

How much EMF is safe?



All humans are irradiated 24 hours a day by electromagnetic fields (EMF). Some are subjected to much higher levels than others. How much is too much?

Keywords: EMF, electromagnetic field, electromagnetic radiation, safety limits, safe limits, guidelines

How much EMF is too much?

The short answer is that nobody really knows, that scientists are hotly debating this, and that much science suggests that many people are already exposed too much.

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The debate is also influenced by the fact that lowering today's limits have enormous financial implications for some very large and powerful sectors of society, including manufacturers of wireless gadgets, operators of mobile phone towers, electric utilities and the military. On top of that is the general public which has become used to wireless gadgets and would be upset by any restrictions on their use.

The official limits

Today's legal limits are almost everywhere solely based on the heating effect. A strong enough EMF will literally vibrate the water molecules inside a human body so strongly that it heats up. The same effect is used inside a microwave oven. An induction stove cooks the food by EMFs as well, using a somewhat similar effect.

This is called the "thermal effect" and is all well understood and accepted. The problem is that EMF has other effects on the human body, at much lower levels. They are called the "non-thermal" effects and are documented by literally thousands of scientific studies (Sage 2012; Blank 2014; Belyaev, 2016).

The disagreement is whether these effects are harmful or not and at what levels they are safe. This issue has been fought over for several decades now.

Regulators who set the limits are very cautious about changing the old standards. Like all political bodies they are trying to weigh the evidence and the political winds. People are rarely marching in the streets demanding lower radiation limits.

Or the other side there is much political lobbying to keep things as they are.

Meanwhile, where the new limits should be is murky at best. Regulators tend to be very afraid of making mistakes, while no action is usually safe for them.

Some people need lower limits than others

It is hotly debated among scientists, but it appears that some people are more affected by electromagnetic radiation than others.

Some scientists believe that EMF is an important factor in the epidemic of childhood autism, ADHD and asthma seen in recent decades (Sage 2017; Divan 2008, 2012; Herbert 2013; Thomas 2009; Li 2011).

This could mean that pregnant women and children need lower EMF levels than other people.

There are also reports that autistic children become calmer when the EMF level is lowered (Clear Light Ventures 2016).

Even more hotly debated is whether there are people who are hypersensitive to EMFs, even at very low levels (Belyaev 2016; www.eiwellspring.org/health/IntroductionToEHS.htm).

What scientists suggest

Scientists who are independent of financial interests tend to accept the non-thermal effects. Three groups of them have come up with some suggestions. As more data became available, their suggested limits were lowered.

Group	RF limits	Reference
BioInitiative 2007	1000 uW/m ²	Sage 2007
BioInitiative 2012	30-60 uW/m ²	Sage 2012
Austrian Medical Association 2012		AMA 2012
Normal	1 uW/m ²	
Slightly elevated	10 uW/m ²	
Far elevated	1000 uW/m ²	
EUROPAEM 2016		Belyaev 2016
Day	10 – 1000 uW/m ²	
Night	1 – 10 uW/m ²	
Sensitive	0.1 – 1 uW/m ²	

Suggested radio-frequency radiation levels from independent scientists.

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Please note that some people use other units for radio-frequency radiation. $1 \text{ uW/cm}^2 = 10,000 \text{ uW/m}^2$.

The EUROPAEM group is the first to suggest radiation limits for sensitive populations, including people with electrical hypersensitivity (EHS). The two BioInitiative reports stated there was a need to further protect vulnerable people, but could not offer a suggested range.

These recommendations are in sharp contrast to the limits recommended by ICNIRP, which forms the basis for the legal limits in most countries (ICNIRP 2020):

Occupational	10,000,000 – 50,000,000 uW/m ²
General public	2,000,000 – 10,000,000 uW/m ²

ICNIRP radio-frequency radiation limits.

ICNIRP does not accept the non-thermal health effects, so their guidelines are solely based on the thermal (heating) health effects. They are also for short term only, not ongoing exposures.

ICNIRP is a private organization, which is closely aligned with the interests of the wireless industry. Membership is by invitation only and their funding is kept secret (Hardell 2017, 2020; Buchner, 2020).

As anyone with a cheap RF-meter can verify, the radiation levels in urban areas are already well above 1000 uW/m^2 in many places. Sometimes they can be above $100,000 \text{ uW/m}^2$ (Hardell 2018).

Other EMF guidelines

The radio frequencies get the most interest these days, but there are other forms of EMF that are equally important, such as from power lines and household wiring.



The table below is a condensed version of the EUROPAEM guidelines (Belyaev 2016):

EMF type	Day	Night	Sensitive
Magnetic field power lines/ELF	1000 nT 10 mG	1000 nT 10 mG	300 nT 3 mG
Magnetic field VLF (3 kHz – 3 MHz)	10 nT 0.1 mG	10 nT 0.1 mG	3 nT 0.03 mG
Electric field Power lines/ELF	10 V/m	1 V/m	0.3 V/m
Electric field VLF (3 kHz – 3 MHz)	0.1 V/m	0.01 V/m	0.003 V/m

EMF guidelines from EUROPAEM
(nT = nanotesla, mG = milligauss, V/m = volt-pr-meter).

There are today no standards for dirty electricity. The issue has received too little scientific attention to set any official standards. Dirty electricity is in the VLF

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range (3 kHz – 3 MHz) and thus somewhat covered by the EUROPAEM guidelines.

Limits for people with EHS

Setting protective limits for people with electrical hypersensitivity is exceedingly difficult and much science still needs to be done (and virtually no funding for it is available).

The level of sensitivity varies from person to person. People can be sensitized to some frequencies and not to others. Other factors may also be important, such as wave forms.

There have been virtually no scientific studies done to establish the safe radiation levels for people with severe EHS, as that is a very slow and difficult task.

Even the lowest limits suggested for "sensitive" people will not be low enough for some people with severe EHS. Based on anecdotes, they would need to be lowered by another factor of 10 to 100, and possibly even more, to be truly inclusive. Such levels used to be widely available, but today are found only in remote rural areas.

More information

Articles about protection against EMF are available on www.eiwellspring.org/shielding.html.

For information on how to measure EMF, go to www.eiwellspring.org/measureemfmenu.html.

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