



ICES

International Committee on Electromagnetic Safety

Approved Minutes

IEEE/ICES TC95 Subcommittee 3

and

IEEE/ICES TC95 Subcommittee 4

Motorola Inc. Facility

8000 West Sunrise Blvd

Plantation, FL 33322

3 December 2008

0900 – 1700 h

1. **Call to Order**

The meeting was called to order by SC4 Co-chairman Ziskin at 0900 h.

2. **Introduction of those Present**

Each of the attendees introduced him/herself. See Attachment 1 for list of those in attendance.

3. **Approval of Agenda**

Following a motion by Needy that was seconded by Reilly the agenda was approved with the following modifications: Item 7 (g) Other – add “One versus two tiers;” add Item 7 (h) “Risk WG and Interpretations WG.”

4. **Approval of the Minutes (June 2008 Meeting)**

a. Subcommittee 3

Following a motion by Bodemann that was seconded by Chou, the minutes of the June 2008 SC3 meeting were approved without modification.

b. Subcommittee 4

Following a motion by Chou that was seconded by Klauenberg, the minutes of the June 2008 SC4 meeting were approved without modification.

5. **Secretary's Report**

Petersen reviewed the status of C95.1a. He pointed out that approximately 55 members of TC95 responded to an initial survey indicating that they intend to participate in the sponsor ballot. He also reviewed the requirements for participating in the sponsor ballot.

Specifically, each TC95 member who intends to vote must obtain an IEEE SA web account – there is no cost – and join the C95.1a activity area, i.e. balloting pool. He said that instructions will be sent shortly. Those who expect to participate in the sponsor ballot must be an IEEE SA member, pay a fee, or be approved as an invited expert by the IEEE SA Standards Board (SASB). He also noted that IEEE members who are not SA members will no longer be approved by the SASB as invited experts. Those who joined the C95.1a ballot pool and are eligible to vote will be sent an invitation to ballot by the IEEE Balloting Center and will have 30 days to accept. He concluded by noting that sponsor balloting should begin in May or June.

6. Chairmen's Reports

Rather than providing individual reports, it was agreed it would be appropriate to move to Item 7 and address important issues related to combining C95.1 and C95.6 into a single standard. Updates to SC3 and SC4 activities will be addressed in Item 7.

7. Issues on Merging C95.1 and C95.6

a. Rationale and approach to merging C95.1 and C95.6

Ziskin asked for comments regarding moving forward with combining the two standards. Reilly stated that the work of each SC should be divided by interaction mechanism rather than setting some artificial boundary, e.g. frequency range. Morrissey supported proceeding in this manner—there were no objections. Ziskin then asked for comments on how we should move forward to combine the two standards. Bodemann explained that the 3 kHz boundary between the two standards was not a science-based decision but was at the time convenient. One issue is that discontinuities 3 kHz resulting from a scientific approach were smoothed for practical reasons. Swicord explained that there are two components necessary for moving forward—physics and biology. He said that we should start with the physics and then move to the biology. Reilly agreed adding that as indicated in C95.1, there is a wide frequency range where the interaction mechanisms overlap, e.g., electro-stimulation and thermal. He said that there also may be other effects that have to be addressed and gave as an example studies that show that by inducing a field across a cut in tissue, healing can be enhanced or retarded. He said that the mechanism is probably not electrostimulation. As suggested by Swicord, Reilly said that all effects, including the wound healing example, should be examined first in terms of the physics, then in terms of the biology.

Bodemann noted that for practical reasons, we may have to set an arbitrary frequency boundary for purposes of the literature surveillance/evaluation process, e.g., 100 kHz. Murphy said that he supports dividing the groups by interaction mechanism. Cohen cautioned against dividing the work into too many small pieces—coordination/tracking between groups could become a problem. In response to a question from Morrissey, Ziskin explained that the literature evaluations could proceed by increasing the scope of the current Literature Surveillance WG to include the lower frequencies. Tell recommended that one SC should prepare the draft; Petersen disagreed. He said that it would be more appropriate if each SC prepared a draft based on their expertise and the work merged by an oversight WG comprised of members of both SCs. Reilly said that the work of the SCs should be divided by interaction mechanism with the understanding that there will be a large overlap in frequency. Klauenberg said that

he supports a single WG with oversight; Reilly said that input from small WGs will be important.

b. Literature surveillance

Morrissey provided an update on the literature surveillance program. He noted that to date the majority of the papers in the database are reports of RF studies with a large number of these focused on mobile telephones. He reviewed the studies to date (see Attachment 2). He also discussed the IEEE/WHO database posted on the WHO EMF Project website. He also discussed possible copyright issues if the papers in the database are distributed outside of the literature evaluation WGs and used for purposes other than “research.” He asked if the database could be moved to the ICES website; Bodemann thought that it could, which would be a positive move. The citation list could be posted in the public area; the more detailed information and the pdf files in the private area accessible by password to those on the literature evaluation WGs.

MOTION 1:

Morrissey moved to move the current ICES database to the ICES website. The citation list will be posted in the public area, the pdf files in the private area with access to a limited number of ICES members, i.e., members of the literature evaluation working groups.

The motion was seconded by Hatfield and approved unanimously.

Morrissey then reviewed the current makeup of the WG members, pointing out that some are from outside of ICES. Murphy said that it should be emphasized on the website that while ICES follows an open consensus process, not all of the material is accessible to the public. Ziskin pointed out that we probably will need additional reviewers for the low frequency papers. Morrissey agreed. He also pointed out that EPRI might be willing to support expanding the scope of the Literature Surveillance WG to include low frequencies.

It was agreed that the approach shown in the last slide of Attachment 2 will be followed. The literature capture, selection and division are ongoing; the evaluation of papers deemed critical will begin next year. In response to a question from Tell regarding assurance that citations identified in the BioInitiative Report are included in the ICES evaluation, and how these papers were identified by the authors of the report, Morrissey explained that while he has not gone through the report in detail, he is confident that all peer reviewed papers cited in the BioInitiative Report will be identified and included in the ICES database.

c. Literature review/evaluation

In response to a question from Klauenberg regarding the format of the reviews, Morrissey said that he will begin updating the clauses in C95.1-2005 that now summarize the literature review results prior to the 2003 cutoff. In response to a question from Murphy regarding treatment of reviews, Morrissey noted that all of the recent reviews are in the database. Elder said that the reviews can be addressed in the same manner that they were in the 2005 standard, i.e., list the reports at the beginning of Annex B (summary of the literature). In response to a question from Gettman regarding treatment of outlier reviews, Morrissey explained that a strict weight of evidence approach will be followed and addressed during balloting. Tell recommended that the Literature Surveillance WG provide a heads-up to the SCs

regarding any new relevant important studies. Morrissey said that could easily be included in the literature surveillance reports. Tell said that it would also be important to summarize such studies (e.g., the conclusions) in any meeting minutes to inform the larger committee. In response to a question from Ziskin regarding availability of the reviews to the public, Morrissey explained that while there will be no individual reviews, weight-of-evidence summaries by category will be prepared in a similar fashion to the “white papers” prepared prior to publishing C95.1-2005—possibly for publication.

