**Introduction**

Classical narrowband transmission techniques (FM, AM, ..) are based on the modulation of a sine wave. On the contrary, Ultra-WideBand Impulse Radio (UWB-IR) uses very short pulses (few ns duration) to communicate. The short duration implies a wideband spectrum (more than 500MHz), but also severe power spectral density (PSD) limitations (-41.3dBm/MHz) to allow UWB-IR to share the spectrum resources with other narrowband systems by means of the overlay principle.

**Modulation**

The data information can be embedded onto certain parameters of the transmitted pulses such as the pulse position (called Pulse Position Modulation or PPM), or the pulse amplitude or orientation (e.g., Bipolar Shift keying or BPSK). In our system, we use a PPM scheme where the time between two pulses is controlled with a resolution of 2ns.

**Positionning using UWB-IR**

In addition to being able to transmit data information, the large bandwidth and corresponding fine time-resolution of UWB-IR allows accurate distance measurements, robustness against interference, thus allowing precise positioning even in very difficult multipath indoor environments. In our system, we use low power UWB-IR transmitters that are located by a network of fixed and time-synchronized receivers.

**Emitter**

The battery powered emitters are designed around an home-brewed Application Specific Integrated Circuit (ASIC) built in a UMC 0.18um CMOS technology. This ASIC creates a pulse in adequation with the authorized spectrum and also includes a BPSK and a PPM modulator. The board is cadenced by a uController and the Identification Data (ID) of the emitter are stored in a CPLD.

**Graphical User Interface (GUI)**

The GUI of the system we develop is called the Control Center (CC). The main windows in the center allows the visualization of the emitters' positions on a map of the building. Other windows allow many functionalities such as to select a zone of interest; to select a different building, or to add or suppress emitters to track. This interface also allows the configuration of receivers, e.g., to change their sensitivity (through the number of pulses added coherently or the detection threshold) or to see the shape of the received pulse (scope function).