ICES

International Committee on Electromagnetic Safety

ICES (SCC-39) Annual Report: 2010 – 2011

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)

31 October 2011

CONTENTS

ICES (SCC-39) Annual Report: 2010 – 2011

1. Scope

"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 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."

The structure of ICES/SCC-39 is shown below in Figure 1.

2. Administrative Committee (AdCom)

2.1 AdCom Membership

The membership of the AdCom is shown below in Table 1; additional "at large" members are being sought, particularly from outside the US.

2.2 AdCom Activities

AdCom members continue to interact with the World Health Organization (EMF Project) explore paths toward international harmonization of standards for the safe use of electromagnetic energy. The increased international ICES membership is providing greater influence within the international community. ICES representatives regularly participate and give presentations on the role of ICES in international standard setting at important international meetings including meetings sponsored by the WHO EMF Project International Advisory Committee, PIERS (Progress in Electromagnetics Research Symposium), ITU (International Telecommunications Union), IEC (International Electrotechnical Commission), the Bioelectromagnetics Society (BEMS), and workshops sponsored by the EU Presidency and the Commission on Worker Safety. ICES members also play a role in drafting public documents on contemporary RF safety issues, e.g., the former Chair of the ICES Membership Committee, Tom McManus, was the main author of the WHO Model Legislation document, which included finding common ground where different opinions existed.

ICES members including, Dr. Michael Murphy (Chairman of the ICES Membership Committee), Mr. Art Thansandote (Co-chairman of TC95/SC4), Dr. J. Patrick Reilly (member of TC-95/SC-3 and a major contributor to IEEE C95.6-2002 represented ICES (by invitation) at a number of ICNIRP Collaboration Meetings and prepared critiques of ICNIRP documents (also by invitation). Drs. Mays Swicord and Joe Elder were invited to attend the May 2011 WHO International Agency for Research on Cancer (IARC) as observers.

2.3 Highlights (2010 – 2011)

- The Administrative Committee (AdCom) met in Seoul, Korea, Plantation, FL, White Oak, MD, Halifax Canada, and several times between these meetings by teleconference. In addition to other duties, the ICES AdCom plans and arranges meetings of TC 34 and TC 95 and their subcommittees, and approves (or rejects) applications for membership on the ICES technical committees. Dr. Ralf Bodemann

(Siemens AG, Germany, and ICES Chairman), Dr. Tom McManus (consultant to the Irish Department of Communications and Natural and Marine Resources, AdCom "at large" member and former Membership Chairman), Dr. Sheila Johnston (independent consulting neuroscientist from Ireland, AdCom "at large" member and former Membership Chairman), and Dr. Michael Murphy (US Air Force Research Laboratory—Membership Chairman) have become ICES roving ambassadors to the EU member states. Each has given several presentations in support of ICES and the IEEE open consensus process for standards setting. Murphy was also President of the Bioelectromagnetics Society (BEMS – the pre-eminent Society for the study of the interaction and effects related to the exposure of living systems to electric, magnetic and electromagnetic fields at frequencies below 300 GHz.) He and several other ICES members serve as ICES liaison to the BEMS Board of Directors. Dr. C-K Chou (Motorola Solutions and TC95 Chairman) has given numerous presentations on IEEE ICES standards in China, Egypt, France, Japan, Malaysia, Singapore, South Africa, and Taiwan.

- In May 2009, the IEEE entered into a Technical Cooperation Agreement (TCA) with the NATO Standardization Agency (NSA) in order to share knowledge of each organization's standards development activities. The objective of the agreement is to avoid duplication of technical standards whenever possible. In addition, on 30 July 2009, ICES entered into a Specific Agreement with the NSA for the conversion of the standard covered by NATO STANAG 2345 Med. (Edition 3) – "Evaluation and Control of Personnel Exposure to Radio Frequency Fields – 3 kHz to 300 GHz," into an IEEE Standard. The result of this agreement is standards project (PC95.1-2345) that is now being developed by an ICES TC95 SC-3/SC-4 working group.

- Dr. B Jon Klauenberg (US Air Force Research Laboratory and long-time member of ICES) is being awarded the IEEE SA International Standards Award in December for helping to convince world bodies and international agencies of the rigor, benefits, and provenance of IEEE standards.

- A joint DoD Services sponsorship of the release of IEEE Standards C-95.1-2005, C95.3-2002, C95.3.1-2010, C95.6-2002 and C95.7-2005 was approved. These standards are now publicly available through the IEEE SA Get Program. In the past, international recognition of the C95 standards was hindered by their cost.

- Following circulation of an IEC TC106 "Q" document titled "Establishment of joint IEC TC106 – IEEE SCC-39/TC-34 projects on the evaluation of specific absorption rate (SAR) using numerical techniques," ICES TC-34 has submitted four draft standards to be jointly developed by IEC and IEEE and published as dual logo standards. All four projects have been approved.

2.4 Policies and Procedures

The ICES Policies and Procedures were accepted by AudCom and the SASB at the June 2007 meeting. A new draft will be prepared based on the SCC Baseline P&Ps and Working Group P&Ps and submitted for AudCom review 2nd Q 2012.

2.5 ICES Website

AdCom members continually provide material for the ICES website (http://www.ices-emfsafety.org/), which includes separate sections for TC-34 and TC-95 with public and private pages for the main committees and the subcommittees (ICES owns the domain); File Transfer

Protocol (FTP) services for subcommittee activities are also included. In addition, TC-34 maintains the following websites:

http://grouper.ieee.org/groups/scc34/sc2/ (public),
http://grouper.ieee.org/groups/scc34/sc2/private/moindex.html (private).

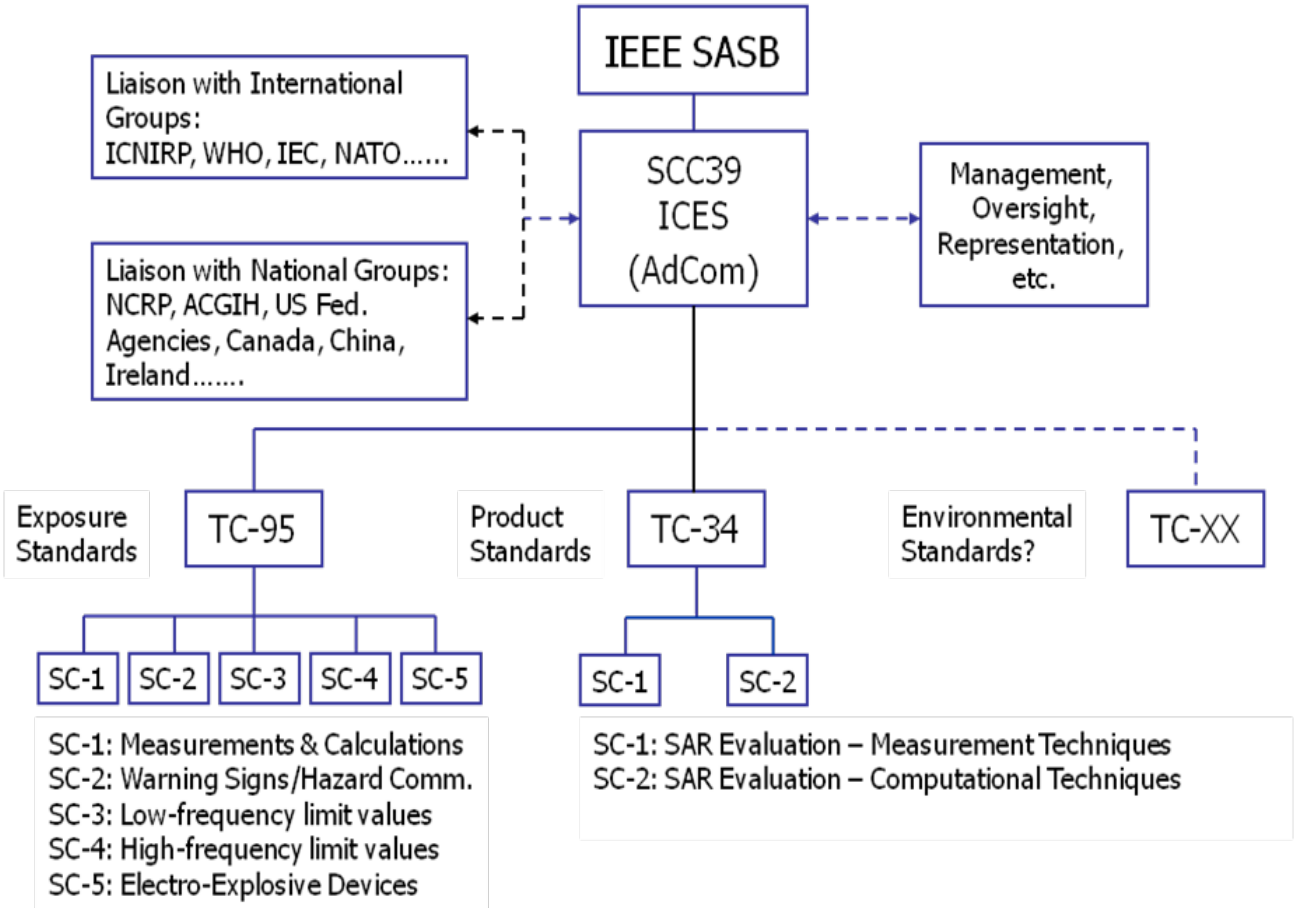

Figure 1—ICES Structure

Table1—ICES AdCom

OFFICE	NAME	AFFILIATION	COUNTRY
Chairman	Dr. Ralf Bodemann	Siemens AG	DE
Vice Chairman	Kenneth Gettman	NEMA	US
Executive Secretary/Treasurer	Ronald C Petersen	R C Petersen Associates LLC	US
Chairman, TC95 Membership	Dr. Michael Murphy	Air Force Research Laboratory	US
Chairman TC-34 and TC34/SC-2	Dr. Wolfgang Kainz	USFDA/CDRH)	US
Chairman, TC-34/SC-1	Dr Mark Douglas	Found. for Research on Information Technologies in Society	CH
Chairman TC-95	Dr. C-K. Chou	Motorola Solutions, Inc.	US
Co-chairman TC-95/SC-1	John DeFrank	US Army CHPPM	US
Co-chairman TC-95/SC-1	Mark Douglas	IT'IS Foundation	CH
Chairman TC-95/SC-2	Richard Tell	Richard A Tell and Associates	US
Co-chairman TC-95/SC-3	Thanh Dovan	SP AusNet Pty. Ltd.	AU
Co-chairman TC-95/SC-3	Rob Kavet	EPRI	US
Co-chairman TC-95/SC-4	Art Thansandote	Health Canada	CA
Co-chairman TC-95/SC-4	Dr Marvin Ziskin	Temple University Medical School	US
Co-chairman TC-95/SC-5	Robert Needy	Naval Surface Warfare Ctr.	US
Co-chairman TC-95/SC-5	Tamera Hay	Naval Surface Warfare Ctr.	US
Chairman Emeritus	Dr. John Osepchuk	Full Spectrum Consulting	US
At Large Member	Dr. Sheila Johnston	Independent Consulting Neuroscientist	IE
At Large Member	Dr. Tom McManus	Consultant - Dept of Comm. & Marine &Natural Resources	IE
IEEE Staff Liaison	Joan Woolery	IEEE Standards	US

3. Technical Committee-34

3.1 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)." (The scope remains the same as the scope of SCC-34 before reorganization.)

