



# ICES

International Committee on Electromagnetic Safety

## *Approved Meeting Minutes*

### **IEEE/ICES TC95 Subcommittee 4**

**25 June 2005**

**Dublin Castle, Dublin, Ireland**

#### **1. Call to Order**

Co-chairman Chou called the meeting to order at 0905 h.

#### **2. Introduction of those Present**

Each of the attendees introduced him/herself. (See Attachment 1 for the list of attendees.)

#### **3. Approval of Agenda**

Following a motion by Bodemann and a second by Bushberg, the agenda was approved without modification. (See Attachment 2 for agenda.)

#### **4. Approval of the Minutes of December 5, 2004 Meeting**

Following a motion by Adair and a second by Gettman, the minutes of the December 2004 meeting were approved with two minor corrections.

#### **5. Secretary's Report**

Petersen reminded the attendees that the PC95.1 PAR for the revision of the 1991 standard expires in December. He also noted that the scope of the revision as stated in the draft revision differs slightly from that in the PAR and it will be necessary to submit a modified PAR with a scope identical to that of the revision. He said that he will not ask for an extension at this time since the intent is to submit the revision to the SA Standards Board's (SASB) Review Committee (RevCom) for consideration at the September SASB meeting. He noted that the same thing will have to be done for the C95.7 standard. He added that if these standards are approved in September, the modified PARs will no longer be valid and a new PAR will have to be submitted prior to beginning work on the revision of the 2005 standard.

#### **6. Chairman's Report**

Co-chairman Chou briefly reviewed the status and membership requirements for SC-4. He noted that many of the members on the SC-4 roster are inactive or cannot be contacted

because of invalid e-mail addresses. He explained that a survey is being conducted to update the membership roster. Specifically, an e-mail notice will be sent to each member asking them to state whether or not they are willing to commit to the work of SC-4. Those who cannot agree to commit, or those who fail to respond after three e-mail requests, will be dropped. He noted that those who do not have the time but are still interested can request “observer” status. The only difference between an observer and a member is that members can vote.

Chou next explained the balloting process followed by ICES. Specifically, draft standards are essentially balloted twice; once by the subcommittee and once by the sponsor (ICES). In each case IEEE rules are followed, i.e., invitations to join a balloting group are sent to the subcommittee members, drafts are sent to the balloting group for vote, all comments and negative votes are addressed by the ballot resolution working group, in this case the Editorial Committee, and the revised draft and all comments received and their resolution are distributed to the balloting group to allow members to affirm or change their original vote, or comment on the changes resulting from ballot resolution.

## **7. Report on IEEE Balloting Results**

Chou noted that the revision is now undergoing sponsor ballot. Of the 59 members in the balloting group, 98% responded to the initial ballot on Draft 2.3. Of those that responded, 51 approved, 2 disapproved with comments, 1 disapproved without comments and 4 abstained. According to IEEE rules, the approval rate was 96% (negative ballots without comment are not considered in the determination). He said that the Editorial Committee will meet in July to respond to the comments and prepare a revised draft. The revised draft will have to be sent for a recirculation ballot before 12 August in order to have the revision considered by RevCom at the September meeting. Chou noted that comments received from a mandatory IEEE legal review and editorial review will have to be addressed. He said that he was concerned that some of the recommendations in the legal review will weaken the standard. These issues and an appropriate response will be prepared by the Editorial Committee, which will probably lead to negotiations with IEEE staff.

## **8. Discussion of D2.3 Comments (see Attachment 3)<sup>1</sup>**

### **A. Normative sections**

Tell explained that his primary concern is with the comments received with the legal review. He said that the recommended changes seem to be associated with a misunderstanding by the reviewers and if adopted will water down the standard. He was particularly concerned about the recommendation to change the words “avoiding established adverse health effects” to “reducing, or minimizing adverse health effects.” He noted that other recommendations were probably needed to clarify the language and were welcome. Gettman suggested that the legal language still accomplishes the intent of the standard – in a legal sense. Black disagreed and pointed out that the strong evidence supporting a threshold below which effects are not known supports the language in Draft 2.3, i.e., the MPEs avoid established adverse health effects. Cyr pointed out that the language suggested in the legal review may be appropriate for some physical agents, e.g., those associated with stochastic effects, but is inappropriate for those that demonstrate non-stochastic mechanisms, such as those associated with RF energy. He

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<sup>1</sup> This comment matrix, which includes the Editorial Committee resolutions, was included with the recirculation ballot.

suggested making it clear to IEEE staff in the response to the legal review that studies reporting stochastic effects have been examined as part of the literature evaluation, i.e., non-thermal effects, but the only mechanism found to be supportable is associated with heating. The mechanism is clearly understood.

There was considerable discussion of a draft response to IEEE staff regarding the legal review that was prepared by Sheppard and Meltz (see Attachment 4). From this discussion, there was agreement that the following items should be included in the response:

- All confirmed adverse health effects are shown to be threshold effects
- While the legal review recommendations are appropriate for some physical agents, they are inappropriate for effects associated with RF energy
- The many years of research and the improving quality of the studies leads to stronger confidence in the conclusions of the revision
- There are more than 19 recent independent reviews to compare with
- The makeup of the committee is balanced with representation from the life sciences and the physics and engineering communities

Curtis said that he was concerned that the local 1°C temperature rise criteria allowed by the standard may present an unknown risk for continuous exposure. Rather than discuss general issues, it was decided at this point to address specific substantive issues raised during the initial ballot, i.e., issues found in the comment matrix (Attachment 3).

#### **B. Specific comments (see Attachment 3)**

**Item 3:** Rejected – the standard is a health standard.

**Item 18:** Tell and Reilly to resolve.

**Item 27:** Rejected – there are no specific limits in Draft C95.7 (RF safety programs)

**Item 47:** Tell suggested addressing the issue of the possibility the existence of effects that have not been established should be addressed in the introduction. Johnston suggested language indicating that effects have been reported but have not been established. Meltz noted that a report of an effect does not mean that the effect exists unless it has been confirmed independently. Bodemann noted that statistics – using a 95% confidence interval – would suggest that effects would be reported based on probability alone.

Chou reviewed Item 1 of the IEEE Code of Ethics.

“To accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public and to disclose promptly factors that might endanger the public or the environment;”

This has been raised a number of times in comments submitted by one of the members of the balloting group. Specifically, the claim is that the committee may be violating the IEEE Code of Ethics because there may be yet to be confirmed effects that could be harmful – effects that have not been used in developing the MPEs. Black summarized the concern as being a risk of a risk that the committee may be wrong. Curtis pointed out that it is clearly stated up front that the standard is based on confirmed or proven adverse health effects; Meltz added that speculative effects have not been ignored – they have been investigated but found not useful for standard setting. It was suggested that the Editorial Committee strengthen the discussion on how non-confirmed effects are treated.

### C. General discussion

Kuster raised the issue of expressing the MPEs at the higher RF frequencies in terms of RF power density when, in fact, power density is rarely used. This led to considerable discussion and an agreement to stay with power density.

Cleveland pointed out that the statement in the draft that the lower tier of the revision is harmonized with ICNIRP is only true over a limited frequency range. Also, it is not clear that the ICNIRP basic restriction for localized exposure, which is claimed to avoid a temperature increase exceeding 1°C, actually limits the temperature increase to this value. Other issues should also be addressed regarding harmonization with ICNIRP, e.g., the issue of the pinnae, the rationale for differences above 100 GHz, etc.

Lotz and Bushberg expressed concern about localized exposures and the rationale for the relaxed basic restrictions, i.e., the 10 W/kg averaged over 10 g of tissue value being related to limiting the increase in sensitive tissue to 1°C. Specifically, how do we deal with reported pathological changes associated with short-term exposures that result in a temperature increase in the brain of 1°C and what evidence exists that such changes are not important and such exposures do not have to be avoided? Johnston and others pointed out that there are many reports that demonstrate the absence of effects associated with a 1°C temperature increase in brain tissue. Also, the difficulty of raising the temperature of the brain using RF energy is well-established. Varanelli noted that there is a huge body of evidence on heating from various sources, which also supports the conclusions found in the revision. Adair supported Johnston's comments noting that human beings being are very efficient thermoregulators – much more efficient than laboratory animals. She said that she does not support a 1°C temperature increase as a threshold for localized exposure – this magnitude temperature occurs all the time in humans and is not an issue.

D'Andrea pointed out that in some animal experiments the WBA SAR required to modify behavior corresponds to a local SAR approaching 30 W/kg, which is far greater than the corresponding 10 W/kg basic restriction in the ICNIRP guidelines and C95.1 drafts and standards. Kuster suggested that such data indicate that the safety factor for the 10 W/kg basic restriction may be as high as 3 and asked if the actual threshold is known? Lotz said he was concerned because we are telling the user that the standard is science-based and will protect against adverse effects but there seems to be some uncertainty about whether or not the 10 W/kg basic restriction will limit the temperature increase to 1°C. He said that he is particularly concerned because of potential exposures in the workplace where exposures may be high, and which may result in a temperature increase exceeding 1°C, in which case we can't say that the limits are safe. Curtis recommended initiating an RF safety program if exposures are such that the localized SAR may exceed 2 W/kg. Swicord pointed out that the safety factor has to be interpreted –the final temperature is more important than 1°C.

Cleveland pointed out that WHO does not endorse standards but does encourage harmonization and that the WHO workshops have not resolved the issue. Meltz asked what do we know and what can we say? If quality data is not available supporting the 10 W/kg basic restriction, then we probably should not relax the 8 W/kg value. Black pointed out the difficulty of producing a 1°C temperature increase in the brain, particularly in a small volume of the brain. Chadwick pointed out that the latest NRPB review document as indicating that the ICNIRP value limits the temperature increase to 2.5°C. Curtis suggested getting good data supporting the 1°C value and in the meantime clearly stress that the relaxation is for purposes of harmonization with ICNIRP. We do

not have a large history of such exposures and, in the meantime, we should tie the 2 W/kg value to an RF safety program.

## **9. Action Items from December 2004 Meeting**

The action items arising from the December 2004 meeting were reviewed and their status reported. (See Attachment 5.)

## **10. Old Business**

### **A. Tribute to Lou Heynick**

Meltz, Sheppard, Adair and a number of others paid tribute to Lou Heynick recalling his major contributions as Chairman of the Literature Surveillance Working Group and his wonderful way of brightening up meetings with his sense of humor. He will be missed by all.

### **B. Website**

Varanelli explained that he will need to change the website in light of changes to ICES. He asked for volunteers willing to help support or take over responsibility for the website. A suggestion was made to purchase a domain name for ICES – Varanelli will explore the possibility. Sections will be added for SC-3 and any of the TC95 and TC34 subcommittees. Petersen noted that Bob Thomas at Brooks City Base maintains the website for the ANSI Z136 laser committee, which operates much the same way as ICES. He suggested taking a look at it for ideas as it seems it could serve as a model.

### **C. Database**

Swicord reported that the IEEE/WHO database will remain on the WHO website. There are now approximately 2400 citations, approximately 1600 of which are primary bioeffects papers. The intent is to add an engineering section. New search tools are expected soon – he encouraged everyone to use the database and offer suggestions for improvement.

## **11. New Business**

Bodemann encouraged everyone to think about promotional material for the C95.1 revision, e.g., papers, short courses, etc., once the standard is approved.

## **12. Date and Place of Next Meeting**

The next meeting will take place in December in San Antonio. The dates will be announced but will probably be the second week of December.

## **13. Adjourn**

There being no further business, following a motion by Varanelli and a second by Thansandote, the meeting was adjourned at 1625 h.

