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ARMY SECURITY AGENCY  
Washington 25, D. C.

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29 April 1947

SUBJECT: 1947 National Convention of the IRE

TO: Chief, Research Laboratories Division

1. Messrs. Rutherford and Mathews covered the 1947 National Convention of the IRE as official representatives of the Army Security Agency. The purpose of this visit was to help this agency keep abreast of the latest happenings in the field of electronics. The four days, March 3, 4, 5 and 6, 1947 that the convention lasted saw many reports of varied subject matter presented in the form of lectures, demonstrations, and exhibits. During that period the technical literature alone which was collected would have made the trip a profitable one, to say nothing of the personal contacts with representatives of various companies and manufacturers. It is strongly recommended that the practice of sending representatives of the Army Security Agency to such technical meetings be continued.

2. A complete report on the Technical Sessions, Exhibits, and Special Conferences is attached.

/s/ Mitford M. Mathews, Jr.

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1 Incl.

"Report on the 1947 National Convention of the IRE."

29 March 1947

REPORTONTHE 1947 NATIONAL CONVENTION OF THE IRESESSIONS ATTENDED

- Monday - Radar and Communication Systems  
Frequency Modulation Reception
- Tuesday - Television  
Electronic Digital Computers
- Wednesday- Broadcasting and Recording
- Thursday - Relay and Pulse-Time Systems of Communication  
Receiver Circuits

General Comments

The papers presented at this meeting represented some of the latest advances in the art of electronics. However, the presentation of some of the papers was far from perfect. The personality of the speakers influenced the presentations to a large extent; particularly the atrocious accents which some of the speakers had. Also some of the pictures shown were almost unreadable. These features plus the rapidity of presentation prevented a complete analysis of the papers presented.

PAPERS PRESENTED AT MEETINGS ATTENDED

- 1 - Shipboard Radar Fire Control from the System Viewpoint
- 2 - System Considerations in the Design of Very-High-Frequency and Super-High-Frequency Communication Circuits
- 3 - Portable Military communications Set
- 4 - Carrier-Current Dialing over Long Distance Telephone Circuits
- 5 - Frequency-Modulation Detector Systems
- 6 - A Method for Measuring the Instantaneous Frequency of a Frequency-Modulation Oscillator
- 7 - General Electric Frequency-Modulation Monitor
- 8 - The Linear Accelerator
- 9 - Syncho-Lite for Television Film Projectors
- 10 - Video-Frequency Performance of Some Receiving Tubes for Television
- 11 - A Theory of Multistage Wide-Band Amplifier Design
- 12 - Recent Advances in the Design of Intermediate Frequency Amplifiers for Television Receivers
- 13 - The Electronic Digital Computer
- 14 - Input Mechanisms for Electronic Digital Computers
- 15 - Electronic Computing
- 16 - The Selectron - A Tube for Selective Electrostatic Storage

- 17.- Applications of Electronic Digital Computers
- 18 - Propagation Characteristics of the Ultra-High-Frequency (480 to 920-Megacycle) Television Band
- 19 - Theoretical and Practical Aspects of Frequency-Modulation
- 20 - Broadcast Antenna Design
- 21 - Monitoring Equipment for Frequency-Modulation Broadcasting
- 22 - Ultra-High-Frequency Multiplex Broadcasting System
- 23 - Field Measurements on Magnetic Recording Heads
- 24 - Consideration of Moon-Relay Communications
- 25 - Experimental Studies of a Remodulating-Repeater System
- 26 - Experiences with Multipath Transmissions at Very-High-Frequency, Ultra-High-Frequency, and Super-High-Frequency
- 27 - Multiplex Employing Pulse-Time and Pulsed Frequency Modulation
- 28 - Multiplex Microwave Radio Applied to Telephone Systems
- 29.- A compact Electromechanical Filter for the 455-Kilocycle Intermediate Frequency Channel

Several of these papers are of interest to the Research Laboratories Division of the Army Security Agency. The papers on Electronic Computers were of general interest and attendance at these meetings would have been of value to all personnel engaged in the construction of electronic or electromechanical decoding equipment. It is only through repeated attendance at lectures similar to this, that the necessary information can be acquired. The information does not consist of a set of facts but rather a fundamental attitude toward the construction of large multipurpose machines. Unfortunately no representative of this agency directly engaged in the construction of decoding equipment were in attendance.

