ICES

International Committee on Electromagnetic Safety

ICES (SCC-39) Annual Report: 2012 – 2013

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)

9 December 2013

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ICES (SCC-39) Annual Report: 2012 – 2013

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 the scientific community outside the US.

2.2 AdCom Activities

AdCom members continue to explore paths toward international harmonization of standards for the safe use of electromagnetic energy. The increased international ICES membership and the agreement with the NATO Standardization Agency to provide a new civil standard to replace NATO standards adopted under Standards Agreement 2345 are 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, PIERS (Progress in Electromagnetics Research Symposium), ITU (International Telecommunication 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.

2.3 Highlights (2012 – 2013)

- During the past year, the Administrative Committee (AdCom) met in San Antonio, TX, Thessaloniki, Greece and several times by teleconference. In addition to other duties, the ICES AdCom plans and arranges meetings of TC34 and TC95 and their subcommittees, and approves (or rejects) applications for membership on the ICES technical committees. Dr. Ralf Bodemann (Siemens AG, Germany—ICES Chairman) and Dr. Michael Murphy (US Air Force Research Laboratory—TC95 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 also is Past 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. During the past year Dr. C-K Chou (Motorola Solutions and TC95 Chairman) has given numerous presentations on IEEE ICES standards in China, India, Malaysia, Taiwan and the United States.

- 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, which is now undergoing Sponsor ballot. (Note that before Sponsor ballot, TC95 subcommittees go through a rigorous ballot process with essentially the same requirements as Sponsor ballot, e.g., ballot groups are formed, 75% response rate and 75% approval rate after ballot resolution is required before a draft standard is moved to Sponsor Ballot.)
- 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. During the months of January through October, 2013, 2922 standards have been downloaded with the majority by "Commercial Users" followed by "Students," Safety Risk Managers" and "Others."

- Following circulation of an IEC TC106 "Q" document titled "Establishment of joint IEC TC106 – IEEE SCC-39/TC34 projects on the evaluation of specific absorption rate (SAR) using numerical techniques," ICES TC34 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. Of the four, the following three are in IEEE Sponsor ballot.
  - IEC/IEEE P62704-1 (general requirements for FDTD simulations of SAR)
  - IEC/IEEE P62704-2 (specific requirements for SAR from vehicular mounted antennas)
  - IEC/IEEE P62704-3 (specific requirements for SAR from mobile telephones)

  A committee draft for the fourth, IEC/IEEE P62704-4 (general requirements for FEM simulations for modeling vehicle-mounted antennas and personal wireless devices), is being developed by the working group.
- IEEE 1528-2013, 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 2013 SA Standards Board meeting and was published September 2013.
- An initial draft of IEEE C95.3 was prepared in September 2012 that combines existing IEEE Standards C95.3-2002 (R2007) and C95.3.1-2010. The draft is under review and will be discussed at the January 2014 meeting.

- ICES provided comments in response to a *Further Notice of Proposed Rule Making* (FNPRM) and *Notice of Inquiry (*NOI) issued by the Federal Communications Commission in the matter of Reassessment of FCC Radiofrequency Exposure Limits and Policies and Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields (ET Dockets ET 13-84 and 03-137, respectively) and also responded to comments submitted by others in the same proceedings. In both cases, ICES encouraged the FCC to base any changes to their current exposure guidelines on IEEE C95.1-2005 (frequencies above 3 kHz) and, should the FCC extend its scope, C95.6-2002 (frequencies below 3 kHz).

2.4 Policies and Procedures

The ICES Policies and Procedures were accepted by AudCom and the SASB at December 2012 meetings. The Working Group P&Ps, based on the September 2012 Working Group Baseline, were found to be without issue by AudCom at the August 2013 meeting.

2.5 Budget

2.51 TC34

TC 34 has no specific budget or operating expenses.

2.52 TC95

The operating expenses and budget for TC95 are found in 4.2.

2.6 Standards

Table 1 lists the SCC-39 published standards and their status:

Table 1(a)

SCC-39 Standards

Standard	Title
	TC34 Standards
1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
1528a-2005	IEEE 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 Human Head Model (SAM Phantom)
	TC95 Standards
1460-1996	IEEE Guide for the Measurement of Quasi-Static Magnetic and Electric Fields
C95.1-2005	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
C95.1a-2010	IEEE Std for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields-Amend 1: Specifies Ceiling Limits for Induced & Contact Current
C95.2-1999	IEEE Standard for Radio-Frequency Energy and Current-Flow Symbols
C95.3-2002	IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields
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
C95.4-2002	IEEE Recommended Practice for Determining Safe Distances From Radio Frequency Transmitting Antennas When Using Electric Blasting Caps During Explosive Operations
C95.6-2002	IEEE Standard for Safety Levels With Respect to Human Exposure to Electromagnetic Fields, 0—3 kHz
C95.7-2005	IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz

Table 1 (b)

SCC-39 Standards—Status

Standard	Year	Expiration Date	SASB Approval Date	SASB Reaffirmation Date	ANSI Approval Date	ANSI Reaffirmation Date
1460	1996	12/31/2018	12/10/1996	06/12/2008	06/5/1997	09/17/2008
1528	2013	12/31/2023	06/14/2013		10/15/2003	
1528a	2005	12/31/2018	09/22/2005		12/29/2005	
C95.1	2005	12/31/2018	10/03/2005		11/02/2006	
C95.1a	2010	02/02/2020	02/02/2010			
C95.2	1999	12/31/2018	09/16/1999	06/09/2005	10/05/2005	
C95.3	2002	12/31/2018	12/11/2002	06/12/2008	04/18/2003	
C95.3.1	2010	03/25/2020	03/25/2010		08/05/2010	
C95.4	2002	12/31/2018	11/11/2002	03/27/2008	02/05/2003	07/15/2008
C95.6	2002	12/31/2018	09/12/2002	12/05/2007	05/19/2008	
C95.7	2005	12/31/2018	09/22/2005		02/02/2006	

2.7 ICES Websites

AdCom members continually provide material for the ICES website (http://www.ices-emfsafety.org/), which includes separate sections for TC34 and TC95 with both 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, TC34 maintains the following websites:

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

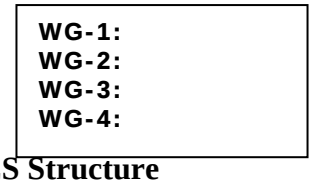

Figure 1—ICES Structure

Table 2—ICES AdCom

OFFICE	NAME	AFFILIATION	COUNTRY
Chair	Dr. Ralf Bodemann	Siemens AG	DE
Vice Chair	Kenneth Gettman	NEMA	US
Executive Secretary/Treasurer	Ronald C Petersen	R C Petersen Associates LLC	US
Chair, TC95 Membership	Dr. Michael Murphy	US Air Force Research Laboratory	US
Chair, TC34 and TC34/SC2	Dr. Wolfgang Kainz	USFDA/CDRH)	US
Chair, TC34/SC1	Dr Mark Douglas	IT'IS Foundation	CH
Chair, TC95	Dr. C-K. Chou	Motorola Solutions, Inc.	US
Co-chair, TC95/SC1	Francis Colville	US Army CHPPM	US
Co-chair, TC95/SC1	Mark Douglas	IT'IS Foundation	CH
Chair, TC95/SC2	Richard Tell	Richard A Tell and Associates	US
Co-chair, TC95/SC3	Thanh Dovan	SP AusNet	AU
Co-chair, TC95/SC3	Rob Kavet	EPRI	US
Co-chair, TC95/SC4	Art Thansandote	Health Canada	CA
Co-chair, TC95/SC4	Dr Marvin Ziskin	Temple University Medical School	US
Co-chair, TC95/SC5	Raymond Harmon	URS Corporation	US
Co-chair, TC95/SC5	Tamera Hay	Naval Surface Warfare Ctr.	US
Past Chair	Dr. John Osepchuk	Full Spectrum Consulting	US
At Large Members			
	Dr. Sheila Johnston	Independent Consulting Neuroscientist	IE
	Dr. Tom McManus	Consultant - Dept of Comm. & Marine &Natural Resources	IE
IEEE Staff Liaison			
IEEE Staff Liaison	Joan Woolery	IEEE Standards Department	US

