



ICES

International Committee on Electromagnetic Safety

Approved Minutes

IEEE/ICES TC95 Subcommittee 4

Mobile Operators Association (MOA) facility

12 Russell Square, Russell Square House

Bloomsbury, London

1 March 2007 (Thursday)

1300 – 1700 h

1. Call to Order

The meeting was called to order by Co-chairman Ziskin at 1300 h.

2. Introduction of those Present

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

3. Approval of Agenda

Following a motion by D'Andrea that was seconded by Thansandote, the agenda was approved with the following modification: add "SAR enhancement at skin surface" as the first item under "New Business" and move the corresponding New Business items down.

4. Approval of the Minutes of 10 June 2006 Meeting

Following a motion by Bodemann that was seconded by Thansandote, the minutes of the 10 June 2006 meeting were approved without modification.

5. Secretary's Report

Petersen reported that the C95.1-2005 standard was approved by the IEEE SA Standards Board (SASB) 3 October 2005. An appeal on procedural issues was filed in December 2005, the appeal was heard by an SASB appeals panel at the 28 March 2006 SASB meeting, where Petersen was present and Chou and the appellant (David Fichtenberg) attended via teleconference, the standard was published 19 April 2006, the appeal decision was handed down 27 April 2006—the appeal was denied. The ANSI Board of Standards Review approved C95.1-2005 for use as an American National Standard, 2 November 2006. Petersen also reported that he will be stepping down as ICES chairman as soon as Ralf Bodemann is approved as chairman, which is on March SASB meeting agenda. Petersen reported that Ken Gettman agreed to replace Bodemann as vice chairman. Ellie Adair is stepping down as executive secretary; Petersen agreed to replace Adair as executive secretary. He also mentioned that with the new structure of ICES, TC34 and TC95 will require chairs, vice-chairs and secretaries. The AdCom will initiate a search for candidates.

6. Chairman's Report

Co-chairman Ziskin presented the SC4 Report. He noted that Petersen agreed to stay on as SC4 secretary for a while longer. He then reviewed ICES interaction with other national and international organizations noting that SC4 Co-chair, Art Thansandote, gave a presentation on activities of ICES, including publication of the C95.1-2005 standard, at the ICNIRP Collaboration Meeting in Chicago in May 2006. Ziskin also noted that Ralf Bodemann will represent ICES at an upcoming ITU meeting and at the WHO IAC meeting in Geneva in June. Ziskin briefly reviewed the presentation given to the RF Interagency Working Group last May by members of SC4, including Chou, D'Andrea, Elder, Petersen, Swicord and Ziskin. Each presented information on specific sections of the C95.1- 2005 revision. Representatives from the EPA, FCC, FDA, NIOSH and OSHA were either physically present or participated by telephone in the discussion, which lasted from about 0900 to 1500 h. There were many questions and a lot of give and take between the presenters and the audience. The general feeling was that the meeting went well and was beneficial to both sides. Ziskin also mentioned a request from Matthias Meier, Project Team Leader of IEC TC106 PT 62209 (SAR from hand-held and body-mounted wireless devices), regarding the possible necessity for a scaling factor to account for enhanced SAR at the skin surface from internal reflections. He noted that the request will be discussed later in the agenda. He also reminded everyone that C95.1-2005 was approved in November by the ANSI Board of Standard Review for use as an American National Standard.

Ziskin then described several issues with the new C95.1 standard that have to be resolved. One issue, confusion between peak power density and localized exposure has to be clarified. This issue was raised during review of the galley proofs but could not be resolved without making substantive changes to the draft. He recommended that we address this issue in the form of an amendment. Also, approximately 380 editorial changes suggested by Tim Harrington following his meticulous review of the new standard should be reviewed/addressed. He also urged the subcommittee to consider the incorporation of temperature elevation as the basic restriction in the GHz range, perhaps not for this amendment but it should be explored by SC4 for future amendments or revisions.

7. Old Business

a) Matters arising from the minutes of the June 2006 meeting

Ziskin reviewed the status of the action items from the June 2006 SC-4 meeting (see Attachment 2). Action Items 1 – 5 are still open or partially complete. The short statement (Action Item 2) has been drafted and will be circulated for comment; the draft for *Health Physics* and shorter versions for *IEEE Microwave Magazine*, *IEEE Spectrum*, and the *BEMS Newsletter* are still being prepared. Petersen mentioned that he was unsuccessful in obtaining guidance from the *IEEE Spectrum* editor regarding the type of article they would likely accept. He said he will try once again.

