

WEDNESDAY MORNING, 12 JUNE 1974

INTRODUCTORY SESSION

0900 - 0945

BENJAMIN J. DASHER

(EE) Auditorium

Welcoming Remarks --

G. P. Rodrigue, Chairman, Symposium Steering Committee
J. M. Pettit, President, Georgia Institute of Technology
R. A. Rivers, President, S-MTT Administrative Committee
C. H. Walter, President, AP-S Administrative Committee

Keynote Address --

John J. Guarrera, President, IEEE

SPECIAL SESSION

Technical Forecasting and Assessment
(Joint AP-S and S-MTT)

SESSION 1. PHASED ARRAYS I (JOINT AP-S AND S-MTT)

1000-1220 Benjamin J. Dasher (EE) Auditorium

Chairman: R. C. Hansen, R. C. Hansen, Inc.,
Encino, CA

SESSION 2. ANALYSIS AND APPLICATION OF MICROWAVES IN BIOLOGY AND MEDICINE

1000-1230 Textile Auditorium

Chairman: H. Allen Ecker, Eng. Exp. Sta., Georgia
Institute of Technology, Atlanta, GA

1000-1230 Van Leer Electrical Engineering Building
Classrooms C-240, C-241, and C-340
Organized by Geoffrey Hyde (AP), Comsat,
Washington, DC, and H. Warren Cooper
(MTT), Westinghouse Electric Corp.,
Baltimore, MD

Round Table Discussions:

"What is hot--what is not?"

Classroom C-240

1000 MICROWAVE SENSORS FOR MILITARY AND
CIVIL USE (Invited)
J. J. Guarrera, SaCOM
Sun Valley, CA
1050 MICROWAVE APPLICATIONS FOR MATERIAL
AND FOOD PROCESSING (Invited)
T. S. Saad, Sage Laboratories, E. Natick, MA
1140 MICROWAVES FOR COMMUNICATIONS AND
COMPUTERS (Invited)

Classroom C-241

1000 MICROWAVE GIGAWATTS--A NEW PARADIGM
FOR ELECTRICAL ENERGY (Invited)
W. C. Brown, Raytheon Co., Waltham, MA
1050 GUIDED PROPAGATION AND PROCESSING AT
OPTICAL FREQUENCIES (Invited)
1140 PHASED ARRAY TECHNOLOGY--PRESENT AND
FUTURE (Invited)

Classroom C-340

1000 MICROWAVE AND MILLIMETER WAVE
ANTENNAS (Invited)
A. C. Schell, Air Force Cambridge Research
Laboratories, Hanscom Air Force Base, MA
1050 NUMERICAL METHODS--ANTENNAS AND
SCATTERING IN FREQUENCY AND TIME
DOMAINS (Invited)
C. E. Baum, Kirtland Air Force Base, NM
1140 OPTICS AND QUASI-OPTICS (Invited)
R. H. Lang, George Washington University,
Washington, DC

1-1	THE PHASED ARRAY SUCCESS STORY; SIX	6
1000	YEARS OF AN/FPS-85 OPERATION	
	J. E. Reed, Bendix Communication Division,	
	Baltimore, MD	
1-2	SELECTION OF PHASED ARRAY CONFIGURA-	9
1020	TION	
	D. T. Thomas, Raytheon Co., Goleta, CA	
1-3	HEMISPHERICALLY SCANNED ARRAYS	12
1040	A. T. Villeneuve, M. C. Behnke, and	
	W. H. Kummer, Hughes Aircraft Co., Culver	
	City, CA	
1-4	A CONICAL BEAM SHIP ARRAY ANTENNA WITH	17
1100	INFINITELY VARIABLE CONTROL OF ELEVA-	
	TION ANGLE	
	H. Foster, H. H. Mattes, and A. Schrott,	
	DFVLR-Institut für Flugfunk und Mikrowellen,	
	Oberpfaffenhofen, Germany	
1-5	AN EXPERIMENTAL EVALUATION OF ADAP-	21
1120	TIVE RADAR	
	F. M. Staudaher, NRL, Washington, DC	
1-6	ANTENNA DESIGN-INCEPTION TO RANGE	22
1140	TEST	
	J. H. Stachlin, Westinghouse Electric Corp.,	
	Baltimore, MD	
1-7	X-BAND REFLECT-ARRAY WITH INTEGRATED	23
1200	PIN DIODES	
	J. A. Salmon, R. Pierrot, and Y. Commault,	
	Thomson-CSF, Malakoff, France	

