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Superconducting Single Photon Detectors: from quantum networks to dark matter

Friday 10 January 2025 12:30 (35 minutes)

Superconducting nanowire single photon detectors (SNSPDs) are low-threshold quantum sensors designed to detect UV, optical and infrared photons. SNSPDs have enabled high-fidelity quantum teleportation, deep space optical communications, exoplanet transit spectroscopy, searches for bosonic and fermionic DM, and have recently been proposed to search for quantum gravity in tabletop experiments. During the first part of this colloquium, I will focus on applications in quantum networking with a emphasis on protocols including quantum teleportation and entanglement swapping using fiber-based infrastructure in the context of the Fermilab Quantum Network Experiment (FQNET) and the Advanced Quantum Network (AQNET) currently deployed at Fermilab and in the Chicagoland area. During the second part, I will cover an emergent research and development program to further decrease the energy threshold of SNSPDs to unprecedented levels and present ideas on how this unique sensor capability will enable new fundamental physics experiments looking for the axions and dark photons.

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