



STANDARDS COORDINATING COMMITTEE 28 (NONIONIZING RADIATION)

Approved Minutes

IEEE SCC-28, Subcommittee 4

Technical University of München

München, Germany

Saturday, 10 June, 2000

1. Call to Order

The meeting was called to order by Co-Chairman J. D'Andrea at 1:35 PM.

2. Introduction of those present

T. McManus made a special announcement and asked each of the guests he invited from Europe and elsewhere to stand and be recognized while he introduced them as special guests. He invited the special guests to attend the SCC28 meeting and to consider joining SCC-28. Co-chair Chou then asked the remainder of the attendees to introduce themselves while the attendance sheet was being circulated. Co-chair D'Andrea welcomed the attendees noting the many new faces. (See Attachment 1 for attendance list.)

3. Approval of Agenda

J. D'Andrea reviewed the agenda (Attachment 2) and called for additions. Chou requested placement of J. R. Ashley's proposal for a revision of C95.1 as a discussion item under New Business. Following a motion by E. Adair that was seconded by D. Blick, the amended agenda was unanimously approved.

4. Approval of Minutes of the October 17, 1999 Meeting

The secretary, R. Petersen, acknowledged the written comments submitted by L. Heynick (see Attachment 3). Following a motion by A. Varanelli that was seconded by E. Adair, the minutes of the October 1999 meeting were approved with Heynick's comments noted.

5. Secretary's Report

R. Petersen reported that a number of changes are being introduced by the IEEE-SA Standards Board to facilitate the approval process for standards. One such change is the

implementation of a system for continuous processing of Project Authorization Requests (PARs). With this system, selected PARs will be reviewed and can be approved during the interval between the quarterly meetings of the Standards Board. Also, coordination requirements are being relaxed. Formerly, evidence of coordination with societies and organizations identified by the sponsor or by the New Engineering Standards Committee (NESCom – the committee that reviews the PARs) had to be provided at the time the standard was submitted to the Review Committee (RevCom) for Standards Board approval. This evidence required a written statement from each coordinating organization listed on the PAR identifying a member of that organization as the coordinator, and a written statement from the designated individual that he or she approves the standard. Any comments from the coordinating organization have to be addressed. The intent now is to make coordination optional (except for IEEE Staff Editorial Review and review by SCC 10 and 14 – IEEE Dictionary, and Quantities, Units and Letter Symbols, respectively). NesCom and the sponsor can still recommend coordination and any comments received should be recognized and considered but confirmation will only be required from the mandatory entities. That is, RevCom will no longer hold up a standard for lack of documentation of optional coordination.

Petersen also reported that he discussed with members of the Standards Department the issue of having each of the project numbers of the SCC-28 standards assigned a C95 number, rather than the sequential numbers now assigned. Thus the standard on electroexplosive devices would be C95.x instead of 1472, the 0-3 kHz standard would be C95.y instead of 1555, etc. These changes require approval of a modified PAR for each project.

6. Chairman's Report

Co-chair Chou noted that Membership Chairman Tom McManus invited more than a dozen international representatives to these meetings and pointed out that IEEE is an international organization. He encouraged participation in the work of the subcommittee and said that he intends to hold more future meetings in Europe. He then discussed the proposal from SCC-34 to have SCC-28 consider the pinna as an extremity, subject to the same SAR limits as the other extremities, e.g., hands, wrists, ankles. He said that a working group of SCC-34/SC-2 has agreed on a rationale including specific wording as to how spatial averaging should be carried out in parts of the body with small cross-sectional areas, such as the pinna. Petersen said that the draft would be submitted to SC-4 for approval in principle – not in detail. He said that it would be more appropriate to include parts of the proposal involving details about spatial averaging in C95.3. In response to a question from R. Cleveland, Chou explained that a working group would be established to address the biological rationale for relaxing the SAR limits for the pinna.

Co-chair D'Andrea presented the revised timelines (see Attachment 4) for the revision noting that the effort is falling behind. He noted that the last two items have to be completed by September 1, 2000, i.e., before the second meeting of the SC-4 Revision Working Group, which meets on September 7 and 8. He explained that the delay has been due to the literature evaluation process bogging down. Chou solicited the audience for additional reviewers. D'Andrea said he expects to have partial first draft by November when SC-4 meets in San Antonio.

