



ICES

International Committee on Electromagnetic Safety

ICES (SCC-39) Annual Report: 2014 – 2015

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)**

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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. New members include Dr. Jafar Keshvari (Aalto University, Finland) who replaced Dr. Wolfgang Kainz as TC34 Chairman; Dr. Akimasa Hirata (Nagoya Technical Institute), who chairs a new subcommittee (SC6) established to address dosimetry and induction model issues at low frequencies; and J Patrick Reilly as an “at large” member recognized internationally for his expertise in low-frequency bioeffects. Dr. B Jon Klauenberg replaced Dr. Michael Murphy as Membership Chair. Additional “at large” members are being sought, especially young scientists and engineers from 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, the DoD-funded IEEE Get Program, and the agreement with the NATO Standardization Agency (now the NATO Standardization Organization, NSO) 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 by, PIERS (Progress in Electromagnetics Research Symposium), ITU (International Telecommunication Union), IEC (International Electrotechnical Commission), the Bioelectromagnetics Society (BEMS), WHO EMF Project workshops, 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 Chairman Bodemann represents ICES at the WHO International Advisory Committee meetings, TC34 Chairman Keshvari and TC95 member Klauenberg represent ICES at IEC TC106 and NATO Standardization Organization meetings, respectively.

2.3 Highlights (2014 – 2015)

- During the past year, the Administrative Committee (AdCom) met in Pacific Grove, CA (in conjunction with BioEM2015) 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. ICES Chairman Dr. Ralf Bodemann (Siemens AG, Germany), TC95 Membership Chairman Dr. B Jon Klauenberg (US Air Force Research Laboratory), TC34 Chairman Dr. Jafar Keshvari (Aalto University School of Science), TC95 Chairman Dr. C-K Chou (Motorola Solutions –retired), and others have become ICES roving ambassadors to the EU member states and other countries. Each has given numerous presentations in support of ICES and the IEEE open consensus process at meetings throughout the world. TC95 Chairman Dr. Chou, for example, has given presentations in Bulgaria, China, India, Malaysia, Taiwan, The Netherlands and the United States. Dr. Murphy, 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) and several other ICES members serve as ICES liaisons to the BEMS Board of Directors.
- 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) into an IEEE Standard. A result of this agreement, IEEE C95.1-2345-2014, "IEEE Standard for Military Workplaces—Force Health Protection Regarding Personnel Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz," was approved 16 May 2014 and published 30 May 2014.

IEEE C95.1-2345TM-2014 was officially adopted by NATO on 26 November 2015 with the end of the promulgation of NATO Standardization Agreement (STANAG 2345 ed. 4. The primary purpose of updating STANAG 2345 was to provide assurances to NATO nations that all participants in NATO activities will not exceed the IEEE C95.1-2345-2014 limits therein. STANAG 2345 is a minimal requirements standard designed to provide a safe maximum exposure limit that would cover and include (but not supersede) the various international, national, and military standards/guidance that have been adopted by NATO Nations; ensuring interoperability. The commonality factor of interoperability can therefore only be achieved by setting the military occupational safety and health EMF exposure limits to a reasonable safe level sufficient to cover most, if not all, of the nations' individual standards. This would ensure multinational operations could be conducted with the assurance that the levels and limits of the STANAG 2345 covered standard IEEE C95.1-2345-2014 would not be exceeded. This ends a seven year IEEE process that included first establishing a Technical Cooperation Agreement between IEEE and NATO, which can be utilized for any and all IEEE standards; a five year revision of IEEE C95.1-2005; and a yearlong NATO ratification process. The STANAG calls out the GET program for access to the

covered IEEE Std 2345TM-2014 making GET a necessary no cost component for several nations to continue to implement the STANAG.

- In accordance with a joint IEEE/DoD agreement, IEEE Standards C-95.1-2005, C95.1-2345-2014, C95.3-2002, C95.3.1-2010, C95.6-2002 and C95.7-2014 are now publicly available at the IEEE SA Get Program through DoD Sponsorship. In the past, international recognition of the C95 standards was hindered somewhat by their cost. During the months of January through October, 2015, 2680 standards have been downloaded, the majority by “Students” followed by “Commercial Users” and “Safety Risk Managers.” This very beneficial no cost access to these health and safety standards will end 7 April 2016 unless either IEEE agrees to continue to provide access without sponsorship or a sponsor can be found. It is important to note that the no cost access is a critical component of the NATO STANAG 2345 and has enhanced international recognition of C95 standards, ICES, and IEEE in general.
- 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 submitted four draft standards to be jointly developed by IEC and IEEE and published as dual logo standards. All four projects have been approved. The status of the four projects in the IEC process is as follows:
 - IEC/IEEE P62704-1 (general requirements for FDTD simulations of SAR) – ACDV (draft approved for committee vote October 2015)
 - IEC/IEEE P62704-2 (specific requirements for SAR from vehicular mounted antennas) –CDV (committee draft circulated for vote October 2015).
 - IEC/IEEE P62704-3 (specific requirements for SAR from mobile telephones) – ACDV (draft approved for committee vote October 2015)
 - IEC/IEEE P62704-4 (general requirements for FEM simulations for modeling vehicle-mounted antennas and personal wireless devices) – 1CD (first committee draft circulated August 2015). (With a new chairman, the project is now moving forward.)
- 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. Note that IEEE 1528 and the IEC 62209-1 standards are developed by essentially the same working group. The intent is to eventually issue a single dual logo IEC/IEEE standard—a joint working group is now being formed.
- 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).

- The World Health Organization (WHO) is preparing a large document entitled, “Radio Frequency fields: Environmental Health Criteria Monograph” and has invited individuals and organizations to submit comments and suggestions on the chapters that have already been written. The document was circulated to TC95 for comment; the comments were edited and circulated as a ballot for approval. The ballot was approved unanimously and the comments submitted to WHO.

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 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields-Amend 1: Specifies Ceiling Limits for Induced & Contact Current
C95.1-2345-2014	IEEE Standard for Military Workplaces—Force Health Protection Regarding Personnel Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz
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
C95.7-2014	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	ANSI Approval Date
1460	1996	12/31/2018	12/10/1996	06/05/1997
1528	2013	12/31/2023	06/14/2013	12/06/2013*
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	
C95.1-2345	2014	12/31/2014	05/16/2014	10/10/2014*
C95.2	1999	12/31/2018	09/16/1999	10/05/2005
C95.3	2002	12/31/2018	12/11/2002	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	02/05/2003
C95.6	2002	12/31/2018	09/12/2002	05/19/2008
C95.7	2014	12/31/2024	06/12/2014	10/10/2014*

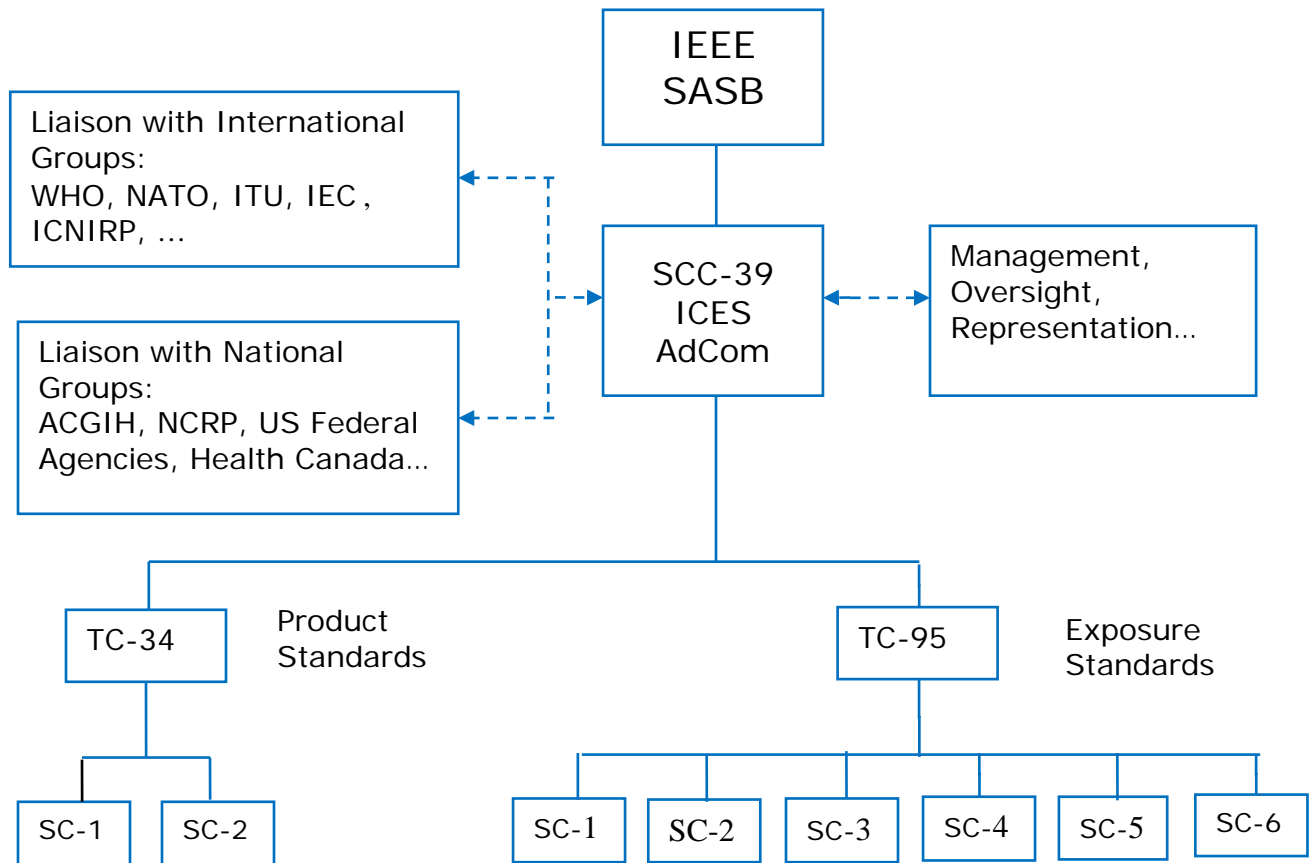
*ANSI BSR8/Public review start date.

