

Greenhouse Gas Laser Imaging Tomography Experiment (GreenLITE)

Award Number: DE-FE0012574

Project Summary:

This project developed a system to measure atmospheric near-surface carbon dioxide (CO₂) over an open area by using two prototype scanning sensors and coupling them with a series of retro-reflecting mirrors in a grid network. The system consists of a pair of laser-based transceivers, retroreflectors, and a set of cloud-based data processing, storage, and dissemination tools, which enable 2D mapping of the CO₂ in near real time. The prototype system was deployed to several test sites for remote autonomous monitoring at an active CO₂ storage site.

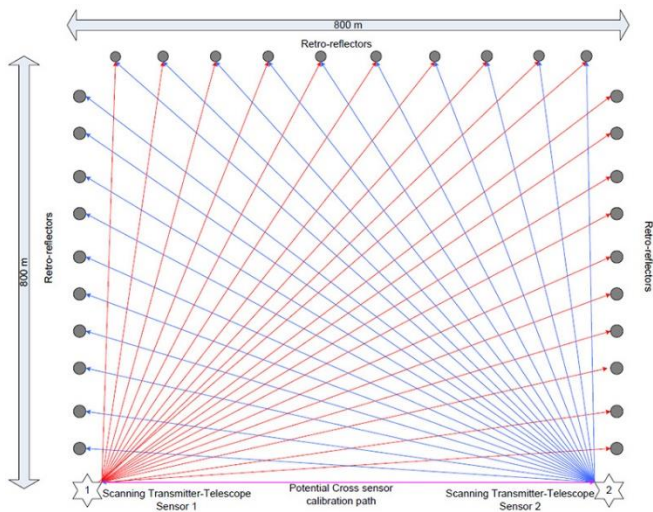


Figure 1: The baseline topology for the Green LITE MVA system.

Project Outcomes:

The system was built, tested, and deployed to the Zero Emissions Research and Technology (ZERT) facility in Bozeman, Montana. Testing at ZERT demonstrated the ability of the Greenhouse Gas Laser Imaging Tomography Experiment (GreenLITE) system to identify and map small underground leaks in the presence of other biological sources and with widely varying background concentrations. The system was then ruggedized and tested at the Harris test site in New Haven, Indiana during winter while exposed to temperatures as low as -15 °C. Additional testing was conducted using simulated concentration enhancements to validate the 2D retrieval accuracy. This test resulted in a high confidence in the reconstruction's ability to identify sources to tens of meters resolution in this configuration. Finally, the system was deployed for approximately 6 months to an active industrial site, Illinois Basin – Decatur Project, where over one million metric tons of CO₂ had been injected into an underground reservoir. The GreenLITE system operated in a wide range of environmental conditions, with temperatures ranging from -20 to 33 °C and wind gusts. During this time period only four on-site visits were made to the site to clean optics and check on the general status of the system. All other interaction, including minor adjustments to alignment and monitoring system health, was performed remotely. The GreenLITE system was successfully tested at field scale, operating for 6 months with minimal adjustments.

Presentations, Papers, and Publications

Final Report: [Greenhouse gas Laser Imaging Tomography Experiment \(GreenLITE\)](#) (June 2016) – Jeremy Dobler, T. Scott Zaccheo, Nathan Blume, Timothy Pernini, Michael Braun, Christopher Botos

Prime Performer:
Exelis, Inc.

Key Performers:
Atmosphere & Environmental Research, Inc.
ITT Space Systems, LLC

Principal Investigator:
Jeremy Dobler

Project Duration:
10/1/2013 – 3/31/2016

Performer Location:
McLean, Virginia

Field Sites:
Zero Emissions Research and Technology facility, Bozeman, Montana
Harris test site, New Haven, Indiana
Illinois Basin Decatur Project, Illinois

Program:
Carbon Transport & Storage