

RF SAFETY: FREQUENTLY ASKED QUESTIONS

I. What is a Distributed Antenna System (DAS)?

A distributed antenna system, or DAS, is a network of spatially separated antenna sites called “nodes” connected to a common source that provides wireless service within a geographic area or structure. DAS antennae are typically installed near the top of light standards or on utility poles (figure 1). The DAS antennae are typically mounted 20-40 feet above the ground.



Figure 1

As illustrated in the figure 2, the idea is to split the transmitted signal among several antenna sites, separated in space so as to provide coverage over the same area as a single antenna but with reduced total power and improved reliability. A single antenna radiating at high power (a) is replaced by a group of low-power antennas to cover the same area (b). Some of the other advantages of DAS include the ability to provide service for multiple wireless carriers (e.g., T-Mobile, AT&T Wireless and Sprint/Nextel) without the need to have separate antenna sites for each carrier at each location and the ability to place the antennae on existing vertical structures such as light or utility poles.

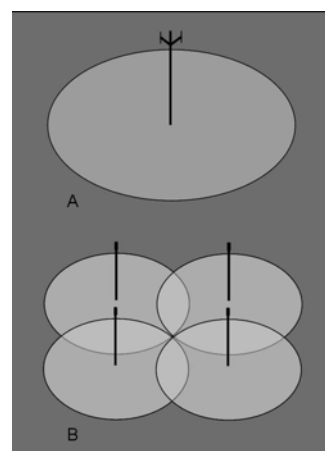


Figure 2

II. What are people exposed to from DAS sites?

As explained above, DAS uses a network of sites that can communicate with one another and customers near the sites using radio waves. These radio waves are referred to by a number of different names such as electromagnetic energy (EME), radiofrequency radiation (RFR), radiofrequency (RF) energy, electromagnetic radiation (EMR), microwaves, electromagnetic fields (EMF) and non-ionizing radiation. The term "RF energy" or just "RF" is used in this document to refer to transmitted signals from DAS sites. Exposure to RF energy is a fact of everyday life. RF energy is emitted by natural sources like the sun and the earth, and by man-made sources such as AM/FM radio and television broadcasts; cellular telephones and their base stations; baby monitors and paging antennas, just to name a few.

III. Is the RF energy from DAS antennas similar to x-ray radiation?

No. While x-rays are a form of EME, the energy of x-rays is more than 100 million times higher than the radio waves transmitted by DAS antenna. The interaction of x-rays with tissues is completely different than with RF energy. X-rays contain enough energy to change the chemistry of important biological molecules in cells like proteins and DNA through a process called "ionization". RF energy is more than 100 million times weaker than x-rays and does not contain anywhere near enough energy to cause ionization and break chemical bonds. For this reason RF energy is referred to as "non-ionizing" radiation. Other forms of non-ionizing radiation include sources of higher energy than RF such as visible light (approximately 100,000 times higher) and lower energy sources such as Extremely Low Frequency (ELF) radiation produced by power lines. Taken together all these forms of EME make the electromagnetic spectrum (figure 3).