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). The website is maintained by NEMA. File Transfer Protocol (FTP) services for subcommittee activities are 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).

The website has been updated to present a more contemporary appearance.



TC-34

- SC-1: Measurement Techniques
 - WG-1: SAR-Handheld Devices
- SC-2: Computational Techniques
 - WG-1: General FDTD Requirements
 - WG-2: Specific FDTD Requirements
 - WG-3: FDTD Requirements for Modeling Devices
 - WG-4: General FEM Requirements

TC-95

- SC-1: Measurements and Calculations
- SC-2: Warning Signs, Hazard Communications
- SC-3: Low-frequency Exposure Values
- SC-4: High-frequency Exposure Values
- SC-5: Electro-explosive Devices
- SC-6: EMF Modeling and Dosimetry

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. B Jon Klauenberg	US Air Force Research Laboratory	US
Chair, TC34 and TC34/SC2	Dr. Jafar Keshvari	Aalto University-School of Science	FI
Chair, TC34/SC1	Dr. Mark Douglas	IT ² IS Foundation	CH
Chair, TC95	Dr. C-K. Chou	C-K Chou Consulting	US
Co-chair, TC95/SC1	Francis Colville	US Army Medical Command	US
Co-chair, TC95/SC1	Dr. Mark Douglas	IT ² IS Foundation	CH
Chair, TC95/SC2	Richard Tell	Richard A Tell and Associates	US
Co-chair, TC95/SC3	Thanh Dovan	SP AusNet (Retired)	AU
Co-chair, TC95/SC3	Dr. Rob Kavet	EPRI	US
Co-chair, TC95/SC4	Dr. Art Thansandote	Health Canada (Retired)	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
Chair, TC95/SC6	Dr. Akimasa Hirata	Nagoya Technical Institute	JP
Past Chair , ICES	Dr. John Osepchuk	Full Spectrum Consulting	US
Past Chair, TC34	Dr. Wolfgang Kainz	US FDA/CDRH	US
At Large Members			
	Dr. Sheila Johnston	Independent Consulting Neuroscientist	IE
	Dr. Tom McManus	Consultant – Dept. of Comm. & Marine & Natural Resources (Retired)	IE
	J. Patrick Reilly	Independent Consultant	US
IEEE Staff Liaison			
IEEE Staff Liaison	Soo Kim	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 organizations such as the IEEE International Committee on Electromagnetic Safety (ICES) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP).” 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 Structure of TC34

There are two subcommittees in TC34—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 and IEC TC106 PT 62209-3, each of 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 (2015-2016)

3.4.1 Past meetings (2015)

- 5 February 2015: San Francisco, CA
- 14 May 2015: Paris, France
- 8 October 2015: Venice, Italy

3.4.2 Future meetings

- 14 January 2016: Plantation, FL

- 24 May 2016: Zurich Switzerland
- 1 November 2016: Hangzhou, China

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 MT1 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.) The SC1 activities are coordinated with IEC TC106 MT1 with the intent of publishing a single dual-logo international standard to replace 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.” In response to a formal ballot, the members of TC34 voted unanimously to move forward with the development of a dual logo standard (IEC 62209-1) to replace IEEE Std 1528-2013. A joint IEC TC106/IEEE SCC39/TC34 working group is now being formed.
- **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 international 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 initial ballot for P62704-1 closed in November 2013 and meets all thresholds for approval by the IEEE SASB. All comments on the IEC draft have been resolved and the revised draft was circulated as an IEC CDV early in October 2015. Reference and model files will be available for download on the IEC server.

3.5.2.2 IEC P62704-2 (formerly P1528.2):

- The initial ballot for P62704-2 closed in November 2013 and meets all thresholds for approval by the IEEE SASB. The team received comments for P62704-2 CD in November 2013. All comments on the IEC draft have been resolved and the revised draft was circulated as an IEC CDV in Oct 2015.

3.5.2.3 P62704-3 (formerly P1528.3):

- The initial ballot closed in August 2013 and meets all thresholds for approval by the IEEE SASB. Comment resolution is still in process. Most of the comments have been resolved but there still remains a question regarding the need for benchmarking. TC34 Chairman Keshvari contacted the Mobile Manufacturers Forum (MMF) as a source for CAD models for benchmarking. Although MMF did not agree to provide the CAD files, the relevant files were obtained from Microsoft Corporation based on the previous NDA. Circulation of the CDV is scheduled for Aug 2016.

3.5.2.4 P62704-4 (formerly P1528.4):

- This project had been progressing more slowly than the other three in the series. A new Chair, Dr. Andreas Christ, has been nominated, which stimulated interest in this activity from a number of software developers. The first CD is planned for Oct 2016.

3.6 TC34 PARs

3.6.1 SC1 PARs

(None)

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. (A one-year PAR extension request was submitted to NesCom for consideration at their December 2015 meeting.)

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. (A one-year PAR extension request was submitted to NesCom for consideration at their December 2015 meeting.)

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. (A two-year PAR extension request was submitted to NesCom for consideration at their December 2015 meeting.)

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.

Status: New Standard Project. (A two-year PAR extension request was submitted to NesCom for consideration at their December 2015 meeting.)

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 two documents are in IEC stage CDV 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 (2015)

- Continue to work with IEC TC106 to ensure harmonization of IEEE 1528-2013 and IEC P62209-2 (Met)

3.8.1.2 Objectives (2016)

- Continue following 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 (2015)

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

3.8.2.2 Objectives (2016)

- P62704-1 – prepare FDIS for IEC and IEEE ballot

- P62704-2 – prepare FDIS for IEC and IEEE ballot
- P62704-3 – prepare CDV for IEC and IEEE ballot
- P62704-4 – prepare CD for IEC and IEEE ballot

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 originally provided by the Cellular Telecommunications and Internet Association (CTIA) are now provided by volunteer committee members. Soo Kim, who replaced Tricia Gerdon, is the IEEE Staff Engineer for both TC34 and TC95—both of their engineering backgrounds 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 the European Committee for Electrotechnical Standardization (CENELEC), IEC, ITU (TC34 Chairman Keshvari was recently nominated as liaison between ITU-T SG5 and IEEE/ICES), the Association of Radio Industries and Businesses (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 continues to move forward to obtain IEC approval of IEEE 1528-2013 and IEC P62209-1 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 IEC standards. During the past three years, TC34/SC1 and 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. Jafar Keshvari	Aalto University- School of Science	FI
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)	Dr. Andreas Christ	IT'IS Foundation	CH
Chair – WG-2 (IEC/IEEE P62704-2)	Dr. Giorgi Bit-Babik	Motorola Solutions, Inc.	US
Chair – WG-3 (IEC/IEEE P62704-3)	Vikass Monebhurrun	Supélec	FR
Chair – WG-4 (IEC/IEEE P62704-4)	Dr. Andreas Christ	IT'IS Foundation	CH

Table TC34-2
TC34 Membership (November 2014)

