

# 1987 MTT Symposium Digest

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8:30 a.m. – 10:00 a.m. Tuesday, June 9, 1987

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Keynote Address	Mr. Les Besser

#### Session B

##### Ziegfeld Room: Joint with Monolithics Symposium – Non-Linear and Power Circuits

10:30 a.m. to Noon Tuesday, June 9, 1987

Chairman D. R. Chen, Microwave Monolithics, Inc.  
Co-Chairman Z. J. Lemnios, Ford Microelectronics, Inc.

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Chairman Ulrich L. Rohde, Compact Software

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Chairman R. V. Snyder, R. S. Microwave Company, Inc.

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Chairman V. Nair, Motorola, Inc.  
Co-Chairman S. Moghe, Pacific Monolithics

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Chairman C. Buntschuh, Narda Microwave

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Chairman Peter LaTourette, Consultant

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Chairman James Schellenberg, Hughes Aircraft Co

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Chairman Arye Rosen, RCA David Sarnoff Research Center

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### Session K

#### Ziegfeld Room: MMW Technology and Applications

8:30 a.m. to 10:00 a.m. Wednesday, June 10, 1987

Chairman J Horton, TRW

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8:30 a.m. to 10:00 a.m. Wednesday, June 10, 1987

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### Session M

#### Gable 3, 4 Room: Communications Systems

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#### Ziegfeld Room: - Focused Session -

#### Advances in Millimeter Wave Systems (60-230 GHz)

10:30 a.m. to Noon Wednesday, June 10, 1987

Chairman James C Wiltse, Georgia Tech Research Institute

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### Session O

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10:30 a.m. to Noon Wednesday, June 10, 1987

Chairman Stephen F Adam, Adam Microwave Consulting, Inc

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#### Gable 3, 4 Room: Radar Systems

10:30 a.m. to Noon **Wednesday, June 10, 1987**

Chairman Kiyo Tomiyasu, General Electric Co

<b>P-1</b> 10:30 a.m.	<b>Solid State Transmitter/Modulator for the Mode Select Airport Beacon System Sensor</b> T M Nelson, M J Reinhart, K J Yoo, D A Poltorak and R K Palmer Westinghouse Electric Corp Baltimore, MD	<b>531</b>
<b>P-2</b> 10:50 a.m.	<b>94 GHz Integrated Monopulse Radar Demonstrator</b> C E Burnett Marconi Electronic Devices Ltd Lincoln, England	<b>535</b>
<b>P-3</b> 11:10 a.m.	<b>Self Adaptive Bandpass Filters with Applications to "Frequency Set-On" Oscillators</b> J D Rhodes Filtronic Components Ltd Charlestown, UK	<b>539</b>
<b>P-4</b> 11:30 a.m.	<b>Noise in Pulsed Microwave Systems</b> C Wong, E Caramanys, A Skantzaris, J Bender and R Campbell Raytheon Co Bedford, MA	<b>543</b>

### Session Q

#### Garland Ballroom: Open Forum II

1:30 to 3:30 p.m. **Wednesday, June 10, 1987**

<b>Q-1</b>	<b>Multioctave Multithrow Active Switches</b> D L Dunn, P G Asher, and C D Chang Hughes Aircraft Company Torrance, CA	<b>549</b>
<b>Q-2</b>	<b>A Comparative Study of TEGFET and MESFET Large Signal Characteristics and Saturation Mechanisms</b> M Weiss Thomson Semiconductors, Orsay, France and D Pavlidis University of Michigan, Ann Arbor, MI	<b>553</b>
<b>Q-3</b>	<b>Comparative Study of Phase Noise in HEMT and MESFET Microwave Oscillators</b> M Pouysegur LAAS du CNRS, Toulouse, France J Gratfeuil, J F Sautereau Université Paul Sabatier, Toulouse, France and J P Fortea Centre Nat D Études Spatiales, Toulouse, France	<b>557</b>
<b>Q-4</b>	<b>A GaAs Monolithic 6 GHz Low-Noise Amplifier for Satellite Receivers</b> R Mott COMSAT Laboratories Clarksburg, MD	<b>561</b>
<b>Q-5</b>	<b>Miniature Gain Block for Satellite Communication Transceivers</b> A Fathy, R Brown and E Belohoubek RCA Laboratories Princeton, NJ	<b>565</b>
<b>Q-6</b>	<b>A GaAs Microwave MESFET with Extremely Low Distortion</b> G G Zhou, T Curtis and R Chen Gould Inc Microwave Products Division San Jose, CA	<b>569</b>
<b>Q-7</b>	<b>The Deformable-Channel Model-A New Approach to High-Frequency MESFET Modeling</b> F Crowne, A Eskandarian, H B Sequerra and R Jahkete Martin Marietta Laboratories, Gamma Monolithics Baltimore, MD	<b>573</b>
<b>Q-8</b>	<b>Load-Line Analysis in the Frequency Domain with Distributed Amplifier Design Examples</b> M L Salib, D E Dawson, and H K Hahn Westinghouse Electric Corp Baltimore, MD	<b>575</b>

