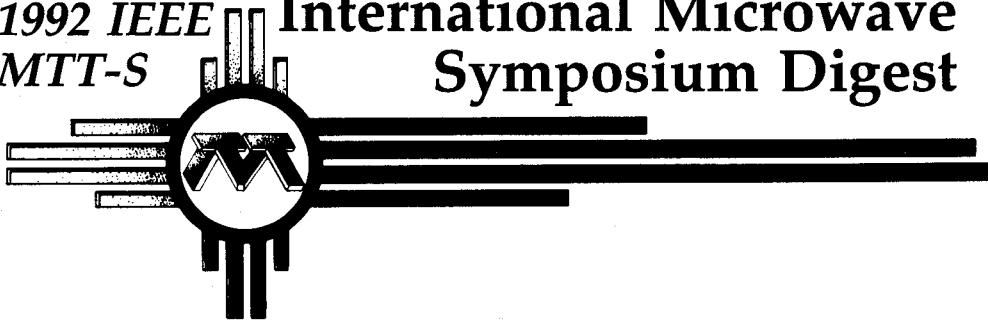


**1992 IEEE
MTT-S**

**International Microwave
Symposium Digest**



Technical Program Contents

Technical Program Contents

Vol I

A

B

Session A (Joint with MMWMC)

Subsystems 2 Kiva Auditorium

8:00 a.m. to 9:00 a.m.

Tuesday, June 2, 1992

Chairman: J.G. Oaks—Raytheon ADC, Andover, MA
Co-Chairman: T.A. Midford, Hughes Microwave Products Div., Torrance, CA

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8:00 a.m. to 9:30 a.m.

Tuesday, June 2, 1992

Chairman: G.L. Mattaei—University of California, Santa Barbara, CA

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Session C

“Q” High Power Components and Systems Mesilla/Pecos

8:00 a.m. to 9:30 a.m.

Tuesday, June 2, 1992

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Session D

(Focused Session)

Monolithic Thin Film Resonators on MMIC Structures Brazos

8:00 a.m. to 9:30 a.m.

Tuesday, June 2, 1992

Co-Chairmen: R.A. Moore—Westinghouse ESG, Arnold, MD
B.R. McAvoy—Westinghouse STC, Pittsburgh, PA

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Session E

(Joint with MMWMC)

Components 2

Kiva Auditorium

1:00 p.m. to 2:10 p.m.

Tuesday, June 2, 1992

Chairman: R. Gold—Pacific Monolithics, Sunnyvale, CA

Co-Chairman: W.C. Niehaas—AT&T Bell Labs, Reading, PA

E-1: 1:00 p.m. A Single Chip X-Band Phase Shifter with 6 Bit Uncorrected Phase Resolution and More Than 8 Bit Corrected Phase Resolution

T.C.B. Tieman, A.P. de Hek, F.L.M. van den Bogaart and W.M.A. van Hoek

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M.E. Goldfarb

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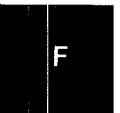
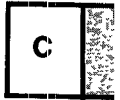
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L.W. Chua

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D.J. Nelly and D.S. Parsons

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Session F

Superconductive Passive Devices

Ballroom A

1:00 p.m. to 2:10 p.m.

Tuesday, June 2, 1992

Chairman: J.M. Pond—Naval Research Laboratory, Washington, DC

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H. Chaloupka, H. Piel, A. Pischke, G. Gieres, M. Peiniger, L. Schultz, M. Bode and J. Schubert

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G.-C. Liang, R.S. Withers, B.F. Cole and N. Newman

*

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Z.-Y. Shen, C. Wilker, P. Pang and W.L. Holstein

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C.W. Lam, D.M. Sheen, S.M. Ali and D.E. Oates

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*Paper not available at the time of printing.

Session G

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Mesilla/Pecos

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Tuesday, June 2, 1992

Chairman: R. Vahldieck—University of Victoria, Victoria, Canada

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Session H

(Focused Session)

Advances in High Power Microwave Source Technology

Brazos

1:00 p.m. to 2:20 p.m.

Tuesday, June 2, 1992

Chairmen: R.B. Miller—Titan/Spectron, Albuquerque, NM

E. Schamiloglu—University of New Mexico, Albuquerque, NM

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*Paper not available at the time of printing.

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Interactive Forum I

Northwest Exhibit Hall

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Tuesday, June 2, 1992

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Co-Chairman: M. Morris—Sandia National Labs., Albuquerque, NM

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IF1

Session I
(Joint with MMWMC Symp)

Frequency Converters & Mixers
Kiva Auditorium

3:00 p.m. to 4:30 p.m.

Tuesday, June 2, 1992

Chairman: L.C.T. Liu—TRW ESG, Redondo Beach, CA

Co-Chairman: V. Sokolov—Honeywell SRC, Bloomington, MN

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Tuesday, June 2, 1992

Chairman: A. Faith—David Sarnoff Research Center, Princeton, NJ

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Session K

New Guided Wave Physical Effects Mesilla/Pecos

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Tuesday, June 2, 1992

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Session L

(Focused Session)

Advances In High Power Microwave Source Technology Brazos

3:00 p.m. to 4:10 p.m.

Tuesday, June 2, 1992

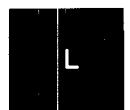
Chairman: R.B. Miller—Titan/Spectron, Albuquerque, NM

Co-Chairman: E. Schamiloglu—University of New Mexico, Albuquerque, NM

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*Paper not available at the time of printing.

Vol I



Session M

FET Power Applications

Kiva Auditorium

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Wednesday, June 3, 1992

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Session N

Wideband Opto-Electronic Links

Mesilla/Pecos

8:00 a.m. to 9:20 a.m.

Wednesday, June 3, 1992

Chairman: A.J. Seeds—University College London, London, England

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N-2:	Fiber Optic Microwave Links Using Balanced Laser Harmonic Generation, and Balanced/Image Cancellation Laser Mixing	559
8:20 a.m.	H. Ogawa and H. Kamitsuna	
N-3:	A Balanced Fiberoptic Communication Link Featuring Laser Bin Cancellation	563
8:40 a.m.	A. Madjar and O. Malz	
N-4:	On-Wafer Characterization, Modelling, and Optimization of InP-Based HEMTs, Pin-Photodiodes and Monolithic Receiver-OEICs for Fiber-Optic Communication	567
8:50 a.m.	D. Kaiser, H. Grosskopf, I. Gyuro, U. Koerner, W. Kuebart, J.-H. Reemtsma and H. Eisele	
N-5:	MMIC Based Optical Modulator Design	571
9:00 a.m.	M.T. Camargo Silva and P.R. Herczfeld	
N-6:	An Externally Modulated Fiber-Optic Link Test Bed for Characterizing Link Performance in a System	575
9:10 a.m.	C.H. Cox III, L.A. Bernotas, G.E. Betts, A.I. Grayzel, D.R. O'Brien, J.J. Scozzafava and A.C. Yee	

Session O

Millimeter and Submillimeter Wave Components

Ballroom A

8:00 a.m. to 9:30 a.m.

