

1985
Technical
Program

Contents
Papers by Sessions

Technical Program Contents

Session A: Plenary Session Program

**Cervantes Convention Center
Room 120**

Tuesday, 4 June, 1985

8:00	Steering Committee Chairman's Welcome	Dr. Fred Rosenbaum
8:05	MTT-S President's Welcome	Harlan Howe
8:10	Remarks	Dr. Bruno Weinschel
8:20	Technical Program Overview	Dr. William Hord
8:25	Introduction of Plenary Session	Dr. R. A. Moore
	The Future of Microwave Engineers:	
8:30	From the Technical Perspective	Dr. Merrill Skolnik
9:00	From the Professional/Industrial Perspective	Dr. David Leeson
9:30	From the Economic Perspective	Dr. Stephen Honickman

Session B: Monolithic Receiver Circuits*

10:30 am to Noon

Tuesday, 4 June, 1985

Chairman: C. Huang, Anadigics, Morristown, NJ
Co-Chairman: R. Kagiwada, TRW, Redondo Beach, CA

10:40 am B-1	X-Band Monolithic Series Feedback LNA R. E. Lehmann, D. D. Heston Texas Instruments, Inc., Dallas, TX	51
11:00 am B-2	0.5 - 2.6 GHz Si-Monolithic Wideband Amplifier IC T. Nakata, S. Miyazaki, K. Shirotori NEC Corporation, Kawasaki, Japan	55
11:20 am B-3	A GaAs Double-Balanced Dual-Gate FET Mixer IC for UHF Receiver Front-End Applications K. Kanazawa, M. Kazumura, S. Nambu, G. Kano, I. Teramoto Matsushita Electric Corp., Osaka, Japan	60
11:40 am B-4	Air Bridge Gate FET for GaAs Monolithic Circuits E. M. Bastida, G. P. Donzelli CISE SpA, Milan, Italy	63

* Joint Session of MTT-S and MW&MMW
Monolithic Symposia

Session C: Biomedical Aspects of Microwaves

10:30 am to Noon

Tuesday, 4 June, 1985

Chairman: J. C. Lin, University of Illinois at Chicago, Chicago, IL

10:40 am C-1	Microwave Radiometric Detection of Thermal Asymmetry of Varicocele T. P. Felderman, J. Shaeffer, A. M. El-Mahdi J. F. Stecker, Jr. Eastern Virginia Medical School, Norfolk, VA K. L. Carr M/A-COM, Inc., Burlington, MA	71
11:00 am C-2	Inversion of Microwave Thermographic Data by the Singular Function Method F. Bardati, M. Mongiardo, D. Solimini Universita di Roma Tor Vergata, Roma, Italy	75
11:10 am C-3	Exact Image Theory for Field Calculation in Layered Biological Medium E. Alanen, I. V. Lindell Helsinki University of Technology, Espoo, Finland	78
11:20 am C-4	Coplanar Waveguide Short Gap Resonator for Medical Applications Y. X. Wang Beijing Institute of Radio Measurement, Beijing, China	82
11:30 am C-5	Direct Contact Applicator with Convergent Effect of EM Field for Microwave Hyperthermia Y. Takahashi, Y. Nikawa, T. Katsumata, S. Mori, M. Nakagawa Keio University, Yokohama, Japan M. Kikuchi National Defense Medical College, Saitama, Japan	86
11:50 am C-6	A Microwave Apparatus for Producing Uniform Hyperthermic Temperatures over Large Surfaces F. Sterzer, R. Paglione RCA Laboratories, Princeton, NJ E. Friedenthal, J. Mendecki Albert Einstein College of Medicine, Bronx, NY	90

Session D: Communication Systems

10:30 am to Noon

Tuesday, 4 June, 1985

Chairman: G. L. Heiter, AT&T - Bell Laboratories,
North Andover, MA

10:40 am D-1	A Novel Technique to Realize SMSK Conversion and Matched Filters at Microwave Frequencies F. Ananasso Telespazio S.p.A. per le Comunicazioni Spaziali, Roma, Italy	95
11:00 am D-2	Temperature Controlled Predistortion Circuits for 64 QAM Microwave Power Amplifier M. Nannicini, P. Magni, F. Oggionni Telettra S.p.A., Vimercate, Italy	99
11:20 am D-3	Up/Down Converter for SCPC Applications A. K. Ghose, M. S. Ravichandran, A. Chattopadhyay, N. M. Ahmed Indian Telephone Industries, Bangalore, India	103
11:40 am D-4	MIC Assembly for 12-GHz Direct Broadcast Satellite Receiver G. Molin, H. Chuandong, Z. Shaoshi, G. Zhongru, X. Qiang Nanjing Research Institute of Electronic Technology, Nanjing, China	107

Session E: Monolithic Millimeter-Wave Circuits*

1:30 pm to 3:00 pm

Tuesday, 4 June, 1985

Chairman: H. J. Kuno, Hughes Aircraft Co., Torrance, CA
Co-Chairman: A. Chu, M/A-COM, Burlington, MA