<b>Q-9</b>	<b>Fast Settling, Low Noise Ku Band Fundamental Bipolar VCO</b> A P S Khanna Avantek Inc Santa Clara, CA	<b>579</b>
<b>Q-10</b>	<b>Long Term Stability of DROs Compared to Crystal Oscillators</b> K R Varian Rockwell International Dallas, TX	<b>583</b>
<b>Q-11</b>	<b>Low Phase Noise X/KU-Band VCO</b> D A Boyd Eaton Corp Microwave Products Division Sunnyvale, CA	<b>587</b>
<b>Q-12</b>	<b>Microwave Resistance of Gallium Arsenide and Silicon P-I-N Diodes</b> R Caverly Southeastern Mass University N Dartmouth, MA and G Hiller M/A-COM Semiconductor Products Burlington, MA	<b>591</b>
<b>Q-13</b>	<b>W Band Crossbar Mixers Integrated Entirely on a Single-Sided Substrate Yielding 15 GHz Instantaneous Bandwidth</b> S Low COM DEV Ltd Cambridge, Canada	<b>595</b>
<b>Q-14</b>	<b>Diode Phase Shifter and Model in Waveguide</b> J A Lester and C M Jackson TRW Redondo Beach, CA and K Chang Texas A & M University, TX	<b>599</b>
<b>Q-15</b>	<b>Wide-Band True Time Delay Phase Shifter Device</b> P R Herczfeld, A Daryoush Drexel University, Philadelphia, PA M Kiehl Thomas & Betts, Raritan, NJ S Siegel RCA, David Sarnoff Lab, Princeton, NJ and R Soref RACD/ESO Hanscom AFB, MA	<b>603</b>
<b>Q-16</b>	<b>A Novel Whiskerless Schottky Diode for Millimeter and Submillimeter Wave Application</b> W L Bishop, K McKinney, R J Mattauch, T W Crowe, and G Green Department of Electrical Engineering University of Virginia, Charlottesville, VA	<b>607</b>
<b>Q-17</b>	<b>Filled Image Guide for Millimeter-Wave Circuits</b> M Q Shi and D H Jiang Peking University Beijing, People's Republic of China	<b>611</b>
<b>Q-18</b>	<b>A Tunable Grating Impedance Transformer</b> J D Xu Northwestern Polytechnical University Xian Shaanxi, China	<b>*</b>
<b>Q-19</b>	<b>A Novel Technique for Evaluation and Integration of Connectorless (Drop-In) Microwave Components</b> D Herstein General Microwave Corporation Amityville, NY	<b>613</b>
<b>Q-20</b>	<b>Coupling Between Hybrid Mode Dielectric Resonators</b> K A Zaki and C M Chen Electrical Engineering Department University of Maryland College Park, MD	<b>617</b>
<b>Q-21</b>	<b>Exact Calculation of Scattering Parameters of the Coplanar -- Slot Transition in a Unilateral In-line Technology</b> O Picon, J P Lefevre, V F Hanna CNET, Issy-Les-Moulineaux, France and J Citerne Laboratoires Structures Rayonnantes, Rennes Cedex, France	<b>621</b>
<b>Q-22</b>	<b>Analysis of VLSI Interconnect Structures</b> L Carr, Q Xu, and K J Webb University of Maryland College Park, MD and J A McClintock Martin Marietta Labs Baltimore, MD	<b>625</b>
<b>Q-23</b>	<b>Towards a Unified Efficient Algorithm for Characterizing The Planar Periodic Waveguides</b> K Wu and P Saguet Laboratoire D'Electromagnetisme Et Optique Guidee E N S R G Grenoble, France	<b>629</b>
<b>Q-24</b>	<b>Centering and Tolerancing the Components of Microwave Amplifiers</b> A MacFarland, J Purviance Department of Electrical Engineering University of Idaho Moscow, Idaho and D Loescher, K Diegert, and T Ferguson Sandia National Laboratories Albuquerque, NM	<b>633</b>

