



Exposure to Electric and Magnetic Fields

All electrical equipment generates electrical and magnetic fields. The fields exhibit characteristics defined by the frequency of the electrical signal and the strength of the electrical current. The field propagates through space and provides the basis for radio signals and measurable exposure to humans.

There has been extensive research on the biological effects of RF fields over the last 20 years. This concern has been fueled by published research on high level experimental exposure research on animals and has been extrapolated to low exposure levels experienced by the general public.

Research was prompted by the effects of early high power radar and exposure to humans. Early radar research provided the basis for the microwave oven. Research on transmission lines found a weak association with leukemia in children. This association has not been strong enough over many studies to establish a clear cut cause and effect.

Computer video display terminals also have caused concern among the general public. Early color TV sets used high voltages to produce color displays and emitted measurable levels of x-rays which prompted public concern. Advisory notices to keep children away from the area directly in front of the sets were issued. Early video data terminals also displayed some low energy x-ray generation. This concern then extended to the electric field also generated by the terminals. An entire industry developed around providing shields for concerned users. The industry responded by building display units without significant emissions. All terminals in use today are of the low emission variety. Measurements taken at units used around Penn State have not found any significant emissions or exposure to electrical or magnetic fields. Flat panel or liquid crystal displays do not emit any significant electrical or magnetic energy.

Some members of the general public still exhibit concern over health effects of exposure to radio frequency (RF) radiation associated with cell phone repeaters and transmitters. This concern is a result of information relayed by the popular press from studies that have since been proven to have methodological flaws or from extrapolating effects from high exposures to the low exposures presented by cell transmitting stations. The typical cell phone user experiences higher exposures during use of their actual transmitting phone.

The only significant biological effect seen to this point is thermal heating by the "microwave" effect of the frequency used in cell communication. The limits adopted by the FCC were reviewed in 1996 and consist of a two tier exposure guideline, one for occupational exposure and one for the general public. Occupational exposure limits are 2 micro watts per square cm and the public exposure limit is 1 micro watt per square cm. Exposure approaching these levels are only likely to be encountered very close to or directly in front of the microwave frequency antennas.

There is no evidence that exposure to RF energy at or below recommended limits has any health significance to humans. Because of the large safety factor incorporated into the FCC exposure standards, the limits are far below anticipated thresholds for hazards. EPA agrees that there are no significant non-thermal human health hazards at FCC limits. Based on the National Council on Radiation Protection review of research on RF fields, biophysical considerations do not suggest a plausible basis for hazards from electromagnetic fields at exposure levels at or below present limits.