MOTION 2:

Morrissey moved to request that the AdCom develop a strategy to solicit funding from EPRI to support the low frequency database.

The motion was seconded by Hatfield and approved unanimously.

In response to a question Elder asked regarding whether anyone following the medical literature is aware of any issues that would be relevant, Bassen noted that some effects of non-thermal origin have been reported recently, some of which are positive but probably not relevant to SC3 and SC4. In response to a follow up question from Elder, Bassen said that there are many contacts at FDA who are interested in these effects but there is no single source that he could identify. He said that he will try to identify someone with broad knowledge—possibly someone from the restorative device area. He said the issue is FDA approves devices that produce non-thermal effects as a modality.

ACTION ITEM 1:

Bassen will identify someone at FDA with broad knowledge—possibly someone from the restorative device area—that could provide a list of papers that would be relevant to the literature surveillance/evaluation effort.

d. BRs and MPEs for the different frequency ranges

Ziskin began the discussion on comparisons of the rationale for the BRs and MPEs for the different frequency ranges by referring to Attachment 3. Chou noted a difference in philosophy; the rationale for the BRs at the lower frequencies is statistically based, those at the higher frequencies are based on thresholds for adverse effects. Reilly added that while exposure at the upper tier of the MPEs in C95.6 may be uncomfortable, it is not harmful. Swicord explained it as being a bottom up approach for C95.6 and a top down approach for C95.1. Ziskin pointed out that the statistical approach followed by SC3 indicates that approximately 3% of the population may not be protected; Reilly said that he is not aware of any of the population that would not be protected since we are not dealing with harmful effects. Bodemann said if the issue of a small percentage of the public not being protected is a real issue, we should be concerned from a public perception viewpoint. Reilly explained that based on studies of small groups, e.g., groups of 100 subjects, the tail of the distribution for sensation is uncertain. He said that any effects are momentary and disappear as soon as the field is removed. Tell noted that several years ago SC4 was considering thermal comfort as an index but moved away from that position even though there is a large database of reliable information on the subject. Cohen reminded everyone that the reason C95.1 has a lower tier is because of a political decision that led to the lower tier in the 1991 standard. Specifically, the consensus of the committee was that without a lower

tier, the standard would not be credible. He said that he hopes politics is left out of this revision.

Ziskin said that he is a bit concerned about a statistical approach, e.g., communicating the rationale to the public. He said that the public does not want to hear that it protects 99% of the public. Reilly asked if anyone can ensure that the C95.1 MPEs protect 100% of the people. Tell pointed out that there is copious data to reverse the question, i.e., standards are set such that for many people the limits could be much higher. Also, one can state that the action level protects 100% of the population from adverse effects associated with heating.

Chou raised the issue of the appropriate nomenclature for the lower tier of the combined standard. In C95.6 the lower tier is for the general public; in C95.1 it is called an action level. He said that a suitable label for the lower tier is an important issue. He also noted that there is a small discontinuity in the MPEs between the two standards at 3 kHz, i.e., 1813 V/m in C95.6 and 1842 V/m in C95.1. Reilly explained that the discrepancy came about while trying to match the C95.6 E-field MPE to the C95.1 MPEs and is a very minor issue that will be addressed in the revision.

Chou said he was concerned about how the new standard will be received by the public. He pointed out that some activists attack the ICNIRP limits claiming that they are not protective—how will they react to a new IEEE standard if it solidly based on science and may be less restrictive than the current standards? He noted that even the FCC apparently has not accepted the 2005 limits, e.g., by revising the limits in the Telecommunications Act of 1996—instead they still maintain the hybrid limits based on C95.1-1991 and the NCRP 1986 recommendations. He asked for suggestions on changing the situation. Bassen suggested that the issue maybe one of litigation, i.e., awareness of issues may be settled in court—IEEE over ICNIRP and vice versa.

e. Terms and definitions

Ziskin pointed out that a small working group comprised of Bodemann, Dovan, Petersen and Reilly will address issues common to both standards. He also noted that a “Terms and Definitions” WG will be established to resolve any issues that arise regarding different definitions/terminology and their use in the two standards.

f. New title and scope for SC3 and for SC4

Bodemann recalled a discussion at the June 2008 meetings regarding renaming SC3 and SC4, perhaps call SC3 Low Frequencies and SC4 High Frequencies—the interface could be around 100 kHz. Swicord was opposed to a specific frequency interface. Tell suggested calling SC3 “Safety levels, 0 Hz to 5 MHz” and SC4 “Safety Levels, 100 kHz to 300 GHz.” Reilly said that SC3 should remain cognizant of effects not associated with electrostimulation. He said that there was a proposal for a task group within SC3 that would address the issue but the group has not yet been organized.

Bodemann presented a slide showing suggested titles and the scope of the “new” SC3 and SC4 (See Attachment 4.) After considerable discussion, the changes indicated were made. It was agreed that after final review, the table should be sent to SC3 and SC4 for comment.

ACTION ITEM 2:

Bodemann will review the table in Attachment 4, make any necessary changes and distribute to SC3 and SC4 for comment.

Klaenberg briefly discussed a clause in the new National Telecommunications & Information Administration (NTIA) *Manual of Regulations and Procedures for Federal Radio Frequency Management*. His concern is that the last sentence in Clause 8.2.28 (see Attachment 5) includes that statement "...to ensure compliance with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations." He said his concern is that the sentence could mean any standard or guidelines—it should at least reference the IEEE standard.

g. Other (one vs. two tier)

Chou reviewed the history of one versus two tiers in the C95 standards. He noted that while the science behind C95.1-1991 supported a single tier as protective for all, a number of committee members decided a lower tier should be included, partly to protect against any unknown effects that may be associated with the aged, infirm and children, and partly as social policy. The 1991 lower tier was for exposures in uncontrolled environments. This was changed to "action level" in the 2005 standard because that was the term used in the C95.7 standard on safety programs. In response to a question from Reilly, Tell explained that the safety programs referred to in Clause 4.8 of C95.1-2005 and described in C95.7-2005 actually imply a single tier standard with an action level that triggers safety programs to ensure that the MPEs of the upper tier are not exceeded. Actions include warning signs, work restrictions, etc. In absence of a safety program, the action levels can be used as a lower tier to protect the public. Swicord pointed out that the policy on how the lower tier is applied diverges widely, which is an issue that should be addressed in the revision. Koepfinger pointed out that the policy of the Nuclear Regulatory Commission (NRC) is to apply a much higher MPE for exposure of the worker, which includes time limits and other factors to control exposure, than the MPEs for exposure of the public. He noted that the NRC MPEs are based on cumulative effects associated with ionizing radiation. Klaenberg suggested that since the action levels are not really a lower tier, perhaps the revision should contain a single tier that protects everyone. The corresponding MPEs could be relaxed for informed people, similar to what the NRC does. There was more discussion on this consideration but no decision was reached.

h. Risk WG and Interpretations WG

Chou pointed out that SC3 should be certain an Interpretation Working Group is established.

