



INTERNATIONAL COMMITTEE *on* ELECTROMAGNETIC SAFETY

APPROVED Minutes

IEEE/ICES TC95 Subcommittee 2
Terminology, Units of Measurements, and Hazard Communications
1300 – 1700 h
Monday, 14 August 2017
National Electrical Manufacturers Association (NEMA)
1300 North 17th Street
Rosslyn, VA 22209, USA

- Call to Order by R. Tell at 13:03. Minutes recorded by D. Haes.
- Welcome and introductions. An attendance signup sheet was circulated. **ATTACHMENT 1.**
- *(This item was taken out of order on agenda)* The unapproved SC2 minutes recorded by D. Haes from the 10 January 2017 meeting at Motorola Solutions, Inc., 8000 West Sunrise Blvd, Plantation, Florida meeting were previously circulated by R. Tell to the group. Motion to approve by M. Ziskin and seconded by A. Visser; unanimous **vote to APPROVE.**
- The Agenda was circulated for approval by R. Tell; Motion to approve by F. Collville and seconded by M. Ziskin; unanimous **vote to APPROVE. SEE ATTACHMENT 2.**
- S. Kim (IEEE Liaison) mentioned that SC2 must ask for a “call for patents” regarding the work performed by the SC in making standards. Any patent which may affect the use or conformance with the standard must be declared. R. Tell asked the SC if there were any such patents assigned to SC members; there was none. The agenda item for “call for patents” was added to the current agenda, and will be included in further meetings.
- R. Tell asked the group about further comments, beyond those received via email, on the status of the revision of C95.2-1999. The feeling of the SC was that the document is good as it is.
 - R. Tell would form a balloting committee within ICES to submit the standard to the IEEE-SA.
 - R. Petersen mentioned that the document could be sent to the IEEE-SA for balloting at the same time.
 - J. Hatfield motioned that IEEE/C95.2-1999 be submitted as is, seconded by M. Ziskin, with a unanimous **vote to APPROVE.**
- R. Tell put the below statements on the screen and read to the group:
 - *“A radiofrequency (RF) safety program is in effect at this transmitter site to help ensure your safety. RF fields in some areas exceed the Action Level set by the safety standard developed by the International Committee on Electromagnetic Safety (ICES)* which requires that you be subject to control and accountability as established by the RF safety*



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*program at this site. These areas are marked with blue RF Notice signs. Yellow RF Caution signs and/or barriers and orange RF Warning signs may also be present that designate restricted access areas. RF fields in these restricted locations may exceed the Maximum Permissible Exposure (MPE) values found in the ICES standard to prevent potentially hazardous effects to the body. Do not enter these restricted areas unless you have been informed of, and have implemented the procedures and controls that are necessary to make it safe for your entry as described in the site RF safety program. Be aware that strong RF fields have the potential for interfering with normal operation of some electronic medical devices. Do NOT go past this sign if you are unaware of the safety program or are unable to control your exposure at this site.” * IEEE Standard C95.1-2005.*

- C.K. suggested that the terms be more generic, and avoid uses of words/acronyms and phrases like “DRL”, “MPE”, “Action Level”, etc.
- P. Zollman suggested any statements or “guides” need to make sure that the message is understood, and not just stated.
- B. Klauenberg had problems with the phrase “...to prevent potentially hazardous effects to the body.”
- J. Hatfield pointed out this Administrative in nature.
- R. Cleveland asked if the workers would have to read the RF Safety Program first?
- A. Faraone suggested the sign consist of bulleted phrases, or be modified to be made simpler.
- P. Reilly asked if this was going to cover low frequency (< 100 kHz)? At 3-100 kHz, the values have been developed such that <1% of the population would experience “pain” below the values, and not necessarily hazardous. Pat also liked the idea of bulleted items.
- A flurry of suggestions were forwarded for one or two signs, signs in conjunction with the RF Safety Program, etc.
- P. Zollman pointed out that personnel would need to be made aware, and need to understand what is presented, not just be made aware.
- R. Cleveland pointed out section 4.5 of the current C95.7 standard has sections on training.
- D. Haes asked if there could be parallels made with chemical exposures? For chemicals, there as safety data sheets (SDS) and the chemical hygiene plan.
- F. Collville suggested we develop “RF safety data sheets”.
- Q. Balzano pointed out that personnel either get in for business purposes and get out, or just stay out.
- R. Tell asked the SC for the feelings on the statement for a sign? The input from the SC was insufficient to draw any consensus. However, Section 4.5.1 of C95.2 was displayed, and in particular, the below section:

A key element of any type of training program is provision of information that will help a person understand how to recognize the potential risks for overexposure and how to avoid such risks. For example, in some cases, signs and labels may be sufficient to provide the necessary degree of information needed to avoid excessive exposure. A label



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or small sign attached directly to the surface of an antenna may be entirely sufficient to avoid excessive exposure if it specifies a minimum approach distance. Another example of where signage, without specific training, could be sufficient is a region where an action level may be exceeded, but where the exposure limit could not be exceeded (Category 2). R. Tell asked the group if the situation arose where RF exposures above the Action Levels were possible, but NOT above the upper tier, whether a sign or label would be sufficient? **There were no comments to the contrary** and the topic was dropped.