Wednesday, June 3, 1992

Chairman: M.N. Afsar—Tufts University, Medford, MA

Co-Chairman: M. Matloubian—Hughes Research Lab., Malibu, CA

O-1:	Ka-band High Efficiency 1 Watt Power Amplifier	579
8:00 a.m.	G.S. Dow, K. Tan, N. Ton, J. Abell, M. Siddiqui, B. Gorospe, D. Streit, P. Liu and M. Sholly	
O-2:	Millimeter-Wave Monolithic Gain Block Amplifiers Using Pseudomorphic HEMT	583
8:10 a.m.	H. Yoshinaga, B. Abe, K. Shibata, H. Kawasaki, M. Ohtomo and I. Tokaji	
O-3:	60 GHz Power Amplifier Using PHEMT	587
8:30 a.m.	J. Goel, K.L. Tan, D.I. Stones, R.W. Chan, D.C. Streit, S. Peratoner and J. Schellenberg	
O-4:	W-Band Quasioptical Integrated Pin Diode Switch	591
8:50 a.m.	K.D. Stephan and P.F. Goldsmith	
O-5:	A 200 GHz Planar Diode Subharmonically Pumped Waveguide Mixer with State-of-the-Art Performance	595
9:00 a.m.	P.H. Siegel, R.J. Dengler, I. Mehdi, W.L. Bishop and T.W. Crowe	
O-6:	A Millimeterwave Subharmonically Pumped Resistive Mixer Based on a Heterostructure Field Effect Transistor Technology	599
9:10 a.m.	H. Zirath, I. Angelov and N. Rorsman	
O-7:	Design and Measurements of a 210 GHz Subharmonically Pumped GaAs MMIC Mixer	603
9:20 a.m.	P.H. Siegel, S. Weinreb, S. Duncan, W. Berk, A. Eskandarian and D.-W. Tu	

Session P

Vehicle Communication and Control Systems I

Brazos

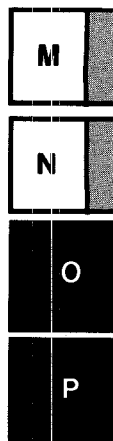
8:00 a.m. to 9:20 a.m.

Wednesday, June 3, 1992

Co-Chairmen: J.B. Horton—TRW, Redondo Beach, CA

T.H. Oxley—Tremont, Newark, England

P-1:	Applications of Microwaves and Millimeterwaves for Vehicle Communications and Control in Europe	609
8:00 a.m.	H.H. Meinel	
P-2:	Automotive Radar at 80-90 GHz	613
8:20 a.m.	A.G. Stove	
P-3:	Experiments on Vehicle to Roadside Microwave Communication	617
8:40 a.m.	A. Zandbergen and A.v.d. Ree	
P-4:	Low-Cost Design of a Quasi-Optical Front-End for on Board MM.Wave Pulsed Radar	621
8:50 a.m.	N. Haese, M. Benlamlh, D. Cailleu and P.A. Rolland	
P-5:	System Aspects and Design of an Automotive Collision Warning PN Code Radar Using Wavefront Reconstruction	625
9:00 a.m.	J. Detlefsen, T. Troll, M. Rožmann and W. Zeilinger	
P-6:	A 61 GHz Doppler Radar Using Inverted Strip Dielectric Waveguide	629
9:10 a.m.	Z.-W. Li and W. Menzel	



Session Q

FET Devices

Kiva Auditorium

10:00 a.m. to 11:20 a.m.

Wednesday, June 3, 1992

Chairman: J.E. Degenford—Westinghouse ESG, Baltimore, MD

Q-1:	A Heterostructure FET with 75.8-Percent Power Added Efficiency at 10 GHz	635
10:00 a.m.	P. Saunier, W.S. Kopp, H.Q. Tserng, Y.C. Kao and D.D. Heston	
Q-2:	One Watt, Very High Efficiency 10 and 18 GHz Pseudomorphic HEMTs	
10:20 a.m.	Fabricated by Dry First Recess Etching	639
	S. Shanfield, A. Platzker, L. Aucoin, T. Kazior, B.I. Patel, A. Bertrand, W. Hoke and P. Lyman	
Q-3:	Optimized 0.1 μm GaAs MESFET's	643
10:30 a.m.	K. Moore, J. East, G. Haddad and T. Brock	
Q-4:	High Breakdown Voltage, Sub-Micron, Strained InGaAlAs/GaAs FET's	647
10:40 a.m.	K.W. Eisenbeiser, J.R. East, G.I. Haddad and T. Brock	
Q-5:	Pseudomorphic Inverted HEMT Suitable to Low Supplied Voltage Application	651
10:50 a.m.	M. Kasashima, Y. Arai, H.I. Fujishiro, H. Nakamura and S. Nishi	
Q-6:	Modeling on Statistical Distribution of Noise Parameters in Pulse-Doped GaAs MESFETs	655
11:10 a.m.	N. Shiga, S. Nakajima, K. Otobe, T. Sekiguchi, N. Kuwata, K. Matsuzaki and H. Hayashi	

Session R

Microwave Optoelectronic Applications

Mesilla/Pecos

10:00 a.m. to 11:30 a.m.

Wednesday, June 3, 1992

Chairman: N.R. Dietrich—AT&T Bell Laboratories, Breinigsville, PA

R-1:	On-Wafer Testing of MMIC with Monolithically Integrated Photoconductive Switches	661
10:00 a.m.	S.L. Huang, E.A. Chauchard, C.H. Lee, T.T. Lee, H.-L.A. Hung and T. Joseph	
R-2:	A Full Wave Simulation of Disturbances in Picosecond Signals by Electro-Optic Probing	665
10:20 a.m.	D. Conn, X. Wu, J. Song and K. Nickerson	
R-3:	Transient Response of High Electric Field Picosecond Photoconductive Switch	669
10:40 a.m.	S.L. Huang and C.H. Lee	
R-4:	Optoelectronic Devices for Unbiased Microwave Switching	673
11:00 a.m.	J.L. Freeman, S. Ray, D.L. West and A.G. Thompson	
R-5:	Fiberoptic Based Recirculating Memory Loop	677
11:10 a.m.	R. Saedi, A. Daryoush and P. Herczfeld	
R-6:	Integrated 6-Bit Photonic True-Time-Delay Unit for Lightweight 3-6 GHz Radar Beamformer	681
11:20 a.m.	E. Ackerman, S. Wanuga, D. Kasemset, W. Minford, N. Thorsten and J. Watson	

Session S

Millimeter Wave Systems Applications Ballroom A

10:00 a.m. to 11:30 a.m.