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 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); EEA was disbanded in August 2001.

3.2 Reorganization

Following combining SCC28 (exposure standards) and SCC34 (product standards) into a new committee (SCC39) the structure and activities of SCC34 (now TC34) were examined and a decision was made to re-organize the committee. Originally, TC-34 consisted of the following three subcommittees: SC-1 (Pleasure-boat radar), SC-2 (SAR evaluation), and SC-3 (Effectiveness of RF-protective clothing). Initially there was considerable interest in the activities of SC-1 and SC-3, but this interest has dwindled during the past few years. The decision was made to disband SC-1 until there is evidence of increased interest. SC-3 was also disbanded. The EMB-S Committee on Man and Radiation (COMAR) was be asked to consider drafting a technical information statement on pleasure boat radar. The remaining subcommittee, SC-2, was divided logically into two subcommittees—SC-1 (SAR evaluation—measurement techniques) and SC-2 (SAR evaluation—numerical techniques). SC-2 includes the following four working groups:

- WG-1 (General requirements for using the FDTD method for SAR calculations);
- WG-2 (Specific requirements for FDTD Modeling of vehicle mounted antenna configurations);
- WG-3 (Specific requirements for FDTD modeling of mobile phones/personal wireless devices);
- WG-4 (Requirements for using the finite-element method for SAR Calculations, specifically vehicle-mounted antennas and personal wireless devices).

The two subcommittees and their working groups are very active and hold face-to-face meetings and teleconferences several times per year. The face-to-face meetings are usually held in conjunction with IEC TC106/PT62209, which has a similar scope and with whom TC-34 has a Category D Liaison.

3.3 Membership Roster

See Table TC-34-2 (NOTE—All members listed are members of TC-34, TC-34/SC-1 and TC-34/SC-2, i.e., the members of SC-1 are also members of SC-2 and also members of TC-34, and vice versa.)

3.4 Meetings (2010-2011)

3.4.1 Upcoming meetings

- December 7-9, 2011 – Sydney, AU
- November 19, 2011 – teleconference

3.4.2 Past meetings

- October 17, 2011 - teleconference
- August 22-24, 2011 – Xian, CN
- August 9, 2011 - teleconference
- July 26, 2011 - teleconference
- June 9, 2011 – teleconference
- April 18-20, 2011 – Istanbul, TR
- February 8, 2011 – teleconference
- December 13-15, 2010 – Paris, FR
- October 22, 2010 – teleconference
- September 6-9, 2010 – Zurich, CH
- August 24, 2010 – teleconference
- June 10-11, 2010 – Seoul, KR
- May 16, 2010 – teleconference
- March 22-24, 2010 – Newbury, UK
- February 16, 2010 - teleconference

3.5 Subcommittee activities

3.5.1 Subcommittee 1 (SAR evaluation – measurement techniques)

- Joint meetings were held (and continue to be held) with IEC TC-106 – PT 62209 to work on draft standard IEC 62209-2, “Human exposure to radio frequency fields from handheld and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for mobile wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).” IEC 62209-2 was published in March 2010.

- **P1528:** The revision of IEEE 1528 (which extends the frequency range of SAR measurement standards up to 6 GHz) is now undergoing Sponsor Ballot. SC-1 is collaborating with IEC PT62209 toward the development of standards for devices held within 20 cm of the body (including body-worn, hand-held and desktop devices). It has been proposed that this work should be directed towards a jointly developed standard bearing a dual IEC/IEEE logo. This would further strengthen the harmonization of international standards.

3.5.2 Subcommittee 2 (SAR evaluation – numerical techniques)

The four SC2 projects (P1528.1, P1528.2, P1528.3 and P1528.4) have been approved as IEC/IEEE jointly developed standards projects).

3.5.2.1 P1528.1 (IEC P62704-1):

- The draft of IEEE P1528.1 is being finalized and will be submitted for voting in the next couple of months. The text has been reviewed and revised based on comments of the committee members.
- A benchmark study based on a particular geometry, the "SAR Star," has been defined and coordinated. It tests the implementation of the SAR averaging algorithm defined in IEEE 95.3 for symmetry, averaging in edges and pointed structures as well as gaps.

3.5.2.2 P1528.2 (IECP62704-2):

- The draft of IEEE P1528.2 is being finalized and will be submitted for voting in the next couple of months.
- Approaches for 95th percentile coverage of the population and coverage of car designs has been drafted and incorporated in the document.
- Simulation results for vehicle-mounted antenna simulations for bystander exposure have been performed and collected as input for the draft.
- The annex on the standard bystander and passenger voxel model file format description has been incorporated in the document.
- The project is underway to evaluate passenger exposure conditions for 90^{th} percentile population coverage and incorporate the results in the draft

3.5.2.3 P1528.3 (P62704-3):

- SAR and reflection coefficient results from simulations of the OpenMoko CAD phone model have been produced by several laboratories and have been implemented in the benchmark validation section of the P1528.3 draft.
- The P1528.3 draft has been updated with the experiences obtained from the conducted inter-laboratory comparison. However, there remains work to be done to finally complete the uncertainty section, but it is agreed that the changes will be considered together with the P1528.1 uncertainty section.

3.5.2.4 P1528.4 (P62704-4):

- An early version of a Recommended Practice has been produced that covers the same topics as P1528.1, P1528.2 and P1528.3 combined. The P1528.4 draft closely follows the earlier PARs and frequently refers to them, while changing FDTD specific guidelines into finite element analysis (FEM)-specific guidelines. As the P1528.1, P1528.2 and P1528.3 continue to grow and evolve, so will those of P1528.4.

3.6 TC-34 PARs

3.6.1 SC-1 PARs

3.6.1.1 P1528 (Approved June 2009)

Title: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

Scope: 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.

Purpose: The purpose of this recommended practice is to provide a protocol for the measurement of the peak spatial-average SAR in an anatomical model of the human head of users of wireless handsets intended to be operated while held next to the ear. It provides the users with standardized and accepted protocols, measurement and validation techniques, and means for estimating the overall uncertainty in order to produce valid and repeatable data. Specific SAR limit values are not included since these are found in other documents, e.g., IEEE C95.1 and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines.

3.6.2 SC-2 PARs

3.6.2.1 P62704-1 (Approved March 2011)

Title: Standard for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz. Part 1: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations

Status: New Standard Project

Project scope: This standard 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 and IEEE C95.1a.

Project purpose: Document will not contain a purpose clause.

3.6.2.2 P62704-2 (Approved March 2011)

Title: Standard for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz. Part 2: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antenna Configurations

Status: New Standard Project

Project scope: This standard 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 are (but are 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 C95.1-2005 and IEEE C95.1a-2010.

Project purpose: Document will not contain a purpose clause.

3.6.2.3 P62704-3 (Approved March 2011)

Title: Standard for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz. Part 3: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Mobile Phones/Personal Wireless Devices

Status: New Standard Project

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 does not recommend specific SAR values since these are found in other documents, e.g., IEEE C95.1 and IEEE C95.1a.

Project purpose: This standard will not contain a purpose clause

3.6.2.4 P1528.4 (Approved June 2008)

This PAR will be withdrawn in December and a new PAR for a jointly developed IEC/IEEE standard with the same title will be submitted (P62704-4)

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: Requirements for Using the Finite-Element Method for SAR Calculations, specifically involving Vehicle Mounted Antennas and Personal Wireless Devices

Scope: The scope of this recommended practice is to describe the concepts, techniques, models, validation procedures, uncertainties and limitations of the Finite-Element Method when used for determining the peak spatial average specific absorption rate (SAR) in standardized models of the human anatomy exposed to wireless communication devices, in particular vehicle-mounted antennas and personal wireless devices such as hand-held mobile phones. Guidance on modeling such devices and benchmark data for simulation are provided. It defines model contents, guidance on meshing and test positions at the anatomical models. This document does not recommend specific SAR values since these are found in other documents, e.g., IEEE C95.1-2005.

Purpose: The purpose of this document is to specify numerical techniques, anatomical models, and other models of the human anatomy and vehicles to determine the peak spatial average specific absorption rates (SAR) in the human body of persons exposed to wireless communication devices, in particular vehicle-mounted antennas and personal wireless devices, such as hand-held mobile phones. SAR is determined using a Finite-Element simulation of the electromagnetic field conditions produced by wireless devices in standardized models of the human anatomy. 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.

3.7 Drafts

3.7.1 SC-1 (Measurement Techniques)

A draft of P1528b (Amendment 2) was prepared and balloted by the subcommittee in April, 2007. It was decided at that time that because of the number of issues addressed it would be appropriate to revise the standard instead of completing an amendment. The PAR for P1528b was withdrawn and a PAR submitted for the revision of IEEE 1528-2003 (and 1528a-2005). A subcommittee draft of the revision was balloted in January 2009 and Sponsor ballot is in progress (recirculation ballot is underway).

3.7.2 SC-2 (Computational Techniques)

Partial first working drafts of P1528.1, P1528.2, 1528.3 and P1528.4 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. All 4 drafts have been submitted to IEC for jointly developed status: P1528.1, P1528.2, 1528.3 are replaced with P62704-1, P62704-2, P62704-3, respectively and the PARs were approved in March 2011. The draft of P1528.4 was approved by IEC as a jointly developed standards project (P62704) and a PAR will be submitted to NesCom for consideration at the December 2011 meeting.

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

3.8.1 SC-1 (Measurement techniques)

3.8.1.1 Objectives (2011)

- Initiate sponsor balloting of the revision of IEEE 1528-2003 (Met)
- Complete Sponsor Balloting of the revision of /1528-2003 (Not Met)

3.8.2 SC-2 (Numerical techniques)

3.8.2.1 Current levels of activity with milestones indicated

- P62704-1 – complete subcommittee ballot draft (Met)
- P62704-2 – complete subcommittee ballot draft (Met)
- P62704-3 – complete subcommittee ballot draft (Met)
- P1528.4 – complete 2nd working draft (Met)
- 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 (Ongoing)

3.9 Website

A website and reflector was set up several years ago for SC-2 (now SC-1 and 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 subcommittee 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 reflector was also set up. The address is stds-ices-tc34@ieee.org

3.10 IEEE Staff support requirements

Originally, secretarial services for SC-2 provided by the Cellular Telecommunications and Internet Association (CTIA) are now provided by volunteer committee members. Joan Woolery is the Staff Engineer for both TC-34 and TC-95—her engineering background and broad knowledge of IEEE procedures is invaluable to this committee.

