconnection Based on Group Multiplexing and Coding Technique, by T. Horimatsu, N. Fujimoto, K. Wakao, and M. Yano (Fujitsu Laboratories Ltd., Kawasaki, 211 Japan): pp. 35–41.

(9.7) Crosstalk Characteristic of Monolithically Integrated Receiver Arrays, by Y. Akahori, M. Ikeda, A. Kohzen, and Y. Itaya (NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 42–49.

(9.8) Bending Loss Characteristics of MQW Optical Waveguides, by T. Aizawa, K.G. Ravikumar, M. Akiyama, T. Watanabe, T. Sekiguchi, M. Agata, and R. Yamaguchi (Advanced Tech. R & D Center, Fujikura Co., Ltd., Sakura, 285 Japan): pp. 50–55.

(9.9) Optical Associative Memory Using Optoelectronic Neurochips for Image Processing, by M. Oita, Y. Nitta, S. Tai, and K. Kyuma (Semiconductor Research Laboratory, Mitsubishi Electric Co., Amagasaki, 661 Japan): pp. 56–62.

(10) *IEICE Trans. Electron.*, vol. E77-C, no. 5, is a special issue on Organic Functional Devices.

(10.1) Control of Electronic State in Oragnic Semiconductor by Substituent Groups, by K. Saito and H. Yokoyama (Electrotechnical Laboratory, Tsukuba, 305 Japan): pp. 654–656.

(10.2) Inelastic Electron Tunneling Spectroscopy and Optical Characterization of TMPD Absorbed C_nTCNQ Langmuir-Blodgett Films, by S. Kuniyoshi*, M. Nagaoka*, K. Kudo*, S. Terashita**, Y. Ozaki**, K. Iriyama***, and K. Tanaka* (*Faculty of Engineering, Chiba University, Chiba, 263 Japan; **Schoool of Science, Kwansei Gakuin University, Nishinomiya, 662 Japan; ***Institute of Medical Science, Jikei University of School of Medicine, Tokyo, 105 Japan): pp. 657–661.

(10.3) Electron Transport Mechanism through Porphyrin Polyimide Langmuir-Blodgett Films, by M. Iwamoto and T. Kubota (Faculty of Engineering, Tokyo Institute of Technology, Tokyo, 152 Japan): pp. 662–665.

(10.4) Electrical and Optical Properties of Organic Thin Film Multilayer Structure and Its Application for Electroluminescent Diode, by Y. Ohmori, C. Morishima, A. Fujii, and K. Yoshino (Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 666–671.

(10.5) Organic Display Devices Using Poly (Arylene Vinylene) Conducting Polymers, by M. Onoda*, H. Nakayama*, Y. Ohmori**, and K. Yoshino** (*Faculty of Engineering, Himeji Institute of Technology, Himeji, 671-22 Japan; **Faculty of Engineering, Osaka University, Suita, 565 Japan): pp. 672–678.

(10.6) Cerenkov Radiation of Second Harmonic Wave by Poled Polymer Planar Waveguide of pNAn-PVA, by T. Kinoshita*, K. Tsuchiya*, K. Sasaki*, Y. Yokoh**, H. Ashitaka**, and N. Ogata*** (*Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **Chiba Laboratory, Ube Industries, Ltd., Ichihara, 290 Japan; ***Department of Chemistry, Sophia University, Tokyo, 102 Japan): pp. 679–683.

(10.7) Second Harmonic Generation in 450 nm Region by 2-Furyl Methacrylic Anhydride Crystal, by T. Kinoshita*, S. Horinouchi*, K. Sasaki*, H. Okamoto**, and N. Tanaka** (*Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **Tokuyama Soda Co., Ltd., Tsukuba, 305 Japan): pp. 684–688.

(10.8) Optical Kerr Shutter Utilizing Symmetrical Π-Conjugated Dyes Dispersed in PMMA, by N. Ooba*, H. Kanbara**, S. Tomaru*, T. Kurihara*, and T. Kaino** (*NTT Opto-Electronics Laboratories, Ibaraki-ken, 319-11 Japan; **NTT Opto-Electronics Laboratories, Atsugi, 243-01 Japan): pp. 689–693.

(10.9) Refractive Index Change of Vanadyl Phthalocyanine Thin Film in Guided Wave Geometry, by T. Wada*, Y. Matsuoka**, M. Sekiya***, K. Sasaki***, and H. Sasabe* (*Frontier Research Program, Institute of Physical and Chemical Research, Wako, 351-01 Japan; **Material Research Laboratory, Hoya Co., Akishima, 196 Japan; ***Faculty of Science and Technology, Keio University, Yokohama, 223 Japan): pp. 694–699.

