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# High Energy Particle Detection with Large Area Superconducting Microwire Array

*Thursday 9 October 2025 16:30 (15 minutes)*

Superconducting Nanowire Single Photon Detectors (SNSPDs) are a leading detector technology for single-photon detection with diverse applications, due to their ultra-low energy threshold of below 0.04˜eV, low dark counts of 10ˆ-5˜Hz, and pico-second level time resolution. Recent advancement in the fabrication of large area superconducting microwire single photon detectors (SMSPDs) make them an ideal photo sensor to detect single photons in dark matter detection experiments and a potential innovative detector technology for future accelerator-based experiments.

In this talk, we present the first detailed study of an 8-channel $2 \times 2$˜mm$^2$ WSi SMSPD array exposed to 120˜GeV proton beam and 8˜GeV electron and pion beam at the Fermilab Test Beam Facility. The SMSPD detection efficiency was measured for the first time for protons, electrons, and pions, enabled by the use of a silicon tracking telescope that provided precise spatial resolution of 30˜\um for 120˜GeV protons and 130˜\um for 8˜GeV electrons and pions. Time resolution of 1.15˜ns was measured for the first time for SMSPD with proton, electron, and pions, enabled by the use of an MCP-PMT which provided a ps-level reference time stamp.

We will also present our future plan to measure the SNSPD hit detection efficiency and beam-induced background more precisely by improving the SNSPD characterization system, to simulate the interactions between charged particles and SNSPD to refine the current physics models, and finally to optimize the SNSPD sensors for high energy particle detection.

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