



## NASA SBIR/STTR Technologies

### High Gain, Position Sensitive, Avalanche Photodiodes for Optical Communication

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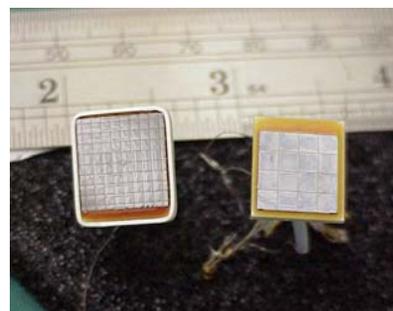
Firm: Radiation Monitoring Devices, Inc. - Watertown, MA 02472

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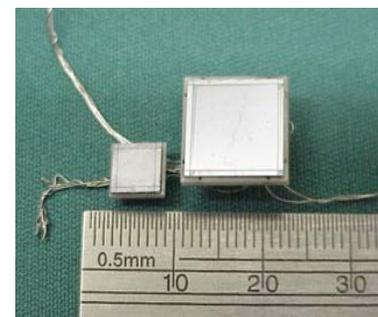


#### Identification and Significance of Innovation

One of the barriers of achieving global and intersatellite free-space optical communication links is the need for a complex pointing system. The pointing system derives from the necessity of satellites to maintain visual contact over a distance of tens of thousands of kilometers. Avalanche photodiodes (APDs) are of particular interest as receivers for such optical systems because of their high-speed response, internal gain and sensitivity to near-infrared wavelengths. We propose to develop a silicon-based, low noise, high gain, position-sensitive APD (PSAPD) sensor for near-IR tracking and pointing applications.



APD array



Lateral-effect APD

#### Technical Objectives

The goal of this work is to design, develop and fabricate a position-sensitive APD module, with associated electronics and readout that would offer a significant improvement over presently available detectors.

#### Work Plan

- Task 1. Design and fabricate PSAPD detectors.
- Task 2. Characterize lateral effect and quadrant detectors.
- Task 3. Formulate a theoretical model for the PSAPD.
- Task 4. Enhance the near-IR quantum efficiency.
- Task 5. Reduce dead space between pixels.
- Task 6. Develop amplification and readout electronics.
- Task 7. Design, and fabricate PSAPD units for delivery to NASA.

#### NASA Applications

free-space optical communication, LADAR, vehicle docking, navigation, and guidance

#### Non-NASA Applications

optical communication systems, LADAR, ranging, near-IR spectroscopy and optical triangulation

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