3. Technical Committee-34

3.1 Scope

The scope of Technical Committee 34 (TC34) 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.) Included in the scope are standards, guides and recommended practices that describe measurement and computational protocols for determining compliance with the basic restrictions and the derived exposure values, e.g., maximum permissible exposure values (MPEs), exposure reference levels (ERLs) found in IEEE Stds C95.1 and C95.6 and in other relevant national and international standards and guidelines.

3.2 Reorganization

Following combining SCC-28 (exposure standards) and SCC-34 (product standards) into a single committee (SCC-39) the structure and activities of SCC-34 (now TC34) were examined and a decision was made to re-organize the committee. Originally, TC34 consisted of the following three subcommittees: SC1 (Pleasure-boat radar), SC2 (SAR evaluation), and SC3 (Effectiveness of RF-protective clothing). Initially there was considerable interest in the activities of SC1 and SC3, but this interest has dwindled during the past few years. The decision was made to disband SC1 until there is evidence of increased interest. SC3 was also disbanded. The IEEE EMB-S Committee on Man and Radiation (COMAR) was asked to consider drafting a technical information statement on pleasure boat radar. The remaining subcommittee, SC2, was divided logically into two subcommittees—SC1 (SAR evaluation—measurement techniques) and SC2 (SAR evaluation—numerical techniques). SC2 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/MT-1, which has a similar scope and with whom TC34 has a Category D Liaison.

3.3 Membership Roster

See Table TC34-2 (NOTE—All members listed are members of TC34, TC34/SC1 and TC34/SC2, i.e., the members of SC1 are also members of SC2 and also members of TC34, and vice versa.)

3.4 Meetings (2013-2014)

3.4.1 Upcoming meetings

- 20 – 24 January, 2014, Freemont, CA, USA
- 21 – 22 May, 2013 – Tokyo, Japan
- TBD (possibly October in conjunction with the TC106 Plenary and CISPR meetings—Frankfurt, Germany)

3.4.2 Past meetings

- 22 – 25 January, 2013 - Ft. Lauderdale, FL, USA
- 7 – 10 May, 2013 - Newbury, UK
- 30 September – 3 October, 2013 - Ottawa, Canada

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 – MT-1 to work on maintenance of IEC 62209 "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 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 62209-1 and 62209-2 were published in 2005 and 2010, respectively.)
- **P1528:** The revision of IEEE 1528 (which extends the frequency range of SAR measurement standards up to 6 GHz) was approved at the June 2013 SA Standards Board meeting. And published in September 2013. SC1 is collaborating with IEC MT-1 toward the development of standards for devices held within 20 cm of the body (including body-worn, hand-held and desktop devices), and addressing harmonization with IEC P62209-2 with the goal of developing a jointly developed dual-logo standard.

3.5.2 Subcommittee 2 (SAR evaluation – numerical techniques)

Following approval of four IEEE projects as IEC/IEEE jointly developed standards projects, PARs P1528.1, P1528.2, P1528.3 and P1528.4 were withdrawn and new PARs with the assigned IEC project numbers were submitted and approved.

3.5.2.1 IEC P62704-1 (formerly P1528.1):

- The draft of IEC/IEEE 62704-1 was completed in September 2012 and submitted to IEC as a committee draft (1CD) for comment by the national committees. The comment period ended in January 2013. The text has been reviewed, revised and a 2nd CD issued. The draft is now undergoing IEEE Sponsor ballot. The initial ballot for P62704-1closed in November 2013 and meets all thresholds for approval by the IEEE SASB. However, 234 comments must be resolved and the revised draft recirculated.

3.5.2.2 IECP62704-2 (formerly P1528.2):

- The draft of IEC/IEEE 62704-2 was completed in September 2012 and submitted to IEC as a committee draft (1CD) for comment by the national committees. The comment period ended in January 2013. The text has been revised and a 2nd CD issued. The target date for completing the IEC CDV is 31 January, 2014. The draft is now undergoing IEEE Sponsor ballot—the initial ballot closed in October 2013 and meets all thresholds for approval by the IEEE SASB. However, a number of comments must be resolved and the revised draft recirculated.
- Approaches for 90th 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 incorporated into the document.

3.5.2.3 P62704-3 (formerly P1528.3):

- The draft of IEC/IEEE 62704-3 was completed in September 2012 and submitted to IEC as a committee draft (1CD) for comment by the national committees. The comment period ended in January 2013. The draft has been updated with the experiences obtained from the conducted inter-laboratory comparison and a 2nd CD issued. The target date for completing the IEC CDV is 31 January, 2014. The draft is now undergoing IEEE Sponsor ballot. The initial ballot closed in August 2013 and meets all thresholds for approval by the IEEE SASB. However, a number of comments must be resolved and the revised draft recirculated.
- 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 draft. The interlaboratory comparison study has been completed.
- A paper on the interlaboratory comparison study has been accepted for publication: "A benchmark CAD mobile phone model for specific absorption rate calculations," V. Monebhurrun, et al., *IEEE Trans. Magn*. Special issue, 2013.

3.5.2.4 P62704-4 (formerly P1528.4):

- 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 new P62704-4 draft closely follows the earlier PARs and frequently refers to them, while changing FDTD specific guidelines into finite element analysis (FEM)-specific guidelines.

3.6 TC34 PARs

3.6.1 SC1 PARs

3.6.1.1 P1528 (Approved June 2013, Published September 2013)

3.6.2 SC2 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 P62704-4 (Approved December 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: General Requirements for Using the Finite Element Method (FEM) for SAR Calculations and Specific Requirements for Modeling Vehicle-Mounted Antennas and Personal Wireless Devices.

Scope: This standard describes the concepts, techniques, models, validation procedures, uncertainties and limitations of the Finite-Element Method when used for determining the spatial-peak specific absorption rate (SAR) in standardized anatomical models exposed to wireless communication devices, including vehicle-mounted antennas and personal wireless devices, such as hand-held mobile phones. Guidance on modeling such devices and benchmark data for simulation is provided; model contents, meshing and test positions of the anatomical models are defined. This document does not recommend specific SAR values since these are found in other documents, e.g., IEEE C95.1-2005 (IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.)

Purpose: This document will not contain a purpose clause.

3.7 Drafts

3.7.1 SC1 (IEEE 1528 Approved June 2013, published September 2013)

3.7.2 SC2 (Computational Techniques)

Drafts of P1528.1, P1528.2, 1528.3 and P1528.4 (now IEC/IEEE P62704-1, -2, -3 and -4) were approved as dual-logo standards projects. The first three documents are in IEC stage 2CD and are in IEEE Sponsor ballot.