1:40 pm E-1	A W-Band Monolithic Balanced Mixer L. T. Yuan, P. G. Asher Hughes Aircraft Co., Torrance, CA	113
2:00 pm E-2	A 30 GHz Monolithic Single Balanced Mixer with Integrated Dipole Receiving Element S. J. Nightingale, M. A. G. Upton, U. S. Mishra, S. M. Palmateer, P. M. Smith General Electric Co., Syracuse, NY	116
2:20 pm E-3	Dual Function Mixer Circuit for Millimeter Wave Transceiver Applications A. Chu, W. E. Courtney, L. J. Mahoney, M. J. Monfra, R. Calawa MIT Lincoln Lab, Lexington, MA	120

**Joint Session of MTT-S and MW&MMW Monolithic Symposia*

2:40 pm E-4	High Efficiency Millimeter Wave Monolithic IMPATT Oscillators B. Bayraktaroglu, H. D. Shih Texas Instruments, Inc., Dallas, TX	124
------------------------------	---	------------

Session F: Guided Waves

1:30 pm to 3:00 pm

Tuesday, 4 June, 1985

Chairman: C. M. Krowne, Naval Research Laboratory
Washington, DC

1:40 pm F-1	Wave Interaction in Doubly Periodic Structures S. T. Peng, J. M. Dong, L. M. Wang New York Institute of Technology, Old Westbury, NY	131
2:00 pm F-2	Formulation of the Singular Integral Equation Technique for General Planar Transmission Lines A. S. Omar, K. Schünemann Technical University Hamburg - Harburg, Hamburg, West Germany	135
2:20 pm F-3	Development of a Coupler in Finline Technique A. Beyer, D. Köther, I. Wolff Duisburg University, Duisburg, FRG	139
2:40 pm F-4	The Influence of Metallization Thickness and Mounting Grooves on the Characteristics of Finline R. Vahldieck, W. J. R. Hoefer University of Ottawa, Ottawa, Canada	143
2:50 pm F-5	Effect of Side-Wall Grooves on Transmission Characteristics of Suspended Strip Lines E. Yamashita, B. Y. Wang, K. Atsuki University of Electro-Communications, Tokyo, Japan	145

Session G: Integrated Microwave Systems

1:30 pm to 3:00 pm

Tuesday, 4 June, 1985

Chairman: K. K. Agarwal, Rockwell International, Dallas, TX

1:40 pm G-1	Integrated Ka-Band Front End with Monolithic Mixer P. J. Meier, J. A. Calviello, A. J. Cappello, L. D. Cohen, R. J. Pomian, P. R. Bie Eaton Corp., AIL Division, Melville, NY	151
------------------------------	---	------------

2:00 pm G-2	A Low Cost, Accurate, Target Detecting Device for Altimetry and Fuzing T. O. Perkins III, J. A. Teunas, A. J. Cann, M. R. Richmond, W. J. Bradley Sanders Inc., Manchester, NH	155
2:40 pm G-4	Miniature Millimeter-Wave Integrated Circuit Wideband Downconverters A. Grote, R. S. Tahim, K. Chang TRW Electronics and Defense, Redondo Beach, CA	159

Session H: Open Forum I

3:30 pm to 5:30 pm

Tuesday, 4 June, 1985

H-1	Characterisation of Large-Signal Bipolar Transistors in L-Band J. L. Hutchings Council for Scientific and Industrial Research, Pretoria, South Africa	165
H-2	A New Approach for the Design of Microwave Oscillators and Filters Using Dielectric Resonators A. Podcameni, L. F. M. Conrado Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil	169
H-3	Gaussian Beam Imaging with Cylindrical Optics P. F. Goldsmith Millitech Corp., South Deerfield, MA	173
H-4	Planar Integrated Microwave Components for Terrestrial and Satellite Application A. M. K. Saad MA Electronics Canada Lt., Mississauga, Canada	175
H-5	Optoelectronic Techniques for Microwave and Millimeter Wave Applications C. H. Lee, M. G. Li, C. S. Chang, A. M. Yurek, M. J. Rhee, E. Chauchard, R. P. Fischer University of Maryland, College Park, MD A. Rosen, H. Davis RCA Laboratories, Princeton, NJ	178
H-6	A New Class of Optimized Finline and E-Plane Metal Insert Filters with Improved Characteristics R. Vahldieck, W. J. R. Hoefer University of Ottawa, Ottawa, Canada	182

H-7	Microwave Characterization of Liquid Films R. P. Roy, J. Ku, I. Kaufman Arizona State University, Tempe, AZ S. P. Kalra Electric Power Research Institute, Palo Alto, CA	185
H-8	Investigation and Evaluation of Low Loss Interconnects on Soft Substrates Clad to Aluminum T. M. Nelson, M. D. Kline Westinghouse Electric Corp., Baltimore, MD	188
H-10	GaAs MESFET Optimization and New Device Applications Based on Wave Property Studies K. Fricke, H. L. Hartnagel Technische Hochschule Darmstadt, Darmstadt, FRG	192
H-11	Microwave Heating System Using Lens Applicator for Localized Hyperthermia Y. Nikawa, Y. Takahashi, W. Watanabe, S. Mori Keio University, Yokohama, Japan M. Kikuchi National Defense Medical College, Saitama, Japan	196
H-12	Sensitivity Analysis of a 15.0 GHz Monopulse Radar Receiver Using A Logarithmic Amplifier Detection Scheme G. W. Stilwell, A. M. Madni, L. A. Wan Systron Donner Corp., Van Nuys, CA	200
H-13	The Relationship of Magnetotransconductance Mobility Profiles and RF Performance of GaAs FETs S. K. Chan, K. M. Lau University of Massachusetts, Amherst, MA P. White Raytheon, Northborough, MA	204
H-14	Performance of Microwave FM Signal Frequency Division Circuits A. Jacob, M. Jenett Technische Univ. Braunschweig, Braunschweig, W. Germany	207
H-15	Optically Controlled Microwave Devices and Circuits P. R. Herczfeld, A. S. Daryoush, V. M. Contarino Drexel University, Philadelphia, Pa A. Rosen RCA Laboratories, Princeton, NJ Z. Turski, A. Khana LORAL-ATL, Lanham, MD	211