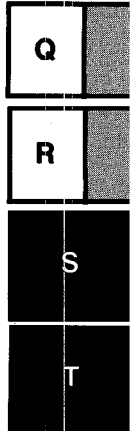
Wednesday, June 3, 1992

Co-Chairmen: J.J. Taub—AIL Systems, Inc., Deer Park, NY

K.K. Agarwal—E-Systems, Garland, TX

S-1:	Extended Range Coverage of an Imaging Radar System with Feed-Mounted 94 GHz MIMIC HEMT Low Noise Amplifier and External ILO	687
10:00 a.m.	L.Q. Bui, Y. Alon and D. Neilson	
S-2:	Millimeter Wave Up/Down Converter Technology for Spaceborne Applications	691
10:20 a.m.	M. Piloni, F. Montauti and S. Crema	
S-3:	A MM-Wave Frequency Divider	695
10:40 a.m.	P. Nüchter and W. Menzel	
S-4:	Quasi-Optical Stabilisation of Millimetre Wave Sources	699
11:00 a.m.	G.M. Smith and J.C.G. Lesurf	
S-5:	GaAs Monolithic Components Development for Q-Band Phased Array Application	703
11:20 a.m.	M. Aust, H. Wang, R. Carandang, K. Tan, C.H. Chen, T. Trinh, R. Esfandiari and H.C. Yen	

Vol II



Session T

Vehicle Communication and Control Systems II Brazos

10:00 a.m. to 11:10 a.m.

Wednesday, June 3, 1992

Co-Chairman: J.B. Horton, TRW, Redondo Beach, CA

T.H. Oxley—Tremont, Neward, England

T-1:	(Invited) Development of Millimeter Wave Automotive Sensing Technology in Japan	709
10:00 a.m.	M. Kotaki, Y. Takimoto, E. Akutsu, Y. Fujita, H. Fukuhara and T. Takahashi	
T-2:	An FM-CW Radar Module with Front-End Switching Heterodyne Receiver	713
10:20 a.m.	T. Saito, N. Okubo, Y. Kawasaki, O. Isaji and H. Suzuki	
T-3:	Improved Discrimination of Microwave Vehicle Profiles	717
10:40 a.m.	H. Roe and G.S. Hobson	
T-4:	Millimetre Wave RADARS for Automotive Applications	721
11:00 a.m.	D.A. Williams	

Session U

Solid State Devices and Circuits: Non-FET I Kiva Auditorium

1:00 p.m. to 2:20 p.m.

Wednesday, June 3, 1992

Chairman: B. Bayraktaroglu—North Carolina State University, NC

U-1:	Investigation of HBT Oscillator Noise Through 1/f Noise and Noise	
1:00 p.m.	Upconversion Studies	727
	M.N. Tutt, D. Pavlidis, A. Khatibzadeh and B. Bayraktaroglu	
U-2:	Temperature Dependence of DC Currents in HBT	731
1:20 p.m.	H. Wang, C. Algani, A. Konczykowska and W. Zuberek	
U-3:	Direct Calculation of the HBT Equivalent Circuit From Measured S-Parameters	735
1:40 p.m.	D.R. Pehlke and D. Pavlidis	
U-4:	Reliability Analysis of Microwave GaAs/AlGaAs HBTs with Beryllium and	
2:00 p.m.	Carbon Doped Base	739
	F.M. Yamada, A.K. Oki, D.C. Streit, Y. Saito, D.K. Umemoto, L.T. Tran, S. Bui, J.R. Velebir and G.W. McIver	
U-5:	On-Wafer Measurement and Modeling of Millimeter-Wave GaAs Schottky	
2:10 p.m.	Mixer Diodes	743
	J.L. Allen, C.-Y. Chen and D.P. Klemmer	

Session V

Microwave Photonic Signal Generation and Detection Mesilla/Pecos

1:00 p.m. to 2:30 p.m.

Wednesday, June 3, 1992

Chairman: C.H. Lee—University of Maryland, College Park, MD

V-1:	Microwave Opto-Electronics in Europe	749
1:00 p.m.	A.J. Seeds	
V-2:	Microwave and Millimeter Wave Signal Generation Using Mode-Locked	
1:20 p.m.	Semiconductor Lasers with Intra-Waveguide Saturable Absorbers	753
	D.J. Derickson, R.J. Helkey, A. Mar, J.G. Wasserbauer, Y.G. Wey and J.E. Bowers	
V-3:	MMIC Compatible Lightwave-Microwave Mixing Techniques	757
1:40 p.m.	S. Malone, A. Paoletta, P.R. Herczfeld and T. Berceci	
V-4:	Photo-Parametric Amplifier/Converter in Subcarrier Multiplexed Lightwave	
1:50 p.m.	Communication Systems	761
	A. Khanifar and R.J. Green	
V-5:	Laser Induced Phase Noise in Optically Injection Locked Oscillator	765
2:00 p.m.	X. Zhang, T.-D. Ni, A.S. Daryoush	
V-6:	The Predicted Signal to Noise Performance of a Photodiode-Distributed Amplifier	
2:20 p.m.	Optical Detector	769
	C.S. Aitchison	

Session W

Discrete Modeling of Fields in Microwave Structures Ballroom A

1:00 p.m. to 2:30 p.m.

Wednesday, June 3, 1992

Chairman: P. Russer—Technische Universität München, Munich, Germany

W-1: 1:00 p.m.	A Frequency Domain TLM Method H. Jin and R. Vahldieck	775
W-2: 1:20 p.m.	TLM Synthesis of Microwave Structures Using Time Reversal M. Forest and W.J.R. Hoefer	779
W-3: 1:40 p.m.	A Fast Two Dimensional FDTD Full-Wave Analyser with Adaptive Mesh Size S. Xiao, R. Vahldieck and H. Jin	783
W-4: 1:50 p.m.	High-T_c Superconducting Coupled Coplanar Transmission Lines: A 3D-Transmission Line Matrix Analysis M. Vanselow, B. Isele, R. Weigel and P. Russer	787
W-5: 2:00 p.m.	The Implementation of Smoothly Moving Boundaries in 2D and 3D TLM Simulations U. Müller, A. Beyer and W.J.R. Hoefer	791
W-6: 2:10 p.m.	Digital Signal Processing of Time Domain Field Simulation Results Using the System Identification Method W. Kuempel and I. Wolff	793
W-7: 2:20 p.m.	The Method of Lines for the Rigorous Full Wave Analysis of Rectangular Bends of Multiple-Line-Systems F.J. Schmückle and R. Pregla	797

Session X

(Focused Session)

Advanced Millimeter Wave Technology Brazos

1:00 p.m. to 2:20 p.m.

