

1989
Technical
Program

Contents

Papers by Sessions

Technical Program Contents

Session A

Receivers and Mixers

Convention Center, Terrace Theater

8:30 a.m. to 10 a.m.

Tuesday, June 13, 1989

Chairman: Y. Tajima—Raytheon Company

Co-Chairman: Y. Ayasli—Hittite Microwave Corporation

- | | | |
|--------------------------------|--|------------|
| A-1
8:30 a.m. | A 3-Chip GaAs Double Conversion TV Tuner System with 70 dB Image Rejection
T. Ducourant, P. Philippe, P. Dautriche, V. Pauker, C. Villalon, M. Pertus and J.-P. Damour
LEP, Phillips Research
Limeil-Brevannes, France | 95 |
| A-2
8:50 a.m. | A Monolithic 60 GHz Diode Mixer in FET-Compatible Technology
B. Adelseck, A. Colquhoun*, J. M. Dieudonne, G. Ebert*, J. Selders*, K. E. Schmegner, and W. Schwab
AEG Aktiengesellschaft
Ulm, FRG
*Telefunken Electronic
Heinbronn, FRG | 99 |
| A-3
9:10 a.m. | A W-Band Channelized Monolithic Receiver
G. L. Lan, J. C. Chen, C. K. Pao and M. I. Herman
Hughes Aircraft, Torrance, CA

R. E. Neidert
Naval Research Lab.
Washington, DC | 103 |
| A-4
9:30 a.m. | Silicon Bipolar Fixed and Variable Gain Amplifier MMICs for Microwave and Lightwave Applications up to 6 GHz
I. Kipnis, J. F. Kukielka, J. Wholey and C. P. Snapp
Avantek
Newark, CA | 109 |

Session B

Phased and Active Array Techniques Convention Center, California Room

8:30 a.m. to 10 a.m.

Tuesday, June 13, 1989

Chairman: H. George Oltman, Jr.—Tecom Industries, Inc.

B-1 8:30 a.m.	6 to 18 GHz Transmit/Receive Modules for Multifunction Phased Arrays D. E. Meharry, J. L. Bugeau, W. J. Coughlin, and M. A. Priolo Sanders Associates, Inc. Nashua, NH	115
B-2 8:50 a.m.	Quasi-Optical Planar FET Transceiver Modules J. Birkeland and T. Itoh The University of Texas Austin, TX	119
B-3 9:10 a.m.	A Waveguide Switched-Susceptance (Diode-Patch) Phase Shifter K. L. Virga, A. F. Seaton, and L. R. Walker Hughes Aircraft Co. Radar Systems Group El Segundo, CA	123
B-4 9:20 a.m.	MMIC Phase Shifters and Amplifiers for Millimeter-Wavelength Active Arrays V. E. Dunn, N. E. Hodges, O. A. Sy, and W. Alyassini Ford Aerospace Corp. Palo Alto, CA M. Feng and Y. C. Chang Ford Microelectronics, Inc. Colorado Springs, CO	127
B-5 9:30 a.m.	A MMIC-Based Injection-Locked Oscillator for Optically-Fed Phased-Array Antennas T. Berceli, A. S. Daryoush, P. R. Herczfeld, W. D. Jemison, and A. Paoella Center for Microwave-Lightwave Engineering Drexel University, Philadelphia, PA	131
B-6 9:40 a.m.	Microwave Broadband Phased-Array Element: Design and Performance. (Microstrip Horn Opened by Conducting Flaps) A. C. Garcia, V. Such, J. L. Cruz, B. Gimeno Dept. de Fisica Aplicada Universitat de Valencia, Spain	135

Session C

Ferrite Applications

Convention Center, Center Theater

8:30 a.m. to 10 a.m.
Tuesday, June 13, 1989

Chairman: William E. Hord, Microwave Applications Group

C-1 8:30 a.m.	W-Band Ferrite-Dielectric Image-Line Field Displacement Isolators J. M. Owens Santa Clara University J. Y. Guo, W. A. Davis and R. L. Carter University of Texas, Arlington, TX	141
C-2 8:50 a.m.	New Uniaxial-Ferrite Millimeter-Wave Junction Circulators J. A. Weiss, N. G. Watson and G. F. Dionne MIT Lincoln Laboratory Lexington, MA	145
C-3 9:10 a.m.	Magnetostatic Wave Resonators of Microstrip Type M. Tsutsumi Kyoto Institute of Technology Matsugasaki, Kyoto, Japan T. Takeda Osaka University Yamada Kami Suita, Japan	149
C-4 9:20 a.m.	A Low-Loss Magnetostatic Wave Filter Using Parallel Strip Transducer T. Nishikawa, K. Wakino, H. Tanaka, S. Shinmura and Y. Ishikawa Murata Manufacturing Co., Ltd., Nagaokakyo, Kyoto, Japan	153
C-5 9:40 a.m.	A 3.8–30.0 GHz YIG Oscillator—Theory and Design M. Odyniec Microsource Inc. Santa Rosa, CA	157
C-6 9:50 a.m.	X- and Ku-Band YIG-Film Tuned Low Noise Oscillators Y. Mizunuma, T. Ohgihara, H. Nakano, T. Okamoto, M. Kubota, and Y. Murakami Sony Corporation Research Center Yokohama, Japan	161

Session D

Biological Effects and Medical Applications Convention Center, Pacific Room

8:30 a.m. to 10 a.m.

Tuesday, June 13, 1989

Chairman: Ayre Rosen, David Sarnoff Research Center

- | | | |
|--------------------------------|---|------------|
| D-1
8:30 a.m. | Percutaneous Transluminal Microwave Angioplasty Catheter
A. Rosen P. Walinsky, D. Smith, Y. Shi, Z. Kosman, A. Martinez, and H. Rosen
Thomas Jefferson University

F. Sterzer, D. Mawhinney, and A. Presser
MMTC, Inc.
Princeton, NJ

J. S. Chou, P. Goth, and G. Lowery
Baxter Health Care Corp.
Irvine, CA | 167 |
| D-2
8:40 a.m. | A Method of Solution for a Class of Inverse Problems Involving Measurement Errors and its Application to Medical Microwave Radiometry
S. Mizushina, Y. Hamamamura, M. Matsuda and T. Sugiura
Shizuoka University
Hamamatsu, Japan | 171 |
| D-3 | Paper was withdrawn | |
| D-4
9:10 a.m. | Electromagnetic Coupling of Microstrip Lines and Coplanar Waveguides to Multilayer Lossy Media
M. F. Iskander and T. S. Lind
Electrical Engineering Department
University of Utah
Salt Lake City, UT | 175 |
| D-5
9:20 a.m. | Analysis of Microstrip Resonator with a Dielectric Protective Layer Radiating Into Human Body
J. Pribetich, P. Kennis, and P. Pribetich
Centre Hyperfréquences & Semiconductors, USTL
Villeneuve D'Ascq, France | 179 |
| D-6
9:30 a.m. | Computation of EM Effects on Large Biological Bodies by an Iterative Moment Method
J. J. H. Wang and J. R. Dubberley
Georgia Institute of Technology
Atlanta, GA | 183 |
| D-7
9:40 a.m. | Sensing Dielectric Properties of Arbitrarily Shaped Biological Objects with a Microwave Resonator
A. W. Kraszewski, S. O. Nelson and T. S. You
U. S. Department of Agriculture
Athens, GA | 187 |

Plenary Session

Convention Center—Terrace Theater

10:30 A.M.—Noon
Tuesday, June 13, 1989

- 10:30 a.m. Welcome from the Chairman—Chuck Swift
10:40 a.m. Welcome from the Technical Program Committee—Reynold Kagiwada
10:50 a.m. Address by the MTT Society President—V. G. Gelnovatch, U. S. Army LABCOT

Keynote Addresses

- 11:00 a.m. “Microwaves in Space”—Dr. Harold Rosen, Vice President, Hughes Aircraft Company, Space and Communications Group. Dr. Rosen was the developer of Syncom, the world’s first synchronous communications satellite. He is presently engaged in the development of advanced communication satellite systems for international and domestic applications.

Keynote Address Abstract: Microwaves are used in satellite communications, in the exploration of the Solar System, in radio astronomy, and in the search for extraterrestrial intelligence. The evolution of microwave systems for these applications is discussed.

- 11:30 a.m. “Microwaves and the World’s Mega-Issues”—Dr. Simon Ramo, Co-Founder and Director Emeritus of TRW, Inc. and co-author of classic textbook for microwave students on “Fields and Waves”.

Keynote Address Abstract: Happenings in microwaves in the years ahead will depend not only on advances in Science and Technology, but also on the global economic-social-Political environment. “Mega-issues” affecting future microwave developments will be described. An attempt will be made to predict how these issues will impinge on, and often control, funding for R and D, risk-taking patterns for investment in new microwave based systems, priorities for assignment of government and private resources, world competitive forces, and patterns for national security, world cooperation in communications, and International technology transfer and trade.

Session E

Millimeter-Wave Amplifiers Convention Center, Terrace Theater

2:00 p.m. to 3:30 p.m.

Tuesday, June 13, 1989

Chairman: Ho Huang—COMSAT Laboratories

Co-Chairman: Vladimir Sokolov—Honeywell

- | | | |
|------------------|---|------------|
| E-1 | Monolithic HEMT LNAs for Radar, EW, and Communications | 193 |
| 2:00 p.m. | M. A. G. Upton, K. H. Snow, D. I. Goldstick*, W. M. Kong, M-Y. Kao, W. F. Kopp, P. Ho, G. J. Tessmer, B. R. Lee, K. A. Wypych and A. A. Jabra
GE Electronics Lab, Syracuse, NY
*GE Aerospace Electronics Systems, Utica, NY | |
| E-2 | Monolithic V-Band Pseudomorphic MODFET Low-Noise Amplifiers | 199 |
| 2:20 p.m. | G. M. Metze, A. Cornfeld, J. Singer, H. E. Carlson, E. Chang, T. Kirkendall, G. Dahrooge, J. Bass, H.-L. Hung and T. Lee
COMSAT Laboratories
Clarksburg, MD | |
| E-3 | A Monolithic 40 GHz HEMT Low-Noise Amplifier | 205 |
| 2:40 p.m. | C. Yuen, C. Nishimoto, S. Bandy and G. Zdasiuk
Varian Research Center
Palo Alto, CA | |
| E-4 | GaAs Molecular Beam Epitaxy Monolithic Power Amplifiers AT U-Band | 209 |
| 3:00 p.m. | G. Hegazi, H.-L. A. Hung, J. L. Singer, F. R. Phelleps, A. B. Cornfeld, T. Smith, J. F. Bass, H. E. Carlson, and H. C. Huang
COMSAT Laboratories
Clarksburg, MD | |

Session F (Focused Session)

Optical Interaction with Microwave Circuits—I Convention Center, California Room

2:00 p.m. to 3:30 p.m.

