"If you can afford it, it is always best to install metal-clad wiring everywhere in the house rather than plastic-jacketed "Romex" wiring. *[But see article farther down, which suggests twisted Romex.]*

"Secondly, you don't need to rewire or shield all your plastic lamp and appliance cords plugged in in a room. It all depends upon how close you are to cords that you plug in and how much time you spend near them.

"The general rule of thumb is that electric field exposure extends about 6-8 feet from unshielded cords and it drops off gradually as you move away. So the really high area of exposure is the closest 3-4 feet. Also, we don't produce melatonin by the pineal gland during the day, only at night when we sleep. And the interference with Stage Four sleep (from electric fields) obviously only occurs at night. So for most people, we don't worry so much about day and evening time exposure to electric fields as much as we do at night, when such exposure *does* reduce melatonin production and interferes with deep, Stage Four sleep, the most restful kind. We plan to keep your exposure to these fields in the bedroom in your new house.

"Granted whenever you are in an electric field, day or night, all the charged particles (both ions and electrons) in every cell are constantly being attracted and repelled from any unshielded plastic cord (or plastic-jacketed Romex wire in the wall) within 6-8 feet, causing a subtle agitation that is most perceived at night. If you are in that field during the day, however, there is a gradual, cumulative biological effect, wearing down your vital energy.

"So the less you are in the presence of electric fields during the day and evening, the better. Focus on areas where you sit or stand for long periods of time and draw an imaginary 6-8 foot arc around that. Any plastic power cords within that range, even in a room on the other side of the wall or underneath you, can and should be shielded, either by rewiring with *unshielded* AC power cord, or with the conductive plastic shielding sleeve and grounding patch cord available through LESS EMF.

"It also depends upon how electrically sensitive you are. The more sensitive you are, the more precise you need to be with this. The less sensitive you are, the less critical it becomes. Then it is up to how you feel. First see how you feel unplugging all cords within an imaginary 6-8 foot bubble of where you sit for a few hours, and then plug some in. See if you notice a difference. If so, try to shield them or plug them into a surge protector/power strip with a switch on it and only turn on the switch when you need to use the appliance, then turn if off at the power strip switch.

"You can also plug an unshielded plastic AC power cord into a "Current Tap with Switch" (also known as a "Wall Tap with Switch") sold at smaller hardware stores for $5 (the big box hardware stores don't seem to have them). That way, when you turn off the lamp or appliance at the Current Tap plugged into the outlet rather than on the lamp or appliance itself, the cord is dead, too. When you turn off the lamp or appliance using it's own on/off switch, the cord remains "hot" with live voltage in it, and hence it produces an electric field. Also, they don't make Wall Taps for three-pronged plugs. They only work with two-pronged plugs, like for a lamp. To shut off a grounded appliance with the third prong, plug it into a

power strip and turn off that switch (remember that the AC power cord for the power strip itself is not shielded, so push that as far away from you as possible).

"The most important thing is that you insure that you sleep in an electric field-free environment at night, and we have taken steps to design that for you. If you use metal-clad (MC) cable everywhere in your new house, you will still want to install a shut-off switch near the bed, so that you and your husband can just reach over and turn off the switch after you read in bed. That way you kill the Voltage in all unshielded power cords within 6-8 feet of your bed while you sleep. That is very important in a bedroom (and surrounding rooms) wired in metal cable. You can turn this switch back on when you need to get up in the middle of the night, and turn it off again when you get back in bed.

"Also remember to look at whatever is plugged in on the other side of the wall from your bed. Let's say you have a table in a living room with a lamp on it and your bed is on the other side of wall from the lamp. You will want to plug the lamp cord into a Wall Tap and shut off that switch every time you turn off the lamp, at least before you go to sleep at night. Otherwise you could have an electric field exposure coming right into your bedroom because your bed is within the 6-8 feet of electric field exposure from the unshielded power cord in the next room. Electric fields go right through walls and floors, but they are contained within grounded metal shielding (metal clad wiring) or the conductive plastic sleeves sold by LESS EMF, provided they are grounded.

