AN ASSESSMENT OF TERAHERTZ-FREQUENCY REMOTE-SENSING FOR APPLICATION TO A BIOLOGICAL WARFARE ATTACK SCENARIO

D. L. WOOLARD, *Research Laboratory, Army Research Office, Research Triangle Park, NC*; E. R. BROWN, *University of California at Los Angeles, Los Angeles, CA*; A. C. SAMUELS, J. O. JENSEN, *Edgewood Chemical and Biological Center, Aberdeen Proving Ground, MD*; T. GLOBUS, B. GELMONT, *University of Virginia, Charlottesville, VA*; M. WOLSKI, *Naval Surface Warfare Center, Dahlgren, VA*.

This presentation gives a detailed assessment of terahertz-frequency spectroscopy as a technique for the remote detection of biological warfare agents. Design studies are presented for a differential-absorption-radar (DAR) approach that utilizes the spectral signatures of *Bacillus (B.) subtillus* spores within the terahertz (THz) regime as the detection mechanism. The signature data used in these studies is taken from laboratory measurements performed on uniform thin films of *B. Subtillus* spores and the system performance is assessed for both incoherent and coherent detector modalities. These studies consider DAR remote sensing of biological (bio) clouds at significant ranges (i.e., 1 km) and include the effects of realistic atmospheric conditions. A high-level remote-sensor design is used to estimate the probabilities of detection (p_d) and false-alarm (p_{fa}) associated with this general technique. These studies suggest useful remote-detection performance can be achieved (i.e., $p_d > 0.9$ & $p_{fa} \ll 10^{-4}$ for bio-cloud densities < 103 cm^{-3}) at 1 km ranges if the THz signature information remains predictably stable under varying atmospheric conditions (e.g., changes in humidity, spore activity state, etc). Furthermore, a realistic bio-agent airframe attack scenario is utilized to demonstrate standoff detection of bio-clouds with $\approx$100% confidence while outside the threat-level concentrations. All together, these results demonstrate that standoff detection of bio-agents is feasible for threat-level concentrations in practical battlefield environments at sufficient ranges to provide for early warning.