

## **Some Experimental Results of UXO Detection Using a Multiband Impulse UWB Radar Sensor**

Rui Xu\*, Jeongwoo Han and Cam Nguyen  
Department of Electrical and Computer Engineering  
Texas A&M University, College Station, TX 77843 USA  
E-mail: [cam@ece.tamu.edu](mailto:cam@ece.tamu.edu)

Ultra-wideband (UWB) radar sensor— operating based on non-sinusoidal signals such as impulse or monocycle-pulse – has demonstrated and received significant interest as an effective sensor for many applications such as UXO (unexploded ordnance) and mine detection, foliage penetration, low-probability interception, small-RCS target detection, etc. An UWB radar sensor having multi-band/multi-pulse capability provides flexibility in the operation and application of the sensor and enhances its ability in detecting and classifying targets. For instance, narrow pulses have wide operating bandwidths and, thus, can be used to obtain fine resolution required for the detection of closely located objects. On the other hand, a wider pulse contains larger low-frequency components, which have relatively low propagation losses in media, hence providing a longer detection range. The multiband operation of the sensor can also render more target information by combining those produced by individual operating frequency bands for certain targets.

We report some experimental results of UXO detection using a newly developed UWB radar sensor. The new UWB system can vary the transmitting pulse duration, thus effectively simulating a multi-band UWB system. The sensor's transmitter generates monocycle pulses with four different durations (450, 600, 880 and 1170 ps) and 200-400 mW of peak power. Its receiver has a conversion gain from 6.5 to 9.5 dB, a dynamic range greater than 50 dB and a sensitivity of -47 dBm. The transmitting and receiving antennas are quasi-TEM horns having seamless connections to the transmitter and receivers, and transmit and receive pulses faithfully with little distortion, respectively. The sensor was used to detect various buried UXO targets with different pulses. Preliminary results are promising and demonstrate the sensor's potential for detection and classification of buried UXO's and mines.