



# Air Force Research Laboratory|AFRL

*Science and Technology for Tomorrow's Air and Space Force*

## **Success Story**

### **SENSORS DIRECTORATE SUCCESSFULLY TESTS DIAL SYSTEM**



The Differential Absorption Ladar (DIAL) system detects and measures concentrations of gasses, such as environmental contaminants and chemical agents in the atmosphere, and may be useful operating in the differential scatter mode for bio-aerosol discrimination. This lightweight, small, and flight-capable system selects the minimum number of wavelengths to provide the maximum probability of identifying a chemical or group of chemicals in a complex chemical environment.



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### **Accomplishment**

The Sensors Directorate's Multi-Function Electro-Optical Branch successfully tested Lidar II, a frequency agile DIAL system designed and assembled by LaSen, Inc. Lidar II is the second-generation device based on the environmental laser mapping system—a DIAL-based, high-speed, multi-chemical mapping system. Directorate researchers successfully tested this sensor on the ground and on a helicopter platform, with detection limits of <1.5 parts per million (ppm).

### **Background**

An Air Force Small Business Innovation Research program funded the initial effort to construct a midwave active laser chemical remote system with potential application as a base remediation sensor. LaSen, Inc. designed Lidar I, a 100 lb sensor with detection limits of <5ppm at ranges up to 2.0 km in a topographic reflector mode, to map volatile organics (methane, toluene, benzene, etc.) associated with Air Force base environmental cleanups, dumpsites, and underground diesel fuel leaks.

Lidar II is a compact (<40 lbs) version of Lidar I, engineered to operate from a helicopter during flight. This new device is less than half the size and weight of Lidar I, with improvements in receiver design performance.

Initial flights proved that the vibration and temperature fluctuations encountered during flight operations did not affect performance of the system. Subsequent flights demonstrated the sensor's ability to detect, from the air, natural gas leaks at pipeline valve stations.

Directorate researchers are currently upgrading the system to include a video tracker and Global Positioning System/Inertial Navigation System to confirm and geo-reference actual sampling locations on the ground. They will further demonstrate sensor capabilities in a number of blind tests against underground pipeline tests during subsequent flights and investigate the sensor's potential to detect and identify hard targets on the ground, based on spectral differences in material reflectivity.

### **Additional information**

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-SN-18)

Sensors  
Emerging Technologies