

EMF Guidelines for Radio Frequency and Low Frequency Electromagnetic Radiation

**In which the health risk of various levels
of EMF exposure are compared**

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Radio-Frequency Radiation Guidelines - for continuous and prolonged exposure

Risk Level	Millivolts per Metre	Microwatts per square meter	Description
1	0.00 – 10.0	0.00 – 0.27	Low risk of health effects, except for electro-hypersensitive people.
2	10.0 – 100	0.1 – 26.5	Slight risk of serious health effects, especially for children / pregnant women
3	100 – 650	26.5 – 1120	Moderate risk of serious health effects
4	Over 650	Over 1120	High risk of serious health effects

Low Frequency Electromagnetic Radiation Guidelines - for continuous and prolonged exposure

Risk Level	Milligauss	MicroTesla	Description
1	0.0 – 1.0	0.00 – 0.1	Low risk of health effects, except for electro-hypersensitive people.
2	1.0 – 2.0	0.1 – 0.2	Slight risk of serious health effects, especially for children / pregnant women
3	2.0 – 5.0	0.2 – 0.5	Moderate risk of serious health effects
4	Over 5.0	Over 0.5	High risk of serious health effects

Continuous and prolonged exposure means exposure for several hours a day, for several months - or years.

Notes

1. Electro-Hypersensitive people may experience discomfort at very low EMF levels (even at Risk Level 1).
2. Pregnant women should spend most of their time in level 1, but brief visits to levels 2 and 3 will probably do no harm. Avoid level 4.
3. Children should spend most of their time in level 1. Short periods of time may be spent in levels 2, 3 and 4.
4. Everyone should avoid continuous prolonged exposure at level 4.
5. Bedrooms, schools, hospitals, libraries and workplaces should be at level 1.

Use with discretion, and at your own risk. Bear in mind that no level of EMF has been proved absolutely safe (except zero).

Two Kinds of Electromagnetic Radiation

There are two kinds of man-made EMF (ElectroMagnetic Field) which are believed to be damaging to our health, and which are common in our homes and workplaces.

One kind is called low-frequency EMF, which is emitted from all mains electrical devices, power lines and house wiring, electric motors and some electronic devices.

The other kind is radio-frequency EMF which is emitted from all radio transmitters, cordless phones, cell phones, cell towers, wi-fi systems, and wireless communications devices.

The two kinds have different qualities. They are measured differently, and the measurements are expressed in different units. That is why the EMF Guidelines on Page 1 above contain two separate sections.

They are both important, because each can affect your health.

This document deals with these two kinds of radiation only.

What About Short-Term Radiation Exposure?

The above guidelines are for **long-term** EMF exposure. That generally means several hours a day for years - but at the very least, months.

What about occasional short-term exposure? If your exposure is limited to a few hours, or days at most, you are unlikely to suffer long-term health consequences, even if exposed to very high levels of radiation (but rather avoid it if you can!)

The exception to this is pregnant women, and possibly very young children. They should avoid high levels of radiation, even for short periods.

How Much Electromagnetic Radiation is Safe?

Sooner or later, in your quest to understand the effects of electromagnetic radiation, you will probably want to understand the numbers.

You may start to ask questions like “How much radiation is in my home right now?”

Suppose you invited me into your house for a cup of tea or coffee, and you asked me to bring along my EMF meter. Walking around your lounge, holding a radio-frequency EMF meter in my hand, I notice that the readings around the room are between 40-100 mV/m, except over by the window, where the level is fluctuating around 250–350 mV/m (millivolts per metre).

So is that too high? Should you be concerned?

To find the answer, refer to our Guidelines (Page 3). You would see that the level of 40 to 100 mV/m spans the Low Risk and Moderate Risk levels, and that 250 – 350 mV/m spans the Moderate Risk and High Risk levels.

We could take similar measurements in your whole house. So now you would have a much better idea of how much risk you are running, and where the “hotspots” are. The meter tells you the numbers.

The EMF Guidelines tell you how much risk you are running. And from that information, you can decide what action, if any, you want to take to reduce your exposure.

How Reliable are the Guidelines?

There is no consensus among scientists as to what level of radiation creates a health risk in the population. Literally thousands of studies have been performed. This means that you can probably find studies to support your viewpoint, no matter what your viewpoint is.

Companies who make profits from devices which generate electromagnetic radiation generally still take the view that there is insufficient evidence of any health risk. They, too can find studies to support this view. (Often, these are studies devised and funded by those companies!)

