



**INTERNATIONAL
COMMITTEE *on*
ELECTROMAGNETIC
SAFETY**

**TECHNICAL COMMITTEE 95
SUBCOMMITTEE 3
SAFETY LEVELS WITH RESPECT TO HUMAN EXPOSURE, 0 to 3 kHz**

**MINUTES OF MEETING
30th Meeting
IEEE Operations Centers
Piscataway, NJ 08854
Tuesday, August 29th, 2006 (1:30 pm – 5:00 pm)**

AGENDA

- 1. Call to Order – 1:06 PM** Chair (Dovan)
- 2. Self Introductions & Attendance Roster** Chair
- 3. Opening Remarks** Chair
Ken Gettman serving as temporary secretary for this meeting
Major item related to Interpretation Request from TC95/SC1.
An update of draft standard from Australia.
- 4. Approval of Agenda** Chair
Approval moved and seconded. Considered approved.
- 5. December 2005 Meeting Minutes** Chair
Minutes not provided and Chair requested for deferral to next meeting. Moved and seconded. Approved.
- 6. Chairman's Report** Chair
 - Excused absence of Cochair Phil Chadwick and he plans to attend the next meeting.
 - Emphasis for this meeting was on discussion with SC1 on "interpretation Request" for clarification of "appropriate metrics" to be used for compliance assessment.
 - Considerations be given for discussion on C95.6 in 2007 (5-year after publication).
 - SC3 has set up basic web site but this will be replace by new facility in the planned ICES Site.
- 7. Secretary's Report** Secretary
Request for volunteer to be permanent secretary made to attendees.
- 8. ICES TC95 ExCom Report** ICES Chair
 - C95.1 and .7 were published in 03/06. Policies and new organization is being reviewed by standards auditing committee.
 - Contract given out for new web site – to include main committees and subcommittees, means for distribution of documents. Demo to be given during Main committee meeting. Domain name will be more related to ICES. Will be similar to Z136 committee site. Chairs will have access for maintenance. HTML input will not be required.
- 9. Interpretation Request from SC1** Interpretation WG Chair (Petersen)
Presentation of questions made to attendees. Emphasized that choosing correct metrics provide for reduced uncertainty, for consistency and for instrument maker guidance. Stressed reduction of "bias" as the basis for choice of metric.

10. Discussion & Response to SC1 Interpretation Request

Dovan & Reilly

Thanh Doan:

Thanks to SC1 for the request and the opportunity to have face-to-face meeting and he

- acknowledged that it would be helpful, where (MPEs) are provided for all possible exposed conditions to aid compliance evaluation to a wide range of complex magnetic field characteristics. However, in practice, Basic Restrictions for in-situ fields and maximum permissible exposure (MPE) for environmental fields in standards/guidelines are constrained by limitations, including such factors as available experimental data, induction models, and exposure conditions.

- Acknowledged that there may be confusion regarding the terms “resultant” field and “polarization” (somewhat different interpretation for power engineering vs. optics and radio frequency).

J Patrick Reilly:

– goal of committee to explain intent of limits so that SC1 can develop measurement guidance and explain how to develop instruments. Part of basic restriction is to specify limit of voltage between any two points 5mm apart, in any orientation. RMS is used because standards typically written that way, and also need to understand waveform, where different set of rules for non-sinusoidal waveforms. Measurements can be taken with assumption of in-phase waveforms as conservative case so that compliance ensures meeting MPE but non-compliance measurement may need to be checked further. Development of MPE did not employ complex models because found as much as 5:1 variation of results, but recent modifications to anatomical models have improved capability.

- With respect to static fields, basic restrictions premised on the induced field in various parts of the body. Table 1 for restrictions states that where field is less than specified frequency then the limit is based on peak exposure.
- With respect to Fourier component, standard gives choice of methods for non-sinusoidal fields, with Fourier analysis as one of choices. Agreement with use of different coefficients but need to be consistent.
- With respect to spatially non-uniform fields, electric field limits essentially not present in real world. However, limits do provide protection against indirect effects. Thought was typical high level fields would be located where reduced likelihood of contact with grounded part. Point made that measurement coils sizes need to be constrained so that gain consistency of results. But need to evaluate what sizes are appropriate. SC3 made assumption that coil size could be proportional to body size for linear fields but smaller coil would be needed for non-linear fields. However, it was noted that a smaller the coil size would result in a more severe application of the requirements.