Q-25	Analysis of Discontinuities in Optical Waveguides J B Davies and B M A Rahman University College London, UK	637	Q-41	Computer Aided Design Models for Unilateral Finlines with Finite Metallization Thickness and Arbitrarily Located Slot Widths P Pramanick, R R Mansour COM DEV Ltd. Cambridge, Canada and R H. MacPhie University of Waterloo Ontario, Canada	703
Q-26	Optical Crosstalk Due to Electrical Coupling in High Speed LiNbO3 P Perlmutter, J E Baran and Y Silberberg Bell Communications Research Red Bank, NJ	641	Q-42	Puff, an Interactive Microwave Computer Aided Design Program for Personal Computers R C Compton W L Williams, and D B Rutledge Division of Engineering and Applied Science California Institute of Technology Pasadena, CA	707
Q-27	Optoelectronic Generation and Sensing of Millimeter Waves A P DeFonzo and C. Lutz University of Massachusetts Amherst, MA	645	Q-43	An Automatic Decomposition Technique for Device Modeling and Large Circuit Design J W Bandler and Q J Zhang Electrical Engineering Department McMaster University Hamilton Canada	709
Q-28	Generation of Kilowatt/Kilovolt Broadband Microwave Bursts with a Single Picosecond Photoconductive Switch H A Sayadian, M G Li and C H Lee University of Maryland College Park, MD	649	Q-44	Modeling the Dispersion in a Suspended Microstripline R S Tomar Bolnet Technologies, Inc Carleton Place, Ontario, Canada and P Bhartia Department of National Defense Ottawa, Ontario, Canada	713
Q-29	Large Signal Modulation of Semiconductor Lasers with Optical Feedback for Millimeter Wave Applications V M Contanno Naval Air Development Center Warminster, PA and A S Dayoush and P R Herczfeld Drexel University Philadelphia, PA	653	Q-45	An Almost-Periodic Fourier Transform for Use with Harmonic Balance K.S Kundert, G Sorkin and A Sangiovanni-Vincentelli University of California Berkeley, CA	717
Q-30	Optically Controlled Millimeter Wave Phase Shifter in a Metallic Waveguide G Hadjicostas and J Butler Southern Methodist University Dallas, TX and M Scott LTV Aerospace & Def Co Dallas, TX	657	Q-46	Generalized Analysis of E-Plane Septa Discontinuities A Rong, S Li Nanjing Institute of Technology Nanjing, China	721
Q-31	A New Generalised Approach to the Design of Microwave Oscillators Y Xuan and C M Snowden Department of Electrical & Electronic Engineering University of Leeds Leeds, UK	661	<div>Session R</div> <div>Gable 5, 6, 7 Room: Guided Waves</div> <div>1:30 p.m. to 3:00 p.m. Wednesday, June 10, 1987</div> <div>Chairman Prof Jeffrey B Knorr, Naval Postgraduate School</div>		
Q-32	A Refractory Self-Aligned Gate Process for Monolithically Combined Microwave and Digital GaAs ICs A Geissberger, R Sadler, E Griffin, H Singh, I Bahl and M Drinkwine ITT Gallium Arsenide Technology Center Roanoke, VA	665	R-1 1:30 p.m.	Simple Analytic Formulas for Dielectric Waveguides S T Peng New York Institute of Technology Old Westbury, NY S L Wang University of New Haven West Haven, CT F K Schwering U S Army CECOM Ft Monmouth, NJ	727
Q-33	Analysis of Multiple-Step Radial-Resonator Waveguide Diode Mounts with Application to IMPATT Oscillator Circuits B D Bates Department of Electrical and Electronic Engineering University of Melbourne Australia	669	R-2 1:50 p.m.	Guidance and Leakage Properties of Offset Groove Guide H Shigesawa, M Tsuji Doshisha University Koyoto, Japan A A Ohner Polytechnic University Brooklyn, NY P Lampariello, F Frezza University of Rome "La Sapienza" Rome, Italy	731
Q-34	Absorbed Power Distribution in Heart Lung System Due to Microwave Irradiation at 750 MHz J Behari School of Environmental Sciences Jawaharlal Nehru University New Delhi, India	673	R-3 2:10 p.m.	Analysis and Design of Microslab™ Waveguide B Young and T Itoh University of Texas Austin, TX	735
Q-35	Dielectric-Resonator-Stabilized Second Harmonic Ka-Band Microstrip Gunn Oscillator S Zhong-Liang and C Ning Department of Radio Engineering Nanjing Institute of Technology Nanjing, China	677	R-4 2:30 p.m.	Microstrip Circuit Elements on Cylindrical Substrates A Nakatani Phraxos Research and Development Inc Santa Monica, CA and N G Alexopoulos University of California Los Angeles, CA	739
Q-36	Edge Corrections for Microstrip Planar Analysis Models H A Burger Goodyear Aerospace Corporation Litchfield Park, AZ	681	R-5 2:50 p.m.	Analysis of Double-Layered Finlines Containing a Magnetized Ferrite M Geshiro On Leave From Ehime University, Ehime, Japan and T Itoh University of Texas Austin, TX	743
Q-37	Characterization Method and Simple Design Formulas of MCS Lines Proposed for MMICs E Yamashita, K R Li, E Kaneko, and Y Suzuki University of Electro-Communications Tokyo, Japan	685	<div>Session S</div> <div>Ziegfeld Room: – Focused Session –</div> <div>Advances in Millimeter Wave Technology (60-230 GHz)</div> <div>1:30 p.m. to 3:00 p.m. Wednesday, June 10, 1987</div> <div>Chairman James C Wiltse, Georgia Tech Research Institute</div>		
Q-38	Global Stability Analysis of Microwave Circuits by a Frequency-Domain Approach V Rizzoli Department Di Electronica University of Bologna Bologna, Italy A Neri Fondazione Ugo Bordon Bologna, Italy	689	S-1 (Invited) 1:30 p.m.	Millimeter Wave Material Properties and Measurements G J Simonis U S Army Harry Diamond Laboratories Adelphi, MD	747
Q-39	Analysis Equations for Shielded Suspended Substrate Microstrip Line and Broadside-Coupled Stripline Y Shu, X Qi, Y Wang Department of Radio Engineering Nanjing Institute of Technology Nanjing, China	693			
Q-40	The Effectiveness of Four Direct Search Optimization Algorithms R W Rhea Scientific Atlanta, Inc. Atlanta, GA	697			