LUNCH

2-1	A SURVEY OF THE POTENTIAL FOR BENE-	26
1000	FICIAL APPLICATIONS OF MICROWAVES IN	
	MEDICINE AND BIOLOGY (Invited)	
	J. M. Osepchuk, Raytheon Co., Waltham, MA	
2-2	INSECT CONTROL POSSIBILITIES USING	27
1030	MICROWAVES AND LOWER FREQUENCY RF	
	ENERGY	
	S. O. Nelson, U.S. Department of Agriculture,	
	University of Nebraska, Lincoln, NE	
2-3	NERVE STIMULATION BY IMPLANTED DIODE	30
1050	C. C. Johnson, J. L. Lords, and	
	M. A. Coombs, University of Utah, Salt Lake	
	City, UT	
2-4	LIQUID CRYSTAL FIBEROPTIC TEMPERATURE	32
1110	PROBE FOR THE MEASUREMENT OF ELECTRO-	
	MAGNETIC POWER ABSORPTION IN TISSUE	
	C. C. Johnson, C. H. Durney, and J. L. Lords,	
	University of Utah, Salt Lake City, UT	
2-5	ELECTROMAGNETIC FIELDS INDUCED INSIDE	35
1130	OF BIOLOGICAL BODIES	
	D. Livesay and Kun-Mu Chen, Michigan State	
	University, East Lansing, MI	
2-6	MULTI-FREQUENCY ELECTROMAGNETIC	38
1150	THAWING OF FROZEN KIDNEYS	
	C. P. Burns and C. E. Burdette, Eng. Exp.	
	Sta., Georgia Institute of Technology,	
	Atlanta, GA	
2-7	SOME THEORY AND PRELIMINARY EXPERI-	41
1210	MENTS ON MICROWAVE RADIOMETRY OF	
	BIOLOGICAL SYSTEMS	
	J. Bigu del Blanco, C. Romero-Sierra, Queen's	
	University, Kingston (Ont), Canada,	
	J. A. Tanner, NRC of Canada, CSL, Ottawa	

LUNCH

SESSION 3. PHASED ARRAYS II (JOINT
AP-S AND S-MTT)

1400-1720 Benjamin J. Dasher (EE) Auditorium

Chairman: B. C. Dodson, NRL, Washington, D. C. Page
G. N. Tsandoulas, Lincoln Laboratories,
MIT, Lexington, MA

3-1	REQUIREMENTS FOR OPTICALLY PROCESS-	46
1400	ING INFORMATION FROM A PHASED ARRAY	
	J. E. Rhodes, Eng. Exp. Sta., Georgia	
	Institute of Technology, Atlanta, GA	
3-2	COMMERCIAL MICRO-COMPUTER CHIPS FOR	50
1420	INTEGRATED PHASED ARRAY CONTROL	
	F. J. Langley, Raytheon Co., Bedford, MA	
3-4	SOLID STATE PHASED ARRAY RADAR	54
1440	A. Y. Harper and J. D. Carlson, U.S. Army	
	Ballistic Missile Defense Agency, Huntsville, AL	
3-4	THE AN/TPS-59 ANTENNA ROW-BOARD DE-	57
1500	SIGN	
	R. R. Kinsey, General Electric Co., Syracuse,	
	NY	
3-5	TPS-59 ARRAY ELECTRONICS	61
1520	R. C. Litty, General Electric Co., Syracuse, NY	
1540	COFFEE BREAK	
3-6	RF POWER MODULES FOR L-BAND SOLID	62
1600	STATE TRANSMITTERS	
	D. J. Hoft and L. R. Lavalley, Raytheon Co.,	
	Wayland, MA	
3-7	OPERATION OF SOLID STATE TRANSCEIVERS	65
1620	IN AN L-BAND ARRAY	
	R. Sudbury, MIT, Lincoln Laboratory, Lexington,	
	MA; K. Fischer, U.S. Army Electronics Com-	
	mand, Ft. Monmouth, NJ; F. Palmer, RCA,	
	Moorestown, NJ; G. Jones, U.S. Army Ballistic	
	Missile Defense Agency, Huntsville, AL	
3-8	SOLID STATE S-BAND TRANSMIT/RECEIVE	68
1640	MODULE	
	G. Hanley and R. Viola, Sperry Gyroscope,	
	Great Neck, NY; P. Koegler, Rome Air Develop-	
	ment Center, Griffiss Air Force Base, NY	
3-9	AN X-BAND TRANSCEIVER MODULE FOR MAIR	69
1700	R. J. Bauer, R. J. Taylor, and J. P. Muhlbaier,	
	Westinghouse Electric Corp., Baltimore, MD	

SESSION 4. MICROWAVE THEORY

1400-1700 Van Leer E.E. Building, Classroom C-240

Chairman: L. Lewin, University of Colorado, Page
Boulder, CO

4-1	DESIGN OF MULTIMODE WAVEGUIDE TRANSI-	72
1400	TION SECTIONS BASED ON RADIAL AND	
	RECTANGULAR MODE ANALYSES	
	E. Bahar and G. Govindarajan, University of	
	Nebraska, Lincoln, NE	
4-2	SYMMETRY-INDUCED MODAL CHARACTER-	75
1420	ISTICS OF UNIFORM WAVEGUIDES	
	P. R. McIsaac, Cornell University, Ithaca, NY	
4-3	UPPER AND LOWER VARIATIONAL BOUNDS	78
1440	IN EM SCATTERING	
	K. Kalikstein, Hunter College, CUNY, NY, NY;	
	C. J. Kleinman, Long Island University,	
	Brooklyn, NY; R. Rosenberg and L. Spruch,	
	New York University, NY, NY	
4-4	PROXIMITY EFFECTS OF TRANSMISSION LINE	81
1500	DISCONTINUITIES	
	T. Parker and T. Cisco, Electronic Resources,	
	Div. of Whittaker Corp., Los Angeles, CA	
1520	COFFEE BREAK	
4-5	ITERATIVE SOLUTION OF THE WAVEGUIDE-	84
1540	HORN JUNCTION	
	M. F. Iskander and M. A. K. Hamid, University	
	of Manitoba, Winnipeg, Canada	
4-6	SOME NEW RESULTS ON COUPLED OR	87
1600	MEANDER MICROSTRIP LINES BY APPLICA-	
	TION OF MATRIX THEORY	
	R. Daumas, D. Pompei, E. Rivier, and A. Ros,	
	Laboratoire D'Electronique, Universite de Nice,	
	Nice-Cedex, France	
4-7	A FULL-WAVE ANALYSIS OF MICROSTRIP	90
1620	RESONATORS	
	T. Itoh, University of Illinois at Urbana-	
	Champaign, Urbana, IL	
4-8	N-WAY BRANCH LINE DIRECTIONAL COUPLERS,	93
1640	C. L. Chao, TRW Systems, Redondo Beach, CA	