7. Executive Committee Report

J. Osepchuk reviewed the IEEE presentation given earlier in the day at the SCC-34 meeting. He noted that J. Gorman of IEEE would give a more detailed presentation at the SCC-28

meeting on Saturday. He then briefly reviewed the history of the C95 standards beginning with the establishment of the committee in 1960. He noted that the 1982 standard was the first to include dosimetry and SAR as the important parameter at radio frequencies. He said that the principle of SCC-28 is to develop standards that are based soundly on science and quoted the first chairman, Dr. Herman Schwan, who stated that “good science will never be outdated.” Osepchuk acknowledged the successful efforts of T. McManus and M. Murphy in attracting the interest in SCC-28 activities of a number of important scientists – many of whom are at the meeting. He explained the requirements for joining SCC-28 and any of its subcommittees and described the function of the Executive Committee (EXCOM). He pointed out that the EXCOM consists of the Chair, Vice-Chair, Executive Secretary and Treasurer of SCC-28 plus the IEEE Staff Liaison and the Chairs of the Membership Committee and the International Liaison Committee. The EXCOM meets several times a year – lately the focus has been on increasing membership from outside of North America.

8. Risk Assessment Working Group Report

No report.

9. Mechanisms Working Group Report

No report.

10. Literature Evaluation Working Group Reports

a) **Literature Surveillance.** D. Blick presented the report for L. Heynick noting that 1387 citations are now the citation list. Heynick is still soliciting input regarding additional papers considered important for the revision and the new citation list has been posted on the SCC-28 web site. (See Attachment 3 for written report.)

b) Engineering.

No report.

c) ***In Vitro.*** M. Meltz presented an overview of the literature evaluation process pointing out many of the complexities. He noted that many papers have good engineering/dosimetry but poor biology and vice versa. Even though some of the papers in the database have been reviewed earlier, e.g., for the 1991 standard, or on paper – not electronically, the goal is to thoroughly review all of the papers deemed important and to get the reviews into the electronic database. Meltz described the different evaluation working groups, e.g., engineering, in vitro, in vivo, epidemiology, and stated that additional reviewers with expertise in science, regardless of their personal opinions, are needed to move the process. He described the scoring system pointing out that each of the sections, e.g., dosimetry, exposure system, is scored between 1 and 3, with 3 being the highest, and the paper is given an overall score between 1 and 5. For the overall score, 3 would be average, 4 above average etc. Papers with overall scores of 1 or 2 on the engineering or the biological evaluation are considered not acceptable. If the overall score differs by more than 2 between reviewers, the paper is sent to a third randomly selected reviewer. Low scores on any of the sections require written explanations. Initially, only the chairman of the Risk Assessment Working Group will have all of the scores and will be able to determine if any particular paper is acceptable or unacceptable. Meltz pointed out that the reviews have been prioritized by topic with the initial focus on mutagenicity and cancer.

Meltz explained that we now need to examine the list of papers that have been completely reviewed and have each section editor of the revision determine which of the remainder should be reviewed. The intent is to focus on those papers to help move the process forward. He welcomed anyone interested in participating in the evaluation process and said they should contact C. K. Chou or J. D'Andrea. He then requested that members of the editorial committee submit a list of topics that need to be addressed and to identify key papers. He also requested that this be done before the end of July. In response to a question from K. Gettman, Meltz explained that the evaluations and scores of the completed reviews are confidential and can not be posted on the SCC-28 website. It was agreed earlier that the data would remain confidential until a balloting draft is completed. In response to a question from E. Adair, Meltz said that lists of critical papers should be sent to C. K. Chou. V. Anderson asked if the results of the evaluations would be shared with ICNIRP – Meltz explained that they would not but anyone on ICNIRP could participate in the evaluation process or the Risk Assessment Working Group activities.

M. Swicord explained that the greatest value of the evaluation process may be feedback from the scientific community but recognized that at this time there is no feedback path. He asked whether we should re-think the process. Meltz said that he has been thinking about this but has not come to any resolution. One thing, he suggested, would be to send the last screen to journal editors – in fact all of the screens would be useful as a checklist for journal reviewers. He suggested that the screens could be sent with the article being reviewed to ensure that all relevant data are included in the paper. He noted, however, that sometimes the sparseness of engineering data, for example, rests with the journal editor's effort to reduce the number of pages.