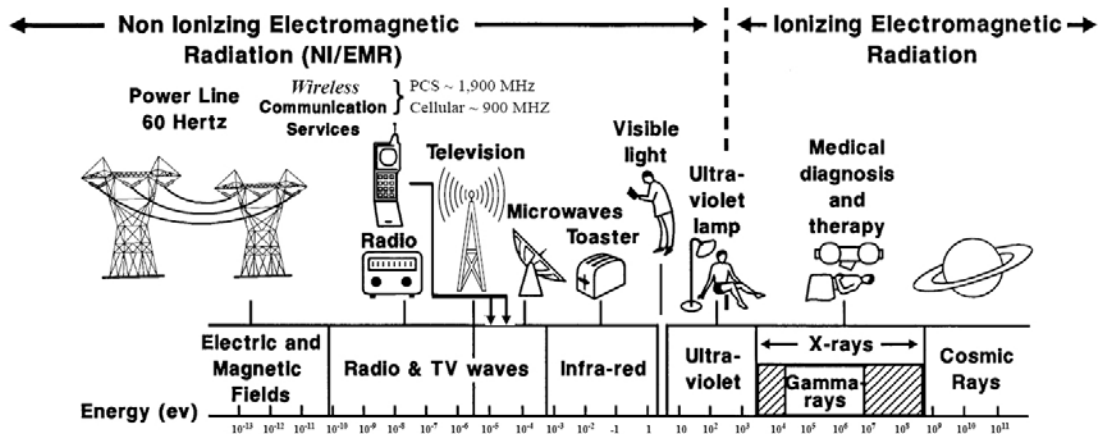


Figure 3: The Electromagnetic Spectrum

IV. Are there government safety standards that regulate what emission levels are safe for the public?

The Federal Communications Commission (FCC) established the RF safety exposure standard from recommendations contained in existing international and national RF safety standard setting organizations. The FCC issued these standards in order to address its responsibilities under the National Environmental Policy Act (NEPA) to consider whether its actions will "significantly affect the quality of the human environment." In as far as there was no other standard issued by a federal agency such as the Environmental Protection Agency (EPA), the FCC utilized their rule making procedures to consider which standards should be adopted. The FCC gave special consideration to the recommendations by the federal health agencies because of their special responsibility for protecting the public health and safety. In fact, the maximum permissible exposure (MPE) values in the FCC standard are those recommended by the federal health authorities. The FCC standard incorporates various elements of the existing international and national standards which were chosen because they are widely accepted, scientifically based and technically supportable.

V. How do I know the safety standards are “safe enough”?

One way to evaluate any safety standard is to compare the standard to similar standards recommended by scientist in other countries and adopted by their governments. The public safety standard for RF energy used by the FCC is identical to that used in Canada and very similar to the vast majority of other RF safety standards used around the world.

In addition, it is important to realize that the FCC maximum allowable public RF exposures are not set at a threshold between safety and known hazard but rather at 50 times below a level that the majority of the scientific community believes may pose a health risk to human populations. Thus, considering that the maximum public exposure from DAS sites are typically less than 1-2% of the standard, the "safety margin" from this threshold of potentially adverse health effects of more than 2,500 times.

VI. Where does the RF energy go when it leaves the antenna?

The DAS antennae are typically mounted 20-40 feet above the ground. The DAS antennae are designed to send the vast majority of the RF energy straight out from the antenna, (i.e., parallel with the ground), with only a small fraction of the energy emitted down towards the ground or up towards the sky (figure 4).

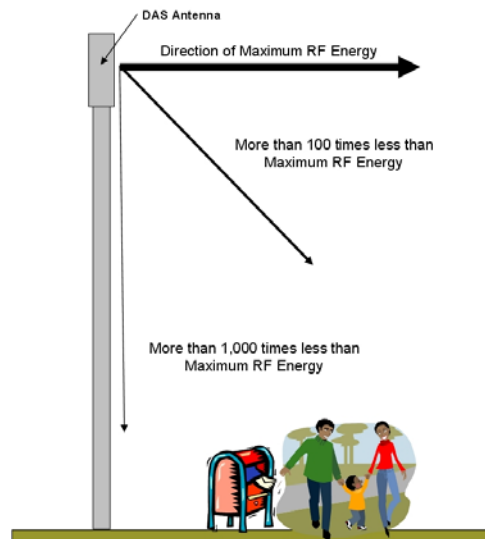


Figure 4

VII. How do typical public exposures from DAS sites compare to the limits in the public safety standard?

Public exposures from DAS sites are typically less than a few percent of the FCC public RF safety standard. In many cases the exposure are less than 0.1% (1,000 times lower than) or even 0.01% of (10,000 times lower than) the safety standard.

VIII. Why are public RF exposures from DAS antennae so low?

As previously stated, DAS uses many distributed low power sites to complete its communications network rather than a single or even a few high power sites to cover the same area. Thus, unlike common broadcast facilities such as AM radio that may have broadcast power as high as 50,000 watts, DAS sites typically use less than 60 watts to transmit their signal. In addition to the fact that the only a small fraction of the antenna's energy is emitted down towards the ground, the intensity of the RF energy decreases very

rapidly with distance from the antenna. For example if the exposure at 100 feet from the site was 2.0% of the safety standard then the exposure 10 times further away (i.e., 1,000 feet) would be 100 times less or 0.02% of the standard. At 10,000 feet away the exposure would be 0.0002% or 500,000 (one-half million) times lower than the public safety standard. This rapid decrease in intensity with distance applies to all forms of electromagnetic energy including light (figure 5).