SESSION 5. BIOLOGICAL EFFECTS OF
MICROWAVES

1400-1700 Textile Auditorium

Chairman: A. W. Guy, University of Washington, Page
Seattle, WA

5-1 1400	EXPERIMENTAL MODELS FOR THE EVALUA- TION OF MICROWAVE BIOLOGICAL EFFECTS (Invited) P. Czerski, National Institute of Mother and Child, Warsaw, ul. Kasprzaka, Poland	98
5-2 1430	AN INTERNATIONAL PROGRAM FOR MICRO- WAVE EXPOSURE PROTECTION S. M. Michaelson and M. J. Suess, University of Rochester, Rochester, NY; WHO Regional Office for Europe, Copenhagen, Denmark	99
5-3 1450	THERMOGENETIC AND CARDIODYNAMIC REGULATION IN DOGS CRANIALY EXPOSED TO 2450 MHz (cw) MICROWAVES Shin-Tsu-Lu, R. Bogardus, J. Cohen, J. Jones, E. Kinnen, and S. Michaelson, University of Rochester, Rochester, NY	102
5-4 1510	MICROWAVE EFFECT ON RABBIT SUPERIOR CERVICAL GANGLION K. Courtney, J. C. Lin, A. W. Guy, and C. K. Chou, University of Washington School of Medicine, Seattle, WA	104
1530	COFFEE BREAK	
5-5 1600	BEHAVIORIAL CHANGES OF RATS EXPOSED TO MICROWAVE RADIATION J. C. Lin, A. W. Guy, L. R. Caldwell, University of Washington School of Medicine, Seattle, WA	106
5-6 1620	ABSORPTION CHARACTERISTICS OF MULTI- LAYERED SPHERE MODELS EXPOSED TO UHF/MICROWAVE RADIATION C. M. Weil, U.S. Environmental Protection Agency, Research Triangle Park, NC	109
5-7 1640	A MICROWAVE DOSIMETRY SYSTEM FOR MEASURING SAMPLED INTEGRAL DOSE RATE C. L. Christman, H. S. Ho, and S. Yarrow, Division of Biological Effects, Bureau of Radiological Health, Food and Drug Administra- tion, Rockville, MD	112

SESSION 6. MILLIMETER ASTRONOMY
AND RELATED TOPICS

1400-1700 Space Science Building, Room 5

Chairman: J. J. Gallagher, Eng. Exp. Sta., Georgia Page
Institute of Technology, Atlanta, GA

6-1 1400	MILLIMETER WAVE RECEIVERS AND THEIR APPLICATIONS TO RADIO ASTRONOMY (Invited) T. G. Phillips and K. B. Jefferts, Bell Laboratories, Murray Hill, NJ	116
6-2 1430	MOLECULAR MILLIMETER WAVE ASTRONOMY (Invited) L. E. Snyder, Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder, CO	117
6-3 1500	A MILLIMETER WAVE RADIOMETER FOR COSMIC BACKGROUND RADIATION MEASURE- MENTS R. J. Pedersen and F. L. Vernon, Jr., The Aerospace Corp., Los Angeles, CA	118
1520	COFFEE BREAK	
6-4 1550	DEVELOPMENT AND TESTING OF A RECEIVER AT 230 GHz M. V. Schneider and G. T. Wrixon, Bell Laboratories, Holmdel, NJ	120
6-5 1610	MILLIMETER WAVE INTERFEROMETRY (Invited) W. J. Welch, Radio Astronomy Laboratory, University of California, Berkeley, CA	123
6-6 1640	MILLIMETER WAVE SOLAR OBSERVATIONS (Invited) J. P. Castelli, Radio Astronomy Branch, Air Force Cambridge Research Laboratory, Hanscom Field, Bedford, MA	124

