



ICES

International Committee on Electromagnetic Safety

ICES (SCC-39) Annual Report: 2005 – 2006

Includes

**Technical Committee 34 (Product Safety Relative to the Safe
Use of Electromagnetic Energy)**

and

**Technical Committee 95 (Safety Levels with Respect to Human
Exposure to Electric, Magnetic and Electromagnetic Fields)**

22 May 2006



ICES

International Committee on Electromagnetic Safety

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ICES (SCC-39) Annual Report: 2005 – 2006

1. Administrative Committee

1.1 Reorganization

The reorganization of the International Committee on Electromagnetic Safety (ICES) was approved at the March 2005 SASB Meeting in Atlanta, GA. Specifically, IEEE SCC-28 (International Committee on Electromagnetic Safety – ICES) and SCC-34 (Product Performance Relative to the Safe Use of Electromagnetic Energy) were combined into a single Type 2 Standards Coordinating Committee (SCC-39), called ICES. SCC-28 is now Technical Committee 95 (TC-95 – in line with the C95 standards it develops); SCC-34 is now TC-34. Each TC functions as it did in the past, retaining the same structure, subcommittees and policies and procedures. An Administrative Committee (AdCom) is being established to oversee the operation of ICES, develop a fundraising program, provide liaison with IEEE and non-IEEE national and international organizations of similar scope, and submit to the SASB standards developed and approved by the TCs. Currently the AdCom is comprised of the leadership of TC-34 and TC-95 (see Table below). Additional “at large” members are being sought to help oversee the operations of ICES, including fundraising, and to provide liaison with specific international groups, such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), WHO, IEC, NATO, national groups, such as the National Council on Radiation Protection and Measurements (NCRP), the American Conference of Government Industrial Hygienists (ACGIH), and the relevant federal agencies of the US, e.g., FDA, FCC, OSHA, NIOSH, as well as corresponding national agencies of other countries.

1.2 Scope (New)

“Development of standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 GHz relative to the potential hazards of exposure of humans, volatile materials, and explosive devices to such energy. Such standards will be based on established effects and will include safety levels for human exposure to electric, magnetic and electromagnetic fields, including induced currents from such fields, methods for the assessment of human exposure to such fields, standards for products that emit electromagnetic energy by design or as a by-product of their operation, and environmental limits.”

1.3 Membership

With the leadership of Dr. Tom McManus, former Membership Chairman, Dr. Sheila Johnston, Membership Chairman, and Dr. Michael Murphy, International Liaison Chairman, the non-US membership of ICES continues to grow. During the period covered by this report, four new members were added to TC-95.

Table 1—ICES AdCom

| Office | Name | Affiliation |
|---|---------------------|---|
| Chairman | Ronald C Petersen | R. C. Petersen Associates, LLC (US) |
| Vice Chairman | Dr. Ralf Bodemann | Siemens AG (DE) |
| Past Chairman/Executive Secretary | Dr. Eleanor Adair | Independent Consultant (US) |
| Chairman Emeritus | Dr. John Osepchuk | Full Spectrum Consulting (US) |
| Treasurer | Arthur Varanelli | Raytheon Company (US) |
| Chairman, International Liaison Committee | Dr. Michael Murphy | Air Force Research Laboratory (US) |
| Past Chairman, Membership Committee | Dr. Tom McManus | Consultant to the Dept of Communications, Marine and Natural Resources (IE) |
| Chairman, Membership Committee | Dr. Sheila Johnston | Independent Consulting Neuroscientist (UK) |
| Vice Chairman TC-34 | Kathy MacLean | APREL Laboratories (CA) |

1.4 Highlights (2004-2005)

The authorization in 2000 by the IEEE Standards Board that SCC-28 be renamed the International Committee on Electromagnetic Safety (ICES) has proved to be a giant forward step toward an international forum for broad consensus in the setting of safety standards across the frequency range of 0 to 300 GHz. During the past few years, ICES, its committees and products have become far better known around the world and we expect this trend to continue.

ICES held its first meeting (as SCC-39) in Dublin Castle, Dublin, Ireland, in June 2005. The five days of meetings of TC-34, TC-95 and their subcommittees were graciously hosted by the Irish Government (Department of Communications, Marine and Natural Resources). The meetings were held in conjunction with the annual meeting of the Bioelectromagnetics Society (BEMS – which were held nearby at Trinity University). This brought a number of non-US attendees from the BEMS meetings to the ICES meetings, thereby strengthening our potential for international recognition and growth.

An International Workshop on Thermal Physiology with Applications to Standards for Electromagnetic Safety (originally proposed in November 2000 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) as a joint ICNIRP/ICES workshop), was held as a joint ICES/COST 281 (European Cooperation in the Field of Scientific and Technological Research: Action 281) workshop in September 2004 at INERIS (Institut National de l’Environnement Industriel et des Risques), outside of Paris. A two-day COST 281 Dosimetry Workshop, which was well-attended by members of ICES, preceded the Thermal Physiology Workshop.

Continuing activities with the World Health Organization EMF Project and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) are aimed at exploring paths

toward the international harmonization of standards for the safe use of electromagnetic energy. The increased international membership in ICES provides greater influence within the international community. ICES continues to be represented at many of the WHO EMF Project meetings world-wide where ICES representatives have given presentations about the role of ICES in international standard setting. For example, Ralf Bodemann (Vice-Chair) presented an update on ICES activities at the WHO Annual International Advisory Committee Meeting, Geneva, 13-14 June 2005; C-K Chou (Co-Chair, TC-95/SC-4) presented a paper "Status of IEEE C95.1 RF Safety Standard Revision" at Bioelectromagnetics 2005, Dublin, 23 June 2005; Michael Murphy (Chairman, International Liaison Committee) presented a paper "Safety Standards for Electromagnetic Energy," at the Union of Radio Science International (URSI) meeting, New Delhi 27 Oct 2005, just to mention a few. In addition, the former Chair of the Membership Committee, Tom McManus, was the main drafter of the WHO Model Legislation document – trying to put into English what others wanted and finding common ground where different opinions existed.

ICES has been invited by special invitation to present at many ICNIRP Commission meetings. Michael Murphy represented ICES at the ICNIRP Commission Meeting in San Antonio in 2005 and ICES has been invited and will be represented at the Commission meeting in Chicago in May 2006.

Other highlights during the year include:

- a) A new standard, C95.7-2005, "IEEE Recommended Practice for Radio Frequency Safety Programs" was approved at the September 2005 SASB meeting and published in March 2006. This document provides the elements of an RF safety program that will be useful to those implementing IEEE C95.1-2005.
- b) The revision of IEEE Std C95.1-1991 (1999 edition), "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," was approved at the September 2005 SASB meeting and published in April 2006. Approval of this standard was appealed – the appeal was heard by the Appeals Panel at the March 2006 SASB meetings and the appeal was denied.
- c) IEEE Std 1528a, "Amendment 1: Include CAD File for Human Head Model (SAM Phantom)," to IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques," was approved at the September 2005 SASB meeting and published in February 2006.
- d) The last of four well-received short-courses to introduce IEEE Std C95.6-2002 (IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0 to 3 kHz) was held in Dublin Ireland in June 2005. The first was held in conjunction with the "Canadian Electrical Association (CEA) Subcommittee on EMF" Workshop in Ottawa, Canada in March 2003; the second was held in Washington DC in June 2004, the third in San Antonio, TX in December 2004, the fourth in Dublin, Ireland in June 2005. All were well-attended and the feedback was very positive. Plans are being made to present similar short-courses that address the IEEE C95.1-2005 and C95.7-2005.
- e) The Executive Committee (ExCom – now the AdCom) met in San Antonio and Dublin and four times by teleconference during the past 12 months. In addition, informal meetings of ExCom members are held frequently as appropriate. The ICES AdCom plans and arranges the two main meetings per year of TC 34 and 95. It approves (or rejects) applications for

membership on ICES technical committees. Dr. Ralf Bodemann, of Siemens AG in Germany, who serves as ICES Vice Chairman, Dr. Tom McManus, consultant to the Irish Department of Communications and Natural and Marine Resources and former ICES Membership Committee Chairman, Dr. Sheila Johnston, an independent consulting neuroscientist from the UK and current ICES Membership Committee Chairman, and Dr. Michael Murphy, US Air Force Research Laboratory and Chairman of the International Liaison Committee, have become the ICES roving ambassadors to the EU member states and have given several presentations in support of ICES and the IEEE open consensus process in standards setting. Dr. Michael Murphy also serves as ICES liaison to the Bioelectromagnetics Society (BEMS) and attends meetings of the BEMS Board of Directors and attends many of the WHO EMF Project meetings.

2. Technical Committee-34

2.1 Scope

The scope of Technical Committee 34 (TC-34) is “the development of product performance standards relative to the safe use of electromagnetic energy for specific products that emit electromagnetic energy at frequencies between 0 and 300 GHz, i.e., the frequency range covered by the basic restrictions and maximum permissible exposure (MPE) values developed by the IEEE International Committee on Electromagnetic Safety (ICES).”

Standards developed by TC-34 are expressed in terms of easily measured parameters, e.g., output power, current, voltage, which are derived from the basic restrictions and MPE values found in the latest revisions of IEEE Std C95.1 and C95.6. Included in the scope are standards, guides and recommended practices that describe measurement and computational protocols for determining compliance with the basic restrictions and derived limits (MPEs) found in the IEEE C95 standards and in other relevant national and international standards and guidelines. This committee was originally a collaborative effort between IEEE and the Electromagnetic Energy Association (EEA); the EEA was disbanded in August 2001.

2.2 Membership Rosters

(See Table TC-34-2 through Table TC-34-5.)

2.3 Meetings (2005-2007)

2.3.1 Main Committee

- June 17, 2004 – Washington, DC, in conjunction with the semi-annual ICES (TC-95) meetings and the BEMS Annual Meeting
- June 27, 2005 – Dublin Ireland, in conjunction with the semi-annual ICES TC-95 meetings and the BEMS Annual Meeting
- June 2006, Cancun, Mexico (tentative)
- Spring 2007, London, England (tentative)

2.3.2 Subcommittee 1 (Recreational Marine Radar) ¹

- June 17, 2004 – Washington DC (informal)
- June 2005 – Dublin Ireland (informal)
- December 2005 – San Antonio, TX

¹ Because of the decreasing lack of interest by the federal agencies, this subcommittee decided against moving forward with a standard on small boat radars and instead will draft a Committee on Man and Radiation (COMAR) Technical Information Statement for publication in EMB-S Magazine.

2.3.3 Subcommittee 2 (Wireless Handset Certification)

- Jan 18-19, 2005 – Rockville, MD
- May 2, 2005 – by teleconference
- June 27-28, 2005 – Dublin Ireland, including joint meeting with IEC TC106, Project Team 62209 (June 28)
- September 13, 2005 – by teleconference
- November 7-10, 2005 – Ottawa, Ontario, including joint meeting with IEC TC106, Project Team 62209 (November 9-10)
- March 10 2006 – by teleconference
- April 3-4, 2006 - Stockholm, Sweden, including joint meeting with IEC TC106, Project Team 62209 (April 5)
- June 9-10, 2006, Cancun, Mexico, including joint meeting with IEC TC106, Project Team 62209 (June 11)
- August 22, 2006 – by teleconference
- October 24-25, 2006 in Tokyo, including joint meeting with IEC TC106, Project Team 62209 (October 26)
- February 19, 2007, Rockville, MD or Plantation, FL
- June 2007 at BEMS '07

2.3.4 Subcommittee 3 (RF Protective Garments)

- June 2005 – Dublin Ireland (informal)
- December 8, 2005 – San Antonio, TX
- August 2006 – Richland WA (tentative)

2.4 Main Committee and Subcommittee Status

2.4.1 Main Committee

Additional representatives from outside the US have been added to the committee (including the Chairman of CENELEC). (See Table for TC-34 leadership and Table TC-34-2 through Table TC-34-5 for membership information.) The first standard developed by TC-34, IEEE Std 1528-2003, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques,” was approved at the June 2003 SASB meeting; 1528a, “Amendment 1: Includes CAD File for Human Head Model (SAM Phantom),” was approved at the September 2005 SASB meeting and published in February, 2006

Table TC-34-1
TC-34 Leadership

| Position | Name |
|------------------|------------------------------|
| Chair- | Ronald C Petersen |
| Vice-Chair | Kathy MacLean |
| Secretary | John M. Osepchuk |
| Treasurer | Arthur Varanelli |
| Chair –SC-1 | Arthur Varanelli |
| Co-chairs – SC-2 | Mark Douglas, Wolfgang Kainz |
| Chair – WG-1 | Mark Douglas |
| Chair – WG-2 | Wolfgang Kainz |
| Chair SC-3 | Richard A. Tell |

2.4.2 Subcommittee 1 (Recreational Marine Radar)

In 1997 the current chair of SC-1 met with FCC Office of Engineering and Technology (OET) Senior Scientist Dr. Robert Cleveland to discuss their interest in standards relating to recreational marine radar. Dr. Cleveland indicated that an IEEE product performance standard would address FCC RF exposure concerns and that the FCC would encourage the development of such a standard. Following this meeting and expressed interest by the FDA Center for Devices and Radiological Health (CDRH) in small boat radar as a consumer electronic product, TC-34 Subcommittee 1 (SC-1) was established to consider the development of a standard to address the safety aspects of these devices. The standard would include measurement techniques for assessing exposure, rules of thumb for mounting radars based on average output power, and other practical guidance. Potential members from pleasure-boat radar manufacturers were identified and agreed to participate on SC-1 once a clear objective was defined (see Table 2 for membership information). Over the past 5 years members of SC-1 met informally a number of times, and also met with FCC and FDA/CDRH staff. During this time, however, emphasis by the federal agencies has shifted to other devices, e.g., article surveillance and anti-theft devices. Moreover, the work of SC-2 (wireless handsets) was of paramount importance to both the FDA and the FCC and with the limited resources of both agencies, their effort has been devoted to completing the wireless handset standard (IEEE Std 1528-2003) and Amendment 1 to 1528 (P1528a). Although a PAR for a small-boat radar standard has not yet been submitted, a dialog was established with the interested parties identified in Table TC-34-2. Because of the decreasing lack of material interest in these devices by the federal agencies, SC-1 decided against moving forward with a standard on small boat radars and instead will draft a Committee on Man and Radiation (COMAR) Technical Information Statement for publication in EMB-S Magazine. The possible need for standards addressing other devices is now being explored by the subcommittee.

2.4.3 Subcommittee 2 (Certification of Wireless Handsets)

Subcommittee 2 was established in February 1997 to develop standard protocols for certifying that certain portable wireless devices, such as hand-held radio transceivers, wireless LANs and similar devices, meet specific absorption rate (SAR) criteria. Initially two working groups were established within SC-2 to develop measurement (WG-1 – P1528) and computational (WG-2 – P1529) protocols for certifying that hand-held mobile phones meet the prescribed SAR limits of IEEE Std C95.1 and other standards and guidelines, e.g., ICNIRP. Although the scope of SC-2 covers a variety of devices, it initially focused on a recommended practice (P1528) devoted exclusively to handsets used for personal wireless communication services. The first standard (IEEE Std 1528-2003) specifies protocols for the measurement of the peak spatial-average SAR in the head of users of certain hand-held radio transceivers that are used for personal wireless communications, operate in the 300 MHz – 3 GHz frequency range, and are intended to be operated while held against the ear. Specifically, this recommended practice describes the concepts, measurement techniques, instruments, calibration techniques, phantom models for SAR system validation, and limitations of systems used for measuring the radio frequency (RF) electric field strength for purposes of determining the spatial-peak mass-averaged SAR, e.g., per 1 gram or 10 grams of tissue, in simulated tissue models, including homogeneous anatomical models of the human head. Some of the protocol requirements of IEEE Std 1528-2003 have been incorporated into IEC Std 62209 and “Supplement C” of the FCC Office of Engineering and Technology (OET) Bulletin 65. The standard is also expected to be adopted by the FCC by reference. Because of the urgency, the major activity of TC-34/SC-2 was the work of WG-1 (IEEE Std 1528-2003 and Amendment 1 – 1528a-2005). Although WG-2 developed a partial draft of a complementary standard based on numerical techniques, this draft was put on hold and the PAR (P1529) withdrawn pending completion of 1528-2003.

