Robust Performance of Superconducting Nanowire Single Photon Detectors under High Magnetic Fields

Claire E. Marvinney,[1] Yun-Yi Pai,[1] Brian E. Lerner,[1] Matthew A. Feldman,[1,2] Jie Zhang,[1] Aaron J. Miller,[3] Benjamin J. Lawrie[1]

[1]*Quantum Heterostructures Group, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA*
[2]*Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235, USA*
[3]*Quantum Opus LLC, Novi, MI 48375, USA*

Importance of SNSPDs

- Detect photons with number resolving capabilities [1]
- Single photon imager for low signal applications [2]
- Large-area SNSPDs for future satellite-ground quantum communication
- Sensing applications in magnetometry and thermometry

Position Sensitive SNSPDs[3]

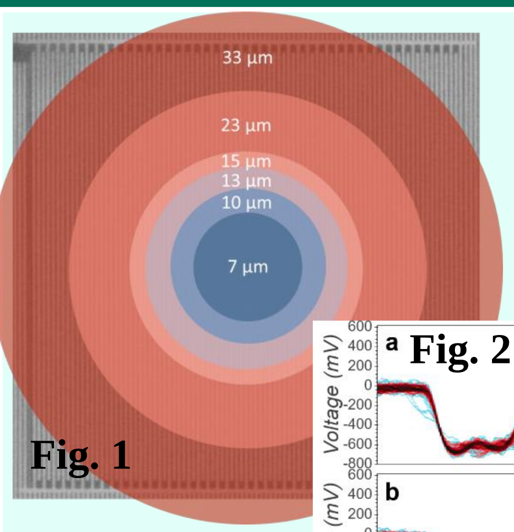


Fig 1: Position-dependent measurements conducted by varying the fiber coupling and thus beam spot size

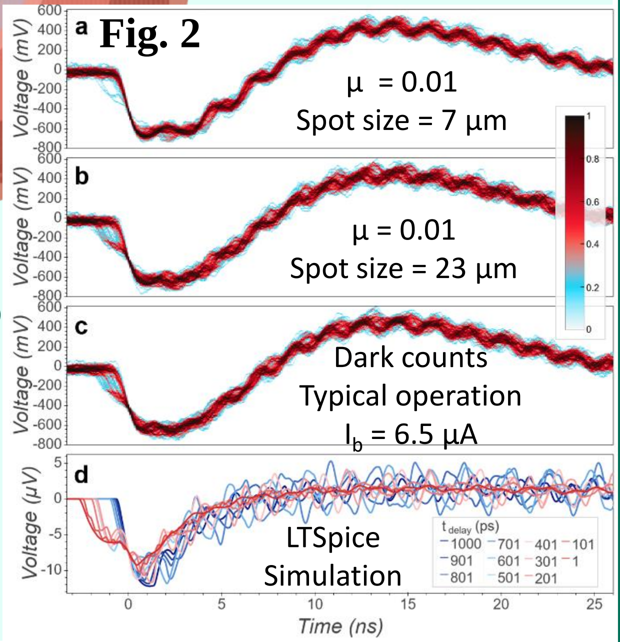
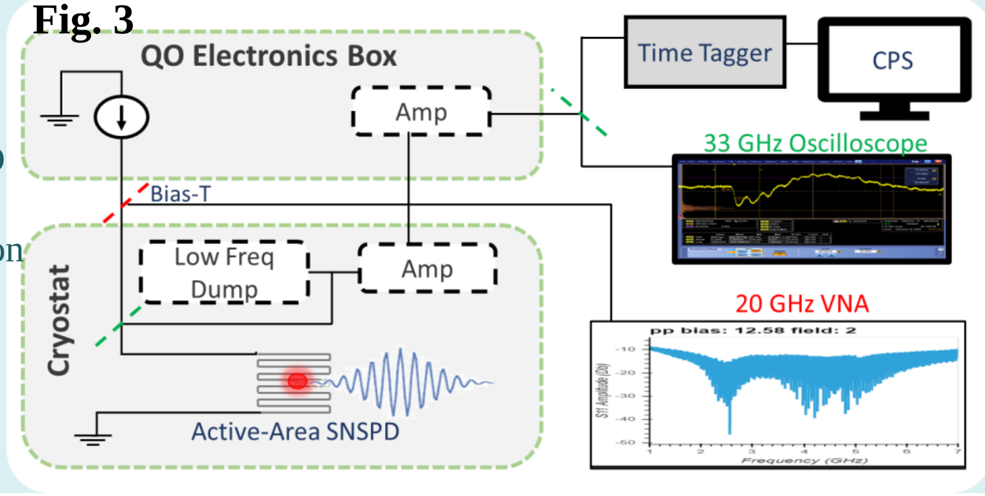