- d) ***In Vivo***. D. Blick reported that there appears to be a lack of commitment by some of the reviewers, i.e., while a small number of reviewers are active and get reviews back on time some don't respond on time or at all. He said that he supports the idea of identifying key papers and moving them up in the queue and appealed to the audience for additional reviewers with *in vivo* and RF expertise. He noted that a total of 208 papers have been completely reviewed by two or more reviewers.
- e) **Epidemiology**.
No report.

11. Editorial Committee Reports

- a) **Revision Working Group**. C. K. Chou reported that the first meeting of the Revision Working Group was held in Florida in March. (See Attachment 5 for the agenda.) He said that breakout sessions were held of the 2nd day to address specific issues. He was disappointed that of the nineteen people who attended, there was no representation from the federal public health agencies. He briefly reviewed the summary of the meeting (see Attachment 6) and explained that there was consensus that for frequencies greater than 100 kHz the only established effects are thermal in nature and are associated with electrostimulation at frequencies below about 100 kHz. He also reported that there was support for a single tier standard. Because of the lack of participation from the federal public health agencies, the next meeting will be held September 7-8, 2000 in Washington, DC.
- b) **Topic Reports**

- i) **Spark discharge.** J. P. Reilly reported that he is proposing additional limits for touch contact, which will be lower than the present limits because of the small area/high current density involved. He said that they would be more in line with the limits of ICNIRP and NRPB. He also said that he is looking for a meaningful, easy-to-measure quantity to limit spark discharge but may have to settle for providing a narrative rather than additional limits.

He also reported that the language now in the standard that addresses peak-field limits might allow exposure to pulsed fields that exceed the thresholds for electrostimulation at frequencies above 100 kHz to, perhaps a few MHz. That is, compliance with the SAR-derived limits for exposure to pulsed fields may not preclude effects associated with electrostimulation in this frequency range. J. Osepchuk asked whether proposed changes would involve a change in averaging time, specifically how the limits on peak fields would fit in with the averaging time at the low frequency end. Reilly responded that it probably would require a change. He added that when he looked at the frequency summation formulas in ICNIRP and NRPB, he thought that they might be too conservative for non-sinusoidal waveforms. He said that he would be presenting material in Brussels, after which he would provide a copy for consideration by SC-4.

- ii) **Thermoregulation.** E. Adair reported that she discussed a draft “white paper” on thermoregulation at the Revision Working Group meeting in March. The presentation included background data and a recommendation for limits based on deep core temperature. She briefly reviewed some new data on human volunteers exposed under far-field partial-body conditions at 450 and 2450 MHz. The exposures were dorsal, for 45 minutes and under three controlled environmental conditions and exposure levels – 0, 27 and 35 mW/cm². She now has permission to go to higher exposure levels – up to 70 mW/cm², which represents a spatial peak SAR of 14.4 W/kg. Seven volunteers will be exposed at 45 or 70 mW/cm² over approximately one-third of the total skin surface of the body. The calculated whole-body-averaged SAR at the higher level is about 1 W/kg at 2450 MHz, which should result in a skin temperature increase of approximately 2 °C. She pointed out that the skin temperature should begin to decrease before the exposure ends because of sweating. She noted that the esophageal temperature remains essentially constant over the entire exposure duration despite the exposure level. Adair concluded by pointing out that the sweat rate increases quickly with increasing environmental temperature but she seldom sees sweating in the cooler environments. The bottom line is that if the standard is to protect against effects caused by heating, the whole-body-averaged and the peak SAR limits in the standard are too low.

G. Lotz stated that if the SAR limits are raised, a caveat in the standard to address hot environments will certainly be required. R. Cleveland asked if any work has been done at lower frequencies. Adair responded that 450 MHz is the lowest frequency that was used but she is in the process of developing a 100 MHz system for whole-body exposures, i.e., near resonance for a seated individual. Also, in response to a question about non-thermal effects, Adair stated that she is not dealing with that issue and would not know how to determine such effects anyway. In response to a question from D’Andrea regarding potential effects to the eye at 70 mW/cm², Adair pointed out that based on the animal data there should not be any.

- iii) **Non-thermal effects.** See Attachment 3.

iv) Selection of an adverse effect level.

No report.