S-2 (Invited) 1:50 p.m.	<b>Advances in HEMT Technology and Applications</b> P M Smith, P C Chao, K H G Duh, L F Lester B R Lee and J M Ballingall General Electric Co Syracuse, NY	749
S-3 (Invited) 2:10 p.m.	<b>Imaging Antenna Arrays</b> D Rutledge California Institute of Technology Pasadena, CA	*
S-4 (Invited) 2:30 p.m.	<b>GaAs Schottky Barrier Diodes for High Sensitivity Millimeter and Submillimeter Wavelength Receivers</b> T W Crowe and R J Mattauch University of Virginia Charlottesville, VA	753

### Session T

#### Ziefeld Room: Invited European Session

3:30 p.m. to 5:00 p.m. Wednesday, June 10, 1987

Chairman R Sparks, Raytheon

T-1 (Invited) 3:30 p.m.	<b>Detection of Millimeter and Submillimeter Waves</b> E Kollberg Chalmers University of Technology Gothenburg, Sweden	759
T-2 (Invited) 4:00 p.m.	<b>State-of-the-Art of MMIC Technology and Design in West Germany</b> E Pettenpaul Siemens AG Munich, West Germany	763
T-3 (Invited) 4:30 p.m.	<b>Modeling of New Microwave Devices</b> G Salmer Université de Lille France	767

### Session U

#### Gable 5, 6, 7 Room: Waveguide Discontinuity Structures

3:30 p.m. to 5:00 p.m. Wednesday, June 10, 1987

Chairman James W Mink, U S Army Research Office

U-1 3:30 p.m.	<b>A Dynamic Model for Microstrip – Slotline Transition and Related Structures</b> H Y Yang and N G Alexopoulos Electrical Engineering Department University of California Los Angeles, CA	773
U-2 3:50 p.m.	<b>Characterization of Stripline Crossing by Transverse Resonance Analysis</b> T Uwano Matsushita Electric Co Osaka, Japan R Sorrentino University of Rome Tor Vergata Roma, Italy and T Itoh University of Texas Austin, TX	777
U-3 4:10 p.m.	<b>An Improved Multimode Small Aperture/Obstacle Theory</b> M Guglielmi and A A Oliner Polytechnic University Brooklyn, NY	781
U-4 4:30 p.m.	<b>An Accurate Analysis of Discontinuities in Dielectric Rectangular Waveguide and its Application to Grating Filters</b> M Tsuji and H Shigesawa Department of Electronics Doshisha University Kyoto, Japan	785
U-5 4:50 p.m.	<b>Variational Bound Analysis of a Discontinuity in Nonradiative Dielectric Waveguide</b> J C Olivier and J A G Malherbe University of Pretoria South Africa	789