Action Item 1

Balzano, Elder, Johnston and Swicord will provide review/summary of non-thermal effect presentations from earlier ICES meetings and other meetings (e.g., COST 281) before the next SC-4 meeting.

Action Item 2

Chou, Elder and Johnston will circulate for comment the one-page press-release on the 2005 standard (with the public or the federal agencies as the targeted audience and which should also address the issue of non-thermal effects) by 1 April 2007.

Needy pointed out that the 500 mA ceiling limit for contact current that is in the amendments to the 1991 standard seems to have disappeared during the revision process. He noted that this was pointed out at an earlier meeting and asked SC4 to follow-up to determine if there was a reason for this.

Action Item 3

The Editorial Committee will follow-up to determine why the induced current ceiling limit does not appear in the 2005 revision of C95.1.

b) Literature surveillance

Thansandote and Ziskin presented an update of the literature surveillance program and presented the slides prepared by the Literature WG Chairman, Joe Morrissey (see Attachment 3). Ziskin noted that the process of collecting relevant papers is going well. Chou explained that about 50 relevant papers per month have been published since the literature review process for the 2005 standard was closed. Regarding the WG activity, Johnston explained that she and Morrissey have been sharing papers but reviews and evaluations have not yet begun. Murphy commented that 50 papers per month seemed high and wondered if this includes older papers. Meltz pointed out that filtering the papers may be premature and suggested categorizing the papers before defining the filtering process. Varanelli supported Meltz's suggestion. Ziskin directed Johnston to take these suggestions/questions back to Morrissey and the WG.

c) Literature review/evaluation

Johnston asked if the Literature Surveillance WG would try to establish a review process similar to the initial review process that led to the 2005 standard, i.e., 2 – 3 anonymous reviewers, and asked further if the authors of the papers should be anonymous to the reviewers. Varanelli said he was in favor of following the old process with independent engineering and biology reviews. Osepchuk supported independent engineering and biological reviews, Meltz suggested beginning with the biology reviews and contacting appropriate physical scientists and engineers only if deemed necessary, i.e., he was not in favor of dual independent reviews of every paper. Bodemann questioned whether the engineering reviews impeded the process during the revision of the 1991 standard and urged the subcommittee to be sure that whatever process is followed should be practical and not overly complicated. Murphy noted that the process may not be bi-directional, i.e., the biologists should have some understanding of the engineering aspects of a study but the engineers do not necessarily need an understanding of the biology. Meltz recommended carrying out the engineering reviews first followed by the biology review—if appropriate. Ziskin pointed out that the process and procedures should be defined as soon as possible noting that the literature Surveillance WG chaired by Morrissey only identifies and categorizes relevant papers—it does not evaluate/review the papers. That should be handled by a separate WG.

ACTION ITEM 4

Ziskin will initiate the formation of a Literature Review WG that will define the literature evaluation/review process and effect the literature evaluations. The WG should be formed and the process defined before the next SC4 meeting.

The following SC4 members agreed to serve on the Literature Review WG: Bailey, Bodemann, Chadwick, Chou, Johnston, Meltz, Varanelli and Ziskin.

d) Short Course

There was considerable discussion about holding a short course on the 2005 standard in conjunction with the next meeting and there was also general agreement that the short-course should also address C95.7. Varanelli agreed that the two standards are complementary and a short-course should address both. He noted that he puts on numerous similar courses for Raytheon employees and would be willing to take the lead in setting up a course for the next meeting.

ACTION ITEM 5

Varanelli will take the lead in setting up a short-course to be given at the next SC4 meeting that will address both C95.1-2005 and C95.7- 2005.

e) Health Physics article

Meltz suggested preparing something like an extended abstract that could be forwarded to a number of journals. The abstract could briefly explain C95.1-2005, its uses, benefits, etc. Each subcommittee could also prepare a short article on the work of their subcommittee. A list of the C95 standards, where they can be obtained could also be prepared and submitted to *Health Physics*—Bailey said that he might be able to help getting the list published. This is still an open action item from the June 2006 meeting.

f) Temperature vs. peak spatial-average SAR

Chou reviewed the history of the interest in a temperature basic restriction for local exposure rather than spatial peak average SAR (see Attachment 4). He noted that the issue was first suggested in 1991 as part of the proposed revision of the 1991 standard. The issue was discussed at subsequent SC4 meetings and, at the June 2006 meeting, a motion was passed to appoint a task group to obtain data and develop a thermal basis for localized exposure limits. The task group was established to obtain data and develop a thermal basis for localized exposure limits (Chadwick, Dimbylow, Elder, Johnston, Meltz, Morrissey, Swicord, and Ziskin); the task group had 6 months to present results/conclusions to SC4 for consideration. Chou noted that although there was considerable e-mail discussion regarding the issue, nothing was resolved in time to change the draft of the C95.1 revision before balloting.