**List of Attendees****IEEE ICES SC-4 Meeting**

**Dublin Castle  
Dublin Ireland  
June 25, 2005  
0900 – 1700 h**

	<b>Last Name</b>	<b>First Name</b>	<b>Affiliation</b>	<b>Country</b>	<b>Status</b>	<b>E-mail</b>
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4.	Black	David	Gillies Clinic	NZ	M	drblack@itmedical.com
5.	Blake	David				
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7.	Bohnam	Shirley	AFRL/HEDO	US	O	
8.	Bowman	Joseph	NIOSH	US	O	
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11.	Bushberg	Jerrold	UC Davis	US	M	jbushberg@ucdavis.edu
12.	Carr	Michael	Raytheon Missile Systems	US	O	rmcarr@raytheon.com
13.	Chadwick	Phillip	MCL	UK	M	phil.chadwick@mcluk.org
14.	Chou	C.K.	Motorola, Inc.	US	M	ck.chou@motorola.com
15.	Cleveland	Robert	FCC	US	M	robert.cleveland@fcc.gov

	Last Name	First Name	Affiliation	Country	Status	E-mail
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20.	Douglas	Mark	Motorola	US	O	mark.douglas@motorola.com
21.	Duerrenberger	Gregor	ETH	CH	M	gregor@mobile-research.ethz.ch
22.	Elder	Joe	Motorola	US	M	joe.elder@motorola.com
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37.	Lotz	Gergory	NIOSH	US	M	wlotz@cdc.gov

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44.	Mizuno	Yukio			O	
45.	Murphy	Michael	AFRL/HEDR	US	M	michael.murphy@brooks.af.mil
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47.	Nelson	David	Michigan Tech Univ	US	M	david.a.nelson@gmail.com
48.	O'Connor	Roger	DCMNR	IE	O	roger.oconnor@dcmnr.gov.ie
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50.	Reilly	J. Patrick	Metatec Associates	US	M	jpreilly@ieee.org
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53.	Sheppard	Asher	Asher Sheppard Conslt'g	US	M	ashersheppard@compuserve.com
54.	Swicord	Mays	Motorola	US	M	mays.swicord@motorola.com
55.	Tattersall	John	DSTL	UK	M	jtattersall@mail.dstl.gov.uk
56.	Tell	Richard	Richard Tell Assoc. Inc.	US	M	rtell@radhaz.com
57.	Thansandote	Art	Health Canada	CA	M	art_thansandote@hc-sc.gc.ca
58.	Thuroczy	Gyorgy	Nat Res Inst for Radiobio	HU	M	thuroczy@hp.osski.hu
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	<b>Last Name</b>	<b>First Name</b>	<b>Affiliation</b>	<b>Country</b>	<b>Status</b>	<b>E-mail</b>
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M =Member  
O =Observer



INTERNATIONAL  
COMMITTEE *on*  
ELECTROMAGNETIC  
SAFETY

ATTACHMENT 2

*Tentative Agenda*

**IEEE/ICES TC95 Subcommittee 4**  
**Safety Levels with Respect to Human Exposure to Radio Frequency**  
**Electromagnetic Fields, 3 kHz to 300 GHz**

**June 25, 2005 (Saturday)**  
**9:00 to 5:00 PM**

**Dublin Castle, Dublin, Ireland**

Conference Phone: 00353 1 6793713/ 6796433

Fax: 00353 679 7831

[info@dublincastle.ie](mailto:info@dublincastle.ie)

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|--|----------------------|
| 1. Call to Order                                       | <i>D'Andrea/Chou</i> |
| 2. Introduction of those Present                       | <i>D'Andrea/Chou</i> |
| 3. Approval of Agenda                                  | <i>D'Andrea/Chou</i> |
| 4. Approval of the Minutes of December 5, 2004 Meeting | <i>D'Andrea/Chou</i> |
| 5. Secretary's Report                                  | <i>Petersen</i>      |
| 6. Chairman's Report                                   | <i>D'Andrea/Chou</i> |
| 7. Report on IEEE Balloting results                    | <i>Chou</i>          |
| 8. Discussion of D2.3 comments                         | <i>Chou</i>          |
| A. Normative Section Discussions                       | <i>Tell</i>          |
| B. Informative Section discussions                     |                      |
| <i>i</i> Annex A                                       | <i>Adair</i>         |
| <i>ii</i> Annex B                                      | <i>Swicord</i>       |
| <i>iii</i> Annex C                                     | <i>Lang</i>          |
| <i>iv</i> Annex D                                      | <i>DeFrank</i>       |
| 9. Old Business  | <i>D'Andrea/Chou</i> |
| 10. New Business                                       | <i>D'Andrea/Chou</i> |
| 11. Date and Place of Next Meeting                     | <i>D'Andrea/Chou</i> |
| 12. Adjourn  |                      |

<b>Date</b> 7 August, 2005	<b>Document:</b> IEEE Std C95.1 Revision
<b>Name</b> ICES/TC95 SC4	<b>Response to comments on IEEE C95.1-200x D2.3 (April 30, 2005)</b>

	<b>Commenter-Name</b>	<b>Section</b>	<b>Clause/Subclause</b>	<b>Paragraph/Figure/Table</b>	<b>Type of Comment: General (G) Editorial (E) Technical (T)</b>	<b>Comment</b>	<b>Proposed Change</b>	<b>Observations of the Ballot Resolution Group:  Accepted (A), Noted (N), Not Accepted, (NA).  Other comments and disposition</b>
1.	Cohen, Jules	1		Pg. 4	E	IEEE C95.7 is no longer a "draft"		<b>NA</b>  <b>C95.7 is a draft until approved by the SASB</b>
2.	Tell, Ric	1	1.1	3	E	Delete "measures of"	"...terms of limits on external fields..."	<b>A</b>

3.	Fichtenberg, David	1	1.1	Line #1	T & E	As noted at SC4 meetings, this is a SAFETY standard. Any effects on delay of response time, impacts on spatial or other memory function can impact safety, especially when driving a car or operating machinery. Therefore, the standard needs to state it addresses itself to safety issues, even if there may be no long term health impacts.	Change “health effects” to “health or safety effects” in Scope	<b>NA</b> <b>The effects noted, i.e., delayed response time and impacts on spatial or other memory function, are not established effects of RF exposure.</b>
4.	Testagrossa, Paul	1	1.1 Scope	1 <sup>st</sup> par. 2 <sup>nd</sup> sentence	G & E	This is an important opening and to emphasize the importance of BRs and MPEs it may be better to break the sentences up:	The recommendations are expressed in terms basic restrictions (BRs) and maximum permissible exposure (MPEs) – MPEs are derived from the BRs. BRs are measures of internal fields, specific absorption rate (SAR), and current density. MPES are measures of measures of external fields and induced and contact current.	<b>N</b> <b>(Revised.)</b>
5.	Testagrossa, Paul	1	1.1 Purpose		G & E	Replace RF with electric, magnetic	“..exposure to electric, magnetic and electromagnetic....	<b>A</b>
6.	Cohen, Jules	1		Pg 3	E	5th line of first full paragraph "of" should be "on"		<b>A</b>

7.	Fichtenberg, David	1	1.2	1	T & E	Same comment as above	In Purpose, make same change as in 1.1	<b>NA</b> <b>The effects noted, i.e., delayed response time and impacts on spatial or other memory function, are not established effects of RF exposure.</b>
8.	Fichtenberg, David	1	1.3	1	T & E	Same comment as above	In Purpose, make same change as in 1.1	<b>NA</b> <b>The effects noted, i.e., delayed response time and impacts on spatial or other memory function, are not established effects of RF exposure.</b>
9.	Testatgrossa, Paul	1	1.3 Introduction	2 <sup>nd</sup> par., 1 <sup>st</sup> sentence	G & E	Too wordy and redundant:	Too wordy and redundant: This standard presents two separate sets of rules to limit human exposure to avoid established adverse health effects associated with exposure to RF fields and currents.	<b>NA</b>

10.	Testagrossa, Paul	1	1.3 Introduction	3 <sup>rd</sup> par.	G & E	Too wordy and redundant:	The rules and the exposure limits, which are expressed in terms of BRs or MPEs, , incorporate safety factors that account for uncertainties and that provide a margin of safety for all.	<b>A</b>
11.	Testagrossa, Paul	1	1.3 Introduction	4 <sup>th</sup> par, 2 <sup>nd</sup> sentence	G & E	Change sentence	This exemption is provided under the expectation that the medical staff is appropriately trained in minimizing the risk of RF hazards concomitant with the provision of a recognized benefit from the exposure.	<b>A</b>
12.	Tell, Ric	1	1.3	Pg. 1, 11	E	Delete last sentence	Remove sentence, duplicated from first of paragraph	<b>A</b>
13.	Tell, Ric	1	1.3	Pg. 2, par 3	E	Delete “generally applies”	Insert “is intended to apply”	<b>A</b> <b>(Removed “generally.”)</b>
14.	Tell, Ric	1	1.3	Pg. 2, Par 4, line 8	E	Clarify when RF safety program should be implemented	Rewrite sentence to read: “The lower tier also defines the action level above which it is recommended that an RF safety program be implemented.”	<b>A</b>

							(Must be Satisfied – YES)	
15.	Tell, Ric	1	1.3	Pg. 2, Par 4, line 9	E	Insert "and MPEs"	"the BRs and MPEs of the lower tier..."	<b>A</b>
16.	Sheppard, Asher	1	1.3	11 [1], last para.	T	Missing comma and word "to"; awkward	and electromagnetic fields, and to induced and contact currents in order	<b>A</b>
17.	Fichtenberg, David	1	1.3	1	T & E	<p>Great credit needs to be given to SC4 in sections A.1.2-A.1.3, A.1.6 in which it is acknowledged that the desired reviews were not able to be done. In A.1.6 it is properly noted that 90% of papers were reviewed (10% not reviewed). While several review papers attempted to address the gaps as was the hazard setting process, we cannot state that there was a comprehensive review.</p> <p>Also, the paper noted by H. Lai by P. Boukamp, "Tumorigenic conversion of immortal skin keratinocytes (HaCaT) by elevated temperature," Oncogene, 1999 Oct. 7, Vol 18, no. 41, p.5638-45 was not properly reviewed. Indeed, in</p>	<p>Change "comprehensive" to "considerable"</p>	<p><b>NA</b></p> <p><b>There were three parallel literature review processes: Evaluation Working Groups, Review papers and Annex B author's reviews. The review is indeed comprehensive.</b></p> <p><b>Regarding the Boukamp paper, since the BRs and MPEs of this standard are based on established adverse health</b></p>

					<p>its response to the IEEE-SA Appeals panel, the Sponsor asserted that if there were a problem it would have been detected by epidemiology studies since so many people use phones.</p> <p>However, the Sponsor neglected to consider that the in-vitro study was focused on skin cells that occur only as mutations, i.e. may impact only a small proportion of people and so be very difficult to detect by epidemiological study. The bottom line is that while this in-vitro study findings have never been verified as actually occurring, the finding is one more reason to be cautious and to support some kind of prudent avoidance/ALARA or related principle to address all of the findings noted in the draft standard that do not reach the level of ‘established effects’ but do raise questions of the protection provided for possible effects for which there is but limited evidence.</p>	<p><b>effects, this one unconfirmed <i>in vitro</i> study, with unrealistic exposure conditions, cannot be used for setting limits. Details are described in Annex B.7.2.14.</b></p> <p><b>Regarding the concept of ALARA, this applies for physical agents that do not have established thresholds. On the other hand, RF is a physical agent that demonstrates well-defined thresholds. Therefore this concept does not apply.</b></p> <p><b>Regarding the concepts of prudent avoidance and the precautionary</b></p>
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								<p><b>principle, both apply to situations where there is little scientific understanding – this is not the case for RF.</b></p> <p><b>According to Weidemann and Schütz (2005), in their paper: “The precautionary principle and risk perception: experimental studies in the EMF area,” <i>Environ Health Perspect.</i> 2005 Apr;113(4):402-5., they presented “...results from two experimental studies that indicate that precautionary measures may trigger concerns, amplify EMF-related risk perceptions,</b></p>
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								<b>and lower trust in public health protection.” They concluded that “Precautionary measures implemented with the intention of reassuring the public about EMF risk potentials seem to produce the opposite effect.”</b>
18.	Tell, Ric	1	1.3.1	Pg. 3, Par 2, line 3	T	The text states that heating is the only adverse effect of exposure above 100 kHz. If there are NO established nonthermal (i.e., electrostimulatory) adverse effects above 100 kHz, why do we have special limits for pulsed exposures in this frequency range?	Text needs to be modified to address the potential hazard associated with pulsed fields, if, in fact, they are potentially hazardous.  (Must be Satisfied – YES)	<b>A</b>
19.	Tell, Ric	1	1.3.1	Pg. 3, Par 2, last line	E	Add “an additional”	“..., or an additional 7 dB.”	<b>A</b>