### Session V

#### Gable 3, 4 Room: Microwave Acoustics: Developments & Applications

3:30 p.m. to 5:00 p.m. Wednesday, June 10, 1987

Chairman Ted Lukaszek, U S Army Labcom

V-1 3:30 p.m.	<b>Applications of Custom SAW Devices</b> Ronald C Rosenfeld Sawtek Inc Orlando, FL	*
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V-2 3:50 p.m.	<b>Evolution of SAW Technology from Discrete Devices to Functional RF Building Blocks</b> H G Volders and D L Ash RF Monolithics Dallas TX	793
V-3 4:10 p.m.	<b>Miniature SAW Antenna Duplexer for Portable Telephone</b> M Hikita, Y Ishida, T Tabuchi and H Kojima Central Research Laboratory Hitachi, Ltd Tokyo, Japan and K Kurosawa Hitachi Tokai Works Katsuta, Japan	797
V-4 4:20 p.m.	<b>Design and Evaluation of UHF Monolithic Film Resonator-Stabilized Oscillators and Bandpass Filters</b> M M Driscoll, R A Moore, J F Rosenbaum Westinghouse Defense and Electronics Center Baltimore, MD and S V Krishnaswami, and J R Szodon Westinghouse Research and Development Center Pittsburgh, PA	801
V-5 4:40 p.m.	<b>Performance of Acoustic Charge Transport Chirp Filters</b> F Fiegel, R Martin, and F Guedin Electronic Decisions, Inc Urbana, IL	805

### Session W

#### Gable 3, 4 Room: – Focused Session –

#### Optical Techniques for Microwave Applications I

8:30 a.m. to 10:00 a.m. Thursday, June 11, 1987

Chairman Tatsuo Itoh, University of Texas, Austin

W-1 (Invited) 8:30 a.m.	<b>Optical Generation and Control of Microwaves and Millimeter-Waves</b> C H Lee Department of Electrical Engineering University of Maryland College Park, MD	811
W-2 9:00 a.m.	<b>Microwave Performance of an Optically Controlled AlGaAs/GaAs High Electron Mobility Transistor and GaAs MESFET</b> R N Simons NRC-NASA Research Associate Cleveland, OH and K B Bhasin NASA Lewis Research Center Cleveland, OH	815
W-3 9:20 a.m.	<b>A High-Speed Phase Shifter Based on Optical Injection</b> L R Brothers and C H Cox, III MIT Lincoln Laboratory Lexington, MA	819
W-4 9:40 a.m.	<b>Phase and Frequency Coherency of Multiple Optically Synchronized 20 GHz FET Oscillators For Satellite Communications</b> A S Duryoush, P R Herzfeld, R Glatz Department of Electrical and Computer Engineering Drexel University, Philadelphia, PA and A P S Khanna Avantek, Santa Clara, CA	823

### Session X

#### Ziegfeld Room: FET Amplifiers

8:30 a.m. to 10:00 a.m. Thursday, June 11, 1987

Chairman Eliot D Cohen, Defense Logistics Agency

X-1 8:30 a.m.	<b>Design and Performance of a New Multi Octave High-Gain Amplifier</b> K B Niclas, R R Pereira, A J Graven and A P Chang Watkins Johnson Company Palo Alto, CA	829
X-2 8:50 a.m.	<b>A High Performance, Quasi-Monolithic 2-18GHz Distributed GaAs FET Amplifier</b> A Cappello, T Alexander, J Calviello, D Ward, P Bié and R Pomian Eaton Corporation/AIL Division Melville, NY	833
X-3 9:00 a.m.	<b>Operating Characteristics of 2-8 GHz GaAs MESFET Amplifiers at Elevated Case Temperatures to 200 Degrees Centigrade</b> E J Criscenzi, Jr, J A Thompson, T R Krtner and M E Kretschmar Watkins-Johnson Co Palo Alto, CA	837
X-4 9:20 a.m.	<b>A 6-18 GHz MMIC Power Amplifier Module Designed for Automated Assembly Fabrication*</b> C A Sapashe, D L Green, C D Palmer, and J S Pavio Texas Instruments Dallas, TX	841