However, most of the independent studies have found a relationship between high radiation levels and increased health risks. Using the results of these studies, it is possible to deduce the EMF exposure level which caused (or at least was associated with) an increase in the incidence of a particular disease.

Many international bodies, governments and medical institutes have used this information to set legal limits or maximum exposure guidelines. (Over time, these limits may tend to move downwards, as increasing evidence is found of health effects.)

Even the World Health Organization has recently acknowledged that electromagnetic radiation might cause serious diseases, such as cancer.

But legal limits in the USA (and some other countries) have not been reduced from the very high levels which were set decades ago by the International Commission on Non-Ionising Radiation Protection (ICNIRP).

EM Watch has looked into the limits in force in various parts of the world and the recommendations of various expert bodies, and has used this information to compile these EMF Guidelines.

How Much Radiation is Too Much for You?

It appears from scientific research that **no level of electromagnetic radiation (low-frequency or radio-frequency) is completely safe**. Even low levels may cause biological damage.

But the body has some ability to repair EMF damage. So if the amount of EMF you are receiving is within your repair capacity, no long-term damage is done. (Of course, the energy used to effect the repair could have been used by your body for some other useful purpose.)

Generally speaking, the level of radiation which will affect **your** health depends on **how much time** you are exposed to it.

But another factor is **who** you are and **your** state of health. A young, healthy adult can handle more EMF than a child or an older person, or a sick person.

That is why any EMF guideline can only give an indication of the risks for the average person. Bear in mind, you may not be average!

Pregnancy

Pregnant women have to be particularly careful because the foetus is very vulnerable.

There is evidence that high levels of electromagnetic radiation can cause miscarriage. Also, it appears that EMF exposure in the womb can cause the unborn child to be more susceptible to various illnesses later in life.

So a pregnant women would want to take special precautions to avoid high EMF levels. For example

- Keep a good distance between your tummy and any electric oven (2 feet for an electric oven and at least 5 feet from a microwave oven) while it is cooking.
- Do not allow any cell phone to come into contact with your tummy. Try to keep them at least 18 inches away at all times. And if at all possible, avoid having a wireless phone in your house.

We recommend that pregnant women learn as much as you can about EMF, from our website and elsewhere. This is a very important time to minimize your exposure to electromagnetic radiation.

Electro-HyperSensitivity

Some people have somehow become sensitized to certain kinds of EMF, rather like hay-fever sufferers who have become sensitized to pollen. People who are sensitive to EMF are called Electro-HyperSensitive (EHS) or just Electro-Sensitive.

EHS people react to much lower levels of EMF than the rest of us, and they may be more likely than others to suffer serious diseases such as cancer when exposed to high EMF levels.

Although you may not be EHS right now, you could become EHS if exposed frequently to high levels of EMF. The condition is acquired, and appears to be caused by previous EMF exposure.

Using Our EMF Guidelines

Until we know for sure what is, and is not safe, we believe the only sensible way to deal with electromagnetic radiation is to act on the **precautionary principle**. (Treat it as harmful until it proves to be safe.)

Actually, there is already plenty of evidence that EMF is harmful, at least to the health of some people. See <http://emwatch.com/emf-research-quality-and-quantity/>. So it is unlikely that it will ever be proven to be safe.

The EMF Guidelines are intended to be useful and practical, but to make the best use of them you will need to have access to the appropriate EMF meter (either a low-frequency meter or a radio-frequency meter, or both)

Reducing Your EMF Exposure

Radiation exposure has two components: intensity of radiation, and duration of exposure.

It usually takes many years of EMF exposure to cause serious disease, and in the case of cancer this can be a decade or more. (It can even be two or three decades.)

So it is a good idea to reduce your exposure now - before you get sick – to prevent your body from accumulating more radiation damage.

EM Watch has plenty of information about how to reduce EMF exposure from many different sources. But without an EMF meter it is hard to know how much radiation you are getting, and where it might be coming from. So you may find it hard to take meaningful action.

That is why we have reviewed what we consider to be the best [low-frequency EMF meters](#) as well as the best [radio-frequency EMF meters](#) and recommend that you get one of each, and use them to make your home and workplace safer.

I hope you will be able to make use of these EMF Guidelines to reduce your EMF exposure and safeguard your health. I don't need to remind you how precious that is!

Robert Sinclair
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Notes on Appendix 1 & 2

Appendix 1 shows the various international limits and recommendations for exposure to **Radio-Frequency** electromagnetic radiation (or EMF) in descending order (highest limits on top).