The discussion continued. D'Andrea pointed out that the internal E-field probably would be more important and can be determined in heterogeneous tissue models, as can temperature, especially since the issue is important for devices that emit greater than 20 mW. Osepchuk stated that he is opposed at this time to using temperature rather than peak spatial-average SAR for localized exposure. Bailey said he tends to agree with Osepchuk pointing out that temperature, and increase in temperature, is related to many

factors in the environment beside RF energy absorption and would be impractical for whole-body exposures, but might be reasonable for localized exposure. Murphy supported using T or ΔT , since they can be related to SAR. Meltz noted that since temperature is mentioned throughout the standard, it makes sense to base the standard on T. Meltz then made the following motion:

MOTION 1

Meltz moved that SC4 consider a temperature-based standard, i.e., to determine if it is possible to develop a thermal basis for a localized limit (basic restriction), especially at the higher frequencies.

The motion was seconded by D'Andrea.

Discussion: D'Andrea pointed out that this is going to be a difficult problem because the tissue in which ΔT is sought is dynamic and small changes would be difficult to discern. Chadwick said that he doesn't see what the issue is—the standard is already thermally based. Bailey pointed out that changing to a temperature basis will open the review process to a much larger literature database, i.e., all thermal effects. Bodemann suggested that at this point, it seems like the issue is more of a proposal for research and not an immediate requirement to revise the basis of the standard. Chadwick reiterated Bailey's earlier comment that while the external fields can be related to SAR, and SAR can be related to ΔT , ΔT is also related to numerous other factors. It might be more reasonable to increase the localized exposure basic restrictions. Collins pointed out that the public does not understand SAR but they do understand temperature. He added that it would be easier to communicate with the public if the basic restrictions were expressed in terms of temperature or ΔT . Osepchuk explained that while he understands the need to incorporate temperature for special cases, he sees no need to revise the whole standard. Varanelli pointed out that basing the standard on T or ΔT opens up a large database on thermal effects, heat stress, etc., that hasn't been looked at by SC4 and, in fact, would be beyond SC4. It was decided that the issue was not going to be resolved at this meeting and the motion was withdrawn. Ziskin volunteered to present a talk at the next SC4 meeting on the biological consequences of hyperthermia so that SC4 members would have a broader perspective on the subject and be in a better position to decide on the appropriate parameters for the revision. At this point Meltz withdrew the motion and D'Andrea agreed.

ACTION ITEM 6

A task Group, consisting of Chou, D'Andrea, Osepchuk, Meltz and Ziskin, will follow-up on the discussion of T versus peak spatial-average SAR for localized exposure and present a position to serve as a basis for the revision or an amendment.

g) Amendment--status

Chou briefly reviewed the status of the amendment. He pointed out that inconsistencies in the use of the terms "peak power density" and "localized exposure" came to light during the review of the galley proofs. A number of attempts to rectify the problem raised other issues, none of which could be resolved with non-substantive changes. It was agreed at that time that the Editorial Committee would recommend the necessary changes and circulate the recommendations for comment. At the same time, editorial comments raised by Harrington would be reviewed and incorporated as appropriate and the combined changes offered as Amendment 1 to C95.1-2005. Petersen suggested holding off on submitting a PAR for the amendment until it is well underway. The following SC4

members agreed to serve on an ad hoc task group to prepare the amendment: Chou, D'Andrea, Osepchuk, Petersen and Ziskin.

ACTION ITEM 7

The ad hoc amendment task group, i.e., Chou, D'Andrea, Osepchuk, Petersen and Ziskin, will prepare an amendment addressing the “peak power density” versus “localized exposure” issue and the editorial suggestions raised by Harrington.

ACTION ITEM 8

Once the draft amendment is prepared and ready to be circulated to SC-4 for comment, Ziskin or Thansandote will submit a PAR to the SASB for the amendment.

