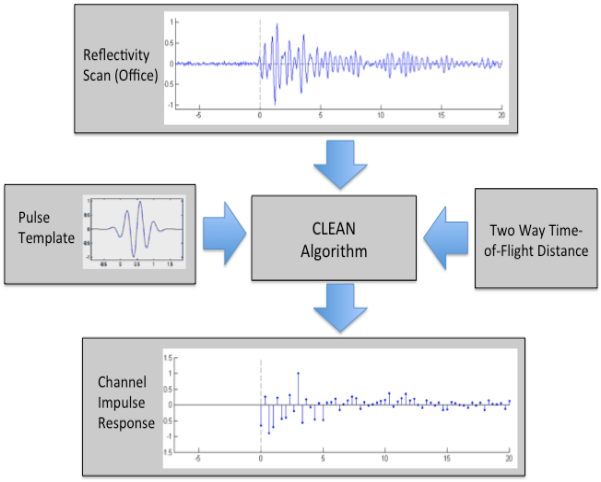
High-Fidelity Peer-to-Peer UWB Propagation Measurements in High Multipath Environments using the PulsON 400 UWB Transceiver

Brandon Dewberry[(1)] and Alan Petroff* [(1)]
(1) Time Domain, Huntsville, AL 35802
http://www.timedomain.com

A new radio transceiver with host toolset enables wireless measurements and automatic analysis of indoor high multipath channels using pulsed UWB channel sounding. This FCC-legal 3.1-5.3 GHz UWB transceiver uses a omni-directional antenna for precision peer-to-peer two-way time of flight distance measurements.

As a by-product of precision peer-to-peer time-of-flight ranging a received pulse is directly scanned in the time domain. These scan vectors, representing the pulse-response reflectivity signature of the propagation environment, are provided to the PC host. Host software averages multiple scans and generates Channel Impulse Response (CIR) plots using a modified CLEAN algorithm that temporally decomposes the array of measurements into wavefronts impinging upon the receiving system.



Each P400 UWB transceiver automatically responds to range requests, enabling a single PC connected to one or more transceivers to sequentially query a distributed array of responding transceivers in a floorplan. A real-time demonstration of m multi-node indoor channel assessment with multi-link distance measurement will be presented.

During propagation tests the rise time of the direct path (leading edge) pulse was found to be a key metric delineating Line-of-Sight (LOS), Non-Line-of-Sight (NLOS) channels, with the slope of this direct path signal highly correlated to range measurement error. Receive-only direct path pulse signal strengths are correlated with Coarse Range Estimation (CRE) and qualified by LOS/NLOS and Saturation flags generated from the pulse signature.

In addition to Channel Impulse Response analysis the P400 UWB transceiver with Test Instrumentation software enables user modification of fundamental UWB radio propagation parameters such as transmission amplitude, acquisition thresholds, symbol integration, and waveform scan start, step, stop offsets relative to the lockspot. Bit Error Rate and Packet Error Rate tests are supported. A series of channel responses can be aligned and motion filtered to provide a novel bistatic radar capability. The transceivers also can be used to send data.