

PTGMMT National Symposium

Miramar Hotel, Santa Monica, Calif. May 20-22, 1963



Members of the Technical Program Committee. From left to right: C. L. Cuccia, R. C. Knechtli, R. W. Beatty, P. Lacy, I. Kaufman, M. T. Weiss, L. Young, A. Clavin, T. Maiman, and S. B. Cohn.



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TECHNICAL PROGRAM

Satellite Room

Monday, May 20, 1963

8:50-9:00 A.M.

Introductory Remarks, D. B. Anderson, *Chairman*, Symposium Steering Committee, and S. B. Cohn, *Chairman*, PTGMMT Administrative Committee.

9:00-9:30 A.M.

Keynote Address, Prof. Robert S. Elliott, Department of Engineering, University of California, Los Angeles, Calif., "An Industry-University Conflict Concerning Graduate Engineering Studies."

SESSION I—RADAR

Chairman: W. L. Pritchard, Aerospace Corporation, El Segundo, Calif.

9:30-10:15 A.M.

"Modern Radar Systems," H. G. Weiss, M.I.T., Lincoln Lab., Lexington, Mass.

10:15-10:35 A.M.

"TRADEX—The Second Generation of Super-Power Transmitters," R. Graham, Jr., RCA, Moorestown, N. J.

Problems in designing a super-power UHF transmitter for TRADEX radar, used for exoatmospheric targets, are discussed. Specifically, these are high-purity fine-line spectrum, low intra-pulse phase-shift nonlinearity, unusually high PRF, and minimization of "off" time.

10:35-10:55 A.M., Coffee Break

SESSION II—PLASMAS

Chairman: V. Josephson, Aerospace Corporation, El Segundo, Calif.

10:55-11:25 A.M.

"Plasmas and Microwaves," T. Morita, Stanford Research Institute, Menlo Park, Calif.

11:25-11:40 A.M.

"Gyro-Interaction of Microwaves in Magneto-Plasmas in Atmospheric Gases," K. V. N. Rao and L. Goldstein, University of Illinois, Urbana, Ill.

Of considerable interest have been methods of altering the propagation parameters of the ionosphere by heating of the plasma electrons with electromagnetic energy. This paper describes results of a laboratory investigation of such heating by cyclotron resonance absorption.

11:40-11:55 A.M.

"Propagation of Linearly Polarized Electromagnetic Waves in Dense Magneto-Plasmas," J. T. Verheyen, University of Illinois, Urbana, Ill.

Propagation through a plasma bounded by parallel conducting planes, with *H*-field parallel to the planes and perpendicular to the propagation is examined. Theory and experiment demonstrate that a surface wave can propagate at frequencies well below the plasma frequency.

11:55 A.M.-12:10 P.M.

"Microwave Breakdown near a Hot Surface," M. Gilden and J. Pergola, Microwave Associates, Inc., Burlington, Mass.

The threshold of microwave breakdown near a hot surface is increased by a rapid flow of gas, which not only cools the surface, but also reduces the thickness of the hot gas film.

12:10-12:20 P.M., Question Period

SESSION III—MICROWAVE FILTERS AND COUPLERS

Chairman: S. B. Cohn, Rantec Corporation, Calabasas, Calif.

2:20-2:50 P.M.

"Synthesis of Microwave Filters and Directional Couplers," H. J. Riblet, Microwave Development Laboratories, Inc., Natick, Mass.

2:50-3:10 P.M.

"General Synthesis of Optimum Multi-Element Coupled-Transmission-Line Directional Couplers," R. Levy, Mullard Research Laboratories.

A new class of multi-element asymmetric couplers is described, for which an exact synthesis has been obtained, leading to optimum Chebyshev characteristics. Design formulas are derived. Excellent experimental agreement with theory was found.

3:10-3:30 P.M.

"An 'Exact' Design Technique for a Type of Maximally Flat Quarter-Wave-Coupled Band-Pass Filter," W. W. Mumford, Bell Telephone Laboratories, Inc., Whippany, N. J.

A practical "exact" design technique for a type of broad-band maximally flat waveguide band-pass filter is presented. Its basis is a configuration of shorted quarter wave stubs shunting a uniform line at quarter wave intervals.

3:30-4:00 P.M., Coffee Break

4:00-4:20 P.M.

"Evaluation of a Coupling Hole between Two Resonant Cavities," H. A. Wheeler, Wheeler Laboratories, Great Neck, N. Y.

A basis is presented for evaluating coupling in terms of an effective area or volume of an aperture relative to that of the adjoining bounded regions. Concepts and formulas derived aid in understanding and computing coupling aperture behavior.