"In terms of your question about which appliance cords to rewire or shield, the answer has more to do with the location of the lamp or appliance and how much time you spend near it rather than the appliance itself. Certainly a metal floor lamp should be rewired with *shielded* AC power cord available for $5 from LESS EMF. This is because the metal amplifies the electric field exposure. I can provide your electrician or small appliance repair shop with a wiring protocol to make the entire metal stem of the lamp continuous with the grounded shielding of the cord so the entire lamp is shielded.

"As for plastic cords for other lamps and appliances, in general, grounded appliances will produce less electric field exposure than ungrounded ones, but they still produce some exposure. You know you have a grounded appliance because there is a third prong on the plug. Don't plug one of these into an ungrounded outlet using a so-called "cheater plug" (those gray plugs that allow you to plug a three-pronged plug into one end, with only two prongs on the other) because that defeats the protection that the grounding provides and increases the electric field exposure. Especially don't plug a refrigerator, which is always grounded, into an ungrounded outlet. The big metal frame will amplify electric field exposure into half your kitchen, right where you stand hours per day, and you will be in an unhealthy, high electric field. Several clients of mine have become quite ill from this. Your new house will have new working grounded outlets, but it is always a good idea to purchase a "Circuit Tester" for $11 from the hardware store to check that all outlets have working grounds.

"Finally, at your computer, you can purchase shielded AC power cords with the molded plug that fits into the back of most desktop computer CPUs (central processing units, or "towers") and monitors. They are available at Radio Shack for $7, labeled "Shielded" AC Power Cord. If it is not labeled that way,

specify Part # 61-2860. Also, the word "SHIELDED" is printed on the cord itself. Unplug your grounded unshielded cords from the computer or monitor and replace them with shielded ones from Radio Shack where you can. For the other cords that are two-pronged or don't have the molded plug at the other end, rewire them with shielded cords or slide the shielding plastic sleeve over them (which you then ground). This includes AC power cords that are grounded but are hardwired right into the back of a monitor or printer and cannot be unplugged at the appliance end.

-- Oram

The tested 3- conductor ROMEX cable did a full turn of the wires inside it for every four inches (10 centimeters) of running cable. This twist could be duplicated by hand – perhaps by using a variable-speed (low speed) power drill with a bent nail in the chuck to hold the cable. A non-electric set up should also be possible.

Twisting the cable more than once per four inches may improve the shielding effect. The author has not tested these possibilities.

It is clear that the 3-conductor ROMEX wire (ROMEX 12/3) is vastly superior to the 2-conductor (ROMEX 12/2). This is due to the fact that the individual wires inside the cable happen to be twisted around each other. This effect is used in wires for computer networks and long telephone cables, so it was not a surprise that it also worked well here.

What was surprising was that the ROMEX 12/3 cable also is superior to the other cable combinations tried, i.e. the flexible metal-clad cable (MC 21/2) and when the ROMEX 12/2 was put in metal conduit and even when put in the heavy duty IMC conduit.

When the ROMEX 12/3 cable was further shielded by EMT conduit, the radiation level become so low that it only measured 0.4 milligauss directly on the surface of the conduit.

http://www.eiwellspring.org/ChoosingHouseholdWiring.htm

http://www.eiwellspring.org/DMH-Wiring.htm

The cables used were standard ROMEX cables, but they were twisted. Twisting the wires reduced the EMF radiation from them by about 90% in an experiment done by the author. (A 90% reduction is not as impressive as it sounds, but it helps). It is a very cheap way to reduce EMF, and really ought to become common practice. It is very simple to do. The electrician simply sticks the end of the cable into the chuck of a power drill and then slowly turns it, twisting the cable. It only takes a minute. One twist per 1 to 4 inches (2.5 cm to 10 cm) is fine. The cable is just as easy to use afterwards, in fact our electrician thought it was easier to pull it. Twisted wires are standard practice in telephone cables and computer networks, because the wires do not disturb each other as much on long runs.