(10.10) Two-Photon Absorption Measurements in PDA(12,8) Waveguides, by A. Kaneko*, A. Ito*, O. Furukawa*, T. Wada**, H. Sasabe**, and K. Sasaki* (* Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **Frontier Research Program, Institute of Physical and Chemical Research, Wako, 351-01 Japan): pp. 700–703.

(10.11) All-Optical Switching Phenomenon in Polydiacetylene(12,8) Based on Nonlinear Directional Coupler, by A. Kaneko*, T. Kuwabara*, T. Wada**, H. Sasabe**, and K. Sasaki* (*Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **Frontier Research Program, Institute of Physical and Chemical Research, Wako, 351-01 Japan): pp. 704–708.

(11) *IEICE Trans. Electron.*, vol. E77-C, no. 6, is a special issue on Measurement Techniques for Microwave/Millimeter Wave.

(11.1) Round Robin Test on a Dielectric Resonator Method for Measuring Complex Permittivity at Microwave Frequency (Invited), by Y. Kobayashi* and H. Tamura** (*Faculty of Engineering, Saitama University, Urawa, 338 Japan; **Murata Manufacturing Co., Ltd., Yokkaichi, 527 Japan): pp. 882–887.

(11.2) Precise Measurement for Temperature Dependence of Dielectric Rod Materials Using an Image-Type Resonator Method, by Y. Kogami*, Y. Kobayashi**, and M. Katoh** (*Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan; **Faculty of Engineering, Saitama University, Urawa, 338 Japan): pp. 888–893.

(11.3) A Measurement Method of Complex Permittivity at Pseudo Microwave Frequencies Using a Cavity Resonator Filled with Dielectric Material, by A. Nakayama (Analysis Center, Kyocera Co., Kagoshima, 899-43 Japan): pp. 894–899.

(11.4) Accurate Q-Factor Evaluation by Resonance Curve Area Method and Its Application to the Cavity Perturbation, by T. Miura, T. Takahashi, and M. Kobayashi (TDK Corporation Materials Research Center, Narita, 286 Japan): pp. 900–907.

(11.5) A Time Domain Reflectometry Using Envelope Extraction and Its Application to Measurement of Stripline Resonator Characteristics, by T. Omori, K. Yashiro, and S. Ohkawa (Graduate School of Science and Technology, Chiba University, Chiba, 263 Japan): pp. 908–912.

(11.6) A Simple Method for Separating Dissipation Factors in Microwave Printed Circuit Boards, by H. Tanaka* and F. Okada** (*Sumibe Techno-Research Co., Ltd., Yokohama, 245 Japan; **Kokushikan University, Tokyo, 154 Japan): pp. 913–918.

(11.7) Measurement of Wave Intensity Reflected from Object by Range Doppler Imaging in Ordinary Laboratory Room, by O. Hashimoto, T. Abe, and W. Tsuchida (College of Science and Engineering, Aoyama Gakuin University, Tokyo, 157 Japan): pp. 919–924.

(11.8) A Simple Adapter De-Embedding Method in the Six-Port Calibration Process Using a Scalar Analyzer, by T. Yakabe and H. Yabe (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): pp. 925–929.

(11.9) Variance Distribution of Reflection Coefficients in Six-Port Reflectometer. by M. Kinoshita, H. Suzuki, T. Yakabe, and H. Yabe (Faculty of Electro-Communications, University of Electro-Communications, Chofu, 182 Japan): pp. 930–934.

(11.10) Intermodulation and Noise Power Ratio Analysis of Multiple-Carrier Amplifiers Using Discrete Fourier Transform, by T. Takagi*, S. Ogura**, Y. Ikeda**, and N. Suematsu* (*Electro-Optics & Microwave Systems Laboratory, Mitsubishi Electric Co., Kamakura, 247 Japan; **Kamakura Works, Mitsubishi Electric Co., Kamakura, 247 Japan): pp. 935–941.

(11.11) Study on Semicylindrical Microstrip Applicator for Microwave Hyperthermia, by T. Shimotori*, Y. Nikawa**, and S. Mori* (*Faculty of Science and Technology, Keio University, Yokohama, 223 Japan; **School of Electrical Engineering, The National Defence Academy, Yokosuka, 239 Japan): pp. 942–948.