- v) Whole-body SAR limit.** M. Meltz explained that he needs help in defining this. He discussed the practice in ionizing radiation of weighting organ dose but said he is not sure how, or if, this relates to RF. He said the issue is how to think about local SAR since the human body is made up of tissues with different cells, blood flow, etc. He asked the rhetorical question about whether the revision should be based on hyperthermia and how long a specific temperature can be maintained before cell killing takes place. He pointed out how this is a unique issue and asked for comments on an approach. He cited examples where cell killing occurred at 30 W/kg but not to chemically treated cells at temperature increases of a few degrees. V. Anderson asked whether a limit based on a 1 °C temperature rise is valid – Meltz replied that maybe it is not – perhaps it should be higher.

vi) Spatial averaging.

No report.

vii) Single versus two tiers.

viii) No report.

- ix) Peak power.** D'Andrea reported that there has been little activity on this issue since the last meeting. He pointed out that there are limits in C95.1-1991 and the literature indicates that very high peak power exposures are required in order to produce reproducible effects.

- x) Low power device exclusion, measurement distance, harmonization with ICNIRP.** Petersen reported that the 1991 standard contains an exclusion that exempts certain devices from SAR characterization if the radiated power is below some nominal level. He said that this provision should be retained but the levels should be re-evaluated based on the tremendous amount of data available from various cell-phone certification programs and the work of SCC-34. Realistic values cannot be decided, however, until the peak spatial-average value and the averaging volume issues are resolved, i.e., 1.6 versus 2 W/kg and 1 g versus 10 g of tissue. He also discussed measurement distance pointing out that changes have already been incorporated into the supplement to the 1991 standard.

- xi) Averaging time.** J. Osepchuk reviewed the rationale for the averaging time in the 1991 standard. He noted that the averaging time at 1 mm (300 GHz) matches the averaging time for infrared (IR) lasers found in the ANSI Z136.1 standard and the IEC standards. However, he explained, the C95 MPEs are higher for short exposures at microwave and millimeter-wave frequencies, i.e., where the penetration depth is comparable to those at IR wavelengths, than the laser MPEs. This led to the caveat “except for the eyes and testes” in the partial body relaxation MPEs in the present standard. He pointed out how this issue was discussed over the past ten years. It was determined that a more realistic averaging time at the RF/microwave frequencies would resolve the issue. Two workshops with members from the RF community and the laser community led to a more realistic averaging time. In response to a question about averaging area, Osepchuk explained that the area over which the MPE is averaged is important and has to be addressed by both communities. Right now the laser MPEs vary with spot size but the averaging time remains constant, which is inappropriate. In response to a question from Anderson,

Osepchuk explained that the MPEs for laser exposure are only based on retinal injury at wavelengths between 400 and 1400 nm – they are based on injury to the skin and cornea at wavelengths greater than 1400 nm.

xii) Replication/validation.

No report.

c) Ear proposal from SCC-34/SC-2

C. K. Chou reported that SC-4 would be receiving a request from SCC-34/SC-2 (SAR measurement protocols for wireless handsets) to review and consider for adoption a draft proposal to include the pinna as an extremity subject to the same SAR requirements as for the other extremities, e.g., the hands and feet. He pointed out that the biophysical rationale for the change must come from SC-4 since SCC-34 develops only engineering standards. He then discussed the reason for the request, specifically the practical problem of determining the spatially averaged SAR in thin portions of the anatomy such as the pinna. He pointed out that computational techniques applied to an anatomically correct model of the head show that when the peak spatially-averaged SAR from a typical cellular phone is less than 1.6 W/kg in any one gram of tissue in the brain, it is always less than 4 W/kg in the pinna, i.e., less than the limits for the extremities. He then noted that a working group has been established to address the issue. The working group consists of E. Adair (chair), C. K. Chou, R. Cleveland, A. W. Guy, S. Lang, G. Lotz, R. Owen and M. Swicord. The scope of the working group is to provide a statement for use as a rationale for the SCC-34 proposal. Chou asked for additional members – seeing that no one responded he asked for a show of hands in support of the working group as constituted and for moving forward. The response in favor was unanimous. Cleveland asked what would happen if the working group decides that the present averaging volume is inadequate and should be changed. Chou responded that the charge is limited to providing a rationale for the 4 W/kg value for the pinna.

12. Interpretations Working Group

E. Adair reported that a request for an interpretation regarding induced current was received from the Navy several months ago. The request was submitted to J. Hatfield, chair of the Interpretations Working Group, who assembled an ad hoc group of knowledgeable people to address the request. A draft response was prepared several weeks ago but a few unresolved issues remain.