20.	Testagrossa, Paul	1	1.3.2	2 <sup>nd</sup> sen	G & E	Change sentence	Areas wherein intense RF fields exist (that exceed the MPEs) would be an exposure issue only when individuals have access to those areas and may become exposed.	<b>A</b>
21.	Sheppard, Asher	3	3.1	P 15 [5], 1 <sup>st</sup> para.	T	Unnecessary comma	“defined in <i>The Authoritative Dictionary of IEEE Standards Terms</i> are contained in a glossary (Annex E).”	<b>A</b>
22.	Testagrossa, Paul	3	3.1.1	N/A	G & E	Change sentence	<b>3.1.1 action level:</b> The values of the electric and magnetic field strength, the incident power density, contact and induced current, and contact voltages above which steps should be initiated to avoid exposures that <b>may</b> exceed the upper tier, e.g., implementation of an RF safety program.	<b>NA</b> <b>(Not necessary)</b>
23.	Sheppard, Asher	3	3.1.2	15 [5], sec. 3.1.2	T	Grammar	are not considered adverse effects.	<b>A</b>
24.	Tell Ric	3	3.1.2	Pg. 5, Note 1	E	Insert “physically”	“..that are not physically related to...”	<b>A</b>
25.	Testagrossa, Paul	3	3.1.7-3.1.9	n/a	G	These items (3.1.7, 3.1.8, 3.1.9 ) seem shifted to the right of the	Adjust left margin	<b>A</b> <b>(IEEE Editor)</b>

						ones coming after		will format)
26.	Testagrossa, Paul	3	3.1.77	n/a	G	Second line indented	Remove indent	A
27.	Glaser, Marne	3	3.1.16	Pg. 6	T & E	The RF safety program referred to in the definition of “controlled environment” must have limits no higher than the MPE and BR of this standard. According to the present text, if an RF safety program exists whose limits are multiple times that of the MPE, then it is still an RF safety program. To avoid any doubts, the definition should explicitly state it does not include private residences, areas accessible to the general public, or work sites unrelated to RF activities. Since the exposure time for the general public is 30 minutes, there can be “hot spots” in public areas as long as the logistics are such that the general public BRs are not exceeded.	Controlled environment: An area in which persons voluntarily enter and where the occupancy and activity of those within is subject to effective control and accountability as established by an RF safety program. Controlled areas exclude: private residences or living quarters other than those at work sites; areas accessible to the general public; and areas where persons work in non-RF-related activities.	<b>NA</b> <b>While the first sentence of the comment is correct, the second sentence is incorrect in that RF safety programs, e.g., C95.7, do not set limits but adopt the MPEs of established standards. Definition of “controlled environment” now linked to definition of “general public.”</b>
28.	Tell Ric	3	3.1.16	Pg. 6, Definition	T	Text reads: “..as established by an RF safety program for the purpose of protection from RF exposure hazards.” Clause 3.1.59 states that the purpose of an RF safety program is to ensure that persons are not exposed in excess of a specified	Retain 3.1.16 as is. Replace 2.1.59 with following which is same as definition in C95.7-2005 balloting draft: <b>radio frequency safety program (RFSP):</b> An organized system of policies, procedures,	A

						exposure limit.	practices, and plans designed to avoid hazards associated with exposure to RF fields, contact voltages, and contact and induced currents. RFSPs must be documented in writing.  (Must be satisfied: YES)	
29.	Fichtenberg, David	3	3.1.16	Pg. 6 all lines	T & E	The RF safety program referred to in the definition of 'controlled environment' must have as its limits, limits no higher than the MPE and BR of this standard. According to the present text, if an RF Safety Program exists whose limits are, say, 5 times that of the MPE then it is still an RF Safety Program. The definition of a controlled environment must require that the referenced RF Safety Program has limits no less restrictive than those of this standard. To avoid any doubts, the definition should explicitly state it does not include private residences, areas accessible by the general public, and areas where persons may do work unrelated to RF activities. Since the exposure time for the general public is 30 min, there can be 'hot spots' in public areas as long as the logistics are such that the general public BRs and	Controlled environment: An area in which persons voluntarily enter and where the occupancy and activity of those within is subject to effective control and accountability as established by an RF Safety Program. Controlled areas exclude private residences or other areas where people live other than living quarters at work-sites, areas accessible by the general public and areas where persons work unrelated to RF activities.	<b>NA</b>  <b>See response to comment 27.</b>

						MPEs are not exceeded.		
30.	Frysinger, James	3	3.1.20	Pg. 7		<p>I do not understand why the equation shows “W/m2” on the right. If this is a quantity equation, the units should work out correctly to this result and that seems to me to be the case.</p> <p>We have <math>(V/m)^2/\square</math> in the middle section of the equation and <math>\square(A/m)^2</math> in the rightmost of the three sections of this equation. I can understand the authors wanting to be explicit about the units working out to W/m2 but the text is the proper place to do this and that statement exists already.</p>		<b>A</b>
31.	Fichtenberg, David	3	3.1.26	Pg. 7 all lines	T & E	<p>It must be clear from the definition that the general public includes all persons not in controlled areas, as modified in the comments above. Notes # 1 and #2 of the present text are ambiguous. The terms, "Generally, unless specifically provided for as part of an RF program" leaves wide open and unclear when those with poor health status or who do not</p>	<p>General public are those persons not in controlled areas.</p>	<p><b>NA</b></p> <p><b>Members of the general public may enter areas where the exposure may be above the action level MPEs provided such areas are covered by an RF safety</b></p>

						volantarily agree to the higher exposure, may still be exposed at the controlled environment level.		<b>program. In areas where there is no RF safety program, the action level MPEs become the limit for the general public. (See definition of “general public.”)</b>
32.	Tell, Ric	3	3.1.35	Pg. 8, Note	T	Clarify when RF safety program should be implemented	Reword note as follows: “The lower tier, which is recommended as an action level, above which an RF safety program must be implemented, recognizes public concerns, ...”	<b>A</b>
33.	Frysinger, James	3	3.1.36	Pg. 8		I recommend a longer dash, say an endash, in the phrase “3 kHz300 GHz” to distinguish this from a difference of two values. Better yet to emulate 3.1.55 and use “3 kHz to 300 GHz.”.		<b>A</b>

34.	Sheppard, Asher	3	3.1.62	20 [10], NOTE 2	T	Unclear: Which safety factor is increased? When? Why? Note also significant changes in use of commas.	Upon considering statistical variation and uncertainties in the data on HT, extrapolation to humans, the models for calculation and measurement of BR or MPE, and biological variability in humans, a safety factor may be increased to ensure a “margin of safety for all.”	<b>A</b>
35.	Fichtenberg, David	3	3.1.59	Pg. 10, all lines	T & E	<p>It is essential that an RF Safety Program include appropriate periodic evaluation, incident response and assigned responsibilities for its implementation. Otherwise RF Safety Programs may be of marginal value. It is not enough for the purpose of the program "to ensure" limits are not exceeded, but the program must actually accomplish its goal. So the definition must require that the program does ensure this. Also, if the limits are less restrictive than those in this standard, the safety provided is uncertain.</p> <p>The RF safety program must take into account total heat stress, including from environmental sources, or when</p>	<p>RF Safety Program: A program that ensures that persons are not exposed in excess of the MPEs or BRs specified in this standard, and must include appropriate periodic evaluation, incident response, and assigned responsibilities for implementing the program.</p> <p>Since an established effect for which protection is provided by this standard is heat stress, the RF Safety Program must take into account total heat stress loads and further restrict RF exposure when it is not at de minimis levels, so that total heat stress does not reach unsafe levels. Note: A</p>	<p><b>A</b> <b>(See revised clause 4.8)</b></p> <p><b>N</b> <b>Taking heat stress into account is an issue addressed in an RF safety program. Moreover, the incremental heat load of the RF exposure</b></p>

						persons have a fever.	program typically includes RF awareness training, implementation of protective measures such as signage and the use of personal protective equipment.  (Must be satisfied: YES)	<b>even at the upper tier MPEs is insignificant with respect to environmental heat stressors.</b>
36.	Glaser, Marne	3	3.159	Pg. 10	T & E	An RF safety program must include appropriate periodic evaluation, incident response and assigned responsibilities for its implementation. They are otherwise of marginal value. It is not enough to state the purpose of the program as “ensuring” limits are not exceeded; rather a true safety program must have provisions for accomplishing this goal. Therefore, the definition must require that a program actually ensures this. Also, if the limits should be less restrictive than those in this standard, the level of safety provided becomes uncertain.	RF Safety Program: A program that ensures that persons are not exposed in excess of the MPEs or BRs specified in this standard. It provides for appropriate periodic evaluation, incident response, and assigned responsibilities for implementing the program.	<b>NA</b> <b>(See response to 35)</b>
37.	Glaser, Marne	3				The RF safety program must take into account total heat stress, including that caused by environmental sources or fever.	Since heat stress is an established effect for which protection is provided by this standard, the RF Safety Program must take into account total heat stress loads and further restrict RF	<b>N</b> <b>(See response to 35)</b>

							exposure accordingly to maintain safe heat stress levels. Note: A program typically includes RF awareness training, implementation of protective measures such as signage and the use of personal protective equipment.	
38.	Frysinger, James	3	3.1.67	Pg. 11		The “d” symbols in the derivatives are math symbols and should be upright, not slanted.		A
39.	Sheppard, Asher	3	3.1.67	21 [11] 3.1.67	T	Violates SI convention; I skip all other such examples, but note the correct usage in the glossary (Annex E).	The SI unit of specific absorption is the joule per kilogram (J/kg).	A
40.	Sheppard, Asher	3		22 [12]	T	Second part of the sentence is redundant.	The case in which the entire body is exposed to the incident fields.  That is, strike, “ <del>or in which the cross section of the body is smaller than the cross-section of the incident beam.</del> ”	A

41.	Frysinger, James	3	3.1.68	Pg. 11		<p>There is only slight risk of confusion but, still, it would be better to be explicit</p> <p>and write “J/kg·°C” or even “J/kg·K”. Raised dots are preferred [IEEE/ASTM SI 102002, 3.5.3.2]</p> <p>over the spaces currently used and the parentheses around the denominator ensure that no confusion</p> <p>arises as to the nature of the temperature unit.</p>	A
42.	Guy, Arthur	3	3.1.72		T	<p>I have two comments about the subject draft that I would like to submit. The first refers to definition 3.1.72 in the list of definitions and the second relates to section 4.2.3 relating to contact and induced current limits in the 100 kHz to 110 MHz range. They are as follows:</p> <p>(1) The stated definition of the strength-duration time constant is:</p> <p><i>3.1.72 strength-duration time constant ( <math>\tau_e</math>): The functional parameter in a strength-duration curve that describes the temporal inflection point between the rheobase and the</i></p>	<p>N</p> <p><b>The following definitions have been modified for clarity:</b></p> <p><b>3.1.61 (rheobase),</b></p> <p><b>3.1.71 strength-duration curve,</b></p> <p><b>3.1.72 strength-duration time constant,</b></p>

					<p><i>rising threshold segment.</i></p> <p>In trying to pin point the parameter in a strength-duration curve, for example, as published in Ruch and Patton, 1965, shown in Figure 1, it is difficult to determine the location of the inflection point in terms of the above definition as the curvature is changing over a considerable duration (up to 2 or more membrane time constants) with no clear indication of an inflection point. Ruch and Patton defines a membrane time constant <math>\tau_m = R_m C_m</math> where <math>R_m</math> and <math>C_m</math> are the respective membrane resistance and capacitance. It is thus the time for the charging or discharging membrane potential to reach <math>1/e</math> of the steady state value. Like the membrane time constant Is there a more quantitative way to define the strength-duration time constant?</p> <p>CK: For figures see attached WORD file.</p> <p> Guy's comments - figures.doc</p>	<p><b>3.1.73 strength-frequency constant,</b></p> <p><b>3.1.74 strength-frequency curve.</b></p>
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43.	Testagrossa, Paul	3	3.2	N/a	G,E	<b>May want to add “UHF”</b>	UHF ultra high frequency (300 – 3000 MHz)	<b>A</b>
44.	Frysinger, James	3	3.4	Pg. 14		I have never seen a proposed standard that listed the SI unit symbols used but I certainly have no objections —especially when it is done properly, as it is here! I do observe that the symbol s for second and the symbol min for minute are not listed but are used in the document.		<b>N</b> <b>(Symbols for seconds minutes and hours added)</b>
45.	Cohen, Jules	4		Pg. 26	E	Table 6, footnote d "distal to" should be "distal from"		<b>A</b>
46.	Fichtenberg, David	4		Pg. 15, add lines	T & E	It must be clear at the standard, and it is suggested this be at the start of the Recommendations section, that there is evidence, including that presented in the appendices, that is supported of adverse effects, but is evidence that does not reach the level of being an 'established effect'. Such a statement is needed in this section to meet the IEEE Code of Ethics requirement "to disclose promptly factors that <i>might</i> endanger the public". Using "might" is broader than considering only 'established effects'. Hence, effects for which there is merely limited evidence, or even reaching	As noted in Appendix B of this Standard, a number of studies have found evidence consistent with adverse effects at levels lower than the level for adverse established effects in this standard. While the evidence did not reach the level of being an established effect, those applying this standard are cautioned that adverse effects with some evidence, but not enough to reach the level of being an established effect exist. Appendix B should be referred to for a description of some of these effects	<b>NA</b> <b>It is recognized that there are reports of novel findings, which are discussed in Annex B. Such reported findings do not reach the level of scientific evidence as being established and cannot be used as the basis of this or any science-based</b>

