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RADIO-FREQUENCY STANDARDIZATION ACTIVITIES

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Radio-Frequency Standardization Activities

Abstract—**Adequate standards are essential to the practice of engineering. In no other field is this requirement more pressing than in the radio-frequency portion of the spectrum. This paper describes the organizations involved and the processes followed in the generation, adoption, and dissemination of Standards Documents concerned with RF measurements. A listing of organizations engaged in this activity, current Standards Documents, and work in process is included.**

Introduction

"STANDARDIZATION is the process of formulating and applying rules for an orderly approach to a specific activity for the benefit and with the cooperation of all concerned."[1] A collection of the rules developed for a specific situation and based on the consolidated results of science, technique, and experience is called a Standard or a Standards Publication, and it is not surprising that the existence of standards is essential to the practice of engineering. There are many types of standards, for example, standards established for internal use by commercial or government organizations, standards developed by technical societies and trade associations, regulatory standards set up by government agencies, standards prepared by military agencies, and standards developed by national and international standardizing bodies. Most standards, within the United States of America at least, are voluntary and depend on industry cooperation and user demands rather than on legal requirements for acceptance. In many international bodies, the term "Recommendation" is used rather than "Standard" because the originating body "recommends" to national Administrations and associated organizations concerned with the development of standards that the document be accepted as a National Standard.

Over the years there has been a steadily increasing utilization of the radio-frequency portion of the spectrum, which for this paper is considered to extend from about 10 kHz to 80 GHz and higher, with the result that there has developed a continuous need for new standards. It was early recognized by the predecessor societies of the IEEE, namely the AIEE and the IRE, that standards dealing with basic technical matters, including RF measurements, were important to the profession, and activities in this area were always considered an essential function of those organizations and continue to be so in the IEEE.

It is the purpose of this paper to present a general description of current standardization activities concerned with radio-frequency measurements, including the organizations developing standards and the work in process on proposed standards in the United States of America and in the international organizations with which these activities are generally coordinated. Although excellent work in this field is being carried out in other countries, a detailed description of that work is beyond the scope of this paper.

The standards which are the subject of this paper are *published documents* that have been prepared by the responsible agencies set forth below, and that establish approved methods, techniques, and calibration procedures, and, to the extent important to measurements, characteristics and dimensions of components and devices. Specifically excluded from consideration here are elements and instruments that may be used as reference standards, such as "frequency standards," "voltage standards," "capacitance standards," etc. Methods of use of such devices, and procedures for obtaining accurate measurements thereby are, however, proper subjects for the standards considered in this paper.

Process for Establishing Standards

Sponsoring Bodies

Most radio-frequency standards are established by means of an agreed procedure which is followed by the sponsoring organization. Sponsoring bodies in the United States include engineering societies such as the IEEE, technical societies such as the American Society for Testing and Materials, and industry associations such as the Electronic Industries Association and the National Electrical Manufacturers Association. Specialized standards have also been developed by manufacturers' associations such as the Institute of High Fidelity. Civilian agencies of the U. S. Government, for example, the National Bureau of Standards and the Federal Communications Commission, issue certain specifications, rules, and regulations that constitute standards. The Office of Engineering Standards Services of the National Bureau of Standards provides a mechanism for the issuance of voluntary standards that are developed by manufacturers, distributors, and users of manufactured commodities. These documents are designated Product Standards. Advisory bodies, the Radio Technical Commission for Aeronautics, for example, assist in the formulation of standard systems and procedures. In addition, as will be mentioned, numerous standards are developed by military agencies for their own use.

An association of many of the aforementioned societies and industrial sponsors, as well as some not specifically mentioned, has been in existence for many years to coordinate

[1] S. D. Hoffman, "Standardization, defined by ISO committee," *Magazine of Standards*, vol. 32, p. 301, October 1961.

voluntary standards activities in the United States, to provide United States representation in international standards activities, and to furnish a central distribution service for Standards Documents. This organization, the American Standards Association (ASA), was superseded at the end of 1966, after a three-year study of the national needs, by a new organization, the United States of America Standards Institute (USASI).[2] The new Standards Institute plans to expand the program of the previous organization and to accelerate the output of voluntary national standards. One of its major objectives is to increase United States participation in international standardization activities, which at the present time is not commensurate with the importance of this activity from either an economic or a technical point of view.[3] It is planned to strengthen the Standards Institute by including departments and agencies of the government as full members of the organization. In the former ASA, government activity was limited mainly to individuals in government agencies working on committees. Legislation now pending[4] will allow and encourage member status for agencies of the Department of Commerce, especially the National Bureau of Standards, and will provide some government financial support for the USASI.

The new USASI organization comprises three Councils—the Member Body Council, the Company Member Council, and the Consumer Council, under a Board of Directors. The Member Body Council includes technical, professional, and scientific societies and trade associations and, after approval of the previously mentioned legislation, will include departments and agencies of the government. Among the responsibilities of this Council are approval of U. S. Standards and establishment of procedures for the preparation, acceptance, and designation of these standards, recognition of needs for new standards, and provision for United States representation in international standards activities. The two other Councils provide representation as their names imply and cooperate in the initiation and review of standards and operation of the organization.

The principal international organizations dealing with measurement standards in the radio-frequency portion of the spectrum are the International Electrotechnical Commission (IEC) and the International Telecommunications Union (ITU).[5] The IEC,[6] one of the oldest international standards bodies, was formed to facilitate the voluntary coordination and unification of *electrical standards* of its member nations. Its work is directed principally toward standardization of nomenclature and units, and of electrical equipment. In 1947, the IEC became affiliated with the International Organization for Standardization (ISO) as its electrical division. Membership in the IEC is comprised of National Committees composed of representatives of electrical standards groups in the country concerned. To implement its standards program, which includes radio-frequency measurements, the IEC publishes "Recommendations," which represent an international consensus on the subjects treated and which member organizations are strongly encouraged to follow when drawing up their National Standards.

The IEC is administered by a Council made up of the Presidents of the National Committees of the member countries. Technical matters are coordinated by a Committee of Action through Technical Committees, Subcommittees, and Working Groups as indicated in Fig. 1. The United States of America Standards Institute (USASI) represents the United States in the ISO, and the United States National Committee (USNC) of the IEC is the USASI group concerned with international electrical standards. Many of the international standards developed in the IEC are worked out by international committees and working groups set up within the IEC and administered in the United States by the USNC and in other countries through similarly established National Committees of IEC.

International standards dealing with telecommunications are developed by the International Telecommunications Union (ITU), a specialized agency of the United Nations. Although the ITU is concerned with all technical and regulatory aspects of radio and wire-line communications between nations, including frequency allocations and operating regulations, this discussion will treat principally the ITU activities in RF measurement standards. The International Radio Consultative Committee (CCIR) is the permanent organ of the ITU most directly concened with technical matters in the radio-frequency region. The CCIR has as members the *Administrations* of countries that are members of the ITU, plus any private operating agencies approved by their own member governments. Scientific and industrial organizations may be approved to participate in CCIR Study Groups. The CCIR is directed to "study technical and operating questions relating *specifically to radio communication* and to issue recommendations on them." Although the CCIR recommendations do not have legal force, in actual practice the ITU member countries consider them as sound guidelines for the installation and operation of telecommunications systems, and in the establishment of regulatory standards. However, they may become the basis for regulatory provisions included in the International Radio Regulations of the ITU. The CCIR has an international meeting called a Plenary Assembly, normally every three years. Its fourteen Study Groups and special committees meet in the periods between Assemblies, as well as at Assemblies, as required to formulate recommendations for adoption and issuance as CCIR documents. The Study Groups are organized according to subject matter.

[2] "Introducing the USA Standards Institute," *Magazine of Standards*, vol. 37, pp. 287–289, October 1966.

[3] A. C. Grove, "International standardization—interface with the future," *IEEE Spectrum*, vol. 3, pp. 91–101, August 1966.

[4] D. L. Peyton, "H.R. 17424-H.R. 17598: An opportunity and a challenge," *Magazine of Standards*, vol. 37, pp. 290–291, October 1966. Note: The numbers of the new bills, reintroduced in the 90th (current) Congress by sponsoring Congressmen Roush and Miller, are: Roush HR 1213 (old 17598); Miller HR 6278 (old 17424).