Reiterating some of the information provided in the standard, Reilly outlined:

- the required metrics (whether measured in rms or peak values) for the Basic Restrictions and MPE's for sinusoidal and non-sinusoidal (e.g., superposition of multiple frequencies or pulsed) fields
- the treatment of spatially non-uniform magnetic field where at present a "worst-case" assumption is made for the relevant human body. For the electric field, MPE refers to an unperturbed field and assumes that the human is standing erect over a ground plane.

General discussion:

Another important technical discussion at the ICES SC3 August meeting related to the question of multi-sensor magnetic field meters in which the orthogonal components (without phase information) were added by the 'root-sum-square' method to provide the 'resultant' field, according to Doan. While this 'resultant' method may address the worst-case condition, it can overestimate the actual field and create concern about the degree of accuracy of compliance evaluation, he added. A situation in which the environmental magnetic field level is near the MPE is not very common in practice, as shown in work by authors including Dan Bracken, a member of the SC3 Application Guide Working Group, Doan pointed out. But when it occurs, measurement with additional phase information can be carried out.

In addition, Doan stressed, C95.6 also states that lack of compliance to MPE does not imply lack of compliance to the fundamental Basic Restrictions, but rather it may suggest that it is necessary to evaluate whether the Basic Restrictions have been met.

Summary:

SC3 will prepare letter response to SC1. Once agreement reached on interpretation is achieved then likely need a revision to C95.6. Anticipate response to SC1 circulated to SC3 members for within 4 weeks, then forward to ICES Chair as formal interpretation.

Motion for SC3 to draft response, circulate to membership, forward to SC1, and then forward to Chair of ICES once agreement achieved. Seconded and approved.

ACTION: Chair to coordinate development of response.

11. C95.6 Revision/Reaffirmation (2007)

Dovan

First published in 2002. IEEE has 5-year revision/reaffirmation cycle. A number of comments have been submitted, thus indicating good level of interest. Interpretation with SC1 will likely need revision or amendment to the document. Need to submit project initiation request. Decision on choice of revision/amendment/reaffirmation needs to be done at next meeting.

ACTION: Chair of SC3 will distribute request to membership for submittal of revisions specified for a particular objective.

Proposal made for workshop on “Modeling ELF exposure – Impact on standards setting” to be held in conjunction with next meeting. Premise is to discuss current status and reliability of ELF modeling (existing C95.6 is based on ellipsoidal model). Workshop would promote ICES standards and organization.

12. C95.6 Application Guide Working Group

Dovan

Small group had been set-up but little progress made. Perhaps interpretation request is justification for moving development forward.

ACTION: Chair to prepare several questions for WG to develop.

13. Update on International Standards Activities

Chair & Presenters

- CENELEC group has developed draft of occupational exposure standard. Annex included concept of zoning.
- ICNIRP workshop held earlier this year – C95.6 acknowledged and appreciated. Standard now considered the “gold standard” for ELF EMF, largely due to the emphasis on internal electrical field effect with respect to electrostimulation. It was indicated that ICNIRP uses occupational vs. non-occupational exposure where C95.6 uses controlled vs. non-controlled.
- Australian Standard – document for ELF expected to be released soon for public comment. MPE levels are somewhat similar to IEEE in shape of graph but at lower values.

14. Other Old Business

Chair

None.

15. New Business

Chair

Suggestion made to include information on the biological endpoint that is being avoided by the specification of the MPE levels in the standard. Point made that the standard does have conceptual information addressing this concept and the MPE is different from the Basic restrictions.

Suggestion that new technologies for non-lethal weapons employing induced biological effect should be addressed by saying that standard does not apply. It was pointed out that COMAR may be the more appropriate venue.

ACTION: John Osephchuk will bring up to ICES ExCom for decision on where to address.

16. Next Meeting – SC 3 and IEEE/ICES Committee

ICES Chair

Tentatively for London or Dallas in Spring 2007.

17. Adjournment

Chair

Thanh Doan
August 2006