

Cisco Systems Radio Products and RF Exposure

History

Concerns about health effects of cellular phones and wireless LAN radio systems has increased significantly over the past several years. The increase in part has been that wireless devices use has increased in our lives and in part by some headlines courtesy of the national media.

Even though radio frequency (RF) energy is a form of radiation, there is a misconception between the safe and potentially damaging forms. This misconception often raises concerns about possible problems caused by RF devices. The various Cisco products use a non ionizing form of radiation where as systems like an x-ray machine use an ionizing radiation that is considered harmful.

For over a century both radio and later television have been widely and safely used both in industry as well as in the home consumer market. Modern homes and offices are filled with RF producing devices from computers, fax machines, to cordless phones, pagers, microwave ovens and wireless LAN devices. The level of RF produced by these devices is extremely low.

The devices of today however do operate at higher frequency levels than earlier devices. The higher frequencies produce shorter wavelengths and shorter wavelengths do have the potential for greater interaction with the human body tissue. With the increase in frequencies, the potential for interference with medical life support devices also increases.

In the first case, most forms of radio energy pass through the human body without any harmful or residual effects. This is because most energy that is absorbed is extremely low, that has no effect on the human body. The second is now being addressed by makers of medical devices working with the manufacturers of RF devices at places like the University of Oklahoma's Wireless Device Center.

Standards

The issue of biological effects of RF energy has been thoroughly researched for over the past 40 years. Among others are the Food and Drug Administration (FDA), Federal Communication Commission (FCC), Environmental Protection Agency (EPA) and the Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma. One of their areas of interest is promotion of standards that help assure safe usage of RF energy.

RF experts at the Institute of Electrical and Electronic Engineers (IEEE) have developed a guide for safe usage to prevent harmful effects of RF energy. The American National Standards Institute (ANSI) under publication C-95.1 - 1991 publishes this guide, which covers non-ionizing RF energy.

As of January 1st of 1997, RF devices from Amateur radio stations, cellular phones, Spread Spectrum data radios, and other RF devices are required to meet the RF safety limits set forth by the FCC in Docket 96-362 (NPRM 93-62). This OET Bulletin number 65 is entitled Evaluating Compliance with the FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

Cisco Systems Compliance

All Cisco Systems radio based products comply with both the ANSI C95.1-1991 IEEE Standards for Safety Levels with Respect to Human Exposure as well as the FCC Office of Engineering and Technology Bulletin 65 for Evaluating Compliance with the FCC Guidelines for Human Exposure. The Cisco Systems radios are evaluated for RF Safety Compliance per the requirements of FCC Part 2.1091 and 2.1093 of the FCC rules as well as RSS-102 requirements from Industry Canada. The compliance is based on the results of the Maximum Permissible Exposure Studies for mobile or fixed devices and per Specific Absorption Rate Tests for portable devices.

By definition portable devices are those devices that are designed to operate with the antenna less than 20cm from the user or bystander. An example would be a radio installed in a Palmtop device, which could be belt worn and used or some laptop installations. Mobile and fixed devices are devices that are designed to be used at greater than 20cm from the user. This includes systems mounted in desktops, or ceiling mounted systems, or systems with the antenna mounted on the roof or tower.

Before approval by the FCC or Industry Canada can be issued, Cisco is required to either submit a MPE study for the devices that fall under the mobile or fixed category and SAR study or test results for devices that are installed in portable devices. When the devices are installed and operated within the parameters set forth in the product instruction manual, the user or general public will not be subjected to any levels of RF greater than the recommended standards.

For devices such as MMDS or wireless Voice over IP Systems, these transmitters fall under the mobile or fixed devices and their normal operation is at distances greater than 20cm from the user and or general public. This type of device usually is designed to operate in locations such as be ceiling mounted or roof top or on an antenna tower.

However though MPE studies were done on the MMDS and the Voice over IP Systems, these systems require either the system installer or system provider to also perform this review. This will require the licensee to perform an MPE study of the system as part of the licensing process and also may require the licensee to perform an Environmental Assessment per the requirements of FCC Part 1.1307 if the installation falls under the category

The spread spectrum radios are designed to operate in all three environments, fixed, mobile or portable. The mobile and fixed devices are designed to be operated at distances greater than 20cm from the user. Since they are categorically excluded from routine examinations for most cases no additional MPE study is required or is an Environmental Assessment required.

For the spread spectrum devices that operate under the portable requirement definition, an independent SAR Evaluation test was performed on the radio with various low gain antennas designed for use in portable devices. The worse case recorded was with a 100mW version of the PC radio. The total SAR level recorded was 1/10th of the recommended exposure requirements for this type of device operating in that frequency bands. .

Cisco Systems products are also designed to reduce emissions, which can interfere with medical devices. Cisco Systems products such as the various spread spectrum radio meet both the FCC and European emission levels required for devices operating in medical environment specifically EN 55011 emission standards.

In Sept of 1996, An independent test was conducted by a hospital, before the installation of Cisco Spread Spectrum Systems. The results showed that the Cisco Systems 2.4 Ghz Radios devices did not interfere or degrade the performance of heart pacemakers when operated at close proximity to such a device.

The bottom line is that Cisco Systems products are safe, provided that they are not used in a manner inconsistent with intended use.