3.11 Liaison with other committees

Liaison with other committees occurs via the circulation of drafts, common meetings and common membership on committees such as CENELEC, IEC, ITU, ARIB and other standards developing organizations, and through a "Category D" liaison with IEC TC106/PT62209. Coordination has also been established with IEEE societies, e.g., EMC-S via representation on the Standards and Advisory Coordination Committee (SACCom).

3.12 Issues: Joint IEC/IEEE development project: IEC 62209 and IEEE 1528

Although P1528.1, P1528.2, P1528,3 and P1528,4 are now IEC/IEEE jointly developed standards projects, TC-34 is considering IEC approval of IEEE P1528 and IEC P62209 as jointly developed IEC/IEEE standards projects.

Rationale: IEC TC106/PT62209 and IEEE TC-34/SC-1) have worked hand in hand to develop IEC 62209-1-2005 "Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices - Human Models, Instrumentation, and Procedures - Part 1: Procedure to Determine the Specific Absorption Rate (SAR) for Hand-held Devices used in Close Proximity to the Ear (Frequency Range of 300 MHz to 3 GHz)" and IEEE 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" and have been working together to develop Part 2 of 62209 and the revision of 1528-2003/1528a/2005. During the development of IEEE 1528-2003 and IEC62209-1-2005, a large number of TC-34 members also participated on the IEC PT, sharing drafts to ensure harmonization. Thus the two existing standards were developed jointly by many of the same people but issued separately as two distinct standards. PT62209 is now working on the maintenance of Part 1 and on Part 2 of the standard (to address body-mounted radios); TC-34 has a Category D Liaison with PT62209 for development of this project and is working with the IEC PT. Both groups have to a large extent common membership (45% of the 62209 PT are TC-34/SC-1 members; 40% of TC-34/SC-1 are members of PT62209). Moreover, during the past two years, the TC-34 WG and PT62209 have held a number of face-to-face meetings and a number of joint teleconferences. While these are dedicated to PT62209 business, or TC-34 business (to limit the time), the discussion topics are common to both WGs and members of both WGs participate.

These are important standards for the wireless communications industry where harmonization is critical. Having a single dual logo standard is important for a variety of reasons and both 62209 Project Team Leader and the leadership of TC-34/SC-1 believe that IEC 62209 and IEEE 1528 are ideal candidates for such a project.

3.13 Membership

See Table TC-34-2 for detailed membership information.

Table TC-34-1

TC-34 Leadership

OFFICE	NAME	AFFILIATION
Chair	Dr. Wolfgang Kainz	USFDA/CDRH
Vice- chair	Dr. Mark Douglas	IT'IS Foundation
Chair – SC-1 (SAR evaluation—measurement techniques)	Dr. Mark Douglas	IT'IS Foundation
Chair – SC-2 (SAR evaluation—numerical techniques)	Dr. Wolfgang Kainz	USFDA/CDRH
Chair – WG-1 (IEC/IEEE P62704-1)	Andreas Christ	IT'IS Foundation
Chair – WG-2 (IEC/IEEE P62704-2)	Giorgi Bit-Babik	Motorola Solutions, Inc.
Chair – WG-3 (IEC/IEEE P62704-3)	Martin Siegbahn	Ericsson
Chair – WG-4 (IEC/IEEE P62704-4)	Martin Vogel	ANSOFT

Table TC-34-2
TC-34 Membership (September 2011)

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Balzano	Quirino	University of Maryland	A	US
2.	Bassen	Howard	US Food and Drug Administration	G	US
3.	Beard	Brian	US Food and Drug Administration	G	US
4.	Bit-Babik	Giorgi	Motorola Solutions, Inc.	P	US
5.	Bodemann	Ralf	Siemens	PI	DE
6.	Case	David	Cisco	P	US
7.	Chan	Kwok	US FCC	G	US
8.	Chang	Isaac	US Food and Drug Administration	G	US
9.	Chao	Justin	PC TEST	U	US
10.	Chen	Ji	University of Houston	A	US
11.	Choi	Hyung-Do	ETRI	P	KR
12.	Chou	C-K.	Motorola Solutions, Inc.	P	US
13.	Christ	Andreas	IT IS Foundation	A	CH
14.	Davis	Chris	University of Maryland	A	US
15.	Derat	Benoit	Field Imaging	P	FR
16.	Dianyuan	Qi	CATR-MIIT	G	CN
17.	Douglas	Mark	IT IS Foundation	A	CH
18.	Faraone	Antonio	Motorola Solutions, Inc.	P	US
19.	Forrester	John	Qualcomm	P	US
20.	Foster	Ken	University of Pennsylvania	A	US
21.	Francavilla	Mauro	Telecom Italia	P	IT
22.	Gabriel	Sami	Vodafone	P	UK
23.	Gallant	Josette	Industry Canada	G	CA
24.	Hamada	Lira	NICT	G	JP
25.	Harrington	Tim	US FCC	G	US
26.	Hauswirth	Steve	Motorola Mobility, Inc.	P	US
27.	Hayes	Gerard	Sony Ericsson	P	US
28.	Heirman	Don	Consultant	P	US
29.	Hibi	Keiichi	Sharp	P	JP
30.	Hong-Bin	Jin	China Mobile	U	CN
31.	Joyner	Ken	Samsung	P	AU
32.	Jun	Haeyoung	Samsung	P	KR

	Last Name	First Name	Affiliation	Interest Category	Country
33.	Kainz	Wolfgang	US FDA/CDRH	G	US
34.	Kenny	Jon	Sony Ericsson	P	UK
35.	Keshvari	Jafar	Nokia	P	FI
36.	Kuster	Niels	IT IS Foundation	A	CH
37.	Lee	Ae-kyoung	ETRI	U	KR
38.	Liu	Steve	PC TEST	U	US
39.	Loader	Benjamin	National Physical Laboratories	G	UK
40.	Lu	Lin	Qualcomm	P	US
41.	Magana	Luis	PC TEST	U	US
42.	Manteuffel	Dirk	Uni-Kiel	A	DE
43.	McIntosh	Robert	Telstra	U	AU
44.	Meier	Matthias	Motorola	P	DE
45.	Monebhurrun	Vikass	Supelec	A	FR
46.	Morrissey	Joseph	Broward College	A	US
47.	Nappert	Hughes	Industry Canada	G	CA
48.	Nicol	Stuart	Aprel	U	CA
49.	Niskala	Kai	Nokia	P	FI
50.	Onishi	Teruo	NTT DoCoMo	P	JP
51.	Park	DS	Samsung	P	KR
52.	Parmentier	Jack	Lenovo	P	US
53.	Penney	Chris	Remcom	P	US
54.	Petersen	Ron	Consultant	GI	US
55.	Poirier	Marcel	Industry Canada	G	CA
56.	Pokovic	Katja	SPEAG	P	CH
57.	Prokop	Alexander	CST	PM	DE
58.	Proulx	Stephane	Industry Canada	G	CA
59.	Roman	John	Intel	P	US
60.	Schiavoni	Andrea	Telecom Italia	U	IT
61.	Schulteis	Geoff	Sierra Wireless	U	US
62.	Seabury	Dave	ETS	P	US
63.	Shah	Yogi	Medtronic	P	US
64.	Shinji	Tanabe	Mitsubishi	P	JP
65.	Siegbahn	Martin	Ericsson	P	SE
66.	Simon	Winfried	IMST	P	DE
67.	Stéphane	Picard	Industry Canada	G	CA

	Last Name	First Name	Affiliation	Interest Category	Country
68.	Thors	Björn	Ericsson	P	SE
69.	Tornevik	Christer	Ericsson	P	SE
70.	Toropainen	Anssi	Nokia	P	FI
71.	Trinchero	Daniele	Polito	A	IT
72.	Vogel	Martin	Ansoft	P	DE
73.	Watanabe	Soichi	NICT	G	JP
74.	Whelan	Conrad	Acceleware	U	CA
75.	Wiart	Joe	ORANGE	U	FR
76.	Wittig	Tilmann	CST	P	DE
77.	Ye	Qiubo	Communications Research Center	G	CA

A = General Interest: Academic
G = General Interest: Government
GI = General Interest
P = Producer

4. Technical Committee -95

4.1 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 before reorganization.)

4.2 TC-95 Membership Roster

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

With the leadership of Dr. Michael Murphy, Membership Chairman, the non-US membership of ICES continues to grow.

Several members of TC-95 have been inactive or have changed e-mail address and can no longer be contacted; their continuing status continues to be 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, not all of which are SA members (there may be more IEEE and IEEE SA members than indicated on Tables TC-95-2 thru TC-95-7), which is to be expected and defended in view of the interdisciplinary nature of our membership. TC-95 is grateful for their voluntary contributions of talent and time under conditions where it would be an unreasonable imposition to require IEEE membership. TC-95 recognizes the financial burden for travel and loss of income generating business opportunity already born by many volunteers during TC-95 activities. However, IEEE SA membership is required of all TC-95 leadership (e.g., Committee and Subcommittee Chairs, Co-Chairs) and is encouraged for all members.

4.3 Meetings (2010-2011)

4.3.1 Main Committee

- Januray 15, 2010 – Silver Spring, MD
- June 12, 2010 – Seoul South Korea (in conjunction with the Bioelectromagnetics Society Annual Meeting)
- December 10, 2010 – Plantation, Florida
- June 11, 2011 – Halifax, Nova Scotia (in conjunction with the Bioelectromagnetics Society Annual Meeting)
- December 14, 2011 – Plantation, Florida
- June, 2012 – Brisbane, Australia (in conjunction with the Bioelectromagnetics Society Annual Meeting – exact date TBD)

4.3.2 Subcommittee 1 (Measurements and Computation)

(The leadership of SC1 changed after publication of C95.3.1-2010)

- June 9, 2011 – Halifax Nova Scotia

- December 14, 2011 – Plantation, Florida

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

- January 13, 2010 – Silver Spring, MD
- December 9, 2010- Plantation, Florida
- June 10, 2011 – Halifax, Nova Scotia
- December 14, 2011 – Plantation, Florida

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

- January 14, 2010 – Silver Spring, MD
- June 11-12, 2010 – Seoul, South Korea (in conjunction with the Bioelectromagnetics Society Annual Meeting)
- December 9-10, 2010- Plantation, Florida (met jointly with SC4)
- June 10, 2011 – Halifax, Nova Scotia (met jointly with SC4)
- December 14-14, 2001 (will meet jointly with SC4)

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

- Januray 14, 2010 – Silver Spring, MD
- June 11-12, 2010 – Seoul, South Korea (in conjunction with the Bioelectromagnetics Society Annual Meeting)
- December 9-10, 2010- Plantation, Florida (met jointly with SC3)
- June 10, 2011 – Halifax, Nova Scotia (met jointly withSC3)
- December 14, Plantation, Florida (will meet jointly with SC3)

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

- The C95.4 standard is stable and the subcommittee has not found it necessary to meet since the June 2008 San Diego meeting.

