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| **Background On Measurements And Gauss Meters**  A 2 milli-gauss reading is comparable to standing 4 feet away from a can opener or a microwave (EPA). Obviously, this limit that the EPA dictated is not even endorsed by even their own evidence. The Gauss is a common unit of measurement of magnetic field strength. To read the strength of an EMF, you must use a Gauss meter, which is an instrument that contains a coil of thin wire, typically with hundreds of turns. As a magnetic field radiates through the coil, it induces a current, which is amplified by the circuitry inside the Gauss meter. Gauss meters may vary in the strength of the magnetic field they are capable of measuring. A meter used for measuring EMFs from power lines, transformers, substations and appliances around the home, for example, should be able to measure as low as .1 mg. Meters have either a single axis coil or a triple axis coil. Single axis meters are much simpler than triple axis meters to manufacture and thus, are less expensive. To use a single axis meter you must point the meter's one sensor in three directions---the x, y and z-axis. Then, you combine the three readings in a mathematical equation to calculate the combined field strength. Triple axis Gauss meters are quite accurate, but they are also more expensive. Some Gauss meters do not even include the frequency of the EMF in its calculation. Most meters will read the same EMF strength no mater what the frequency. As the human body appears to be sensitive to both the field strength and the frequency, Gauss meters used for biological purposes should be "frequency weighted" (Levitt). While researching and looking at the means of research for a small number of studies, gauss meters that lacked frequency meters, therefore their results were swayed and bias occurred without the scientists knowing it. These studies had Gauss meters consider the frequency to be 60 Hz and used it in calculating and displaying the EMF's strength. This feature is why frequency weighted meters will show a higher EMF reading than those meters typically used by electricians and engineers, therefore these studies had probably shown no correlation between biological effects and EMF strength when there might have been one (Grant).  **EMFs Concerning Power Lines**  An enormous amount of electricity is created at power generating stations and sent across the country through wires that carry high voltages. All power lines radiate electromagnetic fields. The amount of EMFs coming from a power line depends on its particular configuration. Power companies know which power line configurations are best for reducing EMFs but most don't feel the evidence supports costly changes in the way they deliver electricity. In relation to the power lines, one of the main cancer causing agents is a substation. A substation is an assemblage of circuit breakers, disconnecting switches and transformers designed to substations have been blamed for causing cancer clusters among nearby residents (Feychting & Ahlbom). Paul Brodeur wrote about several such cancer clusters in the July 9, 1990 issue of the New Yorker Magazine. Another part and a cancer-causing agent is a transformer. A key component of a utility's electrical distribution network depends upon numerous, small transformers mounted on power poles. A transformer looks like a small metal trash can, usually cylindrical. Even when the electrical service is underground, you will often see a metal box (usually square) located on the ground near the street. Many people don't realize that when they see a transformer, the power line feeding the transformer is 4000 to 13,800 volts. The transformer then reduces the voltage to the 120/240 volts needed by nearby homes. Since these transformers can be seen in almost every neighborhood, they are a source of concern. EMFs near a transformer can be quite high, but due to its small structure, the field strength diminishes rapidly with distance, as it does from any point source (Feychting & Ahlbom). For this reason, having a transformer located near your home is usually not a major source of concern, although just to make sure, everyone should measure the field strength around it (Prata).  **Inside And Outside Sources Of EMFs**  If your home has high EMF readings, it is important to determine the sources of the EMF so that remedial action can be taken, if possible. Many times a particular room will have a higher EMF reading. Check to see if the electricity is coming into the house on the wall outside that room. When this is the case, it is usually a good idea to block off that room and only use it for storage purposes. Sometimes, the source of a high magnetic field is incorrect wiring. If you suspect that your home is wired improperly, obtain the services of a licensed electrician (Coghill). Computers are another highly controversial subject concerning EMFs. Electromagnetic Fields radiate from all sides of the computer. Thus, you must not only be concerned with sitting in front of the monitor but also if you are sitting near a computer or if a computer is operating in a nearby room (Hughes). The Swedish safety standard, effective 711/90, specifies a maximum of 0.25 mG at 50 cm from the display (Feychting & Ahlbom). Many US manufactured computers have EMFs of 5 - 100 mG at this distance. The screens placed over monitors do not block EMFs. Not even a lead screen will block ELF and IF magnetic fields (Coghill).  Another source of EMFs are electric blankets create a magnetic field that penetrates about 6-7 inches into the body. Thus it is not surprising that an epidemiological study has linked electric blankets with miscarriages and childhood leukemia. Electric clocks have a very high magnetic field, as much as 5 to 10 mG up to three feet away. If you are using a bedside clock, you are probably sleeping in an EMF equivalent to that of a power line. Studies have linked high rates of brain tumors with chronic exposure to magnetic fields, so it is wise to place all clocks and other electrical devices (such as telephones and answering devices) at least 6 feet from your bed (Sugarman).  