

## **ULTRA WIDE BAND SENSOR FOR ACCURATE TIME DIFFERENCE OF ARRIVAL**

We are developing an unattended Time Difference of Arrival system that can record portions of the VHF and UHF spectrum, determine the position of the responsible transmitters, and report raw IF waveforms and transmitter locations to a user by means of a LPI/LPD data link.

At the heart of our approach is the ability of ultra wideband (UWB) transceivers (radios) to wirelessly synchronize multiple RF receivers using ultra wideband (UWB) transceivers (radios). UWB spreads its energy over several Giga Hertz so it is highly LPI/LPD. This method does not rely on GPS so the synchronization will be maintained when the GPS signal is not available. The same link that is used for time synchronization can also carry data for two-way communication, and provide fast, accurate ranging in both Line of Sight (LOS), and non-LOS environments. These three capabilities: ranging, synchronization, and communications are the three necessary functions needed to localize transmitters by Time Difference of Arrival (TDOA) methods. The most critical functions are already implemented in Silicon-Germanium (SiGe) chips, so the hardware to implement this time synchronization and ranging scheme can be very low-cost and simple. UWB radar and radio are also called "time domain" or "impulse" radar and radio. This is because the only signals transmitted by UWB radar and radio are very narrow pulses. TM-UWB radar or radio generated these pulses pseudo-randomly in time. The pulses we are currently using are ½ nanosecond in duration and a timer chip to 3-

picosecond resolution controls their positions digitally.

At a system level, our technology can be implemented as several or many networked TDOA units, each of them capable of tracking a transmitter, identifying characteristics (frequency, cell phone/cordless phone/UHF radio, etc.), and possibly even intercept data (such as phone numbers), and voice.



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