4.4 Main Committee and Subcommittee Status

4.4.1 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 (6), China (1), Finland (1), France (2), Germany (1), Greece (3), Hungary (1), Ireland (4), Israel (2), Italy (4), Japan (4), Korea (2), Malaysia (4), the Netherlands (1), New Zealand (1), Poland (1), Sweden (1), Slovenia (1), South Africa (1), Switzerland (3), Thailand (1), Turkey (1), the United Kingdom (7) and the United States (72), i.e., approximately 43% of the main committee membership is from outside the US.

The TC-95 mailing list now approaches 350, including subcommittee members and observers. Nine 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; meeting minutes are posted on the

ICES website. The ICES Website (http://www.ices-emfsafety.org/index.php5) contains both open and private pages for TC-95 and its subcommittees and links to TC-34 and its subcommittees. All agendas, approved meeting minutes, white papers, RF research databases, draft standard documents, and many special reports are publicly available; certain proprietary or working documents are available only to members of the subcommittees on private sections of the site. The TC-95/SC-4 literature database, containing more than 5000 titles, which now appears on the WHO website, is also publicly available (http://www.who.int/peh-emf/research/database/IEEEdatabase/).

The following reaffirmations were approved by the IEEE SASB in 2008:

4.4.2 Subcommittee 1 (Measurement and Computation)

Subcommittee 1, has responsibility for IEEE C95.3 "IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz" and IEEE Std C95.3.1-2010, "IEEE Recommended Practice for Measurements and Computations of Electric, Magnetic, and Electromagnetic Fields with Respect to Human Exposure to Such Fields, 0 Hz to 100 kHz" and IEEE 1460, "IEEE Guide for the Measurement of Quasi-Static Magnetic and Electric Fields," IEEE 1460 has been incorporated into C95.3.1 and will not be revised or reaffirmed.

Work has begun to combine IEEE C95.3 and C95.3.1 into a single standard covering the frequency range of 0 Hz to 300 GHz. A PAR for the revision of C95.3-2002 will be submitted for consideration at the March 2012 NesCom meeting.

The former chair of SC-1 stepped down following publication of C95.3.1 – the new co-chairs of SC-1 are Mr. John DeFrank and Dr. Mark Douglas.

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

Subcommittee 2 has responsibility for the following standards: "IEEE C95.7-2005 IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz" and C95.2-1999 (2006) "IEEE Standard for Radio-Frequency Energy and Current-Flow Symbols." PARs for revision of C95.2 and C95.7 were approved by NesCom at the November 8, 2011 Continuous Processing meeting. The PARs were approved through December 31, 2014. At this time there are no PARs for new or existing projects.

SC-2 participated in the development of a response to a request for interpretation submitted to IEEE relative to application of C95.7. The response was prepared and circulated within TC-95 prior to its transmittal to the requestor in early 2011. The preparation of the interpretation response triggered subsequent discussion within SC-2 and SC-4 due to an apparent misunderstanding within the two committees on the definition of general public. At the summer meeting in Halifax in 2011, it was suggested that an addendum to the initial response for interpretation be prepared to further elucidate and clarify the opinion of the committees on proper application of RF safety programs. The addendum was prepared and subsequently submitted to the original requestor during the summer of 2011.

A substantive concern within SC-2 has been a reaction by the National Institute for Occupational Safety and Health (NIOSH) regarding details of recommendations within C95.7 relative to control measures for insuring compliance with the recommended limits provided by C95.1. A suggested response to the NIOSH has been prepared within SC-2

and has been circulated to NIOSH for concurrence. Once this process has been completed, C95.7 will be re-balloted within the subcommittee and prepared for republication in revised form that is consistent with both SC-2 and NIOSH.

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

Subcommittee 3 has responsibility for C95.6-2002 (R2007) "IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz." Following publication, members of SC-3 have presented four short courses on C95.6-2002; two in the US, one in Canada and one in Ireland. In addition, there were two technical presentations in Australia—all very well received. The attendees were mainly from the power utilities and government agencies.

At present, no major revisions of this standard are anticipated but key members of SC-3 continue open dialog including in scientific forums with members of other organizations with similar interests, e.g., the International Commission on Non-Ionizing Radiation Protection (ICNIRP), ARPANSA Australia to improve procedural & philosophical differences in the rationale and numeric limits of the standards/guidelines. In addition, members of SC-3 are also making progress in development of methodology for using an anatomically realistic induction model in future revision applications. There are no active PARs for new or existing projects but members of SC-3 are working with members of SC-4 on the revision of C95.1-2005 (PC95.1), which will incorporate C95.6, thereby extending the frequency range from 0 Hz to 300 GHz. Portions of C95.6 are also being incorporated into PC95.1-2345, a civil standard considered as a replacement of STANAG 2345, the current NATO RF exposure standard.

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

Subcommittee 4 has responsibility for the C95.1 standard "IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz." 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 1998, a combined edition published in 1999, and an amendment in 2004. The latest revision, C95.1-2005 was approved by the SASB at the October 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. An amendment (C95.1a) that specifies ceiling values for induced and contact current, distinguishes between peak power density and localized exposure, and corrects other technical issues was published in March 2010.

The ongoing revision of C95.1-2005 (PC95.1) will incorporate portions of C95.6. Following approval of the revision of C95.1, which will now cover the frequency range of 0 Hz to 300 GHz, C95.6 will be withdrawn or stabilized as a separate standard. Simultaneously, work on PC95.1-2345, which is intended to replace NATO STANAG 2345 (Edition 3) "Evaluation and Control of Personnel Exposure to Radio Frequency Fields – 3 kHz to 300 GHz" is ongoing.

The revision of C95.1-2005 and developing the new standard, C95.1-2345 is being carried out by an editorial working group that meets about four times per year. The working group, with members from both SC-3 and SC-4, prepares the drafts and addresses comments received by the subcommittees following circulation of each draft.

SC-4 continues to pursue the investigation of relationships between localized tissue temperature increase and peak spatial-average SAR (100 kHz to 3 GHz) and power density (3 GHz to 300 GHz) as a basis for a decision on the need to revise the limits for localized exposure at frequencies from 100 kHz to 300 GHz. Although numerous studies that report effects at levels below those where thermal mechanisms would prevail, all reliable evidence indicates that established adverse effects are thermal in nature and, therefore, changes in temperature under localized exposure conditions is important with respect to devices that produce such exposures, e.g., mobile telephones. The results would provide a scientifically sound basis for the current SAR limits for localized exposure or the basis for a change.

An ad hoc committee has been established to address bio-effects at THz frequencies. This is the continuation of a joint effort between members of SC-4 and ANSI ASC Z136 (laser safety) that began informally in 2000. While there was little data in 2000, there is a growing body of data that can be used to provide additional science-based support for reaffirming or revising the maximum permissible exposure values at 300 GHz (the upper frequency of IEEE C95.1 and the lower frequency of ANSI Z136.1). There is close coordination between ICES and ANSI ASC Z136 (ICES Secretary, Ron Petersen, chaired the Z136 committee from 2000 until 2009.)

4.4.6 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 was reaffirmed at the March 2008 SASB meeting. The standard is stabile and there are no PARs for new or existing projects.

4.5 PARs

The following TC-95 PARS are currently active:

4.5.1 SC2 PARs

4.5.1.1 PC95.2 (Approved November 2010)

Title: Standard for Radio-Frequency Energy and Current-Flow Symbols

Status: Revision Project

Project Scope: This standard provides a description of warning symbols for radio frequency radiation and radio frequency induced and contact currents in the frequency range of 3 kHz to 300 GHz.

Project Purpose: The purpose of this standard is to provide guidance on the standardized design of warning symbols that may be used on alerting signs for informing individuals of the potential for exposure to electric, magnetic and electromagnetic fields and associated induced and contact currents and contact voltages.

PC95.7 (Approved November 2010)

Status: Revision Project

Title: Recommended Practice for Radio Frequency Safety Programs - 3 kHz to 300 GHz.

Project Scope: This recommended practice presents guidelines and procedures that can form the basis of a radio frequency exposure safety program (RFSP) that provides guidance for controlling hazards associated with RF sources that operate in the frequency range of 3 kHz to 300 GHz. This is a general-purpose document intended for application in most RF exposure scenarios with the goal of avoiding potentially hazardous exposures to electromagnetic fields, currents, and/or contact voltages. In some complex cases, however, the required elements of an adequate RFSP may exceed those described in this document. In such cases, additional guidance may be necessary to effect a satisfactory RF safety solution. There are many ways of accomplishing the goal of a satisfactory RF safety program. While this recommended practice outlines certain schemes for providing a safe environment for persons who may be exposed to excessive levels of electromagnetic energy, other schemes may be equally effective.

Project Purpose: These guidelines are provided to assist in the development of RF safety programs for the use of RF energy-producing devices, equipment, and systems, and to control any potentially hazardous exposure of workers or the public. The means for accomplishing this are by first characterizing areas into one of four exposure categories according to the potential risk for exposure above prescribed RF exposure limits, as described in 1.3, then specifying the appropriate controls to reduce the likelihood of over-exposure. For many situations, this guidance will assist in the development of site-specific RF safety programs, while in others the programs may be developed to apply across a wide range of exposure environments. These guidelines are designed to complement the International Committee on Electromagnetic Safety (ICES) TC-95 family of standards on electromagnetic safety, but may find use in the development of effective programs to ensure conformance with other guidelines, standards, or regulations for controlling human exposure to electromagnetic energy. This Recommended Practice provides guidelines for establishing RF safety programs, but other recommendations may already exist that are deemed sufficient by local regulatory authorities for achieving RF safety in particular environments. Hence, other recommendations could potentially replace or be used in conjunction with the recommendations in this document. Guidelines developed for specific applications, for example, radio amateur operations, and electrical transmission/distribution personnel working near mobile phone base-station antennas installed on electric utility structures, represent two such examples.

4.5.2 SC3/4 PARs

4.5.2.1 PC95.1 (Approved June 2010)

Title: Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz

Status: Revision Project

Project scope: Recommendations are made to protect against established adverse health effects in humans resulting from exposure to electric, magnetic and electromagnetic fields in the frequency range of 0 Hz to 300 GHz. The recommendations are expressed in terms of exposure reference levels (ERLs) and dosimetric reference levels (DRLs). The DRLs are limits on in situ electric field strength, specific absorption rate (SAR), and incident power density; the ERLs, which are derived from the DRLs, are limits on external fields and induced and contact current. This standard is intended to apply to all human exposures except for exposure of patients under medical supervision. The recommendations are not intended for the purpose of preventing interference with medical and other devices that may exhibit susceptibility to radio frequency (RF) fields. The recommendations at 300 GHz are consistent with existing recommendations for safe exposure in the infrared frequency range, which begins at 300 GHz, cf., ANSI Z136.1, and IEC 60825-1.