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

3.8.1 SC1 (Measurement techniques)

3.8.1.1 Objectives (2013)

- Complete Sponsor Ballot of the revision of IEEE 1528-2003. (Met)

3.8.1.2 Objectives (2014)

- Follow up on harmonization process with IEC P62209-2; seek jointly-developed dual-logo standards status with IEC.

3.8.2 SC2 (Numerical techniques)

3.8.2.1 Current levels of activity and milestones (2013)

- P62704-1 – prepare CDV for IEC and IEEE ballot. (Met)
- P62704-2 – prepare CDV for IEC and IEEE ballot. (Met)
- P62704-3 – prepare CDV for IEC and IEEE ballot. (Met)
- P62704-4 – prepare for circulation as 1CD. (Not met)

3.8.2.2 Objectives (2014)

- P62704-1 – prepare CDV for IEC and IEEE ballot
- P62704-2 – prepare CDV for IEC and IEEE ballot
- P62704-3 – prepare CDV for IEC and IEEE ballot
- P62704-4 – prepare for circulation as 1CD

3.9 Website

A website and reflector was set up several years ago for SC2 (now SC1 and SC2) 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 SC2 provided by the Cellular Telecommunications and Internet Association (CTIA) are now provided by volunteer committee members. Joan Woolery is the IEEE Staff Engineer for both TC34 and TC95—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/MT-1. 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

Because of the close cooperation and overlap of membership and the desire for a single international standard, TC34 is considering IEC approval of IEEE 1528-2013 and IEC P62209 as a jointly developed IEC/IEEE standards project.

Rationale: IEC TC106/MT-1 (maintenance of IEC 62209) and IEEE TC34/SC1 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),” IEC 62209-2-2010 “Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz” and IEEE 1528-2013 “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.” During the development of these standards a number of TC34 members also participated on the IEC PTs, sharing drafts to ensure harmonization. Thus the three existing standards were developed jointly by many of the same people but issued separately as three distinct standards. During the past three years, TC34/SC1and MT-1 have held a number of face-to-face meetings and a number of joint teleconferences. While these exchanges are dedicated to P62209 business or TC34 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 TC34/SC1 believe that IEC 62209 and IEEE 1528 are ideal candidates for such a project.

3.13 Membership

See Table TC34-2 for detailed membership information.

Table TC34-1
TC34 Leadership

OFFICE	NAME	AFFILIATION	COUNTRY
Chair	Dr. Wolfgang Kainz	USFDA/CDRH	DE
Vice- chair	Dr. Mark Douglas	IT'IS Foundation	CH
Chair – SC1 (SAR evaluation—measurement techniques)	Dr. Mark Douglas	IT'IS Foundation	CH
Chair – SC2 (SAR evaluation—numerical techniques)	Dr. Wolfgang Kainz	USFDA/CDRH	US
Chair – WG-1 (IEC/IEEE P62704-1)	Andreas Christ	Independent	BR
Chair – WG-2 (IEC/IEEE P62704-2)	Giorgi Bit-Babik	Motorola Solutions, Inc.	US
Chair – WG-3 (IEC/IEEE P62704-3)	Vikass Monebhurrun	Supelec	FR
Chair – WG-4 (IEC/IEEE P62704-4)	Markus Kopp (acting)	ANSYS	US

Table TC34-2
TC34 Membership (November 2012)

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
1.	Ablehamid	Hadjem	Orange – FT Group	U	FR
2.	Almeida	Antonio	CPQD	S	BR
3.	Alon	Leeor	NYU Med Center	A	US
4.	Attayi	Daoud	RIM	P	CA
5.	Balzano	Quirino	University of Maryland	A	US
6.	Bassen	Howard	US Food and Drug Administration	G	US
7.	Beard	Brian	US Food and Drug Administration	G	US
8.	Bit-Babik	Giorgi	Motorola Solutions, Inc.	P	US
9.	Bodemann	Ralf	Siemens	PI	DE
10.	Case	David	Cisco	P	US
11.	Chan	Kwok	US Fed. Communications Commission	G	US
12.	Chang	Isaac	US Food and Drug Administration	G	US
13.	Chao	Justin	PC TEST	U	US
14.	Chen	Ji	University of Houston	A	US
15.	Choi	Dong-guen	KCC	G	KR
16.	Choi	Hyung-Do	ETRI	P	KR
17.	Chou	C-K.	Motorola Solutions, Inc.	P	US
18.	Christ	Andreas	IT IS Foundation	A	CH
19.	Davis	Chris	University of Maryland	A	US
20.	Derat	Benoit	Field Imaging	P	FR
21.	Dianyuan	Qi	CATR-MIIT	G	CN
22.	Douglas	Mark	IT IS Foundation	A	CH
23.	Faraone	Antonio	Motorola Solutions, Inc.	P	US
24.	Forrester	John	Qualcomm	P	US
25.	Foster	Ken	University of Pennsylvania	A	US
26.	Francavilla	Mauro	Telecom Italia	P	IT
27.	Gabriel	Sami	Vodafone	P	UK
28.	Gallant	Josette	Industry Canada	G	CA
29.	Gouqing	Li	CATR	G	CN
30.	Hamada	Lira	NICT	G	JP
31.	Harrington	Tim	US Fed. Communications Commission	G	US
32.	Hauswirth	Steve	Motorola Mobility, Inc.	P	US

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
33.	Heirman	Don	Consultant	P	US
34.	Jeong	Chan-Ho	LG	U	KR
35.	Joyner	Ken	Samsung	P	AU
36.	Jun	Haeyoung	Samsung	P	KR
37.	Kainz	Wolfgang	US Food and Drug Administration	G	US
38.	Katsumi	Abe	Fujitsu	P	JP
39.	Keshvari	Jafar	Nokia	P	FI
40.	Kopp	Markus	ANSYS	G	US
41.	Koslov	Mikhail	MPG	P	DE
42.	Kuster	Niels	IT IS Foundation	A	CH
43.	Lee	Ae-kyoung	ETRI	U	KR
44.	Liu	Steve	PC TEST	U	US
45.	Loader	Benjamin	National Physical Laboratories	G	UK
46.	Lu	Lin	Qualcomm	P	US
47.	Luc	Jerome	Satimo	P	FR
48.	Magana	Luis	PC TEST	U	US
49.	Manteuffel	Dirk	Uni-Kiel	A	DE
50.	McIntosh	Robert	Telstra	U	AU
51.	Meier	Matthias	Motorola	P	DE
52.	Moller	Paul	Motorola	P	US
53.	Monebhurrun	Vikass	Supelec	A	FR
54.	Nappert	Hughes	Industry Canada	G	CA
55.	Nesterova	Maryna	APREL	GI	CA
56.	Nicol	Stuart	APREL	U	CA
57.	Niskala	Kai	Nokia	P	FI
58.	Onishi	Teruo	NTT DoCoMo	P	JP
59.	Park	DS	Samsung	P	KR
60.	Parmentier	Jack	Lenovo	P	US
61.	Penney	Chris	Remcom	P	US
62.	Picard	Stéphane	Industry Canada	G	CA
63.	Petersen	Ron	Consultant	GI	US
64.	Plicanic	Ramadan	Sony Ericsson Mobile Communications	U	SE
65.	Poirier	Marcel	Industry Canada	G	CA
66.	Pokovic	Katja	SPEAG	P	CH
67.	Prokop	Alexander	CST	PM	DE

