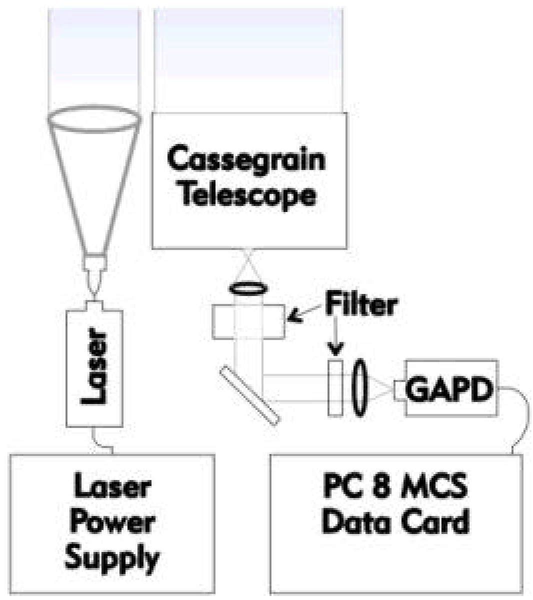
Autonomous Micro-Pulse Lidar System (MPL) (GSC-13493-1)

TOP-610

Objective:

The National Aeronautics and Space Administration seeks users and developers for additional commercial use and development of the Micro Pulse Lidar System (MPL).

Description:



The MPL Components

http://tco.gsfc.nasa.gov/tops/MPLDiagram.gif

MPL is an eye safe lidar system for detecting cloud-base height and profiling atmospheric cloud and aerosol scattering up to altitudes of 30 kilometers. Developed at the Goddard Space Flight Center in answer to the challenge of creating an efficient lidar system for space-borne applications, it has been proven reliable for full-time autonomous operation in ground-based applications over a two year period.
The MPL system uses an optical telescope to transmit and expand solid state laser pulses, allowing it to produce a high level of sensitivity and reliability using eye safe pulse energy levels. MPL has several advantages over similar systems including: aerosol detection and better sensitivity at higher altitudes; ability to detect cirrus clouds; and efficient operation in day and night time conditions.

Lidar systems have been in use as a research tool for twenty plus years. Certain limitations have prevented the widespread use of lidar systems. NASA developed MPL as a solution to three such limitations: (1) lack of eye safety, (2) size and complexity, and (3) lack of reliability. MPL provides eye safety by using laser beam expansion and lower laser pulse energies. It uses a very basic set-up for simplicity of operation. The laser, detector, and all optics can be packaged in a 40 X 40 X 20cm box.

MPL is a conventional time gated, incoherent detection lidar system. There are three main differences between MPL and conventional lidar systems. First, the laser pulse repetition rate is much higher (greater than 1 kHz) and the pulse energies are much lower (less than 40 mJ). The low pulse energies allow the system to be eye safe. Second, the 523.5 nm laser is diode pumped rather than flashlamp pumped. Finally, signal detection is by photon counting. For this, MPL employs a Geiger Mode Avalanche Photo Diode (GAPD), which has quantum efficiencies approaching 70%.

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Benefits:

* **Eye safe**: MPL uses high repetition frequency, low energy laser pulses for eye safety.
* **Sensitive**: Can detect and accurately measure low concentration phenomena.
* **Long Range**: Can detect and accurately measure high-altitude phenomena (up to 30 km).
* **Low Cost**: Uses commercially available components.
* **Flexible**: Operational at night and in full sunlight.
* **Precise**: Enables detection of all significant aerosol and thin cirrus clouds.
* **Autonomous**: Designed for continuous, long-term, full-time, operations in a turn-key installation.

Potential Applications:

* **Atmospheric Research**: monitoring cloud and aerosol structure.
* **Meteorological Monitoring**: in ceilometer applications.
* **Environmental Monitoring**: can detect haze and inversion height.
* **Airport Slant Range Visibility**: MPL is uniquely qualified to fulfill this need.

Technology Commercialization Status:

This technology opportunity is part of the NASA Technology Transfer program. The program seeks to stimulate development of commercial applications from NASA-developed technology. NASA holds U.S. Patent 5,241,315 for MPL. MPL is currently used in a number of research applications. Science and Engineering Services, Inc. (SESI) currently holds a non-exclusive license for the technology and manufactures MPL for research applications. NASA seeks additional users for MPL as well as a partner to adapt MPL for use in other sectors, such as slant-range visibility instrumentation for aviation.

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