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Conversion Chart EMR = EMF

Power equivalents--- $1 \mu\text{W}/\text{cm}^2 = 10,000 \mu\text{W}/\text{m}^2 = 0.01 \text{ W}/\text{m}^2$

- * Low concern- Building Biologists benchmark
 - ** BioinInitiative- No observable effect on humans
 - *** Extreme concern for long term exposure- Building Biologists benchmark
- $\mu\text{W}/\text{m}^2$ = Yellow highlights are Current limits in U.S.

Watts/ Square Meter (W/m^2)	microWatts/Square Meter ($\mu\text{W}/\text{m}^2$)	microWatts/Square Centimeter ($\mu\text{W}/\text{cm}^2$)
0.000,000,000,000,1 W/m^2	0.000,000,1 $\mu\text{W}/\text{m}^2$	0.000,000,000,01 $\mu\text{W}/\text{cm}^2$
0.000,000,000,001 W/m^2	0.000,001 $\mu\text{W}/\text{m}^2$	0.000,000,000,1 $\mu\text{W}/\text{cm}^2$
0.000,000,000,01 W/m^2	0.000,01 $\mu\text{W}/\text{m}^2$	0.000,000,001 $\mu\text{W}/\text{cm}^2$
0.000,000,000,1 W/m^2	0.000,1 $\mu\text{W}/\text{m}^2$	0.000,000,01 $\mu\text{W}/\text{cm}^2$
0.000,000,001 W/m^2	0.001 $\mu\text{W}/\text{m}^2$	0.000,000,1 $\mu\text{W}/\text{cm}^2$
0.000,000,01 W/m^2	0.01 $\mu\text{W}/\text{m}^2$	0.000,001 $\mu\text{W}/\text{cm}^2$
0.000,000,1 W/m^2 *	0.1 $\mu\text{W}/\text{m}^2$ *	0.000,01 $\mu\text{W}/\text{cm}^2$ *
0.000,001 W/m^2 **	1 $\mu\text{W}/\text{m}^2$ **	0.000,1 $\mu\text{W}/\text{cm}^2$ **
0.000,01 W/m^2	10 $\mu\text{W}/\text{m}^2$	0.001 $\mu\text{W}/\text{cm}^2$
0.000,1 W/m^2	100 $\mu\text{W}/\text{m}^2$	0.01 $\mu\text{W}/\text{cm}^2$
0.001 W/m^2 ***	1,000 $\mu\text{W}/\text{m}^2$ ***	0.1 $\mu\text{W}/\text{cm}^2$ ***
0.01 W/m^2	10,000 $\mu\text{W}/\text{m}^2$	1 $\mu\text{W}/\text{cm}^2$
0.1 W/m^2	100,000 $\mu\text{W}/\text{m}^2$	10 $\mu\text{W}/\text{cm}^2$
1 W/m^2	1,000,000 $\mu\text{W}/\text{m}^2$	100 $\mu\text{W}/\text{cm}^2$
10 W/m^2	10,000,000 $\mu\text{W}/\text{m}^2$	1,000 $\mu\text{W}/\text{cm}^2$
100 W/m^2	100,000,000 $\mu\text{W}/\text{m}^2$	10,000 $\mu\text{W}/\text{cm}^2$
1000 W/m^2	1,000,000,000 $\mu\text{W}/\text{m}^2$	100,000 $\mu\text{W}/\text{cm}^2$

Wireless Exposure Limits in Different Countries

From 300Mhz-300GHz in microwatts/cm²

Guidelines in U.S. are from **200 uW/cm² to 1000 uW/cm² (2 W/m² to 10 W/m²)** for RF radiation depending on frequency.

US. **200 microwatts/cm² - 1,000 microwatts/cm²** – depending on frequency
Canada **1,000 microwatts/cm²**

China 10 microwatts/cm²
Russia 10 microwatts/cm²
Italy 10 microwatts/cm²
France 10 microwatts/cm²
Poland 10 microwatts/cm²
Hungary 10 microwatts/cm²

Switzerland General 9.5 microwatts/cm²
Switzerland- Schools and Hospitals 4.25 microwatts/cm²

Belgium 2.4 microwatts/cm²
Bulgaria 2.4 microwatts/cm²
Luxembourg 2.4 microwatts/cm²
Ukraine 2.4 microwatts/cm²

Lichtenstein 0.1 microwatts/cm²

Austria Outdoor 0.001 microwatts/cm²
Austria Indoor 0.0001 microwatts/cm²

Cosmic Background we evolved from <0.0000000001

BioInitiative Report recommendation - ‘No Observable Effect’ with factor of 10 added for safety = 0.0003 microwatts/cm². <http://www.bioinitiative.org/conclusions/>

