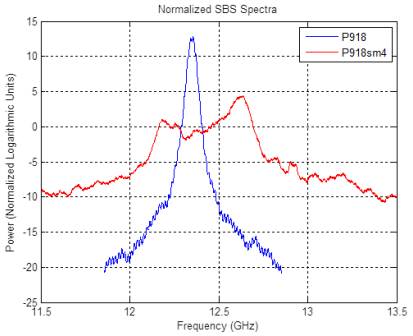
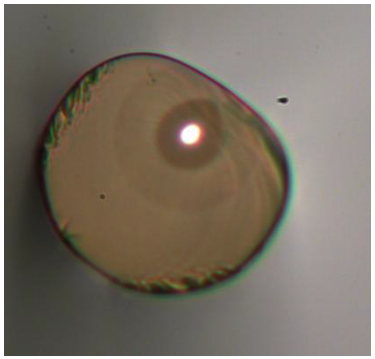
Advancement of the O_2 Subsystem to Demonstrate Retrieval of X_{CO2} Using Simultaneous Laser Absorption Spectrometer Integrated Column Measurements of CO_2 and O_2

PI: Jeremy Dobler, Exelis Geospatial Systems

Objective

- Advance fiber materials and architecture to enable the Oxygen (O_2) band measurement in support of the ASCENDS mission measurement concept
- Achieve scalability of a 1.26 μm fiber Raman amplifier (FRA) to 5W with an optical-to-optical efficiency of >50% to be integrated with ITT's modulated continuous wave (CW) Laser Absorption Spectrometer (LAS)
- Advance the retrieval and software tools to demonstrate the retrieval of dry air mixing ratio of CO_2 using simultaneous active O_2 and CO_2 integrated column measurements





Example of broadening of the Brillouin gain through the development of an off-center core P_2O_5 fiber with a special carbon fiber jacket that allows it to be spooled tightly resulting in a passively varying stressed fiber

Accomplishments

- Developed multiple P_2O_5 fibers with SBS suppression using; 1. acoustic wave guiding, 2. variable longitudinal concentration, 3. longitudinally varying stressed fibers
- Developed a Raman amplifier which generates >3.6 W average CW power at 1.26 um with ~4MHz linewidth
- Developed a pump laser that is 60% more efficient than commercial pump lasers at 1081 nm
- Tested the Raman amplifier with Exelis' Multi-functional Fiber Laser Lidar, allowing simultaneous measurements of CO_2 and O_2.
- Integrated and validated the algorithms to retrieve X_{CO2} from the simultaneous active measurements of CO_2 and O_2
- Flew in support of CO_2 airborne measurement onboard the NASA DC-8

Co-Is/Partners: Nasser Peyghambarian, Robert Norwood, James Nagel, U Arizona & TIPD Inc; Hillary Snell, T. Scott Zaccheo, AER Inc.

TRL_{in} = 3 TRL_{out} = 5