An alternative is to buy cables that happen to be twisted already by the manufacturer. If you ask for twisted ROMEX at the hardware store, you are very likely to draw blank stares. The trick is to closely inspect the available cables. Those that have twisted wires inside the sleeve can be spotted when looking carefully. One commonly available already-twisted cable is one that has three conductors and ground inside the sleeve (they are colored red, black, white and bare copper). These are commonly used for 220 volt AC wall units and three-way hallway lighting. They cost a little extra, but no inspector should raise an eyebrow. Simply cut off the extra red wire at each end, and otherwise use as you would normally.

Twisting ROMEX cable, using a power drill

Routing of the cables

The cables were pulled through the attic and down the walls. They were not pulled horizontally along the walls, except for short stretches. This keeps the cables further away from the people, especially when sitting or lying down. It also avoids the coil-effect, where cables circling a room in effect create a coil. The wiring was done carefully, to ensure that the neutral (white) wires from two circuits are never tied together. This can cause unbalanced circuits, with higher EMF levels the result. The best way to avoid this common error is to have only one circuit connected to each wall box.

Kill switches

All outlets in the bedroom are fed through a kill switch, which is an ordinary double-poled switch that disconnects both the "hot" and the "neutral" wires. Disconnecting both conductors limits the high frequency signals that can travel on a wire, and radiate from it. These signals, called "dirty power", are generated by many sources, such as computers, fluorescent lights, and other types of electronics. They can also come to the house from the outside, caused by old wiring in the street, or activities next door. The adjacent bathroom and adjacent section of the living room also have kill switches, so the whole west end of the house can be made completely free of electricity. An even more effective kill switch would be to install a four-poled switch to also disconnect the ground for the area. The ground wires can act as a conduit for dirty power as well, though less likely. Any sort of switch on the building ground wires will not pass inspection, and should be considered carefully.

GFCIs. The electronics inside a GFCI emit EMF. The amount varies dramatically between brands. This author tested several brands and found that the Cooper brand has the lowest emissions, and it apparently has been the best for several years. To further reduce emissions from the GFCIs in the house, they were all put on switches, so they only have power to them when needed

Computers, clocks, stereos, etc. The problem with these devices is that their power supplies leak electricity onto the grounding wire, and they emit high frequency signals that travels on all wiring. Therefore, using plastic boxes can be better. http://www.eiwellspring.org/DMH-Wiring.pdf

Be aware that some surge protectors radiate high-frequency EMF. Put an AM radio next to one to find out. Choose a power strip with metal housing. This avoids another piece of plastic in the house, and the metal also shields some of the EMF from the wires inside. (In a cable, the two wires run next to each other and largely cancel each other's EMF fields. **Inside a power strip, they run about 1/2 inch from each other.)**

Metal power strips can often be found at hardware stores and building supply centers. One brand is Tripp-Lite, which also is available by mail order (such as Digi-Key, 1-800-344-4539, www.digikey.com).

http://www.eiwellspring.org/ehs/UsingPowerStrips.htm

Then I looked at the breaker panel on the side of the house. **It was not connected directly to a grounding rod, but was only grounded through the underground cable going to the meter on the garage. This setup reduces ground currents, and is thus a good thing,** though many building inspectors would frown upon it. http://www.eiwellspring.org/ehs/ElectromagneticSurveyOfAHome.htm

Arc-detecting breakers

The National Electric Code recently introduced the requirement that the breaker for the bedroom circuit is a special arc-detecting braker, called an AFCI (Arc- Fault Circuit Interrupter). An AFCI has electronic circuitry which monitors the line, to detect sparks generated by faulty wiring, which is a fire hazard. Unfortunately, such sophisticated electronics generate EMF. The model purchased by the author emitted a high level of EMF. Hopefully other models are better designed, but probably not. This is another reason to locate the breaker panel away from frequently occupied areas.
http://www.eiwellspring.org/DMH-Wiring.pdf