X-5 9:30 a.m.	A 6 Watt Power GaAs FET for 14.0-14.5 GHz Band Y Kadowaki, S Igi, M Wataze, T Sonoda, K Hayashi, M Yamanouchi, S Takamiya and S Mitsui Mitsubishi Electric Corporation Hoyogo, Japan	845
X-6 9:40 a.m.	K- and Ka-Band High Efficiency Amplifier Modules Using GaAs Power FETs D Bechtle, J Klatskin, G Taylor, M Eron, S G Liu, R Camisa and H Dudley David Sarnoff Research Center Princeton, NJ	849

### Session Y

#### Table 5, 6, 7 Room: Solid State Devices/Circuits I

8:30 a.m. to 10:00 a.m. Thursday, June 11, 1987

Chairman Michael Dydyk, Motorola

Y-1 8:30 a.m.	Silicon Bipolar MMIC for Frequency-Conversion Application up to 20 GHz L Kipnas Avantek, Inc Santa Clara, CA	855
Y-2 8:50 a.m.	Frequency Stability of L-Band Two-Port Dielectric Resonator Oscillators M Loboda, T E Parker, and G K. Montress Raytheon Research Division Lexington, MA	859
Y-3 9:10 a.m.	Solid State MM-Wave Oscillators with Large Tuning Range K Jacobs, and B Vowinkel University of Cologne West Germany	863
Y-4 9:20 a.m.	Varactor-Tuned Microstrip Ring Resonators K Chang, S Martin, and F Wang Department of Electrical Engineering Texas A & M University College Station, TX	867
Y-5 9:40 a.m.	A Multi-Diode Cavity Power Combiner Using State-of-the-Art Pulsed Gunn Diodes B E Sigmon Motorola Government Electronics Group Tempe, AZ and M Ayyagari MA/COM Semiconductor Burlington, MA	871

### Session Z

#### Table 3, 4 Room: -- Focused Session --

#### Optical Techniques for Microwave Applications II

10:30 a.m. to Noon Thursday, June 11, 1987

Chairman N R Dietrich, AT&T Labs

Z-1 (Invited) 10:30 a.m.	Microwave Measurements of GaAs Integrated Circuits Using Electrooptic Sampling K J Weingarten, R Majdy-Aky, M J W Rodwell, D M Bloom and B A Auld Stanford University Stanford, CA	877
Z-2 11:00 a.m.	Picosecond Reflectometry Technique for On-Chip Characterization of Millimeter-Wave Semiconductor Devices C Rauscher Naval Research Laboratory Washington, DC	881
Z-3 11:20 a.m.	Direct Fiber Optic Transmission of a Wideband Multi-Carrier, Microwave Signal Spectrum to and from Satellite Earth Station Antennas J W Carlin, J E Bowers, A C Chiraloski and S Boodaghians AT&T-Bell Laboratories Holmdel, NJ	885
Z-4 11:40 a.m.	Optical Feedback on Linearity Performance of 1.3 $\mu$ m DFB and Multimode Lasers Under Deep Microwave Modulation W I Way and M M Choy Bell Communications Research Red Bank, NJ	889

### Session AA

#### Ziegfeld Room: Non-Linear FET Applications

10:30 a.m. to Noon Thursday, June 11, 1987

Chairman E C Niehenke, Westinghouse Electric Corp

AA-1 10:30 a.m.	A GaAs MESFET Balanced Mixer with Very Low Intermodulation Stephen A Maas The Aerospace Corp Los Angeles, CA	895
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AA-2 10:50 a.m.	A Monolithic Double Balanced Single Sideband Modulator S D Thompson and A M Pavio Texas Instruments, Inc Dallas, TX	899
AA-3 11:10 a.m.	Passive GaAs FET Switch Models and their Application in Phase Shifters L C Upadhyayula, R L Camisa, G. Taylor, S N Subbarao and S G Liu RCA Laboratories Princeton, NJ	903
AA-4 11:20 a.m.	A Non-Linear Design and Optimization Procedure for Ga As MESFET Oscillators T J Brazil and J O Scanlan Department of Electrical Engineering University College Dublin, Ireland	907
AA-5 11:40 a.m.	High Performance GaAs C-Band and Ku-Band MMIC Oscillators S Moghe and T Holden Pacific Monolithics, Inc Sunnyvale, CA	911

