

Blue Laser Based on Frequency-Quadrupled Tm:Lu2O3, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Aqwest proposes to develop a novel, compact and rugged high-peak power blue laser in the 0.45-0.49 m range. The innovative blue laser is based on a frequency-quadrupling of 1.9-μm laser output from ceramic Tm:Lu2O3, a novel high-performance solid-state laser (SSL) material that is new becoming commercially available. The project will adapt our novel and highly successful edge-pumped disk laser / multi-passed amplifier architecture we developed for the US Army, Navy, and the Department of Energy (DOE). In Phase I, we will use our existing suite of Tm laser models to determine the feasibility of the subject blue laser and identify preferred operating regimes. We will also fabricate a composite Tm:Lu2O3 laser disk using the ceramic material now being produced for Aqwest, and laser test it under relevant condition in our existing test bed to characterize performance at 1.9-μm wavelength. In Phase II, we will develop and demonstrate a full-scale blue laser prototype.



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ANTICIPATED BENEFITS

To NASA funded missions:

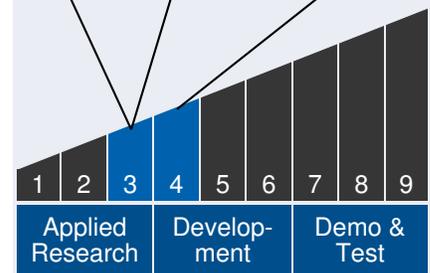
Potential NASA Commercial Applications: 1. Laser bathymetry using the blue output 2. Remote sensing of the 532-nm water absorption line 3. Remote sensing of CO2 using the Tm:Lu2O3 output tuned to 2.05 micron 4. Supplanting of Tm:YAG and Tm:YLF lasers in lidar transmitters in future remote sensing applications on air and space platforms

To the commercial space industry:

Potential Non-NASA Commercial Applications: 1. Eye-safer laser material processing (supplanting traditional 1-micron lasers) 2. Welding of transparent plastics (especially in automotive applications) 3. Remote sensing, lidar 4. Laser bathymetry 5. Medical surgery 6. Dentistry

Technology Maturity

Start: 3 | Current: 3 | Estimated End: 4



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

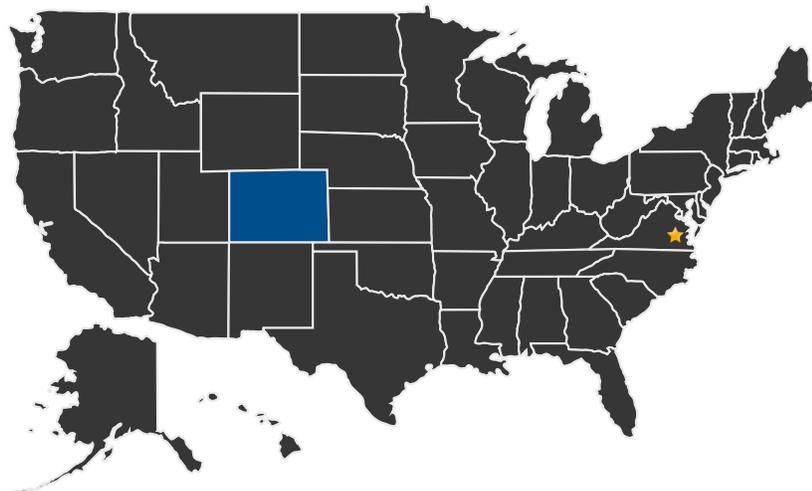
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U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Langley Research Center

Other Organizations Performing Work:

- Aqwest, LLC (Larkspur, CO)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23318>)

Management Team *(cont.)*

Principal Investigator:

- John Vetrovec

Technology Areas

Primary Technology Area:

Science Instruments,
Observatories, and Sensor
Systems (TA 8)

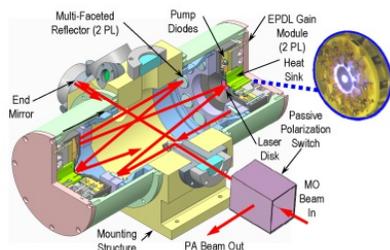
- └ In-Situ Instruments and
Sensors (TA 8.3)

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IMAGE GALLERY



Blue Laser Based on Frequency-Quadrupled Tm:Lu₂O₃, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

Blue Laser Based on Frequency-Quadrupled Tm:Lu₂O₃, Phase I

Potential Applications

1. Laser bathymetry using the blue output
2. Remote sensing of the 532-nm water absorption line
3. Remote sensing of CO₂ using the Tm:Lu₂O₃ output tuned to 2.05 micron
4. Supplanting of Tm:YAG and Tm:YLF lasers in lidar transmitters in future remote sensing applications on air and space platforms