H-16	Multiconductor Planar Transmission-Line Structures for High-Directivity Coupler Applications B. J. Janiczak Tech. University of Gdansk, Gdansk, Poland	215
H-17	A Dual-Gate FET Constant Phase Variable Power Amplifier D. M. Drury, D. C. Zimmermann, D. E. Zimmerman Texas Instruments, Dallas, TX	219
H-18	A Study of W-Band Subharmonically Pumped Mixer W. Yun-Yi, S. Yong-Hui Nanjing Institute of Technology, Nanjing, China	223

Session I: Acoustics and Ferrites

3:30 pm to 5:00 pm

Tuesday, 4 June, 1985

Chairman: J. M. Owens, University of Texas, Arlington, TX

3:40 pm I-1	A High Performance Hexagonal Ferrite Tunable Bandpass Filter for the 40-60 GHz Region D. Nicholson Hewlett Packard Company, Santa Rosa, CA	229
4:00 pm I-2	140 and 220 GHz Ferrite Components J. Rabel, S. Schell, D. Davidson TRW, Redondo Beach, CA	233
4:10 pm I-3	Millimetric Non-Reciprocal Coupled-Slot Fin-Line Components L. E. Davis, D. B. Sillars Paisley College of Technology, Paisley, Scotland	237
4:20 pm I-4	UHF Film Resonator Evaluation and Resonator-Controlled Oscillator and Filter Design Using Computer-Aided Design Techniques M. M. Driscoll, S. V. Krishnaswamy, R. A. Moore, J. R. Szedon Westinghouse D & E Center, Baltimore, MD	239
4:30 pm I-5	Stable Microwave Source Using High Overtone Bulk Resonators J. T. Haynes, M. S. Buchalter, R. A. Moore, H. L. Salvo, S. G. Shepherd, B. R. McAvoy Westinghouse D&E Center, Baltimore, MD	243
4:40 pm I-6	SAW Resonator Filters: Applications and Capabilities B. Horine SAWTEK, Inc., Orlando, FL	247

4:50 pm	A 16 Tap Hybrid Programmable Transversal Filter Using	251
I-7	Monolithic GaAs Dual-Gate FET Array	
	D. E. Zimmerman, C. M. Panasik	
	Texas Instruments, Inc., Dallas, TX	

Session J: FET Oscillators

8:30 am to 10:00 am

Wednesday, 5 June, 1985

Chairman: E. C. Niehenke, Westinghouse Electric Corp.,
Baltimore, MD

8:50 am	A Novel GaAs FET Oscillator with Low Phase Noise	257
J-1	A. N. Riddle, R. J. Trew	
	North Carolina State University, Raleigh, NC	
9:00 am	An Approach to Realizing Multi-Octave Performance in GaAs-FET	261
J-2	YIG-Tuned Oscillators	
	C. F. Schiebold	
	Watkins-Johnson Company, Palo Alto, CA	
9:20 am	Miniature FET Oscillator Stabilized by a Dual Mode Dielectric	264
J-3	Resonator Loaded Cavity	
	S. F. Fiedziuszko	
	Ford Aerospace, Palo Alto, CA	
9:40 am	Push-Push Dielectric Resonator Oscillator	266
J-4	A. M. Pavio, M. A. Smith	
	Texas Instruments, Dallas, TX	

Session K: Microwave Filter Networks

8:30 am to 10:00 am

Wednesday, 5 June, 1985

Chairman: A. E. Williams, COMSAT Laboratories, Clarksburg, MD

8:30 am	Distributed Microwave Active Filters with GaAs FETs	273
K-1	C. Rauscher	
	Naval Research Laboratory, Washington, DC	
8:50 am	Dielectric Waveguide Bandpass Filters with Broad Stopbands	277
K-2	P. K. Ikäläinen, G. L. Matthaei, D. C. Park, M. S. Wei	
	University of California, Santa Barbara, CA	

9:10 am K-3	Influence of Conductor Shields on the Q-Factors of a TE₀ Dielectric Resonator Y. Kobayashi, T. Aoki, Y. Kabe Saitama University, Urawa, Japan	281
9:30 am K-4	A Bandpass Filter Using LPE YIG Film Grown by LPE Y. Murakami, S. Itoh Sony Corporation Research Center, Yokohama, Japan	285
9:40 am K-5	800 MHz Band Dielectric Channel Dropping Filter Using TM₁₁₀ Triplet Mode Resonance T. Nishikawa, K. Wakino, H. Wada, Y. Ishikawa Murata Mfg. Co. Ltd., Kyoto, Japan	289