4:20-4:40 P.M.

"Exact Design of Band-Stop Microwave Filters," B. H. Schiffman and G. L. Matthaei, Stanford Research Institute, Menlo Park, Calif.

An exact band-stop filter design method, using Ozaki-Ishii synthesis techniques, treats configuration of: 1) open-circuited shunt stubs separated by lengths of line; 2) Resonators parallel to main line, either attached or separated from it.

4:40-5:00 P.M.

"Minimum Insertion Loss Microwave Filters," J. J. Taub and H. J. Hindin, Airborne Instruments Laboratory, Deer Park, N. Y.

A design procedure for equal-element band-pass filters for small or large resonator dissipation, in waveguide, coaxial, or strip-line is outlined and demonstrated. SWR and delay are superior to Butterworth or Chebyschev filters of comparable skirt responses.

Tuesday, May 21, 1963

SESSION IV—SEMICONDUCTOR DEVICES—I

Chairman: A. D. Berk, Micromega Corporation, Venice, Calif.

8:50-9:20 A.M.

"Microwave Diodes and Transistors," L. D. Armstrong, Microstate Electronics.

9:20-9:40 A.M.

"A New Microwave Measurement Technique to Characterize Diodes and an 800-Gc Cutoff Frequency Varactor at Zero Volts Bias," B. C. DeLoach, Bell Telephone Laboratories, Inc., Holmdel, N. J.

Mounting of a diode in reduced rectangular waveguide accomplishes characterization by a simple equivalent circuit. Parameters so measured at X-band are compared with audio frequency results. Measurement of a new 800-Gc cutoff varactor at 50-60 Gc is described.

9:40-10:00 A.M.

"Low Noise 11-Gc Parametric Amplifier using Refrigerated Silver-Bonded Germanium Diode," S. Kita, K. Tahara, and T. Masuda, Nippon Telegraph and Telephone Public Corporation, Japan.

Fabrication and test of a silver-bonded germanium diode are described. An 11-Gc parametric amplifier (degenerate), pumped at 23.2 Gc yielded a 3.7-db noise figure at room temperature; 1.5 db when the diode was refrigerated to 140° K.

10:00-10:30 A.M., Coffee Break

10:30-10:50 A.M.

"A Versatile C-band Cryogenic Parametric Amplifier," C. T. Rucker, B. R. Savage, and E. S. Grimes, Jr., Sperry Microwave Electronics Company, Clearwater, Fla.

A liquid nitrogen cooled parametric amplifier, of S. S. noise figure 1.5 db, 25 Mc BW at 16 db gain, capable of tuning from 5.4 to 5.9 Gc, with a unique mechanical design that includes a vacuum insulated diode mounting cartridge, is described.

10:50-11:10 A.M.

"Integrated Electronics at UHF," F. Gleason, G. Schaffner, and P. Clar, Motorola, Inc., Phoenix, Ariz.

11:10-11:30 A.M.

"A High Power Protector using PIN Diodes," M. R. Barber, Bell Telephone Laboratories, Inc.

A switch using two quarterwave-spaced PIN diodes in ridged waveguide is described. Ratings are: 70-db isolation; below 0.16 db low-level loss; 10 per cent BW at 1350 Mc; 1000 watts RF continuous, 100 kw peak; 100 nsec switching with control currents less than 0.5 amperes.

11:30-11:50 A.M.

"Optimum Design of Fast-Acting Broadband Multithrow Diode Switches," P. L. Clar, Motorola, Inc., Phoenix, Ariz.

A 1:16 multithrow switch was designed by use of wide-band matching theory. Ratings, dc to 750 Mc: Less than 1-db loss, 1.3 VSWR; higher than 27 db isolation; 40 nsec switching time.

SESSION V—SEMICONDUCTOR DEVICES—II

Chairman: J. C. Cacheris, Motorola, Inc., Phoenix, Ariz.

1:30-2:00 P.M.

"Submillimeter Harmonic Generation, Mixing, and Detection," K. K. N. Chang, RCA Laboratories.

2:00-2:20 P.M.

"Pumped Tunnel Diode Frequency Converters with Idlers," P. L. Fleming, International Business Machines Corporation, Yorktown Heights, N. Y.

Tunnel diode converters can perform functions similar to varactors, with simpler circuitry and less pump power. Such a converter was operated at 2000 Mc with gains above 30 db and a pump of only 100 μ w.

2:20-2:40 P.M.

"Octave Bandwidth Tunnel Diode Amplifier," G. J. Wheeler and J. H. Lepoff, Sylvania Electronic Defense Laboratories, Mountainview, Calif.