Effective September 30, 2005, Howard Bassen (USFDA/CDRH), Chair of SC-2 since it was established, stepped down as Chair. SC-2 is now co-chaired by Wolfgang Kainz (USFDA/CDRH) and Mark Douglas (Motorola Research Laboratories). The membership of SC-2 now stands at approximately 60, with many members from Europe and the Far East (see Table 3 for membership information). Approximately one-fourth to one-third of the membership has attended each of the subcommittee/working group meetings held since August 1997. (Additional meetings, e.g., Editorial WG meetings, are much smaller and attended mainly by the section editors of the P1528 and P1529 drafts.) In addition, a Standards Harmonization Working Group was established that in the beginning met with other product-standards developers (ARIB, CENELEC TC106X and IEC TC106). These committees are also developing similar standards for measurement protocols. (Because of common membership on these committees, the International Harmonization Working Group was disbanded.) While the IEC and CENELEC standards and the IEEE standard are in complete harmony, IEEE Std 1528-2003 is by far the most comprehensive and detailed of the three documents.

2.4.3.1 Subcommittee 2-Working Group 1 (Measurement Techniques)

The primary tasks of WG 1 in 2005 and 2006 were to expand the 1528 standard. Major accomplishments of WG 1 include the following:

- Joint meetings were held (and continue to be held) with IEC TC-106 – PT 62209 (Procedure to measure the specific absorption rate (SAR) in the

frequency range of 300 MHz to 3 GHz – Part 1: Hand-held mobile wireless communication devices) to harmonize each group’s standard on measurement of SAR in head phantoms exposed to wireless handsets.

- An international inter-comparison of measured SAR in a rectangular, dielectric-filled phantom was initiated in 2003. Participants included many labs associated with the Mobile Manufacturers’ Forum (MMF). The MMF sponsored this project that involved measurements taken in labs of MMF members in Asia, Europe, and North America. This inter-comparison was completed successfully in Feb 2004. A paper has been written on the design and results and was submitted to the *IEEE Transactions on Microwave Theory and Techniques*.
- Amendment 1 to IEEE Std 1528-2003 entitled, “IEEE 1528a - Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques - Amendment 1: CAD File for Head Model (SAM)” was balloted, approved by the IEEE SASB in September 2005 and published in February 2006.
- A PAR for Amendment 2 of IEEE Std 1528-2003, entitled, “IEEE P1528b - Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques. Amendment 2: Additional Procedures for SAR Measurement at 3 - 6 GHz,” was approved at the September 2005 SASB meeting. This PAR extends the frequency range of 1528-2003 to 6 GHz (from 3 GHz).

2.4.3.2 Subcommittee 2-Working Group 2 (Numerical Techniques)

Because of the focus on completing IEEE Std 1528-2003, work on P1529 (computational techniques) has been slow. WG-2 was recently reconstituted and met several times since January 2003 to begin updating and completing the draft (now approximately 50% complete). Major accomplishments of WG-2 include the following:

- Explored the needs for additional computational compliance standards and a computational standard for active implantable medical devices was proposed. A teleconference with ADVAMED and implant manufacturers followed. Implant manufacturers, specifically Medtronic, made it clear that currently a computational standard for active implantable medical devices is not needed. Implant manufacturers and ADVAMED met later during the year again and concluded that a specific standard is not required at this time because of the following reasons:
 - Industry experience is limited at this point as MICS equipment is currently being developed
 - The development of a standard might be more appropriate a few years down the road as the industry understands computations modeling better
 - Current FCC requirements are sufficient;

- The ultra low power of the AIMD MICS technology - the SAR values for

WG-2 agreed that to reevaluate this decision in the future as circumstances change and as the industry accumulates more experience with devices of this type. The industry will maintain a dialog with WG 2 and remain alert for additional information that might warrant industry participation in the development of a computational standard for SAR.

- A new concept for computational compliance standards was proposed. The new concept is based on a document defining the general requirements for using the Finite Difference Time Domain (FDTD) method for computational compliance. Standards for specific compliance needs can be developed building on these general requirements. WG-2 proposed the development of P1528.1, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations," and P1528.2, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antennas." PARs P1528.1 and P1528.2 were approved at the September 2005 SASB meeting. Detailed outlines for P1528.1 and P1528.2 have been developed by WG-2.
- Commenced work on developing a protocol for inter-comparison of various numerical simulation tools and head models, including the SAM (Specific Anthropomorphic Mannequin) phantom developed by members of SC-2/WG-1. The CAD file for SAM, which will be included with IEEE Std 1528a-2005, has also been adopted by IEC (P62209). A number of other head models will be compared by WG-2 members via an inter-laboratory comparison program. The purpose of this program is to assess the overall uncertainty and accuracy of the numerical simulation software now being used throughout the world by comparing SAR distributions in each of the head models.
- Released (July 1, 2005) "Draft Protocol for the Computational Comparison of the SAM Phantom to Anatomically Correct Models of the Human Head."
- A major medical device manufacturer (Medtronic) asked FCC for additional frequency allocations for MICS applications and a low-power exclusion for AIMDs (Active Implantable Medical Devices) is under FCC's consideration, an area of interest and possible opportunity to TC-34.
- Issues relating to the SAM CAD files were resolved. Legitimate copies of the SAM CAD data are now available from a number of sources. A digital signature procedure of the SAM CAD file is therefore no longer necessary.
- Code validation procedures and uncertainty procedures for computational compliance methods have been a major topic of interest leading to in-depth discussions at the WG meetings.

- A proposal for a new project, P1528.3 “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Mobile Phones/Personal Wireless Devices” was approved by the WG. A PAR, P1528.3 was submitted to NesCom and approved by the SASB at the March 2006 meeting. Timeline for 1528.3 development is 5 years – a partial draft was discussed at the April 2006 meeting in Stockholm. The drafting group chair is working closely with section authors of P1528.1 and P1528.2 to achieve consistency of the documents and avoid overlap.
- P1528.1: It was decided not to include FDA’s repaired anatomical CAD models. P1528.1 will recommend the SAM phantom, the elliptical phantom described in IEC 62209 and the “Virtual Family” which is currently under development.
- Members of SC-2/WG-2 are coordinating with IEEE 1597.
- Section authors for P1528.1 and P1528.2 presented first drafts in Stockholm, Sweden (3-5 April 2006).
- Members of SC-2/WG-2 are preparing draft sections on ‘Uncertainty’ for P1528.1 and P1528.1. A first draft will be presented at the meeting in Cancun in June 2006.
- The ‘Code Validation’ sections for P1528.1 and 1528.2 are being prepared – the first draft will be presented at the meeting in Cancun in June 2006.
- A healed version of the SAM CAD files from 1528 were distributed and tested by various groups. The healed version was not compatible with all existing software. A new approach is needed to solve the problem of a unified and healed SAM CAD model. Experts in CAD recommend contracting this task to CAD specialists. Funding for this project will be discussed in the meeting in Cancun in June 2006.
- A number of Items discussed in the current 1528.2 draft need additional or benchmark validations to verify error margins and appropriateness before they can be recommended as suitable procedures in 1528.2.
- The committee had in depth discussions if other methods than FDTD should be included in 1528.1. A section to 1528.1 defining what is meant by FDTD and possible FDTD extensions (e.g. FIT) will be added to the draft.
- A PAR for other CEM (Computational Electromagnetic Methods) is being considered.

2.4.3.3 Subcommittee 2-Working Group 3 (Body-Worn Devices)

WG-3 was established at the May 2002 meeting to explore interest in a standard for certifying body-mounted devices and extending the frequency range covered by IEEE Std 1528 from 3 to 6 GHz. There was little interest by the FCC and others in extending the scope of 1528 to include body-worn devices. Instead, the

decision was made to enter into a “Category D” Liaison” relationship with IEC TC106/ PT 62209 for the following reasons:

- The IEC project team is already developing a draft addressing these issues (Part 2 of P62209),
- There are a number of TC-34 subcommittee members who are also members of IEC PT62209. It was agreed that a “Category D” liaison would be the most expeditious route to follow, i.e., working with IEC rather than working in parallel (to develop an amendment to IEEE Std 1528). The IEC SMB approved the “Category D” liaison in November, 2002.

2.4.4 Subcommittee 3 (Evaluation of RF Protective Clothing)

SC-3 was established at the June 1998 SCC-34 Annual Meeting to develop protocols for characterizing RF-protective garments. The federal agencies, garment manufacturers, their representatives and a number of academics joined the subcommittee (see Table 4 for membership information). Currently several manufacturers supply such garments and each tests the performance of the clothing according to their own in-house protocols. The garment manufacturers and the FCC, OSHA and NIOSH (who consider the use of protective garments as a means for controlling exposure) have encouraged the development of standardized procedures for testing the effectiveness of such garments.

The first official meeting of SC-3 was held on January 27, 1999 in Ft. Lauderdale, FL. At this meeting, it was agreed that the subcommittee should develop a draft "Recommended Practice for Evaluating the Performance Characteristics of RF Protective Clothing." The following scope was suggested:

“This Recommended Practice applies to clothing that is worn to protect persons from excessive exposure to radiofrequency electromagnetic fields. It addresses SAR, induced and contact current reduction, and surface arcing issues. While providing guidance on matters related to but not limited to flammability, durability, comfort, heat stress, and visual acuity, this recommended practice does not address applicable industrial textile requirements.”

A rough outline of a Recommended Practice was produced by May 30, 1999 for discussion at the second meeting of the subcommittee held on June 18, 1999 in Long Beach, CA. Lengthy discussion during the second meeting suggested the need to revisit the overall outline prior to submitting a PAR. Informal meetings were held in 2001, 2002, 2003, 2004 and 2005 to try to reach consensus on the outline but so far the scope is tentative. A formal meeting of SC-3 was held in conjunction with other TC-34 meetings in December 2005 in San Antonio, TX. The primary purpose of the December 2005 meeting was to reach a decision on the continuation of the subcommittee or its dissolution. Extended discussion was held at the meeting as well as a presentation by an industry representative who manufactures RF protective clothing. It was decided that, while there seems to be a general lack of interest in RF protective clothing, it would be a mistake to abandon the project. Hence, it was decided that the SC would resurrect the existing very preliminary draft of a Recommended Practice and work to finalize the document, perhaps as a Guide rather than a Recommended Practice. Following the next meeting of SC-3 in New Jersey in August 2006, a PAR will be prepared and submitted to IEEE describing the project.

2.5 PARs (SC-2)

Subcommittee 2 (certification of wireless handsets) is the only TC-34 subcommittee that has submitted PARs. SC-3 is expected to submit a PAR when a clear objective and timelines are established. The following TC-34/SC-2 PARs have been approved:

2.5.1 P1528b (Approved September 2005)

Title: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques. Amendment 2: Additional Procedures for SAR Measurement at 3 – 6 GHz

Project scope: The scope of this project is to specify protocols for the measurement of the peak spatial average SAR in a simplified model of the head of users of handheld radio transceivers used for personal wireless communications services and intended to be operated while held next to the ear. It applies to contemporary and future devices with the same operational characteristics as contemporary devices that operate in the 300 MHz–6 GHz frequency range and provides a conservative estimate of the peak spatial average SAR representative of that which would be expected to occur in the heads of a significant majority of persons during normal use of these devices, but which may not be the absolute maximum value that could possibly occur under every conceivable combination of head size, head shape, handset orientation, and spacing relative to the head.

Project purpose: The purpose of this project is to extend the frequency range of IEEE 1528 to include the frequency range 3 – 6 GHz. This extension would bring the total applicable frequency range of IEEE 1528 to be 300 MHz – 6 GHz. Recommendations are needed for the measurement resolution, the probe geometry, the phantom specifications, the dielectric parameters of tissue equivalent liquids, and other measurement parameters.

2.5.2 P1528.1 (Approved September 2005)

Title: Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations

Project scope: This recommended practice describes the concepts, anatomical models for compliance assessments, techniques, validation procedures, uncertainties and limitations of the finite-difference time-domain technique (FDTD) when used for determining the spatial peak specific absorption rate (SAR) in standardized human anatomical models exposed to wireless communication devices. Recommendations for standardized anatomical models and general benchmark data for these models are provided. Specific SAR limit values (basic restrictions) are not included since these are found in other documents, e.g., IEEE C95.1-200X.

Project purpose: The purpose of this recommended practice is to specify numerical techniques and standardized anatomical models used for determining the spatial peak specific absorption rates (SAR) in the human body of users for wireless communication

devices. SAR is determined by applying Finite Difference Time Domain (FDTD) techniques to simulate the field conditions produced by wireless devices in anatomically correct models of the human anatomy. Intended users of this practice will be (but will not be limited to) wireless communication device manufacturers and wireless service providers that are required to certify that their products comply with the applicable SAR limits, and government agencies.

2.5.3 P1528.2 (Approved September 2005)

Title: Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antenna Configurations

Project scope: This recommended practice describes the concepts, techniques, vehicle models, validation procedures, uncertainties and limitations of the finite-difference time-domain technique (FDTD) when used for determining the spatial-peak specific absorption rate (SAR) in standardized human anatomical models exposed to vehicle mounted antennas. Recommended vehicle models and general benchmark data for these models are provided. Antenna locations, operating configurations, exposure conditions and positions of persons exposed to the vehicle mounted antennas are defined. Intended users of this practice will be (but will not be limited to) wireless communication devices manufacturers, service providers for wireless communication that are required to certify that their products comply with the applicable SAR limits and government agencies. Specific SAR limit values (basic restrictions) are not included since these are found in other documents, e.g., IEEE C95.1-200X.

Project purpose: The purpose of this recommended practice is to specify numerical techniques, anatomical models, and vehicle models used for determining the spatial peak specific absorption rates (SAR) in the human body when exposed to vehicle-mounted antennas used by wireless communication devices. SAR is determined by applying Finite Difference Time Domain (FDTD) techniques to simulate the field conditions produced by wireless devices in standardized anatomically correct models of the human anatomy.

2.5.4 P1528.3 (Approved March 2006)

Title: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Mobile Phones/Personal Wireless Devices

Project scope: The scope of this project is to describe the concepts, techniques, models, validation procedures, uncertainties and limitations of the finite-difference time-domain technique (FDTD) when used for determining the spatial-peak specific absorption rate (SAR) in standardized human anatomical models. These models are exposed to personal wireless devices, e.g. mobile phones. It recommends and provides guidance on modeling of personal wireless devices and provides benchmark data for simulation of such models. It defines model contents and provides guidance on meshing and test positions at the anatomical models. This document will not recommend specific SAR values since these are found in other documents, e.g., IEEE C95.1-1999.

Project purpose: The purpose of this document is to specify numerical techniques, and anatomical models to determine spatial peak specific absorption rates (SAR) in the human body of persons exposed to personal wireless devices. SAR will be determined by applying Finite Difference Time Domain (FDTD) techniques to simulate the field conditions produced by wireless devices. It will use standardized anatomically correct models of the human anatomy.

Project reason: Computational electromagnetic techniques have reached a level of maturity which allows their use in compliance assessments of professional and consumer wireless communication devices. The increasing costs of assessing product compliance with exposure standards calls for new compliance techniques. Such techniques should be time efficient and cost effective. The benefits to the user include standardized and accepted protocols and standardized anatomical models, validation techniques, benchmark data, reporting format and means for estimating the overall uncertainty in order to produce valid and repeatable and reproducible data. Intended users of this practice will be (but will not be limited to) wireless communication devices manufacturers, service providers for wireless communication that are required to certify that their products comply with the applicable SAR limits and government agencies.