T. McManus suggested that someone explain the function of the Interpretations Working Group. Osepchuk explained that it goes directly to the IEEE process. Anyone can request from IEEE an interpretation or explanation of portions of the standard. A formal process is in place whereby the request is addressed either by a selected member of the committee (if the request is for an explanation) or to a working group if the request is truly for an interpretation. Normally the response takes only a few weeks. He explained that the answer to a request for interpretation should go to the point of what the committee meant when it drafted the standard, i.e., what the committee was thinking. Key people are assembled into an ad hoc group to address each request.

13. Other Old Business.

a) Action items from previous meeting. C. K. Chou briefly reviewed the action items from the last meeting. He asked if the reviews on paper have been imported into the

electronic database – Meltz replied that they have. Meltz also stated that the list of completely reviewed papers has not been prepared yet and that he will have a better estimate by September 1, 2000 of a deadline for completion of the reviews.

FOR ACTION

M. Meltz will follow up on establishing a deadline for completion of the reviews. (See October 1999 Minutes).

- b) **J. R. Ashley revision proposal.** In response to a question as to who asked Ashley to do this, Chou said no one did – he took it upon himself. Chou asked for comments. J. Osepchuk made the following motion:

MOTION

J. Osepchuk moved to have Ashley’s proposal distributed to SC-4 for review before the next meeting.

The motion was seconded by M. Ziskin. Meltz pointed out that many people have already seen the document but have not had time to provide a thorough review. He suggested an amendment to the motion that would encourage people on the Revision Working Group to review those parts of the document that are relevant to their sections of the standard and provide comments. McManus explained how the Ashley document goes to the issue of openness. Swicord suggested using the document as a reference but not circulating it widely. Osepchuk said that he saw no harm in distributing it – it was a voluntary contribution from Ashley and it must be distributed to avoid future criticism by committee members.

The question was called and the motion was approved with one negative vote.

14. New Business

M. Meltz made the following motion:

MOTION

M. Meltz moved that SC-4 and SCC-28 consider whether or not the literature evaluation results should be made available at an earlier time than completion of the standard.

A. Varanelli amended the motion to include IEEE in any decision because of possible intellectual property issues.

M. Swicord seconded the amended motion

D. Blick pointed out that there is no practical way of making the data available at this time. Meltz commented that the motion is for purposes of discussion at this point.

The question was called and the amended motion was approved with 12 in favor and 5 against.

M. Murphy invited everyone to the Air Force workshop on Sunday. In response to a question from K. Gettman, Murphy stated that copies of all of the overheads that will be presented at the workshop would probably not be available.

15. Next Meeting

C. K. Chou announced that the next meeting of SC-4 will be in San Antonio, TX November 18, 2000 following the WHO meetings. The next meeting of the Revision Working Group

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will be in Washington DC, September 7-8, 2000. Osepchuk invited everyone to attend the SCC-28 meeting on Saturday. (See comment on Attachment 3.)

16. Adjourn

There being no further business, D. Blick moved to adjourn. The motion, which was seconded by K. Joyner, was approved unanimously. The meeting was adjourned at 1656 hours.

ATTACHMENTS

IEEE SCC-28, Subcommittee 4

Technical University of München

München, Germany

Saturday, 10 June, 2000

1. Attendance List
2. Preliminary Agenda
3. Report from L. Heynick
4. Revised Timelines
5. Agenda of the March Meeting of the Revision Working Group
6. Summary of the March Meeting of the Revision Working Group

Subcommittee 4 Meeting,

**Technical University of München
München, Germany**

Saturday, 10 June, 2000

Attendance List

Name	Affiliation	Country	Status
1. Adair, Eleanor	USAF	US	M
2. Adlkofer, Franz	Veium Foundation	Germany	O
3. Anderson, Vitas	Telstra	Australia	O
4. Bahr, Achim	IMST Gmbh	Germany	O
5. Baron, David	Holiday Ind	US	O
6. Bellier, Pascale	Health Canada	Canada	O
7. Black, David	Inst of Occ & Env Med	NZ	O
8. Blick, Dennis	Veridian	US	M
9. Bodermann, Ralf	Siemens	Germany	O
10. Bourdages, Michel	Ontario Hydro	Canada	O
11. Bushberg, Jerrold	U of CA, Davis	US	M
12. Chadwick, Philip	Department of Health	UK	O
13. Chou, C. K.	Motorola	US	M
14. Cleveland, Robert	FCC	US	M
15. Collins, J	British Telecom	UK	O
16. Coray, Robert	Department of Communications	Switzerland	O
17. D'Andrea, John	Naval Health Research Det	US	M
18. Daly, James	BICC General	US	M
19. DeFrank, John	US Army CHPPM	US	O
20. Gardner, Robert	Ministry of Defence	UK	O
21. Gajsek, Peter	US Air Force Research Laboratory	Slovenia	O
22. Gettman, Ken	NEMA	US	O
23. Gibney, Kelly	BC Hydro	Canada	O
24. Goldberg, Georges	IEC ACES	Switzerland	O
25. Güstraü, Frank	IMST Gmbh	Germany	O
26. Haes, Donald	MIT	US	M

