

1952 IRE National Convention Program

WALDORF-ASTORIA HOTEL and GRAND CENTRAL PALACE—MARCH 3-6

Registration

Members and visitors may register at either the Waldorf-Astoria Hotel or Grand Central Palace at the following hours:

	<i>Waldorf-Astoria</i>	<i>Grand Central Palace</i>
Mon.	9 A.M.—5 P.M.	11:00 A.M.—9 P.M.
Tue.	9 A.M.—8 P.M.	9:30 A.M.—9 P.M.
Wed.	9 A.M.—6 P.M.	9:30 A.M.—6 P.M.
Thur.	9 A.M.—1 P.M.	9:30 A.M.—9 P.M.

Technical Sessions

Over 200 technical papers will be presented in 43 sessions. A schedule of sessions is listed below; 100-word summaries of papers appear in the following pages.

Exhibits

The Radio Engineering Show, featuring 347 engineering exhibits, will occupy four floors of Grand Central Palace. A list of exhibitors and their products starts on page 1A of this issue. Exhibits will be open during the Palace registration hours noted above.

Principal Events

The **Annual Meeting**, to be held at 10:30 A.M. on Monday in the Jade Room of the Waldorf, is for the entire membership. It will feature a novel presentation of 40 years of IRE by Alfred N. Goldsmith and John V. L. Hogan, two of the co-founders, entitled "The IRE: From Acorn to Oak."

A "get-together" **Cocktail Party** will be held on Monday evening from 5:30 to 8:00

in the Grand Ballroom of the Waldorf. Tickets may be purchased at \$3.80 each.

The **President's Luncheon**, on Tuesday at 12:45 P.M. in the Starlight Roof of the Waldorf, will honor IRE President Donald B. Sinclair. Special tables will be reserved for Professional Group members. Tickets are available at \$5.75 each.

The **Annual Banquet**, to be held in the Grand Ballroom at 6:45 P.M. on Wednesday, will feature a major address by Charles E. Wilson, Director of Defense Mobilization. The 1952 IRE awards will be presented at this time. Tickets are on sale at \$12.00 each.

An outstanding **Women's Program** of tours and shows has been arranged for the four days. Women's registration begins at 9:30 A.M. on Monday in the East Foyer of the Waldorf.

SCHEDULE OF TECHNICAL SESSIONS*

BELMONT-PLAZA		WALDORF-ASTORIA			GRAND CENTRAL PALACE	
	<i>Moderne Room</i>	<i>Grand Ballroom</i>	<i>Astor Gallery</i>	<i>Jade Room</i>	<i>Maroon Room</i>	<i>Blue Room</i>
Mon. P.M. 2:30-5	<i>Symposium:</i> Subaudio Instrumentation (1-5)	<i>Symposium:</i> Management of Research and Development (6-9)	<i>Symposium:</i> Transistor Circuits (10-13)	Information Theory I—Coding Procedures (14-18)	Audio (19-23)	<i>Symposium:</i> New Developments in Telemetry (24-28)
Tues. A.M. 10-12:30	Instrumentation I—High-Frequency Instrumentation (29-33)	Television I—General A (34-37)	Circuits I (38-42)	Information Theory II—Noise Statistics and Signal Detection (43-47)	Microwaves I—Waveguides A (48-52)	<i>Symposium:</i> Television Broadcasting; Audio and Video Systems (53-57)
Tues. P.M. 2:30-5	Instrumentation II—Electronic Measurements A (58-62)	Television II—Color (63-67)	Circuits II and Information Theory III (68-74)	Medical Electronics (75-80)	Microwaves II—Waveguides B (81-85)	<i>Symposium:</i> Television Station Construction and Theater Conversion (86-89)
Tues. Eve. 8-10:30		<i>Special Symposium:</i> Present Status of NTSC Color Television Standards (90)				
Wed. A.M. 10-12:30	Instrumentation III—Electronic Measurements B (91-95)	Television III—General B (96-100)	Circuits III (101-106)	Propagation (107-111)	Microwaves III—Filters and Circuits (112-116)	<i>Symposium:</i> Digital Computers in Control Systems (117-121)
Wed. P.M. 2:30-5	Antennas I—General (122-126)	<i>Symposium:</i> UHF Receivers I (127-132)	Circuits IV (133-138)	Electron Tubes I—Power Output and Gas Tubes (139-143)	Radar and Radio Navigation (144-148)	<i>Symposium:</i> Magnetic Core Memory Devices for Digital Computers (149-153)
Thurs. A.M. 10-12:30	Antennas II—Microwave A (154-158)	<i>Symposium:</i> UHF Receivers II (159-162)	Feedback Control (163-167)	Electron Tubes II—Small High-Frequency Tubes (168-172)	<i>Symposium:</i> The Integration of Electronic Equipment with Airframe Design (173-176)	Digital Computers (177-181)
Thurs. P.M. 2:30-5	Antennas III—Microwave B (182-186)	Radio Communication Systems (187-191)	Circuits V (192-198)	Electron Tubes III—Cathode-Ray Tubes (199-203)	<i>Symposium:</i> What's New in Mobile Radio (204-207)	<i>Symposium:</i> Reliability of Military Electronic Equipment (208-211)