[5] M. C. Selby, "International comparison of measurements at high frequencies," *IEEE Spectrum*, vol. 3, pp. 89–98, January 1966.

[6] For a more detailed description of the IEC, see "The IEC, what it is, what it does, how it works," available from IEC or USASI.

In the United States, the Federal Communications Commission (FCC) promulgates compulsory standards of performance and methods of measurement for equipment and systems used in various radio services and related industrial, scientific, and medical applications. The FCC also participates in the work of the other standards organizations listed in this paper and in the formulation of standards incorporated in the *International Radio Regulations* of the ITU.

A discussion of standards agencies would not be complete without mention of the existence of defense agencies that provide standard specifications and measurement methods for components, equipment, and systems used by them. In the United States these agencies are variously located in the Departments of the Army, Navy, and Air Force and are coordinated by the Department of Defense. Extensive use is made by the military agencies of standards prepared by other organizations, but many radio-frequency standard measurement procedures are developed by these agencies in the absence of existing applicable standards. Frequently, these procedures are later adopted in revised and updated form as engineering standards processed through civilian standards organizations. A discussion of military standards and of standards issued by the FCC is outside the scope of this article.

A tabulation of organizations sponsoring or issuing standards concerned with radio-frequency measurements and of the technical committees involved in specific areas of work is presented in Table I (page 763), with, where available, a brief description of work in process on the development of *RF measurement* standards for each group. Even though the table is by no means a complete listing, it does indicate the magnitude and scope of the activity concerned with the development of RF measurement standards, and may assist in producing even closer cooperation between groups involved in similar standardization activities and thus may increase the effectiveness of the effort.

Procedure

In order to explain the procedure followed by a sponsoring body in preparing and issuing a standard, it will be expedient to describe the operations carried out by the IEEE as outlined in Fig. 1. Although there are variations from this procedure in other organizations, the general outline of the process is fairly basic, and the process has been found to operate successfully in the production of acceptable standards.

In the IEEE,[7,8] the Technical Activities Board (TAB) includes the Standards Committee as a General Committee which "is responsible . . . for encouraging and coordinating the work of formulating and revising IEEE Standards. The Committee gives final approval to IEEE Standards prior to submission to the IEEE Executive Committee for publication. It considers and investigates all matters relating to units and standards in the fields of electrical engineering, electronics, radio, allied branches of engineering or the related arts and sciences. It represents the IEEE in cooperation with other standardizing bodies in matters relating to units and standards." This program is implemented by the assignment of areas of responsibility to the various Groups within the IEEE. Each Group serves its own area of interest with Technical Committees. Some of the Technical Committees within a Group may be designated as Technical Committees on Standards for the particular area to be covered, or standards may be developed by any other Technical Committee. Usually special Subcommittees or Working Groups are organized by the Technical Committees for the development of a particular standard. Thus the responsibility for the development of a standard is delegated to engineers most familiar with the requirements.

The initiation of the development of a Standards Document arises within the Technical Committees by normal activity of these committees in which they consider the state-of-the-art and the need for standards. Further sources of proposals for standards are requests, formal or informal, from industrial, governmental, educational, or other interested groups. Requests for the development of standards may originate in the IEEE Standards Committee itself, or occasionally, requests for particular standards may be generated at the level of the coordinating agency, i.e., USASI. This last procedure is the exception rather than the rule.

Any standard developed by a committee must represent a consensus of the originating body, and the reasons for any negative votes must be forwarded with the document to higher committees. If the standard was prepared by a Subcommittee, the document must be approved by the parent Technical Committee and forwarded with all comments associated with negative votes to the IEEE Standards Committee for final approval and publication. The Standards Committee may then request the appropriate Sectional Committee of the USASI to approve the Standard as a U.S. Standard, and the U. S. National Committee of the IEC may propose that the Standard be considered as a basis for an IEC Recommendation.

The aforementioned "machinery" falls short of adequate performance in very few cases. In those cases, special committees or special temporary committees (Ad-Hoc Committees) may be formed, or joint coordinated efforts between various organizations may be set up to accelerate development of standards. Examples of these procedures may be found in the United States in the National Television System Committee (NTSC) and, on the international scene, in the CISPR (International Special Committee on Radio Interference). The CISPR, operating as a semiautonomous group under the IEC, includes representation from eight other bodies in addition to the National Committees of IEC. These special committees were established to set up standards affecting industry-wide fields of interest as indicated in their titles, on the national (NTSC) and international (CISPR) levels.

The procedure for the generation of a Standards Publication within the IEEE has been carefully considered and is set forth in the *IEEE Standards Manual*, which should be

[7] "IEEE Bylaws," Section 307, Technical Activities Board.
[8] *IEEE Standards Manual—A Guide to Standardization Activities.*

consulted for a complete description of the process. Control of the process is maintained in the IEEE Standards Committee in order to assure that standards issued by the Institute are technically adequate. Technical Committees are required to report to the Standards Committee and receive authorization for all activities associated with the development of standards. In brief, the Standards Committee controls but usually does not become directly involved in the detailed work associated with the development of a standard.

Cataloging and Distribution of Standards Documents

Standards Publications are usually distributed by the issuing agencies, or by the USASI as a central standards agency. The principal organizations concerned with the preparation and distribution of Standards Documents concerned with radio-frequency measurements are listed in Table I (pp. 763–770), and a comprehensive list of current Standards is presented in Table II (pp. 771–773). Requests for Standards Documents should be addressed to the headquarters address of the issuing organization. If the publication is a U.S. Standard or an IEC Recommendation, it will be listed in the *USASI Standards Catalog* and can be obtained from the USASI. (Note: All ASA Standards have been automatically converted to U.S. Standards.) Current CCIR Recommendations are published in five volumes entitled *Documents of the XIth Plenary Assembly*, which may be purchased from the General Secretariat of the International Telecommunications Union, Geneva, Switzerland. Separate copies of individual Recommendations are not available. Standards of the FCC are available in *FCC Reports* and *FCC Rules and Regulations* obtainable from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Most Standards Publications are provided for a small fee to defray publication, handling, and mailing expense.

A central clearinghouse for information on proposed as well as approved standards is planned by USASI.[4] This service is expected to include translation services as well as cataloging, indexing, information search and retrieval services, and dissemination facilities.

Current Activities

Since radio-frequency measurements are of importance in many fields and disciplines, standardization activities concerned with measurements are extensive and varied; consequently, only a brief summary of the work in process in certain areas can be presented in this paper. For compactness, the subjects of measurement standards under development or proposed are listed in Table II and brief descriptions of current activities of Technical Committees concerned with RF measurement standards are given in Table I. A brief general review of the activities in several fields of interest is presented in the following paragraphs.

Major programs are under way in the IEEE to generate a new technical dictionary and in the IEC to revise and expand the International Electrotechnical Vocabulary. Also, many other committees are involved in the establishment of definitions of terms as prerequisites for the development of standards involving RF measurements.

Improved methods for the measurement of the electrical properties of materials at radio frequencies are also being developed, with emphasis on extension to higher frequencies.

Standardization of precision coaxial connectors is receiving attention in both the IEEE and IEC, and some preliminary activity is under way on miniature precision connectors in an Ad-Hoc Committee. Standards on general-purpose cable connectors also are being vigorously pursued; in the United States the approach has been to specify only basic mating dimensions and performance. As a result of demands emanating from increased accuracy requirements, problems associated with the measurement of leakage from cables, connectors, and waveguide couplings are being investigated by several committees.

Standard methods of measuring and monitoring field strength, along with numerous other specialized measurements on antenna systems, are being studied.

Methods of measuring the performance and characteristics, including noise, of all types of microwave tubes continue to be the subject of much study. In the semiconductor field the constant upward extension of the useful frequency range has produced considerable interest in the development of standard methods for the measurement of high-frequency diode and transistor parameters, including noise.

Standards Documents relating to definitions of terms, performance, and test methods for RF noise meters above 1 GHz, signal generators, cathode-ray oscilloscopes, power-measuring instruments, immittance-measuring instruments, coaxial attenuators, and electronic and digital voltmeters are being prepared by national and international groups.

Recommended measurement methods for performance characteristics of all types of receivers and transmitters continue to be improved and expanded, with considerable interest evidenced in the measurement of the susceptibility of receivers to interference, of radiation from receivers, and of spurious emissions from transmitters.