Tuesday, June 13, 1989

Chairman: Chi H. Lee—University of Maryland

- | | | |
|--------------------------------|--|------------|
| F-1
2:10 p.m. | A Time-Domain Network Analyzer Which Uses Optoelectronic Techniques
K. J. Webb, E. P. Chauchard, P. Polk-Dingles*, C. H. Lee, H.-L. A. Hung**, and
T. Smith**
Dept. of Electrical Engr.
University of Maryland
College Park, MD
*Univ. Res. Fnd. Greenbelt, MD
** COMSAT Labs, MD | 217 |
| F-2
2:35 p.m. | Noncontact Waveform Measurement in High Speed Silicon Circuits Using the
Picosecond Photoelectron Scanning Electron Microscope (Invited)
J. M. Halbout, P. May and G. Chiu
IBM Research Division
Yorktown Heights, NY
(Paper not available at the time of printing) | |
| F-3
3:00 p.m. | External Electro-Optic Probing of Millimeter-Wave Integrated Circuits
J. F. Whitaker, J. A. Valdeanis and G. A. Mourou
University of Michigan
Ann Arbor, MI

K. B. Bhasin and R. Romanoffsky
NASA Lewis Research Center

T. A. Jackson
Laboratory for Laser Energetics
University of Rochester
Rochester, NY | 221 |
| F-4
3:20 p.m. | An Optically Excited Microwave Ring Resonator on a Gallium Arsenide
Substrate
D. S. McGregor, C. S. Park, M. H. Weichold and H. F. Taylor
Texas A&M University
College Station, TX | 225 |

Session G

Passive Components I Convention Center, Center Theater

2:00 p.m. to 3:30 p.m.

Tuesday, June 13, 1989

Chairman: Bernard D. Geller—COMSAT Laboratories

G-1 2:10 p.m.	An Accurate Characterization of Open Microstrip Discontinuities Including Radiation Losses W. P. Harokopus jr. and P. B. Katehi Radiation Laboratory University of Michigan Ann Arbor, MI	231
G-2 2:20 p.m.	Rectangular Disk 3 dB Hybrids I. Ohta, H. Kinoshita, T. Kaneko, and K. Fujiwara* Himeji Institute of Technology Himeji-shi, Japan *Fujitsu Ten Ltd. Kobe-shi, Japan	235
G-3 2:40 p.m.	A Compact Planar Microstrip-Slotline Symmetrical Junction Comparator Circuit G. P. Riblet Microwave Development Laboratories, Inc. Natick, MA	239
G-4 2:50 p.m.	A New 6–18 GHz, –3Db Multisection Hybrid Coupler Using Asymmetric Broadside, and Edge Coupled Lines J. S. Izadian TIW Systems, Inc. Sunnyvale, CA	243
G-5 3:00 p.m.	A Microstrip Planar Disk 3dB Quadrature Hybrid M. J. Page and S. R. Judah Dept. of Electrical Engr. University of Hull, UK	247
G-6 3:20 p.m.	Enhanced Model for Interacting Step-Discontinuities F. Giannini, G. Bartolucci, M. Ruggieri University of Roma, “Tor Vergata” Dept. of Electronics Engineering Roma, Italy	251

Session H (Focused Session)

Trends in Microwave Acoustics Convention Center, Terrace Theater

2:00 p.m. to 3:30 p.m.

Tuesday, June 13, 1989

Chairman: Ted Lukaszek—U. S. Army LABCOM

- | | | |
|--------------------------------|---|------------|
| H-1
2:10 p.m. | Trends in Surface Acoustic Wave (SAW) Devices in North America (Invited)
H. L. Robinson
Potomac, MD
(Paper not available at the time of printing) | |
| H-2
2:35 p.m. | Compact Sounding System Using Microwaves and Ultrasound
M. Daas and R. Knochel
Technische Universität Hamburg-Harburg
West Germany | 257 |
| H-3
2:55 p.m. | Low Noise Microwave Signal Generation: Resonator/Oscillator Comparisons (Invited)
M. M. Driscoll
Westinghouse Electric Corporation
Electronic Systems Group
Baltimore, MD | 261 |
| H-4
3:20 p.m. | A 9 GHz Oscillator Stabilized With a STW Delay Line
R. Hügli, and U. Lott
Swiss Federal Institute of Technology (ETH) Zürich
Inst. für Feldtheorie und Höchstfrequenztechnik
Zürich, Switzerland | 265 |
| H-5
3:30 p.m. | Wide-Band Nonlinear Chirp Transducers for Planar Acoustooptic Deflectors
K. Anemogiannis*, P. Russer**, and R. Weigel**
*Siemens Research Laboratories München
München, FRG
**Technische Universität München
München, FRG | 269 |

Session I

Broadband ICs

Convention Center, Terrace Theater

4:00 p.m. to 5:30 p.m.

Tuesday, June 13, 1989

Chairman: Inder Bahl—ITT/GTC

Co-Chairman: Jim Schellenberg—Schellenberg Associates

I-1 4:00 p.m.	An Ultra-Wide Bandwidth Power Divider on MMIC VIII-1 Operating 4 to 10 GHz J. Staudinger Motorola, Inc. Government Electronics Group Chandler, AZ	275
I-2 4:20 p.m.	Silicon Bipolar Double-Balanced Active Mixer MMICs for RF and Microwave Applications up to 6 GHz J. Wholey, I. Kipnis and C. P. Snapp Avantek Newark, CA	281
I-3 4:40 p.m.	Design and Performance of a 2–18 GHz Monolithic Matrix Amplifier A. P. Chang, K. B. Niclas, B. D. Cantos and W. A. Strifler Watkins-Johnson Co. Palo Alto, CA	287
I-4 5:00 p.m.	A Novel 4–18 GHz Monolithic Matrix Distributed Amplifier S. L. G. Chu, Y. Tajima, J. B. Cole, A. Platzker, M. J. Schindler Raytheon Research Division Lexington, MA	291

Session J (Focused Session)
Optical Interaction and Microwave Circuits—II
Convention Center, California Room

4:00 p.m. to 5:30 p.m.

Tuesday, June 13, 1989

Chairman: Ken Yano—TRW/Systems

J-1 4:10 p.m.	100 GHz On-Wafer S-Parameter Measurements by Electrooptic Sampling (Invited) R. Majidi-Ahy, B. A. Auld, and D. M. Bloom Edward L. Ginzton Laboratory Stanford University, CA	299
J-2 4:35 p.m.	Phased Array Antenna Design With MMIC-T/R Modules and Fiberoptic Feed Network (Invited) P. R. Herczfeld Drexel University Philadelphia, PA (Paper not available at the time of printing)	
J-3 5:00 p.m.	Magnetostatic Waves-Based Integrated Optic Device Modules and Applications to Communications and Signal Processings C. S. Tsai, D. Young, T. Q. Vu, and C. L. Wang Dept. of Electrical Engineering and Institute for Surface Interface Science University of California Irvine, CA	303
J-4 5:20 p.m.	An Optically Controlled Coplanar Waveguide Phase-Shifter P. Cheung, D. P. Neikirk and T. Itoh University of Texas At Austin Dept. of Electrical and Computer Engineering Austin, TX	307

Session K

Passive Components—II Convention Center, Center Theater

4:00 p.m. to 5:30 p.m.

Tuesday, June 13, 1989

Chairman: Ali E. Atia—COMSAT Laboratories

K-1 4:10 p.m.	Time-Domain Calculation of Microstrip Components and the Curve-Fitting of Numerical Results X. Zhang and K. K. Mei Dept. of Electrical Engineering and Computer Sciences University of California, Berkeley	313
K-2 4:20 p.m.	Multiport Branch-Waveguide Couplers With Arbitrary Power Splitting P. Carle CSELT Torino, Italy	317
K-3 4:40 p.m.	Multi-Way Unequal Power Divider Circuits Using Sector-Shaped Planar Components M. D. Abouzahra MIT Lincoln Lab Lexington, MA K. C. Gupta Univ. of Colorado Dept. of Electrical and Computer Engr. Boulder, CO	321
K-4 4:50 p.m.	The AC Resistance of Microstripline and its Ground Plane R. Faraji-Dana and Y. L. Chow University of Waterloo Waterloo, Ont., Canada	325
K-5 5:00 p.m.	Analysis and Design of Ideal Non-Symmetrical Coupled Microstrip Directional Couplers T. Emery Hewlett-Packard Y. Chin Dankook University H. Lee and V. K. Tripathi Dept of Electrical and Computer Engineering Oregon State University Corvallis, Oregon	329
K-6 5:20 p.m.	Asymmetric Lumped Element Power Splitters B. Kopp Avantek Inc. Milpitas, CA	333

Session L**Open Forum****Convention Center, Alamitos and Cerritos Rooms****4:00 p.m. to 6:00 p.m.****Tuesday, June 13, 1989**

Chairman: Michael Kim

L-1	Simple CAD Formulas of Edge-Compensated Microstrip Lines E. Yamashita, H. Ohashi, and K. Atsuki University of Electro-Communications Toyko, Japan	339
L-2	A General Planar Circuit Simulator Based on Two Dimensional TLM Method P. P. M. So and W. J. R. Hoefer Dept. of Electrical Engineering University of Ottawa Ottawa, Ont., Canada	343
L-3	A Large Signal Non-Linear MODFET Model From Small Signal S-Parameters J. M. O'Callaghan and J. B. Beyer Dept. of Electrical and Computer Engineering University of Wisconsin Madison, WI	347
L-4	A Novel Analitical Approach for the Nonlinear Mircrowave Circuits and Experimental Characterisation of the Nonlinear Behaviour of a New MESFET Device Structure V. Krozer, K. Fricke, and H. L. Hartnagel Inst. für Hochfrequenztechnik Technische Hochschule Darmstadt, FRG	351
L-5	Control of Aliasing in the Harmonic Balance Simulation of Nonlinear Microwave Cricuits P. L Heron, C-R. Chang, and M. B. Steer North Carolina State University Raleigh, NC	355
L-6	A CAD Program and Equations for System Phase and Amplitude Noise Analysis A. Riddle Avantek Santa Clara, CA	359
L-7	Practical, High-Speed Gradient Computation for Harmonic Balance Simulators J. W. Bandler,* Q. J. Zhang and R. M. Biernacki* Optimization Systems Associates Inc. Dundas, Ontario, Canada *also with McMaster University Hamilton, Canada	363
L-8	Wideband Conductor Loss Calculation of Planar Quasi-TEM Transmission Lines With Thin Conductors Using a Phenomenological Loss Equivalence Method H-Y. Lee and T. Itoh University of Texas Austin, TX	367