- R. Tell brought up the topic of a short form RF Safety Program.
 - P. Zollman stated that the short form RF Safety Program should include basic/generic information and then site-specific information.
 - M. Butcher added that actual case studies could be included.
 - F. Collville pointed out ANNEX B of C95 and suggested a format such as:

<u>Description of hazard</u>	<u>Conclusion</u>	<u>Recommendations</u>
What is hazard?	Probability/Severity?	
Use the RF source categories already listed.		
 - B. Kaluenberg suggested set ONE limit for everyone, and then relax for workers.
 - P. Reilly stated he could endorse use of categories with restrictions for access to exposures above the upper tier.
 - After much further discussion with nothing meaningful being added, R. Tell asked the SC, if all that is really needed was a sign for minimal awareness? There were no comments and the topic was dropped.

- R. Tell brought up a discussion of the RF safety Workshop proposed in Chandler AZ after the ICES meetings. **SEE ATTACHMENT 3**
 - S. Kim stated that she could assist Ric is getting information out for the workshop to check for interest. While the attendance was assumed to be 25-30, there were suggestions from the SC that there may be many more people interested, perhaps > 100.
 - In the submittal for interest, we should ask **what do you feel has been missing in other RF training?**
 - R. Tell displayed the a page from the draft contract for costs of the meeting and a picture of the possible meeting room; **SEE ATTACHMENTS 4 and 5.**

- No OLD or NEW business discussions.

- Time and Place of Next Meeting – Chandler AZ 1/22-24/2018.

- Motion to Adjourn was offered by M. Ziskin, seconded by F. Colville at 16:30.



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- An OVERVIEW of the DRAFT MINUTES was prepared by D. Haes and presented to the ICES TC95 Main Committee on Wednesday, 16 August 2017 at this same location, **SEE ATTACHMENT 6.**



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ATTACHMENT 1

TC95: SC2 (Terminology, Units of Measurements, and Hazard Communications) 1300-1700 h Monday, 14 August 2017

SC2

Last Name	First Name	Affiliation	E-mail Address	Country	IEEE-SA Member?
1. Balzano	Q	University of Maryland	qbalzano@eng.umd.edu	US	
2. Bodemann	Ralf	Siemens	ralf.bodemann@siemens.com	DE	Y
3. Bushberg	Jerrold	U C Davis School of Medicine	jbushberg@ucdavis.edu	US	
4. Butcher	Matthew	Unaffiliated	yomatt@gmail.com	US	✓
5. Chou	C-K	Chou Consulting	ck.chou@ieee.org	US	Y
6. Cleveland	Robert	EMF Consulting	rfcleveland@gmail.com	US	Y
7. Colville	Francis	DoD	francis.t.colville.civ@mail.mil	US	Y
8. Comlekci	Selcuk	SD University, Dept. of ECE	selcukcomlekci@sdu.edu.tr	TR	Y
9. DeFrank	John	US Army	john.j.defrank.civ@mail.mil	US	
10. Douglas	Mark	ITIS Foundation	douglas@itis.ethz.ch	CH	Y
11. Elder	Joe	EPA (Retired)	joecelder@gmail.com	US	
12. Escobar	Roel	US Air Force	roel.escobar@us.af.mil	US	Y
13. Faraone	Antonio	Motorola Solutions, Inc.	antonio.faraone@motorolasolutions.com	US	Y
14. Fisher	Kevin	Smith and Fisher LLC	kevin@smithandfisher.com	US	
15. Foster	Ken	University of Pennsylvania	kfoster@seas.upenn.edu	US	
16. Futch	James	FL Dept of Health, Bureau of Rad	James.Futch@FLHealth.gov	US	Y

