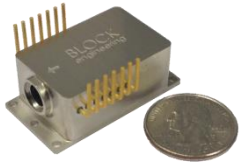
Standoff Chemical Detection using Ultra-Broadly Tunable Quantum Cascade Lasers (QCLs)

Lead Organization: Block MEMS, LLC, **Lead Investigator:** Dr. Petros Kotidis

- Block MEMS has been developing mid-IR chemical detection products since 1956 – multiple DoD/Gov Awards
  - Miniature ultra-widely tunable Quantum Cascade Lasers
  - Originator of rapid-scan FTIR spectrometer
- Mid-infrared (~ 2.5 – 14 μm) radiation enables chemical detection and identification
  - High sensitivity & specificity
  - High speed
  - Eye-safe

ACTIVE DETECTION

Mini-QCL™



- λ = 5.4 - 13 μm
- Extremely fast tuning (5.4-13 μm in 40 msec)
- Ultra-compact

LaserScan™ DE
Disturbed Earth Detector for Dismounted Soldier

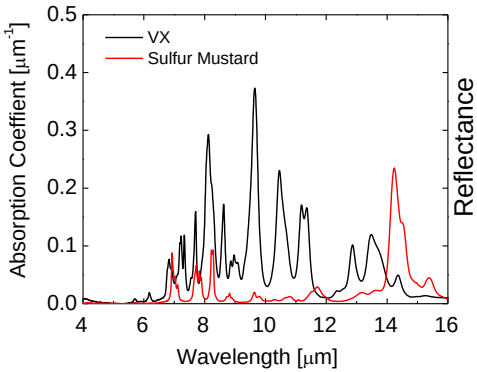
LaserScan™ HH
Handheld, Noncontact Surface Analyzer

LaserWarn™
Large Area and Facilities Chem/Bio Protection

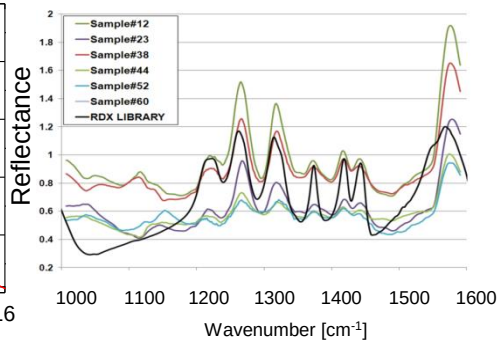
Applications

- **Chemical agents**
- **TIC / TIM**
- **Explosives**
- **Disturbed earth**
- **Latent fingerprints**
- **etc.**

Chemical Agents



Explosives (RDX) On Car Panels



PASSIVE DETECTION

MCAD

PORTHOS™

BLOCK MEMS

Standoff Chemical Detection using Ultra-Broadly Tunable Quantum Cascade Lasers (QCLs)

- Research Areas of Interest:
  - Active Hyperspectral Chemical Imaging using QCLs and Next Generation Focal Plane Arrays
    - e.g., microbolometer, MCT, strained superlattice, QWIP
  - Long-range standoff detection using single-element detectors
  - Advanced algorithms development for detection of trace chemicals on surfaces
  - Increasing the power and tuning range for miniature QCLs
  - Innovative packaging for ultra-light, handheld detectors

