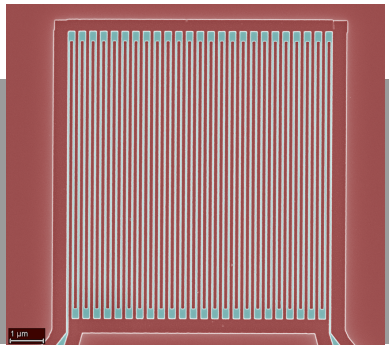
Superconducting Nanowire Detectors for a Compton Polarimeter

Meeting for Lepton Polarimetry Expression of Interest



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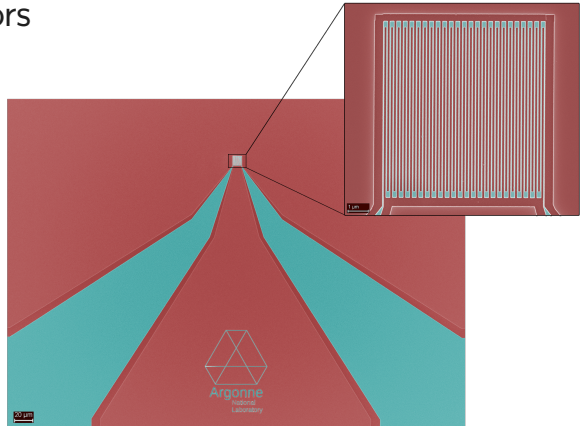
Superconducting Nanowire Detectors

Features

- Ultrafast timing ($\lesssim 20$ ps scale)
- Small and tunable pixel size, allowing for μm position precision if needed.
- Efficient high-rate operation in high magnetic fields.
- Wide choice of substrate material and thicknesses
- Radiation hard detector

New proposal for Detector R&D for an EIC
EIC detector R&D Committee Report, page 28

Recommendations:
Superconducting nanowires have never been deployed in a particle or nuclear physics experiment to our knowledge. As such, this proposal represents a true spirit of detector R&D. This project will have to solve many issues before it would have a working detector as indicated above. There are interesting synergistic activities with other projects under this program such as the polarimetry measurement. The idea to test a device in the Fermilab test beam and study the response to protons, electrons and pions is a very worthwhile exercise and would provide new information. We strongly recommend that at the least this aspect of the project is supported, funding permitting.



- Radiation hard detector
- Operates in vacuum
- Very fast pulses (geometry and readout dependent)
- Pixel dimensions can be adjusted to specific needs.

Nanowire Detectors for Compton Polarimeter

A new detector technology for the EIC

- A collaboration between Argonne's Physics and Materials Science Divisions
- Nanowire devices fabricated at Argonne

Electron detection

- Tracking detector with high detection efficiency
- Vertical position resolution tunable down to μm
- Pixel dimensions can be adjusted to specific needs
  $\rightarrow$ thin strip meandering shape
- Complementary to forward Nanowire Roman Pot detector proposal

Photon detection

- Very fast pulses depend on film thickness, wire geometry, L/R time constant
  $\rightarrow$ active bias recovery allows for even higher rates