All aspects of radio-interference measurements are being studied by many groups, with international coordination provided by CISPR. Specifications for interference-measuring instruments and improved methods for the measurement of interference from many different types of sources, including motor vehicles, are among the subjects receiving attention.

The coverage in this paper of the broad subject of standardization activities in the field of RF measurements has been necessarily brief and incomplete, and the authors are aware that many important activities have been overlooked or omitted. It is hoped, however, that sufficient information has been included to provide an engineer interested in RF measurements with a good starting point for locating established standards on specific subjects, and with some knowledge of work in process in various fields which may be useful to him in his work or make it possible for him to participate in standardization activites of particular interest.

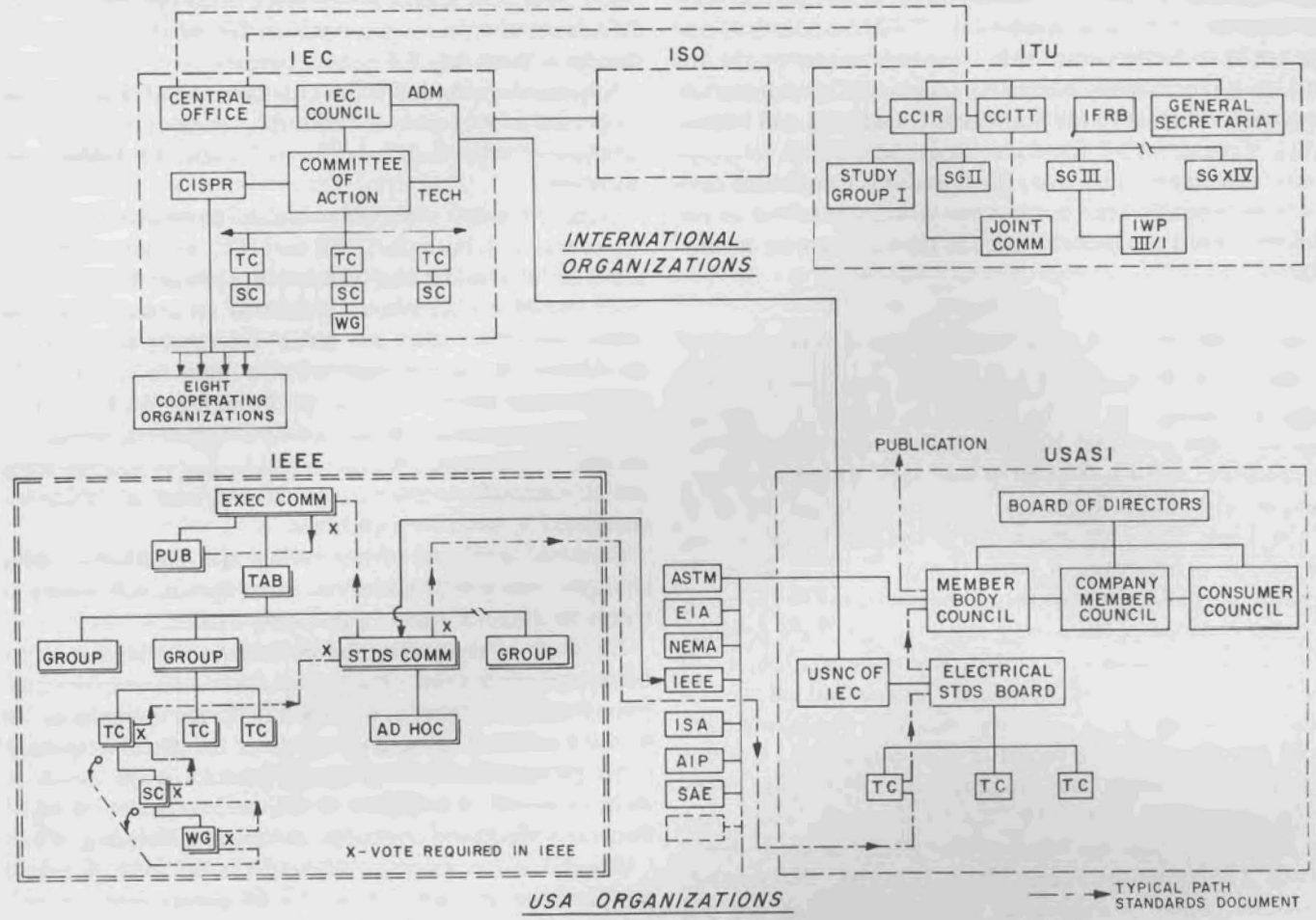

Fig. 1. Chart showing organizations developing radio-frequency measurement standards.

TABLE I

ORGANIZATIONS DEVELOPING STANDARDS (RADIO-FREQUENCY)

Name of Organization*	Address of Organization. Committee Chairman, etc.	Field Covered	RF Measuremcnt Standardization Work in Process
1. **Institute of Electrical and Electronics Engineers (IEEE)**	Headquarters, 345 E. 47th St., New York, N. Y. 10017	Electrical engineering, including radio-frequency field.	
IEEE Standards Committee	Chairman: W. T. Wintringham Secretary: J. J. Anderson	All IEEE Standards activities (see *IEEE Standards Manual* for complete description of field covered).	Coordination of all IEEE Standards Activities. See Table II—Definitions and Units.
IEEE Groups Aerospace and Electronic Systems (G-10)	Chairman: S. H. Dodington ITT Labs. 500 Washington Ave. Nutley 10, N. J.	Aerospace radio, navigation, and telemetry systems and devices.	Nomenclature and terminology standards for aerospace instrumentation. See Table II—Antennas.
Antennas and Propagation (G-3) TC—Standards (2), Antennas and Waveguides	Chairman: M. S. Wheeler Westinghouse Electric Corp. Box 746 Baltimore, Md. 21203	Antennas and waveguides; definitions, methods of measurement (joint committee with G-17).	See Table II—Antennas.
TC—Standards on Wave Propagation	Chairman: S. A. Bowhill Dept. of Elec. Engrg. University of Illinois Urbana, Ill.		

1. IEEE Groups cont'd next page

* Note: TC—Technical Committee; SC—Subcommittee; WG—Working Group; TA—Technical Advisor; SG—Study Group; (G-1), (G-2), etc., designates IEEE Group Number.

TABLE I—*Continued*

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
Broadcast and TV Receivers (G-8)			
TC—Standards Activities Committee	Chairman: J. Avins 199 Laurel Road Princeton, N. J. 08540	Methods of measurement for radio and television broadcast receivers.	See Table II—Receivers.
Broadcasting (G-2)			
TC—Standardizing	Chairman: R. M. Morris American Broadcasting Co. 7 W. 66th St. New York, N. Y. 10023	AM, FM, and TV engineering.	
TC—Television Systems	Chairman: E. M. Leyton RCA Labs. Princeton, N. J.	TV for broadcast. Community antenna TV. Closed-circuit TV.	Line identification and numbering. CATV systems.
TC—Video Techniques	Chairman: I. C. Abraham General Electric Co. Research and Development Center Schenectady, N. Y.	Generating and handling video signals.	TV interlace. Measurement of noise, rate-of-change of sync. timing, HF roll-off characteristics, amplitude response.
Industrial Electronics and Control Instrumentation (G-13)			
TC—Electronic Techniques	Chairman: E. Mittelman 549 W. Washington Ave. Chicago, Ill.	RF heating.	See Table II—Radio Frequency Interference, Miscellaneous (HF Heating).
Electromagnetic Compatibility (G-27)			
TC—EMC Standards Committee	Chairman: J. F. Chappell U. S. Army Electronics Command Fort Monmouth, N. J. 07703 Att.: AMSEL-RD-GFA	Electromagnetic compatibility engineering.	See Table II—Radio Frequency Interference.
Instrumentation and Measurement (G-9)			
TC—Fundamental Electrical Standards (FES)	Chairman: J. C. Riley 2039 S.E. Yamhill St. Portland, Ore. 97214	Basic electrical standards; i.e., standard resistors, capacitors, inductors, and standards of voltage	
TC—HF Instruments and Measurements (HFIM)	Chairman: R. A. Soderman General Radio Co. Bolton, Mass. 01740	RF instruments and measurements.	See Table II—Parameter Measurements, Coaxial Components, Instruments.
TC—Electromagnetic Measurement State-of-the-Art (EMM)	Chairman: M. C. Selby National Bureau of Standards Boulder, Colo. 80302	State-of-the-art with respect to accuracy of voltage, impedance, phase, power, attenuation, and field strength at frequencies above 30 kHz.	See Table II—Parameter Measurements.
TC—Materials Measurement (MM)	Chairman: C. D. Owens Bell Telephone Labs., Inc. 555 Union Blvd. Allentown, Pa.	Measurements of dielectric and magnetic properties of materials.	
TC—Frequency and Time (FT)	Chairman: A. R. Chi Goddard Space Flight Center Code 521 Greenbelt, Md. 20771	Standards and measurement methods for piezoelectric, ferroelectric, electrostrictive, and magnetostrictive materials and devices, atomic and molecular transitions; frequency and time measurements.	See Table II—Measurements on Materials, Miscellaneous.
Microwave Theory and Techniques (G-17)			
TC—Standards (2), Antennas, and Waveguides (See G-3)	Chairman: M. S. Wheeler Westinghouse Electric Corp. Box 746 Baltimore, Md. 21203	Antennas and waveguides; definitions, methods of measurement (joint committee with G-3).	See Table II—Antennas, Waveguide Components.
Sonics and Ultrasonics (G-20)	Chairman: T. R. Meeker Bell Telephone Labs., Inc. Allentown, Pa.	Sonic and ultrasonic devices, including transducers (piezoelectric, electrostrictive, magnetostrictive).	

