National Aeronautics and Space Administration

NASA**facts**

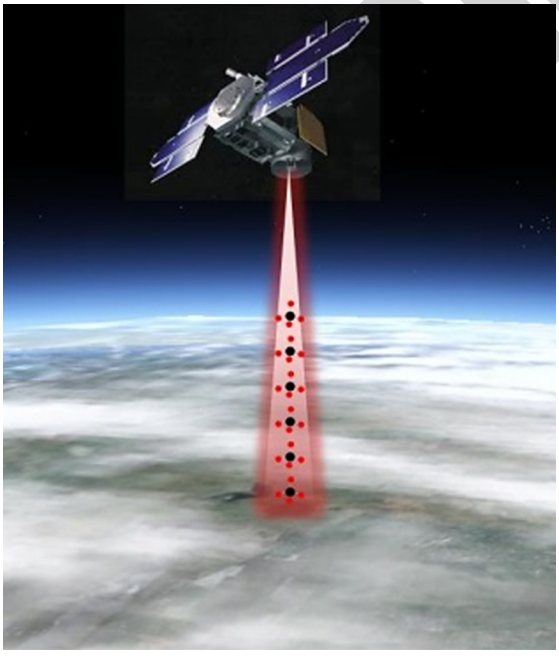
Space Technology
Game Changing Development
Tunable 1.65 Micron Seed Laser for Remote Sensing of Methane

Methane (CH_4) is an important greenhouse gas on Earth. Accurate measurements of the sources and sinks of methane will increase our understanding of the complex, living world we live in. In addition, methane, which on Earth is often a byproduct of biological processes, could be a biomarker for life on other planets such as Mars.

Sampling methane concentrations on a global scale can be performed using satellite based laser systems. These systems measure the absorption of specific frequencies of light as it travels through the atmosphere and is reflected back from Earth's surface.

Satellite monitoring would be valuable for monitoring sources such as the Arctic permafrost and tropical wetlands. For a more focused detection campaign, measurements can be performed from an aircraft of UAV.

One of the key absorption lines for methane is centered on a wavelength of 1.65 microns. There are currently no viable commercial lasers with suitable performance available at this wavelength for use in space. In order to be effective the laser must have a narrow line width and be rapidly tunable around its center frequency. Having a low size, mass, and power are also important for aerospace applications.



Remote sensing of methane from orbit or a UAV, or in an instrument–enabled by laser technology developed in this program.

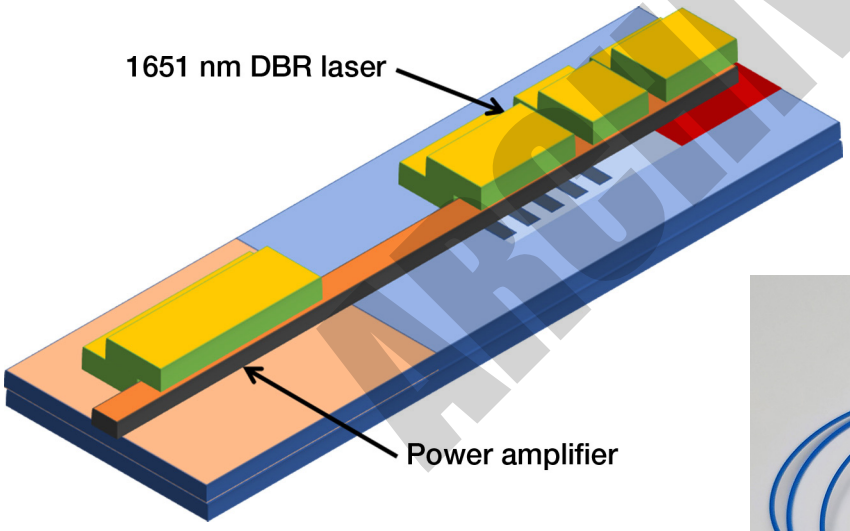
In 2016, a California company Freedom Photonics was competitively selected under a NASA "Tipping Point" Solicitation to help share the development costs of an electronically tunable high power seed laser that will enable remote methane detection. Although important to NASA, this technology can also be commercialized and provide remote detection capabilities to monitor emissions from the energy sector. Industries such as petroleum refineries, mining operations, pipelines and landfills have a need to monitor methane concentrations to detect leaks and hazards.

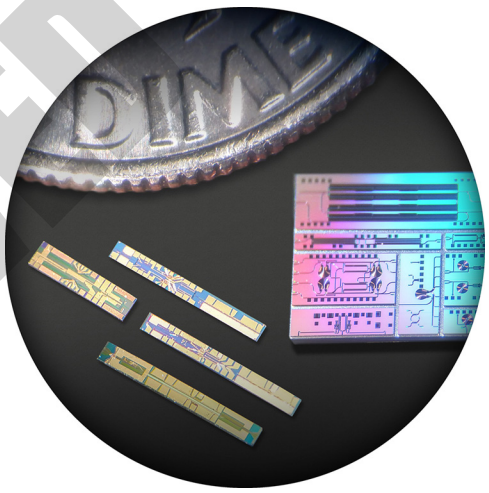
The seed laser development is a two year project. Laser development will be performed by Freedom Photonics and laser assessment will be performed by NASA's Goddard Space Flight Center in Greenbelt, Md. The seed laser will be integrated into an existing Goddard lidar instrument for methane measurements from an airborne platform.

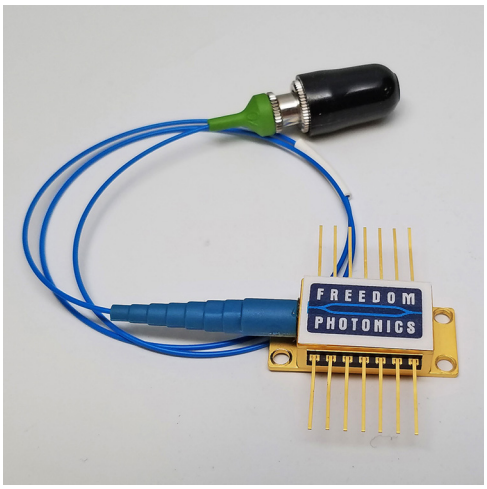
By sharing the development costs with industry, NASA is leveraging its investment in the development of a critical technology and at the same time helping the US industry be more competitive.

The Game Changing Development (GCD) Program investigates ideas and approaches that could solve significant technological problems and revolutionize future space endeavors. GCD projects develop technologies through component and subsystem testing on Earth to prepare them for future use in space. GCD is part of NASA's Space Technology Mission Directorate.

For more information about GCD, please visit http://gameon.nasa.gov/







Tunable Master Oscillator Power Amplifier.

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