					<p>probable cause, does not reach the level of 'established effect'. Yet such evidence is included in the "might" of the Code of Ethics. It is not enough to describe these effects in the Appendices. Rather, reference must be made to them at the appropriate place in the standard.</p>	<p>found by some researchers.</p>	<p><b>standard.</b>  <b>Relative to the comment on the IEEE Code of Ethics, note that, as stated in Annex A.1.9 and C.2.2.2.1, "IEEE standards are based on currently available knowledge; if any new adverse effect is established which would require a change in the standard, the standard can be promptly revised by amendments."</b></p>
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47.	Fichtenberg, David	4		Pg. 15, add lines	T & E	<p>Given the above evidence, some type of "prudent avoidance statement" is required. This is consistent with the IEEE Code of Ethics requirement to make decisions "consistent with the safety, health, and welfare of the public." [Code of Ethics #1]. If the Sponsor finds problems with the particular wording, then modifications may be proposed in the spirit of the concerns noted here.</p> <p>This standard is not a science textbook reporting only established facts. Rather, it is a safety standard for an exposure for which there is some evidence of adverse effects at levels much lower than the hazard effects level of the standard. If IEEE were asked by NASA to develop safety standards for sending men to Mars, there would very likely be questions and disagreement about the level of exposure to a factor at which there are adverse health effects. While NASA engineers might eventually agree that in all cases exposure should not exceed some limit, they likely would state to the extent feasible to try to limit exposure even within allowed limits.</p>	<p>Because of evidence of adverse effects where such evidence has not reached the level of the effect being established, and because such effects have been found at levels as low as 1/1000th of the adverse effects level of this standard (as indicated in reports in Appendix B), users of this standard are encouraged to keep exposure as low as reasonably achievable.</p> <p>In view of our limited knowledge on thresholds for all biological effects, unnecessary exposure should be minimized.</p> <p>Because of the limitations of the biological effects data base, these guides are offered as upper limits of exposure, particularly for the population at large. Where exposure conditions</p>	<p><b>NA</b></p> <p><b>See response to 46.</b></p> <p><b>Introducing precautionary language, a prudent avoidance statement, or referring to ALARA undermines the solidity of the basis and rationale of the standard and would be misleading to the users of this standard.</b></p> <p><b>Moreover, with additional 14 years of research since publication of the 1991 standard, there exists a much stronger position that the adverse effects of RF exposure are related solely to thermal</b></p>
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					<p>If ICES were providing safety limits for a NASA manned trip to MARS would it only protect from "established effects"? If so, then since little is established, then little protection would be provided. Rather, I would hope that ICES would review the possible effects, the evidence supporting them and the costs or feasibility of keeping exposure below certain limits for various activities. And then make specific recommendations so that for each activity safety is maximized within feasibility and not exceeding some upper maximum limit. The same approach should be applied here.</p> <p>The IRPA 1987/1988 RF guidelines offers acceptable text regarding this ALARA matter. While the organizations taking over the IRPA guidelines have dropped this text, this was not justifiable in my view. It seems a number of European organizations are applying prudent avoidance principles anyway. IEEE should have such an approach - as required by its Code of Ethics to provide for public safety.</p> <p>If the preferred above IRPA text</p>	<p>are not precisely known or controlled, exposure reduction should be accomplished by reliable means to values as low as reasonably achievable.</p>	<p><b>mechanisms. The weight of evidence provided by these additional years of research indicates that the upper tier of MPEs should be safe for all.</b></p> <p><b>Relative to the comment on the IEEE Code of Ethics, note that, as stated in Annex A.1.9 and C.2.2.2.1, "IEEE standards are based on currently available knowledge; if any new adverse effect is established which would require a change in the standard, the standard can be promptly revised by amendments."</b></p>
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						<p>is not acceptable then apply "prudent avoidance" , "as low as reasonably achievable" or similar term. An alternative text suggested is based on the previous ANSI C95.1-1982 standard. Since this was in a C95.1 standard, I thought it might be most appropriate for recommending here. While the data base is now much larger than in 1982, also the number of studies consistent with finding adverse effects is also much larger, as evidenced by the number of studies in Appendix B. These studies were not sufficient evidence to meet the Sponsor's criteria for supporting an 'established effect', but nevertheless is evidence consistent with adverse effects occurring at levels far below the hazard threshold of 4 W/kg given in the standard. So the 1982 IRPA statement above still applicable, as well as my proposed above first choice text, and my 3rd choice text to the right.</p>	
48.	Frysinger, James	4	4.1.2.4.2	Pg. 18	T	<p>The “5 MHz” atop the summation symbol could use a space between number and unit, as I have put it here.</p>	A

49.	Frysinger, James	4	Table 5	Pg. 21		Please put a unit symbol after the “3” in the title. My guess is that “kHz” is intended but putting it there would obviate the need to guess.		<b>A</b>
50.	Testagrossa, Paul	4	4.1.1	Heading	G,E	While we have used abbreviations, this is an important section and you may want to emphasize this by spelling out BR – not sure it should be plural	4.1.1 Basic Restriction: <i>in situ</i> electric field	<b>NA</b>  <b>(It is spelled out in the heading B.1)</b>
51.	Testagrossa, Paul	4	4.1.1	1 <sup>st</sup> sentence	G,E	Change sentence for readability	For human exposure to electromagnetic energy at frequencies from 3 kHz to 5 MHz, the BRs refer to limiting <i>in situ</i> electric field to adequately avoid adverse effects associated with electrostimulation.	<b>N</b>
52.	Testagrossa, Paul	4	4.1.1	2 <sup>nd</sup> paragraph, 1 <sup>st</sup> sentence	G,E	Change sentence for readability	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> ).	<b>A</b>
53.	Testagrossa, Paul	4	Notes to Tables 8 & 9	b) last sentence	E,T, G	For frequencies above 300 MHz, either field component may be used, when expressed as equivalent plane wave power density, for determining compliance with this standard for exposure.	Is this correct – either component can be used in the <b>near field</b> for frequencies above 300 MHz to determine compliance.	<b>A</b>

54.	Reilly, Pat	4	4.1.2.4.2	Lines 3-7 below Eq. (2), P. 18	E	subscript “i” should be in italics (4 places)		<b>A</b>
55.	Reilly, Pat	4	4.1.3.1	Table 4, P. 19	T & E	In first column, change from “3-5000” to “3-100”		<b>A</b>
56.	Guy, Arthur	4	4.2.3			<p>I am somewhat concerned about the implication of a statement and what is left out in section 4.2.3 shown below.</p> <p><i>4.2.3 Contact and induced current limits, 100 kHz to 110 MHz</i></p> <p>.....</p> <p>.....</p> <p><i>.....and the limits in Table 7 protect against effects associated with tissue heating. Contact and induced current shall both be limited as specified in Table 7, subject to the conditions enumerated in 4.1.4.1, except for a greater averaging time. Figure 1 (upper tier) and Figure 2 (lower tier) provide E-field values below which induced current does not have to be measured. The electric field strength values plotted in</i></p>		<p><b>N</b></p> <p><b>This issue is addressed by accepting suggestions in comment 57.</b></p> <p><b>The standard accurately states the reality of current induction from incident electric fields.</b></p>

					<p><i>Figures 1 and 2 are derived from estimated induced body currents from exposure to uniform electric fields (typically far field exposures) for individuals 1.75 meters tall standing in good conductive contact with ground (Gandhi et al. [R342])<sup>7</sup>, (Tofani et al. [R564]). The values for induced current are based on the assumption that all current will flow through one foot to ground, resulting in a conservative indication of <b><u>field strength below which induced current measurements are not required.</u></b></i></p> <p>The statement and associated Table 1 and Figures 1 and 2 in the standard imply that the induced foot and contact current measurements aren't required if the electric field exposure does not exceed 16% and 9% of the MPE, respectively for controlled exposures and 16% and 6% of the MPE, respectively for uncontrolled exposures. Making such measurements are very complex and the required instrumentation and techniques for making them are out of reach by many users. Potentially the largest affected group would be amateur radio operators (hams)</p>	
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					<p>who in the United States number nearly 700,000. Each ham must certify that his or her station meets the MPEs in the FCC Standards which are in part based on the IEEE/ANSI guidelines as a requirement for license renewal . Since most hams do not have the equipment or technical background for doing detailed field or induced current surveys in the environment of their stations, they commonly refer to published tables of minimum distances from various types of antennas at different operating frequencies radiated power levels where MPEs would be exceeded. For example see Figures 2 and 3 of my comments. Thus to waive any requirements for contact current measurements the maximum exposure levels in commenly used HF bands would have to be severely reduced. In fact the safe distances tabulated in the tables such as shown in Figures 2 and 3 would have to be increased by factors of 6.25 to 16.6 to insure compliance with the contact current limits without measurements.</p> <p>The current limits in the standard are indeed valid but the stated</p>	
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					<p>reductions in MPE to prevent them from being exceeded needs qualifications. The reductions are based on whole body exposures to uniform plane waves with the body exposed to vertically polarized fields parallel to the body axis with the subject making perfect contact with a perfect ground. Also the electric field levels must extend over a cross section much larger than the projected area of the human body for the specified maximum currents to occur. However, under typical exposure conditions and many mitigating factors such as polarization, reactive fields, and uniformity of the fields beyond the projected area of the body the maximum possible contact currents are unlikely to occur. The guidelines should include a discussion of the mitigating factors and how they would affect the MPE reduction levels plotted in Figures 1 and 2 of the standard. For example in Figure 2 of my comments the distances are in the reactive field of the vertical monopole and in Figure 3 of my comments the distances from the Yagi are in the reactive field and the E-Field is horizontally polarized.</p>		
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						CK: For figures see attached WORD file. Inserted in the previous Guy comment on page 14.		
57.	Tell, Ric	4	4.2.3	Pg. 22, Par 1, line 6	T	Additional qualifying narrative should be included to point out the highly conservative nature of Figures 1 and 2.	Replace 5 <sup>th</sup> sentence with following: “The electric field strength values plotted in Figures 1 and 2 are derived from estimated induced body currents from exposure to uniform electric fields aligned with the body axis (typically far field exposure) for individuals 1.75 meters tall standing in good conductive contact with ground (Gandhi et al. [R342]) <sup>7</sup> , (Tofani et al. [R564]). These assumed conditions of exposure will often not be applicable to realistic exposures with the result that substantially higher electric field strengths will be required to produce the induced body or touch currents specified in this standard. For example, normal footwear can significantly reduce induced body current. Further, the currents specified in this standard in the 100 kHz to 100 MHz frequency range are to be time-averaged over either 6-minutes or 30	<b>A</b>

							minutes.”	
58.	Tell, Ric	4	4.2.3	Pg. 23, Table 7	T	Table 7 implies that there is only one MPE for induced and contact currents, referring only to “Action Level” and “Persons in Controlled Environments” with an averaging time of 6-minutes for the current limit. The footnote, however, refers to “Limits” and does not clearly indicate whether the Action Level values are to be considered Limits in the absence of an RF safety program.	The label for the second column in Table 7 should be modified to read: “Action Level (MPE for the general public when an RF safety program is unavailable)(mA)”	<b>A</b> <b>(Added as note to table)</b>
59.	Tell, Ric	4	4.4(d)	Pg. 29 (last line)	E	Replace “should” with “shall”. This is a standard, not a recommended practice.	Replace with following: “...such fractions shall not exceed unity.”	<b>A</b>
60.	Tell, Ric	4	4.4(d)	Pg. 29 (last clause)	E	Wording is confusing and imprecise.	Replace last clause with: “..., the MPE for the instantaneous peak E field is 100 kV/m.”	<b>A</b>

61.	Frysinger, James	4	4.4	Pg. 30		The units shown here are not needed (see comment on 3.1.20). In any event, they are inappropriately slanted.		<b>N</b> <b>(The units are retained for the convenience of the reader but have been reformatted correctly)</b>
62.	Testagrossa, Paul	4	4.8	n/a	E	MPE is used in this section and I believe it refers to the “upper tier”	Include in parentheses (upper tier)	<b>A</b>
63.	Tell, Ric	4	4.8	Pg. 33 (lines 2-6)	T	Replace text. Keep first sentence and all starting with “Application of...”	Compliance with this standard is determined by whether persons are exposed to RF fields, currents, and/or voltages that exceed the applicable MPE. Where there may be access to RF fields, currents, and/or voltages that exceed the Action Level of this standard, an RF safety program as detailed in IEEE Std C95.7-2005 [B73] should be implemented to control exposures to not exceed the MPE or BR for persons in a controlled environment.	<b>A</b>
64.	Sheppard, Asher	4		40 [30]	T	Unnecessary numbers	Remove the zeroes after the decimal from the x-axis labels.	<b>A</b>

65.	Glaser, Marne	3	3.1.26	All lines	T & E	It must be clear from the definition that the general public includes all persons not in controlled areas, as modified in the comments above. Notes #1 and #2 of the present text are ambiguous. The terms, “Generally, unless specifically provided for as part of an RF program” leaves wide open and unclear when those with poor health status or those who do not voluntarily agree to higher exposure, may still be exposed at the controlled environment level.	General public are those persons not in controlled areas.	<b>NA</b> <b>(See response to comment 31.)</b>
66.	Glaser, Marne			Add 4 lines	T & E	It must be made clear in the standard, preferably at the start of the Recommendations section, that there is evidence as presented in the appendices that supports the occurrence of adverse effects at levels lower than those of this standard, even though the evidence does not reach the level necessary to be considered an “established effect” at this time. (Publicly, even industry organizations, such as CTIA, declare, “more research is needed” whenever a disturbing outcome is publicized, although they don’t seem to say that when the outcome shows no effect.) Such a statement is needed in this	As noted in Appendix B of this Standard, a number of studies have found evidence of adverse effects at intensity levels lower than that forming the basis for this standard. While the evidence has not reached the level of being deemed an established effect, those applying this standard are cautioned that adverse effects with some evidence exist, although they do not reach the level of being deemed an established effect. Refer to Appendix B for a description of some of these effects found by researchers.	<b>NA</b> <b>(See response to comment 46.)</b>

