



Core  
Laboratory  
Capabilities

## Trace Detection Laboratory

**Mission:** The Trace Detection Laboratory develops, validates, and supports machine and canine-based techniques for detection of trace amounts of explosives (picograms to microgram), including systems developed for screening of persons, luggage, packages, and vehicles. The Trace team improves sampling methods, creates new test articles and procedures, and optimizes existing technologies, while providing quality tools and standards to domestic and international security agencies.

### Overview

With its state-of-the-art research facilities, the Trace Detection Laboratory has evaluated almost all of trace explosive detection technologies in use throughout the world today. Using the results of studies that accurately predict the contamination levels of persons and packaging associated with bomb making and transport, the trace team creates standards, sampling methods, and unique scientific instrumentation for the rigorous testing and validation of explosive trace detection (ETD) systems. Working with other domestic and international security organizations the Trace Laboratory continues to enhance the security of the traveling public at home and abroad.



One of the Trace laboratories

### Facilities:

- HPLC, GC, GC-MS and IC, CE instrumentation for organic and inorganic explosives quantification, respectively
- Triple quadrupole and time-of-flight mass spectrometers with atmospheric pressure ionization sources and Electrospray and Desorption Electrospray Ionization (ESI and DESI) sources
- Ion mobility spectrometer-mass spectrometers (IMS-MS) under development for new threat characterizations (e.g. home-made explosives)
- Tabletop, handheld and portal ETD Particle and Vapor Detection Units Used for Baggage and Personnel Trace Explosives Screening

### Expertise:

- Explosive standard sample development, preparation, and verification
- Certification of ETD systems for deployment
- Automation of standard production processes
- Analytical method development for explosive analyses
- Instrument hardware and software integration
- ETD test methods and test plans
- Sampling efficiency determinations and environmental effects on sampling and detection
- Characterization of new explosive threats



Preparing test articles

## Recent Activities

- Certified several new benchtop and handheld ETD systems for deployment
- Integration of a Commercial Ion Mobility Spectrometer with a triple quadrupole Mass Spectrometer (CIMS-MS) and a Time-of-Flight Mass Spectrometer (CIMS-TOFMS)
- Development of a Research Grade IMS-MS, with capability to perform ion chemistry studies and ion mobility spectrometric characterizations of homemade explosives and new threats encountered in the field
- Second generation Vapor Generator for explosive vapor certification and Vapor Generator-MS and Vapor Generator-GC Integration
- Wet Sampling Efficiency, to determine effect of moisture on sampling
- Standoff Laser Technologies Test Preparation
- SQCA Strip/Sample Production Automation
- Trace Explosive Sample Degradation Studies



## Transportation Security Laboratory



The mission of the Transportation Security Laboratory (TSL) is to enhance homeland security by developing and validating solutions to detect and mitigate the threat of improvised explosive devices. Established in 1992 at the William J. Hughes Technical Center, Atlantic City International Airport, the TSL's 12 acre secure campus includes specialized explosive storage and handling areas and a multi-laboratory infrastructure designed for research, development, and test and evaluation of technology for explosives and weapons detection and blast mitigation. TSL's team of physicists, chemists, engineers, research psychologists and mathematicians is internationally recognized for its unique ability to advance technology from conception to deployment through applied research, development, prototyping, test and evaluation, assessment, certification, and system qualification. Research areas at the TSL include

- Vehicle and Infrastructure Vulnerability Assessments,
- Automatic Explosive Detection in Checked Bag
- Containerized, Bulk, Palletized and Parcel Cargo Screening,
- Fast Noninvasive Screening of Passengers, and
- Blast Mitigation Technologies and Strategies.

With award-winning R&D and ISO 9001 Certified Independent Test and Evaluation, TSL proudly contributes to America's Domestic Security.



**Homeland  
Security**

Science and Technology

*From Science and Technology . . . Security and Trust*

For more information regarding the Trace Detection Laboratory and other capabilities and activities of the Transportation Security Laboratory, send e-mail to [TSLinfo@dhs.gov](mailto:TSLinfo@dhs.gov)