8. New Business

a) SAR enhancement at skin surface

Matthias Meier, Project Team Leader of IEC TC 106 PT 62209 (assessment of SAR from hand-held and body-mounted wireless devices) is formally asking ICES and ICNIRP for guidance on an issue that has to be resolved in order for his group to move forward in completing IEC62209 Part 2 (body-mounted devices – see Attachment 5). By way of introducing the issue, he showed a number of slides (Attachment 6). Specifically, the issue is that computational studies indicate the SAR in the skin of an anatomical (heterogeneous) model can in some cases exceed the SAR in a homogeneous phantom. Since hand-held mobile phones are certified using a homogeneous phantom, the question is whether or not a correction factor is necessary to account for the difference in order to ensure protection of the user. The higher peak spatial-averaged SAR computed in the anatomical model is due to an enhanced SAR in the skin layer associated with field reflections at tissue boundaries. SAR scaling factors up to 1.5 were found at some frequencies and distances while SAR enhancement factors less than 1 have been found at others. Meier pointed out that his understanding is that the basic restrictions in IEEE C95.1-2005 are established to protect against excessive temperature rise, particularly to internal organs in the head and torso, but not necessarily in the extremities and limbs where the SAR limits are greater. He said that he seeks expert advice from the subcommittee regarding the following two questions:

1. Is it necessary to apply a scaling factor to limit the skin SAR?
2. Is experimental measurement in the homogenous phantom without incorporating a scaling factor adequate to protect the users?

In response to a question from Osepchuk regarding whether the cubical averaging volume would take care of the problem, Chou responded that it would not. Chadwick pointed out that when using the homogeneous model, applying an enhancement factor of 1.5 would correct for the corresponding higher SAR in the layered model. The effect would only be important for devices placed closer than 35 mm from the surface of the body. Meltz asked if this could be a protective effect, i.e., could higher SAR at the surface mean lower internal SAR? Ziskin pointed out that the human body is built to handle increased temperature and the skin is a good barrier, i.e., an increase in skin temperature is protective.

Bailey asked why the enhancement is greater when averaged over 10 g compared with averaging over 1 g—he said that he would have expected the opposite. Meier responded

that it varies with skin and fat thickness. Chadwick said that the difference in results for the layered model compared with the homogeneous model seems to be a measurement issue. Chou agreed but added that Part 1 of IEC 62209 and IEEE Std 1528 both use a homogeneous liquid tissue-simulant filled head model for assessing SAR from handsets held against the head. He asked what are we protecting, i.e., if the SAR is higher in the skin, is this important regarding underlying tissue? Ziskin pointed out that temperature is important but skin is a good barrier and the temperature beneath the skin is usually constant, i.e., there is a minimal temperature gradient. D'Andrea agreed noting that special applicators have to be used to obtain focal heating below the surface, e.g., for hyperthermia treatments—Chou added that such devices are very difficult to design.

At the conclusion of the discussion, the following straw poll was taken:

Question 1: Is it necessary to apply a scaling factor to limit the skin SAR? (No – unanimous).

Question 2: Is experimental measurement in the homogenous phantom without applying a scaling factor adequate to protect the users? (Yes – unanimous).

ACTION ITEM 9

Chou, Petersen, Thansandote and Ziskin will summarize the discussion of skin enhancement factor and prepare a response to Meier.

b) Dosimetry research needs

Chou reviewed the letter from the Mobile Manufacturers Forum (MMF) and the GSM Association (GSMA – see Attachment 7) that describes an upcoming Dosimetry Workshop. The purpose of the Workshop is to address the following questions:

1. What further dosimetry research is needed to clarify any standards related science?
2. What research can be done to improve compliance measurement techniques?

The second item refers to development of equipment, techniques or procedures that will provide the means for rapid and accurate assessment to assure compliance with safety guidelines and standards for both radio products and installations. Chou asked SC4 for input to add to the last item on the MMF/GSMA agenda (Attachment 7), i.e., “Discussion on Possible Research Topics and Priorities for Phase II of the Dosimetric Program with Inputs from Stakeholders.” Murphy suggested integration of thermal modelling with dosimetry modelling—Chou pointed out that that issue is being addressed in the session on “Dosimetry Refinements in Relating Basic Restrictions to Far Field Derived Limits.” Meltz suggested exploring the issue of whether or not skin SAR could be used to determine internal SAR. There was agreement that the two following items should be submitted and the members of SC 4 should submit any other suggestions before 10 April 2007:

1. Whole-body averaged SAR versus thermoregulation.
2. Explore the use of Adair thermoregulation data (Brooks) for modelling.

c) Tim Harrington Comments

Ziskin mentioned that Tim Harrington had gone through the 2005 revision in excruciating detail and came up with a list of close to 400 comments, e.g., editorial, general, technical,

that should be reviewed during the development of the amendment or the next revision of C95.1. Petersen said that he would review the comments, accept those that he thought appropriate, share the results with the Editorial Committee and respond to Harrington.