8. Old Business

Chou reminded the subcommittees that ΔT is still under consideration by SC4 as a basis for the BR for partial-body exposure. He referred to a recent paper by Sheppard, Balzano and Swicord¹ and pointed out the conclusions—all known effects at

¹ Sheppard, A.R. Swicord, M.L. and Balzano, Q, "Quantitative evaluations of mechanisms of radiofrequency interactions with biological molecules and processes," *Health Physics*, vol.95, no. 8, 2008.

radiofrequencies are related to ΔT . He recommended that this should be a consideration during the revision process and the subject should remain on future agendas. He also recommended continuation of the effort by Anderson and Swicord to explore the ΔT issue. Tofani suggested establishing a liaison with the WHO WG on Thermal Effects, which was established following the thermal physiology workshop held in France in 2004.² Bodemann said that while he understands the rationale for continuing to exploring the ΔT issue, he is opposed to developing BRs based on ΔT instead of SAR. Swicord explained that the C95.1 standard is already indirectly based on ΔT . Ideally, if ΔT could be determined in different parts of the body, conflicts where SAR and ΔT do not track could be addressed. Tell said that a reason to continue would be that perhaps the partial-body BRs and MPEs could be relaxed, or at least supported by more solid evidence. There was consensus that examination of the issue should continue, i.e., more data is needed on ΔT .

9. **Date and Place of Next Meeting**

The next TC95 meetings will be held in conjunction with BioEM 2009 in Davos Switzerland in June. Meeting dates and times to be announced later.

10. **Adjourn**

There being no further business, following a motion by Testagrossa that was seconded by Baron, the meeting was adjourned at 1410 h.

² IEEE ICES/COST 281 Thermal Physiology Workshop, Paris, France, September 22 - 24, 2004.

Action Items Arising at the December 2008 SC3/SC4 Meeting

	Action	Assigned to	Due date	Status
1.	Identify someone at FDA with broad knowledge—possibly someone from the restorative device area—that could provide a list a papers that would be relevant to the literature surveillance/evaluation effort.	Bassen	1 April 2009	
2.	Review the table in Attachment 4, make any necessary changes and distribute to SC3 and SC4 for comment.	Bodemann	Before June meeting	

Motions Arising at the December 2008 SC3/SC4 Meeting

	Motion	Moved/Seconded	Approve
1.	Move the current ICES database to the ICES website. The citation list will be posted in the public area, the pdf files in the private area with access to a limited number of ICES members, i.e., members of the literature evaluation working groups.	Morrissey/Hatfield	Unanimous
2.	Request that the AdCom develop a strategy to solicit funding from EPRI to support the low frequency database.	Morrissey/Hatfield	Unanimous

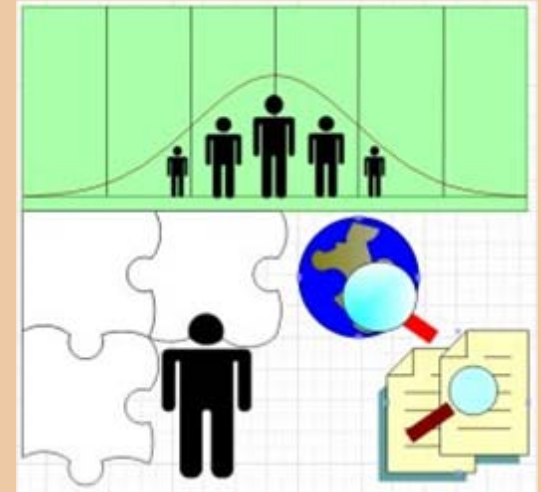
Attendance: TC95 SC3/SC4 Meeting, 3 December 2008

	Last Name	First Name	Affiliation	Status
1.	Baron	Dave	AIHA Representative	M
2.	Bassen	Howard	FDA/CDRH	M
3.	Bodemann	Ralf	Siemens AG	M
4.	Brewer	John	HCJB Global	M
5.	Bushberg	Jerrold	U. of California, Davis	M
6.	Chou	C-K	Motorola	M
7.	Cohen	Jules	Independent Consultant	M
8.	DeFrank	John	US ARMY CHPPM	M
9.	Elder	Joe	Motorola	M
10.	Futch	James	Florida Dept. of Health	M
11.	Gettman	Ken	NEMA	M
12.	Haes	Donald	BAE Systems	M
13.	Hatfield	James	Hatfield and Dawson	M
14.	Hernandez	Jose	Florida Power & Light Co.	M (SC3)
15.	Klauenberg	B. Jon	USAF	M
16.	Koepfinger	Joe	Independent Consultant	M
17.	Lang	Sakari	Nokia	M
18.	Lodwick	Jeff	US Department of Labor	M
19.	Mathur	Rajat	Hammett & Edison	M
20.	Morrissey	Joseph	Motorola	M
21.	Murphy	Michael	USAF	M
22.	Needy	Robert	Naval Surface Warfare Ctr	M
23.	Packer	Malcom	Harris RF Communications	M
24.	Petersen	Ron	Independent Consultant	M

	Last Name	First Name		
25.	Reilly	Pat	Metatec Associates	M
26.	Roberts	Brad	US ARMY CHPPM	M
27.	Swicord	Mays	Independent Consultant	M
28.	Tell	Rick	Richard Tell Assoc. Inc.	M
29.	Testagrossa	Paul	Alcatel Lucent	M
30.	Tofani	Santi	Servizio Di Fisica Sanitaria	M
31.	Umbdenstock	Donald	Tyco/Sensormatic	M
32.	Weller	Robert	FCC	M
33.	Ziskin	Marvin	Temple Univ. Medical School	M