L-9	Modeling and Analysis of GaAs MESFETs Considering the Wave Propagation Effect T. J. Shieh, W. A. Davis, and R. L. Carter Dept. of Electrical Engr. University of Texas at Arlington R. L. Chang CADENCE Design Systems, Inc. San Jose, CA	371
L-10	An Efficient Linear Statistical FET Model M. Petzold, J. Purviance and C. Potratz University of Idaho Moscow, ID	375
L-11	Ultra-Broadband Lossy Match Amplifiers Y. Ito, M. Nakajima, M. Kimishima, and M. Asa Aero and Defense Sys. Divison Tokyo Keiki Co. Toyko, Japan	379
L-12	Modeling of Noise Parameters of MESFET's and MODFET's and Their Frequency and Temperature Dependence M. V. Pospieszalski National Radio Astronomy Observatory Charlottesville, VA	385
L-13	A New GaAs Power-MESFET With Large Unit Gate Width K. Fricke, V. Krozer and H. L. Hartnagel Inst Für Hochfrequenztechnik Darmstadt Darmstadt, FRG	389
L-14	Class-A GaAs FET Power Amplifier Design for Optimizing Intermodulation Product Y. Daido, M. Minowa and N. Okubo Radio and Satellite Communication Lab, Fujitsu Ltd. Kawasaki, Japan	393
L-15	The Design and Performance of Large Signal Distributed Microwave Amplifiers M. I. Sobhy and A. J. Castelino Electronic Engineering Laboratories University of Kent, Canterbury, UK	397
L-16	CAD and Performance of the Ultrawide-Band GaAs FET Amplifiers S. Shiyang, H. Bin, W. Chucheng and Z. Xiaohung Jiaotong University Shanghai China	401
L-17	Design Techniques for GaAs MESFET Switches G. J. Gardiner, M. W. Geon and D. C. Smith Plessey Three-Five Group Towcester, UK	405
L-18	A 2–20 GHz Dual-Channel Receiver With 2–6 GHz IF S. S. Bharj, S. P. Tan, J. Gluck and B. Thompson Anadigics, Inc. Warren, NJ	409

L-19	Characterization of Active and Passive Millimeter-Wave Monolithic Element On-Wafer Probing G. Dawe and L. Raffaelli Alpha Industries Woburn, MA	413
L-20	Nonlinear Charge Control DC and Transmission Line Models for GaAs MODFETs D. H. Huang and H. C. Lin Department of Electrical engineering University of Maryland College Park, MD	417
L-21	A 0.3 to 3 GHz Monolithic Vector Modulator for Adaptive Array Systems A. Truitt, J. Cerney, and J. S. Mason Texas Instruments, Inc. Dallas, TX	421
L-22	Super Low-Noise AlGaAs HEMT With One Tenth Micron Gate H. Kawasaki, T. Shino, M. Kawano and K. Kamei Toshiba Corporation Kawasaki, Japan	423
L-23	A True Off-Set Self-Alligned Process for High Efficiency Ku-Band Power FETs K. Wakamoto, K. Isura, M. Yamamoto, S. Shimoyama, T. Kameyama, M. Isomae, M. Ohoka, and T. Nagashima Nippon Mining Co. Saitama, Japan (Paper not available at the time of printing)	
L-24	A Highly Directive, Broadband, Bidirectional Distributed Amplifier J. W. Byrne and J. B. Beyer University of Wisconsin Madison, WI	427
L-25	High Yield Matching Structures for 20% Bandwidth Microwave Amplifiers W. Brakensiek, J. Perviance and T. Ferguson* Dept. of Electrical Engineering University of Idaho Moscow, ID *Sandia Nat. Labs. Albuquerque, NM	431
L-26	State-Preserving Intermittently-Locked Loop (Spill) Frequency Synthesizer for Portable Radio S. Saito, Y. Tarusawa, H. Suzuki and S. Yuki NTT Radio Communications Systems Laboratories Take, Japan	435
L-27	High Dynamic Range Airborne Tracking and Fire Control Radar Subsystems A. M. Madni, P. T. McDonald, R. K. Hansen and L. A. Wan Systron Donner Corp. Microwave Div. Van Nuys, CA	439

L-28	A Superconducting Single Film Device Oscillator Made of High Tc and Low Tc Materials J. S. Martens, J. B. Beyer, J. E. Nordman, and G. K. G. Hohenwarter* Dept. of Electrical & Computer Engr. University of Wisconsin Madison, WI *also with HYPRES Inc. Elmsford, NY D. S. Ginley Sandia National Laboratories Albuquerque, NM	443
L-29	Observation of Microwave Comb Generation With a Josephson Junction Array G. K. G. Hohenwarter*, D. P. McGinnis**, J. B. Beyer and J. E. Nordman University of Wisconsin, Madison *also with HYPRES Inc. Elmsford, NY **Fermilab Batavia, IL	447
L-30	Propagation Characteristics of Inductively-Coupled Superconducting Microstrip J. M. Pond, P. Weaver and I. Kaufman* Naval Research Laboratory Washington, DC *Arizona State University Tempe, AZ	451
L-31	Magnetic Bremsstrahlung Radiation Sources Using the Meissner Effect A. F. Boden and H. R. Fetterman Dept. Of Electrical Engineering University of California Los Angeles	455
L-32	Theory of Regenerative Frequency Dividers Using Double-Balanced Mixers R. G. Harrison Carleton University Ottawa, Ontario, Canada	459
L-33	An Accurate and Simple Large-Signal Model of HEMT Q. Z. Liu Electromagnetics Inst. Technical University of Denmark, Lyngby	463
L-34	Planar Doped Barrier Mixer and Detector Diodes as Alternatives to Schottky Diodes for Both Microwave and Millimeter-Wave Applications I. Dale, A. Condie, S. Neylon and M. J. Kearney* Marconi Electronic Devices, Ltd. Lincoln, England *GEC Hirst Research Centre, UK	467

L-35	Microwave Characteristics of MBE Grown Resonant-Tunneling Devices J. M. Owens and D. J. Halchin Santa Clara University Santa Clara, CA K. L. Lear, W. S. Lee, J. S. Harris, Jr. Stanford University Palo Alto, CA	471
L-36	Trends in Mixer Damage C. M. Glenn and R. V. Garver Harry Diamond Laboratories Adelphi, MD	475
L-37	Study of Fundamental Wave Injection Locking of MM-Wave Gunn Harmonic Oscillator Using Large Signal Model of Gunn Device Chen Ning, Sun Zhong-Liang and Li Si-Fan Dept. of Radio Engineering Southeast University Nanjing, China	479
L-38	Performances of Laser-Processed HEMTs With AlAs-nGaAs Superlattice Donor Layers J. M. Dumas(1), A. Christou(2,3), A. Belhadj(1), G. Kiriakidis(2), Z. Hatzopoulos(2), P. Audren(4), H. Thomas(5), and J. Goostray(5) 1—CNET, France 2—RCC Crete, Greece 3—NRL, USA 4—IUT, France 5—Univ. of Wales, UK	483
L-39	Microwave and Millimeter Wave Qwitt Diode Oscillator V. P. Kesan, A. Mortazawi, D. P. Neikirk and T. Itoh University of Texas at Austin Austin, TX	487
L-40	Investigations of Complex Modes in a Generalized Bilateral Finline With Mounting Grooves and Finite Conductor Thickness W-K. Wang, C-K. C. Tzuang, C-Y. Shih and T-H. Wang National Chiao Tung University Hsinchu, Taiwan, R.O.C.	491
L-41	Complex Modes in Shielded Planar Microstrip Lines C. K. C. Tzuang, J. T. Kuo, C. C. Tien, J. S. Jang and T. H. Wang Institute of Communication Engineering National Chiao Tung University Taiwan, R.O.C.	495
L-42	An Investigation of NRD Waveguide Grating Y. Ping and M. Jingfeng Dept. of radio Engineering Southeast University Nanjing, China	499

L-43	On the Analysis of Quasi-Planar Transmission Lines in Circular/Elliptical Waveguides Using the Method of Lines K. Wu and R. Vahldieck University of Victoria Victoria, B. C. Canada	503
L-44	Self Adaptive Mesh Scheme for the Finite Element Analysis of Anisotropic Multiconductor Transmission-Lines M. Salazar-Palma E.T.S.I. Telecomunicacion Madrid, Spain J. F. Hernández-Gil Telefonica Madrid, Spain	507
L-45	Analysis of Waveguides With Metal Inserts A. S. Omar and K. Schünemann Technische Universität Hamburg-Harburg Hamburg, West Germany	511
L-46	Microwave Quenchable Oscillators—A New Class A. P. S. Khanna, R. T. Oyafuso, R. Soohoo & J. Huynh Avantek, Inc. Santa Clara, CA.	515
L-47	State-Of-The-Art Performance Millimetre Wave Gallium Arsenide Gunn Diodes Using Ballistically Hot Electron Injectors S. Neylon, I. Dale, H. Spooner, D. Worley, N. Couch, D. Knight, J. Ondria Marconi Electronic Devices Lincoln, England	519

Session M

Advanced GaAs ICs

Convention Center, Terrace Theater

8:30 a.m. to 10:00 a.m.

Wednesday, June 14, 1989

Chairman: Roger Sudbury—M.I.T. Lincoln Laboratories

M-1 8:30 a.m.	Monolithic Millimeter-Wave CPW Circuits M. Riazat, E. Par, G. Zdasiuk, S. Bandy and M. Glenn Varian Research Center Palo Alto, CA	525
M-2 8:50 a.m.	A Monolithic Variable Gain Ku-Band LNA R. D. Eppich and D. D. Heston Texas Instruments Inc. Dallas, TX	529
M-3 9:00 a.m.	Ka-Band Monolithic Broadband LNA Modules N. Camilleri, and P. Chye Avantek Inc. Folsom, CA	533
M-4 9:10 a.m.	A GaAs HBT Monolithic Log IF (0.5 to 1.5 GHz) Amplifier With 60 dB Dynamic Range and 400 mW Power Consumption G. M. Gorman, A. K. Oki, E. M. Mrozek, J. B. Camou, D. K. Umemoto, M. E. Kim TRW Redondo Beach, CA	537
M-5 9:30 a.m.	An L-Band Temperature-Compensated Ultra Low Power Successive Detection Logarithmic Amplifier R. Michels, N. Scheinberg and J. Gluck ANADIGICS, Inc. Warren, NJ	541

Session N

Microwave Properties of Superconductors Convention Center, California Room

8:30 a.m. to 10:00 a.m.