Session L: Optical and Submillimeter Wavelength Technology
8:30 am to 10:00 am **Wednesday, 5 June, 1985**

Chairman: K. J. Button, MIT, Cambridge, MA

8:30 am L-1	Optics for Microwave Applications P. K. Wahi Loral Advanced Technology Labs, Lanham, MD	295
8:50 am L-2	Acoustooptic Interaction of Acoustic Surface Waves with Guided Optical Waves in Planar Tantalum-Pentoxide Waveguides S. Patela, J. Radojewski, J. Kadziela Technical University of Wroclaw, Wroclaw, Poland	299
9:05 am L-3	Analog Signals Transmission over Optical Fiber Systems M. Ramadan Rockwell International, Richardson, TX	303
9:20 am L-4	A New Approach to Dispersion Analysis of Graded Index Optical Fibers H. J. Carlin Cornell University, Ithaca, NY H. Zmuda Stevens Institute of Technology, Hoboken, NJ	307
9:35 am L-5	A Very Low-Noise, Fixed-Tuned Mixer for 240-270 GHz M. T. Faber, J. W. Archer National Radio Astronomy Observatory, Charlottesville, VA	311

9:50 am L-6	Theoretical Efficiency for Triplers Using Real Varister Diode Varistors at Submillimeter Wavelengths K. Benson Duke University, Durham, NC M. A. Frerking Jet Propulsion Laboratory, Pasadena, CA	315
------------------------------	--	------------

Session M: FET Amplifiers

10:30 am to Noon

Wednesday, 5 June, 1985

Chairman: S. J. Temple, Raytheon Co., Bedford, MA

10:40 M-1	A 30 GHz Low Noise FET Amplifier E. T. Watkins, J. M. Schellenberg, H. Yamasaki Hughes Aircraft Co., Torrance, CA	321
11:00 am M-2	A 1 Watt 28 GHz Band Amplifier Using Clustered FETs T. Takagi, K. Seino, A. Iida, M. Kobiki, Y. Mitsui, F. Takeda Mitsubishi Electric Corp., Kamakura City, Japan	324
11:10 am M-3	Wide-Band Limiting Amplifiers with Low Second Harmonic Distortion, Utilizing GaAs MMIC Limiters E. J. Crescenzi Jr., R. S. Besser, G. A. Tucker, T. R. Kritzer Watkins-Johnson Co., Palo Alto, CA	328
11:30 am M-4	High-Power and High-Efficiency Ion-Implanted Power GaAs FETs for C and X Bands S. Yanagawa, Y. Yamada, M. Itoh, K. Arai, N. Tomita Toshiba Corp., Kawasaki, Japan	332
11:50 am M-5	High-Voltage FET Amplifiers for Satellite and Phased-Array Applications A. Ezzeddine, H-L. A. Hung, H. C. Huang COMSAT Laboratories, Clarksburg, MD	336

Session N: Filters and Multiplexers

10:30 am to Noon

Wednesday, 5 June, 1985

Chairman: A. E. Atia, COMSAT, Washington, DC

10:40 am N-1	Dielectric Resonator Output Multiplexer for C-Band Satellite Applications W. C. Tang, J. Sferrazza, B. Beggs, D. Siu COM DEV Ltd., Cambridge, Canada	343
-------------------------------	---	------------

11:00 am N-2	A Ku-Band Contiguous Multiplexer Employing Low-Loss, Odd-Order Mixed Dual-Triple Mode Cavity Filters M. Pley, W. C. Tang COM DEV Ltd., Cambridge, Canada	346
11:20 am N-3	Design and Performance of a W-Band Finline Diplexer with over 20 GHz Bandwidth C. Nguyen, K. Chang TRW, Redondo Beach, CA	349
11:40 am N-4	Practical Aspects and Limitations of Dual Mode Dielectric Resonator Filters S. J. Fiedziuszko Ford Aerospace, Palo Alto, CA	353
11:50 am N-5	Two-Path Cutoff Waveguide Dielectric Resonator Filters H. Shigesawa, M. Tsuji, K. Takiyama Doshisha University, Kyoto, Japan	357

Session O: Millimeter-Wave Component Technology I

10:30 am to Noon

Wednesday, 5 June, 1985

Chairman: A. G. Cardiasmenos, Raytheon Co., Bedford, MA

10:30 am O-1	A High Efficiency Frequency Doubler for 100 GHz M. T. Faber, J. W. Archer National Radio Astronomy Observatory, Charlottesville, VA R. T. Matlack University of Virginia, Charlottesville, VA	363
10:50 am O-2	GaAs Gunn Oscillators Reach the 140 GHz Range H. Barth, W. Menzel AEG Telefunken, Ulm, FRG	367
11:10 am O-3	W-Band (75 to 110 GHz) Microstrip Components K. Chang, R. S. Tahim, D. English, A. Grote, T. Pham, C. Sun, G. Hayashibara, P. Yen, W. Piotrowski TRW Electronics and Defense, Redondo Beach, CA	371
11:30 am O-4	Wideband Electronically Tuneable GaAs VCO's at W-Band (75-110 GHz) J. Ondria Marconi Electron Devices Ltd., Lincoln, UK	375