IEEE ICES Literature Review Report

- Current database
- Copyright Issues
- Review Strategy

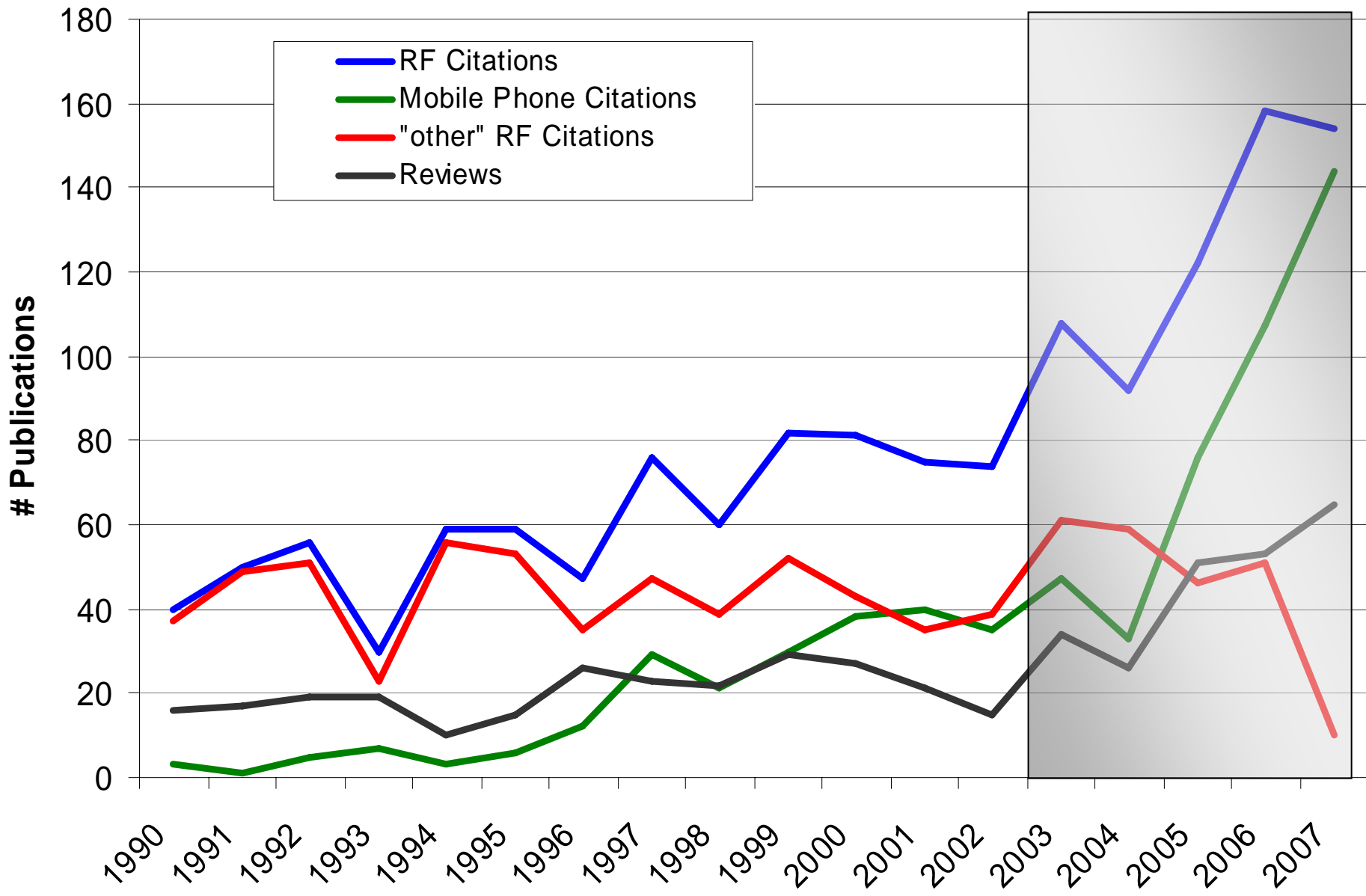


RF Bioeffects Publications

(Excluding Reviews, Engineering, Risk Perception, etc)

Study Type	ALL RF	MP	RF 2003+
Epidemiology	298	130	116
Human	248	181	148
Animal	828	181	161
In Vitro	<u>495</u>	<u>178</u>	<u>146</u>
Total	1869	670	571

Peer Reviewed RF Bioeffects Publications





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EMF research databases

WHO's EMF databases

- [Project Database](#)
- [Citation List](#)
- [Study Chart](#)

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1. [WHO's EMF databases](#)
2. [Germany's EMF-Portal](#)
3. [Related links](#)

The EMF (ElectroMagnetic Field) research database has been developed as a tool for the research community, international agencies, and the general public. Its purpose is to offer information about global projects that examine the effect of electromagnetic field exposure on biological systems. It contains information on studies conducted in humans (epidemiologic and laboratory provocation), animals (in vivo), and in cultured cells and artificial systems (in vitro). It also contains engineering studies that characterize and quantify EMF exposure in these systems, and theoretical studies that consider feasible mechanisms for EMF energy interaction. The database contains studies spanning the non-ionizing part of the electromagnetic spectrum ranging static (0 Hz), extremely low frequency (ELF, >0-300 kHz), intermediate frequencies (IF, >300Hz to 10MHz), and radiofrequency (RF, 10 MHz-300 GHz) fields. - basically everything below visible light and ionizing radiation. It is divided into two sections, a Project Database and a Citation List.

The Project database attempts to be as comprehensive as possible and contains both completed studies as well as recently initiated projects and follow-on work that is ongoing and not yet published. The Project Database is searchable on a variety of categories (e.g., frequency range and subrange, study type and subtype, funding agency, investigator name) and each entry includes a condensed summary description of a project from a given laboratory or group. The Citation List provides the complete reference and is searchable by a more limited number of categories (e.g., frequency range, study type and subtype, investigator name, reference key words, and date of publication). The two databases are linked (forward and backward), so that identifying a project will immediately provide access to all relevant publications, and visa versa. Finally, a summary chart function has been provided to view a specific study category(s) in terms of number of ongoing projects, projects reported but not published, and published studies. Each summary chart entry is further linked to the Project Database and Citation List to for additional information.

- [Click here if you would like to submit a new study for inclusion in WHO's EMF Research Database](#)
- To submit changes or corrections to an existing entry, please [click here and send an email to the Project Secretariat](#). Please ensure you specify the **study's ID Number** as subject in your email.

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 - (2) the nature of the copyrighted work;
 - (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
 - (4) the effect of the use upon the potential market for or value of the copyrighted work.



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IEEE C95.1 Literature Review

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Password: IEEE_C95.1litrev

Current List of Reviewers

- **Joe Morrissey** (Motorola)
- Lutz Haberland (FGF)
- **Dariusz Leszczynski** (STUK)
- Philip Dixon (U Iowa)
- Linda Erdreich (Exponent)
- Jim McNamee (Health Canada)
- Dan Krewski (U Ottawa)
- Myron Maslanyj (HPA)
- Rodney Croft (Swinbourne)
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- Barney de Villiers (UStellenbosch)
- Tom Zickero (Slovenia)
- Georg Neubaur (ARCS)
- **Joe Elder** (Motorola)
- Marv Ziskin (Temple)
- Ron Peterson (IEEE)
- Nadege Varsier (Japan Interphone)

Agreed Approach

- **Step 1: Literature Capture – ongoing through current database**
- **Step 2: Selection - ongoing / we agreed to all peer-reviewed citations**
- **Step 3: Division – ongoing - specialty areas for review per existing database subcategories**
- **Step 4: Critical Evaluation**
- **Step 5: Synoptic Review**

ICES AdCom Meeting – 14 August 2008
Notes for Item 5 ‘Merging C95.6 into the Revision of CV95.1 -2005

Thanh Dovan

Please see attached the highlighted text difference in the 2 existing documents.

Combining 0-3 kHz and the 3kHz – 5MHz Sections (New task; Requesting Pat Reilly lead this task; Resource to be provided to JPR: New Task Group/s ?? .)

Separate and provide more detailed treatment of DC/Static Electric Field and Magnetic Field (New Task/s; Recruiting Experts & Resources; and New Task Group/s ...).