Wednesday, June 14, 1989

Chairman: Clifford M. Krowne—Naval Research Laboratory

- | | | |
|--------------------------------|--|------------|
| N-1
8:30 a.m. | New Experimental Results for Microwave Conductivity of High-T_c Superconductors and Consequences for Applications to Linear Devices
H. Chaloupka, G. Müller, U. Klein* and H. Piel
University of Wuppertal
*Interatom GmbH
Bergisch-Gladbach, FRG | 547 |
| N-2
8:50 a.m. | Surface Impedance of High T_c Superconductors
L. Drabeck, J. Carini, and G. Gruner
Dept. of Physics
University of California
Los Angeles, CA

T. L. Hylton, A. Kapitulnik, and M. R. Beasley
Stanford University
Stanford, CA | 551 |
| N-3
9:00 a.m. | RF Properties of High T_c Superconductors
J.R. Delayen and C.L. Bohn
Argonne National Laboratory
Argonne, IL
(Paper not available at the time of printing) | |
| N-4
9:20 a.m. | Dielectric Resonator Used As a Probe for High-T_c Superconductor Measurements
S. J. Fiedziuszek and P. Heidmann
Ford Aerospace Corp.
Palo Alto, CA | 555 |
| N-5
9:30 a.m. | Microwave Surface Resistance Measurement Technique for Cylindrical High-T_c Superconductor
K. Aida and T. Ono
NTT
Kanagawa, Japan | 559 |

Session O

Computer-Aided Modeling and Design of Active Circuits

Convention Center, Center Theater

8:30 a.m. to 10:00 a.m.

Wednesday, June 14, 1989

Chairman: Rowan Gilmore—Compact Software

O-1 8:30 a.m.	Computer-Aided Design of MESFET Distributed Amplifier M-K Vai and S. Prasad Northeastern University Boston, MA	565
O-2 8:40 a.m.	FET Power Performance Prediction Using a Linearized Device Model H. Kondoh Hewlett-Packard Microwave Technology Division Santa Rosa, CA	569
O-3 8:50 a.m.	A Large Signal Physical MESFET Model for CAD and its Applications R. R. Pantoja, M. J. Howes, J. R. Richardson and C. M. Snowden Dept. of Electrical & Electronic Engr. University of Leeds, UK	573
O-4 9:10 a.m.	Efficient Large-Signal FET Parameter Extraction Using Harmonics J. W. Bandler*, Q. J. Zhang, S. YE* and S. H. Chen Optimization Systems Associates, Inc. Dundas, Ontario, Canada *also with Mc Master University Hamilton, Ontario, Canada	577
O-5 9:30 a.m.	Waveform-Balance Method for Nonlinear MESFET Amplifier Simulation V. D. Hwang* and T. Itoh** *Hughes Aircraft Co. Torrance, CA **University of Texas Austin, TX	581
O-6 9:40 a.m.	Computer-Aided Design of Class-C Microwave Transistor Amplifiers by Direct Numerical Optimization V. Rizzoli, C. Cecchetti and A. Costanzo University of Bologna Bologna, Italy	585

Session P

Advanced Filter Technology Convention Center, Pacific Room

8:30 a.m. to 10:00 a.m.

Wednesday, June 14, 1989

Chairman: H. Clark Bell—Loral Microwave-Wavecom

P-1 8:30 a.m.	Dielectric Receiving Filter With Sharp Stop Band Using Active Feedback Resonator Method for Cellular Base Stations Y. Ishikawa, T. Nishikawa, J. Hattori and K. Wakino Murata Mfg. Co., Ltd. Kyoto, Japan	591
P-2 8:50 a.m.	Notch Filters With Variable Center Frequency and Attenuation S. Toyoda Dept. of Electrical Engr. Osaka Institute of Technology Osaka, Japan	595
P-3 9:10 a.m.	A New Class of E-Plane Integrated Millimeter-Wave Filters J. Bornemann University of Victoria Victoria, Canada	599
P-4 9:40 a.m.	Rigorous Design of Evanescent-Mode E-Plane Finned Waveguide Bandpass Filters J. Bornemann*, and F. Arndt** *Dept. of E. C. E. University of Victoria Victoria, B.C., Canada **Microwave Dept. University of Bremen Bremen, W. Germany	603

Session Q

European Microwave Session Convention Center, Terrace Theater

10:30 a.m. to 12:00 noon

Wednesday, June 14, 1989

Chairman: Richard Sparks—Raytheon Company

Q-1 10:30 a.m.	Recent European Developments in Active Microwave Imaging J. C. Bolomey University of Paris, France	609
Q-2 10:50 a.m.	Modeling of Microwave and Millimeter-Wave Passive Components R. Sorrentino Tor Vergata University Rome, Italy	613
Q-3 11:10 a.m.	Solid-State Local Oscillator Sources for Millimeter and Sub-Millimeter Waves in Europe A. Räisänen Helsinki University of Technology Finland	617

Session R

Microwave Applications of Superconductors

Convention Center, California Room

10:30 a.m. to 12:00 noon

Wednesday, June 14, 1989

Chairman: Dennis Webb—Naval Research Laboratory

- | | | |
|---------------------------------|---|------------|
| R-1
10:40 a.m. | Experiments With a 31-CM High-T_c Superconducting Thin Film Transmission Line
L. A. Hornak, M. Hatamian, S. K. Tewksbury, E. G. Burkhardt,
R. E. Howard, P. M. Mankiewicz, B. L. Straughn, and C. D. Brandle
AT&T Bell Laboratories
Holmdel, NJ | 623 |
| R-2
11:00 a.m. | Superconducting Stripline Resonators and High-T_c Materials
D. E. Oates, A. C. Anderson, and B. S. Shih
MIT Lincoln Laboratory
Lexington, MA | 627 |
| R-3
11:10 a.m. | A 77 K Computer-Controlled MM-Wave Spectral Josephson Detector Using Microstrip Technique, Preliminary Results
M. Daginnus and J. H. Hinken
Technical University of Braunschweig
Braunschweig, FRG | 631 |
| R-4
11:20 a.m. | Microwave Detectors Based on Granular High-T_c Thin Films
J. Konopka, R. Sobolewski, G. Jung, W. Kula, A. Konopka, P. Gierlowski, and
S. J. Lewandowski
Instytut Fizyki, PAN
Warszawa, Poland | 635 |
| R-5
11:30 a.m. | Superconducting Frequency Tunable SAW Filter and Dispersion Line
H-P. Baum, B. K. Sarma and M. Levy
University of Wisconsin
Milwaukee, WI | 639 |
| R-6
11:40 a.m. | An Analysis of High T_c Superconductors for Superdirective Array Applications
R. J. Dinger
Naval Weapons Center
China Lake, CA
(Paper not available at the time of printing) | |

Session S

CAD Methods

Convention Center, Center Theater

10:30 a.m. to 12:00 noon

Wednesday, June 14, 1989

Chairman: William H. Childs—EEsof Inc.

S-1	Parallel Processing Application to Non-Linear Microwave Network Design	645
10:30 a.m.	M. I. Sobhy and Y. A. R. El-Sawy Electronic Engineering Laboratories University of Kent at Canterbury, UK	
S-2	Yield Optimization of Nonlinear Circuits With Statistically	
10:50 a.m.	Characterized Devices	649
	J. W. Bandler*, Q. J. Zhang, J. Song* and R. M. Biernacki* Optimization systems Associates Inc. Dundas, Ontario, Canada *also with McMaster University Hamilton, Ontario, Canada	
S-3	The Generalized Method of Characteristics for Waveform Relaxation Analysis	
11:10 a.m.	of Lossy Coupled Transmission Lines	653
	F-Y. Chang IBM East Fishkill, NY	
S-4	Considering Some Undesired Effects Due to Dense Packing in Supported	
11:30 a.m.	Co-planar Waveguide MMICs by Using Combined Methods	657
	I. Wolff, D. Kiefer, and S. S. Bedair Electrical Engineering Dept. Duisburg University, W. Germany	
S-5	Computer-Aided Design of Square Spiral Transformers and Inductors	661
11:50 a.m.	E. Frlan*, S. Meszaros*, M. Cuhaci*, and J. S. Wight** *Communications Research Centre Ottawa, Ont. Canada **Department of Electronics Carleton University Ottawa, Ont. Canada	

VOLUME II

Session T
Filter Applications
Convention Center, Pacific Room

10:30 a.m. to 12:00 noon

Wednesday, June 14, 1989

Chairman: George L. Matthaei—University of California, Santa Barbara

T-1 10:30 a.m.	Minaturized Hair-Pin Resonator Filters and Their Applications to Reciever Front-End MIC's K. Takahashi, M. Sagawa and M. Makimoto Tokyo Research Lab. Matsushita Electric Ind. Co. Higasimita, Japan	667
T-2 10:50 a.m.	Thin-Film Lumped-Element Microwave Filters D. Swanson Avantek, Inc. Milpitas, CA	671
T-3 11:10 a.m.	Logarithmic-Periodic Contiguous-Channel Microwave Multiplexers C. Rauscher Naval Research Laboratory Washington, DC	675
T-4 11:30 a.m.	Capacitively-Compensated High-Performance Parallel Coupled Microstrip Filters I. J. Bahl ITT-GaAs Technology Center Roanoke, VA	679
T-5 11:40 a.m.	Satellite L-Band Output Multiplexer Utilizing Single and Dual Mode Dielectric Resonators S. J. Fiedziuszko, D. Doust, and S. Holme Ford Aerospace Corp. Palo Alto, CA	683

Session U

Lightwave Links

Convention Center, Terrace Theater

2:00 p.m. to 3:30 p.m.