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE SA MEMBER?
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	Y
6.	Beard	Brian	US Food and Drug Administration	G	US	
7.	Bit-Babik	Giorgi	Motorola Solutions, Inc.	P	US	Y
8.	Bodemann	Ralf	Siemens	PI	DE	Y
9.	Case	David	Cisco	P	US	
10.	Chan	Kwok	US Federal Communications Commission	G	US	
11.	Chang	Isaac	US Food and Drug Administration	G	US	Y
12.	Chao	Justin	PC TEST	U	US	
13.	Chen	Ji	University of Houston	A	US	
14.	Choi	Dong-guen	KCC	G	KR	
15.	Choi	Hyung-Do	ETRI	P	KR	
16.	Chou	C-K.	C-K Chou Consulting	P	US	Y
17.	Christ	Andreas	IT IS Foundation	A	CH	
18.	Davis	Chris	University of Maryland	A	US	
19.	Derat	Benoit	Field Imaging	P	FR	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE SA MEMBER?
20.	Dianyuan	Qi	CATR-MIIT	G	CN	
21.	Douglas	Mark	IT IS Foundation	A	CH	Y
22.	Faraone	Antonio	Motorola Solutions, Inc.	P	US	
23.	Forrester	John	Qualcomm	P	US	
24.	Foster	Ken	University of Pennsylvania	A	US	Y
25.	FrancaVilla	Mauro	Telecom Italia	P	IT	
26.	Gabriel	Sami	Vodafone	P	UK	
27.	Gouqing	Li	CATR	G	CN	
28.	Hamada	Lira	NICT	G	JP	
29.	Harrington	Tim	US Federal Communications Commission	G	US	Y
30.	Hauswirth	Steve	Motorola Mobility, Inc.	P	US	
31.	Heirman	Don	Consultant	P	US	Y
32.	Jeong	Chan-Ho	LG	U	KR	
33.	Joyner	Ken	Samsung	P	AU	Y
34.	Jun	Haeyoung	Samsung	P	KR	
35.	Kainz	Wolfgang	US Food and Drug Administration	G	US	Y
36.	Katsumi	Abe	Fujitsu	P	JP	
37.	Keshvari	Jafar	Aalto University-School of Science	P	FI	
38.	Kopp	Markus	ANSYS	G	US	Y
39.	Koslov	Mikhail	MPG	P	DE	
40.	Kuster	Niels	IT IS Foundation	A	CH	Y
41.	Lee	Ae-kyoung	ETRI	U	KR	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE SA MEMBER?
42.	Liu	Steve	PC TEST	U	US	Y
43.	Loader	Benjamin	National Physical Laboratories	G	UK	
44.	Lu	Lin	Qualcomm	P	US	
45.	Luc	Jerome	Satimo	P	FR	
46.	Magana	Luis	PC TEST	U	US	
47.	Manteuffel	Dirk	Uni-Kiel	A	DE	
48.	McIntosh	Robert	Telstra	U	AU	
49.	Meier	Matthias	Motorola	P	DE	Y
50.	Moller	Paul	Motorola	P	US	
51.	Monebhurrun	Vikass	Supelec	A	FR	
52.	Nappert	Hughes	Industry Canada	G	CA	Y
53.	Nesterova	Maryna	APREL	GI	CA	Y
54.	Nicol	Stuart	APREL	U	CA	Y
55.	Niskala	Kai	Nokia	P	FI	
56.	Onishi	Teruo	NTT DoCoMo	P	JP	
57.	Park	DS	Samsung	P	KR	
58.	Parmentier	Jack	Lenovo	P	US	
59.	Penney	Chris	Remcom	P	US	Y
60.	Picard	Stéphane	Industry Canada	G	CA	
61.	Petersen	Ron	Consultant	GI	US	Y
62.	Plicanic	Ramadan	Sony Ericsson Mobile Communications	U	SE	
63.	Poirier	Marcel	Industry Canada	G	CA	

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

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

P = Producer
 N = IEEE/IEEE SA membership unknown

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 and NetSuite. Funding, which is obtained through meeting registration fees, is used to cover meeting and other expenses, e.g., website maintenance. Opening balance 1 January 2015: \$13,313.22; current balance (as of 1 November 2015): \$17,943.34. Major expenses for the year include: \$500 (website maintenance), \$420 (maintenance of IEEE literature database), \$1400 (June 2015 meeting – meeting rooms, refreshments), \$30/month – ICES PayPal account. Income: \$7125 (registration fees June 2014 meeting).

4.3 TC95 Membership Roster

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

With the leadership of Dr. B Jon Klauenberg, TC95 Membership Chairman, the non-US membership of ICES continues to grow (now greater than 45% of the members are from outside the US). 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 (2015-2016)

4.4.1 Main Committee

4.4.1.1 Past Meetings

- June 11, 2015 – Pacific Grove, CA (in conjunction with BioEM 2015)

4.4.1.2 Future Meetings

- January 12, 2016 –Plantation, FL
- June 4, 2016 – Ghent, Belgium (in conjunction with BioEM2016)

4.4.2 Subcommittee 1 (Measurements and Computation)

4.4.2.1 Past Meetings

- June 11, 2015 – Pacific Grove, CA (in conjunction with BioEM 2015)

4.4.2.2 Future Meetings

- January 10, 2016 – Plantation, FL
- June 2, 2016 – Ghent, Belgium (in conjunction with BioEM2016)

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

4.4.3.1 Past Meetings

- June 11, 2015 – Pacific Grove, CA (in conjunction with BioEM 2015)

4.4.3.2 Future Meetings

- January 10, 2016 – Plantation, FL
- June 2, 2016 – Ghent, Belgium (in conjunction with BioEM 2016)

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

4.4.4.1 Past Meetings

- June 11, 2015 – Pacific Grove, CA (in conjunction with SC4 and BioEM 2015)

4.4.4.2 Future Meetings

- January 11, 2016 – Plantation, FL (in conjunction with SC4)
- June 3, 2016 – Ghent, Belgium (in conjunction with SC4 and BioEM 2016)

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

4.4.5.1 Past Meetings

- June 11, 2015 – Pacific Grove, CA (in conjunction with BioEM 2015)

4.4.5.2 Future Meetings

- January 11, 2016 – Plantation, FL
- June 3, 2016 – Ghent, Belgium (in conjunction with BioEM 2016)

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

SC5 is responsible for IEEE Std C95.4, “IEEE Recommended Practice for Determining Safe Distances from Radio Frequency Transmitting Antennas When Using Electric Blasting Caps During Explosive Operations.” This standard is stable and the subcommittee has not found it necessary to meet face-to-face since the June 2008 San Diego meeting. However, the new leadership intends to hold a meeting to discuss possible needs during the TC95 meeting series in January, 2016.

4.4.6.1 Future Meetings

- January 11, 2016 – Plantation, FL

4.4.7 Subcommittee 6 (EMF Modeling and Dosimetry)

(SC6 was established at the September 2014 meeting in Pismo Beach, CA.)

4.4.7.1 Past Meetings

- June 12, 2015 – Pacific Grove, CA (in conjunction with BioEM 2015)

4.4.7.2 Future Meetings

- January 12, 2016 – Plantation, FL
- June 4, 2016 – Ghent, Belgium (in conjunction with BioEM 2016)

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 (2), Finland (1), Germany (1), Greece (4), Hungary (1), India (1), Ireland (4), Israel (2), Italy (4), Japan (5), Korea (4), Malaysia (3), the Netherlands (2), New Zealand (1), Sweden (1), Slovenia (1), Switzerland (3), Thailand (1), Turkey (1), the United Kingdom (2) and the United States (70)—more than 45% of the main committee membership is from outside the US.

The TC95 mailing list now approaches 350, including subcommittee members and observers. Fifteen 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 6000 titles, which appeared on the WHO website, is now supported by ICES and appears on their website at <http://www.ieee-emf.com/>. All publicly available papers (titles and abstracts only) are accessible to all; 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 (Techniques, Procedures and Instrumentation) has the 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 Std 1460-1996 (R2002), “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 Std 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. An initial draft that combines existing IEEE Stds C95.3-2002 (R2007) and C95.3.1-2010 has been prepared and an SC1 balloting draft is now being prepared. (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 IEEE Sponsor Ballot.)

A request for a new SC1 working group on defining spatial averaging as it applies to performing field intensity measurements was proposed and accepted by SC1. The

current standard, IEEE C95.1, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz” provides only minimal information on spatial averaging and 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” does not adequately address the proper methods and procedures necessary for performing these measurements. This has created confusion and a lack of consistency among users when attempting to demonstrate compliance with RF exposure standards and regulations, including those of the Federal Communications Committee (FCC). The Spatial Averaging Working Group will go through the present C95.1 and C95.3 standards and identify all areas needing revision. The working group also intends to either develop an annex to the current C95.3 standard or draft a recommended practice on field measurements and spatial averaging.

ICES Technical Committee 95 received a request from Industry Canada (IC) to review and provide comments on their draft IC document, “General Methods for Assessing Compliance to Peripheral Nerve Stimulation (NS) limits of RSS-102.” The Administrative Committee (AdCom) assigned this request to the SC1; the Co-chair set up a teleconference between IC and SC1 members to discuss how SC1 could assist the IC working group as they prepare their draft document. The IC working group requested that: 1) SC1 review and provide comments on the Draft IC document and 2) ICES formally submit to the IC working group two technical papers authored by J. Patrick Reilly. SC1 reviewed the IC draft document and comments approved by TC95 were submitted to IC on 31 July 2015 along with the following two papers authored by Reilly: “Comments on Health Canada RMS quantities as exposure metrics” and “Scientific basis for increased exposure limits for limbs: compliance with Health Canada Safety Code (6) – 2015.”

