Competitive Exams Ultra Wide Band Technology

UWB, or Ultra-Wide Band technology offers many advantages, especially in terms of very high data transmission rates which are well beyond those possible with currently deployed technologies such as 802.11a, b, g, WiMax and the like. As such UWB, ultra wideband technology is gaining considerable acceptance and being proposed for use in a number of areas. Already Bluetooth, Wireless USB and others are developing solutions, and in these areas alone its use should be colossal.

Basic Concepts

As the name implies UWB, ultra wide band technology, is a form of transmission that occupies a very wide bandwidth. Typically this will be many Gigahertz, and it is this aspect that enables it to carry data rates of Gigabits per second.

The fact that UWB transmissions have such a wide bandwidth means that they will cross the boundaries of many of the currently licensed carrier based transmissions. As such one of the fears is that UWB transmission may cause interference. However the very high bandwidth used also allows the power spectral density to be very low, and the power limits on UWB are being strictly limited by the regulatory bodies. In many instances they are lower than the spurious emissions from electronic apparatus that has been certified. In view of this it is anticipated that they will cause no noticeable interference to other carrier based licensed users. Nevertheless regulatory bodies are moving forward cautiously so that users who already have spectrum allocations are not affected.

Two UWB, Ultra Wideband Technologies

Despite the single named used for the ultra wideband (UWB) transmissions, there are two very different technologies being developed.

Carrier free direct sequence ultra wideband technology: This form of ultra-wideband technology transmits a series of impulses. In view of the very short duration of the pulses, the spectrum of the signal occupies a very wide bandwidth.

MBOFDM, Multi-Band OFDM ultra wideband technology: This form of ultra wideband technology uses a wide band or multiband orthogonal frequency division multiplex (MBOFDM) signal that is effectively a 500 MHz wide OFDM signal. This is 500 MHz signal is then hopped in frequency to enable it to occupy a sufficiently high bandwidth.

Both these systems are described in greater detail in articles within the Wireless Technologies section of the Radio-Electronics. Com website.

Advantages and Disadvantages

Both these systems have their advantages and disadvantages, each one having its supporters and applications for which it is most suited. The impulse based technology, also called direct sequence ultra wideband (DS-UWB) in view of some of the techniques used is being used for a number of high data rate data transmissions such as short range video transmissions. MBOFDM on the other hand is being adopted for Wireless USB where it performs well.

FCC UWB Definition

To date the FCC in the USA has approved UWB, ultra wideband technology for indoor and short range outdoor communication, but with restrictions on the frequencies over which the transmission can spread as well as the power limits. This will enable the UWB ultra wideband transmissions to communicate successfully, but without affecting existing 'narrowband' transmissions

To achieve these requirements the FCC has mandated that UWB, ultra wideband transmissions can legally operate in the range 3.1 GHz up to 10.6 GHz, at a limited transmit power of-41dBm/MHz. Additionally the transmissions must occupy a bandwidth of at least 500 MHz, as well as having a bandwidth of at least 20 % of the centre frequency. To achieve this last requirement, a transmission with a centre frequency of 6 GHz, for example, must have a bandwidth of at least 1.2 GHz. Consequently, UWB provides dramatic channel capacity at short range that limits interference.

The fact that very low power density levels are transmitted means that the interference to other services will be reduced to limits that are not noticeable to traditional transmissions. Additionally the lowest frequencies for UWB, ultra wideband have been set above 3 GHz to ensure they do not cut across bands currently used for GPS, cellular and many other services.