Wednesday, June 14, 1989

Chairman: Art Paoletta—U. S. Army LABCOM

U-1	Paper was withdrawn	
U-2 2:20 p.m.	A Theoretical and Experimental Comparison of Directly and Externally Modulated Fiber Optic Links C. H. Cox III, L. M. Johnson and G. E. Betts MIT Lincoln Laboratory Lexington, MA	689
U-3 2:40 p.m.	Long Microwave Delay Fiber Optic Link for Radar Testing I. L. Newberg Hughes Aircraft Company Los Angeles, CA C. M. Gee, G. D. Thurmond and H. W. Yen Hughes Research Laboratories Malibu, CA	693
U-4 3:00 p.m.	Multi-Gigabit Fiber-Optic Video Distribution Network Using BPSK Microwave Subcarriers D. D. Tang GTE Laboratories Waltham, MA	697
U-5 3:20 p.m.	Integrated Fiber Optic Transmission of FM HDTV and 622 Mb/S Data C. N. Lo and L. S. Smoot Bellcore Morristown, NJ	703

Session V

Analysis Methods for Guiding Structures

Convention Center, California Room

2:00 p.m. to 3:30 p.m.

Wednesday, June 14, 1989

Chairman: Michael Dydyk—Motorola, Inc.

V-1 2:00 p.m.	Multiport Network Model for Evaluating Radiation Loss and Spurious Coupling Between Discontinuities in Microstrip Circuits A. Sabban and K. C. Gupta Dept. of Electrical and Computer Engr. University of Colorado Boulder, CO	707
V-2 2:20 p.m.	A New Hybrid Mode Boundary Integral Method for Analysis of MMIC Waveguides With Complicated Crossection W. Schroeder, and I. Wolff Dept. of Electrical Engineering Duisburg University Duisburg, FRG	711
V-3 2:40 p.m.	A Mixed Spectral Domain Method Applied to Analysis of Generalized Dielectric-Loaded Ridged Waveguides K. T. Ng* and C. H. Chan** *University of Virginia Charlottesville, VA **University of Illinois Urbana, IL	715
V-4 3:00 p.m.	Characterization of Coupled Asymmetric Suspended Strip Lines Having Three Thick-Strip Conductors and Side-Wall Grooves M. Nakajima and E. Yamashita University of Electrocommunications Tokyo, Japan	719

Session W

Millimeter-Wave Source Technology Convention Center, Center Theater

2:00 p.m. to 3:30 p.m.

Wednesday, June 14, 1989

Chairman: Samuel Dixon, Jr.—U. S. Army LABCOM

W-1 2:00 p.m.	25–42 GHz GaAs Heterojunction Bipolar Transistor Low Phase Noise Push-Push VCOs D. M. Smith, J. C. Canyon and D. L. Tait TRW, Inc. Redondo Beach, CA	725
W-2 2:20 p.m.	MMIC-Compatible 55mW InP and GaAs 30–40 GHz Field Controlled TE Oscillators K. Lübke, H. Scheiber, D. Grützmacher*, C. Diskus and H. Thim Universität Linz Austria *Inst. für Halbleitertechnik Aachen, W. Germany	729
W-3 2:40 p.m.	Design and Performance of a 94 GHz HEMT Mixer P. D. Chow, D. Garske, J. Velebir, E. Hsieh, Y. C. Ngan and H.C. Yen TRW Electronic Systems Group Redondo Beach, CA	731
W-4 3:00 p.m.	Theory of Subharmonic Synchronization of Nonlinear Oscillators A.S. Daryoush, T. Berceci, R. Saedi, P.R. Herczfeld, and A. Rosen(*) E.C.E. Dept. Drexel University Philadelphia, PA (*) David Sarnoff Research Center Princeton, NJ	735
W-5 3:20 p.m.	Monolithic Impatt Millimeter-Wave Oscillator Stabilized by Open-Cavity Resonator W. P. Shillue, S-C. Wong and K. D. Stephan University of Massachusetts Amherst, MA	739

Session X

Special Session in Honor of Dr. Seymour B. Cohn Convention Center, Pacific Room

2:00 p.m. to 3:30 p.m.

Wednesday, June 14, 1989

Chairman: Peter M. LaTourrette, Consultant

X-1 2:10 p.m.	An Admirable Microwave Engineer K. Tomiyasu General Electric Co. Philadelphia, PA	743
X-2 2:30 p.m.	An Overview of Some Important Contributions to Microwave Engineering G. L. Mathaei Dept. of Electrical and Computer Engr. University of California Santa Barbara, California	745
X-3 2:50 p.m.	The Rantec Years—Dr. Seymour B. Cohn (1960 to 1967) W. H. Harrison Loral Wavecom Div. Northridge, CA	749
X-4 3:10 p.m.	Novel Contributions to Microwave Circuit Design J. K. Hunton GTE Government Systems Mountain View, CA	753
X-Ref	S. B. Cohn Reference List	757

Session Y

Manufacturing Microwave Components and Subsystems

Convention Center, Terrace Theater

4:00 p.m. to 5:30 p.m.

Wednesday, June 14, 1989

Chairman: Douglas W. Maki—M/A Com

Y-1 4:00 p.m.	Excellent Reliability With High Throughput Techniques and Materials for Alloy Attachment J. S. Pavio Texas Instruments Dallas, TX	761
Y-2 4:20 p.m.	An Automatic Technique for Post Production Tuning of Microwave Circuits E. C. Gominho Westinghouse Electric Corp. Baltimore, MD	765
Y-3 4:40 p.m.	High Volume Manufacturing of a High-Efficiency, X-Band Power Module for Phased Array Applications J. L. Vorhaus Avantek, Inc. Santa Clara, CA	769
Y-4 5:00 p.m.	Microwave Amplifier Manufacturing With Advanced Thin-Film MIC and Elementary MMIC Technology E. J. Crescenzi, Jr., S. E. Beam, R. L. Fenton, T. R. Kritzer and T. A. Maddox Watkins-Johnson Co. Palo Alto, CA	773

Session Z

Leakage and Package-Mode Effects in Millimeter-Wave ICs Convention Center, California Room

4:00 p.m. to 5:30 p.m.

Wednesday, June 14, 1989

Chairman: Pisti B. Katehi—University of Michigan

- | | | |
|--------------------------------|--|------------|
| Z-1
4:00 p.m. | Full-Wave Theory Based Development of mm-Wave Circuit Models for Microstrip Open End, Gap, Step, Bend and Tee
R. H. Jansen* and L. Wiemer**
*Plessey Research Caswell
Caswell, Great Britain
**Jansen Microwave
Ratingen, W. Germany | 779 |
| Z-2
4:20 p.m. | Printed-Circuit Waveguides With Anisotropic Substrates: A New Leakage Effect
M. Tsuji and H. Shigesawa
Doshisha University
Kyoto, Japan

A. A. Oliner
Polytechnic University
Brooklyn, NY | 783 |
| Z-3
4:40 p.m. | Rigorous Analysis of Open Microstrip Lines of Arbitrary Cross-Section in Bound and Leaky Regimes
K. A. Michalski and D. Zheng
Texas A&M University
College Station, TX | 787 |
| Z-4
4:50 p.m. | Analysis of Radiating End Effects of Symmetric and Asymmetric Coplanar Waveguide Using Integral Equations Technique
M. Drissi, V. Fouad Hanna, and J. Citerne*
C.N.E.T.
Division E.T.R.
Moulineaux, France
*Laboratoire Structures Rayonnantes
Rennes, France | 791 |
| Z-5
5:00 p.m. | Theoretically Zero-Loss Design of Planar Dielectric Waveguide Y-Branch; Amazing Effect of Serpentine-Shaped Taper
H. Shigesawa, M. Tsuji, and O. Tanaka
Doshisha University
Kyoto, Japan | 795 |
| Z-6
5:20 p.m. | Shunt Posts in Microstrip Transmission Lines
K. L. Finch and N. G. Alexopoulos
University of California
Los Angeles, CA
(Paper not available at the time of printing) | |

Session AA

Millimeter-Wave Amplifier Technology

Convention Center, Center Theater

4:00 p.m. to 5:30 p.m.

Wednesday, June 14, 1989

Chairman: Apostle G. Cardiasmenos—Raytheon Company

AA-1 4:00 p.m.	High-Performance V-Band Low Noise Amplifiers S. A. Vaughn, and K. White Hughes Aircraft Co. Space and Comm. Group Los Angeles, CA U. K. Mishra, M. J. Delaney, P. Greiling, and S. Rosenbaum Hughes Research Laboratories Malibu, CA	801
AA-2 4:20 p.m.	High Performance InP-Based HEMT Millimeter-Wave Low-Noise Amplifiers K.H.G. Duh, P. C. Chao, P. Ho, M. Y. Kao, P. M. Smith, J. M. Ballingall and A. A. Jabra GE Electronics Lab. Syracuse, NY	805
AA-3 4:40 p.m.	Q-Band Coplanar Waveguide Amplifier G. S. Dow, T. N. Ton, and K. Nakano TRW, Inc. Redondo Beach, CA	809
AA-4 5:00 p.m.	Millimeter-Wave Noise Parameters of High Performance HEMT's at 300 K and 17 K S. Weinreb*, R. Harris**, and M. Rothman** *Martin Marietta Laboratory Baltimore, MD **National Radio Astronomy Observatory Charlottesville, VA	813
AA-5 5:20 p.m.	Possibility of Silicon Monolithic Millimeter-wave Integrated Circuits S. A. Campbell and A. Gopinath University of Minnesota Minneapolis MN	817

Session BB

Microwave Integrated Circuit Measurements Convention Center, Pacific Room

4:00 p.m. to 5:30 p.m.

Wednesday, June 14, 1989

Chairman: Harry M. Cronson—The MITRE Corporation

BB-1 4:10 p.m.	A Non-Contacting Probe for Measurements on High-Frequency Planar Circuits S. S. Osofsky and S. E. Schwarz University of California Berkeley, CA	823
BB-2 4:30 p.m.	Accuracy Factors in Microwave Noise Parameter Measurements A. Davidson, B. Leake and E. Strid Cascade Microtech, Inc. Beaverton, OR	827
BB-3 4:50 p.m.	On-Wafer Large-Signal Pulsed Measurements J. F. Vidalou*, F. Grossier**, M. Camiade**, and J. Obregon* *IRCOM-CNRS University of Limoges France **Thomson Hybrids Massy, France	831
BB-4 5:10 p.m.	Large-Signal Characterization of Millimeter-Wave Transistors Using an Active Load-Pull Measurement System R. Actis, R. A. McMorran, R. A. Murphy, M. A. Hollis, R. W. Chick, C. O. Bozler and K. B. Nichols Lincoln Lab. MIT Lexington, MA	835

Session CC

Advances in FET Amplifiers

Convention Center, Terrace Theater

8:30 a.m. to 10:00 a.m.