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

Subcommittee 2 has responsibility for the following standards: IEEE C95.2, “IEEE Standard for Radio-Frequency Energy and Current-Flow Symbols” and IEEE C95.7, “IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz.” A revision of IEEE Std C95.7-2005 was approved by The Standards Board on June 12, 2014 and published August 8, 2014.

Two new working groups were established to focus on (1) barriers for excluding persons from entering areas at antenna sites where RF fields may exceed applicable exposure limits, (2) use of safety signage for alerting individuals to the presence of RF fields that may exceed applicable exposure limits and (3) a training guide that would provide minimal requirements for persons to qualify for entering areas wherein RF fields may exceed the uncontrolled exposure limit but would not exceed the controlled environment exposure limit. Progress of the barrier working group and the minimal awareness working group was presented at the summer 2015 meeting in Pacific Grove, CA.

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

There are no active PARs for new or existing projects. However, SC3 is working with SC4 on the ongoing revision of C95.1-2005 (PC95.1), which will incorporate C95.6-2002, thereby extending the frequency range of C95.1 from 0 Hz to 300 GHz. Portions of C95.6 were incorporated into C95.1-2345-2014, a civil standard considered as a

replacement of STANAG 2345, the current NATO RF safety standard. In addition, members of SC3 are making progress in encouraging further research on improvement of induction models and synaptic effects thresholds, including magnetophosphenes in human volunteers, and on issues related to compatibility of medical implants. In order to address issues and inconsistencies in the models and dosimetry used to determine the induced fields in the body (and exposure limits), a new subcommittee (SC6) was recently established (see 4.5.7). Many members of SC3 are also members of the new subcommittee.

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 October 3, 2005 and published April 19, 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 major effort by SC4 (and SC3) this past year was in revising and combining C95.6-2002, the low frequency (0 Hz – 3 kHz) safety standard, with C95.1-2005, the RF safety standard (3 kHz to 300 GHz) into a single standard (C95.1-201X – 0 Hz – 300 GHz). Two major hurdles that were overcome: developing limits for contact currents; addressing differences in the approaches for defining adverse effect thresholds, i.e., effects associated with electrostimulation (low frequencies) and effects associated with tissue heating (high frequencies). Specifically, the question of whether the adverse effects level at high frequencies (a threshold model) should be determined using a probabilistic model (as for low frequencies). After much discussion, it was decided to keep the two different approaches.

The first combined standard covering frequencies from 0 Hz to 300 GHz, IEEE C95.1-2345, “IEEE Standard for Military Workplaces – Force Health Protection Regarding Personnel Exposure to Electric, Magnetic and Electromagnetic Fields, 0 Hz to 300 GHz,” was approved by the Standards Board on April 18, 2014, and published May 30, 2014. Having been promulgated by NATO on November 26, 2015, this standard will be used in NATO and military installations replacing NATO STANAG 2345 (Edition 3). The development and revision of the C95.1 standards 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.

The exposure values and basic restrictions continue to be based on a critical review of the relevant scientific literature. RF literature surveillance is ongoing. Literature review has started with the selection of topic WG Chairs and members. The research selection of topics and proposed authors to initiate the creation of white papers summarizing the findings pertaining to health concerns is ongoing. A paper is being prepared on the procedure for developing a transparent systematic review of the literature in order to minimize “cherry picking” of the literature that could lead to biased conclusions.

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.

SC4 responded to a request from the Federal Communications Commission (FCC) for comment on their intended changes in electromagnetic exposure limits. SC4 also responded to a request from the World Health Organization (WHO) to review their proposed document on “Radio Frequency Fields: Environmental Health Criteria.” A 38 page document of detailed comments was provided to the WHO.

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 and is a member of the Z136.1 AdCom).

4.5.5.1 Issues: Justification of the lower tier of exposure limits

Over the past few years there has been considerable discussion within SC3 and SC4 regarding the rationale and need for the lower tier of exposure limits for the general public. In order to stimulate discussion on the inherent conservatism built into the C95.1 standard, SC4 members John Bergeron and Ric Tell drafted a paper “IEEE Standard C95.1 on Radiofrequency Electromagnetic Safety: Considerations of Conservatism.” The paper was circulated to the subcommittees for review and comment and posted on the ICES website. The authors believe that justification of a lower tier of exposure limits demands clarification in order to distinguish their basis from that used to justify the upper tier. Specifically, it is argued that the language of the standard must recognize the non-scientific basis for the lower tier limits, and whether a lower tier is necessary in future standards. The paper stimulated discussion at the 2014 ICES Pismo Beach, CA, meeting, which continued online and at the June 2015 meeting.

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 considered stable and there are no PARs for new or existing projects. The new Chairman, Ray Harmon, will resume SC5 activities to ensure harmonization with other international standards.

4.5.7 Subcommittee 6 (EMF Modeling and Dosimetry)

The aims of this new subcommittee (established September 2014) are: resolution of uncertainties in the dosimetric data used for the development of dosimetric reference limits and exposure reference levels (the bases of standards and guidelines for human exposure to electric, magnetic and electromagnetic fields); recommend analytical tools and data applicable to human exposure standards, follow and assess the recent literature on EMF dosimetry modeling, both for nerve stimulation effects caused by exposure to electric, magnetic and electromagnetic fields at frequencies below ~100 kHz, and for heating effects caused by RF energy absorption at frequencies above ~100 kHz. SC6 will coordinate closely with the other subcommittees, especially with Subcommittee 3 and Subcommittee 4, both of which are currently working on the update and merger of IEEE Std C95.1TM-2005 and IEEE-Std C95.6TM-2002 (Reaffirmed 2007) into a single standard that covers the frequency range of 0 Hz to 300 GHz.

As a key activity, SC6 held an open workshop “The Current Status of Low Frequency Modeling” in Monterrey, California on June 14, 2015. Nine speakers covered three main topics: (1) Induction modeling; (2) Electrostimulation modeling; (3) Combined induction and electro-stimulation, including experimental verification. A panel discussion on future research topics was included at the end of the formal presentations. Eighty five attendees – many of whom were not IEEE/ICES members but were attending the BioEM2015 meetings – participated. In addition, a new working group, “Merging Computational and Experimental Approaches to Resolve Uncertainties Related to the Electrostimulation Threshold,” was established.

The results and conclusions of the workshop are being made freely available to interested parties via publication in a special edition of *Physics in Medicine and Biology*.

4.6 PARs

The following TC95 PARs are currently active:

4.6.1 SC1 PARs

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.

4.6.3 SC3/4 PARs

4.6.3.1 PC95.1 (Approved June 2010 – PAR Extension Request was submitted to NesCom for consideration at the December 2014 Standards Board series)

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.

4.7 TC95 Objectives and Goals for 2015 and the TC's performance relative to meeting these goals and objectives.

- Initiate subcommittee balloting on PC95.3 (SC1 – 3rd Q 2015: Not met)
- Complete the establishment of the literature evaluation WG. (SC3/SC4 – 1st Q 2015: Partially met)
- Initiate Subcommittee balloting on PC95.1. (SC3/SC4 – 4th Q 2015: Not met)
- Decide whether IEEE C95.4 should be updated and submit PAR if the decision is positive. (SC5 – 2nd Q 2015; Not met)

4.8 Objectives and Goals for 2016 with milestones indicated

- Initiate subcommittee balloting on PC95.3. (SC1 – 3rd Q 2016)
- Complete the establishment of the literature evaluation WG. (SC3/SC4 – 1st Q 2016)
- Initiate Subcommittee balloting on PC95.1. (SC3/SC4 – 4th Q 2016)
- Decide whether IEEE C95.4 should be updated and submit PAR if the decision is positive. (SC5 – 1st Q 2016)

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. The engineering background and broad knowledge of IEEE procedures of Soo Kim, Staff Liaison for both TC34 and TC95, 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 was initially 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. TC95/SC6 was established to reconcile issues related to dosimetry and induction models in order to reconcile the differences. 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 Dr. C-K Chou and J. Patrick Reilly described the IEEE standards, and TC95 and ICES. Dr. B Jon Klauenberg, serving as NATO stakeholder to the EC, described critical impacts of the proposed EC Directive 2004-40-EC to military operations and argued for changes subsequently made in IEEE C95.1-2345-2014. Additionally, the announcement that IEEE C95 standards were publicly available was enthusiastically received by the international community furthering international recognition of IEEE standardization.¹ 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

¹As noted above (2.3 Highlights—2014–2015) the contract between IEEE and the Department of Defense ends 7 April 2016. Alternative funding has not materialized. IEEE should recognize that global access has increased recognition and stature of ICES internationally with minimal cost. We recommend IEEE SA consider continuation of this beneficial practice.

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, 2013).

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. Most notable 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 *BioInitiative 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/cm² 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.