* Numbers in parenthesis following session titles refer to summaries of technical papers on the following pages.

This paper discusses the analysis and synthesis of linear real-time digital-computer programs in the frequency domain. Such programs correspond to linear difference equations, and can be characterized in the frequency domain by a transfer function, which is rational in e^{-sT} (where e is the Napierian base of logarithm, s the complex frequency variable, and T the constant time interval of sampling). This contrasts with linear analog filters, whose transfer functions are rational in s .

Conventional techniques of frequency analysis are adaptable to digital filters: the amplitude, phase and locus of the program are defined, and stability can be studied in the complex plane. Synthesis of programs becomes as systematic as that of networks, and the method finds use in the design of computers, analog-digital systems, as well as numerical processes.

180. A VERY RAPID ACCESS MEMORY USING DIODES AND CAPACITORS

A. W. HOLZ

(National Bureau of Standards,
Washington, D. C.)

An electrostatic memory for computers is described which utilizes the principle of regeneration to store binary information upon discrete capacitors, access being through two diodes. It seems possible to have fractional microsecond access for reading any digit in the matrix. Power efficiency is superior to other forms of electrostatic memory, and is mainly limited by present characteristics of germanium diodes. Emphasis is placed on the fact that only two-terminal devices are used in the memory proper, thus allowing promising design flexibility and minimum maintenance.

181. THE CHARACTRON

J. T. McNANEY

(Consolidated Vultee Aircraft Corporation,
San Diego, Calif.)

The Charactron is a special-purpose cathode-ray tube incorporating a design which is unique among tubes of this type. A matrix containing character-shaped openings is located between the electron gun and the fluorescent screen. A stream of electrons directed through the matrix openings results in a shaped beam that provides a presentation of characters on the screen of the tube where they can be read or photographed.

Among the more general applications of the Charactron are: (1) data conversion and tabulation of analog or digital information, (2) computer readout, (3) high-speed printing, (4) high-speed communications, and (5) monitoring and message display equipments.

Antennas III— Microwave B

Chairman, P. H. SMITH

(Bell Telephone Laboratories, Inc.,
Whippany, N. J.)

182. A MICROWAVE LUNEBERG LENS

G. D. M. PEELER, D. H. ARCHER,

K. S. KELLEHER

(Naval Research Laboratory,
Washington, D. C.)

A two-dimensional microwave model of the Luneberg lens has been designed employ-

ing the TE₁₀ mode. It consists of two 36-inch-diameter, almost-parallel, conducting plates; the spacing between plates is filled with polystyrene and varies with the radius r to give the desired index of refraction $n = \sqrt{2 - r^2}$. Due to symmetry about the axis, this lens has radiation patterns with constant gain and good side-lobe level as a feed horn scans over the circumference. Experimental patterns in the two principal planes show good agreement with computed patterns.