Austrian Medical Association Exposure Limits

“In general, a wide variety of forms of EMF exposure (e.g. from cordless phones, wireless internet access, electrical installations and electrical devices in the building, mobile phone base stations, radio and TV transmitters, high-voltage lines or transformer stations) may be the root causes of health problems....Irrespective of the ICNIRP recommendations for acute effects, the following benchmarks apply to regular exposure of more than four hours per day...” AMA

High-frequency electromagnetic radiation (as power flow density)

0.1 $\mu\text{W}/\text{cm}^2$ ($\geq 1000 \mu\text{W}/\text{m}^2$) ($\geq 1 \text{ mW}/\text{m}^2$)—Very far above normal

0.001 $\mu\text{W}/\text{cm}^2$ to 0.1 $\mu\text{W}/\text{cm}^2$ (10-1000 $\mu\text{W}/\text{m}^2$) (0.01-1 mW/m^2)- Far above normal

0.000,1 $\mu\text{W}/\text{cm}^2$ to 0.001 $\mu\text{W}/\text{cm}^2$ (1-10 $\mu\text{W}/\text{m}^2$) (0.001-0.01 mW/m^2)- Slightly above normal

Less than 0.000,1 $\mu\text{W}/\text{cm}^2$ ($\leq 1 \mu\text{W}/\text{m}^2$) ($\leq 0.001 \text{ mW}/\text{m}^2$) – Within normal limits

“The benchmarks listed are intended to be applied to individual types of radiation, e.g. GSM, UMTS, WiMAX, TETRA, radio, TV, DECT or WLAN, and refer to peak levels. The benchmarks do not apply to radar, which must be evaluated separately. Highly critical types of radiation, such as periodic signals (mobile telephony, DECT, WLAN, digital broadcasting...), should be critically evaluated, especially if levels are far above normal, while less critical types, such as non-pulsed or non-periodic signals (USW, shortwave, medium and long wave, analogue broadcasting), may be considered more leniently.” AMA

Low-frequency alternating electric fields

$\geq 10 \text{ V}/\text{m}$ Very far above normal

1.5-10 V/m -Far above normal

0.3-1.5 V/m - Slightly above normal

$\leq 0.3 \text{ V}/\text{m}$ – Within normal limits

The benchmarks (potential-free measurement) are intended to be applied to the range up to and around 50 Hz; higher frequencies and distinct harmonics should be more critically evaluated.

Exposure Limits for Radio Frequency Energy: Three Models

Ken Foster, University of Pennsylvania, Philadelphia

This **article** points out that different long term exposure limits in different countries is due to different models of reasoning.

- **Heat:** The U.S. uses science based studies but only those that examine heat based adverse effects. They do not take into account studies on non-thermal adverse effects.
- **Non-Thermal Effects:** Russia and China use science based studies on non-thermal effects.
- **Precautionary:** Switzerland, Italy and many other countries use precautionary language for their long term exposure limits

"Thus, Russian (and Eastern European) limits clearly reflect the conviction that long-term (hours or more) exposures at levels far below Western limits result in adverse health effects. Indeed, the Russian and Eastern European medical literature contains many reports of health effects from low-level exposure to RF energy. These include, for example, nonspecific problems (such as headaches, fatigability, irritability, sleep disorders, and dizziness) in workers in radio factories, who are exposed to RF energy at undetermined levels^{11 12}. The Chinese literature contains similar reports.¹³ **The Russian literature contains references to a “microwave disease” characterized by “asthenic, asthenovegetatic, and hypothalamic syndromes”¹⁴ The disease is not recognized in Western medicine, and its diagnostic criteria would undoubtedly strike many Western physicians as vague and nonfalsifiable. Even some Eastern European physicians have complained about the nonspecificity of these criteria as well.^{15 16}**"

http://www.who.int/peh-emf/meetings/day2Varna_Foster.pdf

Russia Explains Protective Standards for EMR

Russian National Committee of Non-Ionizing Radiation Protection - 2008 report: This sobering report discusses the need for exposure guidelines that protect children and the general population from chronic levels of radio frequency radiation.

<http://www.who.int/peh-emf/project/mapnatreps/RUSSIA%20report%202008.pdf>

Russian National Committee on Non-Ionizing Radiation Protection and EMF RF standards. New conditions of EMF RF exposure and guarantee of the health to population. Prof. Yu. Grigoriev, Russian National Committee on Non-Ionizing Radiation Protection Federal Medical Biophysical Centre, FMBA, Moscow, Russia. https://www.radiationresearch.org/wp-content/uploads/2018/06/021235_grigoriev.pdf