					<p>section in order to meet the IEEE Code of Ethics requirement <b>“to disclose promptly factors that MIGHT endanger the public.”</b> This word “might” indicates the ethical requirement to consider more than just already “established effects.” Effects for which there may be limited evidence at this time, some even reaching into the realm of probability, may not be “established” in a scientific sense, but may be necessary to consider when protecting the public health from possible harm. (As we know, the naïve public is often misled by terms like “no established effect” and “no conclusive evidence” into thinking these are synonymous with “no effect” and “no evidence.” We must not reinforce that misconception if we are to act ethically.)</p> <p>It is not enough to describe these effects in the Appendices. Rather, noticeable reference must be made to them at the appropriate place in the standard.</p>	
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67.	Glaser, Marne			Add 4 lines	T & E	Given the above, some type of “prudent avoidance statement” is called for. This is consistent with the IEEE Code of Ethics requirement that <b>decisions be made “consistent with the safety, health, and welfare of the public.”</b> (Code of Ethics #1)	Because there is evidence of adverse effects where such evidence has not reached the level of being “established,” and because such effects have been found at levels significantly lower than the adverse effects level upon which this standard is based, users of this standard are encouraged to keep exposure as low as reasonably achievable.	<b>NA</b> <b>See responses to comments 46 and 47.</b>
68.	Sheppard. Asher	A		45 [35] A.1.6	T	The clause, "The Epidemiology WG and the <i>In Vitro</i> WG did not complete review of all literature in their respective areas, and...." is misleading to the point of being disingenuous. To be clear and consistent with A.1.9 it should read as at right.	The Epidemiology WG and the <i>In Vitro</i> WG did not review much of the literature in their respective areas, whereas...."	<b>A.</b>
69.	Fichtenberg, David	B		39	T & E	There appears to be no description in the standard of mechanisms of effects. It needs to be added, and a good place is before the specific effects are described. My recommended text is based on the NCRP Report No. 119, A Practical Guide to the Determination of Human Exposure to RF Fields, sec. 1.4 Interaction of RF with tissues, p.4-5. If the Sponsor believes more information is	B.1.2 Interaction of Radiofrequency with tissues: Radiofrequency energy at levels where power density measures apply interact with tissues in 3 ways. (1) Water molecules and other molecules that are free to rotate, oscillate according to the frequency of the RF signal. (2) Large molecules that have ‘branches’ that	<b>N</b> <b>Clause B.2 has been modified to address accepted mechanisms of RF energy absorption. (See below.)</b> <b>A list of physical mechanisms is</b>

					<p>needed, then the text can be edited. Again, understanding the fundamental interaction does directly relate to the concerns of many that there can be non-thermal effects.</p>	<p>have a positive or negative charge, such branches can also move cyclically according to the frequency, but the movement is limited due to one end of the branch being bound to the larger molecule. (3) Ions in the human body or other living organism can move in the direction of the field.</p> <p>When thermal energy is present that is much more than a small RF component, as long as the RF energy is directed in a given direction, then there can be movement of ions since the net effect of the thermal energy is zero as far as influencing movement of the ions. Most researchers that believe that the only effects are due to the heating caused by the dielectric loss or otherwise moving molecules. Some members of the SC4 committee are concerned that the movement of fewer molecules that do not cause heating may yet have adverse impacts on body processes.</p>	<p><b>provided at the end of B.3. It is clearly stated throughout the draft that <u>established mechanisms</u> are used as the basis of the standard. Those that are speculative, or have not been confirmed, are not useful for standard setting.</b></p> <p>N</p> <p><b>The following sentences have been added to the end of B.2:</b></p> <p><b>“The accepted mechanism is RF energy is absorbed by the biological system through interaction with polar molecules (dielectric relaxation) or interactions with ions</b></p>
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								(ohmic loss). Such energy is rapidly dispersed to all modes of the system leading to an average energy rise or temperature elevation.”
70.	Sheppard, Asher	B		49 [39] top of page	T	Is the word “(informative)” supposed to appear and appear like this? Also see other annexes		NA (IEEE style)
71.	Sheppard, Asher	B		51 [41] B.2.2	T	Needs hyphen in heading	Non-cancer-related studies	A
72.	Fichtenberg, David	B	B.5.2.1	51 9-11 + others	T & E	<p>Since disruption of behavior is chosen as the ‘statistically reliable endpoint’, it is extremely important that the actual exposure values in Average Whole Body (AWB) SAR units be provided. In this section, sometimes AWB SAR is given, but it needs to be given for all studies where the AWB SAR at which an effect is reported is less than 4 W/kg. Indeed, this is part of the Code of Ethics requirement to “disclose promptly factors that might endanger the public health”.</p> <p>For example, the text mentions</p>	Schrot et al [R425, 0.7 W/kg] (page 52), [and similarly for all of the studies in this section where the AWB SAR is less than the hazard threshold of 4 W/kg, or at least when it is less than 2 (or at least 1 W/kg.)	NA  <b>The writers of this standard used the weight of scientific evidence approach taking into consideration biological endpoints, SAR thresholds, etc., but did not consider it possible to include all exposure details in the text.</b>

					<p>Schrot et al [R425]. The text needs to give the AWB SAR from Schrot, 0.7 W/kg. Whether this is close enough to the range 1-4 reported later in the B.5.2.2 should be for the readers to decide. Likewise the reference to Thomas [R451] should give the AWB SAR of 0.2 W/kg.</p>		<p><b>Moreover, these data are readily available in review papers such as D’Andrea, J. A., “Behavioral evaluation of microwave irradiation,” Bioelectromagnetics, 20:64-74, (1999)</b></p> <p><b>Relative to the comment on the IEEE Code of Ethics, note that, as stated in Annex A.1.9 and C.2.2.2.1, “IEEE standards are based on currently available knowledge; if any new adverse effect is established which would require a change in the standard, the standard can be promptly revised by</b></p>
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								<b>amendments.”</b>
73.	Fichtenberg, David	B		51	T & E	Likewise the reference to Thomas [R451] should give the AWB SAR of 0.2 W/kg.	Thomas [R451, 0.2 W/kg] where the authors note that “The response rates wer notably higher after microwave radiation . . .even though the last exposure to radiation occurred 24 hours before the drug was administered.”	<b>NA</b> <b>(See response to 72)</b>
74.	Sheppard, Asher	B		53 [43] B.2.3 heading	T	Needs hyphen in heading	Cancer-related studies	<b>A</b>
75.	Cohen, Jules	B	B.2.3		E	Second paragraph, first word should be "these" - not "theses"		<b>A</b>
76.	Sheppard, Asher	B		55 [45]	T	In light of the last paragraph before items I - V, it would seem that “Microthermal” effects are on a par with items III.a, III b, IV, V, but there is no microthermal heating of relevance to the standard. Suggested parenthetical statement is at right.	Microthermal (putative, shown to be insignificant)	<b>A</b>

77.	Sheppard, Asher	B		55 [45], last para. (2 places)	T	Misspelling	Astumian Astumian	<b>A</b>
78.	Sheppard, Asher	B		74 [64] B6.5.1	T	Add ‘or “microwave hearing”’ for consistency with other parts of standard	This phenomenon, which is known as “RF hearing,” or “microwave hearing” is a well-established biological effect	<b>A</b>
79.	Sheppard, Asher	B		76 [66] B.6.5.2		Misspelling	Roschmann	<b>A</b>
80.	Santomaa, Veli	B		B.6.9.2	E	should be Hietanen instead of Heitanen (R839)	should be Hietanen instead of Heitanen (R839)	<b>A</b>
81.	Tell, Ric	C	C.1.1.2 a)	Pg. 85, Line 12	T	Clarify when RF safety program is to be implemented	Reword as follows: “For practical purposes, the lower tier may be used for the general public or as an action level, above which an RF safety program must be implemented to avoid exposures that exceed the upper tier.”	<b>A</b>
82.	Tell, Ric	C	C.1.1.2 g)	Pg. 86, Line 1	E	Add word	Add: “...requires the development and implementation of an RF safety program...”	<b>A</b>
83.	Tell, Ric	C	C.2.2.1	Pg. 89, Par 4, line 9	E	Correct grammar and clarify	Change sentence as follows: “The lower tier thus recognizes public concerns, serves as an action level above which	<b>A</b>

							implementation of an RF safety program is required, helps account for uncertainties in laboratory data and exposure assessments, and supports the process of harmonization with other standards, ...”	
84.	Tell, Ric	C	C.2.2.1 b)	Pg. 9, 2 <sup>nd</sup> sentence	E	Clarify action level	Change 2 <sup>nd</sup> sentence to read: “Therefore the lower tier can be a useful criterion, or “action level,” for determining when RF “awareness” communication and, above which, other elements of an RF Safety Program must be implemented.”	<b>A</b>
85.	Sheppard, Asher	C		96 [86] item g)	T	This is unconditional and therefore wrong. The standard requires a RF safety program if certain conditions are met as in sect. .1.3.2: "when and where there may be access to RF fields, currents, and/or voltages that exceed the lower tier MPEs" (section 1.3.2)	The standard now requires the development of an RF safety program in controlled environments when and where there may be access to RF fields, currents, and/or voltages that exceed the lower tier MPEs.	<b>N</b> <b>(See comment 82)</b>
86.	Cleveland, Robert	C	C.2.2.2.1.1 and C.2.2.2.1.2		T	Comments from Dr. Gandhi and others questioning the accuracy and appropriateness of the rationale for the partial body SAR limit should be satisfactorily addressed if the		<b>N</b> <b>The text in Clauses C.1 and C.2.2.2.1.2 has been revised to</b>

						standard is to be credible. Also, it should be made clear throughout the standard whether a one degree C rise in temperature is to be avoided and, if so, what safety (reduction) factors are in place to ensure that this is done with respect to both whole-body and partial-body exposure. Any inconsistencies between the rationale for partial-body exposure and the ICNIRP rationale to avoid a one degree rise in temperature should also be explained, if there is a claim of harmonization with ICNIRP.		<b>address this concern..</b>
87.	Frysinger, James	C	C.2.2.2.1, 2	Pg. 96		A space was omitted in “1.64°C” which occurs in the sixth line of the third paragraph on that page. Also, a superscripted letter “o” is used instead of a raised circle.		<b>A</b>
88.	Sheppard, Asher	C	98 [88], item 6		T	Suggestion that microwave hearing is a low-level effect is not found elsewhere in document, is misleading in context of “low-level effects” and can be easily misunderstood. Also, missing hyphen (low-level).	Despite more than 50 years of RF research, low-level biological effects have not been established. No theoretical mechanism has been established that supports the existence of any effect characterized by trivial heating other than microwave hearing.	<b>A</b>
89.	Frysinger, James	C	C.3.1	Pg. 104		The equations here are numerical value equations. The units do not work out properly.		<b>N</b> <b>The equations</b>

					<p>Unlike the equations in the main body that have been commented on, these need explicit handling of units. For example, the first one states</p> $I = 1.00 f \text{ mA} \quad (\text{for } 3 \text{ kHz} < f \leq 5 \text{ MHz}) .$ <p>This does not effectively deal with the unit for <math>f</math>. It would be better to write</p> $I = (1.00 \text{ mA/Hz}) f (\text{for } 3 \text{ kHz} < f \leq 5 \text{ MHz})$ <p>or (though requiring a more conscious reading)</p> $I = (1.00 \text{ mA}\cdot\text{s}) f (\text{for } 3 \text{ kHz} < f \leq 5 \text{ MHz}) .$ <p>I happen to prefer my first suggestion as being more obvious to the reader.</p> <p>In the second equation on that page, one would similarly write</p> $I = (0.5 \text{ mA/kHz}) f$ <p>and the subsequent “(f is expressed in kHz)” should be elided. For the sake of generality, yet another way to write numerical value equations is to “divide out” the units for each quantity, which serves to tell the reader “what the quantity is in”. For example, one could write these two equations as</p>	<p><b>are empirical and the unit for current is mA. Modifications have been made in C.3.1.</b></p>
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						<p><math>I/mA = 1.00 \text{ } \mu\text{Hz}</math> (for <math>3 \text{ kHz} &lt; f \leq 5 \text{ MHz}</math>) and</p> <p><math>I/mA = 0.5 \text{ } \mu\text{kHz}</math></p> <p>The use of horizontal lines in lieu of soliduses makes this even more dramatically clear.</p>	
90.	Reilly, Pat	C	C.3.1	2 <sup>nd</sup> Par., line 4, P. 104	E	<p>Ref [B25] cites incorrect paper by Chatterjee et al. I include correct citation on page 237 below. I don't know if this requires change of existing [B25] (it might be cited somewhere else), or the addition of a new cite [B26] I will assume the latter.</p>	<b>A</b> <b>(Original reference not cited in text-replaced B25)</b>
91.	Frysinger, James	C	C.3.2	Pg. 105		<p>Unit symbols may not be altered by attribute indications. [IEEE/ASTM SI 10-2002, 3.5.5] Thus, "450 V-RMS" should be written as "450 V (rms)".</p>	<b>A</b>
92.	Frysinger, James	C	C.3.3.2.2	Pg. 111		<p>The raised dot is used to indicate multiplication of units when written in symbolic form. For other multiplications, however, the multiplicative cross (×) is greatly preferred, as in</p> <p><math>T_{sk} = 45 \text{ } ^\circ\text{C}</math> [15 — 20 mL × 100 cm<sup>-2</sup> ·min<sup>-1</sup>].</p> <p>Note, also, that the "T" needs to be slanted, as written here. Further, the use of "L" is</p>	<b>A</b>