Project purpose: The purpose of this standard is to provide rational, science- based exposure values to protect against established adverse effects to human health induced by exposure to electric, magnetic, and electromagnetic fields over the frequency range of 0 Hz to 300 GHz.

4.5.1.2 PC95.1-2345 (Approved September 2009)

Title: Standard for the Evaluation and Control of Personnel Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz

Status: New Standard Project

Project scope: Recommendations are made that protect personnel against established adverse health effects associated with exposure to electric, magnetic and electromagnetic fields in the frequency range of 0 Hz to 300 GHz. The recommendations are expressed in terms of basic restrictions (BRs) and reference levels. The BRs are limits on internal fields, specific absorption rate (SAR), and power density; the reference levels are derived from the BRs, and are expressed in terms of external fields and induced and contact current. The recommendations, which protect against effects associated with electrostimulation, and localized and whole-body heating, are intended to apply to all personnel. These recommendations do not apply to exposures of patients by, or under the direction of, physicians and medical professionals. These recommendations are not intended for the purpose of preventing interference with medical and other devices that may exhibit susceptibility to electric, magnetic or electromagnetic fields.

Project purpose: The purpose of this standard is to protect personnel against established adverse health effects associated with exposure to electric, magnetic and electromagnetic fields in the frequency range of 0 Hz to 300 GHz.

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

- Continue international membership expansion led by Dr. Murphy. Introduce new members for leadership positions with emphasis on non-US members, women and younger members. (Ongoing)
- Strengthen liaisons with ICNIRP, IEC, WHO, COST 281. (Ongoing)

- Pursue the project on publicizing ICES and C95.1 standards in the literature and at international meetings. (Ongoing)
- Complete subcommittee balloting draft of PC95.3.1 "Recommended Practice for Measurements and Computations with Respect to Human Exposure to Electric and Magnetic Fields, 0 to 100 kHz" – 4th Q 2009. (Met 1st Q 2010 – published)

4.7 Current levels of activity with milestones indicated

- Continue international membership expansion led by Dr Murphy. Introduce new members for leadership positions with emphasis on non-US members, women and younger members. (Ongoing)
- Strengthen liaisons with ICNIRP, IEC, WHO, COST 281, etc. (Ongoing)
- Arrange for 2012 meetings of TC-95 and its subcommittees. (Met)
- Pursue the project on publicizing ICES and C95.1 standards in the literature and at international meetings. (Ongoing)
- Complete draft of commonly used terms. (4th Q 2012)
- Submit PAR and begin the revision of C95.1-2005 (incorporating C95.6). (Met)
- Continue efforts with IEEE SA staff to release ICES safety standards IEEE C95.1, C95.6 and C95.7 for distribution as publicly available documents, e.g., downloadable from the ICES website. (Met).
- Complete 1st working draft of PC95.1-2345. (2nd Q 2010 - Met)
- Complete outline of the revision of C95.1-2005. (2nd Q 2010 - Met)
- Complete subcommittee balloting draft of PC95.1. (3rd Q 2012)
- Complete subcommittee balloting draft of PC95.1-2345. (2nd Q 2012)
- Submit Par for revision of C95.3-2002. (1st Q 2012)

4.8 IEEE Staff

Support in setting up meetings at IEEE Piscataway has been required in the past and may be in the future; availability of the IEEE Staff Engineer at meetings held at IEEE is desirable. Ms Joan Woolery is the Staff Engineer for both TC-34 and TC-95—her engineering background and broad knowledge of IEEE procedures is invaluable to this committee.

4.9 Other Activities:

Members of ICES TC-95 are continually involved in a wide spectrum of activities that relate to standard-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, the EU/EC in Europe, and Standard setting bodies in China. TC-95 members participate in the broad activities of the WHO and its EMF Project as well as the European EBEA, and in various other meetings around the world.

4.10 Issues

4.10.1 Recognition of C95 measurement standards by IEC TC106

ICES has twice submitted without success IEEE C95.3-2002 to the IEC for consideration as an IEC/IEEE dual logo standard. The issue seems to focus on objections by a number of EU countries who are looking for a standard that specifically addresses EC Directives, e.g., CENELEC standards that contain exposure limits (ICNIRP). It is unlikely that further attempts will succeed as the C95.3 is due to be revised.

4.10.2 Interaction with ICNIRP

Members of ICES have tried unsuccessfully to coordinate harmonization activities with the International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP, a group of 14 individuals develops safety limits for exposure to electromagnetic energy over the frequency range of 0 to 300 GHz, i.e. the same frequency range as IEEE C95.6 (0 – 3 kHz) and C95.1 (3 kHz – 300 GHz). The ICNIRP process for developing guidelines is closed, uncertain, and relies on claims of "no commercial vested interests" to maintain "credibility," especially within the EU states. Members of the ICES AdCom have met several times with members of ICNIRP (twice at ICNIRP's request) to discuss methods of coordination but attempts at sharing documents are one-way only.

ICES will continue to discuss the IEEE standards and process at major international fora to help recruit key scientists and engineers who have no other way of participating in setting safety standards. Indications are that there may be a closer relationship with ICNIRP in the future. This stems from an issue in the EU whereby a European Commission (EC) Worker Safety Directive to implement ICNIRP-based guidance in the workplace has been delayed four years (until 2012) because of impacts to several stakeholder groups including MRI operators performing certain interventional procedures would be exposed to low frequency magnetic fields in excess of the ICNIRP limits. The relevant ICNIRP limits are far more restrictive than those of IEEE C95.6 and the incorporation of extremely large safety factors in the ICNIRP limits has never been explained. Additional stakeholder impacts included industry (welders and heat-sealer operators) and military (induced and contact current impacts on operations). PC95.1a (submitted to RevCom) eliminated the induced contact current issues that remain under the ICNIRP guideline.

Some of these issues were discussed at a roundtable symposium on exposure standards at the 2008 meeting of the Bioelectromagnetics Society. Dr. C-K Chou (TC-95 Chair) represented ICES and Paolo Vecchia (ICNIRP Chair) and James Lin represented ICNIRP. A similar forum was also held at the 2011 meeting of the Bioelectromagnetics Society, where Dr. C-K Chou represented ICES and Dr. Bernard Veyret represented ICNIRP. This roundtable provided a forum to promote further harmonization of the two major international standards. More recently, the impacts of the EC Directive were discussed and debated at a meeting of stakeholders in Umea, SWE 6-8 October 2009, where Drs. C-K Chou and J. Patrick Reilly described the IEEE standards, and TC95 and ICES. The EC representative challenged the chairs of ICNIRP and ICES to explain why they could not meet to harmonized standards, Dr. Ralf Bodemann emphasized the ICES willingness to meet with ICNIRP to further harmonization of standards. Unfortunately, ICNIRP continued to be reluctant claiming it would destroy its credibility by working with a group that included industry. The stakeholders in attendance were largely impressed with the IEEE process and position on harmonization. In June 2011, another standards harmonization session was held at the Bioelectromagnetics Society Annual

Meeting in Halifax, Canada. Dr. C-K Chou (TC-95 Chair) represented ICES; Dr. Bernard Veyret represented ICNIRP.

4.10.3 Responding to Advocacy Groups

A major ICES concern has been responding to advocacy groups that are gaining an increasing stronger foothold, particularly outside of North America. The most notable group are the advocates of the *BioInitiative Report* (a non-peer reviewed selective, rather than comprehensive, review of the literature that mixes discussions on science with social issues). This group has gained momentum pushing for unrealistic restrictive standards and policies that must be continually rebutted. In 2009, the EMB-S Committee on Man and Radiation (COMAR – which is made up mostly of ICES members) published a peer reviewed article in *Health Physics* that spotlights errors and inconsistencies in the web published *BioIniitative Report*. IEEE/ICES experts need standards developmental organizational support in countering unscientific claims that would be catastrophic if implemented as law or regulation.

4.11 Membership

See Tables TC-95-1 through Table TC-95-7 for committee and subcommittee membership information.

Prepared and Submitted by

Ron Petersen
Secretary, SCC-39

Table TC-95-1

TC-95 Leadership

OFFICE	NAME	AFFILIATION	COUNTRY
Chairman	Dr. C-K Chou	Motorola Solutions,, Inc.	US
Vice Chairman (Vac)			
Secretary/Treasurer	Ron Petersen	R C Petersen Associates LLC	US
Co-chairman, SC-1	John DeFrank	US Army CHPPM	US
Co-chairman, SC-1	Mark Douglas	IT'IS Foundation	CH
Chairman, SC-2	Richard Tell	Richard A Tell Associates, Inc.	US
Co-chairman, SC-3	Thanh Dovan	SP AusNet Pty. Ltd.	AU
Co-chairman, SC-3	Rob Kavet	EPRI	US
Co-chairman, SC-4	Dr. Art Thansandote	Health Canada	CA
Co-chairman, SC-4	Marvin Ziskin, MD	Temple University Medical School	US
Co-chairman, SC-5	Tamera Hay	Naval Surface Warfare Ctr.	US
Co-chairman, SC-5	Robert Needy	Naval Surface Warfare Ctr.	US

Table TC-95-2

TC-95 Membership: Main Committee (December 2010)

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Abd Rahman	Nazaruddin	Universiti Tenaga Nasional	A	MY
2.	Ammann	Max	Dublin Institute of Technology	A	IE
3.	Anderson	Vitas	Swinburne University	A	AU
4.	Attayi	Daoud	Research In Motion, Ltd	P	CA
5.	Balzano	Quirino	University of MD	A	US
6.	Baron	David	AIHA Representative	GI	US
7.	Bassen	Howard	FDA/CDRH	G	US
8.	Bavin	John	Consumers Energy	U	US
9.	Bellier	Pascale	Health Canada	G	CA
10.	Bergeron	John	Independent Consultant	GI	US
11.	Black	David	Environmedix	GI	NZ
12.	Bodemann	Ralf	Siemens AG	P	DE
13.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US
14.	Brewer	John	HCJB Global	U	US
15.	Brooker	Ian	Tyco Fire and Security	P	IE
16.	Bushberg	Jerrold	U. of California, Davis	A	US
17.	Cassata	Jim	Navy Medical NIR Branch	GI	US
18.	Chadwick	Philip	EMFields Ltd	GI	UK
19.	Chiang	Huai	Zhejiang Medical University	A	CN
20.	Chou	C.K.	Motorola Solutions, Inc.	P	US
21.	Cleveland	Robert	EMF Consulting	U	US
22.	Comlekci	Selcuk	Suleyman Demirel University	A	TR
23.	Cotton	David	Sitesafe Inc	U	US
24.	Croft	Rodney	Department of Psychology	A	AU
25.	Curtis	Robert	RF CHECK Incorporated	U	US
26.	D'Andrea	John	Naval Medical Research Unit	G	US
27.	de Seze	Rene	INERIS	GI	FR
28.	DeFrank	John	USACHPPM	G	US
29.	Douglas	Mark	IT'IS Foundation	GI	CH
30.	Dovan	Thanh	SP AusNet Pty. Ltd.	P	AU
31.	Durrenberger	Gregor	ETH	A	CH
32.	Duvdevany	Amnon	IDF Medical Corps	G	IL
33.	Elder	Joe	Independent Consultant	U	US
34.	Erdreich	Linda	Exponent	GI	US
35.	Farrer	Donald	Independent Consultant	U	US