SC-2

Last Name	First Name	Affiliation	E-mail Address	Country	IEEE-SA Member?
17. Gettman	Ken	NEMA	ken_gettman@nema.org	US	YES
18. Graf	Kevin	Exponent	kgraf@exponent.com	US	
19. Haes	Donald	BAE Systems	donald.haes@baesystems.com	US	YES
20. Hatfield	Jim	Consultant	jhb@hatdaw.com	US	YES
21. Kavet	Rob	Kavet Consulting LLC	robandjacob@comcast.net	US	
22. Kim	Soo	IEEE SA	s.h.kim@ieee.org	US	
23. Klauenberg	Bertram J	US Air Force	bertram.klauenberg@us.af.mil	US	YES
24. Miyagi	Hiroaki	HM Research & Consulting Co., Ltd.	hiroaki.miyagi.jp@ieee.org	JP	
25. Petersen	Ronald	R C Petersen Associates, LLC	r.c.petersen@ieee.org	US	YES
26. Reilly	J Patrick	Metatee Associates	jpreilly@erols.com	US	
27. Sturdivant	David	Federal Communications Commission	david.sturdivant@fcc.gov	US	NO
28. Tell	Ric	Richard Tell Associates, Inc	rtell@radhaz.com	US	YES RAT
29. Valberg	Peter	Gradient	pvalberg@gradientcorp.com	US	
30. Visser	Auke	Royal Netherlands Navy	ar.visser@mindef.nl	NL	NO
31. Wandel	Eric	Wavepoint Research, Inc	eric@wavepointresearch.com	US	NO
32. Ziskin	Marvin	Temple University	ziskin@temple.edu	US	YES
33. Zollman	Peter	Unaffiliated	pzellman@theiet.org	UK	Y.
34.					
35.					
36.					



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ATTACHMENT 2



ICES

International Committee on Electromagnetic Safety

Draft Agenda

IEEE/ICES TC95 Subcommittee 2

Terminology, Units of Measurements, and Hazard Communications

1300 – 1700 h

Monday, 14 August 2017

National Electrical Manufacturers Association (NEMA)

1300 North 17th Street

Arlington, VA 22209, USA

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|--|--------|
| 1. Call to Order | R Tell |
| 2. Welcome and Introduction | All |
| 3. Approval of Agenda | R Tell |
| 4. Approval of the Minutes from January meeting in Plantation, FL (2017) | R Tell |
| 5. Patent call | R Tell |
| 6. Discussion on status of | R Tell |
| - C95.2 | |
| -RF Minimal Awareness Guide (appendix for C95.7?) | |
| -Short form RF Safety Program | |
| -RF Safety Workshop (proposed for January 2018) | |
| 7. New Business | |
| 8. Open Discussion | R Tell |
| 9. Time and Place of Next Meeting | R Tell |
| 10. Adjourn | R Tell |



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ATTACHMENT 3

RF Safety for the Broadcast and Wireless Industries Measurements and Compliance for IEEE C95.1 and FCC Regulations A two day workshop presented by the IEEE International Committee on Electromagnetic Safety R Tell (7-28-2017)

Introduction to ICES and radiofrequency (RF) safety

Units of measurement for RF safety

RF field interactions

- Frequency response and “gain” of the human body
- SAR as a heat source (demonstration using microwave oven and heating of water)
- Induced currents
- Contact currents
- Open circuit voltages

Biological effects of RF field exposure

- RF database
- What the experts and expert organizations say about the scientific literature
- Most sensitive indicator of a potentially adverse effect
- Cancer, etc.
- The real hazard of RF exposure: RF burns
- Established adverse effects vs. possible effects

Regulations and standards for safe exposure to radiofrequency fields

- Derivation of exposure limits and safety factors
- IEEE standards
- NCRP recommendations
- FCC regulations
- Consequences of non-compliance, fines, etc.

Antenna nearfields and potential exposure

- Crucial parameters of nearfield exposure
- Beam formation peculiarities

Technical aspects of compliance assessments

- What is required to show compliance (what’s in a compliance report?)
- Measurements of fields, currents



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- Spatial averaging
- Analysis methods, models
- Uncertainty associated with evaluations, how to treat measured/calculated values
- Measurement techniques
- Contact/induced currents
- Calibrations
- Instrumentation

Practical evaluation examples for RF exposure assessment

- Demonstration 1
- Demonstration 2
- Demonstration 3, etc.

RF Health & Safety Issues: Communicating with the Public

- Perceived Risk = Hazard + Outrage
- How To Reduce The Outrage
- Can science Guarantee Safety?
- Public Risk Communication Tips & Traps
- Effective Presentations Strategies
- Responding to Emotionally Laden Questions

RF compliance matters

- Differentiating between real safety issues and regulatory requirements
- Common weaknesses in compliance activities
- How compliance can be most cost effectively achieved
- Inefficiencies in current approaches
- Quality of assessments

Spotlighting the latest FCC developments relating to RF safety

- Regulations
- Requirements
- Enforcement actions
- Citation issues.