183. RADIATION FROM METAL-LOADED WAVEGUIDES TERMINATED IN A GROUND PLANE

R. E. WEBSTER AND M. H. COHEN

(Ohio State University Research
Foundation, Columbus, Ohio)

Radiation from small apertures in a ground plane is considered. Measurements have been made on apertures excited by metal-loaded guides suitable for radiating circular polarization. Dielectric loading and combination metal-dielectric loading were also considered as schemes for reducing the cutoff frequency of the exciting waveguides. Parameters affecting bandwidth and aperture reflections are discussed, and experimental techniques for obtaining the effective aperture impedance are described. A method of calculating the aperture impedance from the guide dimensions for certain loading configurations is also presented.

184. MUTUAL COUPLING BETWEEN SLOT RADIATORS

M. J. EHRLICH, C. W. CURTIS, AND
R. FAWCETT

(Hughes Aircraft Company,
Culver City, Calif.)

In the design of slot arrays with critical radiation patterns, mutual coupling between radiators is an important quantity. Application of Babinet's principle to P. S. Carter's relationships of the self and mutual impedance of parallel dipoles, and normalization of the data with respect to the feed waveguide, furnishes theoretical results. The self and mutual admittances of the two slots located on an infinite ground plane are measured as a function of slot separation and orientation. The theoretical and experimental values are in excellent agreement within the experimental error.

In addition, the coupling between two longitudinal shunt slots, displaced axially on the broad face of a rectangular waveguide, has been measured. The coupling is found to be a negligible magnitude as compared to variations due to manufacturing tolerances.

185. OFF-AXIS CHARACTERISTICS OF PARABOLOIDS AND SPHERES

K. S. KELLEHER

(Naval Research Laboratory,
Washington, D. C.)

Information is presented on the radiation patterns of paraboloids and spheres fed by a point source. A series of paraboloidal reflectors of various focal lengths, each 30 inches in aperture diameter, were evaluated at a wavelength of 3.2 cm. For each reflector an investigation was made of the patterns at various positions of feed horns in front of the reflector. Data was obtained on the gain,

beamwidth, and side-lobe level of the radiation patterns as a function of aperture illumination and f/D ratio. Other quantities evaluated included beam shift as a function of feed displacement and f/D ratio. A similar type of information was obtained from a series of spherical cap reflectors of various radii.

186. A BROAD-BAND AXIALLY SYMMETRIC VERTEX FEED

F. L. HENNESSEY

(Naval Research Laboratory,
Washington, D. C.)

A vertex feed, designed to illuminate a paraboloidal reflector antenna at microwave frequencies, is discussed. Certain advantages over vertex feeds presently in use are pointed out. A small splash plate of special geometry, placed at the end of a circular waveguide extending through the vertex of the reflector, directs the energy back onto the reflector and provides a match to space of $VSWR < 1.5$ over at least a twenty per cent frequency band. The complete axial symmetry of the feed permits the use of either linear or circular polarization and provides mechanical advantages in narrow-angle rapid-scanning systems.

Radio Communication Systems

Chairman, W. M. GOODALL

(Bell Telephone Laboratories, Inc.,
Deal, N. J.)

187. A RADIO RELAY SYSTEM EMPLOYING A 4,000-MC THREE-CAVITY KLYSTRON AMPLIFIER

J. J. LENEHAN

(Western Union Telegraph Company,
New York, N. Y.)

This paper discusses the application of this tube as an amplifier in a relay system already in operation when the amplifier became available. The reasons for using the tube, the design necessary to incorporate it into existing circuitry, and its performance characteristics are described. The practical problems of tube alignment, life, and maintenance as encountered in system operation are discussed.

188. AN FM MICROWAVE RADIO RELAY

R. E. LACY AND C. E. SHARP

(Signal Corps Engineering Laboratories,
Fort Monmouth, N. J.)

The design features of an 8,000–8,500 mc radio relay are reviewed. The innovations described are the result of research and engineering accomplished for the design of a military radio relay system.

A mechanically and electronically tuned cw communications magnetron is included which provides a carrier power in excess of 50 watts, capable of being frequency modulated. A unique frequency stabilization circuit maintains the carrier center frequency, improves the linearity of the modulation, and greatly reduces the carrier-noise frequency variations by virtue of the inverse feedback introduced.

A novel duplexing antenna system, comprised of a waveguide hybrid tee, a wave-