Microwave ovens and radar from military installations and airports emit two types of radiation: RFs and ELFs. Microwaves are measured in milliwatt per centimeter squared (mW/cm2). As of 1/1/93, the U.S. safety limit for microwave exposure is 1 mW/cm2, down from a previous 10 mW/cm2. The Russian safety limit is .01 mW/cm2. As all microwave ovens leak and exceed the Russian safety limit, microwave ovens have been outlawed in Russia. In addition, recent Russian studies have shown that normal microwave cooking coverts food protein molecules into carcinogenic substances. Telephones can emit surprisingly strong EMFs, especially from the handset (Grant). This is a problem because we hold the telephone so close to our head. Some brands emit no measurable fields and others emit strong fields that travel several inches right into your brain. Answering machines, particular those with adapter plugs (mini-transformers), give off high levels of EMFs (EPA). Electric razors and hair dryers emit EMFs as high as 200 to 400 mG. This seems alarming, but there is no evidence if this is worse (or better) than a chronic exposure to a 2-3 mG field. Some EMF consultants recommend that hair dryers not be used on children as the high fields are held close to their rapidly developing brain and nervous system (WHO).  **Mobile Phones and their EMFs**  Mobile phones allow people to be within reach at all times. These low-power radio wave devices transmit and receive signals from a network of fixed low power base stations. Each base station provides coverage to a given area. Depending on the number of calls being handled, base stations may be from only a few hundred meters apart in major cities to several kilometers apart in rural areas. Mobile phone base stations are usually mounted on the tops of buildings or on towers at heights of between 15 and 50 meters. The levels of transmissions from any particular base station are variable and depend on the number of calls and the callers' distance from the base station. Antennas emit a very narrow beam of radio waves, which spreads out almost parallel to the ground (Carlo). Therefore, radiofrequency fields at ground level and in regions normally accessible to the public are many times below hazard levels. Guidelines would only be exceeded if a person were to approach to within a couple feet or two directly in front of the antennas. Until mobile phones became widely used, members of the public were mainly exposed to radiofrequency emissions from radio and TV stations (Carlo). Even today, the phone towers themselves add little to our total exposure, as signal strengths in places of public access are normally similar to or lower than those from distant radio and TV stations. The user of a mobile phone is exposed to radiofrequency fields much higher than those found in the general environment. Mobile phones are operated very close to the head. Therefore, rather than looking at the heating effect across the whole body, the distribution of absorbed energy in the head of the user must be determined. Concerns about other so-called non-thermal effects arising from exposure to mobile phone frequencies have also been raised (Carlo). These include suggestions of subtle effects on cells that could have an effect on cancer development. Effects on electrically excitable tissues that may influence the function of the brain and nervous tissue have also been hypothesized (Bowman, Sobel, & Peters). However, the overall evidence available to date does not suggest that the use of mobile phones has any detrimental effect on human health (Levitt).  **Guidelines on EMF and Who Makes Them**  There's a heated debate as to what electromagnetic field (EMF) level is considered safe. Countries set their own national standards for exposure to electromagnetic fields. However, the majority of these national standards draw on the guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This non-governmental organization, formally recognized by WHO, evaluates scientific results from all over the world. Based on an in-depth review of the literature, ICNIRP produces guidelines recommending limits on exposure. ICNIRP�s aim is  "Protection against the adverse health effects of non-ionizing radiation is a broad field demanding knowledge of many scientific disciplines. Most important among these are epidemiology, medicine, biology and physics and engineering. It is ICNIRP�s aim to harness such expertise by bringing together, within its membership, independent experts in these fields to provide sound advice on the health hazards of non-ionizing radiation exposure based on thorough professional evaluations of the published scientific literature." (ICNIRP)  Their guidelines are reviewed periodically and updated if necessary. Many government and utility documents report the usual ambient level of 60-Hz magnetic field to be 0.5 mG (National Institute of Environmental Health Sciences and United States Department of Energy). Thus, any reading higher than 0.5 mG is above the "usual" ambient exposure. Many experts and public officials, as well as the few governments that have made an effort to offer public protection, have adopted the 3 mG cutoff point (National Health and Welfare Department (Canada)). The EPA has proposed a safety standard of 1 mG. Sweden has set a maximum safety limit of 1 mG. Dr. Robert Becker, an MD who has been studying the effects of EMFs for 20 years, states a 1 mG safety limit. When electricians try to solve a magnetic field problem they do their best to drop the level to 1 mG or below (National Electrical Manufacturers Association). Dr. Nancy Wertheimer, a Ph.D. epidemiologist who has been studying EMFs for 20 years, has been looking at the epidemiological data in a different way; she is trying to associate EMF levels with health rather than disease. The level she is coming up with is a cut off of 1 mG. Russian researchers claim that 1/1000ths of a mG should be the standard.    ([Intro1](http://docs.google.com/introduction.html))([Intro2](http://docs.google.com/intro2.html))([Intro3](http://docs.google.com/intro3.html))([Intro4](http://docs.google.com/intro4.html))  [[Home](http://docs.google.com/home.html)][[Introduction](http://docs.google.com/introduction.html)][[Hypothesis](http://docs.google.com/hypothesis.html)][[Procedure](http://docs.google.com/procedure.html)][[Data](http://docs.google.com/data.html)][[Conclusions](http://docs.google.com/conclusions.html)][[Bilio/Links](http://docs.google.com/biblio.html)]  [[2002 Projects](http://docs.google.com/AP2002/index.html)][[2001 Projects](http://docs.google.com/index.html)][[2000 Projects](http://docs.google.com/AP2000/index.html)][[1999 Projects](http://docs.google.com/AP99/index.html)][[1998 Projects](http://docs.google.com/AP98/index.html)] |