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
68.	Proulx	Stephane	Industry Canada	G	CA
69.	Roman	John	Intel	P	US
70.	Schiavoni	Andrea	Telecom Italia	U	IT
71.	Sen	Indranil	Apple	P	KR
72.	Shah	Yogi	Medtronic	P	US
73.	Simon	Winfried	IMST	P	DE
74.	Thors	Björn	Ericsson	P	SE
75.	Tanabe	Shinji	Mitsubishi	P	JP
76.	Tornevik	Christer	Ericsson	P	SE
77.	Toropainen	Anssi	Nokia	P	FI
78.	Trinchero	Daniele	Polito	A	IT
79.	Vannatta	Louis	Motorola	P	US
80.	Wang	Ying	Sierra Wireless	GI	CA
81.	Watanabe	Soichi	NICT	G	JP
82.	Wiart	Joe	ORANGE	U	FR
83.	Wittig	Tilmann	CST	P	DE
84.	Ye	Qiubo	Communications Research Center	G	CA
85.	Zilberti	Luca	RicMet	G	IT

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

4. Technical Committee -95

4.1 Scope

The scope of ICES TC95 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 TC95." (The scope remains the same as the scope of SCC-28 before reorganization.)

4.2 Budget

TC TC95 manages its funds through the IEEE Concentration Banking System. Funding, which is obtained through meeting registration fees, is used to cover meeting and other expenses, e.g., website maintenance. Opening balance 1 January 2013: $10,497; current balance (as of 1 November 2013): $13, 372. Major expenses for the year: $2900 (website maintenance), $805 (refreshments, January 2013 meeting), $1507 (June 2013 meeting – meeting rooms, refreshments). Gross income (registration fees January 2013, June 2013 and pre-registration fees for January 2014 meetings) $8145.

4.3 TC95 Membership Roster

(See Tables TC95-2 through Table TC95-7.)

With the leadership of Dr. Michael Murphy, TC95 Membership Chairman, the non-US membership of ICES continues to grow.

Several members of TC95 have been inactive or have changed e-mail address and can no longer be contacted; their membership status continues to be addressed by the Membership Committee. In terms of stakeholders, the membership continues to be well balanced. About 50% of the TC95 membership are IEEE members, not all of which are SA members (there may be more IEEE and IEEE SA members than indicated on Tables TC95-2 thru TC95-7), which is to be expected and defended in view of the interdisciplinary nature of our membership. TC95 is grateful for their voluntary contributions of talent and time under conditions where it would be an unreasonable imposition to require IEEE membership. TC95 recognizes the financial burden for travel and loss of income generating business opportunity already born by many volunteers during TC95 activities. However, IEEE SA membership is required of all TC95 leadership (e.g., Committee and Subcommittee Chairs, Co-Chairs) and is encouraged for all members.

4.4 Meetings (2013)

4.4.1 Main Committee

4.4.1.1 Past Meetings

- January 18, 2013 – San Antonio, TX
- June 8, 2013 – Thessaloniki, Greece – in conjunction with BIOEM 2013

4.4.1.2 Future Meetings

- January 16, 2014 – Plantation, FL
- Fall 2014 – (date and venue to be announced)

4.4.2 Subcommittee 1 (Measurements and Computation)

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

4.4.2.1 Past Meetings

- January 16, 2013 – San Antonio, Texas
- June 6, 2013 – Thessaloniki, Greece – in conjunction with BIOEM 2013

4.4.2.2 Future Meetings

- January 14, 2014 – Plantation, FL
- Fall 2014 (date and venue to be determined)

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

4.4.3.1 Past Meetings

- January 16, 2013 – San Antonio, Texas
- June 6, 2013 – Thessaloniki, Greece – in conjunction with BIOEM 2013

4.4.3.2 Future Meetings

- January 14, 2014 – Plantation, FL
- Fall 2014 (date and venue to be determined)

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

4.4.4.1 Past Meetings

- January 17, 2013 – San Antonio, TX
- June 7, 2013 – Thessaloniki, Greece – in conjunction with BIOEM 2013

4.4.4.2 Future Meetings

- January 15, 2014 – Plantation, FL
- Fall 2014 (date and venue to be determined)

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

4.4.5.1 Past Meetings

- January 17, 2013 – San Antonio, Texas
- June 2013 – Thessaloniki, Greece – in conjunction with BIOEM 2013—(dates to be determined)

4.4.5.2 Future Meetings

- January 15, 2014 – Plantation, FL
- Fall 2014 (date and venue to be determined)

4.4.6 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 face-to-face since the June 2008 San Diego meeting but intends to hold a fall meeting in 2014.

4.5 Main Committee and Subcommittee Status

4.5.1 Main Committee

A major effort during the past several years has been to increase the membership of ICES, particularly non-U.S. members. TC95 now has members from Australia (4), Bulgaria (1), Canada (7), China (2), France (3), Germany (1), Greece (4), Hungary (1), India (1), Ireland (4), Israel (2), Italy (3), Japan (4), Korea (4), Malaysia (3), the Netherlands (2), New Zealand (2), Poland (1), Sweden (1), Slovenia (1), Switzerland (3), Thailand (1), Turkey (1), the United Kingdom (3) and the United States (67)—slightly more that 50% of the main committee membership is from outside the US.

The TC95 mailing list now approaches 350, including subcommittee members and observers. Twelve 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/) contains both open and private pages for TC95 and its subcommittees and links to TC34 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 TC95/SC3/SC4 literature database, containing more than 5000 titles, which appears on the WHO website, is also publicly available (titles and abstracts only) on the WHO and ICES websites at http://www.who.int/peh-emf/research/database/IEEEdatabase/ and http://www.ieee-emf.com/, respectively. (The complete papers are offered only to members of the TC95/SC3/SC4 literature evaluation working groups.)

4.5.2 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 was approved at the March 2012 NesCom meeting.

The former chair of SC1 stepped down following publication of C95.3.1 – the new co-chairs of SC1 are Mr. Francis Colville and Dr. Mark Douglas.

4.5.3 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 (R2006), "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.

A revision of C95.7 was prepared within SC-2 and circulated for subcommittee balloting and comment during 2012. Following revision of the document, based on numerous comments, it was anticipated that the document would be put out for sponsor ballot during the Spring of 2013. However, several subcommittee members recommended that the document be held until after the June 2013 meeting in Greece, pending possible comments from international attendees at the meeting. Following the Greece meeting, several relatively minor revisions to the document were made. The revised draft, which had already been balloted at the subcommittee level, and approved, was submitted for sponsor ballot on November 27, 2013. An invitation to join a balloting group is being issued by the sponsor with a 15 day deadline. It is anticipated that balloting can begin before the end of December 2013.

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

At present, no major revisions of this standard are anticipated but key members of SC3 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 SC3 are also making progress in encouraging further R&D on improvement of induction models and synaptic effects thresholds, including magnetophosphenes in human volunteers for future revision/applications. There are no active PARs for new or existing projects but members of SC3 are working with members of SC4 on the ongoing 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 were also incorporated into PC95.1-2345, a civil standard considered as a replacement of STANAG 2345, the current NATO RF exposure standard.

4.5.5 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, 3 kHz – 300 GHz." 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 SC4 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.

