

Electro-Magnetic Compatibility of the Link Wireless Telephone System in the Proximity of Medical Equipment

Concern has been raised about the use of wireless personal communications devices in the vicinity of bio-medical and diagnostic equipment. In fact, some hospitals prohibit the use of conventional cellular and PCS telephones by patients and visitors. Radio interference with medical equipment is caused by radio energy penetrating the equipment and causing sensitive electronic devices such as microprocessors and sensors to malfunction. The potential for a radio device to interfere with sensitive electronics is higher when the transmit power level of the radio device is higher.

The Link Wireless Telephone System operates at significantly lower power levels than a cellular or PCS telephone and can be used in the vicinity of bio-medical equipment with minimal risk of interference, malfunction, or alarms.

Cellular telephones vs. SpectraLink Wireless Telephones

Conventional cellular telephones transmit with a maximum authorized power output of 3 Watts of radio frequency power. Handheld, portable cellular telephones typically operate at a maximum power output of 0.6 Watts (or 600 mWatts), although some units are rated as high as 1.2 Watts. Cellular telephones transmit the voice signal as a frequency-modulated (FM) or phase-modulated (PM) carrier. This carrier level is constant, regardless of the characteristic of the transmitted voice signal. Cellular telephones may transmit without warning to the user, as the telephone activates itself to inform the cellular carrier's network as to its status and availability.

In contrast, the Link Wireless Telephone transmits within the frequency range of 902 to 928 MHz, with a maximum power output of 100 mWatts. The Wireless Telephone transmits the voice signal as a digitally encoded, Time Division Multiple Access (TDMA) carrier. This carrier is active (for the Wireless Telephone) one time slot out of eight time slots, for an effective carrier level of 12.5 mWatts. The corresponding Base Station is active for four time slots out of eight time slots, for an effective carrier level of 50 mWatts. The Wireless Telephone only transmits during an active telephone call, or when the Wireless Telephone is ringing for an incoming call. The Wireless Telephone transmits at a power level of effectively 1/48th that of a handheld cellular telephone.

Cellular telephones in use near medical devices

There is concern that the use of cellular phones within a nursing unit or examination area may cause certain bio-medical equipment to fail or work improperly. There are anecdotal reports that cellular phones have caused problems with infusion pumps, oscillating ventilators, dialysis machines, and infant warmers. The failure modes include the reporting of false alarms, no alarm reporting during a fault condition, and equipment being forced to operate at full rate. It may be prudent to prohibit the use of conventional cellular telephones within hospitals to ensure that these equipment faults do not occur. However, low power devices, such as the SpectraLink Wireless Telephone, have not been found to have any harmful effect on bio-medical equipment.

Conclusion

It is unlikely that the Link Wireless Telephone System will cause problems to bio-medical equipment, such as producing false alarms or suppressing actual alarms. It is important to understand that one hand-held cellular telephone, operating at 600 mWatts, is equivalent to 48 Link Wireless Telephones, all operating in near proximity, in terms of radio frequency power levels. The SpectraLink design relies on very low radio frequency power levels and relatively short distances of coverage. Therefore, in a situation where one cellular telephone may be a cause for concern, there is little likelihood that a Link Wireless Telephone will be a source of interference to bio-medical equipment. SpectraLink recommends that the healthcare facility set up a test environment to ensure the Link Wireless Telephone System does not cause harmful interference. The following page outlines a plan for testing for harmful interference.

Testing for EMC of SpectraLink Wireless Telephone System

Coexistence of SpectraLink Wireless Telephones with Bio-medical Equipment

This procedure describes how to test bio-medical and other equipment for harmful interference from the Link Wireless Telephone System.

Required

1. A Link WTS demonstration system, consisting of one MCU, one Base Station, and two Wireless Telephones. This equipment is a complete working system conveniently packaged in a briefcase.
2. Bio medical equipment to be tested.
3. Personnel familiar with operation of equipment under test (EUT).

Procedure

1. Set up the SpectraLink demonstration system. A telephone line is not required.
2. Locate the Base Station at the worst-case reasonable distance from the EUT. For example, if the EUT is used in a room, and the Base Station is out in the hall, this distance should be 8 feet. If the EUT is a portable device that will be operating while being moved under a Base Station, the distance should be ceiling height to top of equipment (typically 4 feet).
3. Place EUT in normal operating mode.
4. Turn on each Wireless Telephone, and press START. Verify that a radio connection is up — the Wireless Telephones' display will show a row of dashes beneath the alphanumeric portion. Wireless Telephone settings (volume level, ringing mode, etc.) are immaterial to this testing.
5. Place both Wireless Telephones next to the EUT. Observe behavior of EUT, noting unusual state changes, alarms, etc.
6. Move the Wireless Telephones around all sides and top of EUT. Hold the Wireless Telephones both vertically and horizontally while moving them.
7. Document type and model of EUT, and test results. If unusual behavior is noted, determine whether it is acceptable or unacceptable. Example: an acceptable behavior may be a baseline shift in a chart recording reading (such as EEG); an unacceptable behavior may be an alarm on an infusion pump.