**IEEE C95.1 AND C95.6 TEXT COMPARISON –
SECTIONS ON BASIC RESTRICTIONS (BRs) AND MAXIMUM PERMISSIBLE EXPOSURES (MPES) FOR
FREQUENCIES RELEVANT TO ELECTROSTIMULATION LIMITS**

C95.6 – 2002	C95.1 – 2005
5. Exposure Limits	4. Recommendations
5.1 Basic restrictions	4.1 Basic restrictions (BRs) and maximum permissible exposures (MPEs) for frequencies between 3kHz and 5MHz
	This standard provides recommendations to minimize aversive or painful electrostimulation in the frequency range of 3kHz to 5MHz and to protect against adverse heating in the frequency range of 100kHz to 300GHz. In the transition region of 100kHz to 5MHz, protection against both electrostimulation and thermal effects is provided through two separate sets of limits. Below 100kHz only the electrostimulation limits apply, above 5MHz only the thermal limits apply, and both sets of limits apply in the transition region. In the transition region, where both sets of limits apply, the limits based on electrostimulation will generally be more limiting for low duty cycle exposures, while the thermal-based limits will be more limiting for continuous wave fields.
	4.1.1 BRs: <i>in situ</i> electric field
Basic restrictions refer to limits on the <i>in situ</i> electrical forces that adequately avoid adverse effects.	For human exposure to electromagnetic energy at frequencies from 3kHz to 5MHz, the basic restrictions refer to limits on the <i>in situ</i> electric fields that minimize adverse effects associated with electrostimulation.
Such restrictions are derived with consideration of adverse electrical thresholds, their distribution among the population, and safety factors	“ “

ATTACHMENT 3

<p>(See Clause 6)</p> <p>Table 1 lists basic restrictions for particular areas of the body in terms of the electric field within the biological medium.</p>	<p>, as documented in IEEE Std C95.6-2002</p> <p>Table 1 lists basic restrictions for particular areas of the body in terms of the electric field within the biological tissue (<i>in situ</i>). The listed parameters apply to frequencies above and below 3kHz to show continuity with standards adopted below 3kHz, i.e., IEEE Std C95.6-2002.</p>																																														
<p>Two parameters are listed in the table: the rheobase <i>in situ</i> field, E_0, and a frequency parameter, f_e. Limits are determined from table 1 as shown in Equation (1a) and Equation (1b):</p>	<p>Two parameters are listed in the table: the rheobase <i>in situ</i> field, E_0, and a frequency parameter, f_e. Limits are determined from table 1 as:</p>																																														
<p>$E_i = E_0$ for $f \leq f_e$ $E_i = E_0 (f/f_e)$ for $f \geq f_e$</p> <p>where E_i is the maximum allowed induced in situ field.</p>	<p>“ “</p>																																														
<p>The basic restrictions on the <i>in situ</i> electric field apply to an arithmetic average determined over a straight line segment of 0.5cm length oriented in any direction within the tissue identified in Table 1.</p>	<p>“ “</p>																																														
<p>For frequencies above 10Hz, a basic restriction on the <i>in situ</i> magnetic field is not specified in this standard.</p>	<p>The averaging time for an rms measurement is 0.2s. Basic restrictions expressed in Equation (1) apply to frequencies in the range of 0 to 5 MHz.</p>																																														
<p>Table 1 – Basic restrictions applying to various regions of the body^{a, b}</p>	<p>Table 1 – BRs applying to various regions of the body</p>																																														
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<p>indicate lack of compliance with the basic restrictions, but rather that it may be necessary to evaluate whether the basic restrictions have been met.</p>	
	<p>This would typically be done using analytical methods.</p>
<p>If the basic restrictions for Table 1 are not exceeded, then the MPE values in Table 2 can be exceeded. Consequently, it is sufficient to demonstrate compliance with either Table 1 or Table 2.</p>	<p>“ “</p>
<p>For purposes of demonstrating compliance with this standard, Table 2 and Table 4 shall be considered separately, and not additively.</p> <p>Entries in Table 1 and elsewhere in this standard are sometimes given to three significant digits. This degree of precision is provided so that the reader can follow the various derivations and relationships presented in this standard and does not imply that the numerical quantities are known to that precision.</p>	<p>--</p>
<p>5.2.2 Nonuniform exposure to sinusoidal magnetic fields</p>	<p>4.1.2.2 Non-uniform exposure to sinusoidal magnetic fields</p>
<p>When the magnetic field is not constant in magnitude, direction or relative phase over the head and torso, the maximum field over the head and torso shall be limited to the levels in Table 2. Alternatively, it shall be permitted to demonstrate adherence to the basic restrictions.</p>	<p>When the magnetic field is not constant in magnitude, direction or relative phase over the head, torso, or limbs, the maximum field over the head, torso, or limbs shall be limited to the levels in Table 2. Alternatively, it shall be permitted to demonstrate adherence to the basic restrictions.</p>
<p>5.2.3 Exposure of the arms or legs</p>	<p>4.1.2.3. Exposure of the limbs</p>
<p>Maximum permissible exposure (MPE) levels for the arms or legs are listed in Table 3. Compliance with Table 3 ensures compliance with the basic limitations of Table 1. However, lack of compliance with Table 3 does not necessarily imply lack of compliance with the basic restrictions, but rather that it may be necessary to evaluate whether the basic restrictions are met.</p>	<p>The MPEs for the limbs (entire arms and legs) are listed in Table 3. The averaging time for an rms measurement is 0.2 s. Compliance with Table 3 ensures compliance with the basic limitations of Table 1. However, lack of compliance with Table 3 does not necessarily imply lack of compliance with the basic restrictions, but rather that it may be necessary to evaluate whether the basic restrictions are met.</p>
<p>Table 3 – Magnetic flux density maximum permissible exposure levels: exposure of arms or legs^a</p>	<p>Table 3 – MPE for the limbs: $f = 3\text{kHz to } 5\text{ MHz}$</p>

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Frequency range (Hz)	General public B – rms (mT)	Controlled environment B – rms (mT)	Frequency range (kHz)	Action level ^a		Persons in controlled environments	
				B _{rms} (mT)	H _{rms} (A/m)	B _{rms} (mT)	H _{rms} (A/m)
< 10.7	353	353					
10.7 - 3000	3790 / f	3790 / f	3.0-3.35	3.79/f	3016/f	3.79/f	3016/f
			3.35-5000	1.13	900	1.13	900
			NOTE – f is expressed in kHz.				
			^a Within this frequency range the term “action level” is equivalent to the term “general public” in IEEE Std C95.6-2002.				
5.2.4 Pulsed or nonsinusoidal fields			4.1.2.4 Pulsed or non-sinusoidal magnetic fields				
When the magnetic flux density waveform is nonsinusoidal, maximum permissible exposure shall conform to the <i>rms</i> limits of Table 1 or Table 2. In addition, maximum exposure limits shall conform to either 5.2.4.1 or 5.2.4.2. Since both criteria are conservative, adherence to either is sufficient to demonstrate compliance with maximum permissible exposure limits or the basic restrictions.			When the magnetic flux density waveform is nonsinusoidal, maximum permissible exposure shall conform to the <i>rms</i> limits of Table 3. In addition, maximum exposure limits shall conform to either 4.1.2.4.1 or 4.1.2.4.2. Since both criteria are conservative, adherence to either is sufficient to demonstrate compliance with MPEs or BRs.				
5.2.4.1 Restriction based on peak field			4.1.2.4.1 Restriction based on peak (temporal) field				
Demonstration of compliance with either of the following two subclauses is sufficient to demonstrate compliance with restrictions based on the peak field. Subclause 5.2.4.1.1. applies to the <i>in situ</i> induced electric field. Subclause 5.2.4.1.2. applies to the environmental field.			Demonstration of compliance with either 4.1.2.4.1.1. or 4.1.2.4.1.2 is sufficient to demonstrate compliance with restrictions based on the temporal peak field. Subclause 4.1.2.4.1.1 applied to the <i>in situ</i> induced electric field; 4.1.2.4.1.2 applies to the external field.				
5.2.4.1.1 Peak <i>in situ</i> field			4.1.2.4.1.1 Peak <i>in situ</i> electric field				
The peak <i>in situ</i> electric field shall be restricted to a value obtained by multiplying the rms limits of Table 1 by $\sqrt{2}$. To interpret this table for non-sinusoidal waveforms, frequency, f , is defined as $f = 1/(2t_p)$, where t_p is the phase duration of a peak excursion of the <i>in situ</i> electric field. Phase duration is defined as time between zero crossings of a waveform having zero mean. For an exponential waveform, t_p is interpreted as the duration measured from the waveform peak to a point at which it decays to $0.37 (e^{-1})$ of its peak value. Peak limits apply to instantaneous values measured through a bandwidth from zero to the highest frequency content of the waveform under			The temporal peak of the <i>in situ</i> electric field shall be restricted to a value obtained by multiplying the rms limits of Table 1 by $\sqrt{2}$. To interpret this table for non-sinusoidal waveforms, frequency, f , is defined as $f = 1/(2t_p)$, where t_p is the phase duration of a peak excursion of the <i>in situ</i> electric field. Phase duration is defined as the time between zero crossings of a waveform. For an exponential waveform, t_p is interpreted as the duration measured from the waveform peak to a point at which it decays to e^{-1} (~36.8%) of its peak value. Peak limits apply to instantaneous values measured through a bandwidth from zero to the				