11:50 am	An 18-40 Ghz Double Balanced Microstrip Mixer	379
O-5	M. A. Smith, A. M. Pavio Texas Instruments, Dallas, TX	

Session P: Solid State Sources and Amplifiers

1:30 pm to 3:00 pm

Wednesday, 5 June, 1985

Chairman: P. W. Staecker, MIT Lincoln Laboratory,
Lexington, MA

1:40 pm	A 0.5 Micron Silicon Bipolar Transistor for Low Phase Noise	383
P-1	Oscillator Applications up to 20 GHz C. C. Leung, C. P. Snapp, V. Grande Avantek, Inc., Santa Clara, CA	
2:20 pm	500 MHz, 100-W X-Band Solid State Amplifier	387
P-3	R. Mallavarpu, G. MacMaster Raytheon Co., Waltham, MA	
2:40 pm	EHF Solid State Amplifier	391
P-4	G. H. Nesbit, W. L. Leighton Hughes Aircraft Company, Torrance, CA	
2:50 pm	Gain Saturation in Circulator-Coupled Reflection Amplifiers	395
P-5	M. B. Steer North Carolina State University, Raleigh, NC	

Session Q: Computer Modeling and Design of Nonlinear Networks

1:30 pm to 3:00 pm

Wednesday, 5 June, 1985

Chairman: B. S. Perlman, RCA Laboratories, Princeton, NJ

1:40 pm	New Frequency Domain Approach to the Analysis of Nonlinear	401
Q-1	Microwave Circuits G. W. Rhyne, M. B. Steer North Carolina State University, Raleigh, NC	
2:00 pm	A Nonlinear GaAs FET Model for Use in the Design of Output	405
Q-2	Circuits for Power Amplifiers W. R. Curtice RCA Laboratories, Princeton, NJ M. Ettenberg City College of New York, New York, NY	

2:20 pm Q-3	Power Characterisation of a MESFET Amplifier Using Small Signal Measurements and Volterra Series G. Lambrianou, C. S. Aitchison Chelsea College, University of London, London, UK	409
2:40 pm Q-4	Circuit Design to Reduce 3rd Order Intermodulation Distortion in FET Amplifiers R. J. Gilmore, R. Kiehne, F. J. Rosenbaum Central Microwave Co., Maryland Heights, MO	413
2:50 pm Q-5	A General CAD Tool for Large-Signal GaAs MESFET Circuit Design J. M. Golio, P. A. Blakey, R. O. Grondin Arizona State University, Tempe, AZ	417

Session R: Millimeter Wave Component Technology II

1:30 pm to 3:00 pm

Wednesday, 5 June, 1985

Chairman: G. R. Thoren, Raytheon Co., Bedford, MA

1:30 pm R-1	Contiguous Domain Transferred-Electron Oscillators J. Cooper, Jr. Purdue University, West Lafayette, IN K. K. Thornber AT&T Bell Laboratories, Whippany, NJ	423
1:50 pm R-2	GaAs Monolithic Transferred-Electron Devices for Millimeter Wave Applications P. A. Rolland, A. Cappy, M. R. Friscourt Universite' des Sciences et Techniques de Lille I, France	427
2:10 pm R-3	Limitations of Microwave and Millimeter-Wave Mixers Due to Excess Noise G. Hegazi, A. Jelenski, S. Yngvesson University of Massachusetts, Amherst, MA	431
2:30 pm R-4	Comparative Study of Mode Matching Formulations for Microstrip Discontinuity Problems Y. C. Shih, T. S. Chu Hughes Aircraft Co., Torrance, CA T. Itoh University of Texas at Austin, Austin, TX	435
2:50 pm R-5	Dielectric Measurements of Common Polymers at Millimeter Wavelength Range M. N. Afsar Massachusetts Institute of Technology, Cambridge, MA	439

Session S: Open Forum II

3:30 pm to 5:30 pm

Wednesday, 5 June, 1985

S-1	Analysis and Design of Spurline Bandstop Filters C. Nguyen, K. Chang TRW, Redondo Beach, CA	445
S-2	Analysis and Design of Five Port Circular Disc Structures for Six-Port Analyzers M. Abouzahra MIT Lincoln Laboratory, Lexington, MA K. C. Gupta University of Colorado, Boulder, CO	449
S-3	CAD Models for Millimeter-Wave Suspended Substrate Microstrip Lines and Finline P. Pramanick Canadian Marconi Company, Ottawa, Canada P. Bhartia Defence Research Establishment, Ottawa, Canada	453
S-4	A Generalized Algorithm for the Modeling of the Dispersive Characteristics of Microstrip, Inverted Microstrip, Stripline, Slotline, Finline and Coplanar Waveguide Circuits on Anisotropic Substrates A. Nakatani, N. G. Alexopoulos University of California, Los Angeles, CA	457
S-5	Field Distribution of Hybrid Modes in Dielectric Loaded Waveguides K. A. Zaki, C. Chen University of Maryland, College Park, MD	461
S-6	Loss Mechanisms in Dielectric Loaded Resonators K. A. Zaki, C. Chen University of Maryland, College Park, MD	465
S-8	Self-Equalized, Equiripple Microwave Filter L. W. Hendrick, P. J. Tatomir Hughes Aircraft Co., El Segundo, CA	469
S-9	The Use of Higher Resonant Modes in Measuring the Dielectric Constant of Dielectric Resonators W. P. Wheless, Jr., D. Kajfex University of Mississippi, University, MS	473

