How to shield or avoid electromagnetic fields

By the folks at Alphalab Inc.
Makers of the Trifield® EMF meter (model TF2)

RF:

Radio waves and microwaves can be reflected off a metal sheet in exactly the same way that light reflects from a mirror. The metal sheet can be very thin and can even have holes in it (as long as the holes are small: smaller than the wavelength that is to be reflected). Therefore, aluminum foil, aluminum screen door material (or metal mesh), or even Mylar space blankets* will reflect radio waves. Aluminum siding also works. If an outdoor cell tower is transmitting microwaves, and you hang a metal sheet on the wall between the cell tower and you, the direct microwave radiation will be reflected back outdoors. Of course there still may be some microwaves getting indoors because of reflection off of structures in back of you (think of it this way: if you were outdoors and stood under an umbrella to shield yourself from direct sunlight, some indirect light would still be present).

Metal sheet or mesh can be hung on the inside wall or the outside wall. In some cases, if the RF is also coming through the ceiling, metal sheeting or mesh may need to be placed there. The more area that is covered by the metal, the more effective the shielding. If various transmitters completely surround the house, it may be best to apply metal sheeting to all walls. You can tell in which direction the transmitters are located and how strong they are simply by holding the TriField Meter (set to RF) in front of you and rotating in a 360° circle. Because your body blocks the RF sources that are in back of you, the meter will only detect RF sources in front of you.

* The very smooth Mylar space blankets that are shiny on both sides, and are very inexpensive, reflect RF well. However, the more expensive space blankets that are a tarp on one side (and shiny on the other side) may not reflect RF well, especially if the shiny side is embossed with shapes or with a weave pattern.

Electric Field:

Most of the concern over EMF in the environment is with the RF and magnetic fields, not the electric field. Instead of being an environmental concern, a high electric field implies that a device or appliance is not properly grounded and may be a shock hazard (however, it would only be a shock hazard if you touch the appliance and simultaneously touch something grounded). In a typical home, it is not common to see an electric field higher than 100 V/m. In comparison, a magnetic field higher than 1 milligauss is fairly common. One milligauss of magnetic field (at power line frequency) will create a certain amount of current in the body. However, it would require about 700 V/m of electric field (at power line frequency) to produce the same amount of current in

the body, and this high level of an electric field would be quite rare except near improperly grounded appliances or wires.

If the electric field is over 100 V/m when pointing toward an appliance such as a refrigerator, the grounding may be improper. If the appliance plug has three prongs, make sure the ground prong is making contact. If the plug of the appliance only has 2 prongs, and one prong is larger than the other, make sure the larger prong is plugged into the larger slot in the wall. If there are only two prongs and they are both the same size, unplug and flip the plug 180 degrees (reverse the polarity). Then plug it back in. This may reduce the electric field.

Electric field can be shielded by any metal sheet or metal mesh. However, unlike RF the electric field shielding material should be connected to ground. Connection is usually through a wire. One side of the wire is connected to the center screw of a wall outlet cover or light switch cover, or to cold water plumbing. The other side of the wire is usually taped to the metal sheet or mesh.

Magnetic field:

This type of field is difficult to shield. Unlike electric field and RF, thin sheets of metal or mesh have no effect on magnetic field and you'll notice that the presence or absence of your body also has no effect on the magnetic field reading. Another side effect of this insensitivity to thin metal is that it is difficult to tell where the magnetic field is coming from. With electric field and RF, you can simply point the meter outward and rotate around to find the direction where the field is strongest. Your body blocks the RF and electric field that might be coming in from in back of you. This rotation to find the source does not work for magnetic field. Instead, you must move the meter (not just rotate it), and the magnetic field source is the location where the magnetic field is strongest. This means you need to move the meter closer and closer to the source and watch the reading increase.

Much thicker metal sheets are required to shield magnetic fields. Generally, a 1/8" thick sheet of a conductive metal, like aluminum, or a magnetic metal, like steel, will reduce the magnetic field by about 50%. The sheet must be placed between you and the magnetic field source. The sheet must be fairly large-- at least as wide as the distance between the source and the sheet. If the source of the magnetic field is a small object such as an AC wall adapter, then only a small amount of metal is needed to shield it, because the sheet can be placed close to the wall adapter and therefore does not have to be very wide. There is no need to ground the sheet, because grounding will have no effect on the magnetic field.

There is one more problem when trying to shield magnetic fields. Magnetic field is a vector and it has a direction. Conductive metal such (as aluminum) is good at shielding magnetic field in one direction but not another. Magnetic metal is good at shielding magnetic field in the other direction. Here are some examples: If there is wiring in the wall in front of you, and that wiring is carrying current, it will produce an AC (alternating) magnetic field at your location in front of the wall. However the direction of the field

where you are standing cannot be predicted unless you know exactly how the wiring is laid out. The magnetic field as measured at your location might be oscillating forward and backward along your line of sight, or it may be oscillating left-right, or it may be oscillating up-down, or even in some diagonal direction.

An aluminum sheet, placed in front of you (like a wall) will have best effectiveness if the magnetic field happens to be alternating forward-backward along your line of sight. However, aluminum is ineffective if the field direction is left-right or up-down. If the field is in either left-right or up-down, steel is more effective. The best overall shielding is achieved by using both sheet steel and sheet aluminum stacked together. As it turns out, steel does at least have some effectiveness in blocking a forward-backward field in addition to its better effectiveness at up-down and left-right magnetic field. Therefore if only one type of metal is used for shielding, it should be steel, and the thicker the better. Please be aware that the type of steel is the cheap kind, (not stainless). The best steel is the type that a magnet is strongly attracted to.

Other methods of reducing magnetic field exposure include simply avoiding high-field areas (of course), but also experiment with turning off certain appliances, and in some cases, try using an extension cord to plug an appliance like a refrigerator into a different outlet, and measure whether this reduces the field.