					<p>preferred to “l” for the symbol for liter in the United States; it is recognized the world over so international users should have no problem with this.</p> <p>However, the main problem as I see it is that to me this equation does not make any sense dimensionally. The “15” is apparently of dimension 1 while from it is subtracted a term of dimension meter per minute (since volume divided by area gives length). This whole thing in the square brackets, then, is multiplied by a coefficient with a dimension of temperature to give a value to the quantity on the left which seems to be a temperature.</p> <p>Even if the contents of the square brackets were meant to be a condition and not part of the equation (my kingdom for a “where”!), the contents of the square brackets still do not work out well.</p>	
93.	Frysinger, James	C	C.3.3.2.4	Pg. 112	<p>Apparently, from the textual material, the left hand side of the equation here is meant to look something more like <math>CEM_{43\text{ }^{\circ}\text{C}}</math> with the temperature as a subscript, indicating a condition.</p> <p>The exponent for <math>R</math></p>	A

						<p>should read “43-T/°C”, not “43-T”. The exponent needs to be dimensionless (i.e., have a dimensionality of 1), which means that the dimension of <math>T</math> needs to be removed by unit division. Likewise, the base <math>R</math> should be divided by min, else you end up with min to some strange power. For example, if <math>T = 2\text{ }^\circ\text{C}</math> then <math>R^{43-T/^\circ\text{C}}</math> would have units of <math>\text{min}^2</math>.</p> <p>Obviously, except in the simplest instances, numerical value equations are gruesomely difficult to write.</p>		
94.	Frysinger, James	C	C.3.3.3.1.2	Pg. 114		<p>If “PCO<sub>2</sub>” is meant to indicate the partial pressure of CO<sub>2</sub>, it should be written as “<math>P_{\text{CO}_2}</math>” (but with the “2” sub-subscripted). Similarly for “P<sub>a</sub>O<sub>2</sub>” in C.3.3.3.1.3.</p>	A	
95.	Frysinger, James	C	Fig. C-5	Pg. 125		<p>The symbol for second is s, not sec as is seen on the ordinate axis here.</p>	A (Figure will be redrawn)	
96.	Frysinger, James	C	C.6.2	Pg. 132		<p>The “u” in <math>\square u_c</math> should be slanted.</p>	A (Figure will be redrawn)	
97.	Tell, Ric	C	C.6.3	Pg. 133, line 7	T	<p>Remove discretionary language as to when an RF safety program is to be implemented.</p>	<p>Insert: “An RF Safety Program must be employed for...”</p>	A (...shall be

								employed...)
98.	Frysinger, James	C	Table c.5	Pg. 135		The IEEE SA Implementation Plan for the IEEE Metric Policy has entered Phase III. Normally that would indicate that values should be specified in SI units only. However, I anticipate that this table has tremendous safety import and so, on that basis, I hereby register my <i>nihil obstat</i> — let no one object to the inches and feet used in this table. Of course, it not needed for safety reasons, I would expect those two columns should be removed.		<b>N</b> <b>(Inches and feet retained)</b>
99.	Santomaa, Veli	C		C.7.3	T	Because SI units are used ignore the inches and feets in the table C.5.		<b>A</b>
100.	Fichtenberg, David	C	C.7.6	Pg. 139	T & E	Since there are many studies where the level of evidence did not reach that needed for ‘established effects’ another science-based reason for the lower tier is that these studies are partially taken into account, along with other considerations given.	[after safety factor of 50]. In addition, the committee recognized that many studies reviewed presented a limited set of evidence consistent with potential adverse effects even though they did not result in a combined set of evidence to justify a more stringent hazard threshold. Accordingly, recognizing uncontrolled areas include the general public who do not agree to be subject to	<b>NA</b> <b>See, for example: Annex B.2 Executive Summary</b> <b>A review of the extensive literature on RF biological effects, consisting of well over 1300 primary peer</b>

							<p>being controlled and who may have debilitating conditions, or suffer in high temperature environments, the lower tier also found support.</p>	<p><b>reviewed publications published as early as 1950, reveals no adverse health effects that are not thermally related. This conclusion is consistent with those reached by other scientific expert groups... Further examination of the RF literature reveals no reproducible low level (non-thermal) effect that would occur even under extreme environmental exposures. The scientific consensus is that there are no accepted theoretical mechanisms that would suggest the existence of</b></p>
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								<p>such effects. This consensus further supports the analysis presented in this section, i.e., that harmful effects are and will be due to excessive absorption of energy, resulting in heating that can result in a detrimentally elevated temperature.</p> <p>See also: Annex C.1.1.1 Similarities: All relevant reported biological effects at either low (“non-thermal”) or high (“thermal”) levels were evaluated. Research on the effects of chronic</p>
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							<p>exposure and speculations on the biological significance of low-level interactions have not changed the scientific basis of the adverse effect level.</p> <p>Studies on human volunteers at 4 radio frequencies demonstrate the benign nature of exposure at or slightly above the limits of this standard.</p>
101.	Frysinger, James	C	C.7.8.2.2	Pg. 141		<p>I have heard of “clo” but not “met”. These are not SI units and should be removed, per the policy in the comment just above.</p> <p>They are not even defined in your early frontmatter and I’m sure that few IEEE members would know what they are or how to use them. For example, what about a case where the subject is wearing clothing rated at 1.2 clo; is that</p>	<p><b>N</b></p> <p><b>(Defined in footnote at first appearance)</b></p>

						<p>subject twice as challenged or twice as safe? In C.7.9 we see that the subject might even be wearing 2.0 clo.</p> <p>I don't even know how state what I don't know about met.</p>	
102.	Frysinger, James	C	C.7.13	Pg. 150		This document seems not to be finished or perhaps there is a font problem. I see "[?]" in the third line.	A
103.	Frysinger, James	C	C.7.13.1	Pg. 153		The week is not a unit of time accepted for use with the SI and it does not appear in SI 10. I suggest that "d/wk" be spelled out as "days per week" to give non-fluent speakers of English a chance to understand what is meant; they may not grasp "wk" as meaning "week" as opposed to something else.	A
104.	Frysinger, James	D	D.1.1.2.1	Pg. 160		Rather than using "pps" for pulses per second, please use "Hz". That unit can be used for non-sinusoidal signals.	N (pps spelled out)
105.	Frysinger, James	D	D.1.1.2.2	Pg. 161		The symbol for revolution per minute is "r/min", not "rpm". Likewise, in the "Solution" section, please use "r" instead of "rev" for "revolution".	N (rpm spelled out)

106.	Reilly, Pat	F		citation [R908], P. 223	E	In 2 <sup>nd</sup> line, omit reference to particular page numbers.		<b>A</b>
107.	Sheppard, Asher	F		244 [234] R1097	T	Missing info	Ihrig I., Schubert F., Habel B., Haberland L., Glaser R.	<b>A</b>
108.	Sheppard, Asher	F		255 [245] B134	T	Missing title	"Absorption of microwave radiation by DNA double helix in aquo"	<b>A</b>
109.	Reilly, Pat	G		Citation, Pg. 237	E	Add the flowing cite [B26]: Chatterjee, I., D. Wu., and O.P. Gandhi (1986). Human body impedance and threshold currents for perception and pain for contact hazard analysis in the VLF-MF band. <i>IEEE Trans. Biomed. Eng.</i> , BME-33(5): 486-494. (see also p. 104).		<b>A</b>
110.	Amman, Max				E	I wonder would it look better if the single column format was justified? Just a thought.		<b>N</b> <b>IEEE editor will format.</b>
111.	Brecher, Aviva				T	Congratulations to the Chairs and the Risk assessment and drafting subcommittees for your persistence and endurance! You are to be commended for a monumental effort, courage under fire and turning out such a polished product after a long 6		<b>N</b>

						<p>years.</p> <p>Suggested remedy = I think that this Standard should be issued ASAP, but that a companion article should also be published (in BEMS Journal?) comparing its recommendations to those of WHO/ICNIRP, and justifying major differences over key portions of the RF spectrum, in spite of numerous worldwide harmonization workshops and conferences. I also note that C95.1- 1999 is still NOT listed in the WHO Standards database, though the FCC standards and those of many other countries are. This oversight should be redressed ASAP as well, by letter request from ICES.</p>		
112.	Hare, Edward				T	<p>The ARRL position concurs with the comments of Bill Guy regarding Induced and Contact Currents.</p> <p>We feel that the following changes should be made to the draft C95.1D standard in order to avoid an over-conservative set of limits for Induced and Contact Currents in the MF, HF and low VHF section, 100 kHz to 110 MHz (section 4.2.3, Table 7, Figure 1 and Figure 2):</p>	<p>Add the following Note to Table 7 and Figures 1 and 2: These limits apply to vertically polarized plane waves incident on a standing person in perfect contact with a perfect ground. If any of these conditions are not met, these limits do not apply.</p>	<p><b>NA</b></p> <p><b>Adding “in perfect contact with perfect ground” does not represent realistic exposure conditions. Moreover, the E-field limits below which induced current does not have to be measured</b></p>

								<b>would limit the need for current measurements for most situations.</b>
113.	Glaser, Marne					<p>This standard is a human safety document, and not a science textbook reporting only established facts. It is a safety standard for the voluntary and involuntary exposure of a wide range of people—people of various ages, sizes, and physical conditions—and for which exposure there is some evidence of adverse effects at levels much lower than the hazard effects level used as a basis for this standard.</p> <p>A number of European organizations are applying prudent avoidance principles. IEEE should have such an approach, as required by its Code of Ethic, to provide for public safety.</p>	In view of our limited knowledge on thresholds for all biological effects, unnecessary exposure should be minimized	<p><b>N</b></p> <p><b>This standard is based on science and not on prudent avoidance. See response to comment 17.</b></p>
114.	Glaser, Marne					<p>If the above text (taken from IRPA 1987/88 RF guidelines) is not acceptable, then apply “prudent avoidance,” “as low as reasonably achievable,” or similar term. An alternative text suggested is based on the previous ANSI C95.1-1982</p>	<p>Because of the limitations of the biological effects database, these guidelines are offered as upper limits of exposure, particularly for the population at large. Where exposure conditions are not precisely known or</p>	<p><b>N</b></p> <p><b>Same as response to comment 113 above – also see response to comments 47</b></p>

					standard. The database is now much larger than in 1982, but the number of studies consistent with adverse effects is also much larger. Therefore, the 1982 statement is still applicable.	controlled, exposure reduction should be accomplished by reliable means to values as low as reasonably achievable.	<b>and 47.</b>
115.	Glaser, Marne				<p>According to the Code of Ethics of the IEEE, members must declare any conflicts of interest pertinent to their IEEE activities. Certainly the standard which has been in the process of being created for several years is a critical document for public health and safety in the countries in which it will be adopted—the US being prime among them. The categorical listings members of SC4 give themselves, including such categories as “independent consultant,” may lead the public and government decision-makers to assume a great deal more user-independent influence in these standards than is actually the case.</p> <p>Note: This comment must be satisfied.</p>	<p>Conflicts of interest should be registered by persons, independent consultants among them, who have derived any income, fees, perks, research funding or facilities from users, such as RF technology/weapons industries and the military during the period in which these standards have been in the process of development. The specifics of the ties need to be spelled out. While it may be cumbersome to do so within the standard document itself, a paragraph regarding such conflicts of interest should be included in the standards and specific member conflict-of-interest information should be placed on an easy to access website and referenced clearly and noticeably in the standard.</p>	<p><b>NA</b></p> <p><b>The IEEE requires balance on balloting groups voting on standards, which addresses possible conflicts of interest. The balloting group for the revision of C95.1 meets IEEE criteria.</b></p>

116.	Frysinger, James				General	Numbers extending more than 4 places from the decimal mark should be formatted with groups of three digits each, the groups separated by spaces. I noticed a number of places in Annex B where this was not done (e.g. B.6.4.1 — “420,000 users of mobile phones”).		A
117.	Frysinger, James				General	The first portion of this document seems to be written on U.S. letter paper and a later portion on A4. That will be rectified by typesetting, of course, but it might surprise some of your reviewers when that is done.		A
118.	Frysinger, James				General	A number of the comments in the next section actually apply to many instances in the document which will require similar emendation. Often, it is more productive to choose and elaborate on one or two instances to convey to the WG what is needed rather than to ask them to reason from general comments to specific instances. For that reason, the comments below should be take as being illustrative and not as a complete set of problems.		N