Thursday, June 15, 1989

Chairman: Richard Van Wagoner—Department of Defense

CC-1 8:40 a.m.	Performance of a 2–18 GHz Ultra Low-Noise Amplifier Module K. B. Niclas and R. R. Pereira Watkins-Johnson Co Palo Alto, CA	841
CC-2 9:00 a.m.	A Balanced Cascade 26–40 GHz Amplifier D. M. F. McCann Marconi Electronic Devices Ltd Lincoln, England	845
CC-3 9:10 a.m.	A 1 to 40 GHz MESFET Hybrid Distributed Amplifier H. Brouzes, G. Deredec and Y. W. Bender Thomson-CSF Malakoff, France	849
CC-4 9:30 a.m.	A Cryogenic 43-GHz-Band Low-Noise Amplifier for Radio Astronomy T. Saito, Y. Oohashi, H. Kurihara and Y. Hirachi Fujitsu Laboratories, Kawasaki, Japan T. Kasuga and K. Miyazawa Nobeyama Radio Observatory National Astronomical Observatory Minamimaki-mura, Japan	853
CC-5 9:50 a.m.	High-Efficiency Power Amplification for Microwave and Millimeter Frequencies W. S. Kopp and S. D. Pritchett Texas Instruments Dallas, TX	857

Session DD (Focused Session)

High-Power Microwave Convention Center, California Room

8:30 a.m. to 10:00 a.m.

Thursday, June 15, 1989

Chairman: Jitendra Goel—TRW/ESG

DD-1 8:30 a.m.	Operation of Solid State Power Amplifiers at Cryogenic Temperatures (Invited) J. H. Johnson P. D'Anna Microwave Modules & Devices	861
DD-2 8:40 a.m.	Power Amplifier Linearization Using If Feedback K. G. Voyce and J. H. McCandless Boeing Electronics Co Seattle, WA	863
DD-3 8:50 a.m.	A Production 30 KW L-Band Solid-State Transmitter S. Bird and M. Reinhart Westinghouse ESG Baltimore, MD	867
DD-4 9:10 a.m.	Progress in the Development of Gyroklystrons Producing High Energy Microwave Pulses (20–200J) (Invited) V. L. Granatstein, W. Lawson, P. E. Latham, D. Welsh, J. Calame, Y. Carmel, C. D. Striffler, and M. Reiser University of Maryland College Park, MD A. Mondelli and D. Chernin Science Appl.Int'l, VA (Paper not available at the time of printing)	
DD-5 9:20 a.m.	The Sophisticated Properties of the Microwave Oven Magnetron W. C. Brown Consultant, Microwave Power Transmission Systems Weston, MA	871
DD-6 9:30 a.m.	High-Power Microwave Diagnostic System Based on Compact, Single-Unit, Radiate-And-Receive Devices T. A. Treado*, R. S. Smith III*, W. O. Doggett, and D. J. Jenkins* North Carolina State University Raleigh *Varian Beverly Microwave Division Beverly, MA	875
DD-7 9:40 a.m.	Microstrip Plasma Limiter S. D. Patel*, L. Dubrowsky*, S. E. Saddow**, R. Kaul**, and R. V. Garver** *Westinghouse ESG Baltimore, MD **Harry Diamond Labs Adelphi, MD	879

Session EE

Microwave Measurements Convention Center, Center Theater

8:30 a.m. to 10:00 a.m.

Thursday, June 15, 1989

Chairman: Stephen F. Adam—Adam Microwave Consulting

EE-1 8:30 a.m.	Measurement of Memory Effects in Predistortion Linearizers W. Boesch and G. Gatti RF Systems Division ESA/ESTEC, Noordwijk, The Netherlands	885
EE-2 8:50 a.m.	Picosecond Optoelectronic Characterization of a Heterojunction Bipolar Transistor M. Matloubian and H. Fetterman Dept. of Electrical Engineering University of California, Los Angeles M. Kim, A. Oki and J. Camou TRW, Inc. Redondo Beach, CA S. Moss, D. Smith and J. Knudsen The Aerospace Corporation Los Angeles, CA	889
EE-3 9:10 a.m.	Noise Characterization Uncertainty of Microwave Devices Under Low Current Operation R. Lucero, C. Moyer, R. Vaitkus, and M. Dydyk Motorola Phoenix Corporate Research Laboratories Tempe, AZ	893
EE-4 9:20 a.m.	A Parameter Extraction Technique for Heterojunction Bipolar Transistors R. J. Trew, U. K. Mishra and W. L. Pribble North Carolina State University Raleigh, NC J. F. Jensen Hughes Research Laboratories Malibu, CA	897
EE-5 9:30 a.m.	Advances in NIST Dielectric Measurement Capability Using a Mode-Filtered Cylindrical Cavity E. J. Vanzura and W. A. Kissick National Institute of Standards and Technology Boulder CO	901
EE-6 9:40 a.m.	Microstrip Noncontacting Thickness Monitor R. B. Hurley, I. Kaufman and R. P. Roy Arizona State University Tempe, AZ	905

Session FF

Losses in Guided-Wave Structures Convention Center, Pacific Room

8:30 a.m. to 10:00 a.m.

Thursday, June 15, 1989

Chairman: Arvind K. Sharma—TRW/ESG

- | | | |
|---------------------------------|--|------------|
| FF-1
8:30 a.m. | Full-Wave Analysis of Conductor Losses on MMIC Transmission Lines
W. Heinrich
Technische Hochschule Darmstadt
Darmstadt, West Germany | 911 |
| FF-2
8:40 a.m. | Channelized Coplanar Waveguide: Discontinuities, Junctions, and Propagation Characteristics
R. N. Simons, G. E. Ponchak, K. S. Martzaklis and R. R. Romanofsky
NASA Lewis Research Center
Cleveland, OH | 915 |
| FF-3
9:00 a.m. | High Frequency Conductor and Dielectric Losses in Shielded Microstrip
T. E. van Deventer*, P. B. Katehi*, and A. C. Cangellaris**
*Radiation Laboratory
University of Michigan
Ann Arbor, MI
**Electrical and Computer Engineering Department
University of Arizona
Tucson, AZ | 919 |
| FF-4
9:20 a.m. | Analysis of the "Microstrip Loaded Inset Dielectric Waveguide"
T. Rozzi, R. De Leo, and A. Morini
Dipartimento di Elettronica ed Automatica
University of Ancona
Italy | 923 |
| FF-5
9:30 a.m. | Complex Guidance Properties of the Slitted Asymmetric Ridge Waveguide
F. Frezza*, M. Guglielmi** and P. Lampariello*
*University of Rome
Rome, Italy
**New Jersey Institute of Technology
Newark, NJ | 927 |

Session GG

Power FET Amplifiers

Convention Center, Terrace Theater

10:30 a.m. to 12:00 noon

Thursday, June 15, 1989

Chairman: Karl B. Niclas—Watkins-Johnson Company

GG-1 10:30 a.m.	A 12-Watt 20 GHz GaAs FET Power Amplifier R. Auricchio and R. A. Rhodes Hughes Aircraft Co. El Segundo, CA D. S. Day Avantek, Inc. Santa Clara, CA	933
GG-2 10:50 a.m.	Broadband Power Amplifiers Based on a New Monolithic Ceramic Technology F. N. Sechi and M. Bujatti Microwave Power, Inc. Santa Clara, CA	937
GG-3 11:10 a.m.	Design Technique for High Power, High Efficiency, Broadband Distributed Amplifiers J. B. Cole and A. Platzker Raytheon Co. Research Division Lexington, MA	941
GG-4 11:30 a.m.	Monolithic High-Voltage FET Power Amplifiers K. E. Peterson, H-L. Hung, F. R. Phelleps, T. F. Noble and H. C. Huang COMSAT Laboratories Clarksburg, MD	945
GG-5 11:40 a.m.	A Technique for the Maintenance of FET Power Amplifier Efficiency Under Backoff B. D. Geller, F. T. Assal, R. K. Gupta and P. K. Cline COMSAT Lab. Clarksburg, MD	949

Session HH

Microwave Integrated Circuits—I Convention Center, California Room

10:30 a.m. to 12:00 noon

Thursday, June 15, 1989

Chairman: Harlan Howe, Jr.—Adams-Russell

HH-1 10:40 a.m.	Lossless, Broadband Monolithic Microwave Active Inductors S. Hara, T. Tokumitsu and M. Aikawa ATR Optical and Radio Communication Research Laboratories Kyoto, Japan	955
HH-2 11:00 a.m.	A 2–18 GHz 180 Degree Phase Splitter Network S. S. Bharj, S. P. Tan and B. Thompson Anadigics, Inc. Warren, NJ	959
HH-3 11:20 a.m.	Very Small, Ultra-Wideband MMIC Magic-T and Applications to Combiners and Dividers T. Tokumitsu, S. Hara and M. Aikawa ATR Optical and Radio Communications Research Laboratories Kyoto, Japan	963
HH-4 11:30 a.m.	A New Coplanar Waveguide/Slotline Double-Balanced Mixer D. Cahana AVANTEK, Inc. Milpitas, CA	967
HH-5 11:50 a.m.	Recrystallized Silicon-On-Alumina as a Monolithic Circuit Technology T. J. Letavic, S. Wu, E. W. Maby, and R. J. Gutmann Dept. of Electrical, Computer and Systems Engineering Rensselaer Polytechnic Institute Troy, NY	969

Session II

HEMT Technology

Convention Center, Center Theater

10:30 a.m. to 12:00 noon

Thursday, June 15, 1989

Chairman: Ronald L. Carter—University of Texas at Arlington

II-1 10:40 a.m.	Ultra-Low-Noise Millimeter-Wave Pseudomorphic HEMTs R. E. Lee and R. S. Beaubien Linear Monolithics, Inc. Westlake Village, CA R. H. Norton and J. W. Bacon Varian Research Center Palo Alto, CA	975
II-2 11:00 a.m.	Low-Noise InGaAs HEMT Using the New Off-Set Recess Gate Process O. Ishikawa, K. Nishii, T. Matsuno, C. Azuma, Y. Ikeda, S. Nanbu, and K. Inoue Semiconductor Research Center Matsushita Electric Industrial Co. Ltd. Osaka, Japan	979
II-3 11:10 a.m.	A 0.15 μm Gate Length Pseudomorphic HEMT P. M. Smith, M. Y. Kao, P. Ho, P. C. Chao, K. H. G. Duh, A. A. Jabra, R. P. Smith, and J. M. Ballingall General Electric Co. Syracuse, NY	983
II-4 11:30 a.m.	44 GHz Hybrid HEMT Power Amplifiers D. W. Ferguson, P. M. Smith, P. C. Chao, L. F. Lester, R. P. Smith, P. Ho, A. Jabra and J. M. Ballingall GE Aerospace Syracuse, NY	987
II-5 11:40 a.m.	Theoretical Comparison of 0.35 μm Gate Length GaAs and GaInAs HEMTs D. H. Park and K. F. Brennan School of Electrical Engineering Georgia Institute of Technology Atlanta, GA	991