Table TC95-1

TC95 Leadership

OFFICE	NAME	AFFILIATION	COUNTRY
Chairman	C-K Chou	C-K. Chou Consulting	US
Vice Chairman (Vac)			
Secretary/Treasurer	Ron Petersen	R C Petersen Associates LLC	US
Co-chairman, SC1	Francis Colville	US Army MEDCOM PHC	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 (Retired)	AU
Co-chairman, SC3	Rob Kavet	EPRI	US
Co-chairman, SC4	Art Thansandote	Health Canada (Retired)	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
Chairman, SC6	Akimasa Hirata	Nagoya Institute of Technology	JP

Table TC95-2
TC95 Membership: Main Committee (November 2014)

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
1.	Alon	Leor	NYU Medical Center	GI	US	
2.	Ammann	Max	Dublin Institute of Technology	A	IE	
3.	Anderson	Vitas	Swinburne University	A	AU	Y
4.	Attayi	Daoud	Research In Motion, Ltd	P	CA	
5.	Bailey	William	Exponent, Inc.	GI	US	Y
6.	Baron	David	AIHA Representative	GI	US	Y
7.	Bavin	John	Consumers Energy	U	US	
8.	Bellier	Pascale	Health Canada	G	CA	
9.	Bergeron	John	Independent Consultant	GI	US	
10.	Bodemann	Ralf	Siemens AG	P	DE	Y
11.	Bowman	Joseph	CDC NIOSH	G	US	
12.	Brewer	John	HCJB Global	U	US	
13.	Brooker	Ian	Tyco Fire and Security	P	IE	
14.	Bushberg	Jerrold	U. of California, Davis	A	US	
15.	Butcher	Matt	Sitesafe	U	US	Y
16.	Chiang	Huai	Zhejiang Medical University	A	CN	
17.	Chou	C.K.	C-K. Chou Consulting	GI	US	Y
18.	Cleveland	Robert	EMF Consulting	U	US	Y
19.	Colville	Frank	US Army MEDCOM PHC	G	US	
20.	Comlekci	Selcuk	Suleyman Demirel University	A	TR	
21.	Cotton	David	Sitesafe Inc	U	US	
22.	Cotts	Benjamin	Exponent	GI	US	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
23.	Croft	Rodney	Department of Psychology	A	AU	
24.	Curtis	Robert	RF CHECK Incorporated	U	US	Y
25.	D'Andrea	John	Naval Medical Research Unit (Ret)	G	US	Y
26.	De Santis	Valerio	University of L' Aquila	A	IT	
27.	DeFrank	John	US Army MEDCOM PHC	G	US	Y
28.	Delgato	Michael	Verizon Wireless	U	US	Y
29.	Dini	David	Underwriters Lab	G	US	
30.	Dockzat	Martin	FCC-OET	G	US	
31.	Douglas	Mark	IT'IS Foundation	GI	CH	Y
32.	Dovan	Thanh	SP AusNet (Retired)	P	AU	Y
33.	Duvdevany	Amnon	IDF Medical Corps	G	IL	
34.	Elder	Joe	Independent Consultant	U	US	
35.	Erdreich	Linda	Exponent	GI	US	Y
36.	Faraone	Antonio	Motorola Solutions	GI	US	Y
37.	Farrer	Donald	Independent Consultant	U	US	
38.	Filippopoulos	George	Greek Atomic Energy Comm.	G	GR	
39.	Foster	Kenneth	Univ. of Pennsylvania	A	US	Y
40.	Futch	James	Florida Dept of Health	G	US	
41.	Gajsek	Peter	Institute of Public Health	U	SI	
42.	Geber	Kurt	Dynamac Corporation	P	US	
43.	George	David	Unisys Corp.	P	US	Y
44.	Gettman	Ken	NEMA	GI	US	Y
45.	Gledhill	Martin	Monitoring and Adv. Serv. NZ, Ltd	U	NZ	
46.	Grandolfo	Martino	Laboratorio di Fisica	GI	IT	
47.	Haes, Jr.	Donald	BAE Systems	P	US	Y
48.	Halkiotis	Konstantinos	Medical School of Athens	A	GR	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
49.	Hare	Ed	American Radio Relay League	GI	US	Y
50.	Harmon	Raymond	URS Corp.	U	US	
51.	Hatfield	James	Hatfield & Dawson	GI	US	Y
52.	Hay	Tamera	Naval Surface Warfare Center	U	US	
53.	Heirman	Donald	Don HEIRMAN Consultants	GI	US	Y
54.	Hirata	Akimasa	Nagoya Institute of Technology	A	JP	
55.	Hongbin	Jin	China Mobile	U	CN	
56.	Ibey	Bennett	US Air Force Research Laboratory	U	US	
57.	Ikehata	Masateru	Railway Technical Research Inst	A	JP	
58.	Israel	Michel	National Centre of Hygiene	G	BL	
59.	Ivans	Veronica	Medtronic Inc. (Retired)	G	US	Y
60.	Jiang	Hai	Underwriters Lab	G	US	
61.	Johnson	Robert	L-3 Microwave	U	US	Y
62.	Johnston	Sheila	Independent Consultant	GI	IE	
63.	Jones	Christine	Naval Surface Warfare Ctr.	G	US	
64.	Joyner	Ken	Samsung	P	AU	Y
65.	Kandel	Shaiela	Hebrew University of Jerusalem	A	IL	
66.	Karabetsos	Efthymios	Greek Atomic Energy Commission	G	GR	
67.	Kavet	Robert	EPRI	GI	US	Y
68.	Keshvari	Jafar	Aalto University-School of Science	GI	FI	Y
69.	Kim	Byung Chan	ETRI, Korea	GI	KR	Y
70.	Kim	Nam	Chungbuk National University	A	KR	Y
71.	Klauenberg	B. Jon	US Air Force Research Laboratory	G	US	Y
72.	Koepfinger	Joseph	Consultant	G	US	Y
73.	Kuster	Niels	IT'IS Foundation	A	CH	Y
74.	Laakso	Ilkka	Nagoya Inst of Tech	A	JP	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
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	Y
81.	McNamee	James	Health Canada	G	CA	
82.	Meltz	Martin	Retired	GI	US	Y
83.	Mezei	Gabor	Exponent Health Services	GI	US	
84.	Miyagi	Hiroaki	Japan NUS Co., Ltd	P	JP	
85.	Mundy	Wesley	Altalink	U	US	Y
86.	Murphy	Michael	USAF Research Laboratory (Retired)	G	US	Y
87.	Muthuvelu	Pirunthavany	Ministry of Health	G	MY	
88.	Nappert	Hughes	CEM Industry Canada	G	CA	
89.	Nelson	David	Michigan Technical University	A	US	
90.	Ng	Kwan-Hoong	Dept of Radiation	G	MY	
91.	Osepchuk	John	Full Spectrum Consulting	U	US	Y
92.	Packer	Malcolm	Harris RF Communications	P	US	Y
93.	Pakhomov	Andrei	McKesson Bio Services	GI	US	
94.	Persson	Bertil	Lund University	A	SE	
95.	Petersen	Ronald	R C Petersen Associates	GI	US	Y
96.	Ramachandran	TV	Vodafone	U	IN	Y
97.	Ravazzani	Paolo	Italian Nat Res Council	G	IT	
98.	Reilly	J. Patrick	Metatec Associates	GI	US	Y
99.	Repacholi	Michael	World Health Organization (Retired)	GI	CH	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
100.	Ryu	Chungsang	KR Com Radio Res Agency	G	KR	
101.	Samaras	Theodoros	Aristotle University of Thessaloniki	A	GR	Y
102.	Scanlon	William	Queens University, Belfast	A	UK	Y
103.	Shelton, Jr	Wesley	AT&T Mobility	G	US	
104.	Sheppard	Asher	Asher Sheppard Consulting	U	US	
105.	Sheppard	Christopher	Verizon Wireless	U	US	Y
106.	Shkolnikov	Yakov	Advanced Data Analytics	GI	US	
107.	Shrivastava	Devashish	University of Minnesota	A	US	
108.	Sindia	Suraj	Intel Corp	P	US	
109.	Swicord	Mays	Mays Swicord Consulting	U	US	Y
110.	Tattersall	John	DSTL	G	UK	
111.	Tell	Richard	Richard Tell Assoc. Inc.	U	US	Y
112.	Testagrossa	Paul	Independent Consultant	GI	US	Y
113.	Thansandote	Art	Health Canada (Retired)	G	CA	Y
114.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	G	HU	
115.	Tofani	Santi	Servizio Di Fisica Sanitaria	A	IT	
116.	Umbdenstock	Donald	Tyco/Sensormatic	P	US	Y
117.	van Rongen	Eric	Health Council of the Netherlands	G	NL	
118.	Varanelli	Arthur	Independent Consultant	U	US	Y
119.	Vijayalaxmi	“Vijay”	University of Texas	GI	US	
120.	Visser	Auke	Royal Netherlands Navy	G	NL	
121.	Wan Nor Liza	Mahadi	Mahadi. Institute: University Malaya	A	MY	
122.	Wessel	Marvin	Global RF Solutions	U	US	Y
123.	Wiert	Joe	France Telecom Orange Labs R&D	U	FR	Y
124.	Williams, Jr.	Louis	Louis A. Williams Jr. & Associates	U	US	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
125.	Yamazaki	Kenichi	Central Res Inst Elec Power Ind	G	JP	
126.	Zhadobov	Maxim	IETR	GI	FR	
127.	Zipse	Donald	Electrical Forensics, LLC	GI	US	Y
128.	Ziskin, MD	Marvin	Temple Univ. Medical School	A	US	Y