Practical RF safety programs at minimum cost for the vast majority of wireless and broadcast sites which do not require an RF specialist, e.g.

- Locating RF restricted areas (where exposure limits could be exceeded if access is not controlled)
- Simple measures to prevent unplanned access (e.g., signs, barriers)



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- Establishing temporary controls to protect persons needed access inside a restricted area
- Means to communicate the control and minimal health hazard information to affected persons (e.g., signs, safety sheets)
- Knowing when to call for an RF specialist (e.g., complex sites with multiple 100 watt+ antennas and operators)

RF personal monitors and PPE

Workshop wrap-up

What the ICES workshop will do:

This ICES workshop will provide attendees with:

- Background on the IEEE standard and FCC regulations
- How RF exposure limits have been set, their basis, uncertainties in the underlying data, the most sensitive indicator of potential adverse effects and the practical biological hazard implications of exposure to RF
- How RF exposure is quantified (e.g., when spatial averaging is appropriate)
- How RF energy interacts with the body and what and why SAR is so important
- What the scientific literature says about potential hazards of RF exposure
- What the present recommendations and regulations are for RF exposure and what the outlook is for possible changes in exposure limits
- Explanation of some of the consequences of non-compliance for broadcasters and wireless operators
- Insight to nearfield characteristics of antennas
- Explanation of what is necessary for demonstrating compliance and what should be in a compliance report
- Practical information on RF instrumentation, limitations on use and measurement technique issues that can result in erroneous compliance conclusions
- Useful guidance on dealing with uncertainties in field evaluations
- Information about the relevance of contact currents and how to measure them
- Insight to interpreting manufacturers' instrument specifications
- Hands-on demonstrations of measurements
- Understanding cost effective approaches to RF compliance
- The latest FCC developments related to RF safety
- How to set up an RF safety program with examples
- Help with interpreting when training, signage, barriers, RF protective clothing, etc. are required
- An appreciation for what is needed to become competent in RF safety
- Useful guidance on interacting with the public about RF health and safety issues



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An IEEE Workshop Designed to Provide Practical Information on Assessing Compliance for RF Safety in the Broadcasting and Wireless Industries

This two-day workshop is sponsored by the IEEE International Committee on Electromagnetic Safety (ICES) and includes presenters that are the very experts that you want to hear from to learn about RF compliance.

Richard Tell, Richard Tell Associates, Inc., formerly EPA
Ron Petersen, Petersen Associates, formerly Bell Laboratories
Joe Elder, formerly EPA and Motorola Solutions
Marvin Wessel, Global RF Solutions
Jerry Bushberg, University of California, Davis School of Medicine
C-K Chou, C-K Chou Consulting, formerly University of Washington, City of Hope, Motorola Solutions
Robert Cleveland, EMF Consulting, formerly FCC
Bob Curtis, RF Safety Compliance, formerly OSHA

These individuals have had lifetimes of experience related to the scientific basis behind RF exposure standards, practical matters of RF exposure assessment, federal government experience related to RF instrumentation and exposure regulations and industry insights on matters related to compliance.

This workshop is designed around multiple discussion leaders to give you the very best overall insights and draw you into the interesting, challenging and technically complex practice of RF safety. The workshop focuses solely on RF safety and does not address unrelated, general safety issues. This is a rare opportunity to directly interact with all of these experts in one place at the same time. Each of these leaders are nationally and internationally recognized as being at the top of their individual areas of specialization. The workshop will allow you to ask the questions that you have wondered about directly to the experts.

Attendance at this workshop could be a valuable experience for both industry and government employees including:

- Environmental health and safety personnel
- Broadcast and wireless techs and engineers
- Industrial hygienists
- Site acquisition consultants
- Health physicists
- Company regulatory compliance officers
- RF safety consultants



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Have you ever had any of these questions? (questions in random order)

How much power am I absorbing when exposed to the MPE?

What is the frequency response of the human body?

Is it possible to feel the result of RF exposure at the present limits?

How do the current IEEE and FCC exposure limits address so-called non-thermal effects?

Can I trust the current exposure limits, do they really protect our workers?

When making RF field measurements, how much might my body influence the measurement?

What is the typical uncertainty in RF compliance measurements?

Why can a low gain antenna result in greater RF exposure than a higher gain antenna?

When is a broadband probe inappropriate to use for compliance assessment?

How can I best explain my measurement results to a critical audience?