119.	Frysinger, James				Summary	<p>Despite the length of these comments, I must commend the WG for the superb job they have done here. When I first gave the document a quick scan, I feared that the density of quantitative and numerical information would result in a small tome of comments by me. Given this information density, the length of the document, and the incredible breadth of fields that it covers, I am in awe at how well it has been written. Please convey to the WG my highest respect and regards for this magnificent work. As one who uses amateur and marine radio hand-held transceivers and as one who has learned a bit of medicine in my EMT training, I took particular interest in this work. I consider it a pandect on the subject and hope for a speedy emendation, recirculation, and approval process.</p> <p>Please! If there is any question as a result of my comments, do get in touch with me! With best regards...</p>		N
120.	Fichtenberg, David	Page listing members of				The IEEE Code of Ethics requires avoiding "real or perceived conflicts of interest whenever possible, and to	The listing of ballot members should include the name of the organization that he or she identifies as	NA <b>The format is in accordance with</b>

		ballot group			<p>disclose them to affected parties when they do exist." The intent of IEEE-SA policies regarding 'balance' strives to include parties having a variety of perspectives and interests, including the "producers" and "users" of the affected technology. Thus, it is IEEE-SA policy to include in balloting groups persons from organizations whose interests may conflict with those ballot members of other 'balance' groups, e.g. General Public. One might argue that an individual ballot member might be able to best judge if he or she has a "real" conflict of interest.</p> <p>However, the Code of Ethics requires disclosure even when there might be merely a "perceived" conflict of interest by "affected parties". For an IEEE-SA standard, the "affected parties" is the entire universe of all who may be using a IEEE-SA standard or those who rely on it. Neither ballot members nor IEEE-SA can decide with certainty whether any reader of the standard may or may not perceive a conflict of interest that a ballot member from a particular organization may have. Therefore, the only course</p>	<p>being associated with when casting his or her ballot.</p>	<p><b>IEEE procedures</b></p>
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						to take is to include in the standard in the listing of the balloters also the organizations they indicate with which they are associated. Then each reader of the standard can decide for himself or herself whether he or she perceives a conflict of interest.	
121.	Baron, Dave					<p>I submitted my ballot (approve with comments) this evening. I voted for approval based on my belief that the general direction of the revision is good, but not without real reservations regarding the details.</p> <p>I look at the measurement and application details as that is my interest and focus. I look at the steps a user must go through to apply the standard and find it mind-boggling to say the least. The low frequency and higher frequency sections seem as if they were cut and pasted with little or no effort to combine them smoothly and understandably.</p> <p>At the recent AIHA Non-Ionizing Radiation Committee meeting, the revision draft was discussed. The comment made was that this document would be very difficult for the journeyman Industrial Hygienist to use as</p>	<b>N</b>

						<p>parts just cannot be understood.</p> <p>I would really hope some work can be done to smooth the implementation parts of the standard so it can be used and not become a dust-collecting artifact.</p> <p>I'm traveling this week and have been trying to paste together my comments to submit, hopefully soon.</p>		
122.	Testagrossa	General	n/a		G, E	<p>I am having great difficulty accepting the verbiage used for the two tiers. I understand the contentious issues around these choices and wish there was a more suitable choice for these terms: "Action Level" and "Persons in Controlled Environments". In some situations – the upper tier term usage is awkward. As someone who must use this document and refer to it in reports on exposure assessments, I must refer to these tables. Having to write a report that would state "... based on the MPEs for Persons In Controlled Environments...." just sounds (for lack of a better word) bizarre or silly. I appreciate the great effort everyone has put into this standard and I feel it would be a shame to have it weakened with</p>	<p>For lack of a better choice – just refer to the two tiers as everyone does now anyway – Upper and Lower. It is also stated this way in the Introduction</p> <p>The MPEs for the lower tier.</p> <p>The MPEs for the upper tier.</p>	<p><b>NA</b></p> <p><b>This was discussed extensively in the meetings and the decisions have been made as stated in the draft.</b></p>

						<p>this terminology. Particularly the “Persons in Controlled Environments” term. After all, the title of this standard is “... safety levels with respect to human exposure...” and, therefore, the std is applied to humans (or persons)! There is even a reference (4.1.3.1) where the MPEs refer to undisturbed fields – absent of a person! Table titles convey the notion of a “person” by referring to limbs, torso, etc.</p> <p>Also there are a number of cases in Section 4 where just the terms “lower” and “upper” tier are used.</p>		
123.	Fisher (Legal Review)				T	<p><b>Scope:</b> Amend the first three sentences as follows: Recommendations are made to <del>avoid reduce or limit established potential</del> adverse health effects in human beings associated with exposure to electric, magnetic and electromagnetic fields in the frequency range of 3 kHz to 300 GHz. In the frequency range of 3 kHz to 5 MHz, these recommendations <del>protect against</del> <u>reduce or limit</u> effects associated with electrostimulations; in the</p>	<p><b>N</b> <b>NOTE—Draft D2.4, Dated August 7, 2005, has been reviewed by IEEE Editorial Staff and Counsel and the changes in response to the legal review found to be acceptable.</b></p> <p><b>“Avoid” has</b></p>	

							<p>frequency range of 100 kHz to 300 GHz the recommendations <del>protect against</del> <u>reduce or limit</u> effects associated with tissue and body heating. In the transition region, 100 kHz to 5 MHz, these recommendations <del>protect against</del> <u>reduce or limit</u> effects associated with electrostimulation and tissue heating.</p>	<p><b>been changed throughout the draft to “protect against” where appropriate, i.e., where effects associated with heating predominant (frequencies greater than 100 kHz) and changed to “minimize” where effects associated with electrostimulation predominate (frequencies below 100 kHz).</b></p> <p><b>The use of “avoid” vs “limit or minimize” with respect to adverse effects was carefully considered. The conclusion is that “avoid” should be changed to “minimize” only when</b></p>
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								<p>even pain at the limit.</p> <p>However, the suggested changes related to frequencies where tissue heating predominates is inappropriate and would misrepresent the degree of protection found in the standard.</p> <p>Specifically, if adopted, changing “avoid established adverse health effects” to “reduce or limit potential adverse health effects” (for frequencies above 100 kHz) would change the scientific conclusions of ICES and would be misleading. The hazards of RF exposure</p>
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								<p>have well-defined thresholds that can be understood and modeled quantitatively based on underlying experiments and theory in thermal physiology and, therefore, can be avoided.</p> <p>The committee considered the comment and revised the draft to read “protect against” instead of “avoid.”</p> <p>The following is a brief explanation of why the particular language in the draft is appropriate:</p> <p>The subcommittee and working groups followed</p>
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										<p><b>a two-step process to develop the exposure limits set forth in the draft. First was the delineation of the threshold of the threshold for known hazards of RF exposure across the spectrum of frequencies and exposure scenarios within the scope of the standard. Second, exposure limits were set below these thresholds with a sufficiently wide margin of safety that fully avoids the known hazards. Both steps involved identification of the requisite scientific information and provision of clear statements, often using mathematical</b></p>
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								<p>or scientifically possible to exclude the possibility that there may be unidentified hazards. This acknowledgement is not a limitation of the standard, which deals only with the avoidance of known hazards.</p> <p>In summary, the following considerations support retention of certain statements in the standard without the intimation of incompleteness and uncertainty found in phrases such as “reduces or limits [adverse] effects” that were suggested in the IEEE legal review:</p> <ul style="list-style-type: none"> <li>• The overwhelmin</li> </ul>
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								<p>g weight of the scientific evidence shows that RF energy is a deterministic non-stochastic agent that exhibits thresholds for effects and hazards (in contradistinction to other physical agents, such as ionizing radiation, which are considered stochastic agents without clear thresholds for effects and hazards);</p> <ul style="list-style-type: none"> <li>• RF hazard evaluation is a relatively mature field;</li> <li>• More than 50 years of</li> </ul>
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								<p>scientific and engineering research and widespread experience provide ever-greater confidence in the adequacy of the protections embodied in the ICES C95.1 draft standard;</p> <ul style="list-style-type: none"><li>• The draft standard represents refinements and improvements to previous RF safety standards that have a 40 year history of protecting the public and the worker;</li><li>• At least 18 expert panels and government agencies are</li></ul>
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								<p><b>consistent in their conclusion that there are no adverse health effects of RF exposure within internationally accepted exposure limits, including the current IEEE C95.1 standard (see attachment);</b></p> <ul style="list-style-type: none"><li>• <b>The draft standard was formulated by a large number of international experts in engineering, biology, medicine, biophysics, risk assessment, and RF dosimetry who constitute the</b></li></ul>
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								<p><b>subcommittee membership.</b></p> <p><b>For the foregoing reasons, it is unacceptable to introduce those suggested changes that would significantly diminish the advances in standard setting embodied in the draft standard that the subcommittee has worked on for more than 12 years.</b></p>
124.	Fisher				T	<p>If you do use the word “established,” you may want to describe what adverse effects you believe have been “established.”</p>		<p><b>A</b></p> <p><b>The adverse health effects on which the standard is based are now described in 3.1.21.</b></p>

125.	Fisher				T	Annex A describes a process and factors considered in reviewing various studies, it is not clear how the group decided which, if any, adverse health effects were “established.”		<p><b>N</b></p> <p><b>As stated in A.1.9, the conclusions derived from the extensive review process are based on the weight of evidence approach [see 3.1.80] throughout and form the basis of the current revision of the standard.</b></p>
126.	Fisher				G, T	Section 1.3 states that “[t]he recommendations on limiting the potential for adverse health effects from RF exposures have been made on the basis of a comprehensive review of the scientific data.” If the recommendations are for “limiting” and not avoiding, then the word “avoid” should not be used. Also, if the recommendations are for “potential” rather than “established,” then the word “established” should not be used		<p><b>N</b></p> <p><b>Wording changed to “protect against established adverse health effects.”</b></p>

127.	Fisher				T		<b>1.2 Purpose:</b> Amend the first sentence as follows: The purpose of this standard is to provide guidance on <u>avoiding reducing or limiting</u> adverse effects to human health induced by excessive exposure to RF electromagnetic fields over the frequency range of 3kHz to 300 GHz.	<b>NA</b> <b>(See response to comment 123.)</b>
128.	Fisher				T		<b>1.3:</b> Amend ¶ 1, 2 <sup>nd</sup> as follows: <del>It considered</del> <u>In revising the standard, certain</u> findings of studies published between 1950 and December 2003, including those studies that involve low level exposures where increases in temperature could not be measured or were not expected, <u>were considered.</u>	<b>A</b>
129.	Fisher				E		<b>1.3</b> Amend ¶ 1, 4 <sup>th</sup> sentence as follows: This standard provides <del>for the first time</del> guidance on the necessity for an RF exposure control program.	<b>A</b>
130.	Fisher				T		<b>1.3</b> Amend ¶ 2, 1 <sup>st</sup> , 2 <sup>nd</sup> , and 3 <sup>rd</sup> sentences as follows: This standard presents two separate sets of rules to limit	<b>NA</b> <b>(See response to comment 123)</b>

						<p>human exposure to electric fields, magnetic fields, and electromagnetic fields and induced and contact currents to <del>avoid all established</del> <u>reduce or limit potential</u></p> <p>adverse health effects <u>identified in the reviewed studies</u> associated with exposure to such fields and currents.</p> <p>Specifically, in the frequency range of 3kHz to 5 MHz, the rules <del>protect against</del> <u>reduce or limit potential</u></p> <p>adverse effects associated with electrostimulation <u>as identified in the reviewed studies</u>;</p> <p>in the frequency range of 100 kHz to 300 GHz, the rules <del>protect against</del> <u>reduce or limit potential</u></p> <p>adverse health effects associated with heating <u>as identified in the reviewed studies</u></p> <p>In the transition region of 0.1 to 5 MHz, each of the two sets of rules must be applied <u>to limit or reduce potential adverse effects identified in the reviewed</u></p>	<p><b>A</b></p> <p><b>NA</b> <b>(See response to comment 123)</b></p> <p><b>NA</b> <b>(Already said)</b></p> <p><b>NA</b> <b>(See response to comment 123)</b></p> <p><b>NA</b> <b>(Already said)</b></p> <p><b>NA</b> <b>(This is implicit)</b></p>
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							<u>studies</u>	
131.	Fisher				T, E		<p><b>1.3</b> Amend ¶ 4, 2<sup>nd</sup> and 3<sup>rd</sup> sentences as follows: An upper tier is for exposure of persons in controlled environments; a lower tier <del>with an extra margin of safety</del> applies to all other individuals</p> <p>The upper tier is <del>protective for all</del> <u>limits or reduces potential adverse effects identified in the reviewed studies for persons in a controlled environment</u> with an acceptable margin of safety</p>	<p><b>A</b></p> <p>(See response to comment 123)</p>
132.	Fisher				T, E		<p><b>1.3.1 Safety factor and margin of safety:</b> Amend ¶ 1, 1<sup>st</sup> sentence as follows: Below 100 kHz, <del>the a</del> <u>potential</u> adverse effect being <del>avoided</del> <u>reduced or limited</u> is aversive or painful electrostimulation.</p>	<p><b>N</b></p> <p><b>Sentence modified as follows: “...the effect to be avoided is aversive...”</b></p>
133.	Fisher				G, T	<p>As for Sections 3.29 and 3.30, when the term “established” is used, it seems to be for the entire range of frequencies addressed by Draft Standard PC95.1. However, in Annex B, the Draft Standard PC95.1 states that</p>		<p><b>NA</b></p> <p><b>The mechanisms underlying the interaction of RF energy with</b></p>

