SILMARILS

STANDOFF ILLUMINATOR FOR MEASURING ABSORBANCE AND REFLECTANCE INFRARED LIGHT SIGNATURES

INTELLIGENCE VALUE

Standoff chemical detection is a ubiquitous need across the Intelligence Community for applications ranging from forensic crime scene analysis, to border and facility protection, to stockpile and production monitoring. The SILMARILS program aimed to develop a portable system for accurate real-time standoff detection and identification of trace chemical residues on surfaces using active infrared spectroscopy at up to a 30 meter range.

Current approaches for trace chemical detection require physical collection and analysis. These methods require human input, introduce a fundamental limit on the screening speed, and limit the tested surfaces to those with good "wipe-ability."

SILMARILS technology collects hyperspectral image cubes, in which each pixel contains an entire infrared spectrum, and the chemical composition of a scene can be mapped on an image. This spectral map allows target chemical smears and fingerprints to be separated from harmless background surfaces and contaminants. Total time from collection to result is less than a second for a wide range of substances of interest to intelligence, defense, and law enforcement.

The SILMARILS began in March 2016 and concluded in March 2021. Some key accomplishments include:

- Detection of explosives on portable electronics with a limit of detection in the 3-6 ng range
- Detection of trace quantities of narcotic simulants through plastic bags
- Detection of target chemicals on a wide range of "wild" substrates with real world clutter, including packages, fabrics, drink cans/bottles, and electronics during muliple tests
- Participation in stage testing events that screened vehicles for trace explosive seurrogates
- Detection of trace chemicals while in motion at speeds up to 10mph
- Detection of trace chemicals on human hand skin

PRIME PERFORMERS

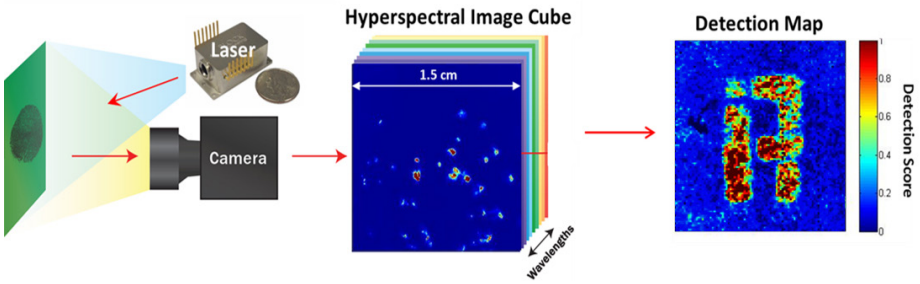
- Block Engineering
- Leidos
- LGS Innovations
- Physical Sciences Inc
- Spectrum Photonics Inc

TESTING AND EVALUATION PARTNERS

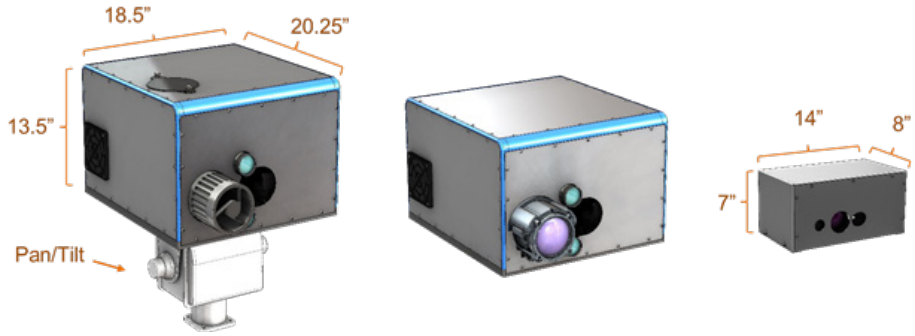
- Johns Hopkins University Applied Physics Laboratory
- MITRE
- Naval Research Laboratory
- Pacific Northwest National Laboratory
- Sandia National Laboratory

KEYWORDS

- Trace surface chemical detection
- Chemical identification
- Standoff detection
- IR spectroscopy
- Hyperspectral Imaging



Exemplar infrared hypercube approach is to measure the reflectance of a surface as a function of wavelength in the LWIR



SILMARILS Phase 3 prototypes

SILMARILS
A LIGHT IN DARK PLACES...

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