ACTION ITEM 10

Petersen will review Harrington’s comments, accept those that seem appropriate, share the results with the Editorial Committee, and respond to Harrington.

d) THz Ad hoc (ICES/Z136)

Following a brief discussion on some of the THz work being carried out at Brooks City Base, D’Andrea made the following Motion:

MOTION 2

Establish an ad hoc working group comprised of selected members of TC95, SC4 and ANSI ASC Z136 (laser safety) to reexamine the basic restrictions and MPEs at the interface between the RF and the laser standards.

Johnston seconded the motion—the motion was approved unanimously.

e) UWB

Meltz opened the discussion by stating that after speaking with Osepchuk, his understanding of the use of the term ultra-wideband” (UWB) and its formal definition differ. Osepchuk pointed out that the confusion stems from the fact that the military generally refers to UWB as extremely narrow pulses of high peak power while commercial interests usually apply the term to low-level broad spectrum signals. Because of the differences, there appears to be considerable misuse of the terms. He said the question is which one is of interest to SC4? Murphy explained that the military is interested in high-peak power pulses and would like to see SC4 reexamine the basis for the 100 kV/m peak E-field MPE in the 2005 standard, a value that appears to be lacking solid support.

ACTION ITEM 11

Meltz, Murphy, Osepchuk Varanelli and Ziskin will form an ad hoc group to review the UWB issue and make recommendations to SC 4 at the next meeting.

9. Date and Place of Next Meeting

It was agreed that the next SC 4 meeting would be held at the Nokia facility in Dallas, TX, during the last week of November, 2007.

10. Adjourn

There being no further business, following a motion by Johnston that was seconded by Meltz, the meeting was adjourned at 1650 h.

Actions Arising from 1 March 2007 SC4 Meeting
MOA, London

	Action	Assigned to	Due	Status
1.	Provide review/summary of non-thermal effect presentations from earlier ICES meetings and other meetings (e.g., COST 281) before the next SC4 meeting.	Balzano, Elder, Johnston and Swicord	15 November 2007	
2.	Circulate for comment the one-page press-release on the 2005 standard (with the public or the federal agencies as the targeted audience and which should also address the issue of non-thermal effects)	Chou, Elder and Johnston	1 April 2007.	
3.	Determine why the induced current ceiling limit does not appear in the 2005 revision of C95.1.	Editorial Committee	15 August 2007	
4.	Initiate the formation of a Literature Review WG that will define the literature evaluation/review process and effect the literature evaluations. The WG should be formed and the process defined before the next SC4 meeting.	Ziskin	15 November 2007	
5.	Take the lead in setting up a short-course to be given at the next SC4 meeting that will address both C95.1-2005 and C95.7.	Varanelli	1 September 2007	
6.	Ad hoc task group on temperature to follow-up on the discussion of T versus peak spatial-average SAR for localized exposure and present a position to serve as a basis for the revision or an amendment.	Chou, D'Andrea, Osepchuk and Ziskin	15 October 2007	

	Action	Assigned to	Due	Status
7.	The ad hoc amendment task group, to prepare an amendment addressing the “peak power density” versus “localized exposure” issue and the editorial suggestions raised by Harrington.	Chou, D’Andrea, Osepchuk, Petersen and Ziskin,	1 September 2007	
8.	Once the draft amendment is prepared and ready to be circulated to SC4 for comment, submit a PAR to the SASB for the amendment.	Ziskin or Thansandote	15 October 2007	
9.	Summarize discussion of skin enhancement factor and prepare a response to Meier.	Chou, Petersen, Thansandote and Ziskin	15 April 2007	
10.	Review Harrington’s comments, accept those that seem appropriate, share the results with the Editorial Committee, and respond to Harrington.	Petersen	1 September 2007	
11.	Form an ad hoc group to review the UWB issue and make recommendations to SC 4 at the next meeting.	Meltz, Murphy, Osepchuk Varanelli and Ziskin	15 November 2007	

Motions Arising from 1 March 2007 SC4 Meeting

	MOTION	MOVED/SECONDED	Y/N/A
1.	Consider a temperature-based standard, i.e., to determine if it is possible to develop a thermal basis for a localized limit, especially at the higher frequencies	Meltz/D’Andrea	Withdrawn
2.	Establish an ad hoc working group comprised of selected members of TC 95, SC 4 and ANSI ASC Z136 (laser safety) to reexamine the basic restrictions and MPEs at the interface between the RF and the laser standards.	D’Andrea/Johnston	(Y): Unanimous

