

FY22/23 DAGSI Research Topic

1. **Research Title:** Development of SWIR Avalanche Photodetectors
2. **Individual Sponsor:**

Dr. Joshua Duran, AFRL/RYDH Bldg 600
2241 Avionics Circle WPAFB, OH 45433-7333
joshua.duran.2@us.af.mil

3. **Academic Area/Field and Education Level**

Electrical Engineering (M.S. or Ph.D. level)
Electro-optics (M.S. or Ph.D. level)
Physics (M.S. or Ph.D. level)
Materials Science (M.S. or Ph.D. level)

4. **Objectives:** The objective of this effort is to investigate materials and architectures for developing avalanche photodiodes (APDs) in the short-wavelength infrared (SWIR) band. Detectors should be single-photon sensitive with operation at or near room temperature. Development should include design, fabrication, and testing of these APDs.
5. **Description:** Next generation LIDAR systems have a wide variety of applications using various imaging modalities that can't be achieved with standard passive imaging. A core component of these systems is the photodetector, which plays a central role in the range performance of these systems. Current LIDAR systems are primarily operated in the near-infrared, leveraging low-cost and high-performance silicon APDs. Range improvement can be realized by increasing the operating wavelength into the SWIR regime, largely due to eye safety constraints at shorter wavelengths. However, high performance SWIR APDs capable of single-photon sensitivity must be developed to realize this potential. This research project will focus on developing single-photon sensitive APDs in the SWIR regime for long range LIDAR applications. There is no constraint on materials or architectures to be considered.
6. **Research Classification/Restrictions:** Research is unclassified
7. **Eligible Research Institutions:** DAGSI

PA Approval #: AFRL-2022-3863