PC95.1-2345, "Draft Standard for Military Workplaces – Force Health Protection Regarding Personnel Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz," which is intended to replace NATO STANAG 2345 (Edition 3), is now in Sponsor ballot.

The revision of C95.1-2005 and development the new standard, C95.1-2345 is carried out by an editorial working group that meets about four times per year face-to-face and several times by teleconference. The working group, with members from both SC3 and SC4, prepares the drafts and addresses comments received by the subcommittees following circulation of each draft.

SC4 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 SC4 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.)

4.5.6 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.

4.6 PARs

The following TC95 PARS are currently active:

4.6.1 SC1 PARs

4.6.1.1 PC95.3 (Approved February 2012)

Title: Recommended Practice for Measurements and Computations of Electric, Magnetic and Electromagnetic Fields With Respect to Human Exposure to Such Fields, 0 Hz-300 GHz.

Status: Revision Project

Project Scope: This recommended practice describes methods for measuring and computing external electric, magnetic and electromagnetic fields to which persons may be exposed over the frequency range of 0 Hz to 300 GHz. Instrument characteristics and the methods of calibrating such instruments and methods for computation and the measurement of the resulting fields and currents that are induced in bodies of humans exposed to these fields are included.

4.6.2 SC2 PARs

4.6.2.1 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.

4.6.2.2 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) TC95 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.

4.6.3 SC3/4 PARs

4.6.3.1 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.

4.6.3.2 PC95.1-2345 (Approved September 2009)

Title: Standard for Military Workplaces--Force Health Protection Regarding Personnel Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz

Status: New Standard Project

Project scope: This standard provides recommendations to protect personnel in military environments against established adverse health effects associated with exposure to electric, magnetic, and electromagnetic fields, induced and contact current, and contact and arcing voltages over the frequency range of 0 Hz to 300 GHz. The recommendations, expressed as dosimetric reference limits (DRLs) and exposure reference levels (ERLs), incorporate safety factors that address uncertainties such as uncertainties in the experimental data, measurement uncertainties, and differences in sensitivity between individuals, so as to establish an appropriate margin of safety. The DRLs are expressed in terms of in situ electric field strength, specific absorption rate (SAR), and incident power density. The ERLs are expressed in terms of environmental exposure fields and power densities. In the case of contact current, however, only ERLs are provided. The DRLs and ERLs are intended to protect against established adverse human health effects associated with electrostimulation of tissue and partial and whole-body heating, but may not protect against electromagnetic interference (EMI) with implanted medical devices. This standard does not apply to exposure of informed volunteers in medical or scientific research studies subject to approval by institutional review boards for the use of human subjects, nor does it include exposure assessment techniques, risk management/safety program procedures, warning sign design, procedures for medical treatment of suspected overexposures, or assessment of hazards associated with exposure of ordnance, fuel, or electro-explosive devices.

Project purpose: The purpose of this standard is to provide science-based exposure limits for incorporation into a safety and occupational health (SOH) risk management program to protect personnel in a military workplace against established adverse health effects associated with exposure to electric, magnetic and electromagnetic fields, induced and contact currents, and contact (and arcing) voltages over the frequency range of 0 Hz to 300 GHz.

4.7 Objectives and Goals for 2013 and the TC's performance relative to meeting these goals and objectives.

- Begin Subcommittee balloting on PC95.3. (SC1 – 4th Q 2013: Not met)
- Complete Subcommittee balloting on PC95.7. (SC2 – 2nd Q 2013: Met)
- Initiate Sponsor balloting on PC95.7. (SC2 – 3rd Q 2013: Not met)
- Complete Subcommittee balloting on PC95.1-2345. (SC3/SC4 – 4th Q 2013: Met)
- Begin Subcommittee balloting on PC95.1. (SC3/SC4 – 2nd Q 2013: Not met)
- Complete Subcommittee balloting on PC95.1. (SC3/SC4 – 1st Q 2014: Not met)

4.8 Objectives and Goals for 2014 with milestones indicated

- Complete Sponsor balloting on PC95.1-2345. (SC3/SC4 – 1st Q 2014)
- Begin Subcommittee balloting on PC95.1. (SC3/SC4 – 2nd Q 2014)
- Begin Subcommittee balloting on PC95.3. (SC1 – 2nd Q 2014)
- Initiate Sponsor balloting on PC95.7. (SC2 – 1st Q 2014)
- Resolve comments from Sponsor ballot on PC95.7. (SC2 – 2nd Q 2014)
- Submit PC95.7 to RevCom. (SC2 – 3rd Q 2014)
- Complete Subcommittee balloting on PC95.1. (SC3/SC4 – 4th Q 2014)

4.9 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 TC34 and TC95—her engineering background and broad knowledge of IEEE procedures is invaluable to this committee.

4.10 Other Activities:

Members of ICES TC95 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. TC95 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.

4.11 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 C95.3 is being revised and expanded to include C95.3.1-2010.

4.11.2 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 Hz – 3 kHz) and C95.1 (3 kHz – 300 GHz). The ICNIRP process for developing guidelines is closed and relies on claims of "no commercial vested interests" to maintain "credibility," especially within the EU states. Since there is no stakeholder involvement, it is not clear how they will deal with "Consideration of Implementation in Practice" in their process. 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 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).

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 (TC95 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 (TC95 Chair) represented ICES; Dr. Bernard Veyret represented ICNIRP. In November 2013, C-K Chou presented "Update of IEEE EMF Exposure Standards Activities," and James Lin presented an update of the ICNIRP Guidelines and activities at the GLORE (Global Coordination of Research and Health Policy on Electromagnetic Fields) meeting held at the FCC (November 14 – 15).

4.11.3 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. In the 2012 revision of the *BioInitiative Report*, the authors of the final chapter (written by two individuals without consulting other authors of the report) recommend a precautionary exposure limit of 0.3 nW/cm^2 for RF exposure, which would essentially shut down radio communications.

4.12 Membership

See Tables TC95-1 through Table TC95-7 for committee and subcommittee membership information.

Prepared by

Ron Petersen
Secretary, SCC-39

Table TC95-1

TC95 Leadership

OFFICE	NAME	AFFILIATION	COUNTRY
Chairman	C-K Chou	Motorola Solutions, Inc.	US
Vice Chairman (Vac.)			
Secretary/Treasurer	Ron Petersen	R C Petersen Associates LLC	US
Co-chairman, SC1	Francis Colville	US Army CHPPM	US
Co-chairman, SC1	Mark Douglas	IT'IS Foundation	CH
Chairman, SC2	Richard Tell	Richard A Tell Associates, Inc.	US
Co-chairman, SC3	Thanh Dovan	SP AusNet	AU
Co-chairman, SC3	Rob Kavet	EPRI	US
Co-chairman, SC4	Art Thansandote	Health Canada	CA
Co-chairman, SC4	Marvin Ziskin	Temple University Medical School	US
Co-chairman, SC5	Tamera Hay	Naval Surface Warfare Ctr.	US
Co-chairman, SC5	Ray Harmon	URS Corp.	US

Table TC95-2

TC95 Membership: Main Committee (November 2012)