1. IEEE Groups cont'd opposite

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
Power (G-31) TC—Transmission and Distribution SC—Radio Noise	Chairman: E. H. Gehrig Bonneville Power Admin. P.O. Box 3621 Portland, Ore. 97208	Radio noise in power transmission systems.	Cooperation with USASI-C63.
Vehicular Communications (G-6) TC—Mobile Communication System Standards	Chairman: W. A. Shipman Columbia Gas System Service Corp. 120 E. 41st St. New York, N. Y.	Mobile radio communication: measurements and systems engineering.	See Table II—Receivers.
2. **United States of America Standards Institute (USASI)**	10 E. 40th St. New York, N. Y. 10016	Standards for use in technical and engineering applications. International standards activity in electrical engineering is handled for the United States through USASI by the U. S. National Committee of IEC.	(See Fig. 1 for chart showing relationship of USASI to other standards organizations. One important function of USASI is to coordinate and encourage member groups in the development of standards.)
Committees of USASI for Current Projects: *C—Electrical Engineering (with sponsor shown)*	(Address Committee Chairmen through USASI Headquarters)	These committees are charged by USASI with responsibility for adequate standards. The sponsor organization is responsible for administration and direction of the standards project.	
C16—Radio and Electronic Equipment (IEEE)	Chairman: H. R. Mimno	Methods of testing, rating, and specifying electronic equipment.	Review of current standards to determine adequacy.
C39—Electrical Measuring Instruments (Electrical Standards Board, USASI)	Chairman: L. J. Lunas	Measuring instruments for electrical quantities.	See Table II— Instruments.
C42—Definitions of Electrical Terms (IEEE)	Chairman: H. P. Westman	Definitions of technical terms used in electrical engineering.	See Table II—Definitions and Units.
C59—Electrical Insulating Materials (ASTM)	Chairman: A. H. Scott	Specifications and methods of test for electrical insulating materials.	See Table II—Materials.
C60—Standardization of Electron Tubes (JEDEC—Joint Electron Devices Engineering Council)	Chairman: J. A. Caffiaux	Definitions, classification, methods of rating and testing, dimensions, and interchangeability of electron tubes.	
C61—Electric and Magnetic Quantities and Units (Electrical Standards Board, USASI)	Chairman: C. C. Chambers	U. S. standards and participation in work of IEC in the field of electric and magnetic quantities and units.	See Table I—10, IEC TC 24.
C63—Radio-Electrical Coordination (NEMA)	Chairman: W. E. Pakala	Definitions and methods of measurement of noise and signal strength, levels of interfering sources (RF interference).	Cooperation with CISPR (IEC). See Table II—Radio Frequency Interference, Instruments.
C83—Components for Electronic Equipment (EIA)	Chairman: L. Podolsky	Components used in electronic circuits, excluding tubes and semiconductor devices.	See Table II—Coaxial Components.
C94—Semiconductor Electron Devices (Semiconductor Device Council of JEDEC)	Chairman: R. A. York	Definitions, classification, methods of rating and testing, dimensions, and interchangeability of semiconductor electron devices.	
C95—RF Radiation Hazards (IEEE and Navy Dept.)	Chairman: H. P. Schwan	Hazards to health of personnel in RF electromagnetic fields.	
C100—Electrical Reference Instruments and Devices (Scientific Apparatus Makers Association)	Chairman: W. H. Shirk	Specifications of electrical reference instruments and devices covering dc to 1 MHz, as used in electrical standardizing laboratories.	Standards are being prepared on ac-dc transfer devices of quality found in standardizing laboratories.

TABLE I—*Continued*

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
3. Electronic Industries Association (EIA)	Engineering Department 2001 Eye St., N.W. Washington, D. C. 20006	Standards for electronic equipment including radio and radar and related devices.	Standards more than five years old are reviewed and brought up to date.
TR-2 Engineering Committee for AM and FM Broadcast Transmitting Systems	Chairman: O. L. Prestholdt	Electrical performance standards for AM and FM broadcast transmitters and antennas.	
TR-4 Engineering Committee for TV Broadcast Transmitting Equipment	Chairman: F. J. Bias	Electrical performance standards for TV studio, transmitter and relay equipment.	
R-4.9 Subcommittee on TV Tuners	Chairman: F. W. Edwards	TV tuners.	Development of correlatable measurement procedures for radiated interference from TV tuners.
TR-8 Engineering Committee on Land Mobile Services	Chairman: R. T. Buesing	Land-mobile communications equipment—minimum standards for transmitters, receivers, systems, engine-noise interference, tone signaling, and antennas.	
TR-14 Engineering Committee on Microwave Relay Systems for Communication	Chairman: C. I. McDowell	Microwave relay equipment and systems; performance specifications.	
G-46 Electromagnetic Compatibility	Chairman: B. L. McArdle	Electromagnetic compatibility (reduction of interference).	1) Cooperation with Mil-Standards development groups (MIL-STD-461, -462). 2) "Designer's Guide for the Electromagnetic Compatibility Engineer."
Joint Electron Devices Engineering Council (JEDEC)	Address: c/o EIA or NEMA Headquarters	Electron Tubes Council, Semiconductor Device Council.	Joint councils, EIA and NEMA, for standardization of electron devices, including tests and measurements.
4. American Society for Testing and Materials (ASTM)	1916 Race St. Philadelphia, Pa. 19103	Technical and engineering properties of materials; specifications and methods of testing.	
C-25 Ceramics for Electronics	Chairman: Dr. M. Berg	Specifications and test methods for microwave ferrites.	See Table II—Materials.
D-9 Electrical Insulating Materials	Chairman: R. W. Orr	Electrical insulating materials, specifically solid dielectrics; measurements at power frequencies on up to microwaves.	See Table II—Materials.
D-27 Electrical Insulating Liquids and Gases	Chairman: E. L. Raab	Specifications and test methods for electrical insulating liquids (oils and similar compounds) and gases.	
F-1 Materials for Electron Devices and Microelectronics	Chairman: A. P. Haase	Includes electrical properties of materials used in electron devices (tubes, transistors, microcircuits).	
5. National Electrical Manufacturers Association (NEMA)	155 E. 44th St. New York, N. Y. 10017	Specifications and measurement procedures on manufactured electrical equipment apparatus, appliances, and other electrical devices.	See USASI C63, JEDEC (EIA).
6. Instrument Society of America (ISA)	530 William Penn Pl. Pittsburgh, Pa. 15219	Measurement Standards Instrumentation Division (MESTIND) has HF Standards, Microwave Standards, and Waveform Standards Committees.	
7. Society of Automotive Engineers (SAE)	485 Lexington Ave. New York, N. Y. 10017		
SC—Radio Frequency Interference	Chairman: R. O. Ellerby	Engineering problems associated with radio interference in vehicles.	Development of test methods for radio interference in vehicles; correlation with international groups (CISPR).