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	IEEE MEMBER?
1.	Baron	David	AIHA Representative	GI	US	Y
2.	Bowman	Joe	NIOSH	G	US	
3.	Brooker	Ian	Tyco Fire and Security	P	IE	
4.	Butcher	Matthew	Sitesafe	U	US	Y
5.	Choi	Dong-guen	Radio Research Agency	P	KR	
6.	Chou	C.K.	C-K. Chou Consulting	P	US	Y
7.	Cleveland	Robert	EMF Consulting	U	US	Y
8.	Colville	Frank	US Army MEDCOM PHC	G	US	
9.	Cotton	David	Sitesafe Inc	U	US	
10.	DeFrank	John	US Army MEDCOM PHC	G	US	Y
11.	Douglas	Mark	IT'IS Foundation	GI	CH	Y
12.	Friedrich	Gerd	Deutsche Telekom	U	DE	
13.	Gettman	Ken	NEMA	GI	US	Y
14.	Harrington	Tim	FCC	G	US	Y
15.	Kainz	Wolfgang	UCFDA/CDRH	G	US	Y
16.	Klauenberg	B. Jon	USAF Research Laboratory	G	US	Y
17.	Kong	Sungsik	Radio Research Agency	G	KR	Y
18.	Mantiplay	Ed	FCC/OET	G	US	
19.	McKenzie	Ray	Telstra, Australia	P	AU	Y
20.	Menard	Francois	Industry Canada	G	CA	
21.	Petersen	Ronald	R C Petersen Associates	GI	US	Y

	Last Name	First Name	Affiliation	Interest Category	Country	IEEE member?
22.	Tell	Richard	Richard Tell Assoc. Inc.	GI	US	Y
23.	Testagrossa	Paul	Independent Consultant	GI	US	Y
24.	Thansandote	Art	Health Canada (Retired)	G	CA	Y
25.	Umbdenstock	Donald	Tyco/Sensormatic	P	US	Y

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	IEEE MEMBER?
1.	Alon	Leeor	NYU Medical Center	A	US	
2.	Anderson	Vitas	Swinburne University	A	AU	Y
3.	Bailey	William	Exponent	GI	US	Y
4.	Baron	David	AIHA Representative	GI	US	Y
5.	Bellier	Pascale	Health Canada	G	CA	
6.	Biby	Richard	Crown Castle International	U	US	Y
7.	Bodemann	Ralf	Siemens AG	P	DE	Y
8.	Bowman	Joe	CDC NIOSH	GI	US	
9.	Boyer	Jim	Lawrence Livermore National Labs	G	US	
10.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US	Y
11.	Bushberg	Jerrold	U. of California, Davis	A	US	
12.	Chou	C.K.	C-K. Chou Consulting	P	US	Y
13.	Cleveland	Robert	EMF Consulting	U	US	Y
14.	Curtis	Robert	Curtis Engineering and Management	U	US	Y
15.	D'Andrea	John	Naval Medical Research Unit	G	US	Y
16.	DeFrank	John	US Army MEDCOM PHC	G	US	Y
17.	Erdreich	Linda	Exponent	GI	US	Y
18.	Everist	Donald	Cohen, Dipell and Everist	GI	US	Y
19.	Gajda	Greg	Health Canada	GI	CA	
20.	Gettman	Ken	NEMA	GI	US	Y
21.	Haes, Jr.	Donald	BAE Systems	P	US	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
22.	Hatfield	James	Hatfield & Dawson	U	US	Y
23.	Hubbard	Roy	Technology Services International	U	ZA	Y
24.	Johnson	Robert	L-3 Microwave NARDA	U	US	
25.	Joyner	Ken	Samsung	P	AU	Y
26.	Kantner	Kimberly	AT&T	U	US	Y
27.	Khalil	Kathy	SPAWARSSYSCEN Charleston	U	US	
28.	Kierl	Bill	Motorola, Inc	P	US	
29.	Klauenberg	B. Jon	USAF Research Laboratory	G	US	Y
30.	Kumbier	Werner	Narda Safety Test Solutions	P	DE	
31.	Kuster	Niels	IT'IS Foundation	GI	CH	Y
32.	Mantiply	Ed	FCC/OET	G	US	
33.	Meltz	Martin	U of Texas (Retired)	GI	US	Y
34.	Mercer	Christopher	Vodacom Group, Pty Ltd	U	ZA	
35.	Nappert	Hughes	CEM Industry Canada	G	CA	
36.	Norman	Larry	Pike Electric	P	US	
37.	Osepchuk	John	Full Spectrum Consulting	U	US	Y
38.	Persson	Bertil	Lund University	A	SE	
39.	Petersen	Ronald	R C Petersen Associates	GI	US	Y
40.	Proctor	Ken	US Army	G	US	
41.	Rogers	Walt	Veridian Eng/RFR Branch	GI	US	Y
42.	Rowley	Jack	Telstra Research Labs	GI	AU	
43.	Scanlon	William	Queens University, Belfast	A	UK	Y
44.	Seabury	David	Chase Systems Inc.	U	US	Y
45.	Smith	Matthew	Dade Moeller & Associates	GI	US	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
46.	Strickland	Richard	RF Safety Solutions	U	US	Y
47.	Tell	Richard	Richard Tell Assoc. Inc.	GI	US	Y
48.	Testagrossa	Paul	Independent Consultant	GI	US	Y
49.	Thansandote	Art	Health Canada (Retired)	G	CA	Y
50.	Ulcek	Jerry	FCC	G	US	
51.	Varanelli	Arthur	Independent Consultant	GI	US	Y
52.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US	Y

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	IEEE MEMBER?
1.	Alon	Leeor	NYU Medical Center	A	US	
2.	Ammann	Max	Dublin Institute of Technology	A	IE	
3.	Anderson	Vitas	Swinburne University	A	AU	Y
4.	Attayi	Daoud	Research In Motion, Ltd	P	CA	
5.	Bailey	William	Exponent Inc.	GI	US	Y
6.	Barker	J. Richard	General Cable	P	US	Y
7.	Baron	David	AIHA Representative	GI	US	Y
8.	Bavin	John	Consumers Energy	P	US	
9.	Bellier	Pascale	Health Canada	G	CA	
10.	Bergeron	John	Independent Consultant	GI	US	
11.	Bodemann	Ralf	Siemens AG	P	DE	Y
12.	Boeggeman	Charles	PECO Energy Co.	P	US	Y
13.	Bowman	Joseph	CDC NIOSH	G	US	
14.	Brecher	Aviva	DOT/RSPA Volpe Ctr.	G	US	Y
15.	Brewer	John	HCJB Global	U	US	
16.	Brooker	Ian	Tyco Fire and Security	P	IE	
17.	Butcher	Matthew	Sitesafe	U	US	Y
18.	Carberry	Robert	Northeast Utilities	P	US	Y
19.	Cassata	Jim	Navy Medical NIR Branch	G	US	
20.	Comlekci	Selcuk	Suleyman Demirel University	A	TR	
21.	Cotton	David	Sitesafe Inc	U	US	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
22.	Cotts	Benjamin	Exponent	GI	US	
23.	Croft	Rodney	Department of Psychology	A	AU	
24.	Dale	Steiner	ABB Power T&D Company	U	US	Y
25.	Doczkat	Martin	Federal Communications Commission	G	US	
26.	Dovan	Thanh	SP AusNet (Retired)	P	AU	Y
27.	Duvdevany	Amnon	IDF Medical Corps	G	IL	
28.	Erdreich	Linda	Exponent	GI	US	Y
29.	Farrer	Donald	Independent Consultant	GI	US	
30.	Filippopoulos	George	Greek Atomic Energy Comm.	G	GR	
31.	Geber	Kurt	Dynamac Corporation	P	US	
32.	George	David	Unisys Corp.	P	US	Y
33.	Gettman	Ken	NEMA	GI	US	Y
34.	Goulet	Daniel	Hydro-Quebec	U	CA	
35.	Haes, Jr.	Donald	BAE Systems	P	US	Y
36.	Harmon	Raymond	URS Corp.	GI	US	Y
37.	Hernandez	Martin	Florida Power & Light Co.	P	US	Y
38.	Herz	Michael	Pacific Gas & Electric Co.	P	US	Y
39.	Hicks	Danny	South Carolina Electric & Gas Co.	P	US	Y
40.	Hirata	Akimasa	Nagoya Institute of Technology	A	JP	
41.	Holley	Jeff	Florida Power and Light	U	US	
42.	Hongbin	Jin	China Mobile	U	CN	
43.	Hubbard	Roy	Technology Services International	GI	ZA	Y
44.	Ibey	Bennett	Brooks City Base	G		