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
1.	Adhikari	Sam	Syssoft Corporation	GI	US
2.	Alon	Leeor	NYU Medical Center	GI	US
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.	Balzano	Quirino	University of MD	A	US
7.	Baron	David	AIHA Representative	GI	US
8.	Bassen	Howard	FDA/CDRH	G	US
9.	Bavin	John	Consumers Energy	U	US
10.	Bellier	Pascale	Health Canada	G	CA
11.	Bergeron	John	Independent Consultant	GI	US
12.	Black	David	Environmedix	GI	NZ
13.	Bodemann	Ralf	Siemens AG	P	DE
14.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US
15.	Brewer	John	HCJB Global	U	US
16.	Brooker	Ian	Tyco Fire and Security	P	IE
17.	Bushberg	Jerrold	U. of California, Davis	A	US
18.	Butcher	Matt	SiteSafe	U	US
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.	Colville	Frank	US Army CHPPM	G	US
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	RF CHECK Incorporated	U	US
27.	D'Andrea	John	Naval Medical Research Unit	G	US
28.	de Seze	Rene	INERIS	GI	FR
29.	DeFrank	John	US Army CHPPM	G	US
30.	Dini	David	Underwriters Lab	G	US
31.	Dockzat	Martin	FCC-OET	G	US
32.	Douglas	Mark	IT'IS Foundation	GI	CH
33.	Dovan	Thanh	SP AusNet	P	AU
34.	Duvdevany	Amnon	IDF Medical Corps	G	IL
35.	Elder	Joe	Independent Consultant	U	US

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
36.	Erdreich	Linda	Exponent	GI	US
37.	Farrer	Donald	Independent Consultant	U	US
38.	Filippopoulos	George	Greek Atomic Energy Comm.	G	GR
39.	Foster	Kenneth	Univ. of Pennsylvania	A	US
40.	Gajsek	Peter	Institute of Public Health	U	SI
41.	Gallant	Josette	Industry Canada	G	CA
42.	Geber	Kurt	Dynamac Corporation	P	US
43.	George	David	Unisys Corp.	P	US
44.	Gettman	Ken	NEMA	GI	US
45.	Gledhill	Martin	Monitoring and Adv. Serv. NZ, Ltd	U	NZ
46.	Grandolfo	Martino	Laboratorio di Fisica	GI	IT
47.	Guy	Arthur	Bioelectromagnetics Consulting	GI	US
48.	Haes, Jr.	Donald	BAE Systems	P	US
49.	Halkiotis	Konstantinos	Medical School of Athens	A	GR
50.	Hare	Ed	American Radio Relay League	GI	US
51.	Harmon	Raymond	URS Corp.	U	US
52.	Hatfield	James	Hatfield & Dawson	GI	US
53.	Hay	Tamera	Naval Surface Warfare Center	U	US
54.	Heirman	Donald	Don HEIRMAN Consultants	GI	US
55.	Hirata	Akimasa	Nagoya Institute of Technology	A	JP
56.	Hongbin	Jin	China Mobile	U	CN
57.	Ibey	Bennett	Brooks City Base	U	US
58.	Ikehata	Masateru	Railway Technical Research Inst	A	JP
59.	Israel	Michel	National Centre of Hygiene	G	BL
60.	Ivans	Veronica	Medtronic Inc.	G	US
61.	Jaffa	Kent	Retired	U	US
62.	Jiang	Hai	Underwriters Lab	G	US
63.	Johnson	Robert	L-3 Microwave	U	US
64.	Johnston	Sheila	Independent Consultant	GI	IE
65.	Jones	Christine	Naval Surface Warfare Ctr.	G	US
66.	Joyner	Ken	Samsung	P	AU
67.	Kandel	Shaiela	Hebrew University of Jerusalem	A	IL
68.	Karabetsos	Efthymios	Greek Atomic Energy Commission	G	GR
69.	Kavet	Robert	EPRI	GI	US
70.	Kim	Byung Chan	ETRI, Korea	GI	KR
71.	Kim	Nam	Chungbuk National University	A	KR
72.	Klauenberg	B. Jon	USAF	G	US
73.	Koepfinger	Joseph	Consultant	G	US
74.	Kuster	Niels	IT'IS Foundation	A	CH

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
75.	Lee	Ae-Kyoung	ETRI	GI	KR
76.	Link	Richard	Radiation Safety Institute of Canada	A	CA
77.	Lodwick	Jeffrey	US Department of Labor	G	US
78.	Manatrakul	Nisakorn	Ministry of Public Health	G	TH
79.	Mathur	Rajat	Hammett & Edison, Inc.	U	US
80.	McManus	Tom	DCMNR, Ireland (Retired)	GI	IE
81.	McNamee	James	Health Canada	G	CA
82.	Meltz	Martin	Retired	GI	US
83.	Miyagi	Hiroaki	Japan NUS Co., Ltd	P	JP
84.	Murphy	Michael	Directed Energy Bioeffects	G	US
85.	Muthuvelu	Pirunthavany	Ministry of Health	G	MY
86.	Nappert	Hughes	CEM Industry Canada	G	CA
87.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
88.	Nelson	David	Michigan Technical University	A	US
89.	Ng	Kwan-Hoong	Dept of Radiation	G	MY
90.	Osepchuk	John	Full Spectrum Consulting	U	US
91.	Packer	Malcolm	Harris RF Communications	P	US
92.	Pakhomov	Andrei	McKesson Bio Services	GI	US
93.	Persson	Bertil	Lund University	A	SE
94.	Petersen	Ronald	R C Petersen Associates	GI	US
95.	Ramachandran	TV	Vodafone	U	IN
96.	Ravazzani	Paolo	Italian Nat Res Council	G	IT
97.	Reilly	J. Patrick	Metatec Associates	GI	US
98.	Repacholi	Michael	World Health Organization (Ret.)	GI	CH
99.	Roberts	Brad	US Army CHPPM	G	US
100.	Ryu	Chungsang	KR Com Radio Res Agency	G	KR
101.	Samaras	Theodoros	Aristotle University of Thessaloniki	A	GR
102.	Scanlon	William	Queens University, Belfast	A	UK
103.	Sheppard	Asher	Asher Sheppard Consulting	U	US
104.	Shkolnikov	Yakov	Exponent	GI	US
105.	Shrivastava	Devashish	University of Minnesota	A	US
106.	Smit	Niels	Royal Netherlands Navy	G	NL
107.	Swicord	Mays	Mays Swicord Consulting	U	US
108.	Szmigielski	Stanislaw	Mil Inst of Hyg. and Epidemiology	G	PL
109.	Tattersall	John	DSTL	G	UK
110.	Tell	Richard	Richard Tell Assoc. Inc.	U	US
111.	Testagrossa	Paul	Alcatel-Lucent	P	US
112.	Thansandote	Art	Health Canada	G	CA
113.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	G	HU

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
114.	Tofani	Santi	Servizio Di Fisica Sanitaria	A	IT
115.	Umbdenstock	Donald	Tyco/Sensormatic	P	US
116.	van Rongen	Eric	Health Council of the Netherlands	G	NL
117.	Varanelli	Arthur	Independent Consultant	U	US
118.	Vijayalaxmi	"Vijay"	University of Texas	GI	US
119.	Wan Nor Liza	Mahadi	Mahadi. Institute: University Malaya	A	MY
120.	Wessel	Marvin	Global RF Solutions	U	US
121.	Wiart	Joe	France Telecom Orange Labs R&D	U	FR
122.	Williams, Jr.	Louis	Louis A. Williams Jr. & Associates	U	US
123.	Yamazaki	Kenichi	Central Res Inst Elect. Power Ind.	G	JP
124.	Zhadobov	Maxim	IETR	GI	FR
125.	Zipse	Donald	Electrical Forensics, LLC	GI	US
126.	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 TC95-3
TC95 Membership: SC1 (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.	Choi	Dong-guen	Radio Research Agency	P	KR
6.	Chou	C.K.	Motorola Solutions, Inc.	P	US
7.	Cleveland	Robert	EMF Consulting	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.	Friedrich	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. Medical School	A	US