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
8. Institute of High Fidelity (IHF)	516 Fifth Ave. New York, N. Y.	High-fidelity radio-broadcast receiving equipment.	Test procedures for stereo FM tuners.
9. Office of Engineering Standards Services, National Bureau of Standards	For list of *Product Standards*, write for: List of Publications (LP) 53 Office of Engineering Standards Services National Bureau of Standards Washington, D. C. 20234	Products Standards (replace Commercial Standard Series and Simplified Practice Recommendations), voluntary commercial standards for manufactured commodities, including method of test.	
INTERNATIONAL ORGANIZATIONS			
10. **International Electrotechnical Commission (IEC)**	Address correspondence to: Central Office 1, rue de Varembé Geneva, Switzerland	Electrical Standards [electrical affiliate of International Organization for Standardization (ISO)].	See chart of Fig. 1—Technical work is done by National Committees and Committee of Action (Technical Committees are under Committee of Action).
United States National Committee (USNC) of IEC (affiliated to USASI)	10 E. 40th St. New York, N. Y. 10016	International Electrical Standards: U. S. A. participates in international electrical standards activities through this organization.	See committee listings.
Technical Committees	TC Chairmen, Secretariat, and Technical Advisors to USNC only are listed below:		
TC 1—Terminology	Chairman: F. Cahen (France) Sec.: G. Nasse (France) TA for U. S. A.: H. P. Westman	Vocabulary, official terminology (international).	See Table II—Definitions.
TC 10—Liquid and Gaseous Dielectrics	Chairman: P. Olmer (France) Sec.: M. Van Rysselberge (Belgium) TA for U. S. A.: E. R. Thomas	Characteristics and standard test methods for liquid and gaseous dielectrics.	Measurement procedures for dielectric losses in liquid dielectrics.
TC 12—Radio Communication	Chairman: P. Besson (France) Sec.:—(Netherlands) TA for U. S. A.: J. T. Brothers	Specifications and measurement of radio communications equipment.	
SC 12A—Radio Receiving Equipment	Chairman: S. A. C. Pedersen (Denmark) Sec.:—(Netherlands) TA for U. S. A.: A. S. Goldsmith	Radio receiver performance measurements.	See Table II—Receivers.
SC 2C—Radio Transmitting Equipment	Chairman: C. Beurtheret (France) Sec.:—(Netherlands) TA for U. S. A.: J. T. Dixon	Technical and safety standards of radio transmitting equipment: definitions, specifications, and measurement procedures.	See Table II—Transmitters.
SC 12D—Aerials	Chairman: to be appointed Sec.:—(Germany)	Aerials (antennas).	See Table II—Antennas.
TC 13—Measuring Instruments	Chairman: I. Böhm (Hungary) Sec.: T. Földesi (Hungary)	Electrical measuring instruments for electrical quantities.	
SC 13C—Electronic Measuring Instruments	Chairman: J. L. Leistra (Netherlands) Sec.:—(Hungary) TA for U. S. A.: M. Domsitz	Electronic measuring instruments for measuring electrical quantities directly.	See Table II—Instruments.
TC 15—Insulating Materials	Chairman: Dr. E. F. Richter (Germany) Sec.: Dr. A. Ruelle (Italy) TA for U. S. A.: K. N. Mathes	Properties of electrical insulating materials and appropriate tests.	See Table II—Measurements on Materials.
TC 24—Electric and Magnetic Quantities and Units	Chairman: Dr. C. C. Chambers (U. S. A.) Sec.: C. Dietsch (France) TA for U. S. A.: C. C. Chambers	International recommendations regarding use of quantities and units used in electricity.	1) Conventions relating to electric and magnetic units. 2) Choice of SI units to be used. 3) Assignment of name "long" to SI unit of magnetic field strength. 4) Definitions of quantities "magnetic current" and "magnetic current density."

10. IEC cont'd next page

TABLE I—*Continued*

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
TC 25—Letter Symbols and Signs	Chairman: M. K. Landolt (Switz.) Sec.: C. H. Page (U. S. A.) TA for U. S. A.: J. G. Brainerd	International recommendations regarding letter symbols and signs for quantities used in electrical engineering.	Symbols for quantities varying with time.
TC 27—Electro-heating	Chairman: M. Mazur (Poland) Sec.: T. Skrzypek (Poland)	Industrial heating—including induction and dielectric.	
TC 39—Electronic Tubes and Valves	Chairman: H. Lewis (U. K.) Sec.:—(Netherlands) TA for U. S. A.: R. E. Moe	Specifications and test methods for measurement of electron tubes.	See Table II—Electron Tubes.
SC 39A—Microwave Tubes and Valves	Chairman: Prof. H. J. Reich (U. S. A.) Sec.:—(U. K.) TA for U. S. A.: R. E. Moe		See Table II—Electron Tubes.
TC 40—Capacitors and Resistors for Electronic Equipment	Chairman: G. D. Reynolds (U. K.) Sec.:—(Netherlands) TA for U. S. A.: L. Podolsky	Specifications and test methods for capacitors and resistors for electronic equipment.	Continuous updating of specifications and test methods for components.
TC 46—Cables, Wires, and Waveguides for Telecommunications Equipment	Chairman: Prof. Dr. W. Druey (Switz.) Sec.: H. Peters (Germany) TA for U. S. A.: J. S. Brown		
SC 46A—RF Cables and Their Accessories	Chairman: Prof. Dr. W. Druey (Switzerland) Sec.: Dr. Spinner (Germany) TA for U. S. A.: J. S. Brown and F. O. Weirich	Specifications and test methods for RF cables and connectors.	See Table II—Coaxial Components.
SC 46B—Waveguides and Their Accessories	Chairman: Dr. B. Josephson (Sweden) Sec.: G. Shapiro (U. S. A) TA for U. S. A.: J. S. Brown	Specifications and test methods for waveguides and connecting devices (flanges, etc.).	See Table II—Waveguide Components.
SC 46C—LF Cables and Wires	Chairman: A. Knacke (Germany) Sec.: L. Verberck (Belgium) TA for U. S. A.: R. A. Sykes	Low-frequency communications cables wires.	
TC 47—Semiconductor Devices	Chairman: R. L. Pritchard (U. S. A.) Sec.: J. Gaschi (France) TA for U. S. A.: R. L. Pritchard	Ratings and characteristics of semiconductor devices; measuring methods.	See Table II—Semiconductors.
TC 49—Piezoelectric Crystals and Associated Devices	Chairman: W. J. Young Sec.: L. A. Lubimow (U. S. S. R.) TA for U. S. A.: R. A. Sykes	International recommendations for standardization regarding piezoelectric crystal units and accessories, and crystal filters.	See Table II—Miscellaneous.
International Special Committee on Radio Interference (CISPR—Comité International Spécial des Perturbations Radioélectriques)†	Chairman: Prof. L. Morren (Belgium) Sec.: P. Bingley British Standards Institution 2 Park St. London, W.1, England CISPR Documents obtainable from IEC, Central Office 1, rue de Varembé Geneva, Switzerland (CISPR, U. S. Activities: address via USASI) TA for U. S. A.: W. E. Pakala (also Chairman USASI—C63)	Special committee working under IEC "to promote international agreement on the aspects of radio interference, with primary objects of fostering satisfactory reception of sound broadcasting and television services and of facilitating international trade."	Development of methods of measuring interference from electrical appliances, ignition systems, power systems, receivers, and industrial, scientific, and medical equipment. See Table II—Radio Frequency Interference.

† Member Bodies of CISPR include: 1) Each national committee of IEC, 2) CCIR, 3) International Radio and Television Organization (OIRT), 4) European B/C Union (EBU), 5) International Conference on Large Electric Systems (CIGRE), 6) International Union of Producers and Distributors of Electric Power (UNIPEDE), 7) International Union of Railways (UIC), 8) International Union of Public Transportation (UITP), 9) International Commission on Rules for Approval of Electric Equipment (CEE).

