A192 NIST Trace Explosives Test Bed

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After attending this presentation, attendees will learn about the laboratory research being conducted at NIST in the area of trace explosives detection and the efforts in transitioning research findings into real-world applications.

This presentation will impact the forensic science community by reporting test bed evaluations to critical stakeholders for the potential modification of explosive trace detection protocols.

There is a critical need to protect government infrastructure from potential terrorist threats. Government agencies have expanded security measures by increasing surveillance, manpower, and threat detection capabilities. The National Institute of Standards and Technology (NIST), Surface and Microanalysis Science Division, focuses on the development of measurements and standards that facilitate improvements in the reliability and effectiveness of currently deployed explosives trace detectors (ETDs) and next-generation detection technologies. Ion mobility spectrometers (IMS) - based ETDs are widely used for the rapid screening of trace explosives and narcotics residues collected by physical swiping of a suspect surface. In this technique, residues collected on a sampling swipe are thermally desorbed by rapid heating to produce neutral vapor molecules that are subsequently ionized with a ^{63}Ni source at atmospheric pressure. Although extensive research is focused on the development of next-generation technology, long-term evaluation of instrument field performance is a need in the area of trace explosives detection.

New efforts have focused in the development of a NIST Trace Explosives Ted Bed. The goal of this field test bed is to test NIST laboratory findings in real-world field conditions to determine end-user utility and provide stakeholders with operation improvement recommendations (OIRs). The development of the test bed has involved the deployment of trace detection systems throughout the NIST campus. In addition, a training program has been developed and implemented for NIST Physical Security. Laboratory research findings have been integrated into the training program including standard operating procedures for proper instrument operation and best practices for sample collection and alarm resolution. To date, over 40 NIST security clerks/police officers have been trained in the daily operation and maintenance of explosives trace detectors. Field experiments with our trained officers have yielded data supporting the improvement of collection media (swabs) as well as hand-held wands used to harvest a sample. In addition, researchers provide field screeners with well-characterized explosives test materials used daily to validate instrument performance under operational environmental conditions. Inkjet printing technology capable of depositing a known mass of explosive with better than one percent precision is used to produce the quality assurance/quality control (QA/QC) test materials. The stability of the test materials as well as testing different storage methods to establish sample shelf-life is being evaluated. Analytical figures of merit such as measurement repeatability and instrument sensitivity are evaluated as part of the analysis. Preliminary QA/QC results of ETDs deployed at the NIST test bed show typical measurement repeatability of approximately 10% RSD, when n = five using these high-level test materials. In summary, the ability to compare field data versus laboratory data allows us to compare factors such instrument drift, environmental effects, test material stability in the field, monitor need for maintenance of the detectors, as well as compare instrument response and measurement repeatability. Operational improvement recommendations developed through the test bed are now being leveraged by stakeholders in a series of pilot studies to determine their value for airport security screening. In the future the test bed will be expanded to take advantage of other resources available such as an explosives canine team and a cargo-screening facility.

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