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

Table TC95-4
TC95 Membership: SC2: (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 Consulting	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
33.	Kumbier	Werner	Narda Safety Test Solutions	P	DE

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
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.	Murphy	Michael	Directed Energy Bioeffects	G	US
40.	Nappert	Hughes	CEM Industry Canada	G	CA
41.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
42.	Norman	Larry	Pike Electric	P	US
43.	Olsen	Richard	Naval Surface Warfare Cntr. (Ret.)	G	US
44.	Osepchuk	John	Full Spectrum Consulting	U	US
45.	Persson	Bertil	Lund University	A	SE
46.	Petersen	Ronald	R C Petersen Associates	GI	US
47.	Proctor	Ken	US Army	G	US
48.	Roberts	Brad	US Army CHPPM	G	US
49.	Rogers	Walt	Veridian Eng/RFR Branch	GI	US
50.	Rowley	Jack	Telstra Research Labs	GI	AU
51.	Scanlon	William	Queens University, Belfast	A	UK
52.	Seabury	David	Chase Systems Inc.	U	US
53.	Smith	Matthew	Dade Moeller & Associates	GI	US
54.	Strickland	Richard	RF Safety Solutions	U	US
55.	Tell	Richard	Richard Tell Assoc. Inc.	GI	US
56.	Testagrossa	Paul	Alcatel-Lucent	P	US
57.	Thansandote	Art	Health Canada	G	CA
58.	Ulcek	Jerry	FCC	G	US
59.	Varanelli	Arthur	Independent Consultant	GI	US
60.	Williams, Jr.	Louis	Louis A. Williams Jr. & Associates	GI	US
61.	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 TC95-5
TC95 Membership: SC3 (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	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.	Hernandez	Martin	Florida Power & Light Co.	P	US
44.	Herz	Michael	Pacific Gas & Electric Co.	P	US
45.	Hicks	Danny	South Carolina Electric & Gas Co.	P	US
46.	Hirata	Akimasa	Nagoya Institute of Technology	A	JP
47.	Hongbin	Jin	China Mobile	U	CN
48.	Hubbard	Roy	Technology Services Int.	GI	ZA
49.	Ibey	Bennett	Brooks City Base	G	
50.	Ikehata	Masateru	Railway Technical Research Inst.	A	JP
51.	Ivans	Veronica	Medtronic Inc. (Retired)	GI	US
52.	Jaffa	Kent	Retired	GI	US
53.	Johnston	Sheila	Independent Consultant	GI	IE
54.	Karabetsos	Efthymios	Greek Atomic Energy Comm.	G	GR
55.	Kautz	Richard	Ford	P	US
56.	Kavet	Robert	EPRI	GI	US
57.	Kim	Byung Chan	ETRI, Korea	GI	KR
58.	Kim	Nam	Chungbuk National University	A	KR
59.	Koepfinger	Joseph	Consultant	GI	US
60.	Kuster	Niels	IT'IS Foundation	GI	CH
61.	Lathrop	Janet	Resource Strategies, Inc	GI	US
62.	Lee	Ae-Kyoung	ETRI	GI	KR
63.	Link	Richard	Radiation Safety Inst. of Canada	A	CA
64.	Lodwick	Jeffrey	US Department of Labor	G	US
65.	Lotz	Gregory	NIOSH	G	US
66.	Mair	Peter	Fronius International GMBH	P	DE
67.	Manatrakul	Nisakorn	Ministry of Public Health	G	TH
68.	Mathur	Rajat	Hammett & Edison, Inc.	U	US
69.	McManus	Tom	DCMNR, Ireland (Retired)	GI	IE
70.	McNamee	James	Health Canada	G	CA
71.	Miyagi	Hiroaki	Japan NUS Co., Ltd	U	JP

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
72.	Murphy	Michael	Directed Energy Bioeffects	G	US
73.	Muthuvelu	Pirunthavany	Ministry of Health	G	MY
74.	Nappert	Hughes	CEM Industry Canada	G	CA
75.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
76.	Nelson	David	Michigan Technical University	A	US
77.	Ng	Kwan-Hoong	Dept of Radiation	G	MY
78.	O'Connor	Roger	Dept of Comm, Marine and Nat Res	G	IE
79.	Osepchuk	John	Full Spectrum Consulting	GI	US
80.	Petersen	Ronald	R C Petersen Associates	GI	US
81.	Pittman	Steve	Potlach Pulp and Paperboard	P	US
82.	Podhrasky	Robert	Garrett Metal Detectors	P	US
83.	Polson	Peter	Ausa Research	GI	US
84.	Proctor	Ken	US Army	G	US
85.	Ravazzani	Paolo	Italian Nat Res Council	G	IT
86.	Reilly	J. Patrick	Metatec Associates	GI	US
87.	Roberts	Brad	US Army CHPPM	G	US
88.	Ryu	Chungsang	KR Com Radio Res Agency	G	KR
89.	Sahl	Jack	J. Sahl Associates	GI	US
90.	Samaras	Theodoros	Aristotle University of Thessaloniki	A	GR
91.	Sawdon	Dave	IBM Global Services	P	UK
92.	Sheppard	Asher	Asher Sheppard Consulting	GI	US
93.	Shkolnikov	Yakov	Exponent	GI	US
94.	Shrivastava	Devashish	University of Minnesota	A	US
95.	Sliney	David	US Army CHPPM Retired	G	US
96.	Smit	Niels	Royal Netherlands Navy	G	NL
97.	Swicord	Mays	Mays Swicord Consulting	GI	US
98.	Szmigielski	Stanislaw	Mil Inst of Hygiene and Epi.	A	PL
99.	Tell	Richard	Richard Tell Assoc. Inc.	U	US
100.	Thansandote	Art	Health Canada	G	CA
101.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	A	HU
102.	Umbdenstock	Donald	Tyco/Sensormatic	P	US
103.	van Rongen	Eric	Health Council of the Netherlands	G	NL
104.	Varanelli	Arthur	Independent Consultant	GI	US
105.	Vijayalaxmi		Univ. Texas Health Science Ctr.	A	US
106.	Wan Nor Liza	Mahadi	Mahadi. Inst.: University Malaya	A	MY
107.	Wiart	Joe	France Telecom Orange Labs R&D	GI	FR
108.	Williams, Jr.	Louis	Louis A. Williams Jr. & Associates	U	US