						<p>“[a]lthough this standard considers the entire frequency range between 3 kHz through 300 GHz, a majority of the studies evaluated employed RF signals relevant to various communications, industrial, and radar technologies. In general, studies are not identified or separated to specific frequencies or modulation characteristics . . . .” This statement seems to suggest that there may not be “established” adverse effects for the frequency ranges. We may want to consider not having definitions 3.29 and 3.30 or limit them to the ones specifically being endorsed by the author of this Draft Standard PC 95.1</p>		<p><b>tissue are sufficiently well-known and supported by the review of the database that it is scientifically justifiable to extrapolate results obtained at specific radio frequencies to all frequencies within the RF spectrum.</b></p>
134.	Fisher				T		<p><b>4.1 Basic restrictions (BRs) and maximum permissible exposures (MPEs) for frequencies between 3 kHz and 5 MHz:</b> Amend the 1<sup>st</sup> sentence as follows: This standard provides <del>protection</del> <u>recommendations to limit or reduce</u> <del>against</del> aversive or painful electrostimulation in the frequency range of 3 kHz to 5 MHz and <del>against</del> <u>to limit or reduce</u> adverse tissue heating in the frequency range of 100 kHz</p>	<p><b>N</b> Sentences have been modified. “Minimize” is used re electrostimulation, but “protect against” is used re adverse tissue heating.</p>

							to 300 GHz.	
135.	Fisher				T		<p><b>4.2.1 BRs for whole-body exposure for frequencies between 100 kHz and 3 GHz:</b> Amend the 1<sup>st</sup> sentence and last sentence in ¶ 1 as follows: The whole-body average BRs shown in Table 6 are based on <del>established</del> adverse health effects <u>suggested in the reviewed articles</u> associated with tissue heating or heating of the body during whole-body heating.</p>	<p><b>NA</b></p> <p><b>The hazards upon which the standard is based have been established, not suggested or speculative effects.</b></p>
136.	Fisher				G, T, E	<p>Please consider doing a global search for the term “established.” To the extent, the term established is used to modify “adverse health effects,” please consider deleting the word “established” and adding the phrase “suggested in the reviewed articles.”</p>		<p><b>NA</b></p> <p><b>(See response to comment 135)</b></p>

137.	Fisher				T		<p><b>4.2.1</b> Applied to the members of the general public, the lower tier provides more assurance that continuous, long-term exposure of all individuals in the population, will <del>be without</del> <u>reduce or limit</u> risk of adverse effects <u>suggested in the reviewed articles.</u></p>	A
138.	Fisher				T, E		<p><b>4.3 BRs for frequencies between 3 GHz and 300 GHz:</b> Please amend the section as follows: BRs to <del>protect against</del> <u>reduce or limit potential</u> adverse effects associated with tissue heating are established for incident power density for frequencies between 3 GHz and 300 GHz. Such restrictions are derived with consideration of adverse effects thresholds <u>based on the reviewed articles.</u></p> <p><del>their</del> <u>the distribution of these adverse effects</u> among the population, and safety factors</p> <p>The BRs for frequencies between 3 GHz and 300 GHz are the same as the corresponding MPEs shown</p>	<p>NA (See response to comment 123)</p> <p>A</p> <p>NA (Redundant)</p> <p>A</p>

							in Table 8 and Table 9. <del>and are considered protective appropriate for all human exposure.</del>	
139.	Fisher				T		<b>4.4 MPEs for frequencies between 100 kHz and 300 GHz:</b> Amend ¶ 1, 1 <sup>st</sup> sentence as follows: Because of the difficulty in determining whether an exposure complies with the BRs, derived limits (MPEs) to <del>protect against</del> <u>limit or reduce potential</u> effects associated with heating are provided below for convenience in exposure assessment	<b>NA</b> <b>(See response to comment 123)</b>
140.	Fisher				T		<b>A.2.2 Assessing thresholds and dose-response relationships:</b> Amend the last sentence as follows: Exposure limits can then be developed to <del>protect against</del> <u>reduce or limit the</u> occurrence of <del>the</del> <u>potentially adverse</u> effects to human beings.	<b>NA</b> <b>(See response to comment 123)</b>

141.	M Fisher (Editorial Review)				E	<p><b>Items/issues that shall be resolved before ballot (or next recirculation)</b></p> <p><b>Copyright</b></p> <ul style="list-style-type: none"> <li>All copyright permission for excerpted text, tables, and figures shall be submitted to the IEEE prior to the start of ballot or next recirculation. If there are missing or needed permission letters, please submit them immediately to your Staff Liaison. Sample permission letters are available in Annex D of the <i>IEEE Standards Style Manual</i>.</li> <li>The correct copyright line shall appear on the bottom of every page, including the body of the standard:</li> </ul> <p>Copyright © 2005 IEEE. All rights reserved. This is an unapproved IEEE Standards Draft, subject to change.</p> <p><b>Standards designation</b></p> <ul style="list-style-type: none"> <li>The correct standard designation and date shall appear in the upper right corner of every page, including the body of the</li> </ul>		<p><b>A</b> <b>(Accept all)</b></p>
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					<p>standard. IEEE P95.1/D2.2, March 2005</p> <p><b>Scope</b></p> <p>Please note that the scope of the document must be within (i.e., less than or equal to) the scope of the PAR. If the scope is not within that of the PAR, the scope of the document must be updated or the PAR must be updated. Balloters will review the scope during the balloting process as one of their responsibilities.</p> <p><i>The scope in this draft is considerably more detailed than the scope in the PAR. Please review.</i></p>		<p><b>(Modified PAR will be submitted)</b></p>
142.	M Fisher				<p><b>Items/issues that shall be resolved before RevCom (or final recirculation)</b></p> <p><b>LEGAL REVIEW</b></p> <p>The draft has been submitted for legal review. Comments from this review will be submitted during the ballot, and should be incorporated into the draft then recirculated.</p> <p><b>Trademarks or service marks</b></p> <ul style="list-style-type: none"> <li>▪ Please review the use of trademarks in the draft, if applicable. References to commercial equipment or products in a standard shall be generic and shall not include</li> </ul>		<p><b>A</b></p>

						<p>trademarks or other proprietary designations. Where a sole source exists for essential equipment or materials, it is permissible to supply the name of the trademark owner in a footnote. The proper use guidelines for trademarks shall be determined by the trademark owner. Trademark owners must grant written permission before their trademarks may be referenced in a standard.</p> <ul style="list-style-type: none"> <li>▪ Trademarks or other proprietary designations that are not commercial equipment or products should be avoided in standards. If used however, all trademarks shall be credited to the trademark owner in the front matter of the standard. The following text shall introduce any mention of specific trademark information:</li> </ul>		
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Draft response to Mike Fisher, IEEE Standards Project Editor.

The committee is grateful for the detailed comments from Mr. Fisher on the draft standard (ICES C95.1 Draft 2.2 “Draft IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”) as they provide further opportunity to clarify the committee's application of scientific and engineering knowledge to definitive rules for radiofrequency safety. Although some suggested changes in language enhance clear expression of the committee's intentions, others are inimical to them. We are thankful for the former and have incorporated them, as indicated in the attached revision pages. However, it is the latter suggested changes that led to the following statement adopted in committee on June 25, 2005.

The draft standard was developed from a scientific perspective that allows setting a bright line for hazardous exposures based on an extensive body of scientific and engineering research. This research has incorporated refinements and improvements to previous RF safety standards going back more than 50 years. Our deliberations during development of the standard involved two major steps. First was delineation of the known hazards of RF exposure which could then be addressed the second step, which was setting exposure limits that fully avoid the known hazards. Both steps involved identification of the requisite scientific information and provision of transparent statements, often requiring mathematical expression, to define exposure conditions that would be non-hazardous for exposed persons. In so doing, the committee dealt in a quantitative manner with the unavoidable uncertainties of physiological responses to environmental exposures in order to arrive at standards that were protective beyond the range of influence of those unavoidable sources of uncertainty. This approach to standard setting explicitly makes unnecessary and improper the intimation of uncertainty found in phrases such as "reduces or limits [adverse] effects".

Of course, as the draft standard acknowledges, it is not logically or scientifically possible to exclude the possibility that there may be unidentified hazards. This acknowledgment is not a limitation on the standard, which deals only with avoidance of known hazards. Furthermore, this limitation has no relationship to the type of scientific uncertainty that might, in other circumstances, require language of the type suggested by Mr. Fisher.

For these reasons, the committee believes that it would be improper to introduce language in the text that would greatly diminish, if not wholly destroy, the advances in standard setting embodied in the draft.

Mr. Fisher also suggested that the standard provide an explicit statement of those effects that are established. This information now appears briefly in paragraph 1.3 and at greater length in paragraph 3.5 and subsidiary paragraphs. Recognizing that Mr. Fisher's suggestion would significantly improve understanding of this large document, section 1.3 has been revised to more

clearly specify established effects that are avoided by adherence to the exposure limits.

**Action items arising from the December 4, 2004 meeting of SC-4  
Updated on June 25, 2005 in Dublin**

	<b>Action</b>	<b>Responsible Individuals</b>	<b>Date Due</b>	<b>Status</b>
1.	Conduct global search for terms defined in clause 3 and delete that those that are not used.	Petersen	1/1/05	Closed
2.	Develop caveat for currents induced on wires, pipes, etc.	Osepchuk, Petersen	1/1/05	Closed
3.	Develop caveat to the effect that high power densities (above 1000 W/m <sup>2</sup> ) may be perceived.	Osepchuk, Petersen, Blick	1/1/05	Open, check
4.	Global search to ensure that “energy” and “power” are used correctly.	Petersen	1/1/05	Closed
5.	Review comment #27 re auditory response/MRI	Elder	1/1/05	Closed
6.	Add “SI” to list of abbreviations	Petersen	1/1/05	Closed
7.	Review comment #30 re window effects	Swicord	1/1/05	Closed
8.	Need explanation of relaxation associated with changing peak spatial-average SAR values and averaging volume, e.g., press release	Lang	At time of publication	Open
9.	Provide additional studies/report citations (additional to those listed, e.g., HCN, Zimrou, etc.)	Johnston	1/1/05	Closed
10.	Provide report by German Radiation Institute	Bodemann	1/1/05	Closed
11.	Explain rationale for changing peak spatial-average SAR values and averaging volume	Lang	1/1/05	Closed
12.	Revise 2 <sup>nd</sup> paragraph of C.2.3 to read the same as Note A of Tables 8 and 9	Petersen	1/1/05	Closed
13.	Explain Figures 3 and 4 e.g., far field exposure	Tell	1/1/05	Closed
14.	Place Figures 3 and 4 before 1 and 2 and renumber.	Petersen	1/1/05	Closed

	<b>Action</b>	<b>Responsible Individuals</b>	<b>Date Due</b>	<b>Status</b>
15.	Revise 4.3, 4.4, 4.7 and C.7.3 re references to near-field/reactive near-field measurement issues.	Tell	1/1/05	Closed
16.	Resolve nomenclature for lower tier (action level, trigger level, etc.)	Ed Committee	1/10/05	Closed
17.	Prepare report summarizing results of literature evaluation.	Blick, Hurt	1/10/05	Check
18.	Review Annex A for consistency re literature evaluation	Adair	1/1/05	Closed
19.	Provide Adair with statistics on the literature evaluation, e.g., how many papers, how many reviewed, etc.	Blick	1/1/05	Closed
20.	Check to see if the list of reviewers can be included in the front-matter of the standard	Ash	12/15/04	Closed (Cannot)
21.	Provide list of all reviewers who returned evaluations	Blick, Hurt	1/31/05	Check
22.	Discuss possible ways of examining the results of the literature evaluation, e.g. summarize statistics for each reviewed paper	Ed Committee	Ongoing	Open
23.	SC-3 and SC-4 co-chairs to discuss reasonable criteria for SC membership.		Ongoing	Closed
24.	Draft letter to OSHA re updating OSHA standards to inform them of C95.1 revision	Petersen, Curtis	At time of publication	Open