

A Compact Remote Sensing Lidar for High Resolution Measurements of Methane

PI: Haris Riris, NASA GSFC

Objective

- Develop a compact, space-qualifiable laser transmitter for a lidar operating at 1.65 μm to enable CH_4 measurements with performance goals of:
 - Output energy greater than 300 μJ
 - Linewidth less than 500 MHz
- Reduce the risk, cost, size, mass and volume of the CH_4 lidar instrument by scaling the laser power of the existing laboratory breadboard
- Demonstrate and validate high sensitivity \mbox{CH}_4 open path measurements



5-Wavelength OPO

65 hour CH_4 LIDAR measurement correlated with in-situ Picarro instrument

Accomplishments

- Demonstrated two viable architectures for a CH₄ transmitter using a burst mode Optical Parametric Amplifier (OPA) and a multiwavelength Optical Parametric Oscillator (OPO)
 - + With a 5-wavelength OPO, obtained 250 μ J/pulse @ 5 KHz and linewidth ~300 MHz
 - With an OPA, obtained 290 μ J/pulse @ 10 KHz and linewidth ~ 500 MHz
- For both OPA and OPO architectures, demonstrated and validated CH₄ open path measurements using an in-situ Picarro instrument for correlation
- Designed an integrated CH₄ lidar to be used in an airborne demonstration using GSFC transmitters (OPO version) and an ESTOdeveloped (IIP) sensitive detector
- Collaborated within GSFC and outside vendors and leveraged IRAD and SBIR to develop alternative transmitter architectures (Er:YAG and Er:YGG) to increase transmitter efficiency and energy, and possibly simplify implementation

```
Co-Is/Partners: Kenji Numata, UMD; Stewart Wu, GSFC
```

TRL_{in}=2 TRL_{out}=4