S-10	A High Performance - Wide Band - Diplexing - Tracking - Depolarization Correcting - Satellite Communication Antenna Feed A. Prata Jr., E. A. Filho Telebras - CPqD, Campinas, Brazil S. Ghosh ITU, Geneva, Switzerland	477
S-11	MICROS 3 - A CAD/CAM Program for Fast Realization of Microstrip Masks J. F. Zürcher Ecole Polytechnique Federale, Lausanne, Switzerland	481
S-12	Analysis of Dielectric Resonators with Tuning Screw and Supporting Structure F. H. Gil, J. Perez E. T. S. Ingenieros de Telecomunicacion, Madrid, Spain	485
S-13	Complete Determination of Circulator Eigenvalues without Transmission Phase Measurement Ch. Schieblich, U. Goebel Technische Universität Hamburg-Harburg, Hamburg, W. Germany	489
S-14	Finline Taper Design Made Easy A. Beyer, I. Wolff Duisburg University, Duisburg, FRG	493
S-15	Equivalent Circuit of Broadside-Coupled Microstrip Open Ends S. K. Koul, B. Bhat Indian Institute of Technology, New Delhi, India	497
S-16	Analysis and Synthesis of Guides with Closely Spaced Discontinuities B. L. Harris, P. E. Mayes University of Illinois, Urbana, IL	499
S-17	Stokes Vector Representation of the Six-Port Network Analyzer: Calibration and Measurement T. Oishi COMSAT, Washington, DC W. K. Kahn George Washington University, Washington, DC	503
S-18	Short Millimeter-Wave Region High Accuracy Power Meter with Self-Calibration Function M. Sasaki, T. Nunotani SPC Electronics Corp., Tokyo, Japan T. Inoue, I. Yokoshima Electrotechnical Laboratory Ibaraki, Japan	507

S-19	A Simple Network Analog Approach for the Quasi-Static Characteristics of General Lossy, Anisotropic, Layered Structures V. K. Tripathi, R. J. Bucolo Oregon State University, Corvallis, OR	511
S-20	$TM_{0\gamma\delta}$ Mode of Cylindrical Dielectric Resonators: Applications to Microwave Filters B. Byzery, P. Guillon Lab. de Communications Microondes et Optiques, Limoges, France	515
S-21	Collinearly Excited Edge-Coupled Resonators K. W. Reed, A. K. Reddy, W. A. Davis University of Texas, Arlington, TX	519

Session T: Solid State Device Topics

3:30 pm to 5:00 pm

Wednesday, 5 June, 1985

Chairman: J. F. White, M/A-COM, Inc., Burlington, MA

3:40 pm T1	20 GHz GaAs IMPATT Diode Development for Solid-State Transmitter M. J. Delaney, M. H. Jones, C. Sun TRW, Redondo Beach, CA	525
4:00 pm T-2	Controlled Bias Preheating for Variable Duty Factor IMPATT Transmitter R. L. Eisenhart, R. S. Robertson Hughes Aircraft Co., Canoga Park, CA	529
4:20 pm T-3	High Speed Varactor Tuned Notch Filter M. Mehdizadeh, B. Smilowitz General Microwave Corp., Farmingdale, NY	531
4:40 pm T-4	Dynamic Diode Mixer Damage Measurements R. V. Garver, C. Fazi, H. Bruns Harry Diamond Labs, Adelphi, MD	535

Session U: Low Noise HEMT Amplifiers

8:30 am to 10:00 am

Thursday, 6 June, 1985

Chairman: R. L. Camisa, RCA, Princeton, NJ

8:40 am	X-Band Noise Parameters of HEMT Devices at 300K and 12.5K	539
U-1	S. Weinreb, M. Pospieszalski National Radio Astronomy Observatory, Charlottesville, VA	
8:50 am	Low Noise Amplifiers using Two Dimensional Electron Gas FETs	543
U-2	T. Mochizuki, K. Honma, K. Handa W. Akinaga, K. Ohata NEC Corporation, Yokohama, Japan	
9:00 am	Broadband HEMT and GaAs FET Amplifiers for 18-26.5 GHz	547
U-3	K. Shibata, B. Abe, H. Kawasaki, S. Hori, K. Kamei Toshiba Corporation, Kawasaki, Japan	
9:20 am	A 20 GHz Peltier-Cooled Low-Noise HEMT Amplifier	551
U-4	M. Iwakuni, M. Niori, T. Hamabe, T. Saito, H. Kurihara, K. Jyoshin, M. Mikuni Fujitsu Laboratories, Kawasaki, Japan	
9:40 am	36.0 - 40.0 GHz HEMT Low Noise Amplifier	555
U-5	M. Sholley, J. Berenz, K. Nakano, R. Sawires, A. Nichols, J. Abell TRW, Redondo Beach, CA	