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Name	Affiliation	Country	Status
27. Healer, Janet	US NTIA	US	O
28. Hubbard, Roy	SA High Voltage Eng Center	South Africa	O
29. Kazuhiko, Chikamoto	Japan NUS Co., Ltd	Japan	O
30. Jaffa, Kent	PacifiCorp	US	O
31. Johnston, Sheila	Neuroscience Consulting	UK	O
32. Joyner, Ken	Motorola	Australia	M
33. Kautz, Richard	Ford	US	O
34. Kumbier, Werner	Wandel & Gottermann	Germany	O
35. Lang, Sakari,	Nokia	Finland	O
36. Lotz, Gregory	Nat Inst of Occ Safety & Health	US	M
37. Mason, Patrick	USAF/AFRL/HEDR	US	M
38. McManus, Tom	Dept Public Enterprise	Ireland	M
39. Meltz, Martin	University of Texas	US	M
40. Mercer, Christopher	Vodacom	South Africa	O
41. Merritt, James	USAF Research Labs	US	O
42. Murphy, Michael	USAF AFRL/HEDR	US	M
43. Ohkubo, Chiyoji	National Institute of Public Health	Japan	O
44. Olsen, Richard	Naval Health research Detachment	US	M
45. Osephchuk, John	Full Spectrum Consulting	US	M
46. Owen, Russel	US Food and Drug Admin/CDRH	US	M
47. Pakhomov, Andrei	McKesson Bio Services	US	M
48. Petersen, Ronald	Bell Labs/Lucent Technologies	US	M
49. Petrowicz, Otto	Tech U of München	Germany	O
50. Puranen, Lauri	Rad and Nuclear Safety Authority	Finland	O
51. Reilly, J. Patrick	Metatec Assoc	US	M
52. Santomaa, Veli	Nokia	Finland	M
53. Schüller, Michael	Mannesmann Mobilfunk	Germany	O
54. Scott, Iain	DERA	UK	O
55. Sirugo, Jon	Southern CA G&E	US	O
56. Sutton, Carl	VA Med Center	US	M
57. Swicord, Mays	Motorola	US	M
58. Szabo, Lazio	Former ICNIRP Member	Hungary	O
59. Taki, Masao	Tokyo Metropolitan University	Japan	M
60. Tattersall, John	DERA	UK	O

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Name	Affiliation	Country	Status
61. Thansandote, Art	Health Canada	Canada	O
62. Utteridge, Tammy	Inst of Med and Veterinary Science	S. Australia	O
63. van Rongen, Eric	Health Council of the Netherlands	Holland	O
64. Varanelli, Arthur	Raytheon	US	M
65. Vecchia	Nat'l Inst of Health	Italy	O
66. Watanabe, So-ichi	Min. of Posts and Telecomm	Japan	O
67. Ziskin, Marvin	Temple University	US	M

M = Member; O = Observer

**SC-4 LITERATURE SURVEILLANCE WORKING GROUP
(LSWG) REPORT—Lou Heynick
30 May 2000**

Since I won't be attending the forthcoming meetings in Munich, this is my report for the LSWG, plus a few items pertaining to the activities of the Editorial Committee (of which I am a member).

**Comments on SC-4 Minutes of 17 October 1999 meeting in
Atlanta**

Item 3: Typo: "A. Adair" should read "E. Adair".`

Item 7, 2nd para, 3rd sentence: Several months ago, I submitted two strawman texts to the RAWG e-mail list for possible inclusion in the Rationale section, which were subsequently included in the material to be discussed at the Motorola meeting in March 2000, one describing the functions and procedures of the SC-4 WGs, the other on "weak-field" (nonthermal) effects. The latter may need some elaboration when the reviews of the papers on that topic are completed.