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consideration.	highest frequency content of the waveform under consideration.
5.2.4.1.2 Peak environmental field	4.1.2.4.1.2 Peak external field
The peak environmental magnetic field, B , shall be limited according to the following procedure, where B is a time-varying flux density waveform whose compliance is under question.	The temporal peak of the external magnetic field, B , shall be limited according to the following procedure, where B is a time-varying flux density waveform whose compliance is under evaluation. For conversion of magnetic field intensity, H, to magnetic flux density, B, note that $B = 4\pi \times 10^{-7} H$.
a) Determine the time derivative of the environmental field, $dB/dT = B$	a) Determine the time derivative of the external field, $dB/dT = B$
b) Identify the peak and phase duration of any excursion of B . Phase duration shall be determined as in 5.2.4.1.1.	b) Identify the peak and phase duration of any excursion of B . Phase duration shall be determined as in 4.2.1.4.1.1.
c) Determine the allowable peak limit on B from Table 2 as $B_p = \sqrt{2} MPE_B(2\pi f)$ where B_p is the maximum permissible value of B , MPE_B is the flux density consistent with Table 2 and Table 3, $f = 1/(2t_p)$ and t_p is the phase duration of B .	
5.2.4.2 Restriction based on Fourier components	4.1.2.4.2 Restriction based on Fourier components
<p>For an exposure waveform consisting of multiple frequencies, a test for compliance of the exposure waveform shall satisfy the following criterion:</p> $\sum_{0}^{5\text{MHz}} \frac{A_i}{ME_i} \leq 1$ <p>where</p> <p>A_i is the magnitude of the ith Fourier component of the exposure waveform. ME_i is the maximum permissible exposure or the basic <i>in situ</i> field restriction with a single sinusoidal waveform at a frequency f_i.</p> <p>The summation is carried out from the lowest frequency of the exposure waveform, to a maximum frequency of 5MHz. Note that A_i and ME_i must measure the same quantity, as well as be in the same units. For instance, if A_i is the magnitude of a flux density waveform, then ME_i must also be a measure of flux density.</p>	<p>For an exposure waveform consisting of multiple frequencies, a test for compliance of the exposure waveform shall satisfy the following criterion:</p> $\sum_{0}^{5\text{MHz}} \frac{A_i}{MPE_i} \leq 1$ <p>where</p> <p>A_i is the magnitude of the ith Fourier component of the exposure waveform, and MPE_i is the maximum permissible exposure (Table 2 or Table 3) or the basic <i>in situ</i> field restriction (Table 1) for a single sinusoidal waveform at a frequency f_i. The summation is carried out from the lowest frequency of the exposure waveform to a maximum frequency of 5 MHz. Note that A_i and MPE_i must measure the same quantity, as well as be in the same units. For instance, if A_i is the magnitude of a flux density, then MPE_i must also be a measure</p>

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<p>Alternatively, both A_i and ME_i could be measures of the time derivative of the field, the induced <i>in situ</i> electric field, or induced current density.</p>	<p>of flux density. Alternatively, both A_i and MPE_i could be measures of the time derivative of the field, the induced <i>in situ</i> electric field, or induced current density.</p>
<p>It may be necessary to evaluate Equation (2) at frequencies outside the limits of this standard. For purposes of such evaluation, the ME_i values applying to frequencies greater than 3 kHz shall be determined as follows.</p> <p>a) <i>Basic restrictions</i> (Table 1). Rheobase values of the <i>in situ</i> electric field (E_{ob}) shall be assumed for frequencies from f_e to 5MHz.</p> <p>b) <i>Magnetic field MPEs</i> (Table 2 and Table 3). The MPE value of B or H shall be determined to a maximum frequency of 3350 Hz using the formulae listed in the last row of the table. From 3350Hz-5 MHz, the MPE value shall equal that at 3350 Hz.</p> <p>c) <i>Electric field MPEs</i> (Table 4). The MPE value applicable to 3000 Hz shall be assumed to a maximum frequency of 5 MHz.</p> <p>d) <i>Induced and contact current MPEs</i> (Table 5). The MPE value listed at 3000 Hz shall be extrapolated to a maximum frequency of 5 MHz using the relationship: $MPE_i = MPE_{3000} (f/3000)$ where MPE_i is the limit at the appropriate frequency between 3 kHz and 5 MHz, MPE_{3000} is the limit at 3000 Hz, and f is the frequency in Hz.</p>	<p>It may be necessary to evaluate Equation (2) at frequencies outside the limits of this standard. For purposes of such evaluation, the ME_i values applying to frequencies greater than 3 kHz shall be determined as follows.</p> <p>a) <i>Basic restrictions</i> (Table 1). The BRs from 0Hz to 3 kHz shall be determined as given in Table 1.</p> <p>b) <i>Magnetic field MPEs</i> (Table 2 and Table 3). The MPE for B or H below 3kHz shall be determined as given in IEEE Std C95.6-2002.</p> <p>c) <i>Electric field MPEs</i> (Table 4). The MPE for the external electric field below 3kHz shall be determined as given in IEEE Std C95.6-2002. The MPE applicable to 3kHz shall be assumed up to a maximum frequency of 5 MHz.</p> <p>d) <i>Induced and contact current MPEs</i> (Table 5). Values of induced and contact current below 3 kHz shall be determined as given in IEEE Std C95.6-2002.</p>
<p>5.3. Maximum permissible exposure values: environmental electric fields</p>	<p>4.1.3.MPE for the external electric field</p>
<p>5.3.1 Constant whole-body exposure to sinusoidal electric fields</p>	<p>4.1.3.1. Uniform whole-body exposure to sinusoidal electric fields</p>
<p>Table 4 lists maximum electric field limits in terms of the undisturbed (absent a person) environmental field, E. It is assumed that the undisturbed field is constant in magnitude, direction, and relative phase over a spatial extent that would fit the human body. The averaging time for an rms measure shall be 0.2 seconds for frequencies above 25 Hz. For lower frequencies, the averaging time is such that at least 5 cycles are included, with a maximum of 10</p>	<p>Table 4 lists MPEs in terms of the undisturbed (absent a person) external electric field, E. It is assumed that the undisturbed field is constant in magnitude, direction, and relative phase over a spatial extent that would encompass the human body. The averaging time for an rms measurement shall be 0.2 s. For a controlled environment in which an exposed individual is not within reach of a grounded object, it may be</p>

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seconds. For a controlled environment in which an exposed individual is not within reach of a grounded object, it may be acceptable to exceed the limits listed in Table 4. This standard does not specify limits for situations involving contact with ungrounded objects.