(11.12) Transmission Characteristics of CPW Bends for Various Curvatures (Letters), by H. Sawaya, H. Nakano, K. Koshiji, and E. Shu (Faculty of Science and Technology, Science University of Tokyo, Noda, 278 Japan): pp. 949–951.

(12) *IEICE Trans. Electron.*, vol. E77-C, no. 8, is a special issue on Superconducting Devices.

(12.1) Interfacial Study of Nb Josephson Junctions with Overlayer Structure (Invited), by S. Morohashi (Fujitsu Laboratories Ltd., Atsugi, 246 Japan): pp. 1150–1156.

(12.2) Off-Chip Superconductor Wiring in Multichip Module for Josephson LSI Circuit (Invited), by S. Tanahashi*, T. Kubo*, R. Jikuhara*, G. Kaji*, M. Terasawa*, M. Tacano*, H. Nakagawa**, M. Aoyagi**, I. Kurosawa* *, and S. Takada** (*Kyocera Co., Kyoto, 606 Japan; **Electrotechnical Laboratory, Tsukuba, 305 Japan): pp. 1157–1163.

(12.3) Fabrication of Nb/AlO$_x$/Nb Josephson Tunnel Junctions by Sputtering Apparatus with Load-Lock System, by A. Nakayama*, N. Inaba*, S. Sawachi*, K. Ishizu*, and Y. Okabe** (*Faculty of Engineering, Kanagawa University, Yokohama, 221 Japan; **Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, 153 Japan): pp. 1164–1168.

(12.4) Low Frequency Noise in Superconducting Nanoconstriction Devices, by M. Hatle, K. Kojima, and K. Hamasaki (Faculty of Engineering, Nagaoka University of Technology, Nagaoka, 940-21 Japan): pp. 1169–1175.

(12.5) A Resistor Coupled Josephson Polarity-Convertible Driver, by S. Nagasawa, S. Tahara, H. Numata,

Y. Hashimoto, and S. Tsuchida (Fundamental Research Laboratory, NEC Co., Tsukuba, 305 Japan): pp. 1176–1180.

(12.6) $LiNbO_3$ Optical Modulator Using a Superconducting Resonant Electrode, by K. Yoshida*, A. Nomura*, and Y. Kanda** (*Faculty of Engineering, Kyusyu University, Fukuoka, 812 Japan; **Faculty of Engineering, Fukuoka Institute of Technology, Fukuoka, 811-02 Japan): pp. 1181–1189.

(12.7) Multi-Channel High T_c SQUID (Invited), by H. Itozaki*, S. Tanaka*, T. Nagaishi**, and H. Kado*** (* Superconducting Sensor Laboratory, Itami Laboratory, Itami, 664 Japan: **Itami Research Laboratory, Sumitomo Electric Industries, Co., Ltd., Itami, 664 Japan; ***Electrotechnical Laboratory, Tsukuba, 305 Japan): pp. 1185–1190.

(12.8) Growth and Tunneling Properties of $(Bi,Pb)_2Sr_2CaCu_2O_y$ Single Crystals, by A. Irie, M. Sakakibara, and G. Oya (Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): pp. 1191–1198.

(12.9) Fabrication of All-Epitaxial High-T_c SIS Tunnel Structures, by Y. Tazoh, J. Kobayashi, M. Mukaida, and S. Miyazawa (NTT LSI Laboratories, Atsugi, 243-01 Japan): pp. 1199–1203.

(12.10) High T_c Superconductor Joint with Low Loss and High Strength, by N. Suzuki*, O. Ishii*, and O. Michikami ** (*NTT Interdisciplinary Research Laboratories, Ibaraki-ken, 319-11 Japan; **Faculty of Engineering, Iwate University, Morioka, 020 Japan): pp. 1204–1208.

(12.11) The Improvement of Compositional Distribution in Depth and Surface Morphology of $YBa_2Cu_3O_{7-\delta}$ - $SrTiO_x$ Multilayers, by C. C. Diao and G. Oya (Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan): pp. 1209–1217.

(12.12) I-V Characteristics of YBCO Step-Edge Josephson Junction, by K. Yamaguchi, S. Yoshikawa, T. Takenaka, S. Fujino, K. Hayashi, T. Mitsuzuka, K. Suzuki, and Y. Enomoto (Superconductivity Research Laboratory, ISTEC, Tokyo, 135 Japan): pp. 1218–1223.