Session JJ

The Time Domain and Electromagnetics Convention Center, Pacific Room

10:30 a.m. to 12:00 noon

Thursday, June 15, 1989

Chairman: James C. Rautio—Sonnet Software

JJ-1 10:40 a.m.	Time-Domain Method of Lines Applied to the Uniform Microstrip Line and its Step Discontinuity S. Nam, H. Ling and T. Itoh University of Texas Austin, TX	997
JJ-2 11:00 a.m.	Distortion of Transient Signals on Multilayer Coupled Symmetric Microstrip Transmission Lines J. P. Gilb and C. A. Balanis Arizona State University Tempe, AZ	1001
JJ-3 11:20 a.m.	Analysis of Coplanar Waveguide by Time-Domain Finite Difference Method G.C. Liang, Y.W. Liu, and K.K. Mei Dept. of Electrical Engineering, Computer Sciences and the Electronics Research Laboratory Univ. of California Berkeley, CA	1005
JJ-4 11:40 a.m.	Analysis of Microstrip Discontinuities Using the Finite Difference Time Domain Technique C. J. Railton and J. P. McGeehan Dept. of Electrical Engineering University of Bristol, UK	1009
JJ-5 11:50 a.m.	Accurate Calculation of the Capacitance Matrix of a Multiconductor Transmission Line in a Multilayered Dielectric Medium W. Delbare, and D. De Zutter Lab of Electromagnetism and Acoustics University of Ghent Ghent, Belgium	1013

Session KK

FET Devices and Applications Convention Center, Terrace Theater

2:00 p.m. to 3:30 p.m.

Thursday, June 15, 1989

Chairman: Joseph A. Calviello—Eaton Corporation/AIL

KK-1 2:05 p.m.	The Effects of P Co-Implants Upon the RF Performance of Ion-Implanted GaAs Power FETs T. A. Winslow and R. J. Trew North Carolina State University Raleigh, NC I. J. Bahl, A. E. Geissberger and M. L. Balzan ITT,GTC Roanoke, VA	1019
KK-2 2:25 p.m.	A True Off-Set Self-Aligned Process for High-Efficiency Ku-Band Power FETS K. Wakamoto, K. Imura, M. Yamamoto, S. Shimoyama, T. Kameyama, M. Isomae, Y. Okubo, M. Ohoka and T. Nagashima Nippon Mining Co. Toda, Saitama, Japan D. A. Figueredo, L. H. McCarty, C-Y. Su, M. Yam and S. Kakihana Menlo Industries, Inc. Fremont, CA	1023
KK-3 2:45 p.m.	Zero Bias GaInAs MISFET Mixers K. W. Chang, B. R. Epstein, E. J. Denlinger and P. D. Gardner David Sarnoff Research Center Princeton, NJ	1027
KK-4 3:05 p.m.	A Practical Distributed FET Mixer for MMIC Applications I. D. Robertson and A. H. Aghvami University of London, King's College London, England	1031
KK-5 3:15 p.m.	An Easy-To-Use FET DRO Design Procedure Suited to Most CAD Programs P. G. Wilson and R. D. Carver British Telecom Researsch Labs Ipswich, UK	1033

Session LL

Microwave Integrated Circuits—II Convention Center, California Room

2:00 p.m. to 3:30 p.m.

Thursday, June 15, 1989

Chairman: John A. Pierro—Eaton Corporation/AIL

- | | | |
|---------------------------------|--|-------------|
| LL-1
2:00 p.m. | Taper and Forward-Feed in GaAs MMIC Distributed Amplifiers
M. Ross*, R. G. Harrison**, and R. K. Surridge***
*Northern Telecom Ltd.
St.-Laurent, Quebec, Canada
**Dept. of Electronics
Carleton Univ.
Ottawa, Ontario, Canada
***Bell-Northern Research
Ottawa, Ontario, Canada | 1039 |
| LL-2
2:20 p.m. | Active Broadband Impedance Transformations Using Distributed Techniques
K. R. Cioffi
Rockwell Internationl
Anaheim, CA | 1043 |
| LL-3
2:40 p.m. | A Ku-Band MMIC PLL Frequency Synthesizer
T. Ohira, M. Muraguchi, T. Hirota, K. Osafune*, and M. Ino*
NTT Radio Communication System Lab.
Yokosuka, Japan
*NTT LSI Laboratories
Atsugi, Japan | 1047 |
| LL-4
3:00 p.m. | An Octave Band GaAs Analog Phase Shifter
S. T. Salvage, R. J. Hash and B. E. Petted
Harris Corp.
Melbourne, FL | 1051 |

Session MM

Solid-State Devices and Circuits

Convention Center, Center Theater

2:00 p.m. to 3:30 p.m.

Thursday, June 15, 1989

Chariman: Dean J. Peterson—Steinbrecher Corporation

MM-1 2:10 p.m.	2.5 W CW X-Band Heterojunction Bipolar Transistor B. Bayraktaroglu, R. D. Hudgens, M. A. Khatibzadeh and H. Q. Tserng Texas Instruments Inc. Dallas, TX	1057
MM-2 2:20 p.m.	Design Optimization of Microwave Power Heterojunction Bipolar Transistor Cells G. W. Wang, L. W. Yang, R. W. Laird, D. A. Williams, J. P. Sadowski and P. D. Wright Ford Microelectronics, Inc. Colorado Springs, CO	1061
MM-3 2:30 p.m.	A 20 GHz Silicon Microwave Monolithic Integrated Circuits Process and a 7.4 GHz Frequency Divider S. Miyazaki, C. Takai, K. Eguchi and T. Nakata NEC Corp. Kawasaki, Japan	1065
MM-4 2:50 p.m.	Quasi-Optical Watt-Level Millimeter-Wave Monolithic Solid-State Diode-Grid Frequency Multipliers R. J. Hwu, L. P. Sadwick, N. C. Luhmann, Jr., D. B. Rutledge*, M. Sokolich**, and B. Hancock*** University of California Los Angeles, CA *California Institute of Technology Pasadena, CA **Hughes Aircraft Co. Torrance, CA ***Jet Propulsion Laboratory Pasadena, CA	1069
MM-5 3:10 p.m.	Distortion in Microwave and RF Switches by Reverse Biased PIN Diodes R. H. Caverly* and G. Hiller** *Southeastern Massachusetts University N. Dartmouth, MA **M/A-COM, Inc. Burlington, MA	1073

Session NN

Microwave Systems Applications Convention Center, Pacific Room

2:00 p.m. to 3:30 p.m.

Thursday, June 15, 1989

Chairman: Joseph Levy—Eaton Corporation/AIL

NN-1 2:00 p.m.	Performance of Five 30 GHz Satellite Receivers R. J. Kerczewski, G. E. Ponchak, and R. R. Romanofsky NASA Lewis Research Center Cleveland, OH	1079
NN-2 2:20 p.m.	Millimeter-Wave Transmitter and Receiver Using the Nonradiative Dielectric Waveguide T. Yoneyama Research Inst. of Electrical Communication Tohoku Univ. Sendai, Japan	1083
NN-3 2:40 p.m.	A 4-Device Power Combiner Used as a Lossless High Power Polarization Switch at 94 GHz H. Barth AEG Aktiengesellschaft Ulm, W. Germany	1087
NN-4 2:50 p.m.	94 GHz 3D-Imaging Radar for Sensor-Based Locomotion M. Lange and J. Detlefsen Technische Universität München München, FRG	1091
NN-5 3:00 p.m.	mm-Wave Direct-To-Home Multichannel TV Delivery System M. Pilgrim and R. P. Searle British Telecom Research Laboratories Martlesham Heath, UK	1095
NN-6 3:10 p.m.	Millimetre-Wave Downconverter Using Monolithic Technology for High Volume Application P. G. Wilson and B. C. Barnes British Telecom Research Labs Martlesham Heath, UK	1099

Session OO

Monolithic Integrated Circuits Convention Center, Terrace Theater

4:00 p.m. to 5:30 p.m.

Thursday, June 15, 1989

Chairman: John R. Selin—Raytheon Company

OO-1 4:10 p.m.	Ka-Band 2-Watt Power GaAs MMIC S. Arai, T. Yoshida, K. Kai, S. Takatsuka, Y. Oda and S. Yanagawa Toshiba Corporation Kawasaki, Japan	1105
OO-2 4:30 p.m.	A Monolithic 2–20 GHz GaAs Pin Diode SP16T Switch S. D. Pritchett and D. Seymour Texas Instruments, Dallas, TX	1109
OO-3 4:50 p.m.	Voltage-Tolerant Monolithic L-Band GaAs SPDT Switch S. W. Cooper and G. A. Truitt Texas Instruments, Dallas, TX	1113
OO-4 5:00 p.m.	An RLC Matching Network and Application in 1–20 GHz Monolithic Amplifier P. K. Ikäläinen Technical Research Centre of Finland Espoo, Finland	1115
OO-5 5:20 p.m.	Broadband High-Efficiency MMIC Power Amplifiers Using Ion-Implanted MESFET Technology Y. C. Shih, K. Tan, K. Kasel, K. K. Yu, and S. K. Wang Hughes Aircraft Co. Microwave Products Div. Torrance, CA	1119

Session PP

Open Forum

Convention Center, Alamitos and Cerritos Rooms

4:00 p.m. to 6:00 p.m.