Can I “prove” that an RF exposure below the limits is “safe”?

At a community meeting, a member of the public says “My daughter died of cancer, and I’m afraid your tower will do the same to me.” How do I respond?

What can the FCC really do if I find a noncompliant situation?

Is averaging time the amount of time one can be exposed to the MPE?

If the IEEE upper tier MPE is safe for all, why is there a lower tier of MPEs?

How should very intense RF fields near the surface of conductors be assessed for compliance?

How should I determine compliance for my tower climbers on hot AM towers?

What can be done to make my company RF compliance program most cost effective?

How do I minimize making mistakes in performing a site compliance inspection?

OSHA’s RF regulation is 47 years old and out of date. What does OSHA require for RF safety?

Where role do RF contact currents play in compliance assessments?

I’ve heard that the body is transparent to radio waves. Is this true?

When do I really need a barrier at my transmitter site for compliance?

How well does RF protective clothing work and when should I use it?

I think that RF safety signage should be installed but my client is concerned that it will unnecessarily frighten workers and the public. What should I do?

How do I identify competent individuals to perform site compliance assessments for me?



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ATTACHMENT 4



Chandler Recreation Division Rental Estimate

Rental Date: 1/22-23-24/2017 Rental Type: ICES
 Renter's Name: Maryn Wessler Phone: (480) 897-0155
 Address: 811 West Shannon Street Chandler, AZ 85249
 Event Hours: 8:30 am - 4:30 pm Clean Up Hour: 4:30 pm - 5:30 pm
 Decorating Hours: 8:00 am - 8:30 am Additional Set Up Hours: N/A
 Rooms Assigned: 109 Number Attending: 100
 Courtyard Hours: No Caterer: Yes

RENTAL FEES		
Hours	Charge	Total
Room rental fee: 24	\$55	\$1,344
Set/Tear & Dec hours: 6	\$25	\$150
Kitchen rental: 0	\$25	\$0
Alcohol permit: 0	\$14	\$0
Courtyard: 0	\$25	\$0
Police Estimate: 0	\$4.89	\$0
Total Rental Fee:		\$1,494
Down Payment:		\$336
Rental Balance:		\$1,158
Tax:		\$25.88
Total:		\$1,187.88

FACILITY/SET UP	
TBA Room set up style	TBA # of additional round tables
10 # of chairs at guest tables	TBA # sitting at the head table
TBA # of round tables for guests	TBA # of additional rectangle tables

RENTAL INFORMATION					
Facility Rules:	Received	<i>[Signature]</i>	Event Layout:	Received	<i>[Signature]</i>
Kitchen Rules:	Received	<i>[Signature]</i>	Caterer Permit:	Received	<i>[Signature]</i>
Alcohol Policy:	Received	<i>[Signature]</i>	Uninvited Guest:	Received	<i>[Signature]</i>
Rental Checklist:	Received	<i>[Signature]</i>	Police Officer Sheet:	Received	<i>[Signature]</i>
Alcohol Permit:	Received	<i>[Signature]</i>	Deposit:	Received	<i>[Signature]</i>

Recreation Staff have provided a copy and have reviewed with me the rules, regulations and policies pertaining to the use of facilities. I agree to comply with those rules, regulations and policies. I understand that I may be financially responsible, if I do not comply.

Renter's Signature: *Maryn Wessler* Date: 7.15.17
 Staff's Signature: _____ Date: _____



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ATTACHMENT 5





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ATTACHMENT 6



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OVERVIEW

IEEE/ICES TC95 Subcommittee 2

Terminology, Units of Measurements, and Hazard Communications

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- Ric asked about the revision of C95.2. The feeling of the SC was that the document is good as it is. Will form a balloting committee within ICES and IEEE-SA for balloting at the same time.
- Ric posted the below statements on the screen for a discussion on a possible sign or statement for minimal awareness and read to the group. Section 4.5.1 of C95.2 was displayed:

Another example of where signage, without specific training, could be sufficient is a region where an action level may be exceeded, but where the exposure limit could not be exceeded (Category 2). Ric asked the group if the situation arose where RF exposures above the Action Levels were possible, but NOT above the upper tier, whether a sign or label would be sufficient? There were no comments to the contrary and the topic was dropped.

- Ric brought up the topic of a short form RF Safety Program.
 - There were plenty of comments but no consensus and the topic was dropped.
- Ric brought up a discussion of the RF Safety Workshop proposed in Chandler AZ. In the submittal for interest, we should ask **what do you feel has been missing in other RF training?**
- No OLD or NEW business discussions.
- Adjourned at 16:30.