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OPEN CHANNELS

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FreeLinc Wireless Microphones' Magnetic Transmission



RF transmitting devices have no effect on the FreeLinc wireless connection.

Shoulder-mounted microphones can be a pain in the neck—literally. But it's even harder to cock your head toward the mic while running after a perp. Throw in getting tangled in the microphone wire while trying to hit the PTT key blind, cocking your neck and running, and you've got a recipe for serious injury.

Not surprisingly, wireless microphones are making their way onto police shoulders. The lack of wires removes one risk factor for officers

on the move and makes more convenient mic placement possible. However, wireless has problems of its own, namely interference problems on the unlicensed radio bands, such as 900 MHz and 2.4 GHz, because of many users crowding into limited bandwidth.

In the worse case scenario, this interference can prevent a wireless microphone from connecting to the officer's portable radio, leaving him isolated and alone. To solve these

problems, FreeLinc has come up with a novel solution: It uses magnetic fields to connect wireless mics to the radios, ensuring portability while eliminating the danger of radio interference.

It really works. In fact, the Michigan State Police Radio Unit used FreeLinc "magnetic-induction" headsets during Super Bowl XL in Detroit in January 2006. Before this test, the Wayne County, MI Sheriff's Office field tested FreeLinc technology during the July 2005 Major League Baseball All-Star Game in Detroit's Comerica Park.

"Any officer will tell you how frustrating it can be to have to fumble with radio controls, handsets and cords when trying to do a job,"



FreeLinc technology wirelessly connects the microphone to the two-way radio.

 www.freelinc.com

Wayne County Sheriff Warren Evans said in a statement published by Mobile Radio Technology magazine. “The FreeMotion devices we tested allowed our team to communicate totally hands-free, so we worked with increased safety and security—without interruption.”

How FreeLinc Makes the Connection

Instead of using shared radio waves, FreeLinc technology communicates by creating an exclusive “magnetic bubble” around its user, within which communications between the FreeLinc wireless microphone and the officer’s two-way radio take place. The “bubble” is created by the FreeLinc adaptor that plugs into the user’s belt-mounted portable radio.

Besides creating the necessary magnetic transmission medium, the FreeLinc adaptor links to the radio’s transceiver functions. This allows these functions to be controlled on the FreeLinc wireless SpeakerMic; a bat-



The FreeLinc technology uses six times less power than Bluetooth technology.

tery-powered unit that clips onto the officer’s uniform.

The actual exchange of signals between the two units is made possible by Near-Field Magnetic Induction (NFMI). According to FreeLinc’s online FAQ, “Magnetic induction tech-



The FreeLinc SpeakerMic battery is good for 20 hours of continuous talk.

nology modulates or changes a weak magnetic field at one device and senses it at another.”

In plain English, the magnetic field at the FreeLinc adaptor is altered by interacting with audio. This influence is detected by the FreeLinc SpeakerMic, which then reproduces the changes as audio. In the same way, pressing the SpeakerMic’s PTT switch and talking into the mic creates a change within the magnetic bubble that is detected by the FreeLinc adaptor and translated into audio that is fed into the user’s portable radio input.

The reason this two-way interaction happens so naturally is because the adaptor and the SpeakerMic exist within the same magnetic field. When something happens to one of them, the other can’t help but be affected.

FreeLinc Technology

FreeLinc’s Near-Field Magnetic Communication technology uses magnetic fields rather than radio frequency (RF) waves to establish wireless communication between the portable radio and its accessories. These magnetic fields create a “personal communica-

tions bubble” around the user and are no larger than 5 feet in diameter. Voice data is transmitted by modulating the magnetic field at the primary frequency of 13.56 MHz.

Because communication occurs by modulating a magnetic field, it is immune to interference from radio waves. This means that RF-transmitting devices (such as radios, microwaves, cordless phones, Bluetooth headsets, etc.) will have no effect on the FreeLinc wireless connection, resulting in the most reliable wireless link possible for short-range use. Furthermore, because nothing propagates beyond the 5-foot “bubble,” the FreeLinc wireless transmission is inherently secure.

Because the FreeLinc system uses magnetic induction, it is interference-free. It is also not affected by buildings or other objects. Better yet, the small size of the magnetic bubble ensures that officer communications remain secure. To eavesdrop on them, you would have to get your eavesdropping equipment within their magnetic bubbles. Considering that its radius only measures 3 to 5 feet, chances are they’d notice.

Also, because the FreeLinc system isn’t trying to pump out a robust, interference-resistant radio signal, the unit doesn’t need to use nearly as much power. In fact, magnetic induction transmits extremely low power, in the range of about 100 nanowatts (nW) compared to RF technologies in the 1,600,000 nW range.

Furthermore, the use of a low-frequency band (10-15 MHz) significantly reduces the RF absorption by biological tissue. The United States currently has the lowest limit (1.6W/Kg) for what is known as specific absorption rate (SAR). To understand how low magnet-

ic induction power levels compares to this limit, consider that if all the emitted power were concentrated into 1 square millimeter, the measured SAR would be 16,000 times less than the U.S. limit.

Of course, the same short range that allows FreeLinc technology to consume up to six times less power than Bluetooth wireless could pose problems in certain situations. For instance, should an officer drop his portable radio or SpeakerMic outside the magnetic bubble, the connection would be lost.

And although they use less power than RF wireless transmitters, FreeLinc units still need to be recharged. This said, the adaptor takes its power from the portable radio, while the SpeakerMic’s battery is said to last up to 20 hours in continuous talk mode.

Products

The FreeMotion 200 is a behind-the-ear wireless microphone—one well-suited for discreet low-profile security details and SWAT. It comes with a volume adjuster on the earpiece and ships with a range of ear gels. You can even use custom made gels on it. The FreeMotion 200 lists at \$349 and adapts to a wide range of Motorola two-way radios.

FreeMic 200 looks like a conventional portable radio PTT handset, minus the cord. It comes in a rugged weatherproof case, has a powerful speaker and microphone and has a built-in 2.5mm jack that allows you to use an earpiece or external speaker. The FreeMic 200 costs \$299 and also adapts to a wide range of Motorola two-way portables.

FreeLinc is developing a range of adaptors to allow its products to work with M/A-COM two-way radios. The company is also planning to create



FreeLinc uses magnetic fields rather than radio frequency to communicate.

wireless PTT switches that can be worn on the body and on rings. Also coming is the FreeMotion 100, which is a lightweight earpiece unit, and the heavy-duty FreeRange 200, which is a noise-blocking headset equipped with a swing-arm mic.

The FreeLinc magnetic-induction system offers a unique approach to wirelessly connecting officers’ microphones with their radios. It’s an approach that solves the radio interference problem by side-stepping it; and it makes it possible for many officers to use wireless microphones while in close proximity to one another. For these reasons, the FreeLinc system is worth a serious look by first responders.

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