Thursday, June 15, 1989

Chairman: Michael Kim—TRW/Systems

- PP-1** **Analysis and Synthesis Equations for Edge-Coupled Suspended Substrate Microstrip Line** **1123**
Y. Y. Wang, Q. L. Wang and Y. H. Shu
Department of Radio Engineering
Southeast University
Jiangsu, Nanjing, China
- PP-2** **Extending the Use of the Conformal Mapping Technique for the Calculation of the Quasi-TEM Parameters of Several Cylindrical and Wrapped Transmission Lines** **1127**
S. S. Bedair and I. Wolff
Department of Electrical Engineering
Duisburg University
W. Germany
- PP-3** **Computation of Capacitance Matrix of Arbitrarily Shaped Conductors in Multiple Dielectric Regions**
J. T. Tung and T. K. Sarkar
Dept. of Electrical and Computer Engr.
Syracuse University, NY

S. N. Rao
Dept. of Electrical Engr.
University of Alabama
(Paper not available at the time of printing)
- PP-4** **Analysis and Design of Slow-Wave Structures Using an Integral Equation Approach** **1131**
T. G. Livernois and P. B. Katchi
Radiation Laboratory
University of Michigan
Ann Arbor, MI
- PP-5** **Formulation of Mode-Coupling Equations at Step Discontinuity Based on the Planar Circuit Theory** **1135**
J. P. Hsu*, T. Anada*, A. A. Oliner and S. T. Peng**
*Kanagawa Univ.
Yokohama, Japan
**Polytechnic Univ.
New York Institute of Technology

PP-6	Modeling of High-Frequency MMIC Passive Components A. Nakatani, S. A. Maas* and J. Castaneda Phraxos Research & Development Inc. Santa Monica, CA *Consultant	1139
PP-7	Analysis And Modeling of Coupled Right Angle Microstrip Bend Discontinuities A. Hill and V.K. Tripathi Dept. of Electrical and Computer Engr. Oregon State University Corvallis, Oregon	1143
PP-8	Equivalent Circuits of Microstrip Discontinuities Including Radiation Effects A. Skrivervik, J.R. Mosig Ecole Polytechnique Fédérale Lausanne, Switzerland	1147
PP-9	Three Dimensional Finite Element Method Applied to Dielectric Resonator Devices S. Verdeyme, P. Auxemery, M. Aubourg and P. Guillon I.R.C.O.M. University de Limoges Limoges Cédex, France	1151
PP-10	New Possibilities of Cavity-Filter Design by a Novel TE-TM-Mode Iris-Coupling U. Rosenberg and D. Wolk ANT Telecommunications Backnang, West Germany	1155
PP-11	Computer-Aided Design of Evanescent-Mode Waveguide Bandpass Filter With Non-Touching E-Plane Fins K. S. Kong and T. Itoh The University of Texas at Austin Austin, TX	1159
PP-12	Microwave Characteristics of GaAs MMIC Integratable Optical Detectors P. C. Claspy, S. M. Hill and K. B. Bhasin NASA Lewis Research Center Cleveland, OH	1163

PP-13	Distortion Characteristics in Directly Modulated Laser Diodes by Microwave Signals M. L. Majewski and L. A. Coldren* Dept. of Electrical Engineering University of Queensland St. Lucia, Australia *Department of Electrical and Computer Engineering University of California Santa Barbara, CA	1167
PP-14	Microwave Characteristics of Planar Electrooptic Modulator R. Delrue, E. Paleczny, J. F. Legier, P. Pribetich, and P. Kennis Centre Hyperfrequences et Semiconductors U.A. CNRS Villeveuve D'Ascq, France	1171
PP-15	Dispersion Studies Of a Single-Mode Triangular-Core Fiber with a Trench By The Vector Mode Analysis G. L. Yip and J. W. Jiang Dept. of Electrical Engineering McGill University Montreal, Que., Canada	1175
PP-16	An 8 mm FM and AM Noise Measuring Equipment D. Minren and X. Dezhong Beijing Institute of Radio Metrology and Measurement Beijing, China	1179
PP-17	Direct Measurement of the Optimum Source Impedance for Minimum Noise Figure O. Ishikawa, H. Yagita, T. Tanbo and T. Onuma Semiconductor Research Center Matsushita Electric Industrial Co. Osaka, Japan	1183
PP-18	Establishing the Complex Measurement Ability of a Homodyne Network Analyzer Via Self-Calibration H. J. Eul Ruhr-Universität Bochum Bochum, FRG	1187
PP-19	Theoretical and Experimental Characterization of Radial-Resonator Waveguide Mounting Structures A. Ko and B. D. Bates Department of Electrical and Electronic Engineering The University of Melbourne Victoria, Australia	1191

PP-20	Vector Measurements of Microwave Devices at Cryogenic Temperatures J. W. Smuk, M. G. Stubbs and J. S. Wight* Communications Research Centre Ottawa, Canada *Dept. of Electronics Carleton University Ottawa, Canada	1195
PP-21	A Multipath Fading Microwave Simulator for Studying Space Diversity Systems J. C. Guillard and X. Le Polozec ALCATEL ATFH Levallois Perret, France	1199
PP-22	A New W-Band Coplanar Waveguide Test Fixture J. V. Bellantoni*, R. C. Compton* and H. M. Levy** *School of Electrical Engineering Cornell University Ithaca, NY **Siemens Corporate Research and Support, Inc. Princeton, NJ	1203
PP-23	Varactor-Tuned Planar W-Band Oscillator J. Buechler*, J. F. Luy**, and K. M. Strohm** *Technische Universität München München, FRG **AEG Research Center Ulm, FRG	1205
PP-24	High-Performance Millimeter-Wave Local Oscillator Module for EW Applications E. Boch, and T. Stajcer COM DEV, Cambridge Ontario, Canada	1207
PP-25	A Novel W-Band Suspended Substrate Microstripline Second Harmonic GaAs Gunn Oscillator Y. Shu and Y. Wang Dept. of Radio Engineering South-East University Nanjing, China	1211
PP-26	A W-Band Dielectric Resonator Power Combiner D. Cros, P. Auxemery, X. H. Jiao, B. Jarry and P. Guillon University of Limoges Limoges Cédex, France	1215

PP-27	Theoretical and Experimental Characterization of Nonsymmetrically Shielded Coplanar Waveguides for Millimeter Wave-Circuits F. Alessandri*, U. Goebel**, F. Melai*** and R. Sorrentino* *Tor Vergata University of Rome Rome, Italy **Technical University Hamburg-Harburg Harburg, W. Germany ***Micrel S.p.a., Firenze, Italy	1219
PP-28	Higher-Order Frequency Multipliers—A Solution for MM-and Submm-Wave Local-Oscillator Signal Generation T. Tolmunen, A. Räisänen and M. Sironen Helsinki University of Technology Espoo, Finland	1223
PP-29	A Tunable, Temperature-Compensated Hybrid-Mode Dielectric Resonator S. W. Chen and K. A. Zaki University of Maryland College Park, MD R. West Trans-Tech, Inc. Adamstown, MD	1227
PP-30	Unloaded Q's of Axially Asymmetric Modes of Dielectric Resonators H. C. Chang and K. A. Zaki Electrical Engineering Dept. University of Maryland College Park, MD	1231
PP-31	Numerical Analysis of the Tubular Dielectric Resonator With a Dielectric Tuning Rod D. Kajfez* and J. Lebaric** *University of Mississippi University, MS **Rose Hulman Institute of Technology Terre Haute, IN	1235
PP-32	Frequency and Low-Temperature Characteristics of High-Q Dielectric Resonators Y. Kobayashi, Y. Kabe, Y. Kogami, and T. Yamagishi Department of Electrical Engineering Saitama University Urawa, Saitama, Japan	1239
PP-33	180° Lumped-Element Hybrids S. J. Parisi MITRE Corp. Bedford, MA	1243

PP-34	Unilateral Microstrip Balanced and Doubly Balanced Mixers R. Knöchel, B. Mayer and U. Goebel Technische Universität Hamburg-Harburg Arbeitsbereich Hochfrequenztechnik Postfach, Hamburg, West Germany	1247
PP-35	The Power Transfer Mechanism of MMIC Spiral Transformers and Adjacent Spiral Inductors G. E. Howard, J. Dai, Y. L. Chow, and M. G. Stubbs University of Waterloo, University of Tianjin and Communications Research Centre of Canada	1251
PP-36	Focusing Mirrors for Gaussian Beams M. Boheim AEG Aktiengesellschaft Ulm, W. Germany	1255
PP-37	Parasitic Effects Induced by Power Strips Current Switching in Full Wafer Package J. Chilo and G. Angenieux LEMO Grenoble, France	1259
PP-38	Suppression of Resonant Modes in Microwave Packages D. F. Williams and D. W. Paananen Ball Communications Systems Division Broomfield, CO	1263
PP-39	Lossy Model of Diode Packages: An Alternative Method for Exact Evaluation of Active Chip Parameters K. Kazi, B. B. Szendrenyi, I. Mojzes Research Institute for Technical Physics Hungarian Academy of Sciences Budapest, Hungary	1267
PP-40	Dispersion in Anisotropic NRD Waveguide A. C. César School of Engineering of São Carlos, USP Brazil R. F. Souza School of Electrical Engineering, UNICAMP Brazil	1271
PP-42	Analysis and Tuning Efficiency Optimization of Magnetically-Tuned, Printed E-Plane Circuit Filters J. Uher and W. J. R. Hoefler Laboratory for Electromagnetics and Microwaves University of Ottawa, Canada	1273

PP-43	Design and Low Power Testing of a Microwave Vlasov Mode Converter	1277
	B. G. Ruth, R. K. Dahlstrom, C. D. Schlesiger and L. F. Libelo Harry Diamond Laboratories Adelphi, MD	
PP-44	50-W Class Multi-Port Amplifier for Multi-Beam Satellite Communications	1281
	K. Yamamoto and M. Tanaka NTT Radio Communication Systems Laboratories Take, Japan	

Session QQ
Solid-State Circuits
Convention Center, Center Theater

4:00 p.m. to 5:30 p.m.

Thursday, June 15, 1989

Chairman: Natalino Camilleri—Avantek

QQ-1 4:10 p.m.	Millimeter-Wave, Lumped Element, Gunn VCO'S With Ultrawideband (20 GHz) Tuning L. D. Cohen and E. Sard AIL Systems, Inc. Melville, NY	1287
QQ-2 4:30 p.m.	Second-Harmonic Reflector Type High-Gain FET Frequency Doubler Operating in K-Band Y. Iyama, A. Iida, T. Takagi and S. Urasaki Mitsubishi Electric Corp. Kanagawa Prefecture, Japan	1291
QQ-3 4:50 p.m.	A Monolithic DC-1.6 GHz Digital Attenuator J. Bayruns, P. Wallace, and N. Schienburg Anadigics, Inc. Warren, NJ	1295
QQ-4 5:10 p.m.	A Balanced 11 GHZ HEMT Up-Converter P. Bura and B. Vassilakis Transmission Networks Division Northern Telecom Montreal, Canada	1299
QQ-5 5:20 p.m.	Transient Response of PIN Limiter Diodes R. J. Tan, A. L. Ward, and R. Kaul Harry Diamond Laboratories Adelphi, MD	1303