For purposes of demonstrating compliance with this standard, Table 2 and Table 4 shall be considered separately, and not additively.

Table 4—Environmental electric field MPEs, whole body exposure

General public		Controlled environment	
Frequency range (Hz)	E – rms (V/m)	Frequency range (Hz)	E – rms (V/m)
1-368 ^c	5000 ^{a,d}	1-272 ^c	20000 ^{b,e}
368-3000	1.84 x 106/f	272-3000	5.44 x 106/f
3000	614	3000	1813

^a Within power line rights-of-way, the MPE for the general public is 10 kV/m under normal load conditions.

^b Painful discharges are readily encountered at 20 kV/m and are possible at 5-10 kV/m without protective measures.

^c Limits below 1 Hz are not less than those specified at 1 Hz

^d At 5 kV/m induced spark discharges will be painful to approximately 7% of adults (well-insulated individual touching ground)

^e The limit of 20 000 V/m may be exceeded in the controlled environment when a worker is not within reach of a grounded conducting object. A specific limit is not provided in this standard.

5.3.2 Nonuniform or partial body exposure to sinusoidal electric fields

When the environmental electric field is not constant in magnitude, direction, and relative phase over the dimensions of the human body, the average environmental field shall be restricted to the levels in Table 4. For a controlled environment in which an exposed individual is not within reach of a grounded conducting object, it may be

acceptable to exceed the MPEs in Table 4. This standard does not specify limits for situations involving contact with ungrounded objects, e.g. , a person above ground on an elevated, insulated platform. (See Annex C.)

Table 4—Electric field MPE – whole body exposure: f = 3 kHz to 100 kHz

	Action level ^a	Persons in controlled environments
Frequency range (kHz)	E (rms) (V/m)	E (rms) (V/m)
3 kHz to 100 kHz	614	1842

^a Within this frequency range the term “action level” is equivalent to the term “general public” in IEEE Std C95.6-2002

4.1.3.2 Non-uniform or localised exposure to sinusoidal electric fields

When the environmental electric field is not constant in magnitude, direction, and relative phase over the dimensions of the human body, the average environmental field shall be restricted to the levels in Table 4. For a controlled environment in which an exposed individual is not within reach of a grounded

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<p>acceptable to exceed the limits listed in Table 4. This standard does not specify limits for such cases. In no case shall the basic limitations of Table 1 or the contact current limits of Table 5 be exceeded.</p>	<p>conducting object, it may be acceptable to exceed the limits listed in Table 4. This standard does not specify limits for such cases. In no case shall the BRs of Table 1 or the contact current limits of Table 5 be exceeded.</p>
<p>5.3.3 Pulsed or nonsinusoidal fields</p>	<p>4.1.3.3 Pulsed or non-sinusoidal electric fields</p>
<p>When the waveform of the electric field is nonsinusoidal, such as with pulsed or mixed frequency waveforms, MPE limits shall conform to the rms limits of Table 4 and also to either of the criteria stated in 5.2.4.1 and 5.2.4.2. For this application, the environmental magnetic field is replaced by the undisturbed electric field, A_i is understood to represent the magnitude of the ith Fourier component of the environmental electric field waveform, and ME_i is the maximum permissible electric field magnitude at frequency f_i.</p>	<p>When the waveform of the external electric field is non-sinusoidal, such as with pulsed or mixed frequency waveforms, the rms value of the spatially averaged external field shall conform to the MPEs of Table 4, and also to either of the criteria stated in 4.1.2.4.1 and 4.1.2.4.2. For this application, the external magnetic field is replaced by the undisturbed electric field; A_i is understood to represent the magnitude of the ith Fourier component of the external electric field waveform, and MPE_i is the maximum permissible electric field magnitude at frequency f_i.</p>
<p>With respect to electric field exposure, 5.2.4.1.2 and 5.2.4.2 shall apply to frequencies from 368-3000 Hz for the general public, and from 272-3000 Hz in controlled environments. Below those frequencies and above 1 Hz, peak electric fields shall not exceed 7100 and 28000 V/m for the general public and controlled environments, respectively, and 14100 V/m for the general public within powerline rights-of-way.</p>	<p>--</p>
<p>5.4 Contact and induced current maximum permissible exposure limits</p>	<p>4.1.4 Contact and induced current limits</p>
<p>5.4.1 Sinusoidal current</p>	<p>4.1.4.1 Sinusoidal current</p>
<p>Contact current shall be limited as indicated in Table 5, subject to the following conditions:</p> <ul style="list-style-type: none"> a) Table 5 limits for freestanding individuals without contact with metallic objects shall not exceed the values listed in the rows labeled “Both feet” and “Each foot”. b) Contact limits in Table 6 assume a freestanding individual who is insulated from ground while touching a conductive path to ground. The criteria do not necessarily protect against aversive sensations from spark discharges just prior 	<p>Contact current shall be limited as indicated in Table 5, subject to the following conditions:</p> <ul style="list-style-type: none"> a) Table 5 limits for freestanding individual without contact with conducting objects shall not exceed the induced current values listed in the rows labeled “Both feet” and “Each foot”. b) Contact limits in Table 5 assume a freestanding individual who is insulated from ground while touching a conductive path to ground. The criteria do not necessarily protect against

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to and just after the moment of direct contact with the ground path.

- c) The averaging time for rms current measurements shall be 0.2 seconds for frequencies above 25 Hz. For lower frequencies, the averaging time shall include at least 5 cycles, with a maximum of ten seconds. The limits for peak exposure refer to instantaneous values measured through a bandwidth from zero to the highest frequency of interest.
- d) In controlled environments, limits for grasp contacts apply where personnel are trained to make grasping contact and to avoid touch contacts with conductive objects that present the possibility of painful contact current. A grasp contact area is assumed to be 15 cm². The use of protective gloves, the prohibition of metallic objects, or training of personnel may be sufficient to assure compliance with contact current MPE in controlled environments. For the general public, it is assumed that access, methods of contact, and protective measures are unconstrained.
- e) for the general public, a touch contact is assumed to have a contact area of 1 cm².

aversive sensations from spark discharges just prior to, and just after the moment of direct contact with the ground path.