Item 9a, 2nd sentence, clarification: I maintain three master lists of citations: The first one is my personal cumulative list of various citations continually gathered over many years [the "larger list" mentioned]. The second one is the cumulative list of *all* citations for SC-4, derived from the first list and assigned accession numbers in numerical order [current-edition filename ACC18.doc]. This list has been partitioned into sublists pertinent to the Engineering, Epidemiologic, In Vitro, and In Vivo WGs plus a "PERIPH" file of citations to papers not likely to undergo the formal database peer review process for various reasons, including lack of original data or findings, or not available in English, or not relevant to SC-4 but initially included before ascertaining that point. All of the citations in ACC18.doc have been entered into the version of the database developed specifically for the LSWG. The third list [current filename AUT18.doc] contains the same citations as ACC18.doc but alphabetically by first author. These lists had been distributed to the SC-4 WG Chairs. Also, AUT18.doc (with the accession numbers removed) is available to the general public on the SC-4 website developed by Arthur Varanelli, and for distribution to other standard-setting bodies towards harmonizing international standards, such as the current efforts by Michael Murphy.

Item 9a, 3rd sentence: A few months ago. I had an e-mail interchange with Howard Bassen about citations on nonthermal effects. Unfortunately, in my recent internet problems, I had lost all of my incoming and outgoing e-mails predating those problems, so the following is my best recollection: I had sent him the full list of citations (either ACC18.doc or AUT.doc), which he forwarded for examination to someone whose name I don't recall, but who responded that the list contained all of the citations about nonthermal effects. I then responded to Howard to suggest to that person to send any new citations directly to me for inclusion. (To date, none were sent.)

Item 9a, last sentence: I recall such a motion at an early SC-4 meeting, but if it passed, it was subsequently superseded by another approved motion to re-review those papers.

Item 10a in the agenda for the Munich meeting: Status of Citation Lists and Database

The last citation number in the master list ACC18.doc distributed (with its partitions) to the WG Chairs was 1378. The next edition, ACC19.doc, has been started and its last citation to date is 1387. As always, any other citations not in ACC18.doc would be welcome and will be added to ACC19.doc, distribution of which is planned prior to the next SC-4 meeting whenever that is scheduled. In this context, a question was raised at the Atlanta meeting whether new citations should be added for possible review, in view of the prior delays and the tight current schedule for completion of the revision. I propose to continue adding such citations to the lists and database, at least for the near future, whether or not they may be examined by the other WG Chairs for possible review.

Item 11b-iii (under Topic Reports) in the agenda for the Munich meeting

As noted in my comments above, I have sent a strawman text on “weak-field” (nonthermal) effects to the Radhaz e-mail list. This text has been incorporated into the documents for review at the Motorola meeting, but was not discussed before I had to leave. From e-mail interchanges between Marty Meltz and Asher Sheppard following the Motorola meeting, we are awaiting a response about how to proceed in drafting text about nonthermal effects (among other topics).

Other Items in the Spring Mailing

Regarding the two letters by John Osepchuk dated May 16, 2000 (for the Munich meeting), I strongly concur with the contents of both.

Item 15 in the agenda for the Munich meeting: Date and Place of Next Meeting

To reduce travel costs and travel time for most members, I would vote for having the next meeting of SCC-28 and its subcommittees (as well as COMAR) within the United States.

Summary of March 30-31, 2000 Meeting of SCC28/SC4 Revision Working Group

- a. Reviewed status of literature review per agenda (3/30)
- b. Items 8.a through 8.l of agenda (3/30)
- c. Consensus decision at this time was only thermal (>100 kHz), and electrostimulation hazards are established. Other potential bases for standard setting are under scrutiny. (3/30)
- d. Consensus that a single set of exposure limits will be derived. (3/30)
- e. The group was subdivided according to the outline for the Informative Section (3/31)
 - * Annex A (Approach to Standard Revision) will incorporate risk assessment principles for weighing the evidence, assessing variability, and identifying adverse effects and dose-response relationships.
 - * For preparation of Annex B (Summary of Literature Evaluation), the list of 1378 papers in the database was subdivided by topic to enable scientific evaluation in coordination with the technical merit reviews. Requested peer review of document that proposed low-frequency limits. Proposed to identify established bioeffects for assessment by the RAWG.
 - * Annex C (Explanation of Maximum Permissible Exposure Limits) refined the objective of presenting unified limits applicable for particular frequencies based on electrostimulation effects below 100 kHz (with possible extensions for pulsed fields up to 3 MHz), whole-body and partial-body thermal and/or other effects (100 kHz to 6 GHz), and surface heating above 6 GHz. Inconsistencies among several exposure metrics in the present standard will be resolved. Protection against RF burns from spark discharges was discussed for possible inclusion in the standard.
- f. The meeting work product is to be further developed for submission to CK Chou by May 15 for review by the Revision WG. It will be submitted to the RAWG by July 10 for review and completion.

