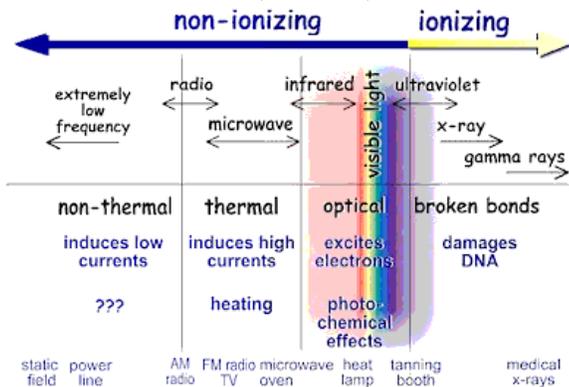


A BUSINESS OF FDH VELOCITEL

What is RF Energy? Radio Frequency (RF) energy is a type of electromagnetic (EM) energy, which is energy that travels, or radiates, through space. Light is EM energy. The sun radiates RF energy as well as light. Just as we have harnessed light to see at night, we have harnessed RF energy in radios to communicate over great and small distances. The first radios appeared in the late 1800s. In the 20th century, the usage of both artificial light and radio communications boomed such that today stores are open 24 hours a day and mobile phones let us communicate anywhere in the world.

Types of Electro-Magnetic Energy

(Source EPA)



RF is non-ionizing: its energy is too weak to remove or add charged particles to an atom. Ionization changes an atom's structure, turning it into an ion. When ionizing radiation, such as X-Rays and Gamma Rays, affects molecules, such as DNA, it can cause permanent defects; hence damage is cumulative. Non-ionizing radiation such as light, infra-red, microwave and RF cannot change the makeup of an atom. Such non-ionizing radiation does induce currents and cause cellular heating, but these effects are not cumulative. Once non-ionizing radiation is removed, its effects cease. However, excessive heating can have serious health effects, which is why RF safety is important.

How much is too much? Based on years of scientific research, the Federal Communications Commission (FCC) has adopted limits for human exposure. It has set a *Maximum Permissible Exposure* for the *General Population* -- people who have no control of their exposure—and a separate maximum for *Occupational* -- workers who understand the risks and can take appropriate actions when working in environments with elevated RF energy. While there are large safety margins, exceeding these limits can cause serious health problems such as burns, dizziness, heat stroke and even death. In the US the FCC regulates RF Health and Safety.

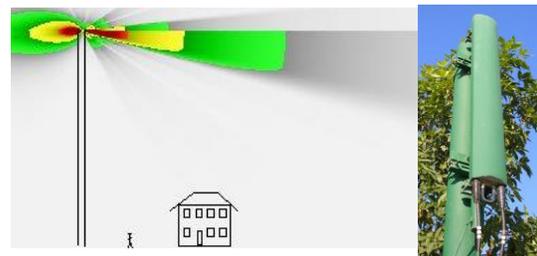
What is Maximum Permissible Exposure?

- 100% of *Occupational Limit* is the Human Exposure Limit which has a 10 times safety factor
- The *General Population Limit* is an additional 5 times lower for a total of a 50 fold safety factor.
- 5% of the *General Population limit* = 1% of the *Occupational Limit* = 1/1,000th of the level known to cause harm.

Comparing Power There is a wide range of powers used based on the radio service. Broadcasters use very high power and portable devices use very little. Mobile base stations and phones reduce their power to eliminate interference and prolong battery life. They will typically use ¼ or less their maximum power. For RF safety analysis maximum power is assumed.

Source	Power (Watts)
TV Broadcast	1,000,000
Radio Broadcast	50,000
Wireless Base Station	2,000
WiFi	1/10
Mobile Phone	1/2

Wireless Base Stations Typical antennas at wireless base stations focus the RF energy so that it is pointing away from the site to give maximum coverage. Relatively little energy is exposed to areas below the antenna. Antennas mounted on roof tops will have their power further reduced in the building because roofing absorbs and reflects RF energy.



Andrew 932DG65VTE

What will the exposure be? Every situation is different but areas around wireless base stations that the public can access, such as the bottom of a tower or inside a building with antennas, are typically much less than 5% of the General Population limit. Our measurements under and in the neighborhood of mobile phone installations are generally less than 0.1% of the limit, similar to measurements a few feet from a WiFi access point.

Do you still have questions / concerns? Please contact Sitesafe.

Matthew J Butcher, PE
VP Engineering & Development

RF Safety and Regulatory History

- A concern since the 1950's when high powered radar systems were introduced
- ANSI initiated the Radiation Hazards Standards project in 1960 with Dept of Navy and IEEE.
- The National Environmental Policy Act (NEPA) of 1969 required the FCC to evaluate the effects of RF with respect to the quality of the human environment.
- ANSI published standards for RF Safety in 1982.
- The FCC first adapted rules on RF Safety in 1985.
- After more research the IEEE published a standard C95.1 in 1992 that was also adopted by ANSI.
- The Federal Telecommunications Act of 1996, Section 704 prohibits local zoning authorities from denying permits on the basis of radio frequency emissions concerns as long as the emissions comply with current FCC regulations.
- In 1997 the FCC enacted the current rules that are followed for RF Health and Safety. The IEEE standard was the basis but input from over 150 parties was used to create these regulations.
- FCC Exposure Limits are similar to ICNIRP limits which are promoted by the WHO for use worldwide.
- In 2009 the ICNIRP found "no evidence of any adverse effects below the basic restrictions" and made no change to exposure limits.
- Research continues on this topic and various concerns have been raised over the years but the scientific community has not found a rationale to change the current safety levels and the FCC has not revised their regulations.
- In 2012 both United Kingdom and Norwegian public health agencies released reports which found current protective exposure levels appropriate after an exhaustive review of the scientific literature.

Reference:

- Site Safe, Inc <http://www.sitesafe.com>
- FCC Radio Frequency Safety <http://www.fcc.gov/encyclopedia/radio-frequency-safety>
- National Council on Radiation Protection and Measurements (NCRP) <http://www.ncrponline.org/>
- International Committee on Electromagnetic Safety, (IEEE / ICES) <http://www.ices-emfsafety.org/>
- American National Standards Institute (ANSI) <http://www.ansi.org>
- Environmental Protection Agency (EPA) <http://www.epa.gov/radtown/wireless-tech.html>
- National Institutes of Health (NIH) <http://www.niehs.nih.gov/health/topics/agents/emf/>
- Occupational Safety and Health Agency (OSHA) <http://www.osha.gov/SLTC/radiofrequencyradiation/>
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) <http://www.icnirp.org/>
- World Health Organization (WHO) <http://www.who.int/peh-emf/en/> and <http://www.who.int/features/qa/30/en/>
- National Cancer Institute <http://www.cancer.gov/cancertopics/factsheet/Risk/cellphones>
- American Cancer Society (ACS) http://www.cancer.org/docroot/PED/content/PED_1_3X_Cellular_Phone_Towers.asp?sitearea=PED
- European Commission Scientific Committee on Emerging and Newly Identified Health Risks http://ec.europa.eu/health/scientific_committees/opinions_layman/en/electromagnetic-fields/index.htm
- Fairfax County, Virginia Public School Survey <http://www.fcps.edu/fts/safety-security/RFEESurvey/>
- UK Health Protection Agency Advisory Group on Non-ionising Radiation http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1317133826368
- Norwegian Institute of Public Health <http://www.fhi.no/dokumenter/545eea7147.pdf>