

Program Title: **“Extended wavelength InP based avalanche diodes for MWIR response”**

Contractor: **Princeton Lightwave Inc.**

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Order No.: **NNX11CI19P**

Date: **February 17, 2012**

NASA STTR Phase I Technical Final Report: Project Summary

For this Phase 1 SBIR program, we have carried out design work, modeling, device fabrication and device characterization to demonstrate the feasibility of broad-band single photon counting detector arrays suitable for deployment in spacecraft for in-situ compositional analysis and mapping. We have also devised novel quantum well device design concepts that can extend our detection wavelength beyond 5 μ m, that would span the entire spectrum from near infrared (NIR) through shortwave infrared (SWIR) and midwave infrared (MWIR). We have demonstrated the device feasibility and look forward to commercializing this technology during a Phase II effort.

For this NASA STTR program, we developed novel superlattice-based near infrared to midwave infrared avalanche photodetector (APD) and arrays grown on InP substrates for single photon counting applications at high operating temperatures on the order of 200K accessible using thermoelectric coolers. This enables a detector with broad spectral response spanning 0.9 to 4+ μ m wavelength with reduced cooling requirements, offering a reliable detector technology with small size weight and power requirements that is ideal for future planetary missions. The detector is based on Princeton Lightwave’s industry-leading planar-geometry single photon counting APD detector platform designed for 1.55 μ m wavelengths, with incorporation of a novel absorber region.