

DEFINITION OF BULK DETECTION

The Bulk Detection Laboratory (BDL) is committed to improving the detection of concentrated masses of energetic materials while simultaneously decreasing false alarms.

As opposed to trace particle contamination or vapors that indicate a threat that may not be present, when a threat is actually present in baggage or on a person, in amounts measuring in grams, ounces or pounds, then that threat can be detected by physics-based methods such as X-ray scanning or millimeter wave imaging. As long as there is enough "bulk" material present, bulk detection methods can be very effective methods of explosive detection.

CURRENT BULK DETECTION TECHNOLOGIES

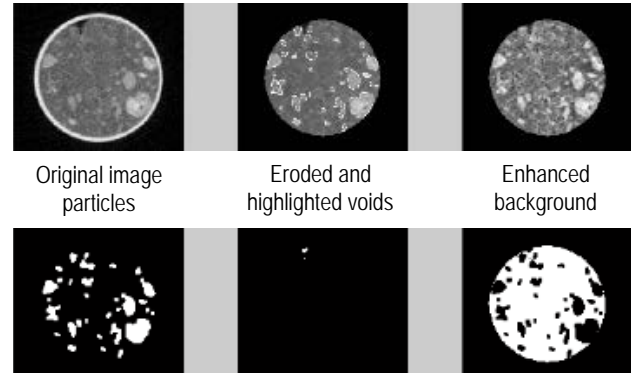
As explosive detection requirements become more stringent over time, and as new threats emerge, it becomes more difficult to discriminate the increasing diversity of threats against innocuous objects that cause false alarms.

Much of the work at BDL includes the characterization of explosives, precursors, and other threats, as well as known or potential false alarm materials, and populating a knowledge base of detection signatures.

The detection-related methods at BDL include dual energy X-ray attenuation measurements up to 450 keV, tomographic imaging at scales down to 10 microns, angle-dispersive X-ray diffraction, and volumetric density measurements. In addition, elemental composition is determined using X-ray fluorescence and combustion. This knowledge can help predict what the attenuation should be, at any energy. Elemental composition measurements can also be used for quality control.

WIDE-RANGING IMPACT

BDL contributes to Department of Homeland Security (DHS) Science and Technology Directorate (S&T) efforts to characterize emerging threats and develop threat



"regions of responsibility" pertaining to bulk threat detection feature ranges. BDL supports inert simulant development by predicting the properties of interest, such as X-ray attenuation and density, or particle distribution. BDL also supports Transportation Security Laboratory testing of bulk explosive detection baggage screening equipment by performing quality control tests on improvised explosives. Finally, BDL conducts applied research in developing specialized tests, and in advanced detection methods, such as spectral computed tomography and basis material decomposition.

AREAS OF FOCUS

- X-ray attenuation and High-Resolution CT
- X-Ray Diffraction analysis
- Elemental analysis
- Mass Density
- Morphology
- Advanced concepts development

