

A 2-micron Pulsed Laser Transmitter for Direct Detection Column CO₂ Measurement from Space

PI: Jirong Yu, NASA LaRC

Objective

- Develop a compact, efficient two-micron pulsed laser for a lidar instrument to make accurate, high-resolution atmospheric CO_2 column measurements in support of the ASCENDS mission.
 - Develop a pulsed two-micron laser that is based on a Thulium fiber-laser pumped Holmium (Ho) solid state laser in a Master Oscillator Power Amplifier (MOPA) configuration.
 - Demonstrate > 35mJ at 100-200Hz needed for the space Integrated Path Differential Absorption (IPDA) instrument in a robust prototype format.





Thulium Fiber laser pumped Holmium-only two micron laser in a ring cavity configuration with demonstrated operation at pulse repetition rates from 100-1 kHz at output powers from 4-8 Watts

Injection seeded, single frequency beam profile

Accomplishments

- Designed and built a compact, injection seeded, 13.8% optical-to-optical efficiency, two-micron pulsed laser for a CO₂ column measurement lidar instrument.
 - Completed optical, mechanical, and electrical integration of a compact, highly stable ring-cavity 2-micron laser.
 - Completed functional characterization of the laser performance operated over a range of pulse repetition rates that enable multiple measurement architectures.
 - Achieved greater than 8 W output power at less than 35 W pump power demonstrating the most efficient laser of its kind to date.
 - Verified single frequency operation by injection seed technique. The beam quality value achieved M² <1.1.
 - The laser is ruggedized and built for deployment in trailer or aircraft operation.

Co-Is/Partners: Upendra Singh, NASA LaRC; Robert Menzies NASA JPL; Yingxin Bai, TehHwa Wong, SSAI