	Last Name	First Name	Affiliation	Interest Category	Country
36.	Filippopoulos	George	Greek Atomic Energy Comm.	G	GR
37.	Foster	Kenneth	Univ. of Pennsylvania	A	US
38.	Gajsek	Peter	Institute of Public Health	U	SI
39.	Gallant	Josette	Industry Canada	G	CA
40.	Geber	Kurt	Dynamac Corporation	P	US
41.	George	David	Unisys Corp.	P	US
42.	Gettman	Ken	NEMA	GI	US
43.	Grandolfo	Martino	Laboratorio di Fisica	GI	IT
44.	Guy	Arthur	Bioelectromagnetics Consulting	GI	US
45.	Haes, Jr.	Donald	BAE Systems	P	US
46.	Halkiotis	Konstantinos	Medical School of Athens	A	GR
47.	Hare	Ed	American Radio Relay Leaque	GI	US
48.	Hatfield	James	Hatfield & Dawson	GI	US
49.	Hay	Tamera	Naval Surface Warfare Center	U	US
50.	Heirman	Donald	Don HEIRMAN Consultants	GI	US
51.	Hirata	Akimasa	Nagoya Institute of Technology	A	JP
52.	Hongbin	Jin	China Mobile	U	CN
53.	Ibey	Bennett	Brooks City Base	U	US
54.	Ikehata	Masateru	Railway Technical Research Inst	A	JP
55.	Israel	Michel	National Centre of Hygiene	G	BL
56.	Ivans	Veronica	Medtronic Inc.	G	US
57.	Jaffa	Kent	Retired	U	US
58.	Johnston	Sheila	Independent Consultant	GI	IE
59.	Joyner	Ken	Samsung	P	AU
60.	Kandel	Shaiela	Hebrew University of Jerusalem	A	IL
61.	Karabetsos	Efthymios	Greek Atomic Energy Comm.	G	GR
62.	Kavet	Robert	EPRI	GI	US
63.	Kemp	Ray	Galson Sciences Limited	U	UK
64.	Kim	Byung Chan	ETRI, Korea	GI	KR
65.	Kim	Nam	Chungbuk National University	A	KR
66.	Klauenberg	B. Jon	USAF	G	US
67.	Koepfinger	Joseph	Consultant	G	US
68.	Kuster	Niels	IT'IS Foundation	A	CH
69.	Lang	Sakari	Nokia Corp-Stand & Ind. Rel.	P	FI
70.	Lee	Ae-Kyoung	ETRI	GI	KR
71.	Link	Richard	Rad. Safety Institute of Canada	A	CA
72.	Lodwick	Jeffrey	US Department of Labor	G	US
73.	Manatrakul	Nisakorn	Ministry of Public Health	G	TH
74.	Mason	Patrick	USAF/AFRL/HEDR	U	US

	Last Name	First Name	Affiliation	Interest Category	Country
75.	Mathur	Rajat	Hammett & Edison, Inc.	U	US
76.	McManus	Tom	DCMNR, Ireland (Retired)	GI	IE
77.	McNamee	James	Health Canada	G	CA
78.	McQuade	Jill	USAF	G	US
79.	Meltz	Martin	Retired	GI	US
80.	Miyagi	Hiroaki	Japan NUS Co., Ltd	P	JP
81.	Montgomery	Noel	Air Force Research Laboratory	G	US
82.	Murphy	Michael	Directed Energy Bioeffects	G	US
83.	Muthuvelu	Pirunthavany	Ministry of Health	G	MY
84.	Nappert	Hughes	CEM Industry Canada	G	CA
85.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
86.	Nelson	David	Michigan Technical University	A	US
87.	Ng	Kwan-Hoong	Dept of Radiation	G	MY
88.	Osepchuk	John	Full Spectrum Consulting	U	US
89.	Packer	Malcolm	Harris RF Communications	P	US
90.	Pakhomov	Andrei	McKesson Bio Services	GI	US
91.	Persson	Bertil	Lund University	A	SE
92.	Petersen	Ronald	R C Petersen Associates	GI	US
93.	Ravazzani	Paolo	Italian Nat Res Council	G	IT
94.	Reilly	J. Patrick	Metatec Associates	GI	US
95.	Repacholi	Michael	World Health Organization (Ret.)	GI	CH
96.	Roberts	Brad	US Army CHPPM	G	US
97.	Ryu	Chungsang	KR Com Radio Res Agency	G	KR
98.	Samaras	Theodoros	Aristotle Univ. of Thessaloniki	A	GR
99.	Scanlon	William	Queens University, Belfast	A	UK
100.	Sheppard	Asher	Asher Sheppard Consulting	U	US
101.	Shkolnikov	Yakov	Exponent	GI	US
102.	Shrivastava	Devashish	University of Minnesota	A	US
103.	Smit	Niels	Royal Netherlands Navy	G	NL
104.	Swicord	Mays	Mays Swicord Consulting	U	US
105.	Szmigielski	Stanislaw	Mil Inst of Hygiene and Epi.	G	PL
106.	Tattersall	John	DSTL	G	UK
107.	Tell	Richard	Richard Tell Assoc. Inc.	U	US
108.	Testagrossa	Paul	Alcatel-Lucent	P	US
109.	Thansandote	Art	Health Canada	G	CA
110.	Thomas	Robert	Optical Radiation Branch AFRL	G	US
111.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	G	HU
112.	Tofani	Santi	Servizio Di Fisica Sanitaria	A	IT
113.	Umbdenstock	Donald	Tyco/Sensormatic	P	US

	Last Name	First Name	Affiliation	Interest Category	Country
114.	van Rongen	Eric	Health Council of the Netherlands	G	NL
115.	Varanelli	Arthur	Independent Consultant	U	US
116.	Wan Nor Liza	Mahadi	Mahadi. Inst.: University Malaya	A	MY
117.	Wiart	Joe	France Telecom Orange Labs	U	FR
118.	Williams, Jr.	Louis	Louis A. Williams Jr. & Assoc.	U	US
119.	Woolery	Joan	IEEE SA Standards Department	Staff Liaison	US
120.	Yamazaki	Kenichi	Central Res Inst Elec Power Ind	G	JP
121.	Zhadobov	Maxim	IETR	GI	FR
122.	Zipse	Donald	Electrical Forensics, LLC	GI	US
123.	Ziriax	John	Naval medical Research Unit	G	US
124.	Ziskin, MD	Marvin	Temple Univ. Medical School	A	US

A = General Interest: Academic
G = General Interest: Government
GI = General Interest
P = Producer
U = User

Table TC-95-3

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

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Baron	David	AIHA Representative	GI	US
2.	Bassen	Howard	FDA/CDRH	G	US
3.	Bowman	Joe	NIOSH	G	US
4.	Brooker	Ian	Tyco Fire and Security	P	IE
5.	Chou	C.K.	Motorola Solutions, Inc.	P	US
6.	Choi	Dong-guen	Radio Research Agency	P	KR
7.	Cleveland	Robert	EMF Consoling	U	US
8.	Colville	Frank	US Army CHPPM	G	US
9.	Cotton	David	Sitesafe Inc	U	US
10.	DeFrank	John	USACHPPM	G	US
11.	Douglas	Mark	IT'IS Foundation	GI	CH
12.	Fredrick	Gerd	Deutche Telekom	U	DE
13.	Gallant	Josette	Industry Canada	G	CA
14.	Gettman	Ken	NEMA	GI	US
15.	Harrington	Tim	FCC	G	US
16.	Kainz	Wolfgang	UCFDA/CDRH	G	US
17.	Kong	Sungsik	Radio Research Agency	G	KR
18.	Mantiply	Ed	FCC/OET	G	US
19.	McKenzie	Ray	Telstra, Australia	P	AU
20.	Menard	Francois	Industry Canada	G	CA
21.	Petersen	Ronald	R C Petersen Associates	GI	US
22.	Tell	Richard	Richard Tell Assoc. Inc.	GI	US
23.	Testagrossa	Paul	Alcatel-Lucent	P	US
24.	Thansandote	Art	Health Canada	G	CA
25.	Umbdenstock	Donald	Tyco/Sensormatic	P	US
26.	Ziskin, MD	Marvin	Temple Univ. Med. School	A	US

A = General Interest: Academic
G = General Interest: Government
GI = General Interest
P= Producer
U = User

Table TC-95-4

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

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Anderson	Vitas	Swinburne University	A	AU
2.	Baron	David	AIHA Representative	GI	US
3.	Bassen	Howard	FDA/CDRH	G	US
4.	Bellier	Pascale	Health Canada	G	CA
5.	Biby	Richard	Crown Castle International	U	US
6.	Black	David	Environmedix	GI	NZ
7.	Bodemann	Ralf	Siemens AG	P	DE
8.	Boyer	Jim	Lawrence Livermore National Labs	G	US
9.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US
10.	Bushberg	Jerrold	U. of California, Davis	A	US
11.	Chou	C.K.	Motorola Solutions, Inc.	P	US
12.	Cleveland	Robert	EMF Consoling	U	US
13.	Curtis	Robert	Curtis Eng. and Management	U	US
14.	D'Andrea	John	Naval Medical Research Unit	G	US
15.	DeFrank	John	USACHPPM	G	US
16.	Erdreich	Linda	Exponent	GI	US
17.	Everist	Donald	Cohen, Dipell and Everist	GI	US
18.	Gajda	Greg	Health Canada	GI	CA
19.	Gettman	Ken	NEMA	GI	US
20.	Guy	Arthur	Bioelectromagnetics Consulting	GI	US
21.	Haes, Jr.	Donald	BAE Systems	P	US
22.	Hare	Ed	American Radio Relay League	GI	US
23.	Hatfield	James	Hatfield & Dawson	U	US
24.	Hubbard	Roy	Technology Services International	U	ZA
25.	Ivans	Veronica	Medtronic Inc.	U	US
26.	Johnson	Robert	L-3 Microwave NARDA	U	US
27.	Johnston	Sheila	Independent Consultant	GI	IE
28.	Joyner	Ken	Samsung	P	AU
29.	Kantner	Kimberly	AT&T	U	US
30.	Khalil	Kathy	SPAWARSYSCEN Charleston	U	US
31.	Kierl	Bill	Motorola, Inc	P	US
32.	Klauenberg	B. Jon	USAF	G	US