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
11. **International Telecommunications Union (ITU)**	Headquarters Address: Place des Nations Geneva, Switzerland	Matters affecting communications activities by wire and radio between the various nations. The ITU is a specialized agency of the United Nations.	Technical matters are under the consultative committees; radio matters are the field of CCIR and also of ITU Administrative Radio Conferences when they are held.
International Radio Consultative Committee (CCIR—Comité Consultatif International des Radiocommunications	Headquarters address: Place des Nations Geneva, Switzerland Address for U. S. activities of CCIR: Department of State, U. S. A. Office of Telecommunications (E/TD) 22nd and "E" St., N.W. Washington, D. C. 20520	Technical and operating questions relating specifically to radiocommunications and issuance of recommendations on them, which are frequently used as technical guidelines for regulatory decisions.	Continuing technical work by 14 Study Groups, and joint Groups (CMTT—Study Group for Long Distance Television and Sound Programs Transmission, joint with CCITT); CISPR (see IEC).
SG I—Transmitters	Chairman: Gen. J. Lochard (France)	Radio transmitters and characteristics of radio emissions; coordination of proposals concerning use of radio spectrum from radio emission aspect; study of unwanted radiations from electrical apparatus and interference to radiocommunications caused thereby.	Measurements concerned with: 1) classifications and designation of emissions 2) radio interference (coordination with CISPR) 3) spectra and bandwidth of transmitted signals 4) frequency tolerance and power of transmitters 5) determination of spurious emissions.
SG II—Receivers	Chairman: Y. Place (France)	Selection, study, and measurement of important characteristics of receivers, investigations of improvements in receivers to solve problems in radio communication.	Study of characteristics of radio receivers and associated measurement methods.
SG III—Fixed Service Systems	Chairman: Dr. H. C. A. van Duuren (Netherlands)	Questions relating to complete systems for fixed and allied services, including ionospheric-scatter systems, but excluding radio relay systems; practical application of communication theory.	Measurements associated with: study of methods for obtaining improved efficiency in use of radio spectrum; fidelity of performance of fixed systems; directivity of antennas; HF radiotelephone and telegraph circuits; frequency shift keying.
SG IV—Space Systems and Radioastronomy	Chairman: Dr. I. Ranzi (Italy)	Technical questions regarding systems of telecommunication with and between locations in space, and radioastronomy.	Measurements associated with studies of communications satellite systems, frequency sharing between satellite systems, space research systems, and radioastronomy.
SG V—Propagation over the Surface of the Earth and through the Nonionized Regions of the Atmosphere	Chairman: Dr. R. L. Smith-Rose (U. K.)	Propagation of radio waves over the surface of the earth and through the nonionized regions of the atmosphere, insofar as they concern radio communication.	Measurements associated with studies of tropospheric propagation (nonionospheric), transmission loss, including field intensity, field strength, available power from antennas, influence of nonionized regions of atmosphere on wave propagation.
SG VI—Ionospheric Propagation	Chairman: D. K. Bailey (U. S. A.)	Propagation of radio waves (including noise) through the ionosphere insofar as it concerns radio communications.	Measurements associated with study of: 1) sky-wave field strength and transmission loss 5–50 MHz 2) atmospheric radio noise 3) basic long-term ionospheric predictions 4) sky-wave propagation 150–1500 kHz 5) sky-wave propagation below 150 kHz.

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TABLE I—*Continued*

Name of Organization*	Address of Organization Committee Chairman, etc.	Field Covered	RF Measurement Standardization Work in Process
SG VII—Standard Frequencies and Time Signals	Chairman: B. Decaux (France)	Organization of a world-wide service of standard frequency and time-signal emissions. Improvement in measurement accuracy.	Continuing study of methods and procedures for disseminating standard frequencies and standard time signals; improvement in measurement accuracy; dissemination of UT and AT information (experimental systems).
SG VIII—International Monitoring	Chairman: M. A. Vieira (Portugal)	Technical and operating problems (with technical answers) relating to monitoring stations in international monitoring service, including evaluation of interference, spectrum occupancy of signals, characteristics of emissions, direction finding, site selection, antennas and equipment for monitoring stations.	"Handbook for Monitoring Stations" (chapters being prepared by various SG VIII member countries). Methods of bandwidth measurement; improvements in measurements made for monitoring purposes.
SG IX—Radio Relay Systems	Chairman: E. O. Dietrich (Germany)	Line-of-sight and trans-horizon radio-relay systems operating above 30 MHz, excluding satellite or ionospheric transmission.	Measurements concerned with study of UHF and microwave relay systems; "sharing" problems with satellites; maintenance measurements for performance checking; PCM; radio relay systems for telephony and TV.
SG X—Broadcasting	Chairman: A. Prose Walker (U. S. A.)	Technical aspects of transmission and reception of sound broadcasting (except for tropical broadcasting), including standards for sound recording and reproduction. Liaison with SG XI on video recording.	Audio and video recording techniques and standards; standards for multiple programming by FM stations; measurements of performance of HF broadcasting systems using directional antennas.
SG XI—Television	Chairman: E. Esping (Sweden)	Technical aspects of television.	Measurements concerned with study of technical characteristics of monochrome and color TV systems video recording techniques; international TV standards.
SG XII—Tropical Broadcasting	Chairman: C. Lal (India)	Tropical broadcasting problems, and development of standards for tropical broadcasting.	"Manual on Tropical Broadcasting" (principally vertical-incidence HF broadcasting), including measurements of performance.
SG XIII—Mobile Services	Chairman: G. H. M. Gleadle (U. K.)	Technical and operating questions concerning aeronautical, maritime, land-mobile, radio location, and radio navigation services (except services using earth satellites—see SG IV).	Selective calling systems for maritime mobile radio telephone service—measurements of performance of various systems and choice of preferred system; measurements concerned with study of protection ratios and minimum field strength in maritime service, D/F and homing on 2-MHz band, technical characteristics of land mobile services.
SG XIV—Vocabulary	Chairman: R. Villeneuve (France)	Radio aspects of vocabulary of terms, lists of definitions, lists of letter and graphic symbols and other means of expression, systematic classification, measurement units, etc. (in cooperation with CCITT).	Joint IEC-CCIR-CCITT radio communications vocabulary.
CMTT—Television Transmission Joint CCITT, Study Group for Long Distance Television and Sound Programs Transmission	Chairman: Prof. Y. Angel (France)	Study of specifications to be satisfied by telecommunication systems for the transmission of sound and television broadcasting signals over long distances.	Standardized testing techniques for TV transmission systems. Problems of world-wide TV system.