Wednesday, June 3, 1992

Chairman: J.C. Wiltse—Georgia Tech Research Institute, Atlanta, GA

X-1: 1:00 p.m.	An Ultra Low Noise W-Band Monolithic Three-Stage Amplifier Using 0.1 μm Pseudomorphic InGaAs/GaAs HEMT Technology H. Wang, T.N. Ton, K.L. Tan, G.S. Dow, T.H. Chen, K.W. Chang, J. Berenz, B. Allen, P. Liu, D. Streit, G. Hayashibara and L.C.T. Liu	803
X-2: 1:20 p.m.	W-Band and D-Band Low Noise Amplifiers Using 0.1 Micron Pseudomorphic InAlAs/InGaAs/InP HEMTs P.D. Chow, K. Tan, D. Streit, D. Garske, P. Liu and R. Lai	807
X-3: 1:30 p.m.	60 GHz Sources Using Optically Driven HBTs D.C. Scott, D.V. Plant and H.R. Fetterman	811
X-4: 1:50 p.m.	Oscillator and Amplifier Grids D. Rutledge, J.B. Hacker, M. Kim, R.M. Weikle II, R.P. Smith and E. Sovero	815
X-5: 2:10 p.m.	V-Band and W-Band Broadband, Monolithic Distributed Frequency Multipliers E. Carman, M. Case, M. Kamegawa, R. Yu, K. Giboney and M. Rodwell	819

Vol II



Session IF2

Interactive Forum II Northwest Exhibit Hall

2:30 p.m. to 5:00 p.m.

Wednesday, June 3

Chairman: E. Schamiloglu—University of New Mexico, Albuquerque, NM

Co-Chairman: M. Morris—Sandia National Labs, Albuquerque, NM

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IF2 C-2:	The S-Probe: A New, Cost-Effective, 4-Gamma Method for Evaluating Multi-Stage Amplifier Stability	829
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IF2 C-3:	Exact Group Delay Sensitivities for Minimization of Delay and Distortion in High-Speed VLSI Interconnects	833
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	Z. Cai and J. Bornemann	
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	G. Parks and D. Linton	
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*Paper not available at the time of printing.

Session Y

Solid-State Devices and Circuits: Non-FET II Kiva Auditorium

3:00 p.m. to 4:20 p.m.

Wednesday, June 3, 1992

Chairman: D. Peterson—Steinbrecher, Woburn, MA

Y-1:	Low Noise Oscillators	1077
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3:20 p.m.	L.D. Cohen	
Y-3:	New Type of Push-Push Oscillators for the Frequency Synthesizer	1085
3:40 p.m.	H. Yabuki, M. Sagawa and M. Makimoto	
Y-4:	Design, Fabrication and Evaluation of Tunnel Transit-Time Diodes for V-Band and W-Band Power Generation	1089
4:00 p.m.	C. Kidner, H. Eisele, J. East and G.I. Haddad	
Y-5:	Multiple Element Oscillators Utilizing a New Power Combining Technique	1093
4:10 p.m.	A. Mortazawi and B.C. De Loach Jr.	

Session Z

System Applications of Microwave/Millimeter Wave Technology Mesilla/Pecos

3:00 p.m. to 4:00 p.m.

Wednesday, June 3, 1992

Chairman: R.W. Laton—Raytheon Missile Systems Division, Bedford, MA

Z-1:	A New Passive Microwave Linescanner for Airborne Measurements of Maritime Oil Pollutions	*
3:00 p.m.	K. Gruner, G. Kahlisch, H. Schreiber, P. Sliwinski and B. Vowinkel	
Z-2:	Integrated MMIC and MIC Components for Multichannel Ka-Band Receivers	1099
3:20 p.m.	P.J. Meier, P.R. Bie and J. DeCarlo	
Z-3:	A 5.5 Watt 20 GHz Solid State Power Amplifier for On-Board Satellite Communication	1101
3:30 p.m.	F. Bonecchi and L. Negri	
Z-4:	Experimental Performance of an Adaptive Digital Linearized Power Amplifier	1105
3:50 p.m.	A.S. Wright and W.G. Durtler	

*Paper not available at the time of printing.

Session AA

Analytical Modeling of Fields in Microwave Structures

Ballroom A

3:00 p.m. to 4:30 p.m.

Wednesday, June 3, 1992

Chairman: R. Sorrentino—Università di Perugia, Perugia, Italy

AA-1:	A Dynamic Analysis of Non-Uniform Microstrip Multi-Conductor Transmission	
3:00 p.m.	Lines Using the Grounded Slab Green's Functions Approach	1111
	T.R. Arabi, A.T. Murphy, T.K. Sarkar and R.F. Harrington	
AA-2:	A Study of Sub-Millimeter Wave Coupled Dielectric Waveguides Using the	
3:10 p.m.	GIE Method	1115
	T.E. van Deventer and P.B. Katehi	
AA-3:	Numerical Simulation of a Virtual Matched Load for the Characterization of	
3:30 p.m.	Planar Discontinuities	1119
	H. Ghali, M. Drissi, J. Citerne and V. Fouad Hanna	
AA-4:	Full-Wave Analysis of 3D Metallization Structures Using a Spectral	
3:50 p.m.	Domain Technique	1123
	T. Becks and I. Wolff	
AA-5:	Modelling of Miniaturized Coplanar Striplines Based on $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ Thin Films	1127
4:00 p.m.	J. Keßler, P. Russer and R. Dill	
AA-6:	Characterization of Anisotropic Substrate Materials for Microwave Applications	1131
4:10 p.m.	U. Fritsch and I. Wolff	
AA-7:	Using Brewster Angle for Measuring Microwave Material Parameters of	
4:20 p.m.	Bi-Isotropic and Chiral Media	1135
	A.H. Sihvola and I.V. Lindell	

Session BB

(Focused Session)

Submillimeter-Wave Systems

Brazos

3:00 p.m. to 4:20 p.m.