EM Watch's own EMF Guidelines are also shown in this table, and the colors reflect the same risk levels we used in the Guidelines on page 1. (High risk is red.)

Notice the huge disparity between different countries' limits. Leading the pack is the USA (with Canada and Japan) whose legal limit is 1000 times higher than Austria (already in our High Risk band) and 10,000 times higher than the BioInitiative Report recommends.

Appendix 2 is similar to Appendix 1, but shows various limits and recommendations for exposure to **Low-Frequency** magnetic radiation, again in descending order (highest limits on top), together with EM Watch's Guidelines.

The table is color-coded to reflect the same risk levels used in the Guidelines on page 1. (High risk is red.)

Again you will notice the enormous range.

Many countries do not even set statutory limits for this kind of radiation, despite known health implications.

Appendix 1 – Radio-Frequency Electromagnetic Limits and Recommendations

EM Watch Electromagnetic Radiation Exposure Guidelines			Copyright: www.emwatch.com
Radio / Microwave Radiation – International Safety Limits (Highest levels at top)			
Electric Field Strength	Power Density		Country or Organization
	mV/m	W/m ²	
61400	10.00	10000000	USA Statutory Limit (also Canada and Japan) ICNIRP Public Exposure Limit (2-300GHz) 1998
6140	0.100	100000	China, Italy (sum of multiple frequencies), Russia statutory limit
5984	0.095	95000	Switzerland, Lichtenstein, Luxembourg statutory limit
3008	0.024	24000	Belgium statutory limit
1942	0.010	10000	Austria statutory limit
650	0.001	1120	EM Watch Guidelines – Maximum for Level 3 - Moderate Risk
614	0.001	1000	BioInitiative Report - Limit for Long-Term Exposure to Pulsed Signal
614	0.001	1000	Salzburg, Austria (1998) Sum GSM
614	0.001	1000	Italy statutory limit for a single frequency
600	0.001	954.9	Council of Europe (2011) - proposed indoor limit (also see 200 mV/m)
200	0.0001	106.1	Council of Europe Report (2011) - proposed indoor limit for "medium term"
194	0.0001	100.0	Building Biology Standard (2003) - Pulsed RF - "Extreme Anomaly" level
135	0.0000	48.1	Median Level of 15 US cities in 1977 (Mainly VHF TV)
100	0.0000	26.5	EM Watch Guidelines – Maximum for Level 2 - Slight Risk
61	0.0000	10.0	Salzburg, Austria (2002) GSM / 3G Limit for Residences (Outdoors)
43	0.0000	5.0	Building Biology Standard (2003)- Pulsed RF - "Strong Anomaly" level
10	0.0000	0.2656	EM Watch Guidelines – Maximum for Level 1 - Low Risk
6	0.0000	0.1	Building Biology Standard (2003)- Pulsed RF - "Weak Anomaly" level

Appendix 2 – Low-Frequency Magnetic Radiation Limits and Recommendations

EM Watch Electromagnetic Radiation Exposure Guidelines		Copyright: www.emwatch.com
Low-Frequency Magnetic Radiation – International Safety Limits (Highest levels at top)		
MilliGauss	MicroTesla	Country or Organization
4166	416.6	ICNIRP Occupational Exposure Limit (60Hz) 1998
1000	100	European Union Recommendation 1999
833	83.3	ICNIRP Public Exposure Limit (60Hz) 1998
750	75	Poland statutory limit
100	10	Russia statutory limit
100	10	Belgium (Flanders)
5.0	0.5	EM Watch Guidelines – Maximum for Level 3 - Moderate Risk
5.0	0.5	Building Biology Standard (2003) - ELF magnetic -"Extreme Anomaly"
2.5	0.25	American National Standards Institute (ANSI) limit
2.5	0.25	National Council for Radiation Protection and Measurement (NCRP)(USA)
2.5	0.25	Confederation of Professional Employees (Sweden)
2.0	0.2	EM Watch Guidelines – Maximum for Level 2 - Slight Risk
2.0	0.2	BioInitiative Report - Planning Limit for all new construction projects
1.0	0.1	EM Watch Guidelines – Maximum for Level 1 - Low Risk
1.0	0.1	BioInitiative Report - Limit for pregnant women and children
1.0	0.1	BioInitiative Report - Limit for all new space adjacent to power lines
1.0	0.1	Building Biology Standard (2003) - ELF magnetic -"Strong Anomaly" level
1.0	0.1	Switzerland – New Installations (Sensitive Use) Limit
0.2	0.02	Building Biology Standard (2003) - ELF magnetic -"Weak Anomaly" level