2.6 Drafts

2.6.1 SC-2 (Working Group 1: Measurement Techniques)

The final draft of IEEE Std 1528a was approved at the SASB September 2005 meeting.

2.6.3 SC-2 (Working Group 2: Computational Techniques)

Partial first working drafts of P1528.1, P1528.2 and 1528.3 have been prepared. Important decisions have been made and parameters defined, e.g., head model, electrical properties of the dielectric phantom head material, distance between the handset and the head, measurement positions.

2.7 Website (SC-2)

A website and reflector was set up several years ago for SC-2 and operates successfully. All meeting minutes, action items, motions, and drafts are posted on the web – SC balloting is carried out electronically. The site has recently been updated and reorganized. Public areas contain links to other sites important for SC-2 activities, e.g., the USAF Dosimetry Handbook, Tables of Dielectric Properties of Tissues (Gabriel), schedules for meetings. A private area contains draft sections of the practice, the results of measurements on canonical models, etc.

The website URL is: <http://grouper.ieee.org/groups/scc34/sc2/>

A new reflector was also set up. The address is stds-tc34sc2@ieee.org

2.8 Objectives and goals for the past year and the TC's performance relative to meeting these goals and objectives.

- Publish amendment IEEE 1528a. (2nd Q 05) – Met
- Submit PAR for IEEE 1528b. (3rd Q 05) – Met

- Hold ICES TC-34 SC-2 meetings, including joint meetings with IEC 62209 to foster harmonized measurement standards (4th Q 05) – Met
- Complete outline for a recommended practice for the evaluation of RF-protective garments. (3rd Q 05) – Not met (ongoing)
- Develop scope and outline for a recommended practice for small boat radars or abandon project. (3rd Q 05) – Met (project dropped)
- Submit PAR for recommended practice on RF protective clothing. (3rd Q 05) – Not met (ongoing)
- Hold Ninth Annual Meeting of main committee. (2nd Q 05) – Met
- Complete outline and submit PAR for proposed P1528.1 “Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations.” Replaces P1529. (2nd Q 05) – Met
- Complete outline and submit PAR for proposed P1528.2 “Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antenna Configurations.” (4th Q 05) – Met
- Complete outline and submit PAR for proposed 1528.3, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices: Specific Requirements for Modeling Communication Devices Used in Combination with Vehicles.” (4th Q 05) – Met but scope has been modified)
- Explore the need for a standard for the assessment low-frequency magnetic field security devices. (2nd Q 05) – Not met (ongoing)
- Meet with IEEE staff to explore fund-raising possibilities to support TC-34 and TC-95. (1st Q 05) – Ongoing
- Invite implant manufacturers to participate in the development of a “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices: Specific Requirements for Modeling Medical Implants Using the Medical Implant Communications Service (MICS).” (1st Q 05) – Met

2.9 Current levels of activity with milestones indicated

- Complete outline for a recommended practice for the evaluation of RF-protective garments. (3rd Q 06)
- Submit PAR for recommended practice on RF protective clothing. (3rd Q 06 following New Jersey meetings in August 2006)
- Develop 1st Draft of 1528b. (4th Q 06)

- Hold Tenth Annual Meeting of main committee. (2nd Q 06)
- Complete 1st working draft of P1528.1 “Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz – 6 GHz: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations.” (4th Q 06)
- Complete 1st working draft for P1528.2 “Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz – 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antenna Configurations.” (2nd Q 07)
- Complete 1st working draft for 1528.3, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Mobile Phones/Personal Wireless Devices.” (2nd Q 07)
- Explore the need for a standard for the assessment low-frequency magnetic field security devices. (2nd Q 06)
- Complete the process of establishing an umbrella AdCom with oversight over TC-34 and TC-95. (1st Q 06)
- Complete revision of TC-34 P&Ps. (1st Q 06)
- Develop a healed version of the SAM CAD files. A new approach is needed to solve the problem of a unified and healed SAM CAD model. (2nd Q 07)

2.10 IEEE Staff support requirements

In the past, secretarial services for SC-2 provided by the Cellular Telecommunications and Internet Association (CTIA) are now provided by volunteer committee members. Support in setting up meetings at IEEE Piscataway has been required in the past; availability of the IEEE Staff Engineer at meetings held at IEEE is desirable. Since Bill Ash is the Staff Engineer for both TC-34 and TC-95, his attendance at the semi annual/annual TC-34 meetings is appropriate. His engineering background and broad knowledge of IEEE procedures is invaluable to this committee.

2.11 Summary of other activities

2.11.1 Liaison with other committees

Liaison with ICES occurs via the circulation of drafts, common membership and common meetings of TC-34 and ICES. Liaison with CENELEC, IEC, ARIB and other standards developing organizations is via common membership, sharing of drafts and meetings with members of the SC-2 harmonization WG, and “Category D” liaisons. Coordination has also been established with IEEE societies, e.g., EMC-S via representation on the Standards and Advisory Coordination Committee (SACCom).

2.12 Committee Operating Procedures

(See Annex A)

2.13 Membership

See Table TC-34-2 through Table TC-34-5 for committee and subcommittee membership information and the attached Excel file for detailed membership information for TC-34 Main Committee.

Table TC-34-2
TC-34 Membership: Main Committee (May 2006)

| | LAST NAME | FIRST NAME | MI | AFFILIATION | INTEREST* |
|-----|-------------|------------|----|------------------------------------|-----------|
| 1. | Adair | Eleanor | R. | Independent Consultant | GI |
| 2. | Aslan | Edward | | L-3 Microwave NARDA. | P |
| 3. | Babij | Tadeusz | M. | Florida International University | GI-(A) |
| 4. | Baron | David | | AIHA Representative | P |
| 5. | Bassen | Howard | | FDA/CDRH | GI-(G) |
| 6. | Beard | Brian | | FDA/CDRH | GI-(G) |
| 7. | Bell | Clark | H | HF Plus | U |
| 8. | Chadwick | Philip | | MCL | GI |
| 9. | Chan | Kwok | W | FCC Laboratory | GI-(G) |
| 10. | Chou | C.K. | | Motorola, Inc. | P |
| 11. | Cleveland | Robert | F. | FCC, Office of Eng. & Technology | GI-(G) |
| 12. | Curtis | Robert | A. | OSHA - USDOL | GI-(G) |
| 13. | Dini | David | | Underwriters Laboratory | U |
| 14. | Douglas | Mark | | Motorola research Labs | P |
| 15. | Foster | Kenneth | R. | Univ. of Pennsylvania | GI-(A) |
| 16. | Gandhi | Prof. Om | P. | Univ. of Utah, Dept. of Elec. Eng. | GI-(A) |
| 17. | Guy | Arthur | W. | Bioelectromagnetics Consulting | GI |
| 18. | Hare | Ed | | American Radio Relay League | GI |
| 19. | Joyner | Kenneth | | Motorola Australia Pty, Ltd | P |
| 20. | Kainz | Wolfgang | | FDA/CDRH | GI-(G) |
| 21. | Kim | Nam | | Chungbuk National University | GI-(A) |
| 22. | Kuster | Niels | | IT'IS | GI |
| 23. | MacLean | Kathy | | APREL Laboratories-SSI | U |
| 24. | Mason | Patrick | A. | USAF/AFRL/HEDR | GI-(G) |
| 25. | Osepchuk | John | M. | Full Spectrum Consulting | GI |
| 26. | Petersen | Ronald | C. | R C Petersen Associates LLC | GI |
| 27. | Santomaa | Veli | A | Independent Consultant | GI |
| 28. | Scanlon | William | G. | Center for Comm Eng | GI-(A) |
| 29. | Tell | Richard | A. | Richard Tell Assoc. Inc. | GI |
| 30. | Thansandote | Art | | Health Canada | U |
| 31. | Toropainen | Anssi | | Nokia Research Ctr. | P |
| 32. | Varanelli | Arthur | G. | Raytheon Company | P |

GI = General Interest

GI (A) = General Interest (Academic)

GI (G) = General Interest (Government)

P = Producer

U = User

Table TC-34-3**TC-34 Membership: Subcommittee 1 (Small Boat Radar)**

| | LAST NAME | FIRST NAME | MI | AFFILIATION |
|----|------------------|-------------------|-----------|---------------------------|
| 1. | Adair | Eleanor | R | Independent Consultant |
| 2. | Bell | Clark | H | HF Plus |
| 3. | Dini | David | | Underwriters Laboratory |
| 4. | Mantiplay | Ed | | FCC |
| 5. | Osepchuk | John | M | Full Spectrum Consulting |
| 6. | Petersen | Ronald | C. | R. C. Petersen Associates |
| 7. | Varanelli | Arthur | G | Raytheon Company |

Table TC-34-4

TC 34 Membership: Subcommittee 2 (Certification of Wireless Handsets)

| | LAST NAME | FIRST NAME | AFFILIATION |
|-----|--------------|-------------|------------------------------------|
| 1. | Balzano | Quirino | University of Maryland |
| 2. | Bassen | Howard | FDA/CDRH (HFZ 133) |
| 3. | Beard | Brian | FDA/CDRH (HFZ 133) |
| 4. | Bit-Babik | Giorgi | Motorola Labs |
| 5. | Björn | Thors | Ericsson |
| 6. | Buris | Nicholas | Motorola Labs |
| 7. | Cardinal,PhD | Paul | Research in Motion |
| 8. | Case | David | Cisco Systems Corporate Compliance |
| 9. | Chan | Kwok | FCC Laboratory |
| 10. | Choi | Hyung-Do | ETRI |
| 11. | Chou | C.K. | Motorola, Inc. |
| 12. | Chirs | Penney | REMCOM |
| 13. | Christ | Andreas | It'IS ETHZ |
| 14. | Cleveland | Robert | FCC |
| 15. | Davis | Christopher | University of Maryland |
| 16. | Douglas | Mark | Motorola, Inc. |
| 17. | Faraone | Antonio | Motorola, Inc. |
| 18. | Foster | Kenneth | Univ. of Pennsylvania |
| 19. | Gabriel | Sami | Vodafone Group Services Ltd. |
| 20. | Graff | Bill | American TCB, Inc |
| 21. | Grangeat | Christophe | Alcatel |
| 22. | Harrington | Tim | FCC |
| 23. | Heirman | Donald | Don HEIRMAN Consultants |
| 24. | Ivans | Veronica | Medtronic |
| 25. | Jiang | Deng | Huawei Technologies Co Ltd |
| 26. | Kainz | Wolfgang | USFDA/CDRH |
| 27. | Kang | Gang | Sigrity, Inc |
| 28. | Karkkanien | Kimmo | Nokia |
| 29. | Kee | Victor | Ultratech |
| 30. | Keshvari | Jafar | Nokia |
| 31. | Kuster | Niels | It'ls |
| 32. | Lazzi | Gianluca | North Carolina State University |
| 33. | Lee | Ae-kyoung | ETRI |

| | LAST NAME | FIRST NAME | AFFILIATION |
|-----|---------------|------------|------------------------------------|
| 34. | Li | C. | Kyocera Wireless |
| 35. | Loader | Benjamin | National Physical Laboratory |
| 36. | Lu | Lin | Kyocera Wireless |
| 37. | Luebbers | Raymond | Remcom Inc |
| 38. | MacLean | Kathy | APREL Laboratories |
| 39. | Moller | Paul | Motorola, Inc. |
| 40. | Manning | Mike | IndesSAR Ltd |
| 41. | Nappert | Hughes | Industry Canada |
| 42. | Nicol | Stuart | APREL Laboratories |
| 43. | Okoniewski | Michael | University of Calgary |
| 44. | Onishi | Teruo | NTT DOCOMO |
| 45. | Petersen | Ronald | R C Petersen Associates LLC |
| 46. | Picard | Stephane | IC GC CA |
| 47. | Plicanic | Ramadan | Sony Ericsson Mobile AB |
| 48. | Pokovic | Katja | Schmid & Partner Eng. AG |
| 49. | Prokop | Alexander | Ansoft |
| 50. | Schulteis | Geoff | Airprime Inc |
| 51. | Seabury | David | ETS-Lundgren |
| 52. | Shah | Yogi | Guidant |
| 53. | Siegbahn | Martin | Ericsson |
| 54. | Slättman | Peter | Ansoft |
| 55. | Slesin | Louis | Microwave News |
| 56. | Tanabe | Shinji | Mitsubishi Electric Corp |
| 57. | Törnevik | Christer | Ericsson |
| 58. | Toropainen | Anssi | Nokia Research Center |
| 59. | Wittig | Tilmann | Computer Simulation Tech(CST) GmbH |
| 60. | Wojcik, Ph.D. | Jacek | Spectrum Sciences Institute |
| 61. | Ye | Qiubo | Comm Research Center, Canada |
| 62. | You | Feng | Nokia |

Table TC-34-5

TC-34 Membership: Subcommittee 3 (Effectiveness of RF Protective Garments)

| | LAST NAME | FIRST NAME | MI | AFFILIATION |
|-----|-----------|------------|----|-----------------------------|
| 1. | Anderson | Vitas | | TVNZ Australia Pty Ltd. |
| 2. | Baron | David | | AIHA Representative |
| 3. | Bruckner | Gunter | | Teracom Components Inc. |
| 4. | Chou | C.K. | | Motorola, Inc. |
| 5. | Cohen | Jules | | Jules Cohen P.E. |
| 6. | Curtis | Robert | A. | OSHA - USDOL |
| 7. | Davis | Edward | B. | Euclid Garment Manufact |
| 8. | Frazier | William | F | Laurence Behr Assoc |
| 9. | Joyner | Ken | H. | Motorola Australia Pty Ltd. |
| 10. | Kanda | Michael | | Motorola Research Labs |
| 11. | Kuster | Niels | | IT'IS |
| 12. | Maurer | Stewart | | RF & ELF Consultant |
| 13. | Meier | Matthias | | Motorola GmbH |
| 14. | Needy | Robert | | Naval Surface Warfare Ctr. |
| 15. | Petersen | Ronald | C. | R C Petersen Associates |
| 16. | Rowley | Jack | | Telstra Research Labs |
| 17. | Siekmann | Harald | | HVBG - BIA |
| 18. | Simm | Jamie | | IMMAD Broadcast Services |
| 19. | Taylor | Scott | | Nortel |
| 20. | Tell | Richard | A. | Richard Tell Assoc. Inc. |
| 21. | Zakharia | Deanna | | Motorola FLRes Laboratory |

3. Technical Committee -95

3.1 Scope

The scope of ICES TC-95 is:

“Development of standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 GHz relative to the potential hazards of exposure of man, volatile materials, and explosive devices to such energy. It is not intended to include infrared, visible, ultraviolet, or ionizing radiation. The committee will coordinate with other committees whose scopes are contiguous with TC-95.” (The scope remains the same as the scope of SCC-28.)

3.2 Membership Roster

(See Table TC-95-2 through Table TC-95-7.)

Several members of TC-95 have been inactive and their continuing status has been addressed by the Membership Committee. In terms of stakeholders, the membership continues to be well balanced. About 50% of the TC-95 membership are IEEE members, with a fewer number of SA members. This is to be expected and defended in view of the interdisciplinary nature of our membership. TC-95 is grateful for their voluntary contributions under conditions where it would be an unreasonable imposition to require IEEE membership. However, IEEE SA membership is required of all TC-95 leadership (e.g., Committee and Subcommittee Chairs, Co-chairs) and encouraged for all members.