Session V: Continuous and Discontinuous Microstrip Structures

8:30 am to 10:00 am

Thursday, 6 June, 1985

Chairman: J. W. Mink, U.S. Army Research Office
Research Triangle Park. NC

8:30 am	A Perturbation Theory for Microstrip Propagation	561
V-1	R. E. Collin, B. Kretch Case Western Reserve University, Cleveland, OH	
8:50 am	Surface Wave Losses at Discontinuities in Millimeter Wave Integrated Transmission Lines	563
V-2	R. W. Jackson, D. M. Pozar University of Massachusetts, Amherst, MA	

9:10 am V-3	Millimeter-Wave Diplexers with Printed Circuit Elements Y. C. Shih, L. Q. Bui, T. Itoh Hughes Aircraft Co., Torrance, CA University of Texas at Austin, Austin TX	567
9:30 am V-4	Microstrip Discontinuity Modelling for Millimetric Integrated Circuits P. B. Katehi University of Michigan, Ann Arbor, MI N. G. Alexopoulos University of California, Los Angeles, CA	571
9:50 am V-5	Convergence of Numerical Solutions of Open-Ended Waveguide by Modal Analysis and Hybrid Modal-Spectral Techniques J. A. Encinar, J. M. Rebollar Universidad Politécnica de Madrid, Madrid, Spain	575

Session W: Network Analyzer Techniques

8:30 am to 10:00 am

Thursday, 6 June, 1985

Chairman: H. G. Oltman, Jr., Hughes Aircraft, Canoga Park, CA

9:00 am W-2	Pulse Network Analyzer D. L. Landt, R. J. Weber Rockwell International, Collins Div., Cedar Rapids, IA	581
9:10 am W-3	Vector Method of Characterizing Nonlinearity in Microwave Power Devices W. J. Thompson, K. K. Agarwal Rockwell International, Dallas, TX	585
9:30 am W-4	Calibrating a Six-Port Reflectometer using Three Known Loads M. E. Bialkowski, G. S. Woods James Cook University of North Queensland, Townsville, Australia	589
9:50 am W-5	Waveguide Star Junction used in Ka Band Dual Six Port Measurements M. Riazat, G. Zdasiuk Varian Central Research, Palo Alto, CA	593

Session X: FET Applications

10:30 am to Noon

Thursday, 6 June, 1985

Chairman: F. N. Sechi, RCA Laboratories, Princeton, NJ

10:40 am X-1	Miniature Ceramic Circuit Components for Ku Band Receivers B. Dornan, G. Lan, P. Goldgeier, P. Pelka, F. Sechi RCA Laboratories, Princeton, NJ	597
11:00 am X-2	A 4.5 to 18 GHz Phase Shifter D. C. Boire, J. E. Degenford, M. Cohn Westinghouse Electric Corp., Baltimore, MD	601
11:10 am X-3	A Practical Microwave Travelling-Wave MESFET Gate Mixer O. S. A. Tang, C. S. Aitchison Chelsea College, University of London, London, U.K.	605
11:20 am X-4	Broadband and Broad Dynamic Range GaAs Dual-Gate MESFET Linearizer for TWTA and SSPA used in Satellite Transponder M. Kumar, J. C. Whartenby, H. J. Wolkstein RCA Laboratories, Princeton, NJ	609
11:30 am X-5	30 dB of AGC from an FET B. R. Hallford Rockwell International, Dallas, TX	613

Session Y: Waveguiding Structures

10:30 am to Noon

Thursday, 6 June, 1985

Chairman: N. G. Alexopoulos, Univ. of California, Los Angeles, CA

10:30 am Y-1	Leakage from a Gap in NRD Guide A. A. Oliner, S. T. Peng, K. M. Sheng Polytechnic Institute of New York, Brooklyn, NY	619
10:50 am Y-2	Microwave Network Representation of Discontinuity in Open Dielectric Waveguides and its Applications to Periodic Structures H. Shigesawa, M. Tsuji, K. Takiyama Doshisha University, Hyoto, Japan	623

11:10 am Y-3	Scattering of Surface Waves by Nonuniform Waveguides S. T. Peng, S. J. Xu New York Institute of Technology, Old Westbury, NY F. K. Schwering U.S. Army CECOM, Fort Monmouth, NJ	627
11:30 am Y-4	Finite Element Analysis Applied to Gyroelectrically Loaded Waveguiding Structures N. Mohsenian, T. J. Delph, D. M. Bolle Lehigh University, Bethlehem, PA	631
11:50 am Y-5	On the Question of the Dyadic Operation of Dyadic Green's Functions at the Source Region P. Shenggen Shanghai University, Shanghai, China	635

Session Z: Microwave Measurements

10:30 am to Noon

Thursday, 6 June, 1985

Chairman: S. F. Adam, Adam Microwave Consulting, Los Altos, CA

10:40 am Z-1	An Improved Method of Mixer Noise Figure Measurement as Applied to Beam Lead Schottky Diodes at 94 GHz F. Azan, P. Boireau, J. Lacombe Thomson-CSF, Orsay, France	639
11:00 am Z-2	Quasi-Optical Slot Ring Mixer Noise Figure Measurements K. D. Stephan, G. Perks University of Massachusetts, Amherst, MA	643
11:20 am Z-3	Dynamic Measurement of Complex Permittivity and Temperature During Microwave Heating M. R. Ollivon C.N.R.S., Thiais, France	645
11:30 am Z-4	Measurement of TDC in Engine by Microwave Technique T. Yamanaka, M. Esaki, M. Kinoshita Toyota, Aichi, Japan	647
11:40 am Z-5	A Novel Cavity Resonator Measurement Method for Leaky Waveguides A. A. Oliner, J. S. Myung Polytechnic Institute of New York, Brooklyn, NY	651