TC-95 SC4 Attendance
MOA, London
1 March 2007

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26.	Ziskin, MD	Marvin	Temple Univ. Med School	US	M	ziskin@temple.edu

M = Member

O = Observer

Actions Arising from June 2006 SC4 Meeting

	Action	Assigned to	Due	Status
1.	Provide review/summary of non-thermal effect presentations from earlier ICES meetings and other meetings (e.g., COST 281)	Balzano, Elder, Johnston, Swicord	September 2006	Open
2.	Prepare succinct one-page press-release on the 2005 standard that would be useful for the public but especially for the federal agencies. Should also address the issue of non-thermal effects.	Chou, Elder, Foster, Johnston	1 September 2006	Partially Complete.
3.	Work with Tell to provide rough draft (based on paper already prepared by Chou) of a paper that could serve as the basis for an in-depth paper for publication in a journal such as <i>Health Physics</i> .	Chou, Tell	1 August	Open
4.	Polish the rough draft developed above for publication in a journal such as <i>Health Physics</i> .	Adair, Chou, Lang, Osepchuk, Petersen Tell, Varanelli, Ziskin	1 September (Draft)	Open (Awaiting completion of AI-3)
5.	Prepare shorter paper for publication in the <i>Bioelectromagnetics Newsletter</i> or an article in <i>IEEE Spectrum</i> . Follow up (again) with the <i>Spectrum</i> Editor to determine the type of paper that they would accept.	Osepchuk, Petersen	1 August	Open
6.	Literature review – Begin to distribute relevant papers to Literature Evaluation Filtering Group – (initially Bushberg, Elder, Johnston)	Morrissey	1 July (Begin)	Ongoing
7.	Poll the subcommittee for volunteers who are willing to participate in the initial stages of the literature review process.	Ziskin	1 July	Ongoing
8.	Submit PAR for C95.1-2005 Amendment A to address issue of peak power density/localized exposure conflict	Petersen	In time for consideration at the September 2006 SASB meeting	Open

	Action	Assigned to	Due	Status
9.	Review 2005 standard and provide changes to resolve conflicts in wording regarding peak power density/localized exposure.	Chou, Cleveland, Mantiplay, Murphy, Osepchuk, Petersen, Tell, Ziskin.	1 September	Open