WEDNESDAY EVENING, 12 JUNE 1974

SESSION 7. MICROWAVE TECHNOLOGY FOR PHASED ARRAYS

2000-2220	Sheraton Hall, Rm. A, Sheraton-Biltmore	<u>Page</u>
Chairman:	B. L. Smith, ABMDA, Huntsville, AL J. B. LaGrange, Texas Instruments, Inc. Dallas, TX	
7-1 2000	FIDELITY OF PULSED MICROWAVE TRANSIS- TOR AMPLIFIERS D. Staiman and J. Liston, RCA, Missile and Surface Radar Div., Moorestown, NJ	130
7-2 2020	DESIGN CONSIDERATIONS OF ACTIVE ELE- MENT ARRAY TRANSCEIVERS J. N. Jansen and R. F. Wade, Microwave Asso- ciates, Inc., Burlington, MA; D. Renkowitz and H. Balshem, Microwave Semiconductor Corp., Somerset, NJ	132
7-3 2040	A COMPUTER-AIDED DESIGN OF L-BAND TRANSISTOR POWER AMPLIFIERS G. T. O'Reilly and R. E. Neidert, NRL, Washington, DC; L. K. Wilson, Vanderbilt University, Nashville, TN	135
7-4 2100	R.F. RELIABILITY TESTING OF L-BAND POWER TRANSISTORS W. Weisenberger, B. C. Dodson, Jr., and A. Christou, NRL, Washington, DC	138
7-5 2120	INVESTIGATIONS OF RF INDUCED BURNOUT IN MICROWAVE MIXER DIODES: A CONTIN- UING STUDY G. E. Morris, G. A. Hall, C. F. Cook, and V. J. Higgins, U.S. Army Electronics Com- mand, Ft. Monmouth, NJ	139
7-6 2140	S-BAND, 3-BIT, 1 kW PEAK, 0.8 dB AVERAGE LOSS, DIODE PHASE SHIFTER AND DRIVER UNDER \$100 J. F. White, Microwave Associates, Inc., Burlington, MA	142
7-7 2200	A HIGH POWER MICROWAVE WAVEGUIDE WINDOW DESIGN H. L. Bassett, Eng. Exp. Sta.; G. T. Colwell, Mech. Eng.; J. M. Schuchardt, Eng. Exp. Sta., Georgia Institute of Technology, Atlanta, GA; B. L. Smith, U.S. Army Ballistic Missile Defense Agency, Huntsville, AL	145

SESSION 8. RECENT ADVANCEMENTS IN GALLIUM ARSENIDE DEVICES (PANEL)

2000-2200	Sheraton Hall, Room B, Sheraton-Biltmore	
Organized by:	J. B. Horton, TRW Systems Redondo Beach, CA	<u>Page</u>
Panel Moderator:	Gary L. McCoy, Air Force Avionics Laboratory, WPAFB, OH	150
	J. A. Eisenberg, Watkins-Johnson Co. Palo Alto, CA	
	Berin Fank, Varian Solid State West Palo Alto, CA	
	C. K. Kim, Special Microwave Device Operation, Raytheon Co. Waltham MA	
	R. A. Murphy, Lincoln Laboratory, MIT Lexington, MA	

WEDNESDAY EVENING, 12 JUNE 1974

SESSION 9. MILLIMETER WAVES

2000-2200	Sheraton Hall, Room C, Sheraton-Biltmore	
Chairman:	J. W. Dees, Eng. Exp. Sta., Georgia Institute of Technology, Atlanta, GA	
9-1 2000	MILLIMETER WAVE RADARS (Invited) F. B. Dyer and E. K. Reedy, Eng. Exp. Sta., Georgia Institute of Technology, Atlanta, GA	152
9-2 2040	HIGHLIGHTS AND REVIEW OF THE NELC MILLIMETER CONFERENCE (Invited) L. R. Whicker, NRL, Washington, DC	153
9-3 2120	HIGHLIGHTS AND REVIEW OF THE INTER- NATIONAL CONFERENCE ON SUBMILLIMETER WAVES AND THEIR APPLICATIONS (Invited) J. J. Gallagher, Eng. Exp. Sta., Georgia Institute of Technology, Atlanta, GA	154

THURSDAY MORNING, 13 JUNE 1974

SESSION 10. PLANAR MICROWAVE ACTIVE
AND PASSIVE COMPONENTS

0900-1220 Space Science Building, Room 3

Chairman W. H. From, Raytheon Co., Missile
Systems Div., Bedford, MA Page

10-1	FUNDAMENTAL EVEN- AND ODD-MODE WAVES	156
0910	FOR NONSYMMETRICAL COUPLED LINES IN NON-HOMOGENEOUS MEDIA	
	R. A. Speciale, Tektronix, Inc., Beaverton, OR	
10-2	INHOMOGENEOUS COUPLED-LINE FILTERS	159
0930	J. L. Allen, Univ. of South Florida, Tampa, FL	
10-3	FOLDED-LINE AND HYBRID FOLDED-LINE	162
0950	BANDSTOP FILTERS	
	P. A. Dupuis, Vidatel Limited, Ottawa, Ontario, Canada, E. G. Cristal, Hewlett-Packard Labora- tories, Palo Alto, CA	
10-4	DISPERSION AND FIELD ANALYSIS OF A	165
1010	MICROSTRIP MEANDER LINE SLOW-WAVE CIRCUIT	
	J. A. Weiss, Mass. Institute of Technology Lincoln Laboratory, Lexington, MA	
1030	COFFEE BREAK	
10-5	THE DESIGN OF PLANAR CIRCUIT MOUNTED	168
1100	IN WAVEGUIDE AND THE APPLICATION TO LOW NOISE 12 GHz CONVERTER	
	Y. Komski, K. Uenakada, and N. Hoshino, Technical Research Laboratories of NHK, Japan Broadcasting Corp., Tokyo, Japan	
10-6	HARMONIC MIXING WITH AN ANTI-PARALLEL	171
1120	DIODE PAIR	
	M. Cohn, J. E. Degenford, and B. A. Newman, Westinghouse Electric Corp., Baltimore, MD	
10-7	HIGH POWER PIN DIODE SWITCH MATRIX	173
1140	H. R. Malone, M. L. Matson, and P. D. Kennedy, Motorola, Inc., Scottsdale, AZ	
10-8	FAST ACTING VARACTORS FOR SUB-	176
1200	NANOSECOND POWER LIMITING IN RECEIVER PROTECTORS	
	T. M. Nelson and H. Goldie, Westinghouse Elec- tric Corp., Baltimore, MD	