Wednesday, June 3, 1992

Chairman: D. Rutledge—Caltech, Pasadena, CA

BB-1:	Quasi-Optical Superconducting Flux-Flow Oscillator for		
3:00 p.m.	Submillimeter Application	*	
	J. Inatani		
BB-2:	GaAs Schottky Barrier Diodes for THz Applications	1141	
3:20 p.m.	T.W. Crowe, W.C.B. Peatman, P.A.D. Wood and X. Liu		
BB-3:	Current Status of Integrated Submillimeter-Wave Antennas	1145	
3:40 p.m.	G.M. Rebeiz		
BB-4:	Slot Antenna SIS Mixers for Submillimeter Wavelengths	*	
4:00 p.m.	J. Zmuidzinas, H.G. LeDuc and J.A. Stern		
BB-5:	A 500 GHz Transmitter/Receiver System for Phase/Magnitude Measurements	1149	
4:10 p.m.	N.R. Erickson		

*Paper not available at the time of printing.

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Session CC

Microwave Integrated Circuits Ruidoso/San Miguel

8:00 a.m. to 9:30 a.m.

Thursday, June 4, 1992

Chairman: C. Buntschuh—Microwave Engineering Service, Great River, NY

CC-1: 8:00 a.m.	Fully Integrated Double Balanced MMIC Mixer Using a Star Arrangement of Diodes for Extended IF Performance J. Staudinger and M. Friesen	1163
CC-2: 8:20 a.m.	Novel 36 GHz GaAs Frequency Doublers using (M)MIC Coplanar Technology A. Tuko and I. Wolff	1167
CC-3: 8:40 a.m.	A Six-Bit GMIC Phase Shifter for 6-18 GHz T.A. Murphy, J.W. Gippich, M.E. Hines, D. Kryger	1171
CC-4: 8:50 a.m.	Ultra Wide Band Slotline Hybrid Ring Couplers C.-H. Ho, L. Fan and K. Chang	1175
CC-5: 9:00 a.m.	0.25 μm PHEMT X Band Multifunction LNA MMIC with T/R Switch and Attenuator Achieves 1.85 dB Noise Figure S.T. Janesch, K.H.G. Duh, P. Ho, S.C. Wang and S.M.J. Liu	1179
CC-6: 9:20 a.m.	A 3.5 Watt High Efficiency GaAs Fet Amplifier for Digital Telephone Communications M. Easton, R. Basset, D.S. Day, C. Hua, C.S. Chang and J. Wei	1183

Session DD

Miniature Filters Mesilla/Pecos

8:00 a.m. to 9:30 a.m.

Thursday, June 4, 1992

Chairman: R.V. Snyder—RS Microwave, Butler, NJ

DD-1: 8:00 a.m.	An Optimal Low Loss HF Diplexer Using Helical Resonators R. Levy and K.J. Andersen	1187
DD-2: 8:20 a.m.	A 10 GHz Thin Film Lumped Element High Temperature Superconductor Filter D.G. Swanson, Jr., R. Forse and B.J.L. Nilsson	1191
DD-3: 8:30 a.m.	An MMIC Active Filter with 60-dB Rejection R.R. Bonetti, A.E. Williams, T. Duong, R. Gupta and R. Mott	1195
DD-4: 8:40 a.m.	Synthesis of Planar Microwave Band-Pass Filter Based on Foster-Type Network and Normal Mode Expansion Method J. P Hsu, T. Anada, H. Tsubaki, Y. Migita and K. Nagashima	1199
DD-5: 9:00 a.m.	Multi-Layered Planar Filters Based on Aperture Coupled, Dual Mode Microstrip or Stripline Resonators J.A. Curtis and S.J. Fiedziuszko	1203
DD-6: 9:20 a.m.	Compact Bandpass Filters with Improved Stop-Band Characteristics Using Planar Multilayer Structures W. Schwab and W. Menzel	1207

Session EE

CADI—Electromagnetic Simulation

Ballroom A

8:00 a.m. to 9:20 a.m.

Thursday, June 4, 1992

Chairman: K.C. Gupta—University of Colorado, Boulder, CO

EE-1:	Full Wave Analysis of Tapered Microstrip Lines Using the Conformal Grids	
8:00 a.m.	FD-TD Method	1213
	T. Kashiwa, M. Sasaki, S. Maeda and I. Fukai	
EE-2:	Modeling of Nonlinear Dispersive Active Elements in TLM	1217
8:10 a.m.	B. Isele and P. Russer	
EE-3:	New 3D TLM Condensed Node Structures for Improved Simulation of	
8:30 a.m.	Conductor Strips	1221
	J.S. Nielsen and W.J.R. Hoefer	
EE-4:	Removing Package Effects From Microstrip Moment Method Calculations	1225
8:40 a.m.	R.W. Jackson	
EE-5:	Time Domain Electromagnetic Analysis of a Via in a Multilayer Computer	
8:50 a.m.	Chip Package	1229
	W.D. Becker, P. Harms and R. Mittra	
EE-6:	A Full-Wave Electromagnetic Model of Cylindrical and Conical via Hole Grounds	
9:00 a.m.	for Use in Interactive MIC/MMIC Design	1233
	R.H. Jansen	
EE-7:	Full-Wave Modeling of Via Hole Grounds in Microstrip by Three-Dimensional	
9:10 a.m.	Mode Matching Technique	1237
	F. Alessandri, M. Mongiardo and R. Sorrentino	

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Session FF

(Focused Session)

Microwave Technology in Radio Astronomy

Brazos

8:00 a.m. to 9:10 a.m.

Thursday, June 4, 1992

Co-Chairmen: K. Tomiyasu—General Electric, Philadelphia, PA
P.J. Napier—NRAO, Socorro, NM

FF-0:	Introductory Remarks by Session Chairman	
FF-1:	The Large Synthesis Radio Telescopes of the National Radio	
8:00 a.m.	Astronomy Observatory	1243
	P.J. Napier	
FF-2:	The Millimeter Array	1247
8:30 a.m.	A.R. Thompson	
FF-3:	Design Philosophy and Technology Aspects of Submillimeter Wavelength	
8:40 a.m.	Radio Telescopes	1251
	J.W.M. Baars	
FF-4:	Focal Plane Arrays for Millimeter-Wavelength Astronomy	1255
9:00 a.m.	P.F. Goldsmith	

Session GG

Biological Effects and Medical Applications Ballroom B

8:00 a.m. to 9:30 a.m.