3.3 Meetings (2005-2007)

3.3.1 Main Committee

June 2005, Dublin Ireland
December 2005, San Antonio, TX
June 2006, Cancun Mexico (SC-4 only)
August 2006, IEEE Piscataway, NJ
Spring 2007, London, England (tentative)

3.3.2 Subcommittee 1 (Measurements and Computation)

September 2005, Teleconference
November 2005, Teleconference
January 2006, Rockville, MD
April 2006, Teleconference
August 2006, IEEE, Piscataway, NJ
December 2006 (TBD)
January 2007, Rockville, MD

3.3.3 Subcommittee 2 (Warning Signs, Symbols and Hazard Communication)

June 2005, Dublin Ireland
December 2005, San Antonio, TX
August 2006, Richland, WA
August 2006, IEEE, Piscataway, NJ
Spring 2007, London, England (tentative)

3.3.4 Subcommittee 3 (Safety Levels – 0-3 kHz)

June 2005, Dublin Ireland
December 2005, San Antonio, TX
August 2006, IEEE, Piscataway, NJ
Spring 2007, London, England (tentative)

3.3.5 Subcommittee 4 (Safety Levels – 3 kHz to 300 GHz)

January 2005, Ft Lauderdale, FL (SC-4, Editorial Committee)
June 2005, Dublin Ireland
July 2005, Roslyn, VA (SC-4, Editorial Committee)
December 2005, San Antonio, TX,
June 2006, Cancun, Mexico
Spring 2007, London, England (tentative)

3.3.6 Subcommittee 5 (Safe Distances from Antennas during Blasting Operations)

June 2005, Dublin Ireland
December 2005, San Antonio, TX
June 2006, Cancun Mexico – tentative
December 2006 (TBD)
August 2006, IEEE, Piscataway, NJ
Spring 2007, London, England (tentative)

3.4 Main Committee and Subcommittee Status

3.4.1 Main Committee

A major effort during the past several years has been to increase the membership of ICES, particularly non-U.S. members. TC-95 now has members from Australia (4), Bulgaria (1), Canada (4), China (1), Finland (3), France (1), Germany (1), Greece (3), Hungary (1), Ireland (3), Israel (1), Italy (3), Japan (1), Korea (2), Malaya (1), the Netherlands (2), New Zealand (1), Poland (1), Sweden (1), Slovenia (1), South Africa (2), Switzerland (3), Thailand (1), the United Kingdom (8) and the United States (65).

The following members have been added to TC-95 since the last annual report:

| Name | Affiliation | Country |
|------------------|-------------------------------|----------------|
| James Cassata | US Navy Bureau of Med/Surgery | US |
| Malcolm Packer | Harris Corporation | US |
| Paul Testagrossa | Lucent Technologies | US |
| John Ziriaux | Naval Health Research Center | US |

The TC-95 mailing list now approaches 350, including the many observers on the Subcommittees. Six years ago, the long-standing practice of sending hard copies of our extensive documents through the mail to our global mailing list was discontinued – all communications are now via e-mail and the Internet. The ICES Website contains both open and private sites for TC-95 and its subcommittees. Subcommittee 4 makes all agendas, meeting minutes, white papers, RF research database, draft standard documents, and many special reports available to all, with certain proprietary or working documents available only to members of the subcommittee on private sections of the site. The TC-95 SC-4 literature database, containing more than 2400 titles, now appears on the WHO website and is also accessible to all.

During the past year, one new standard, one revised standard and one reaffirmation were approved by the SASB. Specifically, IEEE C95.1-2005, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” and IEEE C95.7-2005, “IEEE Recommended Practice for Radiofrequency Safety Programs” were approved. C95.1-2005 replaces IEEE C95.1-1991: 1999 edition (including Amendment 2); C95.7 is a new standard. IEEE Std C95.2-1999, “IEEE Standard for Radio Frequency Energy and Current Flow Symbols” was reaffirmed.

Table TC-95-1
TC-95 Leadership

| Office | Name | Affiliation |
|---|-----------------------|---|
| Chairman | Ronald C Petersen | R. C. Petersen Associates, LLC |
| Vice Chairman | Dr. Ralf Bodemann | Siemens AG |
| Past Chairman/Executive Secretary | Dr. Eleanor Adair | Independent Consultant |
| Chairman Emeritus | Dr. John Osepchuk | Full Spectrum Consulting |
| Treasurer | Arthur Varanelli | Raytheon Company |
| Chairman, International Liaison Committee | Dr. Michael Murphy | Air Force Research Laboratory |
| Chairman, Membership Committee | Dr. Sheila Johnston | Independent Consultant |
| Past Chairman Membership Committee | Dr. Tom McManus | Independent Consultant |
| Chairman, SC-1 | Howard Bassen | US FDA Center for Devices and Rad. Health |
| Chairman, SC-2 | Richard Tell | Richard A Tell Associates, Inc. |
| Co-Chairman, SC-3 | Dr. Phillip Chadwick | Microwave Consultants Ltd. |
| Co-Chairman, SC-3 | Thanh Dovan | SPI PowerNet Pty. Ltd. |
| Co-Chairman, SC-4 | Art Thansandote | Health Canada |
| Co-Chairman, SC-4 | Dr. Marvin Ziskin, MD | Temple University Medical School |
| Co-Chairman, SC-5 | G. A. (Drew) Koban | Naval Surface Warfare Ctr. |
| Co-Chairman, SC-5 | Robert Needy | Naval Surface Warfare Ctr. |

3.4.2 Subcommittee 1 (Measurement and Computation)

Subcommittee 1 is in the process of developing a new standard, PC95.3.1, "Recommended Practice for Measurements and Computation of Electric, Magnetic and Electromagnetic Fields With Respect to Human Exposure to Such Fields, 0 - 100 kHz," which will extend the frequency range of ICES measurement standards. A partial working draft has been completed – action items have been assigned to the subcommittee members with the goal of completing a first draft during the 3rd Q, 2006. At present, there is an issue relating to the proper exposure metric for certain fields to allow comparison of measured and numerical exposure fields with the limits set forth in IEEE C96.6-2002. A request for interpretation has been submitted to SC-3 (low frequency safety limits) and resolution is expected at the August 2006 meetings.

3.4.3 Subcommittee 2 (RF Warning Symbols, Safety Programs and Hazard Communication)

Subcommittee 2 has responsibility for two standards (C95.7-2005 and C95.2-1999). C95.2 was reaffirmed at the September 2005 SASB meeting; C95.7 was approved at the September SASB meeting and published in March, 2006. At this time there are no PARs for new or existing projects. Plans are underway to develop a short-course describing the implementation of an RF safety program based on C95.7. SC-2 will develop several new documents as examples of the application of C95.7-2005 for RF safety programs that would be appropriate to different work scenarios. It is anticipated that these new documents would become sub-standards/guides, a part of the C95.7 family of standards.

3.4.4 Subcommittee 3 (Safety Levels – 0 to 3 kHz)

Subcommittee 3 has responsibility for C95.6-2002. At present, no major revisions of this standard are anticipated but key members of SC-3 continue open dialog with members of other organizations with similar guidelines, e.g., the International Commission on Non-Ionizing Radiation Protection (ICNIRP) to iron out philosophical differences in the rationale for each of the standards and guidelines. In addition, members of SC-3 are in the process of exploring the development of an application guide” as an adjunct to C95.6-2002. There are no PARs for new or existing projects.

During the past two years, members of SC-3 have presented four short courses on C95.6-2002; two in the US, one in Canada and one in Ireland. Each was very well received. The attendees are mainly from the power utilities and government agencies.

3.4.5 Subcommittee 4 (Safety Levels – 3 kHz -300-GHz)

Subcommittee 4 has responsibility for the C95.1 standard. This standard was first published as a USASI standard in 1966 and revisions were published as ANSI standards in 1974 and 1982. In 1991 a revision was published as an IEEE standard. It was reaffirmed in 1997, a corrigendum published in 1999 and an amendment in 2004. The latest revision, C95.1-2005 was approved by the SASB at the September 2005 meeting and published in April 2006. The revision is the result of a major effort by SC-4 to fully review and evaluate the relevant scientific literature. There are no PARs for new or existing projects. Plans are underway to develop a short-course that explains the differences between the 2005 and 1991 standards and describes the implementation of the safety limits.

3.4.6 Subcommittee 5 (Safe Distances from Antennas during Blasting Operations)

Subcommittee 5 is responsible for C95.4-2002 (IEEE Recommended Practice for Determining Safe Distances from Radio Frequency Transmitting Antennas When Using Electric Blasting Caps during Explosive Operations). The standard is now being reviewed – there are no PARs for new or existing projects.

3.5 PARs

The only active TC-95 PAR is the SC-1 PAR for a new standard project – PC95.3.1 (Approved December 2003)

Title: Recommended Practice for Measurements and Computation of Electric, Magnetic and Electromagnetic Fields With Respect to Human Exposure to Such Fields, 0 - 100 kHz

Project scope: This recommended practice describes 1) methods for measuring external electric and magnetic fields and contact currents to which persons may be exposed, 2) instrument characteristics and the methods for calibrating such instruments, and 3) methods for computation and the measurement of the resulting fields and currents that are induced in bodies of humans exposed to these fields. This recommended practice is applicable over the frequency range of 0 to 100 kHz.

Project purpose: The purpose of this recommended practice is to describe preferred measurement techniques and computational methods that can be used to ascertain compliance with contemporary standards for human exposure to electric and magnetic fields in the frequency range of 0 to 100 kHz such as IEEE Std C95.1, C95.6 and similar standards. This document is intended primarily for use by engineers, biophysicists, and other specialists who are familiar with basic electromagnetic (EM) field theory and practice, and the potential hazards associated with exposure to EM fields. It will also be useful to bioeffects researchers, instrument developers and manufacturers, those developing calibration systems and standards, and individuals involved in critical hazard assessments or surveys.

3.6 Objectives and goals for the past year and the TC's performance relative to meeting these goals and objectives.

- Work with the ICES AdCom, with the guidance of the IEEE staff, to develop a fundraising program to support critical travel, support for special projects and meetings, support for visiting scientists and experts, and other critical needs – 2nd Q 2006). (Ongoing)
- Continue international expansion led by Drs. McManus and Murphy. Introduce new leadership with emphasis on non-U.S. and younger members. (Ongoing)
- Strengthen liaisons with ICNIRP, IEC, WHO, COST 281, etc. (Ongoing)
- Arrange for summer 2006 meetings of TC-95 and its subcommittees – 1st Q 2006. (Partially met. Original plans were to meet in Cancun, Mexico, in conjunction with the Bioelectromagnetics Society but, because of hurricane damage to the hotels, only SC-4 will be meeting in Cancun. SC-1, 2, 3 and 5 will be meeting in August in Piscataway, NJ.)
- Pursue the project on publicizing ICES and C95.1 standards in the literature, with the assistance of IEEE staff – 2nd Q 2006. (Not met)
- Reassess the plans for an electronic newsletter in recognition of ICES objectives – 2nd Q 2006. (Not met)
- Attempt to carry out a third closed leadership meeting with ICNIRP, possibly during the June 2006 meetings in Cancun – 2nd Q 2006. (Not met – however, a representative of ICES was invited to meet with ICNIRP at their Commission meetings in 2006 and 2006)
- Update the TC-95 website, include SC sections, and provide FTP service for subcommittee activities – 1st Q, 2006. (Partially met)

- Complete 1st draft of new project “Recommended Practice for Measurements and Computations with Respect to Human Exposure to Electric and Magnetic Fields, 0 to 100 kHz” – 1st Q 2006. (Partially met)
- Complete draft of commonly used terms – 2nd Q 2006. (Not met)
- Complete guide for the application of C95.6 – 3rd Q 2006. (Partially met)
- Review plans for future activities related to electro-explosive devices (SC-5). (Ongoing)
- Complete sponsor balloting revision of C95.1 – 2nd Q 2005 (Met – 3rd Q 2005)
- Complete sponsor balloting revision of C95.7 – 2nd Q 2005 (Met – 3rd Q 2005)
- Publish revision of C95.1 – 4th Q 2005. (Met – standard approved in September 2005 and published in April 2006)
- Publish revision of C95.7 – 4th Q 2005. (Met – standard approved in September 2005 and published in March 2006)

3.7 Current levels of activity with milestones indicated

- Work with the ICES AdCom, with the guidance of the IEEE staff, to develop a fund-raising program to support critical travel, support for special projects and meetings, support for visiting scientists and experts, and other critical needs – 3rd Q 2006).
- Continue international expansion led by Drs. McManus, Johnston and Murphy. Introduce new leadership with emphasis on non-U.S. and younger members – Ongoing
- Strengthen liaisons with ICNIRP, IEC, WHO, COST 281, etc. – Ongoing
- Arrange for spring 2007 meetings of TC-95 and its subcommittees – 3rd Q 2006.
- Pursue the project on publicizing ICES and C95.1 standards in the literature, with the assistance of IEEE staff – 3rd Q 2006.
- Reassess the plans for an electronic newsletter in recognition of ICES objectives – 2nd Q 2006.
- Update the TC-95 website, include subcommittee sections, provide FTP service for subcommittee activities – 3rd Q, 2006
- Complete 1st draft of new project “Recommended Practice for Measurements and Computations with Respect to Human Exposure to Electric and Magnetic Fields, 0 to 100 kHz” – 3rd Q 2006
- Complete draft of commonly used terms – 3rd Q 2006
- Complete guide for the application of C95.6 – 3rd Q 2006
- Review plans for future activities related to electro-explosive devices (SC-5) – ongoing.
- Publish general interest paper (e.g., in *IEEE Spectrum*) and technical paper (e.g., in *Health Physics*) on C95.1-2005 – 4th Q 2006

3.8 IEEE Staff

Support in setting up meetings at IEEE Piscataway has been required in the past; availability of the IEEE Staff Engineer at meetings held at IEEE is desirable. Since Bill Ash is the Staff Engineer for both TC-34 and TC-95, his attendance at the semi annual/annual TC-34 meetings is appropriate. His engineering background and broad knowledge of IEEE procedures is invaluable to this committee.

3.9 Other Activities:

Members of ICES TC-95 are continually involved in a wide spectrum of activities that relate to standards setting including research, education, and drafting of regulations. Members participate in the governmental activities in many nations, as well. These include the FCC and FDA in the US and the EU/EC in Europe. TC-95 members participate in the broad activities of the WHO and its EMF Project as well as the European EBFA, and in various other meetings around the world. In the future, ICES members will be represented at a number of international meetings including the WHO EMF Project meetings, the Progress in Electromagnetics Research Symposium (PIERS) in Beijing, China (March 2007) and Tokyo, Japan, (August 2006), EMB-S Meeting in NYC (September 2006) and the Bioelectromagnetics School in Erice, Sicily (October 2006).

3.10 Committee Operating Procedures

(See Annex A)

3.11 Membership

See Table TC-95-2 through Table TC-95-7 for committee and subcommittee membership information and the attached Excel file for detailed membership information for TC-95 Main Committee.