LUNCH

SESSION 11. APPLICATIONS OF ACOUSTIC
DEVICES IN MICROWAVE SYSTEMS

0900-1210 Textile Auditorium

Chairman R. A. Sparks, Raytheon Co., Missile
Systems Div., Bedford, MA Page

11-1	RADAR APPLICATIONS OF ACOUSTIC SURFACE	180
0910	WAVE DEVICES (Invited)	
	J. D. Carlson, U. S. Army Advanced Ballistic Missile Defense Agency, Arlington, VA	
11-2	APPLICATIONS OF SURFACE ACOUSTIC WAVE	182
0940	DEVICES IN SPREAD SPECTRUM COMMUNICA- TIONS (Invited)	
	C. E. Wheatley, Autonetics Div., Rockwell International, Anaheim, CA	
1010	COFFEE BREAK	
11-3	THE ECONOMIC FUTURE OF SURFACE	183
1040	ACOUSTIC WAVE DEVICES (Invited)	
	M. G. Holland, Raytheon Co., Waltham, MA	
11-4	ANALOG SIGNAL PROCESSING USING SURFACE	185
1110	WAVE AND CHARGE TRANSFER DEVICES (Invited)	
	L. T. Claiborne, Texas Instruments, Inc., Dallas, TX	
11-5	INDUSTRIAL APPLICATIONS OF ACOUSTIC	186
1140	WAVE PHENOMENA (Invited)	
	G. A. Alers, Science Center, Rockwell International, Thousand Oaks, CA	

LUNCH

SESSION 12. MILLIMETER INTEGRATED
CIRCUITS AND COMPONENTS

0900-1220 Space Science Building, Room 5

Chairman J. C. Wiltse, Martin-Marietta Corp.,
Orlando, FL Page

12-1	MILLIMETER-WAVE MICROSTRIP	188
0900	OSCILLATORS	
	B. S. Glance and M. V. Schneider, Bell Laboratories, Holmdel, NJ	
12-2	PLANAR DIELECTRIC STRIP WAVEGUIDE FOR	191
0920	MILLIMETER-WAVE INTEGRATED CIRCUITS	
	F. T. Fong, Hughes Research Laboratories, Torrance, CA; S. W. Lee, Univ. of Illinois, Urbana, IL	
12-3	INTEGRATED FIN-LINE MILLIMETER	195
0940	COMPONENTS	
	P. J. Meier, AIL, a Division of Cutler-Hammer, Melville, NY	
12-4	SEMICONDUCTOR MILLIMETER WAVE	198
1000	INTEGRATED CIRCUITS	
	H. Jacobs, U.S. Army Electronics Command, Ft. Monmouth, NJ	
1020	COFFEE BREAK	
12-5	QUASI-OPTICAL DIPLEXERS (Invited)	199
1050	A. A. M. Saleh, Bell Laboratories, Holmdel, NJ	
12-6	AN EXPANSION JOINT FOR A MILLIMETER	200
1120	WAVEGUIDE TRANSMISSION SYSTEM	
	J. W. Carlin and R. J. Colardeau, Bell Laboratories, Murray Hill, NJ	
12-7	H ₀₁ CIRCULAR WAVEGUIDE LOW PASS FILTER	203
1140	FOR MILLIMETER WAVE TRANSMISSION SYSTEM	
	Chung-Li Ren and Han-Chiu Wang, Bell Labora- tories, North Andover, MA	
12-8	FOUR GIGABITS/SECOND MILLIMETER WAVE	206
1200	EXCITER-MODULATOR-AMPLIFIER MODULE	
	Y. Chang, D. L. English, and H. J. Kuno, Hughes Research Laboratories, Torrance, CA	

LUNCH

THURSDAY AFTERNOON, 13 JUNE 1974

SESSION 13. PARAMETRIC AMPLIFIERS
AND UPCONVERTERS

1400-1710	Space Science Building, Room 3	
Chairman:	J. J. Taub, AIL, a Division of Cutler-Hammer, Melville, NY	<u>Page</u>
13-1 1400	A LOW COST X-BAND MIC PARAMP D. A. Fleri, J. J. Taub, J. J. Whelehan, and J. M. Wolczok, AIL, a Div. of Cutler-Hammer, Deer Park, Long Island, NY	210
13-2 1420	AN INTEGRATED X-BAND PARAMETRIC AMPLIFIER L. E. Dickens and R. S. Littlepage, Westing- house Electric Corp., Baltimore, MD	213
13-3 1440	A COOLED MIC PARAMETRIC UPCONVERTER, G. V. Kopesay, R. A. Lange, E. W. Sard, and J. J. Taub, AIL, a Div. of Cutler-Hammer, Melville, NY	215
13-4 1500	OCTAVE INPUT, S- TO K_u -BAND LARGE SIGNAL UPPER-SIDEBAND VARACTOR UPCONVERTER H. C. Okean and L. J. Steffek, LNR Communi- cations, Inc., Farmingdale, NY	218
1520	COFFEE BREAK	
13-5 1540	A LOW NOISE, ROOM TEMPERATURE 12 GHz PARAMETRIC AMPLIFIER S. D. Lacey, B. T. Hughes and J. C. Vokes, Ministry of Defence (PE), Baldock, Herts, U.K.	221
13-6 1600	K_u -BAND SPACECRAFT PARAMETRIC AMPLIFIER E. Kraemer, J. Leeper, and J. Whelehan, AIL, a Div. of Cutler-Hammer, Deer Park, Long Island, NY	222
13-7 1620	MINIATURIZED NON-DEGENERATE K_u -BAND PARAMP FOR EARTH TO SATELLITE COM- MUNICATIONS M. A. Balfour, A. Larsen, and S. Nussbaum, AIL, a Div. of Cutler-Hammer, Melville, NY	225
13-8 1640	AN IMPATT PUMP FOR A LOW NOISE PARAMETRIC AMPLIFIER T. Smith, B. Smilowitz, G. Irvin, and K. Kaminsky, AIL, a Div. of Cutler-Hammer, Melville, NY	228
13-9 1650	LOW NOISE DOWN-CONVERTER AND HIGH EFFICIENCY UP-CONVERTER FOR 60-86 GHz TRANSMITTER-RECEIVER N. Kanmuri, Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan; S. Kitazume, H. Kobayashi, and H. Ishihara, Nippon Electric Co., Ltd., Yokohama, Japan	231