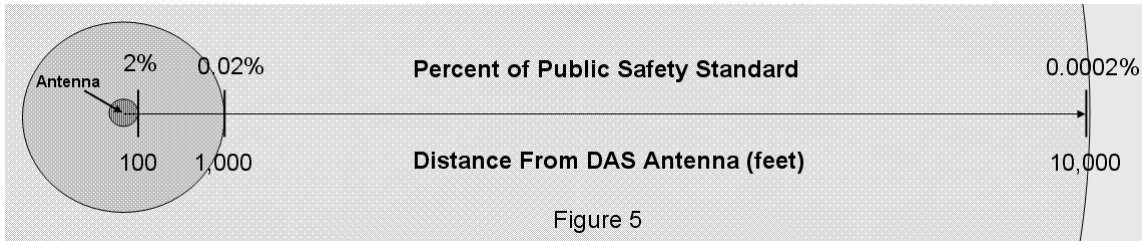


Figure 5

IX. What are some other common sources of RF energy that the public is exposed to and what are the typical exposures?

There are many common sources of public exposure to RF energy such as TV, AM/FM and amateur radio broadcasts; communication devices such as two-way radio, cordless and cellular telephones and Bluetooth headsets; one way communication devices such as baby monitors; household appliances like the microwave oven, and many others. Public exposure from these sources ranges from a very low exposures that are a small percentage of the FCC public exposure standard (e.g., DAS nodes) to much higher exposure that are close to 100% of the public exposure standard (e.g., cell phones). Several examples of typical exposures from various RF sources are shown in figure 6.

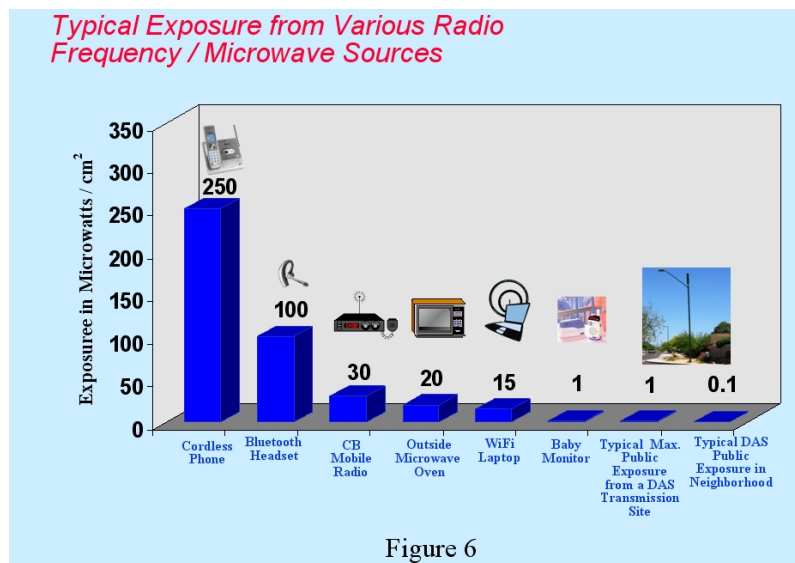


Figure 6

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X. Does exposure to radio waves from DAS cause cancer or other adverse health effects?

Responding to similar questions from the public and governments around the world about the potential for adverse health affects from wireless base stations like cellular telephone and DAS sites, the World Health Organization (WHO) released a fact sheet (# 304) in May 2006 which said:

"From all evidence accumulated so far, no adverse short- or long-term health effects have been shown to occur from the RF signals produced by base stations." This statement refers to continuous exposures at or below the maximum public safety limits.

Specifically in relation to any cancer risk associated with emissions from these types of wireless facilities, the World Health Organization says:

“Over the past 15 years, studies examining a potential relationship between RF transmitters and cancer have been published. These studies have not provided evidence that RF exposure from the transmitters increases the risk of cancer. Likewise, long-term minimal studies have not established an increased risk of cancer from exposure to RF fields, even at levels that are much higher than produced by base stations and wireless networks.”

XI. Is it safe to live or work next to a DAS site?

Yes. As describe above, due to the nature of the design of DAS facilities, the public exposure to radio wave energy from the DAS antennae is very low, typically less than 1% of the public safety standard. In addition, many scientific and public health organizations around the world (like the World Health Organization) have reviewed the substantial body of scientific research on the biological effects of RF energy have concluded that exposures to RF energy below established safety standards have not been shown to be adverse to human health.

XII. Where can I get more information?

--U.S. Federal Communications Commission (FCC) (www.fcc.gov/oet/rfsafety)
Information on exposure guidelines and RF safety

-- International Commission on Non-Ionizing Radiation Protection (ICNIRP)
<http://www.icnirp.org/> ICNIRP is comprised of independent scientific from around the world with expertise in a wide variety of disciplines that study the possible adverse effects on human health of RF exposure and recommend safety standards.

--World Health Organization - International EMF Project (www.who.int/peh-emf)
Research data base and facts sheets

-- For additional information email Stephen Garcia, Director, External Affairs/Land Use
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