Thursday, June 4, 1992

Chairman: A. van der Vorst—Universite Catholique, Louvain, Belgium

GG-1: 8:00 a.m.	Treatment of Intracoronary Thrombus with Microwave Thermal Balloon Angioplasty A. Rosen, P. Walinsky, D. Nardone, B. Bravette, Y. Shi, A. Martinez-Hernandez and A. Zalewski	1261
GG-2: 8:10 a.m.	Comparison of Microwave and Convective Heating in Rapid Specimen Preparation Techniques for Electron Microscopy J.B. Leonard and S.P. Shepardson	1263
GG-3: 8:20 a.m.	Sterile Docking Using Microwave Heating K.L. Carr and R.S. Grabowy	1267
GG-4: 8:30 a.m.	Biological Applications of a Technique for Broadband Complex Permittivity Measurements Y. Wei and S. Sridhar	1271
GG-5: 8:40 a.m.	Bidimensional Analysis of Planar Applicators from Spectral Domain Approach Method for 915 MHz Hyperthermia J. Pribetich, L. Dubois, P.Y. Cresson and M. Chive	1275
GG-6: 8:50 a.m.	Phased Coaxial Antennas Array: Antenna Design-Power Deposition Diagram-Application in 915 MHz Interstitial Hyperthermia J.C. Camart, J.J. Fabre, J. Pribetich and M. Chive	1279
GG-7: 9:00 a.m.	A Frequency-Dependent FDTD Method for Induced-Current Calculations for a Heterogeneous Model of the Human Body O.P. Gandhi, J.Y. Chen and C.M. Furse	1283
GG-8: 9:10 a.m.	Microwave Radiometry for Medical Thermal Imaging: Theory and Experiment F. Bardati, V.J. Brown, M.P. Ross and P. Tognolatti	1287
GG-9: 9:20 a.m.	Microwave Thermal Radiometry for Detecting Cancer in Deep Human Tissues X. Xiang	1291

Session HH

Advances In Microwave Oscillator Technology Ruidoso/San Miguel

10:00 a.m. to 11:30 a.m.

Thursday, June 4, 1992

Chairman: J. Pierro—AIL Systems, Melville, NY

HH-1: 10:00 a.m.	2-22 GHz Low Phase Noise Silicon Bipolar YIG Tuned Oscillator Using Composite Feedback A.P.S. Khanna and J. Buenrostro	1297
HH-2: 10:20 a.m.	A Novel MMIC Approach to Sampling Phase/Frequency Detection for Microwave Quartz-Lock Oscillators T. Nakagawa, T. Hirota and T. Ohira	1301
HH-3: 10:40 a.m.	4GHz Miniaturized Low Noise Dielectric Resonator Stabilized Oscillator K. Kamozaiki	1305
HH-4: 10:50 a.m.	A 23 GHz Monolithic MESFET DRO as Self-Oscillating Mixer U. Güttich	1309
HH-5: 11:00 a.m.	Fast Starting, Pulse Primed DROs Without Phase Noise Degradation G. Osborn and E.-B El-Sharawy	1313
HH-6: 11:20 a.m.	A Semi-Monolithic Wideband VCO with Output Power Control Capability Using an Active Power Splitter M. Kimishima, S. Ohmura and T. Ashizuka	1317

Vol III



Session II

Cavity Filters Mesilla/Pecos

10:00 a.m. to 11:10 a.m.

Thursday, June 4, 1992

Chairman: C. Kudsia—COM DEV Ltd., Ontario, Canada

II-1: 10:00 a.m.	Miniature Radiating Filters for Phased Array Antenna Applications S.J. Fiedziuszko	*
II-2: 10:20 a.m.	A New Type of Annular Ring Waveguide Cavity for Resonator and Filter Applications C.-H. Ho and K. Chang	1323
II-3: 10:30 a.m.	800 MHz High Power Duplexer Using TM Dual Mode Dielectric Resonators Y. Ishikawa, J. Hattori, M. Andoh and T. Nishikawa	1617
II-4: 10:50 a.m.	Dual Mode Coupling by Square Corner Cut in Resonators and Filters X.-P. Liang, K.A. Zaki and A.E. Atia	1327
II-5: 11:00 a.m.	A Narrowband Filter with a Wide Spurious-Free Stopband R.R. Bonetti and A.E. Williams	1331

*Paper not available at the time of printing.

Session JJ

CAD2—Modeling and Analysis Techniques Ballroom A

10:00 a.m. to 11:20 a.m.

Thursday, June 4, 1992

Chairman: D.G. Swanson, Jr—Watkins-Johnson Co., Palo Alto, CA

JJ-1:	Simulating Distributed Elements with Asymptotic Waveform Evaluation	1337
10:00 a.m.	J.E. Bracken, V. Raghavan and R.A. Rohrer	
JJ-2:	Fast Nonlinear Waveform Estimation for Large Distributed Networks	1341
10:20 a.m.	E. Chiprout and M. Nakhla	
JJ-3:	A Broadband Parameter Extraction Technique for the Equivalent Circuit of Planar Inductors	1345
10:40 a.m.	Y.C. Shih, C.K. Pao and T. Itoh	
JJ-4:	Experimental Models of Series and Shunt Elements in Coplanar MMICs	1349
10:50 a.m.	A.K. Sharma and H. Wang	
JJ-5:	Approximate Calculation of the High-Frequency Resistance Matrix for Multiple Coupled Lines	1353
11:00 a.m.	G.L. Matthaei and G.C. Chinn	
JJ-6:	A Novel Approach to the Synthesis of Mixed Lumped and Distributed Lossy Networks	1355
11:10 a.m.	L. Zhu	

Session KK

Microwave Technology in Radio Astronomy II Brazos

10:00 a.m. to 11:20 a.m.

Thursday, June 4, 1992

Co-Chairmen: K. Tomiyasu—General Electric Co., Philadelphia, PA

P.J. Napier—NRAO, Socorro, NM

KK-1:	Wideband Feed Systems for Radio Telescopes	1361
10:00 a.m.	G.L. James	
KK-2:	Receiver and Optics Designs for the 100-Meter Green Bank Telescope	1365
10:20 a.m.	R.D. Norrod, S. Srikanth and M. Balister	
KK-3:	Cryogenically-Cooled, HFET Amplifiers and Receivers: State-of-the-Art and Future Trends	1369
10:30 a.m.	M.W. Pospieszalski	
KK-4:	Phase Calibration of the Very Long Baseline Array (VLBA)	1373
10:50 a.m.	A.E.E. Rogers, B.E. Corey and E.F. Nesman	
KK-5:	Microwave Technology Innovations in Orbiting VLBI	1375
11:00 a.m.	L.R. D'Addario	
KK-6:	A Differential Radiometer for MM Wavelengths	1379
11:10 a.m.	L. Piccirillo, M. Calabresi and M. Zucchetti	

Session LL

Bulk and Thin Film Ferrites Ballroom B

10:00 a.m. to 11:30 a.m.

