



ICES

International Committee on Electromagnetic Safety

What follows are the IEEE International Committee on Electromagnetic Safety's (IEEE ICES) comments on the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) "Preliminary opinion on Potential health effects of exposure to electromagnetic fields (EMF)." — This document solely represents the views of ICES and does not necessarily represent a position of either the IEEE or the IEEE Standards Association.

Introduction

The SCENIHR Report (Health effects of EMF – 2013-11-29) is an update of the 2009 report that includes reviews of new studies published from 2009 to 2013. Overall, this is an excellent comprehensive review of the recent relevant scientific literature using a weight of evidence approach. The revision process of IEEE ICES standards also uses the weight of evidence to evaluate all available peer reviewed publications. The basic restrictions and exposure values in the latest revision of IEEE C95.1-2005 were based on a comprehensive review of the literature published before 2003; this SCENIHR report provides a more up to date review on the "Potential health effects of exposure to electromagnetic fields." IEEE ICES is providing comments on the following items identified by committee members:

Reference:

IEEE C95.1TM-2005, IEEE Standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz. (Available at no cost at <http://standards.ieee.org/getieee/C95/download/C95.1-2005.pdf>.)

General Comments

It would be very useful if this review addressed the question as to whether it has been established that an adverse whole body heating response (e.g., disorientation, heat exhaustion, heat stroke) can result from RF exposures in realistic public and occupational settings. IEEE ICES is not aware of any peer-reviewed studies or other credible reports indicating such outcomes. Although the ICNIRP guidelines and IEEE ICES standards include a safety factor of 10 or 50 for the two exposure environments based on animal experimentation, which protects against the theoretical risk of a whole body heating response, we nevertheless encourage the reviewers to investigate if there is any evidence of such adverse RF response actually occurring in realistic occupational and public settings, particularly referring to reputable accident reports and registers. Indeed a general compilation of RF accident statistics across Europe would be an invaluable resource to standards setting committees in making risk assessments and setting appropriate protective measures. The collection of such basic indicators is also vital for gauging the effectiveness of current and ongoing RF protective measures.

It is important to discuss the basic science and, accordingly, there should be a section on mechanisms. Any repeatable observation should be supported with a discussion of the mechanism or mechanisms that led to the observed effect, i.e., how a physical quantity (electric, magnetic or electromagnetic fields) interacts with a biological system. Although the interaction of fields with molecular constructs can and has been modeled by theoretical physicists, no theory has been developed or seems to exist that supports the hypothesis of non-thermal effects occurring below levels set by international standards and guidelines. This observation is consistent with the lack of any confirmed low level effect. Sheppard et al. (2008) have provided an extensive discussion of the subject.

Reference:

Sheppard A. R., Swicord M. L., Balzano Q, “Quantitative evaluations of mechanisms of radiofrequency interactions with biological molecules and processes, *Health Phys*, vol. 95, pp. 365 – 396, 2008.

Specific Comments

1. Page 27, L29-30: “Although not statistically significant, a trend of decreasing SAR over a period of years was clear from this study.” This is supported by the following statement in a recent dosimetry paper by Kuehn et al. (2013): “It is noteworthy that maximum SARs decreased over the period from 1999 to 2005,...” We suggest adding this reference to the report.

Reference:

Kuehn S, Kelsh MA, Kuster N, Sheppard AR, Shum M, “Analysis of mobile phone design features affecting radiofrequency power absorbed in a human head phantom,” *Bioelectromagnetics*, vol. 34, no. 6, pp. 479-488, September 2013.

2. Page 27, L36-45, This paragraph discusses the work of Perentos et al. (2007), Jokela et al. (2004), and Ilvonen et al. (2005), and compares the results with the 1998 ICNIRP limits. ICNIRP has since revised and relaxed its low frequency limits in 2010—this discussion should be updated.

Reference:

ICNIRP (International Commission on Non-ionizing Radiation Protection), “Guidelines for limiting exposure to time varying electric and magnetic fields (1 Hz to 100 kHz),” *Health Physics*, vol. 99, no. 6, pp. 818-836, December 2010.

3. Page 27, L46-50, this paragraph discusses differences in energy absorption from mobile phones between children and adults. While this non-uniformity is common in near field exposures, it should be noted that the papers cited by Christ et al. 2010 and Hadjem et al. 2010 point out the following about the important parameter (peak SAR, which is the basic restriction for localized exposure): “*The peak spatial specific absorption rate (SAR) assessed with the standardized specific anthropometric mannequin head phantom has been shown to yield a conservative exposure estimate for both adults and children using mobile phones*”

[Christ, et al.], and “*It was also pointed out that the value of the maximum local peak SAR in the SAM was always higher than in the adult and children models*” [Hadjem, et al.].

References:

Christ A, Gosselin MC, Christopoulou M, Kuhn S, Kuster N, “Age-dependent tissue-specific exposure of cell phone users,” *Phys. Med. Biol.*, vol. 55, pp. 1767–1783, Mar. 2010.

Hadjem A, Conil E, Gati A, Wong MF and Wiart J, “Analysis of power absorbed by children’s head as a result of new usages of mobile phones,” *IEEE Trans. Electromagn. Compat.*, vol. 52, no. 4, pp. 812–819, Nov. 2010.

4. Page 36, L29-31, “The effect on man from a short term exposure besides feeling of heat is not known.” Hearing of radar pulses has been reported since World War II and was extensively studied in the 60’s and 70’s. IEEE ICES suggests changing the sentence to “It has been confirmed that in a quiet environment humans can hear radar pulses (Chou et al., 1982; Elder and Chou, 2003). Experimental studies have shown that the hearing is caused by thermoelastic pressure waves generated in the head due to the inhomogeneous absorption of the radar pulses. Other effects on man from a short term exposure, besides feeling heat, are not known.”

References:

Chou CK, Guy AW, and Galambos R, “Auditory perception of radio-frequency electromagnetic fields,” *J of Acoustic Society of America*, vol. 71, no. 6, pp. 1321-1334, 1982.

Elder JA and Chou CK, “Auditory response to pulsed radiofrequency energy,” *Bioelectromagnetics*, vol. 24, Supplement 6, pp. S162 – S173, 2003.

5. Page 43, Section 3.3.7. Household appliances. The exposure section does not address certain sources in homes, mainly frequencies in the ELF band (e.g., exposure from household appliances and power distribution systems). More details regarding the issue of exposure from switched power supplies should be useful, which is detailed only in the discussion (3.3.9). Details about wireless routers for distribution of Internet connectivity and electric power smart meters would also be useful.

Again, ICES appreciates the efforts of the SCENIHR and the opportunity to offer comments.