	Last Name	First Name	Affiliation	Interest Category	Country
33.	Kumbier	Werner	Narda Safety Test Solutions	P	DE
34.	Kuster	Niels	IT'IS Foundation	GI	CH
35.	Lathrop	Janet	Resource Strategies, Inc	GI	US
36.	Mantiply	Ed	FCC/OET	G	US
37.	Meltz	Martin	Retired	GI	US
38.	Mercer	Christopher	Vodacom Group, Pty Ltd	U	ZA
39.	Montgomery	Noel	Air Force Research Laboratory	G	US
40.	Murphy	Michael	Directed Energy Bioeffects	G	US
41.	Nappert	Hughes	CEM Industry Canada	G	CA
42.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
43.	Norman	Larry	Pike Electric	P	US
44.	Olsen	Richard	Naval Surface Warfare Cntr (Ret.)	G	US
45.	Osepchuk	John	Full Spectrum Consulting	U	US
46.	Persson	Bertil	Lund University	A	SE
47.	Petersen	Ronald	R C Petersen Associates	GI	US
48.	Proctor	Ken	US Army	G	US
49.	Roberts	Brad	US Army Public Health Command	G	US
50.	Rogers	Walt	Veridian Eng/RFR Branch	GI	US
51.	Rowley	Jack	Telstra Research Labs	GI	AU
52.	Scanlon	William	Queens University, Belfast	A	UK
53.	Seabury	David	Chase Systems Inc.	U	US
54.	Smith	Matthew	Dade Moeller & Associates	GI	US
55.	Strickland	Richard	RF Safety Solutions	U	US
56.	Tell	Richard	Richard Tell Assoc. Inc.	GI	US
57.	Testagrossa	Paul	Alcatel-Lucent	P	US
58.	Thansandote	Art	Health Canada	G	CA
59.	Ulcek	Jerry	FCC	G	US
60.	Varanelli	Arthur	Independent Consultant	GI	US
61.	Williams, Jr.	Louis	Louis A. Williams Jr. & Associates	GI	US
62.	Woolery	Joan	IEEE SA Standards Department	Staff Liaison	US
63.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US

A = General Interest: Academic
G = General Interest: Government
GI = General Interest
P= Producer
U = User

Table TC-95-5

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

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Abd Rahman	Nazaruddin	Universiti Tenaga Nasional	A	MY
2.	Adlkofer	Franz	VerUm Foundation	A	DE
3.	Ammann	Max	Dublin Institute of Technology	A	IE
4.	Anderson	Vitas	Swinburne University	A	AU
5.	Attayi	Daoud	Research In Motion, Ltd	P	CA
6.	Bailey	William	Exponent Inc.	GI	US
7.	Barker	J. Richard	General Cable	P	US
8.	Baron	David	AIHA Representative	GI	US
9.	Bassen	Howard	FDA/CDRH	G	US
10.	Bavin	John	Consumers Energy	P	US
11.	Bellier	Pascale	Health Canada	G	CA
12.	Bergeron	John	Independent Consultant	GI	US
13.	Black	David	Environmedix	GI	NZ
14.	Bodemann	Ralf	Siemens AG	P	DE
15.	Boeggeman	Charles	PECO Energy Co.	P	US
16.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US
17.	Brewer	John	HCJB Global	U	US
18.	Brooker	Ian	Tyco Fire and Security	P	IE
19.	Carberry	Robert	Northeast Utilities	P	US
20.	Cassata	Jim	Navy Medical NIR Branch	G	US
21.	Chadwick	Philip	EMFields Ltd	GI	UK
22.	Comlekci	Selcuk	Suleyman Demirel University	A	TR
23.	Cotton	David	Sitesafe Inc	U	US
24.	Croft	Rodney	Department of Psychology	A	AU
25.	Curtis	Robert	Curtis Eng. and Management	U	US
26.	Dale	Steiner	ABB Power T&D Company	U	US
27.	D'Andrea	John	Naval Medical Research Unit	G	US
28.	de Seze	Rene	INERIS	A	FR
29.	DeFrank	John	USACHPPM	G	US
30.	Doczkat	Martin	US FCC	G	US
31.	Dovan	Thanh	SP AusNet Pty. Ltd.	P	AU
32.	Duvdevany	Amnon	IDF Medical Corps	G	IL
33.	Erdreich	Linda	Exponent	GI	US
34.	Farrer	Donald	Independent Consultant	GI	US

	Last Name	First Name	Affiliation	Interest Category	Country
35.	Feero	William	Independent Consultant	GI	US
36.	Filippopoulos	George	Greek Atomic Energy Comm.	G	GR
37.	Gallant	Josette	Industry Canada	G	CA
38.	Geber	Kurt	Dynamac Corporation	P	US
39.	George	David	Unisys Corp.	P	US
40.	Gettman	Ken	NEMA	GI	US
41.	Goulet	Daniel	Hydro-Quebec	U	CA
42.	Haes, Jr.	Donald	BAE Systems	P	US
43.	Hanna	Bob	DCMNR, Ireland	G	IE
44.	Hernandez	Martin	Florida Power & Light Co.	P	US
45.	Herz	Michael	Pacific Gas & Electric Co.	P	US
46.	Hicks	Danny	South Carolina Electric & Gas Co.	P	US
47.	Hirata	Akimasa	Nagoya Inst. of Technology	A	JP
48.	Hongbin	Jin	China Mobile	U	CN
49.	Hubbard	Roy	Technology Services International	GI	ZA
50.	Ibey	Bennett	Brooks City Base	G	
51.	Ikehata	Masateru	Railway Technical Research Inst.	A	JP
52.	Ivans	Veronica	Medtronic Inc. (Retired)	GI	US
53.	Jaffa	Kent	Retired	GI	US
54.	Johnston	Sheila	Independent Consultant	GI	IE
55.	Karabetsos	Efthymios	Greek Atomic Energy Commission	G	GR
56.	Kautz	Richard	Ford	P	US
57.	Kavet	Robert	EPRI	GI	US
58.	Kim	Byung Chan	ETRI, Korea	GI	KR
59.	Kim	Nam	Chungbuk National University	A	KR
60.	Koepfinger	Joseph	Consultant	GI	US
61.	Kuster	Niels	IT'IS Foundation	GI	CH
62.	Lathrop	Janet	Resource Strategies, Inc	GI	US
63.	Lee	Ae-Kyoung	ETRI	GI	KR
64.	Link	Richard	Rad. Safety Inst. of Canada	A	CA
65.	Lodwick	Jeffrey	US Department of Labor	G	US
66.	Lotz	Gregory	NIOSH	G	US
67.	Mair	Peter	Fronius International GMBH	P	DE
68.	Manatrakul	Nisakorn	Ministry of Public Health	G	TH
69.	Mason	Patrick	USAF/AFRL/HEDR	G	US
70.	Mathur	Rajat	Hammett & Edison, Inc.	U	US
71.	McManus	Tom	DCMNR, Ireland (Retired)	GI	IE

	Last Name	First Name	Affiliation	Interest Category	Country
72.	McNamee	James	Health Canada	G	CA
73.	Miyagi	Hiroaki	Japan NUS Co., Ltd	U	JP
74.	Montgomery	Noel	Air Force Research Laboratory	G	US
75.	Murphy	Michael	Directed Energy Bioeffects	G	US
76.	Muthuvelu	Pirunthavany	Ministry of Health	G	MY
77.	Nappert	Hughes	CEM Industry Canada	G	CA
78.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
79.	Nelson	David	Michigan Technical University	A	US
80.	Ng	Kwan-Hoong	Dept of Radiation	G	MY
81.	O'Connor	Roger	Dept of Comm. Marine and Nat Res	G	IE
82.	Osepchuk	John	Full Spectrum Consulting	GI	US
83.	Petersen	Ronald	R C Petersen Associates	GI	US
84.	Pittman	Steve	Potlach Pulp and Paperboard	P	US
85.	Podhrasky	Robert	Garrett Metal Detectors	P	US
86.	Polson	Peter	Ausa Research	GI	US
87.	Proctor	Ken	US Army	G	US
88.	Ravazzani	Paolo	Italian Nat Res Council	G	IT
89.	Reilly	J. Patrick	Metatec Associates	GI	US
90.	Roberts	Brad	US Army Pub. Health Command	G	US
91.	Ryu	Chungsang	KR Com Radio Res Agency	G	KR
92.	Sahl	Jack	J. Sahl Associates	GI	US
93.	Samaras	Theodoros	Aristotle Univ. of Thessaloniki	A	GR
94.	Sawdon	Dave	IBM Global Services	P	UK
95.	Sheppard	Asher	Asher Sheppard Consulting	GI	US
96.	Shkolnikov	Yakov	Exponent	GI	US
97.	Shrivastava	Devashish	University of Minnesota	A	US
98.	Sliney	David	US Army CHPPM Retired	G	US
99.	Smit	Niels	Royal Netherlands Navy	G	NL
100.	Swicord	Mays	Mays Swicord Consulting	GI	US
101.	Szmigielski	Stanislaw	Mil Inst of Hygiene and Epi.	A	PL
102.	Tell	Richard	Richard Tell Assoc. Inc.	U	US
103.	Thansandote	Art	Health Canada	G	CA
104.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	A	HU
105.	Umbdenstock	Donald	Tyco/Sensormatic	P	US
106.	Valberg	Peter	Gradient Corporation	GI	US
107.	van Rongen	Eric	Health Council of the Netherlands	G	NL
108.	Varanelli	Arthur	Independent Consultant	GI	US

	Last Name	First Name	Affiliation	Interest Category	Country
109.	Vijayalaxmi		Univ. Texas Health Science Ctr.	A	US
110.	Wan Nor Liza	Mahadi	Mahadi. Institute: Univ. Malaya	A	MY
111.	Wiart	Joe	France Telecom Orange Labs	GI	FR
112.	Williams, Jr.	Louis	Louis A. Williams Jr. & Assoc.	U	US
113.	Woods	Richard	Sensormatic Electronics	P	US
114.	Woolery	Joan	IEEE SA Standards Department	Staff Liaison	US
115.	Yamazaki	Kenichi	Central Res Inst Elec Power Ind	P	JP
116.	Yandek	Edward	GE Lighting	P	US
117.	Zhadobov	Maxim	IETR	GI	FR
118.	Zipse	Donald	Electrical Forensics, LLC	GI	US
119.	Ziriax	John	Naval medical Research Unit	G	US
120.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US

