

Proprietary Systems are Viable Options for Short-Range Wireless

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While much attention is paid to Bluetooth, Ultra Wideband (UWB) and ZigBee, these standards-based short-range wireless systems may not be the first choice for many applications. When an application has no need to communicate with other manufacturers' equipment, standardized transmission protocols are not necessary. A proprietary system based on readily-available hardware often is the best choice for an optimized balance of cost, data rate, range and reliability.

Unlicensed bands at 315/433 MHz, 900 MHz and 2.4 GHz can be used to great advantage, and in the U.S. and some other countries, much of the entire radio spectrum can be used within FCC Part 15 or equivalent foreign interference regulations. RFICs, passive components and modules are offered by a number of companies to serve this marketplace niche.

Low data rate, very low cost applications are often accomplished using the 315 MHz (433 MHz in Europe) unlicensed band. Common application areas include remote control—garage door openers, wireless doorbells and security sensors—and low data rate telemetry, such as remote-reading weather instruments. Some type of RFID applications also use this frequency, as well as some early examples of remote tire pressure monitors.

The simplicity of ASK (amplitude-shift, or on-off, keying) and the ready availability of components makes it possible to incorporate a 315 MHz link into a product with minimal design effort and very low cost. TX/RX modules are available as catalog items from major electronics catalog distributors.

For ground-up design, application-specific ICs are standard products, available from major semiconductor companies like Maxim Integrated Products, Texas Instruments, Infineon and Atmel, plus some more narrowly focused firms like Melexis and Xemics. Most major crystal and SAW filter firms make standard products for this specific application. The proliferation of consumer products assures that quantities will be sufficient to justify the demand for very low cost.

Although very low cost, the use of a proprietary coding scheme allows security to be incorporated into these products at various levels of robustness. High-volume applications like keyless entry have driven the price of security to a minimum, particularly if a simple access code is all that is needed. Encryption is more complex, but is not required by many applications.

When higher data rates are required—a communications link rather than a simple control function—spread-spectrum transmission in the 900 MHz or 2.4 GHz ISM bands is often the best solution. The bandwidth and power levels permitted in these bands allows data rates in the hundreds of kbps and communication range that can reach to several miles in a point-to-point system with directive antennas. Since these bands are also used for standards-based WLAN, it is easy to see that performance of proprietary systems would be similar.

Applications for these systems range from simple "wireless RS-232" interconnections to full proprietary WLAN networks. The technology is also used for low-cost, high data rate one-way communications such as video surveillance. 900 MHz in particular has seen use in telemetry applications that once were done with licensed channels in the 450 MHz mobile communications band or the 402 MHz scientific telemetry band.

Most WLAN components can simply be copied to a proprietary system, with the coding scheme and hopping/spreading sequences being the main differences. In some cases, the end user actually desires a WLAN system, but one that cannot be accessed using commonly-available equipment—assuring essentially 100% security against casual, or nuisance interlopers.

This type of wireless transmission is supported with TX/RX modules and system software from several companies. AeroComm, Linx Technologies, Radiocrafts and others provide fully assembled modules that are easily integrated into the finished products. RF expertise is not required by the finished product manufacturer, being provided in the product and through the technical support staffs of the module supplier.

As a final note, it is interesting to see that very short range applications also use very low power at almost any frequency, remaining within the FCC Part 15 limits for incidental radiation. Recent examples are receivers for satellite radio. To add Sirius or XM reception to an automobile's existing entertainment system, the demodulated satellite programming is remodulated onto a signal in the FM broadcast band and transmitted the necessary few inches or few feet to the FM radio. The AM broadcast band is also used for short-range communications, with "talking houses" in the real estate market, and information radio channels providing both commercial and safety information along major highways.