### Session BB

#### Table 5, 6, 7 Room: Solid State Devices/Circuits II

10:30 a.m. to Noon Thursday, June 11, 1987

Chairman Clifford Krowne, Naval Research Lab

BB-1 10:30 a.m.	Multi-Watt Power Generation at Millimeter-Wave Frequencies Using Epitaxially-Stacked Varactor Diodes P W Staecker, M E Hines, F Occhiuti and J F Cushman M/A Com Inc Burlington, MA	917
BB-2 10:50 a.m.	A New Reversible Varactor Frequency Halver/Double Device Z Nativ Rafael State of Israel Armament Development Authority Haifa, Israel	921
BB-3 11:10 a.m.	Measurements and Modeling of Kinetic Inductance Microstrip Delay Lines J M Pond, J H Claasen and W L Carter Naval Research Laboratory Washington, DC	925
BB-4 11:30 a.m.	A 100 GHz SIS Quasiparticle Mixer with 10 DB Coupled Gain A V Rausanen, D C Crete, P L Richards and F L Lloyd* Department of Physics University of California Berkeley, CA *National Bureau of Standards Boulder, CO	929

### Session CC

#### Table 3, 4 Room: Phased and Active Array Techniques

1:30 p.m. to 3:00 p.m. Thursday, June 11, 1987

Chairman Eugene H Gregory, Hughes Aircraft Co

CC-1 1:30 p.m.	A 2 Watt GaAs TX/RX Module with Integral Control Circuitry, For S-Band Phased Array Radars C R Green, A A Lane, P N Tombs, R Shukla, P D Cooper J R Suffolk, and J A Sparrow Plessey Research Caswell Ltd Caswell, UK	933
CC-2 1:50 p.m.	A 35 GHz Electronically Steered Line Array R J Lang and B J Edward General Electric Company Syracuse, NY	937
CC-3 2:10 p.m.	An Ultraminiature 5-10 GHz, 2 Watt Transmit Module for Active Aperture Application J Pierro and R Clouse Eaton Corp /AFL Division Melville, NY	941
CC-4 2:30 p.m.	Microstrip FED Planar Frequency Multiplying Space Combiner S Nam, T Uwano, and T Itoh Department of Electrical and Computer Engineering University of Texas Austin, TX	945
CC-5 2:40 p.m.	Low Cost Cartop Phased Array Steering G Schaffner Teledyne Ryan Electronics San Diego, CA	949

### Session DD

#### Ziegfeld Room: HEMT/MESFET Applications

1:30 p.m. to 3:00 p.m. Thursday, June 11, 1987

Chairman B D Geller, Comsat Corporation

DD-1 1:30 p.m.	Bias-Dependent Microwave Characteristics of an Atomic Planar- Doped AlGaAs/InGaAs/GaAs Double Heterojunction MODFET Y K Chen, D C Radulescu, G W Wang, A N Lepore, P J Tasker and L F Eastman School of Electrical Engineering Cornell University Ithaca, NY
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<b>DD-2</b> 1:50 p.m.	<b>FETs and HEMTs at Cryogenic Temperatures – Their Properties and Use in Low-Noise Amplifiers</b> M W Pospieszalski and S Weinreb National Radio Astronomy Observatory Charlottesville, VA	<b>955</b>	<b>FF-2</b> 3:50 p.m.	<b>Impact of Dielectric Loss Tangent on the Performance of Millimeter Wave Ferrite Circulators</b> G R Harrison, S B Thompson, J T Vaughn Electromagnetic Sciences, Inc Norcross, GA and G P Rodrigue School of Electrical Engineering Georgia Institute of Technology Atlanta, GA	<b>989</b>
<b>DD-3</b> 2:10 p.m.	<b>Reliability of Low-Noise Microwave HEMT Using by MOCVD</b> K Tanaka, H Takakuwa, K Togashi, Y Kato and S Watanabe Sony Corp Kanagawa, Japan	<b>*</b>	<b>FF-3</b> 4:00 p.m.	<b>Full Wave Analysis of Slot Line and Coplanar Waveguide on a Magnetic Substrate</b> E El-Sharawy and R W Jackson University of Massachusetts Amherst, MA	<b>993</b>
<b>DD-4</b> 2:20 p.m.	<b>Predicting Long Term Frequency Drift in FET Oscillators Using Device Modeling</b> K K Agarwal and C Ho Telecommunication Division Rockwell International Corp Dallas, TX	<b>959</b>	<b>FF-4</b> 4:10 p.m.	<b>Magnetostatic Waves in a Normally Magnetized Waveguide Structure</b> M Radmanesh GMI Engineering & Management Institute Flint, MI and C M Chu and G I Haddad University of Michigan Ann Arbor, MI	<b>997</b>
<b>DD-5</b> 2:40 p.m.	<b>Harmonic Reaction Amplifier – A Novel High-Efficiency and High-Power Microwave Amplifier</b> S Nishiki and T Nojima NTT Electrical Communications Laboratories Take Yokosuka-Shi, Kanagawa-Ken, Japan	<b>963</b>			