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
45.	Ikehata	Masateru	Railway Technical Research Institute	A	JP	
46.	Jaffa	Kent	Retired	GI	US	Y
47.	Jiang	Hai	UL Labs	GI	US	Y
48.	Karabetsos	Efthymios	Greek Atomic Energy Commission	G	GR	
49.	Kautz	Richard	Ford	P	US	
50.	Kavet	Robert	EPRI	GI	US	Y
51.	Klauenberg	B. Jon	US Air Force Research Laboratory	G	US	Y
52.	Kim	Byung Chan	ETRI, Korea	GI	KR	Y
53.	Kim	Nam	Chungbuk National University	A	KR	Y
54.	Koepfinger	Joseph	Consultant	GI	US	Y
55.	Kuster	Niels	IT'IS Foundation	GI	CH	Y
56.	Kaalso	Ilkka	Nagoya Institute of Technology	A	JP	Y
57.	Lee	Ae-Kyoung	ETRI	GI	KR	
58.	Link	Richard	Radiation Safety Institute of Canada	A	CA	
59.	Lodwick	Jeffrey	US Department of Labor	G	US	
60.	Mair	Peter	Fronius International GMBH	P	DE	
61.	Manatrakul	Nisakorn	Ministry of Public Health	G	TH	
62.	Mathur	Rajat	Hammett & Edison, Inc.	U	US	
63.	McNamee	James	Health Canada	G	CA	
64.	Miyagi	Hiroaki	Japan NUS Co., Ltd	U	JP	
65.	Muthuvelu	Pirunthavany	Ministry of Health	G	MY	
66.	Nappert	Hughes	CEM Industry Canada	G	CA	
67.	Nelson	David	Michigan Technical University	A	US	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
68.	Ng	Kwan-Hoong	Dept of Radiation	G	MY	
69.	O'Connor	Roger	Dept of Comm, Marine and Nat Res	G	IE	
70.	Osepchuk	John	Full Spectrum Consulting	GI	US	Y
71.	Petersen	Ronald	R C Petersen Associates	GI	US	Y
72.	Pittman	Steve	Potlach Pulp and Paperboard	P	US	Y
73.	Podhrasky	Robert	Garrett Metal Detectors	P	US	
74.	Proctor	Ken	US Army	G	US	
75.	Ravazzani	Paolo	Italian Nat Res Council	G	IT	
76.	Reilly	J. Patrick	Metatec Associates	GI	US	Y
77.	Ryu	Chungsang	KR Com Radio Res Agency	G	KR	
78.	Sahl	Jack	J. Sahl Associates	GI	US	
79.	Samaras	Theodoros	Aristotle University of Thessaloniki	A	GR	Y
80.	Sawdon	Dave	IBM Global Services	P	UK	
81.	Sheppard	Asher	Asher Sheppard Consulting	GI	US	
82.	Shkolnikov	Yakov	Exponent	GI	US	
83.	Shrivastava	Devashish	University of Minnesota	A	US	
84.	Swicord	Mays	Mays Swicord Consulting	GI	US	Y
85.	Tell	Richard	Richard Tell Assoc. Inc.	U	US	Y
86.	Thansandote	Art	Health Canada (Retired)	G	CA	Y
87.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	A	HU	
88.	Umbdenstock	Donald	Tyco/Sensormatic	P	US	Y
89.	van Rongen	Eric	Health Council of the Netherlands	G	NL	
90.	Varanelli	Arthur	Independent Consultant	GI	US	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
91.	Vijayalaxmi		Univ. Texas Health Science Ctr.	A	US	
92.	Wan Nor Liza	Mahadi	Mahadi. Institute: University Malaya	A	MY	
93.	Wiar	Joe	France Telecom Orange Labs R&D	GI	FR	Y
94.	Woods	Richard	Sensormatic Electronics	P	US	Y
95.	Yamazaki	Kenichi	Central Res Inst Elec Power Ind	P	JP	
96.	Yandek	Edward	GE Lighting	P	US	Y
97.	Zhadobov	Maxim	IETR	GI	FR	
98.	Zipse	Donald	Electrical Forensics, LLC	GI	US	Y
99.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US	Y

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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	IEEE MEMBER?
1.	Abd Rahman	Nazaruddin	Universiti Tenaga Nasional	A	MY	
2.	Alon	Leeor	NYU Medical Center	A	US	
3.	Ammann	Max	Dublin Institute of Technology	A	IE	
4.	Anderson	Vitas	Swinburne University	A	AU	Y
5.	Attayi	Daoud	Research In Motion, Ltd	P	US	
6.	Bailey	William	Exponent Inc.	GI	US	Y
7.	Baron	David	AIHA Representative	GI	US	Y
8.	Bellier	Pascale	Health Canada	G	US	
9.	Bergeron	John	Independent Consultant	GI	NZ	
10.	Bodemann	Ralf	Siemens AG	P	US	Y
11.	Bowman	Joseph	CDC NIOSH	G	US	
12.	Brecher	Aviva	DOT/RSPA Volpe Ctr. (Retired)	G	US	Y
13.	Brewer	John	HCJB Global	P	IE	
14.	Brooker	Ian	Tyco Fire and Security	P	US	
15.	Bushberg	Jerrold	UC Davis	A	US	
16.	Butcher	Matthew	Sitesafe, Inc.	U	US	Y
17.	Cassata	Jim	Navy Medical NIR Branch	G	UK	
18.	Chiang	Huai	Zhejiang Medical University	A	US	
19.	Chou	C.K.	C-K. Chou Consulting	GI	US	Y
20.	Cleveland	Robert	EMF Consulting	GI	UK	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
21.	Colville	Frank	US Army MEDCOM PHC	G	US	
22.	Comlekci	Selcuk	Suleyman Demirel University	A	TR	
23.	Cotton	David	Sitesafe Inc	U	US	
24.	Cotts	Benjamin	Exponent	GI	US	Y
25.	Croft	Rodney	Department of Psychology	A	AU	
26.	Curtis	Robert	Curtis Engineering and Management	U	US	Y
27.	D'Andrea	John	Naval Med. Research NIR Unit (Retired)	G	US	Y
28.	DeFrank	John	US Army MEDCOM PHC	G	US	Y
29.	Delgato	Michael	Verizon Wireless	U	US	Y
30.	Dini	David	UL	U	US	
31.	Doczkat	Martin	Federal Communications Commission	G	IT	
32.	Dovan	Thanh	SP AusNet (Retired)	GI	AU	Y
33.	Duvdevany	Amnon	IDF Medical Corps	G	ZA	
34.	Elder	Joe	Independent Consultant	G	IL	
35.	Erdreich	Linda	Exponent	GI	US	Y
36.	Faraone	Antonio	Motorola Solutions, Inc.	P	US	Y
37.	Farrer	Donald	Independent Consultant	GI	US	
38.	Filippopoulos	George	Greek Atomic Energy Comm.	G	US	
39.	Foster	Kenneth	Univ. of Pennsylvania	A	US	Y
40.	Futch	James	Florida Department of Health	U	US	
41.	Gajsek	Peter	Institute of Public Health	G	GR	
42.	Geber	Kurt	Dynamac Corporation	P	SI	
43.	George	David	Unisys Corp.	P	CA	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
44.	Gettman	Ken	NEMA	A	US	Y
45.	Gledhill	Martin	Monitoring and Advis. Serv. NZ, Ltd.	U	NZ	
46.	Haes, Jr.	Donald	BAE Systems	P	UK	Y
47.	Halkiotis	Konstantinos	Medical School of Athens	A	US	
48.	Hatfield	James	Hatfield & Dawson	U	US	Y
49.	Hay	Tamera	Naval Surface Warfare Center	G	CH	
50.	Heirman	Donald	Don HEIRMAN Consultants	U	US	Y
51.	Hirata	Akimasa	Nagoya Institute of Technology	A	GR	
52.	Hongbin	Jin	China Mobile	U	IE	
53.	Hubbard	Roy	Technology Services International	GI	US	Y
54.	Ibey	Bennett	Brooks City Base	G	US	
55.	Ikehata	Masateru	Railway Technical Research Institute	A	CA	
56.	Israel	Michel	National Centre of Hygiene	G	US	
57.	Jiang	Hai	Underwriters Labs	U	US	
58.	Johnson	Robert	L-3 Microwave-NARDA	US	GI	Y
59.	Johnston	Sheila	Independent Consultant	GI	BL	
60.	Jones	Christine	Naval Surface Warfare Ctr.	U	US	
61.	Joyner	Ken	Samsung	P	US	Y
62.	Kandel	Shaiela	Hebrew University of Jerusalem	A	IE	
63.	Kantner	Kimberly	AT&T	U	AU	Y
64.	Karabetsos	Efthymios	Greek Atomic Energy Commission	G	IL	
65.	Kavet	Robert	EPRI	GI	US	Y
66.	Keshvari	Jafar	Aalto University-School of Science	GI	FI	Y
67.	Kim	Nam	Chungbuk National University	A	KR	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
68.	Kim	Byung Chan	ETRI, Korea	GI	KR	Y
69.	Klauenberg	B. Jon	US Air Force Research Laboratory	G	US	Y
70.	Koepfinger	Joseph	Consultant	U	US	Y
71.	Kwee	Sianette	University of Aarhus	A	US	
72.	Laakso	Ilkka	Nagoya Institute of Technology	A	JP	Y
73.	Lee	Ae-Kyoung	ETRI	GI	FI	
74.	Link	Richard	Radiation Safety Institute of Canada	A	US	
75.	Lodwick	Jeffrey	US Department of Labor	G	CA	
76.	Manatrakul	Nisakorn	Ministry of Public Health	G	US	
77.	Mantiplay	Ed	FCC/OET	G	TH	
78.	Mathur	Rajat	Hammett & Edison, Inc.	U	US	
79.	McKenzie	Ray	Telstra Chief Technology Office	P	US	
80.	McNamee	James	Health Canada	G	AU	
81.	Meltz	Martin	Retired	GI	CA	Y
82.	Miyagi	Hiroaki	Japan NUS Co., Ltd	P	US	
83.	Mundy	Wesley	Altalink	U	US	
84.	Muthuvelu	Pirunthavany	Ministry of Health	G	US	
85.	Nappert	Hughes	CEM Industry Canada	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	GI	CA	Y
89.	Packer	Malcolm	Harris RF Communications	P	US	Y
90.	Pakhomov	Andrei	McKesson Bio Services	GI	US	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
91.	Persson	Bertil	Lund University	A	MY	
92.	Petersen	Ronald	R C Petersen Associates	GI	US	Y
93.	Proctor	Ken	US Army	G	US	
94.	Ramachandran	TV	Vodafone	IN	GI	Y
95.	Ravazzani	Paolo	Italian Nat Res Council	G	SE	
96.	Reilly	J. Patrick	Metatec Associates	GI	US	Y
97.	Rogers	Walt	Veridian Eng/RFR Branch	GI	US	Y
98.	Rybak	Terence	General Motors Proving Grnd.	GI	IT	Y
99.	Ryu	Chungsang	KR Com Radio Res Agency	G	US	
100.	Samaras	Theodoros	Aristotle University of Thessaloniki	A	US	Y
101.	Scanlon	William	Queens University, Belfast	A	US	Y
102.	Shelton	Wesley	AT&T Mobility	U	US	Y
103.	Sheppard	Asher	Asher Sheppard Consulting	GI	US	Y
104.	Sheppard	Christopher	Verizon Wireless	GI	US	Y
105.	Shkolnikov	Yakov	Exponent	GI	FI	
106.	Shrivastava	Devashish	University of Minnesota	A	UK	
107.	Swicord	Mays	Mays Swicord Consulting	GI	PL	Y
108.	Tattersall	John	DSTL	G	US	
109.	Tell	Richard	Richard Tell Assoc. Inc.	U	US	Y
110.	Testagrossa	Paul	Independent Consultant	U	CA	Y
111.	Thansandote	Art	Health Canada (Retired)	G	US	Y
112.	Thuroczy	Gyorgy	Nat Res Inst for Radiobiology	G	IT	
113.	Umbdenstock	Donald	Tyco/Sensormatic	P	NL	Y
114.	van Rongen	Eric	Health Council of the Netherlands	G	US	