SESSION 14. MICROWAVE ACOUSTIC DEVICES

1400-1710	Textile Auditorium	
Chairman:	N. Lipetz, U S. Army Electronics Com- mand, Ft. Monmouth, NJ	<u>Page</u>
14-1 1400	ONE HUNDRED CHANNEL SELECTABLE SURFACE WAVE BANDPASS FILTER R. M. Hays, R. C. Rosenfeld, and C. S. Hart- mann, Texas Instruments, Inc., Dallas, TX	236
14-2 1420	ELECTRONICALLY VARIABLE CHIRP SIGNAL CORRELATION WITH THE DIODE-CORRELA- TOR T. M. Reeder, United Aircraft Research Laboratories, East Hartford, CT	237
14-3 1440	ACOUSTIC SURFACE WAVE BURST CORRELA- TOR H. M. Gerard, T. W. Bristol, E. H. Ross, W. R. Smith, and P. B. Snow, Hughes Aircraft Co., Fullerton, CA	240
14-4 1500	DEVELOPMENT OF A PULSE COMPRESSION DME SYSTEM USING SURFACE ACOUSTIC WAVE DEVICES D. W. Mellon and W. D. Daniels, Texas Instruments, Inc., Dallas, TX	243
1520	COFFEE BREAK	
14-5 1550	RADAR PULSE EXPANSION/COMPRESSION FILTERS UTILIZING SURFACE ACOUSTIC WAVES E. H. Gregory and J. Burnsweig, Hughes Aircraft Co., Culver City, CA	244
14-6 1610	SYNTHESIS OF PERIODIC APODIZED SAW FILTERS IN THE PRESENCE OF DIFFRACTION A. J. Slobodnik, Jr. and T. L. Szabo, Air Force Cambridge Research Laboratories, Hanscom Field, Bedford, MA	247
14-7 1630	MULTI-PIEZO FILM MICROWAVE ACOUSTIC TRANSDUCERS R. Kaul, T. M. Reeder, and J. T. Flynn, United Aircraft Research Laboratories, East Hartford, CT	250
14-8 1650	MAGNETOSTATIC SURFACE WAVE DELAY LINES J. C. Sethares and M. R. Stiglitz, Air Force Cambridge Research Laboratories, Hanscom Field, Bedford, MA	253

SESSION 15. MICROWAVE AUTOMATED MEASURE-
MENT AND COMPUTER OPTIMI-
ZATION TECHNIQUES

1400-1730	Space Science Building, Room 5	
Chairman:	B. S. Perlman, RCA Laboratories Princeton, NJ	<u>Page</u>
15-1 1400	TESTING MICROWAVE TRANSMISSION LINES A. R. Howland, Hal R. Sanders & Assoc., Inc., Atlanta, GA	258
15-2 1420	AN ALTERNATIVE CALIBRATION TECHNIQUE FOR AUTOMATED NETWORK ANALYZERS WITH APPLICATION TO ADAPTOR EVALUA- TION G. F. Egen, U.S. National Bureau of Standards, Boulder, CO	261
15-3 1440	AN APPLICATION OF THE POWER EQUATION CONCEPT AND AUTOMATION TECHNIQUES TO PRECISION BOLOMETER UNIT CALIBRATION E. L. Komarek, U.S. National Bureau of Stand- ards, Boulder, CO	263
15-4 1500	TIME DOMAIN OSCILLOGRAPHIC MICROWAVE NETWORK ANALYSIS USING FREQUENCY DOMAIN DATA H. E. Stuehelfer, Microwave Associates, Inc., Burlington, MA	266
1530	COFFEE BREAK	
15-5 1550	AN AUTOMATED GENERAL PURPOSE TEST SYSTEM FOR SOLID STATE L.O.'s J. R. Humphrey, Texas Instruments, Inc., Dallas, TX	268
15-6 1610	AUTOMATIC LOAD CONTOUR MAPPING FOR MICROWAVE POWER TRANSISTORS J. Cusack, S. Perlow, and B. S. Perlman, RCA Laboratories, Princeton, NJ	269
15-7 1630	GENERALIZED DESIGN OF BANDPASS AND OTHER FILTERS BY COMPUTER OPTIMI- ZATION S. B. Cohn, S. B. Cohn Associates, Inc., Tarzana, CA	272
15-8 1650	COMPUTER AIDED TOLERANCE OPTIMI- ZATION APPLIED TO MICROWAVE CIRCUITS J. W. Bandler, P. C. Lin, and J. H. K. Chen, McMaster University, Hamilton, Ont., Canada	275
15-9 1710	TECHNIQUES FOR NEW MICROWAVE SYNTH- SIZERS THAT SHOW BROADER BANDWIDTH AND INCREASED SPECTRAL PURITY P. G. Tipon, Systron-Donner Corp., Concord, CA	278