### Session EE

#### Gable 5, 6, 7 Room: Solid State Devices/Circuits III

1:30 p.m. to 3:00 p.m. Thursday, June 11, 1987

Chairman Robert L. Eisenhart, Hughes Aircraft Co

<b>EE-1</b> 1:30 p.m.	<b>AlGaAs/GaAs Heterojunction Bipolar Transistors with 4W/mm Power Density at X Band</b> B Bayraktaroglu, N Camilleri, H D Shih, and H G Tserng Texas Instruments Dallas, TX	<b>969</b>
<b>EE-2</b> 1:50 p.m.	<b>Millimeter Wave Heterojunction MITATT Diodes</b> N S Dogan, J R East Department of Electrical Engineering Washington State University Pullman, WA M E Elta and G I Haddad The University of Michigan Ann Arbor, MI	<b>973</b>
<b>EE-3</b> 2:10 p.m.	<b>Improved Performance of Fundamental and Second Harmonic MMW Oscillators Through Active Device Doping Concentration Contouring</b> J Ondra Marconi Electronic Devices Ltd Lincoln, England and R L Ross U S Army Electronic Technology and Devices Laboratory Fort Monmouth, NJ	<b>977</b>
<b>EE-4</b> 2:30 p.m.	<b>W-Band Microstrip Oscillator Using InP Gunn Diode</b> D R Singh Defense Systems Division Honeywell Inc Minnetonka, MN	<b>981</b>

### Session FF

#### Gable 3, 4 Room: Microwave Ferrites

3:30 p.m. to 5:00 p.m. Thursday, June 11, 1987

Chairman W E Hord, Microwave Applications Group

<b>FF-1</b> 3:30 p.m.	<b>A New Type of Fast Switching Dual-Mode Ferrite Phase Shifter</b> W E Hord, C R Boyd, Jr and D Diaz Microwave Applications Group Santa Maria, CA	<b>985</b>
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<b>FF-5</b> 4:20 p.m.	<b>Energy Storage Effect in MSSW Metal-Finger Reflectors</b> T S Cheng Bell Communications Research Red Bank, NJ and J P Parekh and H S Tuan Department of Electrical Engineering State University of New York Stony Brook, NY	<b>1001</b>
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### Session GG

#### Gable 5, 6, 7 Room: HEMT Amplifiers and Devices

3:30 p.m. to 5:00 p.m. Thursday, June 11, 1987

Chairman Bert Berson, Berson & Associates

<b>GG-1</b> 3:30 p.m.	<b>HEMT Low-Noise Amplifier for Ka-Band</b> M A G Upton, P M Smith and P C Chao General Electric Co Syracuse, NY	<b>1007</b>
<b>GG-2</b> 3:50 p.m.	<b>Broadband HEMT Amplifier for 26.5-40 GHz</b> K Shibata, B. Abe, S Hori and K Kamei Toshiba Corporation Kawasaki, Japan	<b>1011</b>
<b>GG-3</b> 4:10 p.m.	<b>A Four Stage V-Band MOCVD HEMT Amplifier</b> W Yau, E T Watkins, S K Wang, K Wang and B Klatskin Hughes Aircraft Company Torrance, CA	<b>1015</b>
<b>GG-4</b> 4:30 p.m.	<b>Super Low-Noise HEMTs with a T-Shaped Gate Structure</b> S Asai, K Joshin, Y Hirachi and M Abe Fujitsu Laboratories Ltd Atsugi, Japan	<b>1019</b>
<b>GG-5</b> 4:40 p.m.	<b>Reliability of Super Low Noise HEMTs</b> K Hayashi, T. Sonoda, T Yamaguchi, K Nagahama, S Takamiya, S Mitsui, and M Yamanouchi Mitsubishi Electric Corp Itami, Japan	<b>1023</b>