A tunnel-diode amplifier covering 2-3 Gc was combined with one covering 3-4 Gc (bandwidth in each case limited by circulator) in a diplexing circuit, to make a single two-port amplifier with gain above 12 db from 2-4 Gc.

2:40-3:00 P.M.

"Practical Design Techniques for Solid-State Microwave Generators," D. O. Fairley, Lenkurt Electric Company, San Carlos, Calif.

Techniques are presented for the development of diode harmonic multipliers. This includes a discussion of the methods of design; problem areas; spurious enhancement; and cascading techniques.

3:00-3:30 P.M., Coffee Break

SESSION VI—SPECIAL DEVICES

Chairman: C. L. Cuccia, Radio Corporation of America

3:30-3:50 P.M.

"Analysis of a Microwave Radiometer for Precise Standardization of Noise Sources," G. Ward and J. M. Richardson, National Bureau of Standards, Boulder, Colo.

A detailed analysis of the radiometer employing the cascading matrix method displays potential sources of error, such as those due to departure from ideal impedance match. Influence of fluctuations on the sensitivity is also considered.

3:50-4:10 P.M.

"A High-Power Rotary Waveguide Joint," P. H. Smith and G. H. Mongold, Bell Telephone Laboratories, Inc., Whippany, N. J.

A conceptually new type of high power rotary waveguide joint, comprising two tightly coupled ring arrays of keystone-shaped waveguide elements, is described. A multi-megawatt design is discussed. Experimental results on a C-band model are presented.

4:10-4:30 P.M.

"The Focused Fabry-Perot Resonator and Its Application to Plasma Diagnostics," R. I. Primich and R. A. Hayami, General Motors Corporation, Santa Barbara, Calif.

Focused Fabry-Perot resonators have given Q's of 80,000-100,000 at 70 Gc and spot sizes half as large as those without a resonator. The resonance property provides a great increase in sensitivity for plasma diagnostics.

4:30-4:50 P.M.

"Electro-Optic Interference Filter Light Modulator," X. De Angelis, Sylvania Electronic Systems, New York, N. Y.

The power required for modulation of a laser beam by utilization of the Pockels effect in KDP or similar materials has been greatly reduced over existing devices by construction of a Fabry-Perot interference filter filled with the electro-optic material.

Wednesday, May 22, 1963

SESSION VII—MAGNETICALLY ACTIVE DEVICES

Chairman: R. F. Soohoo,
California Institute of Technology,
Pasadena, Calif.

8:50-9:20 A.M.

"A Review of Microwave Ferrite Devices," K. J. Button, M.I.T. National Magnet Laboratory.

9:20-9:40 P.M.

"4-Port Crossed-Junction Waveguide Circulators," L. E. Davis and M. D. Coleman, Mullard Research Laboratories, and J. J. Cotter, Mullard Equipment, Ltd.

Results of experimental investigations of 4-port H-plane waveguide junction circulators between 2.6 Gc and 36 Gc are reported. Typical results are: Isolation greater than 20 db; insertion loss below 0.5 db, VSWR below 1.1; bandwidth 3 per cent.

9:40-10:00 A.M.

"Superconducting Solenoid—Traveling-Wave Maser System," S. Okwit, K. Siegel, and J. G. Smith, Airborne Instruments Laboratory, Deer Park, N. Y.

A superconducting air core solenoid, 5 inches in length and weighing less than 3 pounds was packaged into a high gain 2200 to 2300-Mc maser system: stable gain above 30 db; 20-Mc BW; 10° noise temperature.

10:00-10:20 A.M.

"The Investigation of an Electron Resonance Spectrometer Utilizing a Generalized Feedback Microwave Oscillator," J. B. Payne, Lynchburg, Va.

This new oscillator-spectrometer has a microwave amplifier with a generalized sample-carrying network element in the positive-feedback loop, causing oscillations to occur at the network's central resonant frequency, with essentially instantaneous frequency stability.

10:20-10:40 A.M., Coffee Break

SESSION VIII—PHASE AT MICROWAVE FREQUENCIES

Chairman: P. Lacy,
Wilton Company

10:40-11:10 A.M.

"Importance of Phase in System Design," Jean A. Develet, Aerospace Corporation, El Segundo, Calif.

11:10-11:40 A.M.

"Microwave Phase Measurement Techniques," G. E. Schafer, National Bureau of Standards, Boulder, Colo.

SESSION IX—LASERS AND MICROWAVE ACOUSTICS

Chairman: T. A. Maiman,
Korad, Inc.

1:15-1:45 P.M.

"Lasers," R. H. Kingston, M.I.T. Lincoln Laboratory, Lexington, Mass.