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
109.	Woods	Richard	Sensormatic Electronics	P	US
110.	Yamazaki	Kenichi	Central Res Inst Elect. Power Ind.	P	JP
111.	Yandek	Edward	GE Lighting	P	US
112.	Zhadobov	Maxim	IETR	GI	FR
113.	Zipse	Donald	Electrical Forensics, LLC	GI	US
114.	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 TC95-6
TC95 Membership: SC4 (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.	Adhikari	Sam	Syssoft Corporation	GI	US
3.	Ammann	Max	Dublin Inst. of Technology	A	IE
4.	Anderson	Vitas	Swinburne University	A	AU
5.	Attayi	Daoud	Research In Motion, Ltd	P	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	Nat'l 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 Consulting	GI	UK
23.	Colville	Frank	US Army CHPPM	G	US
24.	Comlekci	Selcuk	Suleyman Demirel University	A	TR
25.	Cotton	David	Sitesafe Inc	U	US
26.	Croft	Rodney	Department of Psychology	A	AU
27.	Curtis	Robert	Curtis Eng. and Management	U	US
28.	D'Andrea	John	Naval Med. Research NIR Unit	G	US
29.	de Seze	Rene	INERIS	A	FR
30.	DeFrank	John	US Army CHPPM	G	US
31.	Dini	David	UL	U	US
32.	Doczkat	Martin	US FCC	G	IT
33.	Dovan	Thanh	SP AusNet	P	AU

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
34.	Durrenberger	Gregor	ETH	A	CH
35.	Duvdevany	Amnon	IDF Medical Corps	G	ZA
36.	Elder	Joe	Independent Consultant	G	IL
37.	Erdreich	Linda	Exponent	GI	US
38.	Farrer	Donald	Independent Consultant	GI	US
39.	Filippopoulos	George	Greek Atomic Energy Comm.	G	US
40.	Foster	Kenneth	Univ. of Pennsylvania	A	US
41.	Gajsek	Peter	Institute of Public Health	G	GR
42.	Gallant	Josette	Industry Canada	G	US
43.	Geber	Kurt	Dynamac Corporation	P	SI
44.	George	David	Unisys Corp.	P	CA
45.	Gettman	Ken	NEMA	A	US
46.	Gledhill	Martin	Monitoring and Advis. Serv. NZ, Ltd.	U	NZ
47.	Haes, Jr.	Donald	BAE Systems	P	UK
48.	Halkiotis	Konstantinos	Medical School of Athens	A	US
49.	Hatfield	James	Hatfield & Dawson	U	US
50.	Hay	Tamera	Naval Surface Warfare Center	G	CH
51.	Heirman	Donald	Don HEIRMAN Consultants	U	US
52.	Hirata	Akimasa	Nagoya Institute of Technology	A	GR
53.	Hongbin	Jin	China Mobile	U	IE
54.	Hubbard	Roy	Technology Services International	GI	US
55.	Ibey	Bennett	Brooks City Base	G	US
56.	Ikehata	Masateru	Railway Technical Research Institute	A	CA
57.	Israel	Michel	National Centre of Hygiene	G	US
58.	Ivans	Veronica	Medtronic Inc.	P	JP
59.	Jiang	Hai	Underwriters Labs	U	US
60.	Johnston	Sheila	Independent Consultant	GI	BL
61.	Jones	Christine	Naval Surface Warfare Ctr.	U	US
62.	Joyner	Ken	Samsung	P	US
63.	Kandel	Shaiela	Hebrew University of Jerusalem	A	IE
64.	Kantner	Kimberly	AT&T	U	AU
65.	Karabetsos	Efthymios	Greek Atomic Energy Commission	G	IL
66.	Kavet	Robert	EPRI	GI	US
67.	Kim	Nam	Chungbuk National University	A	US
68.	Kim	Byung Chan	ETRI, Korea	GI	UK
69.	Klauenberg	B. Jon	USAF	G	KR
70.	Koepfinger	Joseph	Consultant	U	US

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY
71.	Kwee	Sianette	University of Aarhus	A	US
72.	Lee	Ae-Kyoung	ETRI	GI	FI
73.	Link	Richard	Radiation Safety Institute of Canada	A	US
74.	Lodwick	Jeffrey	US Department of Labor	G	CA
75.	Lotz	Gregory	NIOSH	G	US
76.	Manatrakul	Nisakorn	Ministry of Public Health	G	US
77.	Mantiply	Ed	FCC/OET	G	TH
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.	Murphy	Michael	Directed Energy Bioeffects	G	JP
86.	Muthuvelu	Pirunthavany	Ministry of Health	G	US
87.	Nappert	Hughes	CEM Industry Canada	G	US
88.	Needy	Robert	Naval Surface Warfare Ctr.	G	US
89.	Nelson	David	Michigan Technical University	A	US
90.	Ng	Kwan-Hoong	Dept of Radiation	G	MY
91.	Osepchuk	John	Full Spectrum Consulting	GI	CA
92.	Packer	Malcolm	Harris RF Communications	P	US
93.	Pakhomov	Andrei	McKesson Bio Services	GI	US
94.	Persson	Bertil	Lund University	A	MY
95.	Petersen	Ronald	R C Petersen Associates	GI	US
96.	Polson	Peter	Ausa Research	GI	US
97.	Proctor	Ken	US Army	G	US
98.	Ravazzani	Paolo	Italian Nat Res Council	G	SE
99.	Reilly	J. Patrick	Metatec Associates	GI	US
100.	Roberts	Brad	US Army Public Health Commend	G	US
101.	Rogers	Walt	Veridian Eng/RFR Branch	GI	US
102.	Rybak	Terence	General Motors Proving Ground.	GI	IT
103.	Ryu	Chungsang	KR Com Radio Res Agency	G	US
104.	Samaras	Theodoros	Aristotle University of Thessaloniki	A	US
105.	Santomaa	Veli	Nokia (Retired)	GI	US
106.	Scanlon	William	Queens University, Belfast	A	US
107.	Sheppard	Asher	Asher Sheppard Consulting	GI	GR

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108.	Shkolnikov	Yakov	Exponent	GI	FI
109.	Shrivastava	Devashish	University of Minnesota	A	UK
110.	Smit	Niels	Royal Netherlands Navy	G	US
111.	Swicord	Mays	Mays Swicord Consulting	GI	PL
112.	Szmigielski	Stanislaw	Mil Inst of Hygiene and Epi.	G	UK
113.	Tattersall	John	DSTL	G	US
114.	Tell	Richard	Richard Tell Assoc. Inc.	U	US
115.	Testagrossa	Paul	Alcatel-Lucent	U	CA
116.	Thansandote	Art	Health Canada	G	US
117.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	G	IT
118.	Tofani	Santi	Servizio Di Fisica Sanitaria	G	US
119.	Umbdenstock	Donald	Tyco/Sensormatic	P	NL
120.	van Rongen	Eric	Health Council of the Netherlands	G	US
121.	Varanelli	Arthur	Independent Consultant	GI	MY
122.	Wan Nor Liza	Mahadi	Mahadi. Institute: University Malaya	A	US
123.	Weller	Robert	FCC	G	FR
124.	Wiart	Joe	France Telecom Orange Labs R&D	P	US
125.	Williams, Jr.	Louis	Louis A. Williams Jr. & Associates	GI	US
126.	Woods	Richard	Sensormatic Electronics	P	KR
127.	Yamazaki	Kenichi	Central Res Inst Elect. Power Ind.	p	US
128.	Zhadobov	Maxim	IETR	GI	US
129.	Zipse	Donald	Electrical Forensics, LLC	GI	US
130.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US

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G = General Interest: Government
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Table TC95-7
TC95 Membership: SC5 (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 Command	G	US
17.	Stuart	James	Franklin Applied Physics	GI	US
18.	Thompson	Ramie	Franklin Applied Physics	GI	US

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