Attendees: Eleanor Adair, Robert Ashley, Dennis Blick, Jerrold Bushberg, CK Chou, Jules Cohen (first day only), John D'Andrea, Linda Erdreich, James Hatfield, Lou Heynick, William Hurt, Jonathan Kiel, B. Jon Klauenberg, Martin Meltz, J. Patrick Reilly, Deborah Sean (first day only), Asher Sheppard, Mays Swicord, Ric Tell.

**IEEE SCC-28 Subcommittee 4
Revision Working Group Meeting
Safety Levels with Respect to Human Exposure to Radio Frequency
Electromagnetic Fields, 3 kHz to 300 GHz**

**Motorola Florida Research Laboratories
8000 West Sunrise Blvd.
Plantation, Florida
March 30-31, 2000
8:15 to 5:30 PM**

Agenda

30-Mar		
8:15	1. Call to Order	Chou/D'Andrea
8:15	2. Introduction of those Present	
8:18	3. Approval of Agenda	Chou/D'Andrea
8:20	4. Chairmen report	Chou/D'Andrea
8:25	5. Risk Assessment Working Group Report	Tell
8:30	6. Mechanism Working Group Report	Sheppard
8:35	7. Literature Evaluation Working Group Reports	
8:40	a) Literature Surveillance	Heynick
8:42	b) Engineering	Hurt
8:44	c) In Vitro	Meltz
8:46	d) In Vivo	Blick
8:48	e) Epidemiology	Erdreich
8:50	8. Topic Reports	
8:50	a) Spark discharge and induced current (Reilly)	
	* Criteria for Preventing Hazards Caused by Transient Discharges	
	* Lack of Peak (or Ceiling) Limits for Induced and Contact Current	
	* Mechanism and measurement techniques for 3 -100 kHz	
9:10	Bob Ashley's issues related to induced currents	
9:15	b) Thermoregulation (Adair)	
	* Thermal effects	
	* Surface vs. depth heating	
9:35	c) Non-thermal effects (Heynick)	
9:55	d) Selection of an Adverse Effect Level (Sheppard)	
	* Amplitude modulation	
10:15	Break	
10:30	e) Whole body SAR limit (Chou/D'Andrea)	
10:50	f) Biological Basis for Local SAR Limit (Meltz)	
11:10	g) Spatial averaging, averaging volume (Tell)	
	* Important Health Effects Literature Areas	
11:30	h) Single vs. two tier (Erdreich)	
	* One-Tier vs. Two-Tier Guidelines	
	* Controlled vs. Uncontrolled (Applicability of 2 IEEE Exposure Tiers)	
	* Acute and Chronic Exposures	

Approved SC-4 Minutes (June 2000 Meeting)

- * Uncertainty Factors
 - 12:00 Lunch
 - 13:00 (Single vs. two tier continued)
 - 13:30 i) Peak power limits (D'Andrea)
 - * Pulsed (Intensity) or Frequency-Modulated RF Radiation
 - 13:50 j) Low power device exclusion, measurement distance (Petersen)
 - * Compatibility of RFR Guidelines
 - 14:10 k) Averaging time 6 GHz to 300 GHz (Foster)
 - * Time Averaging
 - * Limits for Exposure at Microwave Frequencies
 - 14:30 l) Replication/Validation (Curtis)
 - 14:50 Break
 - 15:10 9. Discuss working format
 - 17:30 Adjourn
 - 18:30 Dinner
- 31-Mar
- 8:15 10. Working group meeting
(Details to be determined on March 30)
 - 10:00 Break
 - 10:20 (working group meeting continued)
 - 12:00 Lunch
 - 13:00 (working group meeting continued)
 - 17:00 11. New Business
 - 17:15 12. Date and Place of Next Meeting
Chou/D'Andrea
 - * SC4 meeting in Munich June 9, 2000
 - * 2nd Working Group meeting, ?, September 2000
 - 17:30 13. Adjourn