TABLE II

MEASUREMENT STANDARDS ISSUED OR UNDER CONSIDERATION

Standards/Recommendations Issued		Standards/Recommendations in Preparation * Under Consideration ** Draft Completed *** Approved	
Subject	Issuing Organization and Document Number†	Subject	Responsible Organization(s)‡
Definitions and Units, General		**Definitions and Units, General**	
Units in Published Scientific and Technical Work, Recommended Practice	IEEE 268(1966)	Dictionary of electrical and electronic terms.*	IEEE Standards Committee USASI C42
Quantities and Units Used in Electricity	USASI C61.1(1966)	Revision of International Electrotechnical Vocabulary.*	IEC TC 1
Symbols for Units	IEEE 260(1965)	Nomenclature and terminology standards for use in aerospace instrumentation.*	IEEE G-10(AES)
Electrical and Electronic Terms, Definitions of Fundamentals (For trial use)	IEEE 270(1966)		
Electrical Terms, Definitions—Communications	USASI C42.65(1957)		
Electrical Terms, Definitions—Electron Devices	USASI C42.70(1956)		
International Electrotechnical Vocabulary—Fundamental Definitions	IEC 50-05(1954)		
International Electrotechnical Vocabulary—Electronics	IEC 50-07(1956)		
International Electrotechnical Vocabulary—Scientific and Industrial Measurement Instruments	IEC 50-20(1958)		
International Electrotechnical Vocabulary—Waveguides	IEC 50-62(1961)		
Parameter Measurements, General		**Parameter Measurements, General**	
Sine-Wave Unbalanced RF Voltage, State-of-the-Art of Measuring and Accuracy of Measurements	IEEE 197(1962)	Documents describing state-of-the-art in attainable accuracies at various calibration levels for measurements of phase,** field strength,** and thermal noise** at frequencies above 30 kHz.	IEEE G-9 (IM) TC (EMM)
Noise in Linear Two-Ports, Method of Measurement	IEEE 158-pt.9(1962)		
Pulses, Definitions of Terms	IEEE 194(1951, 1952)	Revision of IEEE 194, Definitions of pulse terms.	IEEE G-9 (IM) TC (HFIM)
Pulses, Methods of Measurement	IEEE 181(1955) USASI C16.28(1956, R61)	Definitions of pulse terms.*	IEC TC 39
Measurements on Materials		**Measurements on Materials**	
Ferroelectric Ceramics, Measurements of	IEEE 179(1961) USASI C83.24(1962)	Improvement of existing standards on methods of measuring electrical properties of materials.*	ASTM C-25, D-27, D-9, F-1 USASI C59
Test Methods for:		Broadening of ASTM D2520 to different techniques, frequencies, and materials.*	ASTM-D9
AC Loss and Dielectric-Constant Solid Insulating Materials (Tentative)	ASTM D150-65T(1965)	Methods for determination of relative permittivity and dissipation factor of electrical insulating materials at frequencies above 300 MHz.	IEC TC 15
Dissipation Factor and Dielectric-Constant Laminated-Sheet Insulating Materials	ASTM D669-59(1959)		
Power Factor and Dielectric-Constant Solid Ceramics to 10 MHz and 500°C (Tentative)	ASTM D2149-63T(1963)		
Power Factor and Dielectric Constant of Natural Mica	ASTM D1082-54(1954) USASI C59.42(1963)		
Complex Permittivity of Solid Insulating Materials at Microwave Frequencies and Temperature to 1650°C (Tentative)	ASTM D2520-66T(1966)		
Power Factor and Dielectric Constant Insulation of Liquids	ASTM D924-65(1965) USASI C59.22(1965)		
Dielectric Constant and Dissipation Factor Polyethylene—Liquid-Displacement Procedure	ASTM D1531-62(1962) USASI C59.60(1964)		
Dielectric Constant and Dissipation Factor Exp. Cellular Plastics	ASTM D1673-61(1961)		
Ferrimagnetic Resonance Line Width and Gyromagnetic Ratio of Nonmetallic Magnetic Materials (Tentative)	ASTM C524-63T(1963)		
Complex Dielectric Constant of Nonmetallic Magnetic Materials (Tentative)	ASTM C525-63T(1963)		
Coaxial Lines and Components		**Coaxial Lines and Components**	
RF Cables, pt. 1, General Requirements and Measurement Methods	IEC 96-1, 1A(1962, 1964)	Revision of International Electrotechnical Vocabulary.*	IEC SC 46A
RF Cables, pt. 2, Relevant Cable Specifications	IEC 96-2(1961)	Precision coaxial connectors—specifications and test methods for 7- and 14-mm general precision and laboratory precision connectors.*	IEEE G-9 (IM) TC (HIFM) IEC SC 46A
Solid Dielectric Transmission Lines, Requirements for	EIA RS199(1957) USASI C83.21(1958)		
Characteristic Impedance and Dimensions of RF Coaxial Cables	IEC 78(1961)	Precision miniature coaxial connectors—smaller than 3.5 mm.	Ad-Hoc Committee§
Semiflexible, Air Dielectric Coaxial Cables and Connectors	EIA RS258(1962)	RF connectors for cables, standards for.**	USASI C83.2
Rigid Coaxial Transmission Lines—50 ohms, Requirements for	EIA RS225(1959) USASI C83.14(1963)	Rigid coaxial lines, flanges, and connectors—requirements for.*	IEC SC 46A
Rigid Coaxial Transmission Lines—75 ohms, Requirements for	EIA RS259(1962)	Measurement of shielding efficiency of RF cables.*	IEC SC 46A
Dimensions and Mating Parts of RF Connectors	IEC 159(1964)	Test methods and specifications for rms values of VSWR for close-tolerance cables.*	IEC SC 46A
RF Connectors, pt. 1, General Requirements and Measurement Methods	IEC 169-1(1965)	Swept-frequency test method for uniformity of impedance of RF cables.***	IEC SC 46A
RF Connectors, pt. 4, Cable Connectors (U. S. & European Types)	IEC 169-4(1966)		
Waveguides and Waveguide Components		**Waveguides and Waveguide Components**	
Waveguides, Definitions of Terms	IEEE 146(1953)	Revision of definitions of waveguide terms.*	IEEE G-17 (MTT)
Waveguide Components, Definitions of Terms	IEEE 147(1955)	Revision of International Electrotechnical Vocabulary.*	IEC TC 46
Waveguides and Components, Measurement of	IEEE 148(1959)	Establishment of specifications for:	
Microwave Transmission Systems	EIA RS203(1958)	rectangular waveguide with circular outside cross section***	IEC SC 46B
Hollow Metallic Waveguides, General Requirements and Measurement Methods	IEC 153-1(1964)	medium flat rectangular waveguide***	IEC SC 46B
Hollow Metallic Waveguides, Specifications for Rectangular Waveguide	EIA RS261A(1965) USASI C83.10(1963) IEC 153-2(1964)	flat rectangular waveguide	IEC SC 46B
		heavy wall waveguide*	IEC SC 46B
		miniature-size rectangular waveguide*	IEC SC 46B
Hollow Metallic Waveguides, Specifications for Flat Rectangular Waveguide	IEC 153-3(1964)	circular waveguide flanges**	IEC SC 46B
		flexible rectangular waveguide*	IEC SC 46B
Hollow Metallic Waveguides, Specifications for Circular Waveguide	EIA RS200(1957) USASI C83.19(1958) IEC 153-4(1964)	measurement methods for leakage of electromagnetic energy from waveguide couplings.*	IEC SC 46B
Ridge Waveguides	EIA RS304(1965)		
Flanges, Waveguide, General Requirements and Measurement Methods	IEC 154-1(1964)		

† When two or more standards are listed under one subject, they may or may not be similar.

‡ See Table I for information on organizations listed. When two or more organizations are shown working on a standard on a particular subject, the standards being prepared by the different committees may or may not be similar.

§ Joint Industry Research Committee on Standardization of Miniature Coaxial Connectors, A. Alford, Chairman, Alford Manufacturing Co., 120 Cross St., Winchester, Mass.

