White Paper

Wireless Networks and Safety

Background

We have all read or heard about the concerns that have been raised from time to time about the safety of cellular telephones. Not surprisingly, some have also wondered whether other wireless devices—such as the wireless networking equipment manufactured by Cisco and others—create health risks. In all these cases, the concern is that the emission of radio frequency (RF) energy by a wireless device could cause some type of health risk. But the available evidence suggests that, used as intended, wireless networking devices do not pose health risks. Like other devices that emit RF energy, such as computers, fax machines and microwave ovens, the level of RF emissions from wireless networking devices, is extremely low—too low to cause harm.

Research

The wireless industry, independent researchers and regulators take concerns about the safety of RF emissions seriously, and have done so for many years. Indeed, researchers have studied the biological effects of RF energy for decades. A number of important studies recently have suggested that today's RF devices do not create health risks. For example, in September 2002, the Swedish Radiation Protection Authority released a report written by Dr. John D. Boice, Jr. and Dr. Joseph K. McLaughlin of the International Epidemiology Institute in the United States. They reviewed published studies on the relationship between the use of cellular telephones and cancer risk. They found no consistent evidence of any increased health risk resulting from the use of cellular telephones. Shortly thereafter, in November 2002, an influential scientific commission in France's National Assembly issued a report concluding that cellular telephones and relay antenna pose no danger to human health. Most other serious studies have reached the same conclusion. This research strongly suggests that Cisco's wireless networking equipment, which emits far lower levels of RF energy than cellular and cordless telephones, and is almost always used further away from the body than such phones, poses no health risks to users. Cisco wireless devices also operate at lower duty cycles than cellular and cordless telephones, which further decreases the exposure to RF energy.

Standards and Limits

It is not just researchers that have looked into whether the emission of RF energy can cause harm. Government agencies such the Food and Drug Administration (FDA), the Federal Communication Commission (FCC), and the Environmental Protection Agency (EPA) have all looked into whether RF emissions can cause health problems. So too have industry standards bodies. Among their goals has been the development of standards that would ensure the safety

of devices emitting RF energy. Thus, the Institute of Electrical and Electronic Engineers (IEEE) developed an RF emissions guide, *Standards for Safety Levels with Respect to Human Exposure*, to prevent harm from being caused by RF emissions. The American National Standards Institute (ANSI) adopted the IEEE standards in Publication C-95.1. Thereafter, in 1997, the FCC adopted RF emission safety limits for cellular telephones, wireless networking devices, and other devices emitting RF energy based in part on the ANSI C-95.1 standard. These limits are set out in the FCC's Office of Engineering and Technology Bulletin No. 65, *Evaluating Compliance with the FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields*. Other countries have adopted similar RF emission safety limits.

Cisco Systems Compliance

All Cisco products are evaluated to ensure they conform to the RF emission safety limits adopted by the FCC. The devices must also comply with the ANSI C95.1 Standards. These evaluations are conducted using the compliances rules and guidelines adopted by the FCC and by Industry Canada. They are based on the results of the Maximum Permissible Exposure (MPE) Studies for mobile or fixed devices and per Specific Absorption Rate (SAR) Tests for portable devices.

Under FCC rules, portable devices are devices that are designed to operate with the antenna less than 20 cm from the user or bystander. Mobile and fixed devices are designed to operate at distances greater than 20 cm from the user.

Before selling any wireless devices to the public, Cisco submits MPE studies for mobile or fixed devices, and SAR studies for portable devices, to the FCC and to Industry Canada. These studies must demonstrate that the devices meet the RF emissions safety limits or the devices will not be approved for sale, and will not be sold, to the public. This means that, when Cisco wireless devices are installed and operated as instructed, the RF emissions will be equal or less than the levels accepted as safe by the FCC and by Industry Canada.

Impact on Medical Devices

Another traditional concern about cellular telephones has been their potential impact on medical devices. Indeed, many hospitals ban such phones from emergency rooms or other sensitive areas. Again, this has led some to question whether wireless networking devices can be used in proximity to medical equipment.

To address these concerns, Cisco wireless networking devices are specifically designed to reduce emissions that could interfere with medical devices. Cisco radio module products meet both the FCC and European emission levels required for devices operating in a medical environment, specifically the EN 55011 emission standards. Cisco also has somewhat higher power "bridging" products, but when installed and operated properly meet or exceed the safety thresholds are required by regulatory agencies around the world. In addition, in September 1996, an independent test was conducted by a hospital before the installation of Cisco spread spectrum wireless network. The results showed that the Cisco 2.4 GHz wireless network devices did not interfere or degrade the performance of heart pacemakers even when operated at close proximity to such a device. Cisco is doing further studies of its 2.4 and 5 GHz wireless devices with a variety of medical device implant manufacturers. The initial test results support the conclusions reached in 1996 study. Perhaps as a result of this work, Cisco is not aware of a single reported case of interference to any medical device caused by a Cisco product.

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