Thursday, June 4, 1992

Co-Chairmen: J. Owens—Auburn University, Auburn, AL

R. Miller—Westinghouse ESG, Baltimore, MD

LL-1:	Recent Developments in the Average Power Capacity of Rotary-Field Ferrite Phase Shifters	1385
10:00 a.m.	W.E. Hord	
LL-2:	A Compact Broadband Microstrip Circulator for Phased Array Antenna Modules	1389
10:20 a.m.	R.E. Blight and E. Schloemann	
LL-3:	Novel Ferrite Circulator Junctions with Predicted Performance	1393
10:30 a.m.	A.M. Borjak and L.E. Davis	
LL-4:	On the YIG Film Filters	1397
10:50 a.m.	M. Tsutsumi and K. Okubo	
LL-5:	Magnetostatic Wave Notch Filter	1401
11:10 a.m.	M.R. Daniel and J.D. Adam	
LL-6:	A Miniaturized Low-Spurious 1.9 GHz MSW Band-Pass Filter Using YIG Resonators with Multi Metal Rings	1403
11:20 a.m.	Y. Ishikawa, T. Okada, S. Shinmura, F. Kanaya, K. Wakino and T. Nishikawa	

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MM

Session MM

Millimeter Wave Mixers and Receivers Ruidoso/San Miguel

1:00 p.m. to 2:30 p.m.

Thursday, June 4, 1992

Chairman: J. Whelehan—AIL Systems, Inc., Melville, NY

MM-1:	High Performance Resistive EHF Mixers Using InGaAs HEMTs	1409
1:00 p.m.	K.W. Chang, T.H. Chen, S.B.T. Bui, L.C.T. Liu and L. Nguyen	
MM-2:	A Heterodyne Receiver for 40-GHz-Modulated 1.3-μm Optical Signals Using a Multi-Tasked InP-Based HEMT	1413
1:20 p.m.	C. Rauscher and K.J. Williams	
MM-3:	A 90 GHz Quasi-Integrated Horn Antenna Receiver	1417
1:40 p.m.	W.Y. Ali-Ahmad and G.M. Rebeiz	
MM-4:	A Planar Quasi-Optical SIS Receiver Suitable for Array Applications	1421
2:00 p.m.	P.A. Stimson, R.J. Dengler, P.H. Siegel and H.G. LeDuc	
MM-5:	Reflected Power Effects in Computer Simulations Using the Quantum Theory of Mixing	1425
2:20 p.m.	Q. Ke and M.J. Feldman	

Session NN

Active On-Wafer and Time Domain Analyzer Measurements Mesilla/Pecos

1:00 p.m. to 2:30 p.m.

Thursday, June 4, 1992

Chairman: H.M. Cronson—The Mitre Corporation, Bedford, MA

NN-1:	A High Power On-Wafer Pulsed Active Load Pull System	1431
1:00 p.m.	D.D. Poulin, J.R. Mahon, J.-P. Lanteri	
NN-2:	A New On-Wafer Large-Signal Waveform Measurement System with 40 GHz Harmonic Bandwidth	1435
1:20 p.m.	F. van Raay and G. Kompa	
NN-3:	On-Wafer RF Measurement Setup for the Characterization of HEMT's and High T_c Superconductors at Very Low Temperatures Down to 20 K	1439
1:30 p.m.	H. Meschede, R. Reuter, D. Peters, J. Kraus, R.M. Bertenburg, W. Brockerhoff and F.J. Tegude	
NN-4:	Two-Dimensional Field Mapping in MMIC-Substrates by Electro-Optic Sampling Technique	1443
1:40 p.m.	W. Mertin, C. Böhm, L.J. Balk and E. Kubalek	
NN-5:	Thru-Match-Short Calibration for Time Domain Network Analysis	1447
2:00 p.m.	L.A. Hayden and V.K. Tripathi	
NN-6:	A Complete Calibration Procedure for Time Domain Network Analysers	1451
2:10 p.m.	P. Ferrari, G. Angénieux and B. Fléchet	
NN-7:	Introducing the Through-Line Deembedding Procedure	1455
2:20 p.m.	M.B. Steer, S.B. Goldberg, G. Rinne, P.D. Franzon, I. Turlik and J.S. Kasten	

Session OO

CAD3—Circuit Simulation and Yield Optimization Ballroom A

1:00 p.m. to 2:10 p.m.

Thursday, June 4, 1992

Chairman: B.S. Perlman—Army Research Laboratory, Fort Monmouth, NJ

OO-1:	An Equivalent Circuit Model for the Coplanar Waveguide Step Discontinuity	1461
1:00 p.m.	C. Sinclair and S.J. Nightingale	
OO-2:	A New Formulation for Yield Optimization	1465
1:10 p.m.	J.W. Bandler, S.H. Chen and R.M. Biernacki	
OO-3:	Combining Yield Optimization with Circuit Level Electromagnetic Simulation	1469
1:20 p.m.	M.D. Meehan, P. Draxler and L.C. Henning	
OO-4:	Small-Signal RF Yield Analysis of MMIC Circuits Based on Physical Device Parameters	1473
1:30 p.m.	D.L. Allen, J. Beall and M. King	
OO-5:	Reflectionless Broad-Band Matching Networks Using a Diplexer Approach	1477
1:40 p.m.	T.G. McKay	
OO-6:	Noise Analysis of Microwave Circuits with General Topology	1481
1:50 p.m.	P. Russer, S. Müller	
OO-7:	A New Method for the Transient Simulation of Causal Linear Systems Described in the Frequency Domain	1485
2:00 p.m.	T.J. Brazil	

Session PP

(Focused Session)

Recent Advances in UWB Systems & Technology

Brazos

1:00 p.m. to 2:20 p.m.

Thursday, June 4, 1992

Chairman: A. Rosen—David Sarnoff Research Center, Princeton, NJ

PP-1:	(Paper has been withdrawn)	
1:00 p.m.		
PP-2:	0.02 to 1.0 GHz Ultra-Wideband Radar Measurements and Experience at the	
1:20 p.m.	Naval Ocean Systems Center	*
	M. Pollock, T. Tice and R. Dingler	
PP-3:	UWB Radar for Ground Vehicle Self Protect	1491
1:40 p.m.	J.W. Toevs, D.R. Smith, D.P. Byrne and G.F. Ross	
PP-4:	Calibration and Measurement Issues for RCS Measurements Using	
2:00 p.m.	UWB Techniques	*
	R.G. Madonna	
PP-5:	CARABAS: An UWB Low Frequency SAR	1495
2:10 p.m.	H. Hellsten	

Session QQ

Microwave and Millimeter Wave Packaging

Ballroom B

1:00 p.m. to 2:20 p.m.

