

Background on the Thermal vs Non-thermal RF exposure and Health Issue

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The possibility of "non-thermal" effects and mechanisms has come up a number of times during the past five decades. Because of this, ICNIRP, NCRP and ICES/IEEE ensure that all relevant studies are included in the literature reviews and evaluations, whether the proposed mechanism is thermal or non-thermal. Indeed, the RF Health & Safety Standards are based on thresholds for the most sensitive, reproducible biological effect that could be related to adverse effects in humans regardless of the nature of the interaction mechanism.

ICNIRP, NCRP and ICES/IEEE identified SAR as the threshold above which adverse effects in humans could occur. They then added a safety factor of 10 for occupational exposure and a further layer of protection for public exposures that brought the safety factor to 50 times below the identified threshold for the most sensitive, reproducible biological effect that could be related to adverse effects in humans. One of the reasons such a large margin of safety was built into the public exposure standard was because it would apply to the entire population; it was assumed that those exposed may have no knowledge or control of their exposure and the standard needed to apply to continuous, indefinite exposure 24 hours a day, every day.

In developing the 1991 standard, the IEEE stated that: "The members of Subcommittee 4 believe the recommended exposure levels should be safe for all, and submit as support for this conclusion the observation that no reliable scientific data exist including . . . that," among other things, certain subgroups (e.g., infants, the aged, the ill) are more at risk than others or that non-thermal exposure "may be meaningfully related to human health." This position remains the same in the 2005 C95.1 standard and in contemporary safety guidelines developed by others, e.g., ICNIRP. Thus, any assertion that the standards do not address potential non-thermal health effects or apply to potentially sensitive members of the population such as children is incorrect.

The RF Health & Safety standards are living documents, meaning that the committees remain active, continually review and evaluate the scientific literature, and incorporate necessary changes into amendments and revisions of the standard. The standards-setting organizations and federal agency representatives, including the FCC, keep abreast of the latest studies and developments by actively participating on the ICES committee and through interactions between the ICES committee and the Federal Interagency RF Work Group. This ongoing process led to a Supplement and an Amendment to the 1991 standard, published in 1999 and 2004, respectively. A complete revision of IEEE C95.1-1991 was approved by the IEEE SASB in 2005 and published and approved by ANSI in 2006. The current ICNIRP standard (2009) and ICES/ANSI standard (2006) reaffirmed the conclusions made in the IEEE

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1991 standard & NCRP Report No. 86 that were used by the FCC to develop their safety standards thus the FCC MPE values, adequately protect human health.

The IEEE and NCRP RF safety standards are based on their scientific conclusion (adopted by the FCC) that any potential injury from exposure to RF energy is a threshold phenomenon—below a certain threshold no injury has been demonstrated to occur. While the FCC has the congressionally mandated jurisdiction to set public RF exposure regulations they did so in consultation with the Federal Health Agencies (EPA, FDA, NIOSH). See Page 8 FCC OET 65 1997:

“In reaching its decision on adopting new guidelines the Commission carefully considered the large number of comments submitted in its rule-making proceeding, and particularly those submitted by the U.S. Environmental Protection Agency (EPA), the Food and Drug Administration (FDA) and other federal health and safety agencies. The new guidelines are based substantially on the recommendations of those agencies, and it is the Commission's belief that they represent a consensus view of the federal agencies responsible for matters relating to public safety and health.”

These regulations and the safety standards they were based on were developed following an exhaustive review of all the available scientific evidence which included the results of research where the exposure levels were at thermal and non-thermal levels. All biological effects of RF energy reported in the literature, where the exposures were both acute and chronic (lifetime in many cases) and at high and low exposure levels, were considered. These included many health endpoints of which thermal effects was only one. For example the table of contents of the NCRP report 86 entitled “Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Field” includes an evaluation of the biological effects of RF energy grouped by the general health endpoints shown below:

- Macromolecular and Cellular Effects
- Chromosomal and Mutagenic Effects
- Carcinogenesis
- Effects on Reproduction, Growth and Development
- Effects on Hematopoietic and Immune Systems
- Effects on Endocrine Systems
- Effects on Cardiovascular Function
- Interaction with the Blood-Brain Barrier
- Interaction with the Nervous System
- Thermoregulatory Responses in Human Beings

The challenge to FCC regulations on the grounds that they fail to account for potential non-thermal RF health effects is not new. This was one of the main components of the EMR Networks challenge of the FCC regulations in the DC circuit of the US Court of Appeals. EMR petitioned for review of the FCC safety standards, arguing principally that the Commission has violated its duty under § 102 of the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4332, to ensure that agencies consider the environmental effects of their decisions. The EMR petition was denied by the DC circuit court on February 11, 2005.

Quoting from the decision:

"In upholding the earlier decision not to tighten regulation on account of non-thermal effects, the Second Circuit rejected a claim that the Commission had improperly relied on expert standard-setting organizations. Cellular Phone Taskforce, 205 F.3d at 90. Moreover, as the Environmental Protection Agency is "the agency with primacy in evaluating environmental impacts," *id.* at 91, the FCC's decision not to leap in, at a time when the EPA (and other agencies) saw no compelling case for action, appears to represent the sort of priority-setting in the use of agency resources that is least subject to second-guessing by courts. See, e.g., *American Horse*, 812 F.2d at 4. Finally, the Commission's determination to keep an eye on developments in other expert agencies suggests that here, as in Cellular Phone Taskforce, the Commission has an adequate "mechanism in place for accommodating changes in scientific knowledge." 205 F.3d at 91."

"EMR suggests that the studies it submitted (after the decision of the Office of Engineering & Technology) show that exposure to RF radiation is unsafe at levels too low to cause thermal effects. But the articles submitted are nothing if not tentative. One, for example, hypothesizes a mechanism by which cell phone radiation might promote cancer, but also notes that "[t]o date, there is limited scientific evidence of health issues, and no mechanism by which mobile phone radiation could influence cancer development." Peter W. French et al., *Mobile Phones, Heat Shock Proteins and Cancer*, 67 *Differentiation* 93, 93 (2000). We find nothing in those studies so strongly evidencing risk as to call into question the Commission's decision to maintain a stance of what appears to be watchful waiting."

Moreover recent reviews of the literature continue to support this opinion: See the 2009 ICNIRP STATEMENT ON THE "GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC, AND ELECTROMAGNETIC FIELDS (UP TO 300 GHz)" *Health Physics Journal* September 2009, Volume 97, Number 3. Regarding the possibility of non-thermal effects they said: "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."

This view was also held by the European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) who's 2008 report on the potential effects of chronic exposure to low level RF energy provided an update of their previous review of the science in 2001 stated: "Since the adoption of the 2001 opinion extensive research has been conducted regarding possible health effects

of exposure to low intensity RF fields, including epidemiologic, in vivo, and in vitro research. In conclusion, no health effect has been consistently demonstrated at exposure levels below the limits of ICNIRP (International Committee on Non Ionising Radiation Protection) established in 1998.”

There is more that could be said but I think that this make the point that the non-thermal issue is not one for which we do not know if there are any adverse effects. Rather it would be more correct to say that it is one for which, after decades of research, have demonstrated that none of the adverse health effects at non-thermal exposure levels that were initially reported have been establish or verified.