FRIDAY MORNING, 14 JUNE 1974

SESSION 16. FERRITE CONTROL COMPONENTS

0900-1200 Space Science Building, Room 3

Chairman: L. R. Whicker, NRL, Washington, D. C. Page

16-1 0900	MANUFACTURING METHODS STUDIES OF FERRITE PHASERS (Invited) M. Mohr, Raytheon Co., Bedford, MA	282
16-2 0930	THE FERRITE-LOADED WAVEGUIDE DISCONTINUITY PROBLEM F. J. Bernues, Hughes Aircraft Co., Torrance, CA; D. M. Bolle, Brown University, Providence, RI	283
16-3 0950	A NEW EDGE MODE ISOLATOR IN THE VHF RANGE L. Courtois, C.N.R.S., Meudon-Bellevue-France; B. Chiron, and G. Forterre, Lignes Telegraphiques et Telephoniques, Conflans-Sainte-Honorine-France	286
☞ 1010	COFFEE BREAK	
16-4 1040	A NARROW-BAND MILLIMETER WAVE Y-JUNCTION CIRCULATOR WITH WIDE-BAND TUNING CAPABILITY B. Owen, Bell Laboratories, Inc., Allentown, PA	287
16-5 1100	BANDWIDTH ENLARGEMENT OF A MILLI-METER WAVE Y-CIRCULATOR WITH HALF WAVELENGTH LINE RESONATORS Y. Akaiwa, Nippon Electric Co., Ltd., Nakahara, Kawasaki, Japan	290
16-6 1120	A 1.7 GHZ LUMPED-ELEMENT CIRCULATOR HIGHLY STABILIZED WITH TEMPERATURE I. Ikushima and M. Maeda, Hitachi Ltd., Kokubunji, Tokyo, Japan	293
16-7 1140	THEORY OF 4-PORT NONRECIPROCAL CIRCUIT-FILTER AND CIRCULATOR M. Igarashi and Y. Naito, Tokyo Institute of Technology, Tokyo, Japan	296

LUNCH

SESSION 17. ACTIVE SOLID STATE DEVICES I

0900-1210 Space Science Building, Room 5

Chairman: R. A. Weck, U.S. Army Electronics Command, Ft. Monmouth, NJ Page

17-1 0900	MEASUREMENT OF THE LARGE SIGNAL CHARACTERISTICS OF MICROWAVE SOLID STATE DEVICES USING AN INJECTION LOCKING TECHNIQUE J. C. I. Young and I. M. Stephenson, University College of North Wales, School of Electronic Engineering Science, Bangor, Caerns, U.K.	300
17-2 0920	DETERMINATION OF SEMICONDUCTOR JUNCTION DEVICE PACKAGE NETWORKS R. W. Laton and P. T. Greiling, Lincoln Laboratory, Mass. Institute of Technology, Lexington, MA	303
17-3 0940	PERFORMANCE OF AVALANCHE DIODE OSCILLATORS WITH LARGE LEAKAGE CURRENT R. J. Gutmann and J. M. Borrego, Rensselaer Polytechnic Institute, Troy, NY	306
17-4 1000	HIGH EFFICIENCY READ DIODE AMPLIFIER W. C. Tsai, C. K. Kim, and R. E. Gray, Raytheon Company, Waltham, MA	309
17-5 1020	PULSED AND CW DOUBLE-DRIFT SILICON IMPATTS G. Pfund, C. P. Snapp, and A. F. Podell, Hewlett-Packard Associates, Palo Alto, CA	312
1030	COFFEE BREAK	
17-6 1050	PERFORMANCE AND RELIABILITY OF K_a -BAND GaAs IMPATT DIODES R. A. Murphy, W. T. Lindley, D. F. Peterson, and P. Staecker, Lincoln Laboratory, MIT, Lexington, MA	315
17-7 1110	A FOUR-STAGE, 30 dB GAIN, 100 mW GUNN EFFECT AMPLIFIER IN K_a -BAND J. G. de Koning, R. E. Goldwasser, R. J. Hamilton, Jr., and F. E. Rosztoczy, Varian Associates, Palo Alto, CA	318
17-8 1130	TUNABLE MILLIMETER-WAVE PACKAGED IMPATT DIODE OSCILLATORS H. J. Kumo, K. P. Weller, and D. L. English, Hughes Research Laboratories, Torrance, CA	320
17-9 1150	A LOW NOISE 80 GHZ SILICON IMPATT OSCILLATOR HIGHLY STABILIZED WITH A TRANSMISSION CAVITY S. Nagano, S. Ohnaka, K. Sekido, and K. Ayaki, Nippon Electric Co., Kawasaki, Japan	323

SESSION 18. THE REAL WORLD OF MIC PACKAGING

0900-1200 Space Science Building, Room 2

Panel Discussion, Sponsored by MTT-6 Committee on MIC's.