Thursday, June 4, 1992

Chairman: B. Berson—Berson & Associates, Mountain View, CA

QQ-1:	Packaging Requirements for High Volume Wireless Communications	1501	Vol III
1:00 p.m.	D.R. Green, J.P. Beccone and R.B. Crispell		NN
QQ-2:	Microwave Module Packaging	1503	
1:20 p.m.	G. Jerinic and M. Borkowski		OO
QQ-3:	Millimeter-Wave Packaging	1507	
1:40 p.m.	H.J. Kuno and T.A. Midford		PP
QQ-4:	Microwave Module Interconnection and Packaging Using Multilayer Thin	1509	
2:00 p.m.	Film/Thick Film Technology		QQ
	A.K. Agrawal, R.D. Clark, J.J. Komiak and R. Browne		
QQ-5:	Miniaturized Stripline Circuitry Utilizing Low Temperature Cofired Ceramic	1513	
2:10 p.m.	(LTCC) Technology		
	B.A. Kopp and A.S. Francomacaro		
QQ-6:	Highly Efficient, Very Compact GaAs Power Module for Cellular Telephone	1517	
2:20 p.m.	Y. Ota, M. Yanagihara, T. Yokoyama, C. Azuma, M. Maeda and O. Ishikawa		

*Paper not available at the time of printing.

Session RR

Phased and Active Array Techniques Ruidoso/San Miguel

3:00 p.m. to 4:30 p.m.

Thursday, June 4, 1992

Chairman: D.C. Zimmermann—Texas Instruments, Dallas, TX

RR-1: 3:00 p.m.	T/R Module Architectural Consideration for Active Electronically Steerable Arrays T.R. Turlington, F.E. Sacks and J.W. Gippich	1523
RR-2: 3:20 p.m.	L-Band Phase Shifter with Switching FET's for Phased Array Antenna T. Kato, Y. Tanaka, H. Ueda, H. Kano and M. Hashimoto	1527
RR-3: 3:30 p.m.	Ultra Small Size X Band MMIC T/R Module for Active Phased Array T. Sakai, N. Takeuchi, A. Mizobuchi, Y. Iyama and N. Tanino	1531
RR-4: 3:50 p.m.	An FET Oscillator Element for Spatially Injection Locked Arrays J. Birkeland and T. Itoh	1535
RR-5: 4:00 p.m.	Quasi-Optical Array VCO's S. Bundy, T.B. Mader and Z.B. Popović	1539
RR-6: 4:20 p.m.	40 GHz Quasi-Optical Second Harmonic Spatial Power Combiner Using FETs and Slots S. Kawasaki and T. Itoh	1543

Session SS

Microwave Measurements Mesilla/Pecos

3:00 p.m. to 4:30 p.m.

Thursday, June 4, 1992

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

SS-1: 3:00 p.m.	A New Aperture Admittance Model for Open-Ended Waveguides C.L. Sibbald and S.S. Stuchly	1549
SS-2: 3:20 p.m.	Microwave-Based Low-Cost Instrument for Film Thickness Measurement L.F. Root and I. Kaufman	1553
SS-3: 3:30 p.m.	Dielectric Probe for Permittivity and Permeability Measurements at Low Microwave Frequencies D. Derray, A. Julien, P. Guillon, P. Naud, J.L. Bonnefoy and J.P. Prulhiere	1557
SS-4: 3:40 p.m.	In Situ Thickness Monitor for Conducting Films S.A. Khan, J.B. Farmer, R.J. Gutmann and J.M. Borrego	1561
SS-5: 3:50 p.m.	A Smith Chart Represented by a Neural Network and its Applications M. Vai, S. Prasad and H. Wang	1565
SS-6: 4:10 p.m.	Accuracy Improvements in Two-Port Noise Parameter Extraction Method A. Boudiaf, M. Laporte, J. Dangla and G. Vernet	1569
SS-7: 4:20 p.m.	Theoretical and Experimental Investigations of Resonance Frequencies in a Microwave Heated Fluidized Bed Reactor A. Baysar, J.L. Kuester and S. El-Ghazaly	1573

Session TT

Nonlinear CAD

Ballroom A

3:00 p.m. to 4:10 p.m.

Thursday, June 4, 1992

Chairman: S. Mass—UCLA, Los Angeles, CA

TT-1:	Direct Use of a MESFET Physical Model in Non-Linear CAD	1579
3:00 p.m.	P.J.C. Rodrigues, M.J. Howes and J.R. Richardson	
TT-2:	A New Empirical Nonlinear Model for HEMT-Devices	1583
3:20 p.m.	I. Angelov, H. Zirath and N. Rorsman	
TT-3:	Analysis and Optimization of Third Order Intermodulation Distortion Mechanisms in AlGaAs/GaAs Heterojunction Bipolar Transistors	1587
3:30 p.m.	A. Samelis and D. Pavlidis	
TT-4:	The Application of Harmonic-Balance Methodology to the Analysis of Injection Locking	1591
3:40 p.m.	V. Rizzoli, A. Neri and D. Masotti	
TT-5:	Large Signal Design of Broadband Monolithic Microwave Frequency Dividers	1595
4:00 p.m.	A. Suarez, R. Quéré, M. Camiade and E. Ngoya	

Session UU

(Focused Session)

Recent Advances in UWB Systems & Technology

Brazos

3:00 p.m. to 4:30 p.m.

Thursday, June 4, 1992

Chairman: P. Vail—Phillips Lab., Kirtland AFB, NM

UU-1:	The Generation of High Energy Ultra Wide Band Pulses	1601
1:00 p.m.	O. Zucker and I.A. McIntyre	
UU-2:	High Power Silicon Switch Ultra Wide Band Transmitter	*
3:20 p.m.	J.A. Demarest, R.G. Highland, M.T. Buttram and G. Loubriel	
UU-3:	High Power, 10 kHz Repetition Rate Ultra-Wideband Source Development at the U.S. Army's Missile Command	1605
3:40 p.m.	D. Birx and J.R. Fishback	
UU-4:	Ultra-Wide Band, High-Repetition Rate Single Channel Mobile Diagnostic System	1609
4:00 p.m.	D.E. Voss and L.M. Miner	
UU-5:	On The Wide Band Microwave Testing of Generic Digital and Analog Circuits	*
4:20 p.m.	T.A. Loughry	

*Paper not available at the time of printing.

