

## EVIS Trace Gas Sensor

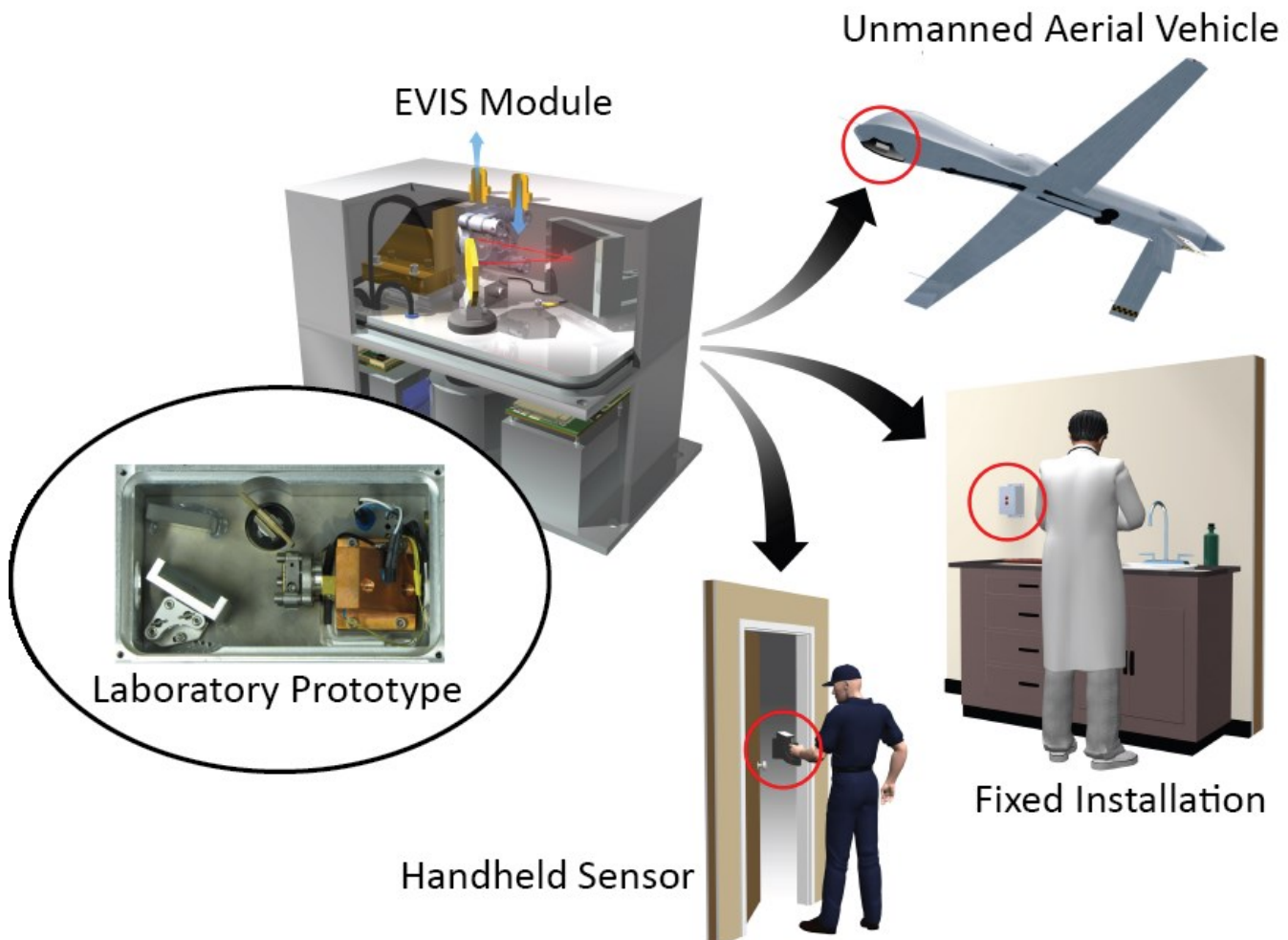
**Sensitive Mid-IR spectroscopy without an external detector**

**EVIS concept developed by PNNL**

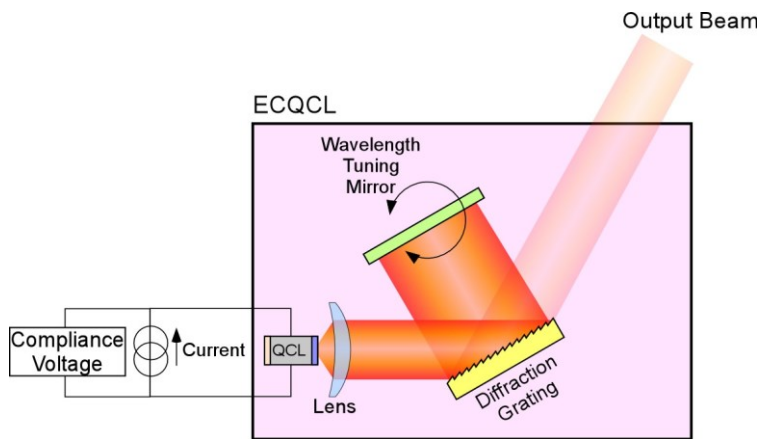
- External Cavity Quantum Cascade Laser (EC-QCL)
- Voltage applied to EC-QCL measured during sweep
- Intracavity absorption spectra produced & analyzed
- Sensing of multiple trace gas species in compact system



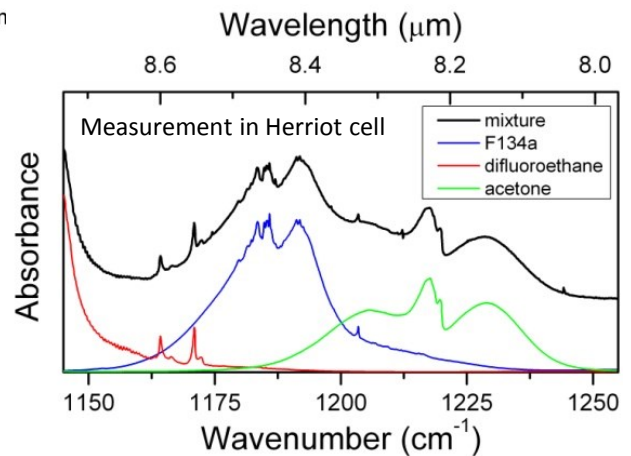
**Pacific Northwest**  
NATIONAL LABORATORY



## EVIS Trace Gas Sensor



Littman-Metcalf cavity EC-QCL



Quantification of broad absorbers

### Utility of Compliance Voltage Signal (patent pending)

Compact intracavity sensing without an external detector or an external gas cell, i.e., EVIS  
Power normalization for better sensitivity with multi-pass cell or pitch/catch configuration  
Highly accurate stabilization of EC-QCL output

### General Specifications

Center wavelength:  $\lambda = 3 - 10 \mu\text{m}$   
Scan range (per unit):  $100 - 200 \text{ cm}^{-1}$   
Full scan rate: 20 Hz  
Scan resolution:  $0.1 - 0.2 \text{ cm}^{-1}$   
Laser line width:  $\sim 1 \text{ MHz}$

### Example Species

Volatile Organic Compounds (VOC)  
Hydrocarbons, Alcohols  
Fluorocarbons, Freons  
Ammonia, SF<sub>6</sub>, DIMP, etc., etc.

### Applications

Chemical / toxin / pollutant detection and quantification  
Combustion / propulsion diagnostics  
Process / environmental monitoring  
Breath analysis