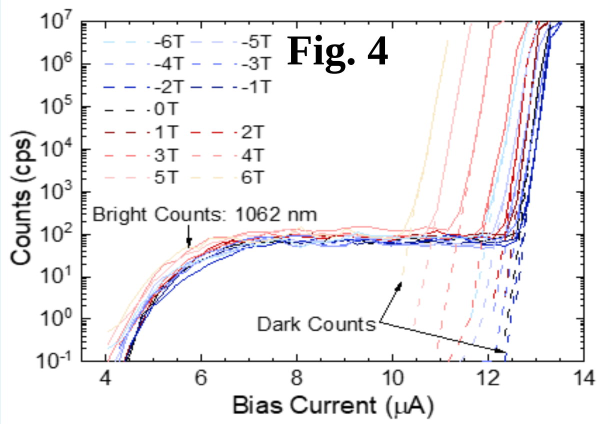
Fig. 2: Detection at front end of SNSPD meander line leads to slower rise-times
Dark counts originate from locations spanning entire device

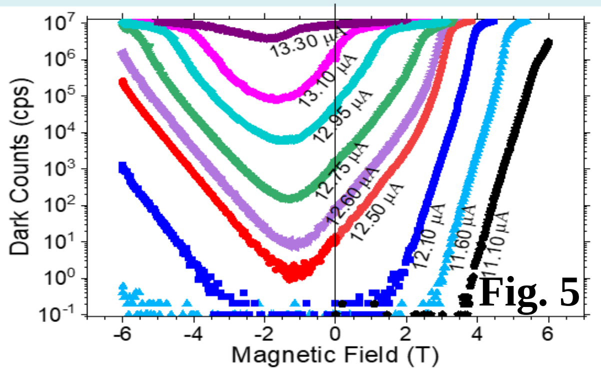
Experiment Design

Fig. 3: Schematic design for various SNSPD experiments, including photon counting, reflection measurements, waveform analysis



Temperature and Magnetic Field Sensing





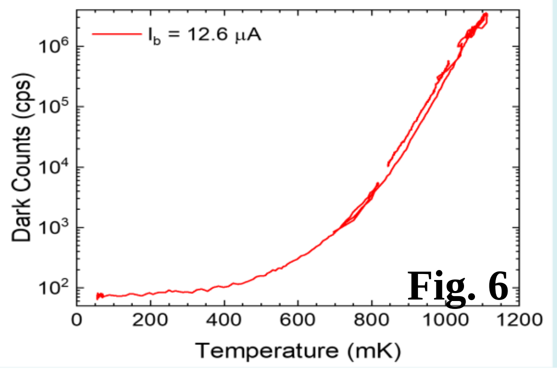


Fig 4: Robust under high parallel magnetic fields with no change to the quantum efficiency on the operation plateau

Fig. 5: Magnetic field dependence of SNSPD dark counts at set bias currents

Fig. 6: Temperature dependence of SNSPD dark counts at set bias current

Future mK Microscopy

Towards SNSPDs integrated with quantum devices as photon, temperature, and magnetic field sensors

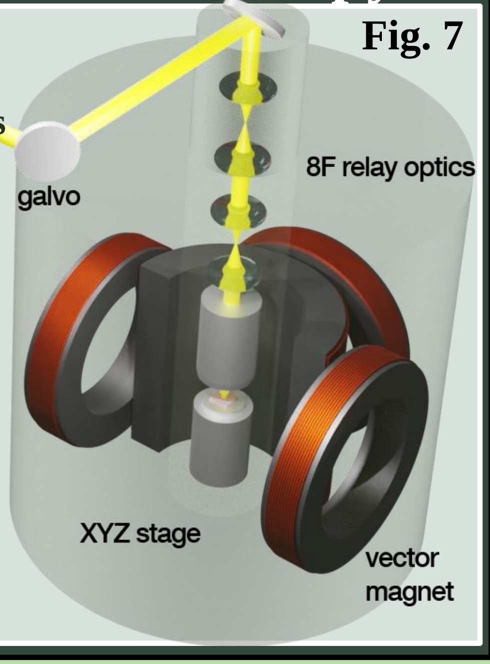


Fig. 7: Near-diffraction limited position-dependent scanning-laser experiments of large-area SNSPDs at mK

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