This report was prepared and submitted by:

Ron Petersen
Chairman, ICES/
May 19, 2006

Table TC-95-2

TC-95 Membership: Main Committee (May 2006)

| | LAST_NAME | FIRST_NAME | MI | AFFILIATION | COUNTRY | INT CATEGORY |
|-----|--------------|------------|----|-----------------------------------|---------|--------------|
| 1. | Adair | Eleanor | R. | Independent Consultant | US | GI |
| 2. | Ammann | Max | J | Dublin Institute of Technology | IE | GI (A) |
| 3. | Anderson | Vitas | | THL Australia Pty Ltd | AU | P |
| 4. | Balzano | Quirino | | Independent Consultant | US | GI (A) |
| 5. | Baron | David | | AIHA Representative | US | GI |
| 6. | Bassen | Howard | | FDA/CDRH | US | GI (G) |
| 7. | Bavin | John | | Consumers Energy | US | GI |
| 8. | Bellier | Pascale | | Health Canada | CA | GI (G) |
| 9. | Bergeron | John | A. | Independent Consultant | US | GI |
| 10. | Black | David | R | Independent Consultant | NZ | GI |
| 11. | Blick | Dennis | W. | Independent Consultant | US | GI(G) |
| 12. | Bodemann | Ralf | | Siemens AG | DE | U |
| 13. | Brecher | Aviva | | DOT/RSPA Volpe Ctr. | US | GI(G) |
| 14. | Brooker | Ian | | Tyco Safety Products, Sensormatic | IE | P |
| 15. | Bushberg | Jerrold | T. | U. of California, Davis | US | GI (A) |
| 16. | Cassata | James | | Navy – Bureau Med/Surgery | US | GI(G) |
| 17. | Chadwick | Philip | | MCL | UK | GI |
| 18. | Chiang | Huai | | Zhejiang Medical University | CN | GI (A) |
| 19. | Chiusano | Stephen | | Lawrence Livermore Nat'l Lab. | US | U |
| 20. | Chou | C.K. | | Motorola, Inc. | US | P |
| 21. | Cleveland | Robert | F. | FCC, Office of Eng. & Technology | US | GI (G) |
| 22. | Coghill | Roger | W. | Coghill Research Labs | UK | U |
| 23. | Cohen | Jules | | Jules Cohen P.E. | US | GI |
| 24. | Curtis | Robert | A. | OSHA - USDOL | US | GI (G) |
| 25. | D'Andrea | John | A. | Naval Health Research Ctr. | US | GI (G) |
| 26. | de jager | Linda | | School of Health Technology | ZA | GI (A) |
| 27. | DeFrank | John | J. | USACHPPM | US | GI (G) |
| 28. | DeLorge | John | O. | Independent Consultant | US | GI |
| 29. | Dini | David | | Underwriters Laboratory | US | U |
| 30. | d'Inzeo | Guglielmo | | La Sapienza University of Rome | IT | GI (A) |
| 31. | Dovan | Thanh | | SPI PowerNet Pty. Ltd. | AU | U |
| 32. | Durrenberger | Gregor | | ETH | CH | GI (A) |
| 33. | DuToit | Leon | | Department of Health | ZA | GI (G) |
| 34. | Erdreich | Linda | S. | Exponent | US | GI |

| | LAST_NAME | FIRST_NAME | MI | AFFILIATION | COUNTRY | INT CATEGORY |
|-----|-------------|--------------|----|------------------------------------|---------|--------------|
| 35. | Foster | Kenneth | R. | Univ. of Pennsylvania | US | GI (G) |
| 36. | Gajsek | Peter | | Institute of Public Health | SI | GI (G) |
| 37. | Gandhi | Om | P. | Univ. of Utah, Dept. of Elec. Eng. | US | GI A) |
| 38. | Gardner | Robert | C. | MOD D S&F Pol | UK | U |
| 39. | George | David | L. | Unisys Corp. | US | U |
| 40. | Grandolfo | Martino | | Laboratorio di Fisica | IT | GI |
| 41. | Guy | Arthur | W. | Bioelectromagnetics Consulting | US | GI |
| 42. | Haes, Jr. | Donald | L. | Consultant | US | U |
| 43. | Halkiotis | Konstantinos | | Greek Atomic Energy Commission | GR | GI (G) |
| 44. | Hare | Ed | | American Radio Relay League | US | U |
| 45. | Hatfield | James | B | Hatfield & Dawson | US | U |
| 46. | Heirman | Donald | N. | Don HEIRMAN Consultants | US | GI |
| 47. | Heroux | Paul | | McGill University | CA | GI (A) |
| 48. | Holley | Jeff | L | Florida Power and Light | US | U |
| 49. | Ikehata | Masateru | | Railway Techl Research Institute | JP | GI (A) |
| 50. | Israel | Michel | | National Centre of Hygiene | BL | GI (G) |
| 51. | Ivans | Veronica | | Medtronic Inc. | US | U |
| 52. | Jaffa | Kent | C. | Pacificorp | US | U |
| 53. | Johnston | Sheila | | Independent Consultant | UK | GI |
| 54. | Joyner | Ken | H. | Motorola Australia Pty Ltd. | AU | P |
| 55. | Kandel | Shaiela | | SOREQ NRC | IL | GI (G) |
| 56. | Karabetsos | Efthymios | | Greek Atomic Energy Commission | GR | GI (G) |
| 57. | Kemp | Ray | | Galson Sciences Limited | UK | GI |
| 58. | Kim | Nam | | Chungbuk National University | KR | GI (A) |
| 59. | Klauenberg | B. Jon | | USAF | US | GI (G) |
| 60. | Koban | George | A. | Naval Surface Warfare Center | US | GI (G) |
| 61. | Koepfinger | Joseph | L. | Consultant | US | GI |
| 62. | Kuster | Niels | | IT'IS Foundation | CH | GI (A) |
| 63. | Lang | Sakari | | Nokia Research Ctr. | FI | P |
| 64. | Leonowich | John | A. | Battelle Pacific NW Nat. Lab | US | GI (G) |
| 65. | Leszczynski | Dariusz | | STUK-Rad and Nuclear Rad Lab | FI | GI (G) |
| 66. | Lin | James | C. | University of Illinois | US | GI (A) |
| 67. | Manatrakul | Nisakorn | | Ministry of Public Health | TH | GI (G) |
| 68. | Manning | Michael | | IndeXsar, Ltd | UK | U |
| 69. | Mason | Patrick | A. | USAF/AFRL/HEDR | US | GI (G) |
| 70. | Maurer | Stewart | | RF & ELF Consultant | US | U |
| 71. | McManus | Tom | | Dept Comm, Nat & Mar Res | IE | GI (G) |

| | LAST_NAME | FIRST_NAME | MI | AFFILIATION | COUNTRY | INT CATEGORY |
|------|--------------|------------|----|--------------------------------------|---------|--------------|
| 72. | McNamee | James | P. | Health Canada | CA | GI (G) |
| 73. | Meltz | Martin | L. | Dept of Rad Oncology | US | GI (A) |
| 74. | Montgomery | Noel | D. | Air Force Research Laboratory | US | GI (G) |
| 75. | Moore | Michael | R. | Oak Ridge National Lab | US | GI (G) |
| 76. | Mukhopadhyay | Amitabha | | Con Edison | US | U |
| 77. | Murphy | Michael | R. | Directed Energy Bioeffects | US | GI (G) |
| 78. | Nelson | David | | Michigan Technical University | US | GI (A) |
| 79. | Ng | Kwan-Hoong | | Dept of Radiation | MY | GI (G) |
| 80. | Osepchuk | John | M. | Full Spectrum Consulting | US | GI |
| 81. | Packer | Malcolm | | Harris International | US | P |
| 82. | Pakhomov | Andrei | G. | McKesson Bio Services | US | GI |
| 83. | Paul | William | F. | Int. Brotherhood of Elect.Workers | US | U |
| 84. | Persson | Bertil | R. | Lund University | SE | GI (A) |
| 85. | Petersen | Ronald | C. | R C Petersen Associates | US | U |
| 86. | Ravazzani | Paolo | | Italian Nat Res Council | IT | GI (A) |
| 87. | Reilly | J. Patrick | | Metatec Associates | US | GI |
| 88. | Repacholi | Michael | H. | World Health Organization | CH | GI |
| 89. | Roberts | Brad | J. | US Army CHPPM | US | U |
| 90. | Root | Ervin | D. | Alliant Energy | US | U |
| 91. | Samaras | Theodoros | | Aristotle University of Thessaloniki | GR | GI (G) |
| 92. | Santomaa | Veli | A | Independent Consultant | FI | GI |
| 93. | Scanlon | William | G. | Queens University, Belfast | UK | GI (A) |
| 94. | Sheppard | Asher | R. | Asher Sheppard Consulting | US | U |
| 95. | Sirugo | Jon | H | Southern California Edison | US | U |
| 96. | Stolwijk | Jan A. | J. | Yale University | US | GI (A) |
| 97. | Swicord | Mays | L. | Motorola | US | P |
| 98. | Szmigielski | Stanislaw | | Mil Inst of Hyg and Epidemiology | PL | GI (G) |
| 99. | Tang, MD | Rosa | M | UTMB, Galveston | US | GI |
| 100. | Tattersall | John | | DSTL | UK | GI (G) |
| 101. | Tell | Richard | A. | Richard Tell Assoc. Inc. | US | U |
| 102. | Tenforde | Thomas | S. | Battelle Pacific NW Lab. | US | GI |
| 103. | Testagrossa | Paul | A | Lucent Technologies | US | GI |
| 104. | Thansandote | Art | | Health Canada | CA | U |
| 105. | Thuroczy | Gyorgy | | Nat Res Inst for Radiobiology | HU | GI (G) |
| 106. | Utteridge | Tammy | | Inst of Med & Veterinary Science | AU | GI (A) |
| 107. | van Rongen | Eric | | Health Council of the Netherlands | NL | GI (G) |
| 108. | Varanelli | Arthur | G. | Raytheon Company | US | P |

| | LAST_NAME | FIRST_NAME | MI | AFFILIATION | COUNTRY | INT CATEGORY |
|------|---------------|----------------|----|------------------------------------|---------|--------------|
| 109. | Wagenaar | Femme-Michelle | | PhoneVision International | NL | GI |
| 110. | Wiaart | Joe | | France Telecom R&D | FR | P |
| 111. | Williams, Jr. | Louis | A. | Louis A. Williams Jr. & Associates | US | U |
| 112. | Yoo | Done-Sik | | Elect & Telecom Res Inst | KR | GI (A) |
| 113. | Zipse | Donald | W. | Zipse Electrical Eng., Inc. | US | GI |
| 114. | Ziriaux | John | | Naval Health Research Center | US | GI(G) |
| 115. | Ziskin, MD | Marvin | C. | Temple Univ. Medical School | US | GI (A) |

- GI General Interest
- GI (G) General Interest – Government
- GI (A) General Interest – Academic
- P Producer
- U User

Table TC-95-3

TC-95 Membership: SC-1 (Techniques, Procedures, Instrumentation and Computation)

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|----|------------------|-------------------|-----------|--------------------------------------|----------------|
| 1 | Adair | Eleanor | R. | Independent Consultant | US |
| 2 | Anderson | Vitas | | TVNZ Australia Pty Ltd. | AU |
| 3 | Babij | Tadeusz | M. | Florida International University | US |
| 4 | Balzano | Quirino | | Independent Consultant | US |
| 5 | Baron | David | | AIHA Representative | US |
| 6 | Bassen | Howard | | FDA/CDRH | US |
| 7 | Bergeron | John | A. | Independent Consultant | US |
| 8 | Bodemann | Ralf | | Siemens AG | DE |
| 9 | Bowman | Joe | | NIOSH | US |
| 10 | Brecher | Aviva | | DOT/RSPA Volpe Ctr. | US |
| 11 | Chan | Kwok | W | FCC Laboratory | US |
| 12 | Chou | C.K. | | Motorola, Inc. | US |
| 13 | Cleveland | Robert | F. | FCC, Office of Eng. & Technology | US |
| 14 | Cohen | Jules | | Jules Cohen P.E. | US |
| 15 | Cox | Diane | | US Navy, NHRC | |
| 16 | Curtis | Robert | A. | OSHA - USDOL | US |
| 17 | Dovan | Thanh | | SPI PowerNet Pty. Ltd. | AU |
| 18 | Frazier | William | F | Laurence Behr Associates, Inc. (LBA) | US |
| 19 | Gandhi | Prof. Om | P. | Univ. of Utah, Dept. of Elec. Eng. | US |
| 20 | Guy | Arthur | W. | Bioelectromagnetics Consulting | US |
| 21 | Hare | Ed | | American Radio Relay League | US |
| 22 | Hatfield | James | B | Hatfield & Dawson | US |
| 23 | Hubbard | Roy | | Technology Services International) | ZA |
| 24 | Hurt | William | D. | USAF | US |
| 25 | Iskra | Steve | | Telstra Corp | |
| 26 | Ivans | Veronica | | Medtronic Inc. | US |
| 27 | Johnston | Sheila | | Independent Consultant | UK |
| 28 | Kainz | Wolfgang | | USFDA-CDRH | US |
| 29 | Khalil | Kathy | | SPAWARSSYSCEN Charleston | US |
| 30 | Kim | Jin Suk | | ETRI | KR |
| 31 | Kumbier | Werner | | Narda Safety Test Solutions | DE |

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|----|---------------|------------|----|-------------------------------------|---------|
| 32 | Kuster | Niels | | IT'IS | CH |
| 33 | Leonowich | John | A. | Battelle Pacific NW Nat. Lab | US |
| 34 | Lotz | Gregory | | NIOSH | US |
| 35 | Luebbers | Raymond | | Remcom Inc. | US |
| 36 | MacLean | Kathy | | APREL Laboratories-SSI | CA |
| 37 | Mantipty | Ed | | FCC/OET | US |
| 38 | Moore | Michael | R. | Oak Ridge National Lab | US |
| 39 | Needy | Robert | | Naval Surface Warfare Ctr. | US |
| 40 | Osepchuk | John | M. | Full Spectrum Consulting | US |
| 41 | Persson | Bertil | R. | Lund University | SE |
| 42 | Petersen | Ronald | C. | R C Petersen Associates | US |
| 43 | Roberts | Brad | J. | US Army CHPPM | US |
| 44 | Rowley | Jack | | Telstra Research Labs | AU |
| 45 | Santomaa | Veli | A | Independent Consultant | FI |
| 46 | Schueller | Michael | | Mannesmann Mobilfunk Gmbh | DE |
| 47 | Seabury | David | | Chase Systems Inc. | US |
| 48 | Tell | Richard | A. | Richard Tell Assoc. Inc. | US |
| 49 | Testagrossa | Paul | A | Lucent Technologies | US |
| 50 | Thansandote | Art | | Health Canada | CA |
| 51 | Umbdenstock | Donald | J. | Sensormatic Electronics Corp. | US |
| 52 | Varanelli | Arthur | G. | Raytheon Company | US |
| 53 | Watanabe | Soichi | | CRL, Ministry of Telecommunications | JP |
| 54 | Watkins | Cleveland | F. | Independent Consultant | US |
| 55 | Williams, Jr. | Louis | A. | Louis A. Williams Jr. & Associates | US |
| 56 | Zirix | John | | Microwave Department | US |
| 57 | Zollman | Peter | | Vodafone Group R&D | UK |