Chairman: Fred Rosenbaum, Washington University, St. Louis, MO

Keynote Address: Microwave Integration--Promises and Problems, L. Young, M. L. Reuss, and B. E. Spielman, NRL, Washington, DC

Presentation by Panel Members:

Packaging L-band MIC Modules for Ground Based Applications, R. J. Taylor and P. S. Schaus, Westinghouse Defense and Space Center, Baltimore, MD

Impact Extruded MIC Packaging, J. Miley and K. Derdarian, Microwave Associates, Burlington, MA

Thermal Expansion Problems in Hybrid Package Assembly, R. Jackson, IBM, Owego, NY

Microwave Planar Packages, D. Nelson, The Bendix Corp., Sidney, NY

High Reliability Packages for Space Craft
P. Petrelis, TRW, Redondo Beach, CA

LUNCH

FRIDAY AFTERNOON, 14 JUNE 1974

SESSION 19. MICROWAVES IN COMMUNICATION AND INDUSTRIAL SYSTEMS

1330-1630 Space Science Building, Room 3

Chairman: S. F. Adam, Hewlett-Packard Co.,
Palo Alto, CA Page

19-1 1330	TRENDS IN TRANSPONDERS IN COMMERCIAL COMMUNICATION SATELLITES (Invited) D. P. Sullivan, TRW Systems, Redondo Beach, CA	330
19-2 1400	MODERN MICROWAVE TECHNOLOGY IN HIGH SPEED QPSK COMMUNICATION SYSTEMS (Invited) C. L. Cuccia, Philco-Ford Corp., Palo Alto, CA	331
19-3 1430	RECENT PROGRESS IN POWER RECEPTION EFFICIENCY IN A FREE SPACE MICROWAVE POWER TRANSMISSION SYSTEM W. C. Brown and C. K. Kim, Raytheon Co., Waltham, MA	332
1450	COFFEE BREAK	
19-4 1510	MORE THAN 4 PERCENT EFFICIENCY SOLID-STATE TRANSMITTER FOR 4 GHz RADIO RELAY Y. Kitahara, T. Kyuzaki, and R. Tamura, Nippon Electric Co., Ltd., Yokohama, Japan	334
19-5 1530	3.7 TO 4.2 GHz PORTABLE MICROWAVE REPEATER (Invited) W. W. Raukko, Hewlett-Packard Co., Palo Alto, CA	337
19-6 1550	SOLID STATE LINEAR FM/CW RADAR SYSTEMS--THEIR PROMISE AND THEIR PROBLEMS P. Denniss and S. E. Gibbs, Royal Radar Establishment, Malvern, England	340
19-7 1610	BIDIRECTIONAL MICROWAVE REPEATER FOR OBSTACLE DETECTION RADAR IN GUIDED GROUND TRANSPORTATION H. H. Tan, Univ. of Waterloo, Ontario, Canada; M. S. Gupta, MIT, Cambridge, MA	343

SESSION 20. ACTIVE SOLID STATE DEVICES II

1330-1630 Space Science Building, Room 5

Chairman: E. D. Maynard, Jr., NELC, San Diego, CA Page

20-1 1330	BANDPASS MICROWAVE ELECTRON-BOMBARDED SEMICONDUCTOR AMPLIFIERS P. S. Carter, Jr., J. A. Long and L. A. Roberts, Watkins-Johnson Co., Palo Alto, CA	348
20-2 1350	APPLICATION OF DUAL-GATE GaAs FET TO MICROWAVE VARIABLE-GAIN AMPLIFIER M. Maeda and Y. Minai, Central Res. Lab., Hitachi, Ltd., Kokubunji, Tokyo, Japan	351
20-3 1410	HIGH EFFICIENCY BROADBAND POWER TRANSISTORS FOR S-BAND APPLICATIONS J. E. Chapman, Jr., Texas Instruments, Inc., Dallas, TX	354
20-4 1430	NEW RESULTS ON THE DESIGN OF BROAD-BAND MICROWAVE BIPOLAR AND FET AMPLIFIERS W. H. Ku and W. C. Petersen, Univ. of California, Berkeley, CA; A. F. Podell, Hewlett-Packard Associates, Palo Alto, CA	357
1450	COFFEE BREAK	
20-5 1510	CIRCUIT OPTIMIZATION OF S-BAND TRAPATT OSCILLATORS R. J. Trew, N. A. Masnari, and G. I. Haddad, Univ. of Michigan, Ann Arbor, MI	360
20-6 1530	HIGH PULSE ENERGY F-BAND TRAPATT DIODE AMPLIFIER V. A. Mikenas, A. Schwarzmann, J. H. Bowen, M. E. Breese, M. Weiss, RCA, Moorestown, NJ; S. C. Lin and H. Sobol, RCA, Princeton, NY	362
20-7 1550	COMPLEMENTARY X-BAND TRAPATT DIODES T. T. Fong and R. S. Ying, Hughes Research Laboratories, Torrance, CA	365
20-8 1610	X-BAND TRAPATT AMPLIFIER N. W. Cox and C. T. Rucker, Eng. Exp. Sta., Georgia Institute of Technology, Atlanta, GA; K. E. Gsteiger, Sperry Microwave Components, Gainesville, FL	367