

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of

Reassessment of Federal Communications)	
Commission Radiofrequency Exposure Limits and)	ET Docket No. 13-84
Policies)	
)	
Proposed Changes in the Commission's Rules)	
Regarding Human Exposure to Radiofrequency)	ET Docket No. 03-137
Electromagnetic Fields)	
)	

**COMMENTS OF JOE A. ELDER
Submitted August 31, 2013**

Joe A. Elder, PhD, a consultant in RF Bioelectromagnetics, submits these Comments in response to the publication of FCC 13-39, First Report and Order, Further Notice of Proposed Rule Making and Notice of Inquiry (ET Docket No. 13-84 and ET Docket No. 03-137) released March 29, 2013 by the FCC.

Joe A. Elder has 40 years of experience with the biological and health effects of RF energy. He was employed by the U.S. Environmental Protection Agency (EPA) for 28 years (1973-2001) and at the time of his retirement he was a Senior Scientist and Special Assistant to the Associate Director for Health, National Health and Environmental Effects Research Laboratory in Research Triangle Park, NC. He was EPA's technical expert on the biological effects of RF exposure. He was Director of the EPA RF biological effects research program in the early 1980's and is principal editor of the 1984 EPA report entitled BIOLOGICAL EFFECTS OF RADIOFREQUENCY RADIATION, a comprehensive review of the world's literature on this subject. He was co-organizer of the 1993 EPA conference that resulted in published proceedings providing an update of the conclusions in the 1984 report. He has participated in committees that developed the ANSI/IEEE RF safety standards and is a member of the IEEE Committee on Man and Radiation (COMAR). Of particular relevance to this correspondence, during my employment at EPA, I contributed to the EPA review of the proposed regulations that led to the 1996 FCC regulations and was a member of the federal RF Interagency Work Group. I served on technical review panels for the Harvard Center for Risk Analysis, Food and Drug Administration (FDA), National Institute on Occupational Safety and Health (NIOSH), and U.S. Navy; served on the WHO Committee that developed the RF Research Agenda; reviewed a number of RF systems/facilities including the U.S. National Weather Service radar system and PAVE PAWS. I was an invited member of the National Council on Radiation Protection and Measurements (1983-89) and the FDA Technical Electronics Products Radiation Safety Committee (1996-98). Upon retirement from EPA, I was employed by Motorola from 2001-2009.

Dr. Elder holds a PhD in biophysics from The Pennsylvania State University and conducted research in physiological chemistry at The Johns Hopkins School of Medicine while on a postdoctoral fellowship.

These comments are those of Joe A. Elder, personally, and are not comments of any employer or committee or organization in which I have or had membership or some other type of affiliation.

In the NOI, the FCC requests comment on whether the FCC's limits for human exposure to radiofrequency (RF) radiation should remain the same or be revised. I am writing this letter to recommend that the Commission revise its RF limits by adopting the basic restrictions and maximum permissible exposure (MPE) values of IEEE C95.1-2005.

During my employment by the U.S. Environmental Protection Agency from 1973-2001, I participated in the development of the EPA response to FCC's call for comment on the proposal that led to the current FCC RF Regulations promulgated in 1996. Comments led to the development of FCC regulations that were based in part on limits for human exposure to RF fields in the IEEE C95.1-1991 Standard. I mention this fact because the IEEE 1991 Standard has been revised and the updated IEEE 2005 Standard is available to support a revision of the 1996 FCC RF Regulations.

The 2005 IEEE RF Standard was developed by an international committee of more than 125 members representing 25 countries. The international committee had members from the government, military, academia, industry, and the general public who had expertise in engineering, biology, medicine, measurements, and safety programs. U.S. government participation included representatives from the FCC, FDA, NIOSH and OSHA. The limits for general public exposure in the IEEE C95.1-2005 standard are in harmony with the corresponding basic restrictions and "reference levels" of the 1998 International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for frequencies between 30 MHz and 100 GHz, and include a safety factor of 50 for the general public. Adoption of the IEEE C95.1-2005 basic restrictions for partial-body exposure (2 W/kg averaged over 10 g of tissue) would place the FCC limits in conformity with the corresponding value used internationally. It is noted that no existing international standard or guideline supports the 1.6 W/kg averaged over 1 g of tissue basic restriction for partial-body exposure that was adopted by the FCC in 1996.