Table TC-95-4

TC-95 Membership: SC-2: (Terminology, Units of Measurements and Hazard Communication)

| | LAST NAME | FIRST NAME | | AFFILIATION | COUNTRY |
|-----|-----------|------------|----|----------------------------------|---------|
| 1. | Adair | Eleanor | R. | Independent Consultant | US |
| 2. | Anderson | Vitas | | TVNZ Australia Pty Ltd | AU |
| 3. | Baron | David | | AIHA Representative | US |
| 4. | Bassen | Howard | | FDA/CDRH | US |
| 5. | Bellier | Pascale | | Health Canada | CA |
| 6. | Biby | Richard | P. | Crown Castle International | US |
| 7. | Black | David | R | Suite 6, Gillies Clinic | NZ |
| 8. | Bodemann | Ralf | | Siemens AG | DE |
| 9. | Boyer | Jim | | Lawrence Livermore National Labs | US |
| 10. | Brecher | Aviva | | DOT/RSPA Volpe Ctr. | US |
| 11. | Bushberg | Jerrold | T. | Dir. Health Physics | US |
| 12. | Cassata | James | | Navy – Bureau Med/Surgery | US |
| 13. | Charlow | Kevin | J | NISE | US |
| 14. | Chou | C.K. | | Motorola, Inc. | US |
| 15. | Cleveland | Robert | F. | FCC, Office of Eng. & Technology | US |
| 16. | Coghill | Roger | W. | Coghill Research Labs | UK |
| 17. | Cohen | Jules | | Jules Cohen P.E. | US |
| 18. | Conover | David | | NIOSH Contractor | US |
| 19. | Curtis | Robert | A. | OSHA - USDOL | US |
| 20. | D'Andrea | John | A. | Naval Health Research Ctr. | US |
| 21. | DeFrank | John | J. | USACHPPM | US |
| 22. | Erdreich | Linda | S. | Exponent | US |
| 23. | Everist | Donald | G | Cohen, Dipell and Everist | US |
| 24. | Gajda | Greg | | Health Canada | CA |
| 25. | Gettman | Ken | | National Elect Manufact Assoc. | US |
| 26. | Guy | Arthur | W. | Bioelectromagnetics Consulting | US |
| 27. | Haes, Jr. | Donald | L. | Consultant | US |
| 28. | Hare | Ed | | American Radio Relay League | US |
| 29. | Hatfield | James | B | Hatfield & Dawson | US |
| 30. | Hubbard | Roy | | Tech Services International | ZA |
| 31. | Ivans | Veronica | | Medtronic Inc. | US |

| | LAST NAME | FIRST NAME | | AFFILIATION | COUNTRY |
|-----|-------------|-------------|----|-------------------------------|---------|
| 32. | Johnson | Robert | E. | L-3 Microwave NARDA | US |
| 33. | Johnston | Sheila | | Independent Consultant | UK |
| 34. | Joyner | Ken | H. | Motorola Australia Pty Ltd. | AU |
| 35. | Kantner | Kimberly | | AT&T | US |
| 36. | Khalil | Kathy | | SPAWARSSYSCEN Charleston | US |
| 37. | Kierl | Bill | | Motorola | US |
| 38. | Klauenberg | B. Jon | | USAF | US |
| 39. | Koban | George | A. | Naval Surface Warfare Center | US |
| 40. | Kumbier | Werner | | Narda Safety Test Solutions | DE |
| 41. | Kuster | Niels | | IT'IS | CH |
| 42. | Lathrop | Janet | | Resource Strategies, Inc | US |
| 43. | Leonowich | John | A. | Battelle Pacific NW Nat. Lab | US |
| 44. | MacLean | Kathy | M | APREL Laboratories | CA |
| 45. | Mantiplay | Ed | | FCC/OET | US |
| 46. | Maurer | Stewart | | RF & ELF Consultant | US |
| 47. | Meltz | Martin | L. | Dept of Radiation Oncology | US |
| 48. | Mercer | Christopher | | Vodacom Pty Ltd | ZA |
| 49. | Murphy | Michael | R. | Air Force Research Laboratory | US |
| 50. | Nappert | Hughes | | Industry Canada | CA |
| 51. | Needy | Robert | | Naval Surface Warfare Ctr. | US |
| 52. | Norman | Larry | | Pike Electric | |
| 53. | Osepchuk | John | M. | Full Spectrum Consulting | US |
| 54. | Packer | Malcolm | | Harris International | US |
| 55. | Persson | Bertil | R. | Lund University | SE |
| 56. | Petersen | Ronald | C. | R C Petersen Associates | US |
| 57. | Proctor | Ken | R. | US Army | US |
| 58. | Roberts | Brad | J. | US Army CHPPM | US |
| 59. | Rowley | Jack | | Telstra Research Labs | AU |
| 60. | Scanlon | William | G. | Center for Comm Eng | UK |
| 61. | Seabury | David | | Chase Systems Inc. | US |
| 62. | Smith | Matthew | | Dade Moeller & Associates | US |
| 63. | Strickland | Richard | | RF Safety Solutions | US |
| 64. | Tell | Richard | A. | Richard Tell Assoc. Inc. | US |
| 65. | Testagrossa | Paul | A | Lucent Technologies Inc. | US |
| 66. | Thansandote | Art | | Health Canada | CA |

| | LAST NAME | FIRST NAME | | AFFILIATION | COUNTRY |
|-----|---------------|----------------|----|------------------------------------|---------|
| 67. | Ulcek | Jerry | | FCC | US |
| 68. | Varanelli | Arthur | G. | Raytheon Company | US |
| 69. | Wagenaar | Femme-Michelle | | PhoneVision International | NL |
| 70. | Williams, Jr. | Louis | A. | Louis A. Williams Jr. & Associates | US |
| 71. | Zirix | John | | Naval Health Research Center | US |
| 72. | Ziskin, MD | Marvin | C. | Temple Univ. Medical School | US |

Table TC-95-5

TC-95 Membership: SC-3 (Safety Levels with Respect to Human Exposure, 0-3 kHz)

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|-----|------------------|-------------------|-----------|------------------------------------|----------------|
| 1. | Adair | Eleanor | R. | Independent Consultant | US |
| 2. | Adlkofer | Franz | | VerUm Foundation | DE |
| 3. | Bailey | William | H. | Exponent Inc. | US |
| 4. | Barker | J. Richard | | General Cable | US |
| 5. | Baron | David | | AIHA Representative | US |
| 6. | Bassen | Howard | | FDA/CDRH | US |
| 7. | Bavin | John | | Consumers Energy | US |
| 8. | Bellier | Pascale | | Health Canada | CA |
| 9. | Bergeron | John | A. | Independent Consultant | US |
| 10. | Black | David | R | Suite 6, Gillies Clinic | NZ |
| 11. | Bodemann | Ralf | | Siemens AG | DE |
| 12. | Boeggeman | Charles | J. | PECO Energy Co. | US |
| 13. | Brecher | Aviva | | DOT/RSPA Volpe Ctr. | US |
| 14. | Cassata | James | | Navy – Bureau Med/Surgery | US |
| 15. | Carberry | Robert | E. | Northeast Utilities | US |
| 16. | Chadwick | Philip | | MCL | UK |
| 17. | Chikamoto | Kazuhiko | | Japan Nus Co. Ltd. (JANUS) | JP |
| 18. | Coghill | Roger | W. | Coghill Research Labs | UK |
| 19. | Curtis | Robert | A. | OSHA - USDOL | US |
| 20. | Dale | Steiner | J. | ABB Power T&D Company | US |
| 21. | D'Andrea | John | A. | Naval Health Research Ctr. | US |
| 22. | de jager | Linda | | School of Health Technology | ZA |
| 23. | DeFrank | John | J. | USACHPPM | US |
| 24. | d'Inzeo | Gugliemo | | La Sapienza University of Rome | IT |
| 25. | Dovan | Thanh | | SPI PowerNet Pty. Ltd. | AU |
| 26. | Fichtenberg | David | S | State of Washington, Med Asst Ad | US |
| 27. | Gandhi | Prof. Om | P. | Univ. of Utah, Dept. of Elec. Eng. | US |
| 28. | Gettman | Ken | | National Electrical Man Assoc. | US |
| 29. | Gibney | Kelly | B | Retired | CA |
| 30. | Goldberg | Georges | | Advisory Comm. on Elect Comp | CH |
| 31. | Goulet | Daniel | | Hydro-Quebec | CA |
| 32. | Haes, Jr. | Donald | L. | Consultant | US |

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|-----|-------------|------------|----|--------------------------------------|---------|
| 33. | Hernandez | Martin | A. | Florida Power & Light Co. | US |
| 34. | Herz | Michael | C. | Pacific Gas & Electric Co. | US |
| 35. | Hicks | Danny | O. | South Carolina Electric & Gas Co. | US |
| 36. | Hubbard | Roy | | Technology Services Intl (TSI) | ZA |
| 37. | Ikehata | Masatero | | Railway Technical Research Institute | JP |
| 38. | Ivans | Veronica | | Medtronic Inc. | US |
| 39. | Jaffa | Kent | C. | Pacificorp | US |
| 40. | Johnston | Sheila | | Independent Consultant | UK |
| 41. | Karabetsos | Efthymios | | Greek Atomic Energy Commission | GR |
| 42. | Kautz | Richard | W. | Ford | US |
| 43. | Koepfinger | Joseph | L. | Consultant | US |
| 44. | Kuster | Niels | | IT'IS | CH |
| 45. | Lathrop | Janet | | Resource Strategies, Inc | US |
| 46. | Leonowich | John | A. | Battelle Pacific NW Nat. Lab | US |
| 47. | Leszczynski | Dariusz | | STUK-Radiation & Nuclear Rad Lab | FI |
| 48. | Manatrakul | Nisakorn | | Ministry of Public Health | TH |
| 49. | Lotz | Gregory | | NIOSH | US |
| 50. | Mason | Patrick | A. | USAF/AFRL/HEDR | US |
| 51. | McManus | Tom | | Dept of Comm, Marine and Nat Res | IE |
| 52. | McNamee | James | P. | Health Canada | CA |
| 53. | Merritt | James | H. | USAF Research Lab | US |
| 54. | Murphy | Michael | R. | Air Force Research Laboratory | US |
| 55. | Needy | Robert | | Naval Surface Warfare Ctr. | US |
| 56. | Osepchuk | John | M. | Full Spectrum Consulting | US |
| 57. | Packer | Malcolm | | Harris International | US |
| 58. | Paul | William | F. | Int. Brotherhood of Elect. Workers | US |
| 59. | Petersen | Ronald | C. | R C Petersen Associates | US |
| 60. | Pittman | Steve | | Potlach Pulp and Paperboard | US |
| 61. | Podhrasky | Robert | J. | Garrett Metal Detectors | US |
| 62. | Polson | Peter | | Ausa Research | US |
| 63. | Proctor | Ken | R. | US Army | US |
| 64. | Ravazzani | Paolo | | Italian National Research Council | IT |
| 65. | Reilly | J. Patrick | | Metatec Associates | US |
| 66. | Roberts | Brad | J. | US Army CHPPM | US |
| 67. | Rogers | Walter | | AFRL (Veridian) | US |

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|-----|---------------|----------------|----|--|---------|
| 68. | Root | Ervin | D. | Alliant Energy | US |
| 69. | Samaras | Theodoros | | Aristotle University of Thessaloniki | GR |
| 70. | Sawdon | Dave | | IBM Global Services | UK |
| 71. | Sheppard | Asher | R. | Asher Sheppard Consulting | US |
| 72. | Sirugo | Jon | H | Southern California Edison | US |
| 73. | Slesin | Louis | | Microwave News | US |
| 74. | Sliney | David | | US Army CHPPM | US |
| 75. | Swicord | Mays | L. | Motorola | US |
| 76. | Szmigielski | Stanislaw | | Military Institute of Hygiene and Epi. | |
| 77. | Tell | Richard | A. | Richard Tell Assoc. Inc. | US |
| 78. | Testagrossa | Paul | A | Lucent Technologies Inc. | US |
| 79. | Thansandote | Art | | Health Canada | CA |
| 80. | Thuroczy | Gyorgy | | Nat Research Inst of Radiobiology | HU |
| 81. | van Rongen | Eric | | Health Council of the Netherlands | NL |
| 82. | Varanelli | Arthur | G. | Raytheon Company | US |
| 83. | Wagenaar | Femme-Michelle | | PhoneVision International | NL |
| 84. | Watkins | Cleveland | F. | | US |
| 85. | Wiert | Joe | | France Telecom R & D | FR |
| 86. | Williams, Jr. | Louis | A. | Louis A. Williams Jr. & Associates | US |
| 87. | Woods | Richard | W. | Sensormatic Electronics | US |
| 88. | Yandek | Edward | M. | GE Lighting | US |
| 89. | Zipse | Donald | W. | Zipse Electrical Eng., Inc. | US |
| 90. | Zirix | John | | Naval Health Research Center | US |
| 91. | Ziskin | Marvin | C. | Temple Univ. Medical School | US |

Table TC-95-6

TC-95 Membership: SC-4 (Safety Levels with Respect to Human Exposure, 3 kHz-300 GHz)

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|----|-----------|------------|----|----------------------------------|---------|
| 1 | Adair | Eleanor | R. | Independent Consultant | US |
| 2 | Allen | Stuart | G. | Nat'l Rad. Protection Board | UK |
| 3 | Ammann | Max | J | Dublin Institute of Technology | IE |
| 4 | Anderson | Vitas | | TVNZ Australia Pty Ltd. | AU |
| 5 | Babij | Tadeusz | M. | Florida International University | US |
| 6 | Bailey | William | H. | Exponent Inc. | US |
| 7 | Baron | David | | AIHA Representative | US |
| 8 | Bassen | Howard | | FDA/CDRH | US |
| 9 | Bellier | Pascale | | Health Canada | CA |
| 10 | Bergeron | John | A. | Independent Consultant | US |
| 11 | Black | David | R | Suite 6, Gillies Clinic | NZ |
| 12 | Blick | Dennis | W. | AFRL/HEDR (Veridian) | US |
| 13 | Bodemann | Ralf | | Siemens AG | DE |
| 14 | Brecher | Aviva | | DOT/RSPA Volpe Ctr. | US |
| 15 | Bushberg | Jerrold | T. | Dir. Health Physics | US |
| 16 | Cassata | James | | Navy – Bureau Med/Surgery | US |
| 17 | Chadwick | Philip | | MCL | UK |
| 18 | Chiang | Huai | | Zhejiang Medical University | CN |
| 19 | Chikamoto | Kazuhiko | | Japan NUS Co, Ltd | JP |
| 20 | Chou | C.K. | | Motorola, Inc. | US |
| 21 | Cleveland | Robert | F. | FCC, Office of Eng. & Technology | US |
| 22 | Cobb | Brenda | | Air Force Res Labs | US |
| 23 | Coghill | Roger | | Coghill Res Labs | UK |
| 24 | Cohen | Jules | | Jules Cohen P.E. | US |
| 25 | Curtis | Robert | A. | OSHA - USDOL | US |
| 26 | Cyr | Howard | W | FDA/CDRH | US |
| 27 | D'Andrea | John | A. | Naval Health Research Ctr. | US |
| 28 | de jager | Linda | | School of Health Technology | ZA |
| 29 | DeFrank | John | J. | USACHPPM | US |
| 30 | deLorge | John | O | Ind Consultant | US |
| 31 | Dini | David | | Underwriters Laboratory | US |

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|----|--------------|--------------|----|--------------------------------------|---------|
| 32 | d'Inzeo | Gugliemo | | La Sapienza University of Rome | IT |
| 33 | Dovan | Thanh | | SPI PowerNet Pty. Ltd. | AU |
| 34 | Durrenberger | Gregor | | ETH | CH |
| 35 | Elder | Joe | A | Motorola | US |
| 36 | Erdreich | Linda | S. | Exponent | US |
| 37 | Fastman | Stewart | M. | American Insurers | US |
| 38 | Fichtenberg | David | S | State of Washington, Med Asst Ad | US |
| 39 | Foster | Kenneth | R. | Univ. of Pennsylvania | US |
| 40 | Futch | James | | Florida Dept. of Health | US |
| 41 | Gajsek | Peter | | Inst of Public Health | SI |
| 42 | Gandhi | Prof. Om | P. | Univ. of Utah, Dept. of Elec. Eng. | US |
| 43 | Gardner | Robert | C. | MOD D S&F Pol | UK |
| 44 | George | David | L. | Unisys Corp. | US |
| 45 | Gettman | Ken | | National Electrical Manufact Assoc. | US |
| 46 | Goldberg | Georges | | Advisory Comm. on EMC | CH |
| 47 | Haes, Jr. | Donald | L. | Consultant | US |
| 48 | Halkiotis | Konstantinos | | Greek Atomic Energy Commission | GR |
| 49 | Hatfield | James | B | Hatfield & Dawson | US |
| 50 | Healer | Janet | | NTIA | US |
| 51 | Heirman | Donald | N. | Don HEIRMAN Consultants | US |
| 52 | Heroux | Paul | | McGill University | CA |
| 53 | Hubbard | Roy | | Tech Services International (TSI) | ZA |
| 54 | Hurt | William | D. | USAF | US |
| 55 | Ikehata | Masatero | | Railway Technical Research Institute | JP |
| 56 | Ilieva | Michael | D | | |
| 57 | Israel | Michel | | National Centre of Hygiene | BL |
| 58 | Ivans | Veronica | | Medtronic Inc. | US |
| 59 | Johnston | Sheila | | Independent Consultant | UK |
| 60 | Joyner | Ken | H. | Motorola Australia Pty Ltd. | AU |
| 61 | Kandel | Shaiela | | SOREQ NRC | IL |
| 62 | Kantner | Kimberly | | AT&T | US |
| 63 | Karabetsos | Efthymios | | Greek Atomic Energy Commission | GR |
| 64 | Kean | John | | BTS IEEE | US |
| 65 | Klaenberg | B. Jon | | USAF | US |
| 66 | Koepfinger | Joseph | L. | Consultant | US |