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
115.	Varanelli	Arthur	Independent Consultant	GI	MY	Y
116.	Wan Nor Liza	Mahadi	Mahadi. Institute: University Malaya	A	US	
117.	Weller	Robert	National Broadcasting Association	G	US	Y
118.	Wiert	Joe	France Telecom Orange Labs R&D	P	FR	Y
119.	Woods	Richard	Sensormatic Electronics	P	KR	Y
120.	Yamazaki	Kenichi	Central Res Inst Elec Power Ind	P	JP	
121.	Zhadobov	Maxim	IETR	GI	FR	
122.	Zipse	Donald	Electrical Forensics, LLC	GI	US	Y
123.	Ziskin, MD	Marvin	Temple Univ. Medical School	GI	US	Y

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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	IEEE MEMBER?
1.	Balzano	Quirino	University of MD	A	US	Y
2.	Bean	John	Naval Surface Warfare Center	G	US	
3.	Colville	Frank	US Army MEDCOM PHC	G	US	
4.	Comlekci	Selcuk	Suleyman Demirel University	A	TR	
5.	DeFrank	John	US Army MEDCOM PHC	G	US	Y
6.	Doczkat	Martin	Federal Communications Commission	G	US	
7.	Duvdevany	Amnon	IDF Medical Corps	G	IL	
8.	Harmon	Ray	EG&G	P	US	
9.	Hatfield	James	Hatfield & Dawson	U	US	Y
10.	Hay	Tamera	Naval Surface Warfare Center	G	US	
11.	Joyner	Ken	Samsung	P	AU	Y
12.	Leidel	David	Halliburton Energy Services	U	US	
13.	Nappert	Hughes	CEM Industry Canada	G	CA	
14.	Petersen	Ronald	R C Petersen Associates	GI	US	Y
15.	Stuart	James	Franklin Applied Physics	GI	US	
16.	Thompson	Ramie	Franklin Applied Physics	GI	US	

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Table TC95-8
TC95 Membership: SC6 (EMF Dosimetry Modeling)

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
1.	Alon	Leeor	New York University	G	US	
2.	Angelone	Leonardo	FDA/CDRH	G	US	
3.	Bikson	Marom	City College of New York	A	US	
4.	Bodemann	Ralf	Siemens	P	DE	Y
5.	Daga	Andrew	Momentum Dynamics	P	US	
6.	De Santis	Valerio	University of L'Aquila	A	IT	Y
7.	Diamant	Alan	Diamant Engineering	G	US	
8.	Findlay	Richard	EMFcomp	GI	UK	
9.	Hikage	Takashi	Hokkaido University	A	JP	Y
10.	Hirata	Akimasa	Nagoya Institute of Technology	A	JP	Y
11.	Iocono	Maria	FDA/CDRH	G	US	
12.	Israel	Michel	Medical University, Blevin	A	BG	
13.	Jeffreys	John	University of Oxford	A	UK	
14.	Kainz	Wolfgang	FDA/CDRH	G	US	Y
15.	Kamimura	Yoshitsugu	Utsunomiya University	A	JP	Y
16.	Kavet	Robert	EPRI	GI	US	Y
17.	Krauthamer	Victor	FDA/CDRH	G	US	
18.	Kuster	Niels	IT'IS Foundation	G	CH	Y
19.	Laakso	Ilkka	Nagoya Institute of Technology	A	JP	
20.	Lazzi	Gianluca	University of Utah	A	US	Y

	LAST NAME	FIRST NAME	AFFILIATION	INTEREST CATEGORY	COUNTRY	IEEE MEMBER?
21.	Legros	Alexandre	Lawson Health Research Institute	A	CA	
22.	Lee	Ae-Kyoung	ETRI	A	KR	
23.	Leung	Sai Wing	City University of Hong Kong	A	HK	Y
24.	Matsumoto	Hideyuki	Japanese Red Cross Medical Center	GI	JP	
25.	McIntyre	Cameron	Case Western Reserve University	A	US	
26.	Neufeld	Esra	IT'IS Foundation	G	CH	Y
27.	Poljak	Dragan	University of Split	A	HR	Y
28.	Reilly	J. Patrick	Metatec Associates	GI	US	Y
29.	Samaras	Theodros	Aristotle U. of Thessaloniki	A	GR	Y
30.	Sasaki	Kensuke	NICT	GI	JP	Y
31.	Salolic	Antonio	University of Split	A	HR	
32.	Schmid	Gernot	Seibersdorf Lab.	GI	AT	
33.	Sindia	Suraj	Intel Corp, Corp Quality Network	P	US	
34.	Sweeney	James D.	FL Gulf Coast U.	A	US	Y
35.	Tarao	Hiroo	Kagawa National College of Tech.	A	JP	
36.	Wake	Kanako	NICT	GI	JP	Y
37.	Wuart	Joe	Orange Lab	U	FR	Y
38.	Wu	Tongning	China Acad. of Telecomm. Research	GI	CN	Y
39.	Yamazaki	Kenichi	CRIEPI	U	JP	Y

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