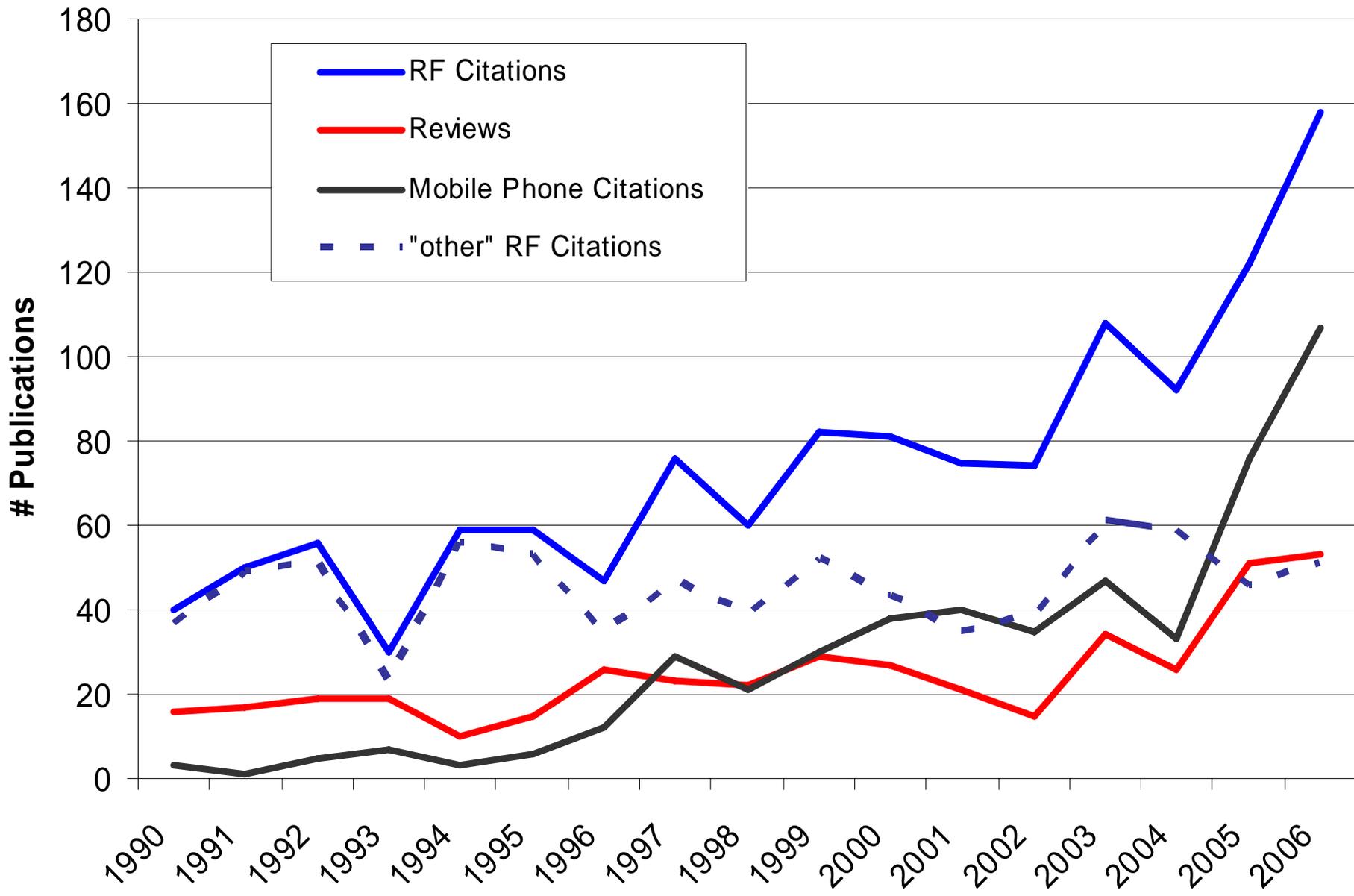
- **WG Members**

- Joe Morrissey
- Dariusz Leszczynski
- Sheila Johnston
- Joe Elder

- **Literature Database**

- **2964** published citations
- Less the 776 reviews, letters, reports = **2059** primary research publications
 - *up from ~1500 published citations reported at BEMS Cancun*
 - *~50% of this reflects capture of papers not previously in database*
- **607** in subcategory “mobile phone specific signals” + **154** ongoing
- **712** in subcategory “915, 2450 MHz, ISM” + **0** ongoing (many older studies)
- **337** in subcategory “other RF/MW frequencies” + **3** ongoing
- **88** in subcategory “military & radar frequencies” + **2** ongoing
- Handfuls in other subcategories

RF Publications over the Last 15 Years



- **Literature not slowing down**
- **Mobile phone / base station studies increasingly weight the database**

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

- **Step 4: Critical Evaluation**

- How should the evaluation be performed ?

(Joe M's opinion: teams chosen / drafted to review relevant subcategories)

- Should studies be “scored” or “merit based” ?

(Joe M's opinion: NO, existing peer review coupled with independent verification, corroboration with studies of related physiological endpoints, and total weight of evidence should be the evaluation criteria)

- **Step 5: Synoptic Review**

- How is this to be performed (if different than prior C95.1-2005) ?



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

TECHNICAL COMMITTEE 106/Project Team 62209

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09 February 2007

Dear Dr. Vecchia and Dr. Ziskin,

IEC Project Team 62209 and IEEE ICES TC34 SC2 are developing standards for the measurement of the peak spatial-averaged SAR in simplified models of users exposed to wireless devices worn on the body. The committees are sharing information through a Category D Liaison and support the development of each others' standards.

IEC 62209-1 has defined a homogeneous flat phantom to represent the exposed body in the 30 MHz to 3 GHz frequency range. The chosen homogeneous dielectric parameters were intended to produce a conservative estimate of the SAR in the user's head. IEC PT62209-2 is now covering human exposure to body-worn devices with a frequency range extended up to 6 GHz. For practical implementation in the testing laboratories, the homogeneous dielectric parameters need to be the same as in IEC 62209-1.

However, recent computational studies indicate that the SAR in a heterogeneous layered body model can in some cases exceed the SAR in the homogeneous phantom. The higher peak spatial-averaged SAR computed in the layered model

is due to an enhanced SAR in the skin layer, due to field reflections at tissue boundaries. The fat layer exhibits a relatively low SAR due to its lower electrical conductivity, and the muscle layer has a relatively low SAR due to its location behind the skin and fat layers. On the body trunk where the intended position of the wireless device is located, the inner organs are exposed to levels well below the SAR in the skin.

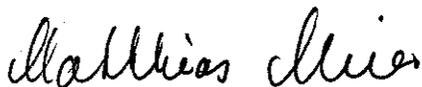
A question has arisen as to whether a SAR scaling factor might be required to produce conservative SAR estimates using the experimental test setup that is presently envisioned, as described above. Although SAR scaling factors less than 1 have been found in many conditions SAR scaling factors up to 1.5 were found at some frequencies and distances.