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|-----|-------------|------------|----|--------------------------------------|---------|
| 67 | Lang | Sakari | | Nokia Research Ctr. | FI |
| 68 | Leonowich | John | A. | Battelle Pacific NW Nat. Lab | US |
| 69 | Leszczynski | Dariusz | | STUK-Radiation & Nuclear Rad Lab | FI |
| 70 | Lin | James | C. | University of Illinois | US |
| 71 | Lotz | Gregory | | NIOSH | US |
| 72 | Mantipty | Ed | | FCC/OET | US |
| 73 | Manatrakul | Nisakorn | | Ministry of Public Health | TH |
| 74 | Mason | Patrick | A. | USAF/AFRL/HEDR | US |
| 75 | Maurer | Stewart | | RF & ELF Consultant | US |
| 76 | McKenzie | Raymond | J | Telstra Research Laboratories | AU |
| 77 | McManus | Tom | | Dept of Comm, Marine and Nat Res | IE |
| 78 | McNamee | James | P. | Health Canada | CA |
| 79 | Meltz | Martin | L. | Dept of Radiation Oncology | US |
| 80 | Montgomery | Noel | D. | Air Force Research Laboratory | US |
| 81 | Moore | Michael | R. | Oak Ridge National Lab | US |
| 82 | Morrissey | Joe | | Motorola | US |
| 83 | Murphy | Michael | R. | Air Force Research Laboratory | US |
| 84 | Needy | Robert | | Naval Surface Warfare Ctr. | US |
| 85 | Osepchuk | John | M. | Full Spectrum Consulting | US |
| 86 | Packer | Malcolm | | Harris International | US |
| 87 | Pakhomov | Andrei | G. | McKesson Bio Services | US |
| 88 | Persson | Bertil | R. | Lund University | SE |
| 89 | Petersen | Ronald | C. | R C Petersen Associates | US |
| 90 | Polson | Peter | | Ausa Research | US |
| 91 | Proctor | Kenneth | R | US Army HQ CECOM | US |
| 92 | Ravazzani | Paolo | | Italian National Research Council | IT |
| 93 | Reilly | J. Patrick | | Metatec Associates | US |
| 94 | Roberts | Brad | J. | US Army CHPPM | US |
| 95 | Ruscio | Bruce | | Joint Programs Office, MMR | US |
| 96 | Samaras | Theodoros | | Aristotle University of Thessaloniki | GR |
| 97 | Santomaa | Veli | A | Independent Consultant | FI |
| 98 | Scanlon | William | G. | Center for Comm Eng | UK |
| 99 | Sheppard | Asher | R. | Asher Sheppard Consulting | US |
| 100 | Sliney | David | H | US Army-CHPPM | US |
| 101 | Swicord | Mays | L. | Motorola | US |

| | LAST NAME | FIRST NAME | MI | AFFILIATION | COUNTRY |
|-----|---------------|----------------|----|--|---------|
| 102 | Szmigielski | Stanislaw | | Military Institute of Hygiene and Epi. | |
| 103 | Tattersall | John | | DSTL | UK |
| 104 | Tell | Richard | A. | Richard Tell Assoc. Inc. | US |
| 105 | Tenforde | Thomas | S. | Battelle Pacific NW Lab. | US |
| 106 | Testagrossa | Paul | A | Lucent Technologies Inc. | US |
| 107 | Thansandote | Art | | Health Canada | CA |
| 108 | Thuroczy | Gyorgy | | Nat Research Inst of Radiobiology | HU |
| 109 | Tofani | Santi | | Servizio Di Fisica Sanitaria | IT |
| 110 | Utteridge | Tammy | | Inst of Med & Veterinary Science | AU |
| 111 | van Rongen | Eric | | Health Council of the Netherlands | NL |
| 112 | Varanelli | Arthur | G. | Raytheon Company | US |
| 113 | Wachtel | Howard | | University of Colorado | US |
| 114 | Wagenaar | Femme-Michelle | | PhoneVision International | NL |
| 115 | Weller | Robert | D. | Hammett & Edison, Inc. | US |
| 116 | Whitmore | Jamaal | A | US navy Bur Med & Surgery | US |
| 117 | Williams, Jr. | Louis | A. | Louis A. Williams Jr. & Associates | US |
| 118 | Wiat | Joe | | France Telecom R & D | FR |
| 119 | Woods | Richard | W. | Sensormatic Electronics | US |
| 120 | Zipse | Donald | W. | Zipse Electrical Eng., Inc. | US |
| 121 | Zirix | John | | Naval Health Research Center | US |
| 122 | Ziskin | Marvin | C. | Temple Univ. Medical School | US |

Table TC-95-7

TC-95 Membership: SC-5 (Safety Levels with Respect to Electro-Explosive Devices)

| | FIRST NAME | LAST NAME | MI | AFFILIATION | COUNTRY |
|-----|-------------------|------------------|-----------|----------------------------------|----------------|
| 1. | Adair | Eleanor | R. | Independent Consultant | US |
| 2. | Babij | Tadeusz | M. | Florida International University | US |
| 3. | Balzano | Quirino | | Independent Consultant | US |
| 4. | Bean | John | | Naval Surface Warfare Center | US |
| 5. | Colville | Frank | | U.S. Army CHPPM | US |
| 6. | DeFrank | John | J. | USACHPPM | US |
| 7. | Harmon | Ray | | EG&G | US |
| 8. | Hatfield | James | B | Hatfield & Dawson | US |
| 9. | Joyner | Ken | H. | Motorola Australia Pty Ltd. | AU |
| 10. | Koban | George | A. | Naval Surface Warfare Center | US |
| 11. | Leidel | David | | Halliburton Energy Services | US |
| 12. | Petersen | Ronald | C. | R C Petersen Associates | US |
| 13. | Roberts | Brad | | CHPPM | US |
| 14. | Stuart | James | | Franklin Applied Physics | US |
| 15. | Thompson | Ramie | | Franklin Applied Physics | US |

Annex A

IEEE INTERNATIONAL COMMITTEE
on
ELECTROMAGNETIC SAFETY (ICES – SCC-39)
OPERATING PROCEDURES

1. Introduction

In today's marketplace, standards development plays a critical role in product development and market share. In the IEEE, the responsibility for how a standard originates and evolves is managed by a Sponsor. It is essential in the management of a standard's development to avoid any actions by the Sponsor or the participants that result of a violation of these Procedures.

Adherence to these Procedures is an essential asset in determining the applicability of IEEE's indemnification policy.

These Operating Procedures outline the orderly transaction of business of SCC-39 (ICES), which shall act as a sponsor for individual standards projects. For the development of standards, openness and due process must apply, which means that any individual with a direct and material interest who meets the requirements of these Procedures has a right to participate by

- a) Expressing a position and its basis,
- b) Having that position considered, and
- c) Appealing if adversely affected.

Due process allows for equity and fair play. In addition to openness, due process requires balance, i.e., the standards development process should strive to have a balance of interests and not be dominated by any single interest category. However, for the IEEE Standards Sponsor (Committee) ballot, there shall be a balance of interests without dominance by any single interest category. Balloting shall be in accordance with Clauses 8 and 9 of these Procedures and with Subclause 5.4 of the *IEEE-SA Standards Board Operations Manual*.

Although these procedures are approved by the IEEE-SA Standards Board, the latest version of several documents take precedence in the following order:

- New York State Not-for-Profit Law
- IEEE Certificate of Incorporation
- IEEE Constitution
- IEEE Bylaws (Includes IEEE Standards Association Bylaws)
- IEEE Policy and Procedures Manual

IEEE Board of Directors Resolutions
IEEE-SA Standards Association Operations Manual
IEEE-SA Board of Governors Resolutions
IEEE-SA Standards Board Bylaws
IEEE-SA Standards Board Operations Manual
IEEE ICES (SCC-39) Operating Procedures

On questions of parliamentary procedure not covered in these procedures, Robert's Rules of Order (Revised) shall be used to expedite due process.

1.1 Scope

1.1.1 ICES (SCC39)

“Development of standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 GHz relative to the potential hazards of exposure of humans, volatile materials, and explosive devices to such energy. Such standards will be based on established effects and will include safety levels for human exposure to electric, magnetic and electromagnetic fields, including induced currents from such fields, methods for the assessment of human exposure to such fields, standards for products that emit electromagnetic energy by design or as a by-product of their operation, and environmental limits.”

1.1.2 Technical Committee 34

ICES TC-34 was approved by the IEEE SA Standards Board in June 1995 (as SCC-34) and merged with SCC-28 (now TC-95) in 2005 as a technical committee of ICES (SCC-39) TC-34. The scope of TC-34 is:

“Development of product performance standards relative to the safe use of electromagnetic energy for specific products that emit electromagnetic energy at frequencies between 0 Hz and 300 GHz. The Committee shall coordinate with other Committees whose scopes are contiguous with TC-34.”

1.1.3 Technical Committee 95

ICES TC-95 was established in 1960 as the USASI C95 Committee and approved as IEEE SCC-28 in 1990 under the sponsorship of the IEEE Standards Board. In 2001 use of the name “International Committee on Electromagnetic Safety” was approved and the committee was merged with SCC-34 (now TC-34) in 2005 as ICES (SCC-39) TC-95. The scope of TC-95 is:

“Development of standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 GHz relative to the potential hazards of exposure of man, volatile materials, and explosive devices to such energy. It is not intended to include infrared, visible, ultraviolet, or ionizing radiation. The committee will coordinate with other committees whose scopes are contiguous with TC-95.”

If the scope of a TC changes, the rules in the *IEEE-SA Standards Board Operations Manual* concerning change of scope shall be followed.

1.2 Organization of the Committee

ICES (SCC-39) shall consist of its officers (see clause 3) and members. The structure of the Committee shall consist of an Administrative Committee (AdCom) and Technical Committees (TC-34 and TC-95). Each Technical Committee shall have a title, scope, and an interest classification system for its members. When staff resources permit, the Technical Committees should be supported by a Standards Staff Liaison.

The membership of the Technical Committees shall be sufficiently diverse to ensure reasonable balance without dominance by a single interest category. Care shall be taken to ensure all interest categories are represented to the extent possible (see Subclause 4.5).

2. Responsibilities of the Committees

2.1 Administrative Committee

The Administrative Committee (AdCom) shall consist of a Chair, Vice-Chair, Executive Secretary, Treasurer, Chair of the Membership Committee, Chair of the International Liaison Committee, Chairs of the Technical Committees and Members at Large who shall:

- a) Direct the activities of the Technical Committees;
- b) Review all applications for membership;
- c) Interact with the IEEE SA on general matters such as fund raising, publication, education, and policy and procedure;
- d) Review and submit PARs from the Technical Committees;
- e) Submit proposed standards documents, after approval by the Committee, with supporting documentation, to the IEEE SA Standards Board for review and approval as IEEE Standards documents;
- f) Develop policies and activities to enhance the international harmonization of standards within the scope of the Committee, develop appropriate liaison and collaboration with other international and national organizations and work towards improved broad international consensus on such standards;
- g) Maintain and authorize for presentation and content public access web sites and private member only access web sites hosted on the IEEE computer;
- h) Report annually to the IEEE-SA Standards Board.

The Staff Liaison and Past Chairs shall be ex-officio members of the Executive Committee.

2.2 Technical Committees

The Technical Committees shall be responsible for the following:

- a) Proposing, developing and initiating standards projects within the scope of the Committee;

- b) Proposing, developing and initiating ballots on proposed IEEE Standards within the scope of the Committee;
- c) Voting on approval of proposed IEEE Standards within its scope;
- d) Maintaining the standards developed by the Committee in accordance with *IEEE-SA Standards Board Operations Manual*;
- e) Responding to requests for interpretations of the standard(s) developed by the Committee;
- f) Acting on other matters requiring Committee action as provided in these procedures;
- g) Cooperating with other appropriate standards developing organizations;
- h) Protecting against actions taken in the name of the Committee without Committee authorization;
- i) Communicating with the ICES AdCom and the IEEE-SA Standards Board on specific activities as needed.

3. Officers

3.1 Administrative Committee

The AdCom shall consist of a Chair, Vice-Chair, Executive Secretary, Treasurer, Chair of the Membership Committee, Chair of the International Liaison Committee, Chairs of the Technical Committees and Members at Large. The Chair and Vice-Chair of the AdCom are considered the Chair and Vice-Chair of ICES and are each appointed by the IEEE-SA Standards Board Chair; the term of appointment shall be one year, renewable annually. The Treasurer and Secretary of the AdCom are appointed by the Committee Chair for a term of up to three (3) years and may serve consecutive terms. The officers of the AdCom shall be a member of any grade of the IEEE and a member of the IEEE SA. Officers shall read the training material available through IEEE Standards Development Online.

3.2 Technical Committees

The Technical Committees shall consist of a Chair, Vice-Chair, Secretary, and its members. The Chairs of the Technical Committees are appointed by the Committee Chair for a term of up to three (3) years and may serve consecutive terms.

The officers of the Technical Committees shall be a member of any grade of the IEEE and a member of the IEEE-SA and shall organize the Committee, oversee the Committee's compliance with these procedures, and submit to the AdCom proposed standards approved by the balloting group, with supporting documentation, for IEEE-SA Standards Board review and approval as IEEE standards. Officers shall read the training material available through IEEE Standards Development Online.

The Executive Secretary of the AdCom and the Secretaries of the Technical Committees shall record and have published minutes of each meeting in such a manner that, once approved, are available to the public. Each Secretary shall be a member of the IEEE-SA.

IEEE-SA Standards Staff Liaison may provide administrative work including maintenance of adequate records including the committee roster.

3.3 Removal of Officers

The IEEE-SA Standards Board Chair has the authority to remove an officer of the AdCom. An officer of a Technical Committee may be removed by approval of two-thirds of the members of the Committee or at the discretion of the ICES AdCom or the IEEE-SA Standards Board Chair. Grounds for removal shall be included in any motion to remove an officer of a Committee.

3.4 Responsibilities of the Officers

3.4.1 Chair

The Chair shall

- a) Lead the participants according to all of the relevant policies and procedures,
- b) Form subgroups, as necessary.

The Chair also shall

- a) Be objective,
- b) Entertain motions, but not make motions,
- c) Not bias discussions,
- d) Delegate necessary functions,
- e) Ensure that all parties have reasonable opportunity to express their views,
- f) Set goals and deadlines and adhere to them,
- g) Be knowledgeable in IEEE standards processes and parliamentary procedures and ensure that the processes and procedures are followed,
- h) Seek consensus of the Committee as a means of resolving all issues,
- i) Prioritize objectives to best serve the group and the goals,
- j) Ensure that a process for responding to interpretations requests for standards approved by the Technical Committee is in place.

3.4.2 Vice-Chair

The Vice-Chair shall carry out the Chair's duties if the Chair is temporarily unable to do so or chooses to recuse him- or herself (i.e., to give a technical opinion).

3.4.3 Secretary

The Secretary shall

- a) Distribute the agenda at least 14 calendar days before meeting,

- b) Record and publish minutes of each meeting within 60 calendar days of the end of meeting,
- c) Create and maintain the membership roster and submit to the ICES AdCom and the IEEE Standards Department annually,
- d) Schedule meetings in coordination with the Committee Chair with at least 30 calendar days notice,
- e) Be responsible for the management and distribution of Committee documentation,
- f) Maintain lists of unresolved issues, action items, and assignments.

3.4.4 Treasurer

The Treasurer shall

- a) Maintain a budget
- b) Control all funds into and out of the Committee's financial account,
- c) Follow IEEE policies concerning standards meetings and finances,
- d) Adhere to the *IEEE Financial Operations Manual*.