(12.13) Weak Link Array Junctions in $EuBa_2Cu_3O_{7-x}$ Films for Microwave Detection, by K. Tsuru, and O. Michikami (NTT Interdisciplinary Research Laboratories, Ibaraki-ken, 319-11 Japan): pp. 1224–1228.

(12.14) Properties of Thin-Film Thermal Switches for High-T_c Superconductive Filter, by Y. Nagai*, N. Suzuki*, and O. Michikami** (*NTT Interdisciplinary Research Laboratories, Ibaraki-ken, 319-11 Japan; **Faculty of Engineering, Iwate University, Morioka, 020 Japan): pp. 1229–1233.

(12.15) A Method for Measuring Surface Impedance of Superconductor and Dielectric Characteristics of Substrate by Using Strip Line Resonator, by A. Taketomi*, K. Sawaya**, S. Adachi***, S. Ohshima****, and N. Yaoi** (*Toyota Moter Co., Toyota, 471 Japan; **Faculty of Engineering, Tohoku University, Sendai, 980-77 Japan; ***Department of Electrical Comunications, Tohoku Institute of Technology, Sendai, 982 Japan; ****Faculty of Engineering, Yamagata University, Yonezawa, 992 Japan): pp. 1234–1241.

(12.16) Analysis of High T_c Superconducting Microstrip Antenna Using Modified Spectral Domain Moment Mehod, by N. Ishii, T. Fukasawa, and K. Itoh (Faculty of Engineering, Hokkaido University, Sapporo, 060 Japan): pp. 1242–1248.

(13) *IEICE Trans. Electron.*, vol. E77-C, no. 11, Nov. 1994, is a special issue on Electromagnetic Theory.

(13.1) Excellent Linearly Frequency-Swept Light Source for Sensing System Utilizing FMCW Technique, by L.-T. Wang, K. Iiyama, and K. Hayashi (Faculty of Engineering, Kanazawa University, Kanazawa, 920 Japan): pp. 1716–1721.

(13.2) A Novel Optical Polarization Splitter Using a Dimensionally Tapered Velocity Coupler, by M. Hotta* and M. Geshiro** (*Faculty of Engineering, Ehime University, Matsuyama, 790-77 Japan; **College of Engineering, University of Osaka Prefecture, Sakai, 593 Japan): pp. 1722–1725.

(13.3) A New Formulation of Absorbing Boundary Conditions for Finite-Difference Time-Domain Method, by P.-Y. Wang, S. Kozaki, M. Ohki, and T. Yabe (Faculty of Engineering, Gunma University, Kiryu, 376 Japan): pp. 1726–1730.

(13.4) A Variable Optical Beam Splitter Utilizing a Tapered Velocity Coupler, by M. Geshiro* and M. Hotta** (*College of Engineering, University of Osaka Prefecture, Sakai, 593 Japan; **Faculty of Engineering, Ehime University, Matsuyama, 790-77 Japan): pp. 1731–1734.

(13.5) Electromagnetic Wave Scattering from Perfectly Conducting Moving Boundary: An Application of the Body Fitted Grid Generation with Moving Boundary, by M. Kuroda (Faculty of Engineering, Tokyo Engineering University, Hachioji, 192 Japan): pp. 1735–1739.

(13.6) Nonlinear Characteristics of the Magnetostatic Surface Waves, by V. Priye and M. Tsutsumi (Faculty of Engineering and Design, Kyoto Institute of Technology, Kyoto, 606 Japan): pp. 1740–1746.

(13.7) Resonance Characteristics of Circulary Propagating Mode in a Coaxial Dielectric Resonator, by Q. Han*, Y. Kogami*, Y. Tomabechi**, and K. Matsumura* (*Faculty of Engineering, Utsunomiya University, Utsunomiya, 321 Japan; **Faculty of Education, Utsunomiya University, Utsunomiya, 321 Japan): pp. 1747–1751.

(13.8) Extinction Ratio Adjustment for the Coupler-Type Wavelength Demultiplexer Made by K^+-Ion Diffused Waveguides, by K. Kishioka and Y. Yamamoto (Department of Applied Electronics, Osaka Electro-Communication University, Neyagawa, 572 Japan): pp. 1752–1758.

(13.9) Scattering Cross Sections of Lossy Dielectric Elliptic Cylinders for Plane Waves, by M. Abe*, Y. Hoshihara**, and T. Sekiguchi* (*Faculty of Engineering, Musashi Institute of Technology, Tokyo, 158 Japan; **Communication Equipment Works, Mitsubishi Electric Co., Amagasaki, 661 Japan): pp. 1759–1765.