Adoption of the IEEE C95.1-2005 Standard by the FCC would be consistent with the prior regulatory process in which an IEEE standard was used in the development of FCC regulations and consistent with the statement of the IEEE Committee on Man and Radiation (COMAR) that "...health officials continue to base their policies on RF safety limits recommended by established and sanctioned international organizations such as the Institute of Electrical and Electronics Engineers International Committee on Electromagnetic Safety and the International Commission on Non-Ionizing Radiation Protection, which is formally related to the World Health Organization." (Health Physics. 97:348-356, 2009)

The IEEE C95.1-2005 RF Standard incorporates science-based improvements over IEEE C95.1-1991 that was used, in part, to develop the 1996 FCC RF Regulations. For example, the 1991 SAR basic restrictions for partial-body exposure were based on dosimetry considerations alone, whereas the 2005 limits are based on a biological/health effect. The occupational exposure limit of 10 W/kg averaged over 10 g is supported by results from animal experiments showing that this value is at least 10 times below the SAR threshold for inducing cataracts (100 W/kg). The cataractogenic threshold in humans is also determined to be 100 W/kg deposited in the approximately 10 g mass of the human eyeball. For the public exposure limit, a safety factor of 50 was applied to obtain a limit of 2 W/kg averaged over 10 g of tissue.

Based on comments from the U.S. health agencies, the FCC in 1996 promulgated a regulation adopting the recommendations of NCRP (1986) for public exposure at the higher radiofrequencies from 1.5 GHz up to 100 GHz rather than the higher limits in IEEE C95.1-1991. This is the reason why the 1991 IEEE Standard was adopted in part only by the FCC in 1996. Now there is no good reason to continue use of the 1986 NCRP

recommendations because similar recommendations are found in IEEE C95.1-2005 for frequencies between 30 MHz and 100 GHz [0.2 mW/cm² from 30-400 MHz, ramping up to 1 mW/cm² at 2 GHz and remaining at 1 mW/cm² to 100 GHz (the limit ramps up to 10 mW/cm² at 300 GHz to match the ANSI and IEC laser standards)]. Furthermore, the MPE limits for public exposure in IEEE C95.1-2005 are harmonized with those in the 1998 ICNIRP Guidelines for the frequency range from 30 MHz to 100 GHz.

In addition to addressing established adverse health effects, the IEEE C95.1-2005 Standard also addresses biological effects ascribed to exposure to low-level fields, i.e., at or below the corresponding basic restrictions in the frequency range 3 kHz to 300 GHz; low-level effects are sometimes called "non-thermal" or "athermal" effects in the literature. The IEEE C95.1-2005 Standard states: "Despite more than 50 years of RF research, low-level biological effects have not been established. No theoretical mechanism has been established that supports the existence of any effect characterized by trivial heating other than microwave hearing. Moreover, the relevance of reported low-level effects to health remains speculative and such effects are not useful for standard setting." (Annex C.1.2, page 82 of IEEE C95.1-2005.)

In summary, I recommend the Commission adopt the exposure limits for public exposures in the IEEE Standard C95.1-2005. These limits, expressed in terms of basic restrictions (SAR) and reference levels (MPEs), are in harmony with ICNIRP guidelines for frequencies between 30 MHz and 100 GHz; ICNIRP is formally related to WHO. The IEEE C95.1-2005 limits incorporate biological/health-based improvements over IEEE C95.1-1991 that was used in the development of the current FCC regulations. Adoption of IEEE C95.1-2005 basic restrictions would place the FCC limits in conformity with the internationally harmonized partial-body limit of 2 W/kg averaged over 10 g of tissue. As noted above, no existing international standard or guideline supports the partial-body exposure basic restriction of 1.6 W/kg, averaged over 1 g of tissue that was adopted by FCC in 1996.

Respectfully yours,
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