

UWB Antennas and Channel Characteristics

Spectrum is presently one of the most valuable goods worldwide as the demand is permanently increasing and it can be traded only locally. Since the United States FCC has opened the spectrum from 3.1 GHz to 10.6 GHz, i.e. a bandwidth of 7.5 GHz, for unlicensed use with up to -41.25 dBm/MHz EIRP, numerous applications in communications and sensor areas are showing up.

All of these applications have in common that they spread the necessary energy over a wide frequency range in this unlicensed band in order to radiate below the limit. The results are ultra-wideband systems. These new devices exhibit especially at the air interface, the antenna, quite surprising behaviors.

This talk presents an insight into design, evaluation and measurement procedures for ultra wideband (UWB) antennas as well as into the characteristics of the UWB radio channel as a whole. UWB antenna basics and principles of wideband radiators, transient antenna characterization and UWB antenna quality measures, derived from the antenna impulse response, are topics. EM simulations and measurements of transient antenna properties in frequency domain and in time domain are included.

Different antennas, based on different UWB principles, will be presented. Depending on the interest, there are ridged horn antenna, Vivaldi antenna, logarithmic periodic antenna, mono cone antenna, spiral antenna, aperture-coupled bowtie antennas, multimode antennas, sinus antenna and impulse radiating antennas. The channel characterization comprises ray-tracing tools for deterministic indoor UWB channel modeling and measurements.

The advantages and drawbacks of the UWB transmission will be discussed, depending on interest. The radiation from different antennas will be demonstrated by movies with a pulse excitation.