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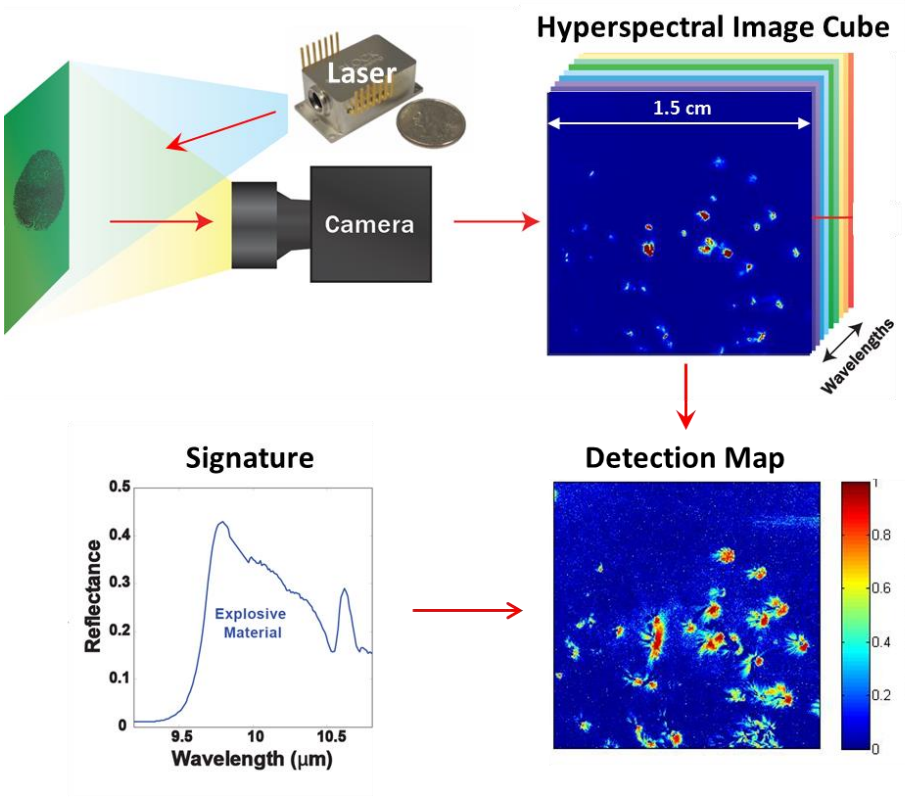
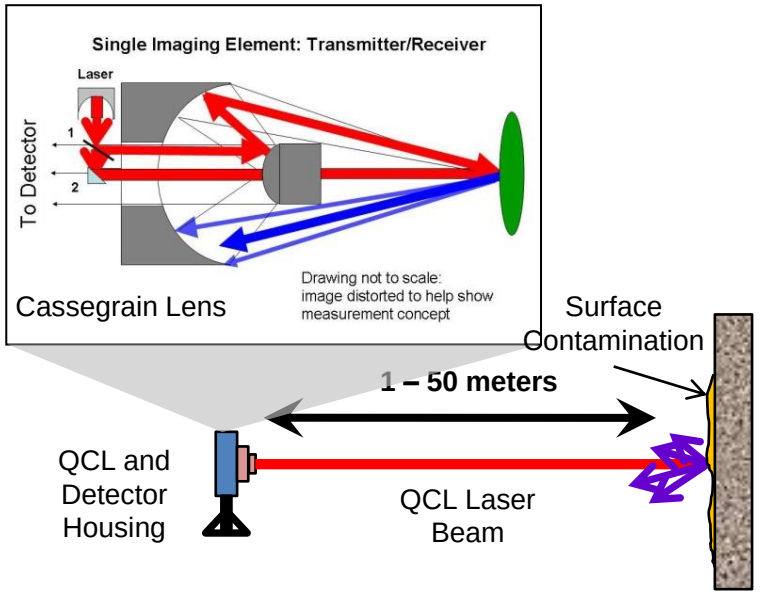
Block Capabilities and Areas of Interest

Hyperspectral Imaging



Long-distance Standoff



Portable Systems

BLOCK MEMS

Standoff Chemical Detection using Ultra-Broadly Tunable Quantum Cascade Lasers (QCLs)

- Seeking the following capabilities:
  - Next Generation Long-Wave IR Focal Plane Arrays
  - Low-SWaP optical scanning technologies for infrared lasers
  - Spectroscopic algorithms
  - Applications
  - Advanced packaging capability
- And/Or, Seeking to join research group:
  - Active QCL-based, Hyperspectral Chemical Imaging
  - Trace detection of surface contaminants
  - Signature phenomenology
  - Novel spectroscopic methods using QCLs

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