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## Recent Work

### Title

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### Authors

Gasperikova, Erika

Smith, J.T.

Morrison, H.F.

et al.

### Publication Date

2006-01-11

## BERKELEY UXO DISCRIMINATOR (BUD) FOR UXO DETECTION AND DISCRIMINATION

DR. ERIKA GASPERIKOVA  
Lawrence Berkeley National Laboratory  
One Cyclotron Road  
MS: 90R1116  
Berkeley, CA 94720  
(510) 486-4930  
egasperikova@lbl.gov

CO-PERFORMERS: J. T. Smith (LBNL); H. F. Morrison (LBNL); A. Becker (LBNL)

An optimally designed active electromagnetic system (AEM), Berkeley UXO Discriminator (BUD) has been developed for detection and characterization of UXO in the 20 mm to 155 mm size range, for depths between 0 and 1 m. The system incorporates three orthogonal transmitters and eight pairs of differenced receivers. BUD is mounted on a small cart to assure system mobility. The system has two modes of operation: (1) search mode, in which BUD moves along a profile and exclusively detects targets in its vicinity providing target depth and horizontal location, and (2) discrimination mode, in which BUD, stationary above a target, performs a full sequence of measurements using all three transmitters, and the three discriminating polarizability responses are recorded and visually presented on the computer screen, together with the object location and orientation. In this mode, BUD not only detects but also determines the principal polarizabilities and size of a metallic target from a single position of the BUD platform.

The search for UXO is a two-step process. The object must first be detected; then the parameters of the object, the principal dipole polarizabilities, must be determined. While UXO objects have a single major polarizability (principal moment) coincident with the long axis of the object and two equal transverse polarizabilities, scrap metal has three different principal moments. This description of the inherent polarizabilities of a target is a major advance in discriminating UXO from irregular scrap metal. Our results clearly show that BUD can resolve the intrinsic polarizabilities of a target, and that there are very clear distinctions between symmetric intact UXO and irregular scrap metal.

The field survey at the Yuma Proving Ground in Arizona showed excellent detection and characterization results within the predicted size-depth range. Moreover, BUD is easy to use and requires low maintenance – transmitter batteries last for three hours, whereas acquisition system batteries last for six hours.

This research was funded by the U.S. Department of Defense under ESTCP Project UX-0437.