On the other hand, thermal simulations suggest that SAR scaling factors might not be necessary for the protection of the skin, an organ that is routinely subject to wide temperature excursions and is already several degrees below core temperature under normal environmental circumstances. We note that the SAR limits in both ICNIRP and IEEE exposure standards are established to protect against excessive temperature rise. We expect that the limits for the head and torso are meant to protect the internal organs, because the guidelines or standard have higher SAR limits for the extremities and limbs where skin also exists.

We seek the expert advice of ICNIRP and IEEE ICES TC95 SC4 to answer the question whether it is necessary to apply a scaling factor to limit the skin SAR as computed by the theoretical model, or if the experimental measurement in the homogenous phantom without a scaling factor is adequate to protect the users.

The ICES TC34 SC2 and IEC Project Team 62209 are at your disposal for any further clarification or additional information you might require in order to make a determination about this issue.

Yours Sincerely,



Matthias Meier
Chairman
IEC PT 62209



14 February 2007

Dear Colleagues,

The Mobile Manufacturers Forum (MMF) and the GSM Association (GSMA) will host a scientific workshop to review the outcomes of jointly funded dosimetry research and to commence a process to determine what further research is needed to clarify standards related science. The workshop will be held in Bordeaux, France on April 10 in conjunction with the EBEA meeting.

The 1998 ICNIRP Guidelines and the ICES C95.1-2005 standard have been established to protect individuals from all established health hazards. In the mobile communications frequency band, both ICNIRP and ICES relate those health hazards to an excessive temperature rise due to RF exposure. However, both use SAR, a surrogate for temperature, as the basic restrictions. This along with dosimetric uncertainties leads to small but important differences in the two documents, and complications in measurement standards established to demonstrate compliance to the safety standards.

In order to reduce uncertainties and provide a firmer rationale for standards, the MMF and GSMA have established a dosimetry research program. Phase I of this program is now drawing to a close and the workshop will specifically address:

- What further dosimetry research is needed to clarify any standards related science?
- What research can be done to improve compliance measurement techniques?

The second item refers to development of equipment, techniques or procedures that will provide rapid and accurate assessment and assure compliance to safety guidelines and standards for both radio products and installations.

An agenda is attached indicating the presentation of Phase I projects and the time established for discussion of future research (Phase II).

Your attendance and participation in this process would be most welcome and will be important for formulating research request for proposals. Please respond with your availability to attend no later than 20 March to allow meeting arrangements to be confirmed.

If you have any questions, please do not hesitate to contact either of the undersigned.

Yours sincerely,

A handwritten signature in black ink that reads 'M. Milligan'.

Michael Milligan
Secretary General
Mobile Manufacturers Forum¹
michael.milligan@mmfai.org

A handwritten signature in black ink that reads 'Jack Rowley'.

Jack Rowley, PhD
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Agenda

MMF & GSMA Dosimetric Research Program Workshop

Held in Conjunction with the EBEA meeting

Bordeaux, France

April 10th, 2007

- 9:00 – Welcome by MMF and GSMA (Michael Milligan and Jack Rowley)
9:10
- 9:10 – Low Power Exclusion Criteria Based on the Basic Restrictions - University of South
9:50 Carolina &/or ARCS (Chair: Antonio Faraone)
- 9:50 – Discussion
10:10
- 10:10 –

Dosimetry Refinements in Relating Basic Restrictions to Far Field Derived Limits -
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10:50
Tbilisi State University & ARCS (Chair: GSMA representative)
- 10:50 – Coffee break
11:10
- 11:10 – Dosimetry Refinements in Relating Basic Restrictions to Near Field Derived Limits -
11:50 Swinburne University of Technology/ Australian Centre for Radio Frequency
Bioeffects Research (Chair: Jafar Keshvari)
- 11:50 – Discussion
12:30
- 12:30 – Lunch
14:00
- 14:00 – A Family of Human Models Based on MRI scans of Humans - FDA &/or IT'IS
14:40 (Chair: Joe Wiart, TBC)
- 14:40 – Discussion
15:00
- 15:00 – Coffee Break
15:20
- 15:20 – Discussion on Possible Research Topics and Priorities for Phase II of the Dosimetric
17:50 Program with Inputs from Stakeholders. (Chairs: Mays Swicord & Sakari Lang)
- 17:50 – Wrap-up by MMF and GSMA (Michael Milligan and Jack Rowley)
18:00