Session AA: Solid State Device Applications - Non FET

1:30 pm to 3:00 pm

Thursday, 6 June, 1985

Chairman: C. Buntschuh, Narda Microwave Corp., Hauppauge, NY

1:40 pm AA-1	Linear Analog Hyperabrupt Varactor Diode Phase Shifters E. C. Niehenke, V. V. DiMarco, A. Friedberg Westinghouse Electric Corp., Baltimore, MD	657
2:00 pm AA-2	A Reflective Diode Linearizer for Spacecraft Applications A. Katz, R. Sudarsanam, D. Aubert RCA Astro, Princeton, NJ	661
2:20 pm AA-3	An Experimental Linearized Power Upconverter for SSB Signals E. H. Löser Institute für Hochfrequenztechnik, Braunschweig, W. Germany	665
2:40 pm AA-4	A Simple Integrated Matching Element for SIS Quasiparticle Mixers A. V. Räisänen, W. R. McGrath, P. L. Richards University of California, Berkeley, CA F. L. Lloyd NBS, Boulder, CO	669

Session BB: Microwave Integrated Circuit Techniques

1:30 pm to 3:00 pm

Thursday, 6 June, 1985

Chairman: E. F. Belohoubek, RCA Labs, Princeton, NJ

1:40 pm BB-1	An Experimental Investigation of Microstrip Properties on Soft Substrates from 2 to 40 GHz R. R. Romanofsky, K. B. Bhasin, G. E. Ponchak, A. N. Downey, D. J. Connolly NASA Lewis Research Center, Cleveland, OH	675
1:50 pm BB-2	Modelling and Measurement of Microstrip Transmission Line Structures P. R. Shepherd, P. Daly University of Leeds, Leeds, UK	679
2:00 pm BB-3	A New Slotline-Microstrip Frequency Halver G. A. Kalivas, R. G. Harrison Carleton University, Ottawa, Canada	683

2:20 pm BB-4	Microstrip Mixer Design with Image Cancellation and Low Conversion Loss C. Ansgor Technische Univ. Hamburg-Harburg, Hamburg, W. Germany	687
2:30 pm BB-5	Small Size VCO Module for 900 MHz Band Using Coupled Microstrip-Coplanar Lines K. Kawamoto, K. Hirota, N. Niizaki Hitachi, Ltd., Yokohama, Japan Y. Fujiwara, K. Ueki Hitachi Denshi, Ltd., Tokyo, Japan	689
2:40 pm BB-6	Frequency Agile Circular Microstrip Antennas G. L. Lan, D. L. Sengupta University of Michigan, Ann Arbor, MI	693

Session CC: Computer-Aided Design Techniques for Linear Circuits
1:30 pm to 3:00 pm **Thursday, 6 June, 1985**

Chairman: S. L. March, Compact Software, Round Rock, TX

1:40 pm CC-1	A CAD Solution to the Generalized Problem of Noise Figure Calculation V. Rizzoli, A. Lipparini University of Bologna, Bologna, Italy	699
2:00 pm CC-2	A SPICE Model for Multiple Coupled Microstrips and Other Transmission Lines V. K. Tripathi Oregon State University, Corvallis, OR J. B. Rettig Tektronix, Inc., Beaverton, OR	703
2:20 pm CC-3	MIDAS, A New Microwave/RF CAD Program D. Rhodes, S. Perlow RCA Laboratories, Princeton, NJ	707
2:40 pm CC-4	A Novel CAD Tool and Concept Compatible with the Requirements of Multilayer GaAs MMIC Technology R. H. Jansen University of Duisburg, Duisburg, West Germany	711

Addendum

3:30 pm to 5:30 pm

Tuesday, 4 June, 1985

- | | | |
|------------|---|------------|
| H-9 | The Design and Performance of a Double Balanced Mixer Using FETs | 717 |
| | S. J. Nightingale, M. A. G. Upton, N. V. Dandekar
General Electric Company, Syracuse, New York | |

3:30 pm to 5:30 pm

Wednesday, 5 June, 1985

- | | | |
|------------|--|------------|
| S-7 | A Superlinearly Convergent Minimum Algorithm for
Microwave Circuit Design | 721 |
| | J. W. Bandler, W. Kellerman, K. Madsen
McMaster University, Hamilton, Canada | |

8:30 am to 10:00 am

Thursday, 6 June, 1985

- | | | |
|------------|--|------------|
| W-1 | A Broadband Homodyne Network Analyser With
Binary Phase Modulation | 725 |
| | U. Gärtner, B. Scheik
Institut für Hoch- und Höchstfrequenztechnik,
Ruhr-Universität Bochum,
Bochum, Federal Republic of West Germany | |