4. Membership

4.1 Technical Committee Membership

1. Technical Committee members are appointed by one or more of the following:
 - a) The Committee Chair,
 - b) The ICES AdCom
 - c) An IEEE Society,
 - d) The IEEE-SA Standards Board
2. Subcommittee members are appointed by the chair of the subcommittee.
3. Members may be terminated at the request of the Chair.
4. An interested Society of the IEEE may designate members to a Technical Committee who will serve as the official representative of the Society upon approval of the Chair.
5. The IEEE-SA Standards Board and the ICES AdCom may designate official representatives of outside organizations. A representative may have an alternate serve in his/her absence.
6. Membership in the IEEE-SA is encouraged for all Committee members.

The membership of a Technical Committee shall observe the following policies:

Each member is expected to attend meetings as required by these procedures. The Secretary records attendance for members who attend at least 50% of a meeting's duration. Attendance

at a meeting via teleconferencing and/or electronic means, e.g., Internet conferencing shall count towards the attendance requirements.

4.2 Application

A request for membership on Technical Committee shall be addressed to the Committee Chair indicating the applicant's direct and material interest in the Committee's work and qualifications and willingness to participate actively. Membership on the Technical Committees is approved by the AdCom.

A request for membership on a subcommittee shall be addressed to the Subcommittee Chair indicating the applicant's direct and material interest in the Subcommittee's work and qualifications and willingness to participate actively.

4.3 Review of Membership

The Chair of a Technical Committee and the Chairs of the Subcommittees shall review the membership rosters annually. Members are expected to fulfill the obligations of active participation. When a member is found in habitual default of these obligations, the Chair shall consider the matter for appropriate action, which may include termination of membership.

Active participation in the work of the Committee and Subcommittees is a prerequisite to continuing membership. Failure to participate in committee activities for one year without specific written notification to the Secretary of the Committee or Subcommittee shall be deemed grounds for termination from the Committee or Subcommittee.

4.4 Observers and Invited Individual Experts

Individuals and organizations having an interest in a Technical Committee's work may request listing as observers. Observers shall be advised of the Committee activities, may attend meetings, and may submit comments for consideration, but shall have no vote. A Technical Committee may also invite individual experts to assist it. Individual experts shall be subject to approval by vote of the AdCom and shall have all rights and privileges of a Committee member. Invited Experts who are not IEEE SA members must be approved by the SASB in order to participate in a Sponsor ballot.

4.5 Interest categories

All appropriate interests that might be directly and materially affected by the standards activity of the Technical Committee shall have the opportunity for fair and equitable participation without dominance by a single interest. Each member shall propose his/her own interest category as appropriate and in accordance with the Committee's established categories. The interest categories shall be established or revised by a vote of the Committee upon recommendation by the Administrative Committee. The categories of producer, user, and general interest will be used when determining balance. The Technical Committee Chair shall address any issues of balance on Balloting Groups.

4.6 Membership roster

4.6.1 Technical Committee

The Secretary of each Technical Committee shall maintain a current and accurate Committee roster of members and shall distribute it to the members upon request. All changes to the roster shall be forwarded to the Chair immediately. The roster shall include the following:

- a) Title of the Technical Committee and its designation
- b) Scope of the Committee
- c) Officers
- d) Members: for all, list name, email address, affiliation and if available mailing address and IEEE Society(ies).
- e) For each subcommittee and working group—title, chair, and names and e-mail addresses and affiliations of all members.

4.6.2 Subcommittees Created by the Technical Committee

The Secretary of each Subcommittee created by a Technical Committee shall maintain a current and accurate Subcommittee roster of members and shall distribute it to the Technical Committee Secretary and to the members upon request. All changes to the roster shall be forwarded to the Subcommittee Chair immediately. The roster shall include the following:

- a) Title of the Subcommittee and its designation
- b) Scope of the Subcommittee
- c) Officers
- d) Members: for all, list name, email address, affiliation and if available mailing address and IEEE Society(ies).
- e) For each Subcommittee Working Group—title, chair, and names and e-mail addresses and affiliations of all members.

5. Subcommittees and Working Groups

5.1 Subcommittees

When one or more subcommittees are formed to expedite the work of a Technical Committee, their formation (and later disbandment) requires recommendation of the Technical Committee officers, approval by a majority of the voting members of the Technical Committee and approval of the ICES AdCom. The Chairperson of a Subcommittee shall be appointed by the Technical Committee Chair, with the approval of the Technical Committee officers. The subcommittees shall follow rules as specified by the Technical Committee. In matters not covered in these Operating Procedures, the subcommittee is free to vote upon appropriate rules.

The scope, duties, and membership of all subcommittees shall be reviewed by the Technical Committee annually. The charge to the subcommittee shall clearly state which of the following complementary activities is appropriate:

1. The subcommittee is responsible for the definitive content of one or more documents and for responding to views and objections thereon. Such subcommittees shall maintain a membership roster and shall comply with the provisions for voting on the standard(s).
2. The subcommittee is responsible for assisting the Technical Committee (for example, drafting all or a portion of a document, drafting responses to comments, drafting positions on standards, or other purely advisory functions).

The disbandment of subcommittees requires approval by a majority vote of the eligible members of the Technical Committee

The duties of the officers of the subcommittee are the same as that for the Technical Committee officers. Meetings of subcommittees may be held as decided upon by the members or chair of the subcommittee.

The formation and disbandment of a subcommittee requires approval by the majority of the voting members of the Technical Committee.

5.2 Working Groups Created by a Subcommittee

When one or more working groups are formed to expedite the work of a subcommittee, their formation (and later disbandment) requires recommendation of the Subcommittee officers. The Chairperson of a working group shall be appointed by the Subcommittee Chair. The working group shall follow rules as specified by the Subcommittee. In matters not covered in these Operating Procedures, the working group is free to vote upon appropriate rules.

The scope, duties, and membership of all working groups shall be reviewed by the Subcommittee annually. The charge to the working group shall clearly state which of the following complementary activities is appropriate:

1. The working group is responsible for the definitive content of one or more documents and for responding to views and objections thereon. Such working groups shall maintain a membership roster and shall comply with the provisions for voting on the standard(s).
2. The working group is responsible for assisting the Subcommittee (for example, drafting all or a portion of a document, drafting responses to comments, drafting positions on standards, or other purely advisory functions).

The disbandment of working groups requires approval by the Subcommittee Officers.

The duties of the officers of the working group are the same as that for the Subcommittee officers. Meetings of working groups may be held as decided upon by the members or chair of the working group.

5.1 Approval of Standards

Draft Standards and any substantive change in the content of a standard proposed and or approved by a subcommittee shall be referred to the Technical Committee for approval. The Committee may form and delegate approval authority to a balloting group.

6. Termination of a Technical Committee

A proposal to terminate an ICES Technical Committee may be made by a directly and materially affected interest. The proposal shall be submitted in writing to the Technical Committee Secretary, the ICES AdCom, and to the IEEE-SA Standards Board and shall include at least the following:

1. Reasons why the Committee should be terminated
2. The name of the organization(s) that will assume responsibility for maintenance of any existing IEEE Standard(s) that are the responsibility of the Committee

7. Meetings

Technical Committee and Subcommittee meetings shall be held, as decided by the appropriate Committee or Subcommittee Chair, or by petition of 10 or more members, to conduct business, such as making assignments, receiving reports of work, considering draft standards, resolving differences among subgroups, and considering views and objections from any source. A 30 calendar-day notice, including an agenda, shall be distributed to all members, observers, and experts for face-to-face meetings and a 14 calendar day notice including an agenda, shall be distributed to all members, observers, and experts for electronic meetings.

The Technical Committee or Subcommittee may charge a meeting fee to cover services needed for the conduct of the meeting. The fee shall not be used to restrict participation by any interested parties.

All IEEE Standards development meetings are open to anyone who may be materially affected and wishes to attend. Some meetings may require payment of an attendance fee to help cover costs.

7.1 Quorum

There shall be a quorum for conducting business at a meeting. If a quorum is not present, actions may be taken subject to confirmations by letter ballot, as detailed in Subclause 8.2. (See latest edition of *Robert's Rules of Order*.) A quorum is considered to be a majority of the voting members of the Committee. If a quorum is not present at a meeting, the Chair may choose to conduct certain business of the meeting via e-mail, fax or letter ballot, as appropriate.

7.2 Conduct

It is expected that participants in the Committee behave in a professional manner at all times. Participants shall demonstrate respect and courtesy towards officers and each other, while

allowing participants a fair and equal opportunity to contribute to the meeting, in accordance with the IEEE Code of Ethics.

8. Vote

8.1 Actions Requiring Approval by a Majority of the Committee Membership

Approval of the following actions require an approval vote from a majority of those votes cast from those entitled to vote at the time of a vote (either at a meeting or by electronic ballot), provided a quorum is present.

These actions include

1. Adoption of new or revised Committee procedures, interest categories, or revisions thereof
2. Formation of a subgroup, including its scope and duties
3. Disbandment of subgroups
4. Approval of minutes
5. Approval of public statements
6. Approval of change of the Committee scope
7. Approval of termination of the Committee
8. Position Statements for Standards

Notification of the potential for action shall be included on any distributed agendas for meetings. Final action on items (1) and (6) and (7) above require approval by the ICES AdCom and the IEEE-SA Standards Board.

8.2 Voting Between Meetings

The Committee shall be allowed to conduct Committee business between meetings at the discretion of the Chair by use of a letter or electronic ballot. If such actions are to be taken, they shall follow the rules of IEEE Bylaw I-300.4(4).

8.3 Proxy Voting

Proxy voting is not permitted except on subcommittee ballots where entity voting has been instituted to ensure balance.

8.4 Vote of Alternate

Alternate voting only applies to entity voting on subcommittees. An alternate's vote is counted only if the designated representative fails to vote.

8.5 Actions Requiring Approval by Seventy-five Percent of those Voting of the Technical Committee and Subcommittee Membership

The following action requires receipt of an electronic ballot from at least 75% of the voting members of the Technical Committee and the Subcommittee with approval by at least 75%

of those voting affirmative or negative. All negative ballots shall be recorded and an attempt made for their resolution.

1. Approval of a new or revised standards project

The following action requires receipt of an electronic ballot from at least 75% of the voting members of the Committee with approval by at least 75% of those voting affirmative or negative. All negative ballots shall be recorded and an attempt made for their resolution.

2. Approval of a new or revised standards project
3. Reaffirmation of an existing standard

8.6 Balloting on Standards

The Technical Committees act as the balloting bodies for ICES standards. In order to vote on a document at the Sponsor level, each voting member shall have paid the appropriate fees associated with balloting privileges or have been approved by the SA-Standards Board as an invited expert.

Each voting Technical Committee member or Subcommittee member voting on a draft standard shall vote one of the following positions:

- (1) Affirmative
- (2) Negative with reasons (the reasons for a negative vote shall be given and should include specific wording or actions that would resolve the objection)
- (3) Negative without Comments
- (4) Abstain

9. Balloting Group for a Standard

Before a standard is sent for Sponsor ballot, it must first be balloted by the Subcommittee responsible for the standard. For approval of proposed standards, the Technical Committee and the Subcommittee responsible for the standard shall form a balloting group. The Subcommittee balloting groups are established by invitation to members of the Subcommittee. The Technical Committee balloting groups shall be formed using the invitation process in accordance with the *IEEE-SA Standards Board Operations Manual*, Subclause 5.4.2.

The criteria for approval of a new or revised standard project or a reaffirmation of an existing standard shall be as described in the *IEEE-SA Standards Board Operations Manual*, Subclause 5.4.3.

10. Communications

All Technical Committee and Subcommittee officers should use ICES letterhead if available, or email notification, when corresponding on behalf of Committee activities.

10.1 Formal Internal Communication

If correspondence between technical committees, subcommittees or between working groups of different subcommittees involves issues or decisions (that is, non-routine matters) affecting other technical committees or subcommittees, copies shall be sent to all affected technical committee and subcommittee chairs, secretaries, and the ICES AdCom officers.

10.2 External Communication

Inquiries relating to the Technical Committee should be directed to the Chair, and members should so inform individuals who raise such questions. All replies to inquiries shall be made through the Chair.

10.3. Public Statements for Standards

All Committee public communications shall comply with the policies of the *IEEE-SA Standards Board Operations Manual*.

10.4 Informal Communications

Informal communications shall not state that they are a formal position of the IEEE, the IEEE-SA, or the Committee.

10.5 Position Statements to be Issued by Other Entities

If a Technical Committee wishes to go to another IEEE entity (as defined in Section 15 of the *IEEE Policy and Procedures*) to have that entity offer a position statement on a standards matter, they shall do so after agreement from the ICES AdCom and the IEEE-SA Standards Board and after informing the IEEE-SA BOG. Upon Technical Committee and AdCom approval, proposed position statements that need to be issued by other IEEE entities shall be forwarded to the IEEE-SA Standards Board Secretary for further action.

10.6. Standards Publicity

The Committee is encouraged to prepare press releases and other forms of publicity to promote their activities. See Subclause 5.1.5 of the *IEEE-SA Standards Board Operations Manual* for further instructions.

11. Interpretations

Written inquiries requesting interpretations of the Committee's IEEE approved standards shall be responded to by the appropriate Subcommittee Interpretations Working Group. The policies of Subclause 5.9 of the *IEEE-SA Standards Board Operations Manual* shall be followed. Revisions to the standard resulting from requests for interpretations shall be processed in accordance with the procedures of the IEEE-SA Standards Board and the Technical Committee. Copies of all requests for interpretations and subsequent responses shall be forwarded to the ICES AdCom and the Secretary of the IEEE-SA Standards Board.

11.1 Interpretations Process

Each subcommittee of a Technical Committee that generates an IEEE standard shall create an Interpretations Working Group following publication of the standard. Each Interpretations Working Group shall consist of a Chair and approximately 5-10 subcommittee volunteers whose areas of expertise or affiliation are representative of the subcommittee. Membership on the Interpretations Working Group shall be for a term of 5 years, renewable once at the request of the member.

The Vice-Chair of the AdCom shall serve as the Committee designee for receipt of requests for interpretation submitted to the IEEE-SA Standards Board Secretary. Copies of each request shall be distributed to the appropriate Technical Committee Chair by the AdCom Vice Chair, together with a form to indicate the adjudged nature of the request (explanation only, bona fide interpretation, other). Requests judged to be for explanation only shall be directed to an appropriate member of the Subcommittee and the Chair of that Subcommittee's Interpretations Working Group for a response to the requester in the name of ICES.

The Subcommittee Interpretations Working Group Chair shall be the designee for receipt of requests for interpretation forwarded by the Technical Committee Chair. Upon receipt of such a request, this designee shall select a working group member (or members) to be responsible for the preparation of a draft response. Upon completion, the draft shall be circulated to the full Interpretations Working Group by the Chair with comments and/or revisions to be returned in a timely fashion. The resolution of comments and/or suggested revisions shall be by the drafters of the response in consultation with the Chair of the Interpretations Working Group, and a final draft for ballot prepared. The final draft response shall be approved by the full working group in accordance with the standard IEEE-SA consensus process, which shall include attempts to reconcile negative ballots.

Following approval, the Chair of the Interpretations Working Group shall forward the response to the individual who made the original request for interpretation. Copies of the response, together with the roster of the Interpretations Working Group, shall be sent to the Secretary of the IEEE-SA Standards Board, the IEEE Staff Liaison, the ICES Secretary, and the Vice-Chair of the Technical Committee.

Revisions to the standard resulting from requests for interpretations shall be processed in accordance with the procedures of the IEEE-SA Standards Board and of these procedures.

12. Appeals

The Committee recognizes the right of appeal. Technical appeals will be heard and decided by the appropriate Subcommittee or the Technical Committee. Procedural appeals will be referred to the IEEE-SA Standards Board. (See Section 5.8 of the *IEEE Standards Operations Manual* for further details.)