The talk on the Selectron Tube gave details of an electrostatic storage tube which is similar to those which are being developed in secrecy by the Army Security Agency. (A tube almost identical with ours was discussed at the March 10th meeting of the Washington Section of the IRE.)

The new principle which was set forth in the Selectron Tube was the method of selecting the active element on the storage matrix. This was done by means of two intersecting grid structures each having 64 slots thus forming 4096 (or 642) individual openings. Only when the four bounding wires of the opening are energized will a particular area be energized.

The storage feature of the tube was identical to the storage method suggested for the tube being developed under specification number 471-5832 for ASA. One method of reading was ingenious. It involved coating the storage elements with a fluorescent material and then when it is read by allowing electrons to flow toward it, it will fluoresce to a different degree depending on whether it is active or inactive. The light output is picked up by a photo-electric cell and converted to a useful signal.

The paper entitled "Ultra-High-Frequency Multiplex-Broadcasting System" contained a reference to a single channel Cyclophone tube

which was pictured as being about the same size as a type 6L6 tube. A tube like this would prove useful for unmultiplexing a single channel of a time multiplex system. For handling all the channels of a time multiplex system the multichannel cyclophone tube is suggested. The speaker represented the Federal Telecommunication Laboratories.

The paper entitled "Experimental Studies of a Remodulating-Repeater System", presented a summary of a technique which is worthy of application to some of the projects of the Research Laboratories Division. The basic problem presented was to measure the distortion of an almost distortionless system and to predict the effect of a multitude of such systems, in series on the intelligence information. This was to be done without the construction of more than one unit of the equipment under test.

The solution consists of recirculating the information through the system and introducing a suitable time delay between the input and output points. Hence the successive degeneration of the information can be recorded, as it is repeatedly passed through the system. In the system under discussion the delay was achieved by means of a coaxial delay line.

Messrs. Goldberg and Bath in their paper, "Multiplex Employing Pulse-Time and Pulsed Frequency Modulation," presented an interesting concept of multiplexing. Radio sets to which it might be applied are the AN/TRC-5, AN/TRC-6 and the AN/TRA-16 plus AN/TRA-6 combination. Essentially they found another means of transmitting intelligence on a pulse system by means of frequency modulating the individual pulses in the R. F. carrier. These F.M. pulses can be utilized to carry low grade circuits which do not lend themselves to encipherment. Difficulty will be experienced in suitably repeating the intelligence in these channels. However, it does offer the possibility of multiple order wire circuits.

The paper by Dr. Adler on "A Compact Electromechanical Filter for the 455-Kilocycle Intermediate-Frequency-Channel," offers a new approach to the design of filters. Essentially he replaces the electrical elements to a multisection band-pass filter with their mechanical equivalents and produces a compact metallic ladder of mechanically resonant elements, linked by compliant members and coupled to electrical circuits by magnetostrictive terminations. This produces a filter having much better pass band characteristics than equivalent electrical ladder filters due to the higher Q of the mechanical elements. Further exploration of mechanical filters should prove fruitful especially in the narrow band-pass case.

#### EXHIBITS DISPLAYED AT THE CONVENTION

The Radio Show of the 1947 National Convention of the IRE displayed the products of 182 different companies listed in Appendix A. The display was housed on the main and second floors of Grand Central Palace, 46th and Lexington, New York, N.Y. Items of particular interest

to ASA which were displayed or advertised are listed below with comments:

1. Aircraft Marine Products, Inc., Harrisburg, Pa.

A line of solderless terminal lugs attached by a crimping process.

2. Cambridge Thermonic Corp., Cambridge, Mass.

A group of slug-tuned inductors ranging from 750 microhenries to fractional microhenry sizes. The coverage was not continuous but the representative of the company informed the writer that there would be no extra charge for the manufacture of special sizes in quantities of one hundred. The small inductances would prove excellent for compensation in high speed ring circuits.

3. Catham Electronics, Newark, N. J.

Exhibited a miniature half wave high voltage rectifier for use in cathode ray accelerating supplies. Tube type Z2. Peak inverse 20,000 current 2Ma filament 1.25 volts, 265 Ma.

4. Fairchild Camera and Instrument Corp., Jamaica, N. Y.

a. A special camera attachment for photographing oscilloscope traces. Used in conjunction with a standard DuMont scope. Film speed up to five feet per second are available.

b. Precision recorders incorporating synchronous motor drive.

c. Precision wirewound potentiometers.

5. Finch Telecommunications, Inc., New York, N. Y.

A group of page copy facsimile receivers were displayed, also facsimile transmitters.