1:45-2:15 P.M.

"Optical Modulation and Detection," D. A. Chisholm, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

2:15-2:35 P.M., Coffee Break

2:35-3:05 P.M.

"Microwave Ultrasonics," R. T. Denton, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

3:05-3:35 P.M.

"Amplification of Ultrasonic Waves in Piezoelectric Semiconductors," D. L. White, Bell Telephone Laboratories, Inc., Whippoorwill, N. J.

REGISTRATION

Advanced registration may be made by obtaining a registration form from and returning it before May 1 with appropriate payment to:

1963 PTGMMT National Symposium
Mr. Warren Perry,
Chairman Finance Committee
5721 Manton Avenue
Woodland Hills, Calif.

Checks should be made payable to: 1963 PTGMMT National Symposium.

The advance registration rate which includes one copy of the symposium digest is:

IEEE	STUDENT	NON-IEEE
\$5.00	\$3.00	\$9.00

Registration after May 1 is rated:

IEEE	STUDENT	NON-IEEE
\$6.00	\$4.00	\$10.00

Cocktail Party

Advance Registration—\$1.75
After May 1—\$2.00

Banquet

Advance Registration—\$7.50
After May 1—\$8.50

The registration desk will be opened on Sunday, May 19, in the Main Lobby of the Miramar Hotel and will be open in the Foyer of the Satellite Room during the following hours:

Monday, May 20, 1963—8:15 A.M. to

2:30 P.M.

Tuesday, May 21, 1963—8:15 A.M. to

2:30 P.M.

Wednesday, May 22, 1963—8:15 A.M. to

2:30 P.M.

TRANSPORTATION

Visitors to Los Angeles arriving by air may ride the Santa Monica limousine directly to the Miramar Hotel for \$1.25. Those arriving by train may take a taxi from Union Station. Santa Monica is 10 miles from the Los Angeles International Airport and 17 miles from Union Station.

Courtesy convention stickers for your automobile will be issued at the registration desk to permit parking in the vicinity of the Miramar Hotel.

HOTEL ACCOMMODATIONS

Requests for lodging reservations should be addressed to the Santa Monica Chamber of Commerce Convention Bureau, 109 Santa Monica Boulevard, Santa Monica, Calif. The telephone number is EX 3-9825. A block reservation of rooms for the symposium has been made at the Miramar Hotel. Reservations in excess of the allowed space will automatically be placed with other nearby hotels. All hotel registrations for the Symposium will be handled through the Santa Monica Convention Bureau on a "first come, first served" basis. Confirmation of your reservation will come to you directly from your assigned hotel or motel.

Reservation requests through the Santa Monica Convention Bureau must be placed before May 1.

TECHNICAL SESSIONS

All sessions of the Symposium will be held in the Satellite Room of the Miramar Hotel. There are no simultaneous sessions.

SPECIAL EVENTS

Cocktail Klatsch, Monday, May 20, 6:00 to 7:00 P.M. An informal gathering will be held under the Moreton Bay Fig Tree adjacent to the Satellite Room. A bar will be open for those who wish cocktails.

SYMPOSIUM DIGEST

A copy of the Symposium Digest consisting of abstracts of the technical program papers will be distributed to each registrant. Additional copies of the Symposium Digest may be purchased at the registration desk for \$3.00 each.

COCKTAIL PARTY AND BANQUET

A Cocktail Party will be held prior to the symposium banquet on Tuesday, May 21, at 6:00 P.M. under the Moreton Bay Fig Tree adjacent to the Satellite Room. The symposium banquet will be held in the Satellite Room of the Miramar Hotel at 7:00 P.M.

The featured banquet speaker will be Dr. Bernard M. Oliver of Hewlett-Packard Company, Palo Alto, Calif. The subject is "Problems of Deep Space Communication."

The Microwave Prize will be awarded to Dr. L. Lewin for his paper entitled, "On the Resolution of a Class of Waveguide Discontinuity Problems by the Use of Singular Integral Equations." This paper appeared in the July, 1961, issue of these TRANSACTIONS.

The Master of Ceremonies for the banquet will be Dr. Kiyo Tomiyasu.

LADIES' ACTIVITIES

For the ladies a hospitality room in the Miramar Hotel will be maintained. Several hostesses from the Los Angeles area will help to organize shopping and sight-seeing tours to the Miracle Mile, Marineland, Knott's Berry Farm, or the Huntington Library. (Disneyland is closed Monday and Tuesday.) Those interested should assemble at 9:45 A.M., Monday, May 20, in the Garden Room and Tuesday, May 21, in the Lanai Room.