

ICNIRP STATEMENT ON THE “GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC, AND ELECTROMAGNETIC FIELDS (UP TO 300 GHz)”

The International Commission on Non-Ionizing Radiation Protection*

INTRODUCTION

SINCE THE publication of the ICNIRP “Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)” (ICNIRP 1998) many scientific studies of the effects of such fields have been published. In the frequency range up to approximately 100 kHz several scientific reviews and health hazard assessments have been undertaken by organizations such as the World Health Organization (WHO 2006, 2007), national radiation protection institutions (HPA 2006, 2008), and by ICNIRP (2003). For static and extremely low frequency (ELF) fields, ICNIRP’s process of reviewing its guidelines is, respectively, finalized (ICNIRP 2009) or in progress.

For frequencies above 100 kHz, including frequencies used for modern wireless communications, several major national and international research programs have been completed recently (e.g., MTHR 2007; Federal Office for Radiation Protection 2008) and others are ongoing. The new data need to be reviewed and assessed with respect to possible health hazards prior to a revision of ICNIRP’s recommendations in this frequency band. This process of review and assessment is currently in progress.

However, it is the opinion of ICNIRP that the scientific literature published since the 1998 guidelines has provided no evidence of any adverse effects below the basic restrictions and does not necessitate an immediate revision of its guidance on limiting exposure to high frequency electromagnetic fields. The biological basis of such guidance remains the avoidance of adverse

effects such as “work stoppage” caused by mild whole-body heat stress and/or tissue damage caused by excessive localized heating (D’Andrea et al. 2007). With regard to non-thermal interactions, it is in principle impossible to disprove their possible existence but the plausibility of the various non-thermal mechanisms that have been proposed is very low. In addition, the recent *in vitro* and animal genotoxicity and carcinogenicity studies are rather consistent overall and indicate that such effects are unlikely at low levels of exposure. Therefore, ICNIRP reconfirms the 1998 basic restrictions in the frequency range 100 kHz–300 GHz until further notice.

ICNIRP notes that there has been considerable advance in dosimetric investigations in terms of precision and resolution (Lin 2007). A special concern was raised with regard to numerical computations using anatomical models of human bodies which might influence the derivation of reference levels from the basic restrictions. Some published studies (Wang et al. 2006; Dimbylow and Bolch 2007; Conil et al. 2008; Nagaoka et al. 2008; Kuehn et al. 2009) showed that in the frequency ranges of body resonance (~100 MHz) and from 1 to 4 GHz for bodies shorter than 1.3 m in height (corresponding approximately to children aged 8 y or younger) at the recommended reference level the induced SARs could be up to 40% higher than the current basic restriction under worst-case conditions. However, this is negligible compared with the large reduction factor of 50 (5,000%) for the general public.

Many epidemiological studies initiated recently have focused primarily on possible biological and adverse health conditions that might be associated with the operation of modern telecommunication systems. The Interphone Study, a multi-country coordinated case-control study, addresses possible cancer risks due to the relatively high local exposure of the user’s head when using mobile phones. The pooled analysis of all national data is not yet published. However, individual national and multinational results published thus far do not indicate an elevation of the risk of cancers in the head

* ICNIRP, c/o BfS—G. Ziegelberger, Ingolstaedter Landstr. 1, 85764 Oberschleissheim, Germany.

For correspondence contact G. Ziegelberger at the above address, or email at info@icnirp.org.

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with cell phones within 10 years of first use. More data are needed before conclusions can be drawn for longer durations (ICNIRP in press).

Epidemiological data on possible health effects of chronic, low-level, whole-body exposure in the far-field of radiofrequency (RF) transmitters are poor, especially because of lack of satisfactory individual exposure assessment. The few studies with adequate exposure assessment did not reveal any health-related effects. Exposure levels due to cell phone base stations are generally around one-ten-thousandth of the guideline levels.

Details of the approach that ICNIRP follows in providing science-based independent advice on non-ionizing radiation protection are outlined in the Statement "General Approach to Protection against Non-Ionizing Radiation" (ICNIRP 2002).

During the preparation of the statement, the composition of the International Commission on Non-Ionizing Radiation Protection was as follows:

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REFERENCES

Conil E, Hadjem A, Lacroux F, Wong MF, Wiart J. Variability analysis of SAR from 20 MHz to 2.4 GHz for different adult and child models using finite-difference time-domain. *Phys Med Biol* 53:1511–1525; 2008.

D'Andrea JA, Ziriak JM, Adair EA. Radio frequency electromagnetic fields: mild hyperthermia and safety standards. *Prog Brain Res* 162:107–135; 2007.

Dimbylow P, Bolch W. Whole-body-averaged SAR from 50 MHz to 4 GHz in the University of Florida child voxel phantoms. *Phys Med Biol* 52:6639–6649; 2007.

Federal Office for Radiation Protection. DMF, German Mobile Telecommunication Research Programme, health risk assessment of mobile communications. Federal Office for Radiation Protection, BfS-SG-08/08. Bremerhaven: Verlag für neue Wissenschaft GmbH; 2008.

Health Protection Agency. Power frequency electromagnetic fields, melatonin and the risk of breast cancer. Report of an independent Advisory Group on Non-Ionising Radiation. Chilton: HPA; Doc HPA, RCE-1; 2006.

Health Protection Agency. Static magnetic fields. Report of an independent Advisory Group on Non-Ionising Radiation. Chilton: HPA; Doc HPA, RCE-6; 2008.

International Commission on Non-Ionizing Radiation Protection. General approach to protection against non-ionizing radiation. *Health Phys* 82:540–548; 2002.

International Commission on Non-Ionizing Radiation Protection. Exposure to static and low frequency electromagnetic fields, biological effects and health consequences (0–100 kHz)—review of the scientific evidence and health consequences. Munich: ICNIRP; 2003.

International Commission on Non-Ionizing Radiation Protection. Guidelines on limiting exposure to static magnetic fields. *Health Phys* 96:504–514; 2009.

International Commission on Non-Ionizing Radiation Protection, Standing Committee on Epidemiology. Epidemiologic evidence on mobile phones and tumor risk. *Epidemiol* (in press).

Kuehn S, Jennings W, Christ A, Kuster N. Assessment of induced radio-frequency electromagnetic fields in various anatomical human body models. *Phys Med Biol* 54:875–890; 2009.

Lin JC. Dosimetric comparison between different possible quantities for limiting exposure in the RF band: rationale for the basic one and implications for guidelines. *Health Phys* 92:547–453; 2007.

Mobile Telecommunications and Health Research Programme. Report 2007 [online]. 2007. Available at: http://www.mthr.org.uk/documents/MTHR_report_2007.pdf. Accessed 4 March 2009.

Nagaoka T, Kunieda E, Watanabe S. Proportion-corrected scaled voxel models for Japanese children and their application to the numerical dosimetry of specific absorption rate for frequencies from 30 MHz to 3 GHz. *Phys Med Biol* 53:6695–6711; 2008.

Wang JQ, Fujiwara O, Kodera S, Watanabe S. FDTD calculation of whole-body average SAR in adult and child models for frequencies from 30 MHz to 3 GHz. *Phys Med Biol* 51:4119–4127; 2006.

World Health Organization, International Labour Organization, International Commission on Non-Ionizing Radiation Protection. Environmental Health Criteria 232, Static fields. Geneva: World Health Organization; 2006.

World Health Organization, International Labour Organization, International Commission on Non-Ionizing Radiation Protection. Environmental Health Criteria 238, Extremely low frequency fields. Geneva: World Health Organization; 2007.