6. Radio Corporation of America, Camden, N. J.

A complete portable television pickup unit was displayed including sync signal generators, image orthicon camera, monitor, and power control panel.

7. Sylvania Electric Products, Inc., New York, N. Y.

a. Miniature and sub-miniature vacuum tubes were displayed.

b. Germanium crystal varistors were displayed. These will be suitable for use in place of Western Electric copperoxide varistors.

8. Technology Instrument Corp., Waltham, Mass.

a. An impedance meter termed "Z Meter" was displayed. This device will rapidly measure the impedance and phase angle of inductive and capacitive reactances.

b. A line of precision potentiometers was displayed.

9. Telequip Radio Company, Chicago, Ill.

A line of television synchronizing generators, monoscopes, and monitors for television was displayed.

10. Television Projects, Inc., Newark, N. J.

A studio rehearsal set up for television shows was displayed.

11. Times Facsimile Corp., New York, N. Y.

A line of facsimile equipment was displayed. Of particular interest was the 14" X 18" fax transmission equipment.

12. United States Television Mfg. Corp., New York, N. Y.

A line of television parts and equipment was displayed.

SPECIAL DEMONSTRATIONS AND MEETINGS NOT DIRECTLY ASSOCIATED WITH IRE

Color Television

Because of recent FCC Proceedings, the question of color television is perhaps as greatly published as any in the whole field of radio communication. It seemed a shame, therefore, to visit New York without seeing a demonstration of the CBS color system. Since at present, the CBS equipment is only being demonstrated to small audiences chosen on the basis of the good they are likely to do the CBS cause, it was not particularly easy to arrange for admission to the showing. However, after explaining that we were connected with the Research and Development Division of the Army Security Agency, CBS arranged for our admittance.

Without entering the debate on the relative merits of the CBS sequential system as contrasted with other techniques, allow me to say the demonstration was extremely good. The color television gives the impression of producing much better pictures than black and white because of the sharp color contrast. In my opinion the television we saw was fully as good as any colored movie, and black and white always seems inferior to color movies.

Meeting with Dr. Leedy and Dr. Vaile

Tuesday noon, March 4, 1947, at the expense of the lunch hour, Messrs. Rutherford and Mathews "sandwiched" a visit to the hotel suite of Drs. Leedy and Vaile in between the lectures on Television and Computers. The purpose of this visit was to discuss the magnetic recorder and to discover whether or not the Armour Research Foundation would be interested in the contract for its construction.

Dr. Vaile was somewhat late for the meeting and in his absence Dr. Leedy demonstrated the magnetic sound-on-film system and a telephone with an automatic magnetic secretary was on display.

In due course, Dr. Vaile arrived and the discussion got under way. It was somewhat disconcerting that the good doctors missed the general picture of the equipment. They were interested in pulse shape, duration, amplitude, appearance of the output signal and other minor details and didn't seem to grasp the implication of synchronous operation in conjunction with a frequency standard. Incidentally, a long discussion took place regarding the accuracy of the frequency standard even though that was taken by definition to be correct.

Finally, the overall system and the timing requirements of the same seemed to dawn upon them and their first reaction was that it was an expensive and difficult job. Being more or less satisfied that they understood the problem and its requirements and were interested in the contract, we made a hurried exit and returned to the Convention Hall just in time to stand two hours before getting a seat in the Digital Computer lecture.

Meeting with Dr. Travis and Dr. Chedaker

Wednesday afternoon, March 5, 1947, a rumor to the affect that portions of the EDVAC would be demonstrated at 9:00 the next morning by representatives of the Moore School of Engineering came to the attention of Messrs. Rutherford and Mathews. Consequently, the next morning found us expectantly waiting in the conference room.

The attendance to the lecture was so small that those present gathered around the mercury delay equipment on display and asked their questions in very informal fashion.

Because reports in our possession had already indicated that the Moore School was doing considerable work with magnetic recording equipment in connection with their computed design, we got Dr. I. Travis and Dr. J. Chedaker off in a corner and broached our synchronous recording and playback problems to them. Dr. Travis's response was indeed gratifying. He sized up the problem almost instantly, mentioned work of a fairly similar nature they were doing and expressed interest in further discussion with us at our convenience.

Evidently the Moore School has engineers who have worked on similar problems and could handle this job. It is strongly recommended that further liaison be planned with these people.

Incl.  
List of Exhibitors, App. A

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Section