TABLE II—*Continued*

Standards/Recommendations Issued		Standards/Recommendations in Preparation * Under Consideration ** Draft Completed *** Approved	
Subject	Issuing Organization and Document Number†	Subject	Responsible Organization(s)‡
Waveguides and Waveguide Components (*cont'd*)			
Flanges, Waveguide, for Ordinary Rectangular Waveguide	IEC 154-2(1966)		
Flanges, Waveguide, for Flat Rectangular Waveguide	IEC 154-3(1966)		
Flanges, Waveguide, Miniature, Unpressurized Contact Types	EIA RS166(1956, 1962)		
Flanges, Waveguide, Pressurizable Contact Types	EIA RS271A(1963)		
Flanges, Waveguide, Dual Contact, Pressurized and Miniature	EIA RS285(1963)		
Antennas (Including Field Strength Measurements)		**Antennas (Including Field Strength Measurements)**	
Antennas and Waveguides, Definitions of Terms	IEEE 146(1953) USASI C16.21(1954)	Revision of definitions of terms on antennas.*	IEEE G-3(AP)
		Development of antenna specifications.*	IEC SC 12D
Antennas, Modulation Systems and Transmitters, Definitions of Terms	IEEE 145(1948)	Community antenna systems, measurements on.	IEC SC 12A
Antennas, Test Procedures for	IEEE 149(1965) USASI C16.11(1949, 1961)	Measurement method of vertical polarization in VOR antennas.	IEEE G-10 (AES)
Directional Antennas, Presentation of Antenna Diagrams	CCIR Rec. 414	Test spectrum for radar measurements in Doppler spectrum.	IEEE G-10 (AES)
Receiving Aerials, Measurement Methods from 30 to 1000 MHz	IEC 138, 138A(1962, 1963)		
VHF Receiving Antenna Performance, Presentation, and Measurement	EIA REC 141(1954)	Standard methods for field strength measurement.***	IEEE G-10 (AES)
Skywave Polarization in Direction Finders, Measurement of	IEEE 173(1959)		
Field Strength Measurement by Monitoring Stations, Accuracy of	CCIR Rec. 378-1		
Field Strength Measurement at Monitoring Stations, Expeditious Method	CCIR Rec. 442		
Electron Tubes		**Electron Tubes**	
Electron Tubes, Definitions of Terms	IEEE 160(1957) IEEE 161(1962) USASI C60.9(1964) IEC 151-7(1964)	Definitions for microwave tubes.* Definitions for noise effects.** Methods of measuring electronic tubes and valves.* Methods of measuring RF output power.*	IEC TC 39 IEC TC 39 IEC TC 39 IEC TC 39
Electron Tubes, Methods of Testing, including Noise Measurement	IEEE 158(1962) USASI C60.15(1963)	Measurement of disk-seal tubes.** General measurement requirements of microwave tubes.*	IEC TC 39A IEC TC 39A
Electron Tubes and Valves, Measurement of Electrical Properties of		Methods of measuring magnetrons.*	IEC TC 39A
Equivalent Input and Output Admittance	IEC 151-3(1963)	Methods of measuring klystrons.*	IEC TC 39A
Noise Factor	IEC 151-4(1963)	Methods of measuring traveling-wave tubes.*	IEC TC 39A
Equivalent Noise Resistance	IEC 151-7(1964)	Measurement of noise in microwave tubes.*	EIA-JEDEC JT-13
Noise Figure Testing of RF Amplifier Tubes	EIA-JEDEC 38(1962)		IEC TC 39A
Semiconductors		**Semiconductors**	
Semiconductors, Definitions of Terms	IEEE 216(1960)	General principles of measurement methods for:	
Semiconductor Devices, Ratings, Characteristics, and Measurement Methods	IEC 147-2(1963)	low-power, small-signal diodes***	IEC TC 47
		transistor storage time***	IEC TC 47
Semiconductor Diodes, Test Procedure for	IEEE 256(1963)	HF parameters of transistors**	IEC TC 47
Semiconductor Tunnel and Backward Diodes, Definitions and Measurement	IEEE 253(1963)	variable capacitance diodes to 1 GHz**	IEC TC 47
		reference diodes**	IEC TC 47
Recovery Time for Semiconductor Diodes, Measurement of	EIA RS318(1965) NEMA SK511(1965)	noise figure to 300 MHz**	IEC TC 47
		tunnel diodes.*	IEC TC 47
Forward Transient Measurement on Semiconductor Diodes	EIA RS286(1963) NEMA 501(1963)	Measurement of small-signal VHF-UHF transistor admittance parameters and current gain.	EIA-JEDEC JS-9
Small-Signal HF, VHF, and UHF Power Gain of Transistors, Measurement of	EIA RS306(1965) NEMA SK507(1965)		
Collector-Base TC and Resistive Part of Common-Emitter Input Impedance, Measurement of	EIA RS284(1963) NEMA SK504(1963)		
Transistor Noise Figure, Measurement at Medium Frequency	EIA RS283(1963) NEMA SK503(1963)		
Transistor Noise Figure, Measurement at HF and VHF	EIA RS311(1965) NEMA SK509(1965)		
Instruments		**Instruments**	
Electronic Voltmeters, Guide to Specification of (For trial use)	IEEE 108(1955)	Specifications and test methods for:	
Cathode Ray Instruments, Guide to Specification of (For trial use)	IEEE 110(1955)	electronic** and digital* voltmeters	IEC SC 13C
Signal Sources, Guide to Specification of (For trial use)	IEEE 109(1955)		USASI C39.6
Radio-Noise and Field Strength Meters, Specifications for:			IEEE G-9 (IM) TC (FES)
0.015 to 30 MHz	USASI C63.2(1963)	cathode-ray oscilloscopes*	IEEE G-9 (IM) TC (HFIM)
20 to 1000 MHz	USASI C63.3(1964)		IEC SC 13C
Electrical Measuring Instruments (including RF current)	USASI 39.1(1964)	signal generators*	IEEE G-9 (IM) TC (HFIM)
			IEC SC 13C
		power-measuring instruments*	IEEE G-9 (IM) TC (HFIM)
		immittance-measuring instruments*	IEEE G-9 (IM) TC (HFIM)
		coaxial fixed and variable attenuators*	IEEE G-9 (IM) TC (HFIM)
		RF current measurement instruments (Rev. C39.1)	USASI C39.1
		radio noise meter, 1 GHz and up.*	USASI C63.6
		Safety requirements for electronic instruments.	IEC SC 13C
Receivers		**Receivers**	
Receivers, Definitions of Terms	IEEE 188(1952)	Recommended methods of measurement on receivers:	
Television: Signal Measurement Terms, Definitions of	IEEE 202, 3(1955, 1961)	general measurement methods**	IEC SC 12A
AM Broadcast Receivers, Methods of Testing	IEEE 186(1948) USASI C16.19(1961) IEC 69(1954)	RF measurement on AM receivers, full carrier, double sideband**	IEC SC 12A
		susceptibility of AM receivers to interference between 150 kHz and 30 MHz***	IEC SC 12A
Receivers with Ferrite Core, Loop Antennas, Methods of Test	IEEE 189(1955)		
FM Broadcast Receivers, Methods of Test	IEEE 185(1947) USASI C16.12(1949, 1961) IEC 91(1958)	susceptibility of FM receivers to impulsive interference**	IEC SC 12A
		RF measurement on FM receivers for stereo transmission using pilot-tone system**	IEC SC 12A
Sensitivity, Selectivity, and Stability of AM and FM Broadcast Receivers, Definitions and Measurement	CCIR Rec. 237	measurement of visual picture interference on TV screens*	IEC SC 12A
Sensitivity, Selectivity, and Stability of TV Broadcast Receivers, Definitions and Measurement	CCIR Rec. 330	measurement on professional-type receivers*	IEC SC 12A
Monochrome TV Broadcast Receivers, Methods of Testing	IEEE 190(1960) IEC 107(1960)	standard methods for measuring performance of receivers (consumer-oriented quality ratings).*	IEC SC 12A

Standards/Recommendations Issued		Standards/Recommendations in Preparation * Under Consideration ** Draft Completed *** Approved	
Subject	Issuing Organization and Document Number†	Subject	Responsible Organization(s)‡
Receivers (*cont'd*)		**Receivers** (*cont'd*)	
TV Tuner Performance, Presentation, and Measurement	EIA RS207(1958)	Radiation from receivers, measurement of.*	IEC SC 12A
Resp. of Broadcast and TV Receivers to Impulsive and Quasi-Impulsive Interference, Measurement of	CCIR Rec. 334	Susceptibility of receivers to interference.*	IEC SC 12A
Differential Gain and Phase in TV Signals, Measurement of	IEEE 206(1960)	FM mobile communications receivers, methods of testing.**	IEEE G-6 (VC)
	USASI C16.3(1961)	FM broadcast receivers, test methods.**	IEEE G-8 (BTR)
Vehicular Communications Receivers, Methods of Testing	IEEE 184(1949)	AM broadcast receivers, test methods.**	IEEE G-8 (BTR)
	USASI C16.18(1951, 1961)	Color TV receivers, test methods.*	IEEE G-8 (BTR)
	EIA RS204(1958)		
Transmitters		**Transmitters**	
Radio Transmitters, Definitions of Terms on	USASI C16.36(1963)	Recommended methods of measurement for radio transmitters:	
	IEEE 182(1961)	frequency**	IEC SC 12C
Emission, Transmission, and Radiation, Definition of Terms	CCIR Rec. 325	bandwidth and spurious output.**	IEC SC 12C
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		Instruments for RFI measurement—14 to 150 kHz.*	CISPR
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Interference from industrial, scientific, and electronic-medical equipment		1 GHz and up.*	USASI C63.7
Interference from power lines		Specifications for radio interference measurement apparatus having detectors other than quasi-peak—0.15 to 1000 MHz***	CISPR
Interference from ignition systems			
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		Measurement of unwanted resonances in crystal filters.***	IEC TC 49
		Standard method for measurement of frequency and equivalent resistance of unwanted resonances in above.	IEC TC 49
		Measurement of HF power absorption by load in an HF heating generator.*	IEEE G-13 (IE-CI)
		RF radiation hazards, 2 standards.**	USASI C95