- c) The averaging time for rms current measurements shall be 0.2 s. The limits for peak exposure refer to instantaneous values measured through a bandwidth from zero to the maximum frequency determined by Fourier decomposition of the waveform of interest.
- d) In controlled environments, limits for grasping contacts apply where personnel are trained to make grasping contact and to avoid touch contacts with conductive objects that present the possibility of painful contact current. A grasp contact area is assumed to be 15 cm². The use of protective gloves, the prohibition of metallic objects, or the training of personnel may be sufficient to assure compliance with the contact current limit in controlled environments. For the general public, it is assumed that access, methods of contact, and protective measures are unconstrained.
- e) A touch contact is assumed to have a contact area of 1cm².
- f) For long exposure duration ($t \gg 1s$), the values of induced and contact currents in Table 7 for protecting against heating effects in the RF range, are more restrictive than the corresponding values of currents in Table 5 for frequencies greater than 100 kHz. Hence, for long exposure duration, compliance with this standard at frequencies greater than 100kHz will be associated with meeting the limits of Table 7.
- g) The limits in table 5 protect against adverse electrostimulation effects; the MPEs in Table 8 and Table 9 apply to effects associated with tissue heating.

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	<p>NOTE—All three tables must be considered the corresponding values for the appropriate exposure group satisfied at all applicable frequencies.</p>																														
<p>Table 5 – Induced and contact current MPEs (mA-rms) for continuous sinusoidal waveforms, 0-3 kHz^{a, b}</p>	<p>Table 5 – Induced and contact current MPEs (mA-rms) for continuous sinusoidal waveforms, f = 3kHz to 100 kHz</p>																														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Condition</th> <th style="width: 33%;">General public (mA, rms)</th> <th style="width: 33%;">Controlled environment (mA, rms)</th> </tr> </thead> <tbody> <tr> <td>Both feet</td> <td style="text-align: center;">2.70</td> <td style="text-align: center;">6.0</td> </tr> <tr> <td>Each foot</td> <td style="text-align: center;">1.35</td> <td style="text-align: center;">3.0</td> </tr> <tr> <td>Contact, grasp</td> <td style="text-align: center;">--</td> <td style="text-align: center;">3.0</td> </tr> <tr> <td>Contact, touch</td> <td style="text-align: center;">0.50</td> <td style="text-align: center;">1.5</td> </tr> </tbody> </table> <p>^a Grasping contact limit pertains to controlled environments where personnel are trained to effect grasping contact and to avoid touch contacts with conductive objects that present the possibility of painful contact.</p> <p>^b Limits apply to current flowing between body and grounded object that may be contacted by the person.</p>	Condition	General public (mA, rms)	Controlled environment (mA, rms)	Both feet	2.70	6.0	Each foot	1.35	3.0	Contact, grasp	--	3.0	Contact, touch	0.50	1.5	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Condition</th> <th style="width: 33%;">Action level^a (mA)</th> <th style="width: 33%;">Persons in controlled environments (mA)</th> </tr> </thead> <tbody> <tr> <td>Both feet</td> <td style="text-align: center;">$0.90f$</td> <td style="text-align: center;">$2.00f$</td> </tr> <tr> <td>Each foot</td> <td style="text-align: center;">$0.45f$</td> <td style="text-align: center;">$1.00f$</td> </tr> <tr> <td>Contact, grasp^b</td> <td style="text-align: center;">--</td> <td style="text-align: center;">$1.00f$</td> </tr> <tr> <td>Contact, touch</td> <td style="text-align: center;">$0.167f$</td> <td style="text-align: center;">$0.50f$</td> </tr> </tbody> </table> <p>NOTE 1 – f is expressed in kHz.</p> <p>NOTE 2 – Limits apply to current flowing between the body and a grounded object that may be contacted by the person.</p> <p>NOTE 3 – The averaging time for determination of compliance is 0.2 s.</p> <p>^a Within this frequency range the term “action level” is equivalent to the term “general public” in IEEE Std C95.6-2002.</p> <p>^b The grasping contact limit pertains to controlled environments where personnel are trained to make grasping contact and to avoid touch contacts with conductive objects that present the possibility of painful contact.</p>	Condition	Action level ^a (mA)	Persons in controlled environments (mA)	Both feet	$0.90f$	$2.00f$	Each foot	$0.45f$	$1.00f$	Contact, grasp ^b	--	$1.00f$	Contact, touch	$0.167f$	$0.50f$
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<p>5.4.2 Nonsinusoidal (pulsed or mixed frequency) current</p>	<p>4.1.4.2 Non-sinusoidal (pulsed or mixed frequency) current</p>																														
<p>When the current waveform is nonsinusoidal, such as with pulsed or mixed frequency waveforms, MPE limits shall conform to the rms limits of Table 5 and also to either of the criteria stated in 5.2.4.1 and 5.2.4.2. For this application, the environmental field is replaced by the applied current, A_i is understood to represent the magnitude of the ith Fourier component of the current waveform, and ME_i is the maximum permissible current magnitude at frequency f_i.</p>	<p>When the current waveform is non-sinusoidal, such as with pulsed or mixed frequency waveforms, exposure shall conform to the rms MPEs of Table 5, and also to either of the criteria stated in 4.1.2.4.1 and 4.1.2.4.2. For this application, the external field is replaced by the applied current, A_i is understood to represent the magnitude of the ith Fourier component of the current waveform, and MPE_i is the maximum permissible current magnitude at frequency f_i.</p>																														

Number	SC3	SC4
Title	Safety levels for Low Frequency Exposure	Safety Levels for High Frequency Exposures
Scope (Needs elaboration)	<ol style="list-style-type: none"> 1. Set limit values for protection against adverse electro-stimulation 2. Literature review on other possible EMF effects ($f \leq 100$ kHz) 	<ol style="list-style-type: none"> 1. Set limit values for protection against adverse tissue heating 2. Literature review on other possible EMF effects ($f > 100$ kHz)
Need for Coordination	<ol style="list-style-type: none"> 1. Review studies covering frequencies below and above 100 kHz 2. Ensure consistency between the LF and HF parts of the C95.1 standard 	
Consideration of reorganization	<p>When If a third adverse health effect turns out to be “established”</p>	

National Telecommunications & Information Administration (NTIA) *Manual of Regulations and Procedures for Federal Radio Frequency Management*

8.2.28 RADIO FREQUENCY ELECTROMAGNETIC FIELD SAFETY AND PROTECTION

1. Exposure to radio frequency (RF) electromagnetic fields may present potential health hazards. Federal agencies shall take actions consistent with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations to ensure that people are protected from such emissions.
2. Federal agencies shall implement an RF safety program to protect exposed persons. RF safety programs may be individualized by agency and may be a part of an overall general safety program. Agencies may adopt recognized emission exposure standards/guidelines or portions of recognized standards/guidelines to develop an RF safety program most suitable for their facilities. Agencies should ensure that the most current versions of their chosen standard/guideline are used.
3. RF emitters licensed by the Federal Communications Commission (FCC) but located on Federal property must comply with the FCC's existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations. NTIA-authorized emitters on non-Federal property must comply with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations used by the Federal agency operating the emitter.
4. All RF emitters at or near a specific location must be taken into consideration in a complete RF safety evaluation. Agencies shall use the most current methodologies for the calculations and/or measurements to ensure compliance with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed Federal regulations.