The Tethering and Ranging Mission of the Georgia Institute of Technology (TARGIT) is a nanosatellite (CubeSat) mission, tentatively slated to launch in late 2019, that strives to provide centimeter-level topographical mapping of an inflatable target using a compact LiDAR imager.

TARGIT CubeSat

The objective of this mission is to develop, and test on-orbit, a small form factor LiDAR imaging camera. The LiDAR camera will be the primary payload of this NASA sponsored CubeSat mission. The LiDAR system will image an inflatable target tethered to the CubeSat starting at three meters away, and then after the tether is released, will continue ranging the target until it is no longer detectable.

This mission will raise the technology readiness level of new silicon photomultiplier arrays by demonstrating their utility for space applications and will lay the groundwork for future planetary missions that need imaging technology at lower cost. The LiDAR subsystem will be suitable for ride-share applications due to its small form factor and will be a viable cost option for imaging of planetary bodies.

OVERVIEW and APPROACH

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TESTING and RESULTS

The QP50 Photodiode (initial trigger T0) could not produce a start signal fast enough, due to its slow rise time. This caused the GP-22 to experience timeout errors before aToF could be obtained. The MicroFJ-SMA-66035 SiPM selected to replace the QP50, eliminating the rise time issue.

The graph above shows partial results from a radiometry study used to determine the maximum possible ranging distance with the selected laser at solar intensities expected on-orbit. The study confirmed that amplifiers for the SiPM signals will not be necessary, reducing the complexity, cost, and volume of custom circuit boards used for flight hardware.

FUTURE WORK

GOAL: To scale from the one pixel benchtop setup to a 16 pixel flight hardware system. This involves testing and manufacturing nanosatellite form factor LiDAR system.

POTENTIAL NEAR-RANGE HARDWARE LIST:
- Initial Trigger: SensL J-Series 30035 TSV Single Cell
- Receiving array: SensL J-Series 30035 16 Cell Array
- Microcontroller: PSoC5 by Cypress Semiconductor
- ToF Processor: ACAM TDC-GPX (32 for 16 channels)
- High Speed Comparators
- Receiving and Transmitting Optics

ACKNOWLEDGEMENTS

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