A = General Interest: Academic
GI = General Interest
G = General Interest: Government
P= Producer
U = User

Table TC-95-6

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

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Abd Rahman	Nazaruddin	Universiti Tenaga Nasional	A	MY
2.	Ammann	Max	Dublin Institute of Technology	A	IE
3.	Anderson	Vitas	Swinburne University	A	AU
4.	Attayi	Daoud	Research In Motion, Ltd	P	US
5.	Babij	Tadeusz	Florida International University	A	US
6.	Bailey	William	Exponent Inc.	GI	US
7.	Baron	David	AIHA Representative	GI	US
8.	Bassen	Howard	FDA/CDRH	G	CA
9.	Bellier	Pascale	Health Canada	G	US
10.	Bergeron	John	Independent Consultant	GI	NZ
11.	Black	David	Environmedix	GI	DE
12.	Bodemann	Ralf	Siemens AG	P	US
13.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US
14.	Brewer	John	HCJB Global	P	IE
15.	Brooker	Ian	Tyco Fire and Security	P	US
16.	Bushberg	Jerrold	UC Davis	A	US
17.	Cassata	Jim	Navy Medical NIR Branch	G	UK
18.	Chadwick	Philip	EMFields Ltd	GI	US
19.	Chesnick	Scott	National Heart Lung Blood Inst.	g	CN
20.	Chiang	Huai	Zhejiang Medical University	A	US
21.	Chou	C.K.	Motorola Solutions, Inc.	P	US
22.	Cleveland	Robert	EMF Consoling	GI	UK
23.	Comlekci	Selcuk	Suleyman Demirel University	A	TR
24.	Cotton	David	Sitesafe Inc	U	US
25.	Croft	Rodney	Department of Psychology	A	AU
26.	Curtis	Robert	Curtis Eng. and Management	U	US
27.	D'Andrea	John	Naval Med. Research NIR Unit	G	US
28.	de Seze	Rene	INERIS	A	FR
29.	DeFrank	John	US Army CHPPM	G	US
30.	Dini	David	UL	U	US
31.	Doczkat	Martin	US FCC	G	IT
32.	Dovan	Thanh	SP AusNet Pty. Ltd.	P	AU

	Last Name	First Name	Affiliation	Interest Category	Country
33.	Durrenberger	Gregor	ETH	A	CH
34.	Duvdevany	Amnon	IDF Medical Corps	G	ZA
35.	Elder	Joe	Independent Consultant	G	IL
36.	Erdreich	Linda	Exponent	GI	US
37.	Farrer	Donald	Independent Consultant	GI	US
38.	Filippopoulos	George	Greek Atomic Energy Comm.	G	US
39.	Foster	Kenneth	Univ. of Pennsylvania	A	US
40.	Gajsek	Peter	Institute of Public Health	G	GR
41.	Gallant	Josette	Industry Canada	G	US
42.	Geber	Kurt	Dynamac Corporation	P	SI
43.	George	David	Unisys Corp.	P	CA
44.	Gettman	Ken	NEMA	A	US
45.	Haes, Jr.	Donald	BAE Systems	P	UK
46.	Halkiotis	Konstantinos	Medical School of Athens	A	US
47.	Hanna	Bob	DCMNR, Ireland	G	US
48.	Hatfield	James	Hatfield & Dawson	U	US
49.	Hay	Tamera	Naval Surface Warfare Center	G	CH
50.	Heirman	Donald	Don HEIRMAN Consultants	U	US
51.	Hirata	Akimasa	Nagoya Institute of Technology	A	GR
52.	Hongbin	Jin	China Mobile	U	IE
53.	Hubbard	Roy	Technology Services Int.	GI	US
54.	Ibey	Bennett	Brooks City Base	G	US
55.	Ikehata	Masateru	Railway Technical Res. Inst.	A	CA
56.	Israel	Michel	National Centre of Hygiene	G	US
57.	Ivans	Veronica	Medtronic Inc.	P	JP
58.	Johnston	Sheila	Independent Consultant	GI	BL
59.	Joyner	Ken	Samsung	P	US
60.	Kandel	Shaiela	Hebrew University of Jerusalem	A	IE
61.	Kantner	Kimberly	AT&T	U	AU
62.	Karabetsos	Efthymios	Greek Atomic Energy Comm.	G	IL
63.	Kavet	Robert	EPRI	GI	US
64.	Kemp	Ray	Galson Sciences Limited	GI	GR
65.	Kim	Nam	Chungbuk National University	A	US
66.	Kim	Byung Chan	ETRI, Korea	GI	UK
67.	Klauenberg	B. Jon	USAF	G	KR
68.	Koepfinger	Joseph	Consultant	U	US
69.	Kwee	Sianette	University of Aarhus	A	US

	Last Name	First Name	Affiliation	Interest Category	Country
70.	Lang	Sakari	Nokia Corp-Stand & Ind Rel	P	DK
71.	Lee	Ae-Kyoung	ETRI	GI	FI
72.	Link	Richard	Radiation Safety Inst. of Canada	A	US
73.	Lodwick	Jeffrey	US Department of Labor	G	CA
74.	Lotz	Gregory	NIOSH	G	US
75.	Manatrakul	Nisakorn	Ministry of Public Health	G	US
76.	Mantiply	Ed	FCC/OET	G	TH
77.	Mason	Patrick	USAF/AFRL/HEDR	G	UK
78.	Mathur	Rajat	Hammett & Edison, Inc.	U	US
79.	McKenzie	Ray	Telstra Chief Technology Office	P	US
80.	McManus	Tom	DCMNR, Ireland (Retired)	GI	US
81.	McNamee	James	Health Canada	G	AU
82.	McQuade	Jill	USAF	G	IE
83.	Meltz	Martin	Retired	GI	CA
84.	Miyagi	Hiroaki	Japan NUS Co., Ltd	P	US
85.	Montgomery	Noel	Air Force Research Laboratory	G	US
86.	Murphy	Michael	Directed Energy Bioeffects	G	JP
87.	Muthuvelu	Pirunthavany	Ministry of Health	G	US
88.	Nappert	Hughes	CEM Industry Canada	G	US
89.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
90.	Nelson	David	Michigan Technical University	A	US
91.	Ng	Kwan-Hoong	Dept of Radiation	G	MY
92.	Osepchuk	John	Full Spectrum Consulting	GI	CA
93.	Packer	Malcolm	Harris RF Communications	P	US
94.	Pakhomov	Andrei	McKesson Bio Services	GI	US
95.	Persson	Bertil	Lund University	A	MY
96.	Petersen	Ronald	R C Petersen Associates	GI	US
97.	Polson	Peter	Ausa Research	GI	US
98.	Proctor	Ken	US Army	G	US
99.	Ravazzani	Paolo	Italian Nat Res Council	G	SE
100.	Reilly	J. Patrick	Metatec Associates	GI	US
101.	Roberts	Brad	US Army Pub. Health Command	G	US
102.	Rogers	Walt	Veridian Eng/RFR Branch	GI	US
103.	Rybak	Terence	General Motors Proving Ground.	GI	IT
104.	Ryu	Chungsang	KR Com Radio Res Agency	G	US
105.	Samaras	Theodoros	Aristotle Univ. of Thessaloniki	A	US
106.	Santomaa	Veli	Nokia (Retired)	GI	US

	Last Name	First Name	Affiliation	Interest Category	Country
107.	Scanlon	William	Queens University, Belfast	A	US
108.	Sheppard	Asher	Asher Sheppard Consulting	GI	GR
109.	Shkolnikov	Yakov	Exponent	GI	FI
110.	Shrivastava	Devashish	University of Minnesota	A	UK
111.	Smit	Niels	Royal Netherlands Navy	G	US
112.	Swicord	Mays	Mays Swicord Consulting	GI	PL
113.	Szmigielski	Stanislaw	Mil Inst of Hygiene and Epi.	G	UK
114.	Tattersall	John	DSTL	G	US
115.	Tell	Richard	Richard Tell Assoc. Inc.	U	US
116.	Testagrossa	Paul	Alcatel-Lucent	U	CA
117.	Thansandote	Art	Health Canada	G	US
118.	Thomas	Robert	Optical Radiation Branch AFRL	G	HU
119.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	G	IT
120.	Tofani	Santi	Servizio Di Fisica Sanitaria	G	US
121.	Umbdenstock	Donald	Tyco/Sensormatic	P	NL
122.	van Rongen	Eric	Health Coun. of the Netherlands	G	US
123.	Varanelli	Arthur	Independent Consultant	GI	MY
124.	Wan Nor Liza	Mahadi	Mahadi. Institute: Univ. Malaya	A	US
125.	Weller	Robert	FCC	G	FR
126.	Wiart	Joe	France Telecom Orange Labs	P	US
127.	Williams, Jr.	Louis	Louis A. Williams Jr. & Assoc.	GI	US
128.	Woods	Richard	Sensormatic Electronics	P	KR
129.	Woolery	Joan	IEEE SA Standards Department	Staff Liaison	US
130.	Yamazaki	Kenichi	Central Res Inst Elec Power Ind	p	US
131.	Zhadobov	Maxim	IETR	GI	US
132.	Zipse	Donald	Electrical Forensics, LLC	GI	US
133.	Ziriax	John	Naval medical Research Unit	G	US
134.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US

A = General Interest: Academic
G = General Interest: Government
GI = General Interest
P = Producer
U = User

Table TC-95-7

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

	Last Name	First Name	Affiliation	Interest Category	Country
1.	Babij	Tadeusz	Florida International University	A	US
2.	Balzano	Quirino	University of MD	A	US
3.	Bean	John	Naval Surface Warfare Center	G	US
4.	Colville	Frank	US Army CHPPM	G	US
5.	Comlekci	Selcuk	Suleyman Demirel University	A	TR
6.	DeFrank	John	US Army CHPPM	G	US
7.	Doczkat	Martin	US FCC	G	US
8.	Duvdevany	Amnon	IDF Medical Corps	G	IL
9.	Harmon	Ray	EG&G	P	US
10.	Hatfield	James	Hatfield & Dawson	U	US
11.	Hay	Tamera	Naval Surface Warfare Center	G	US
12.	Joyner	Ken	Samsung	P	AU
13.	Leidel	David	Halliburton Energy Services	U	US
14.	Nappert	Hughes	CEM Industry Canada	G	CA
15.	Petersen	Ronald	R C Petersen Associates	GI	US
16.	Roberts	Brad	US Army Public Health Commend	G	US
17.	Stuart	James	Franklin Applied Physics	GI	US
18.	Thompson	Ramie	Franklin Applied Physics	GI	US
19.	Woolery	Joan	IEEE SA Standards Department	Staff Liaison	US

A = General Interest: Academic
GI = General Interest
G = General Interest: Government
P = Producer
U = User