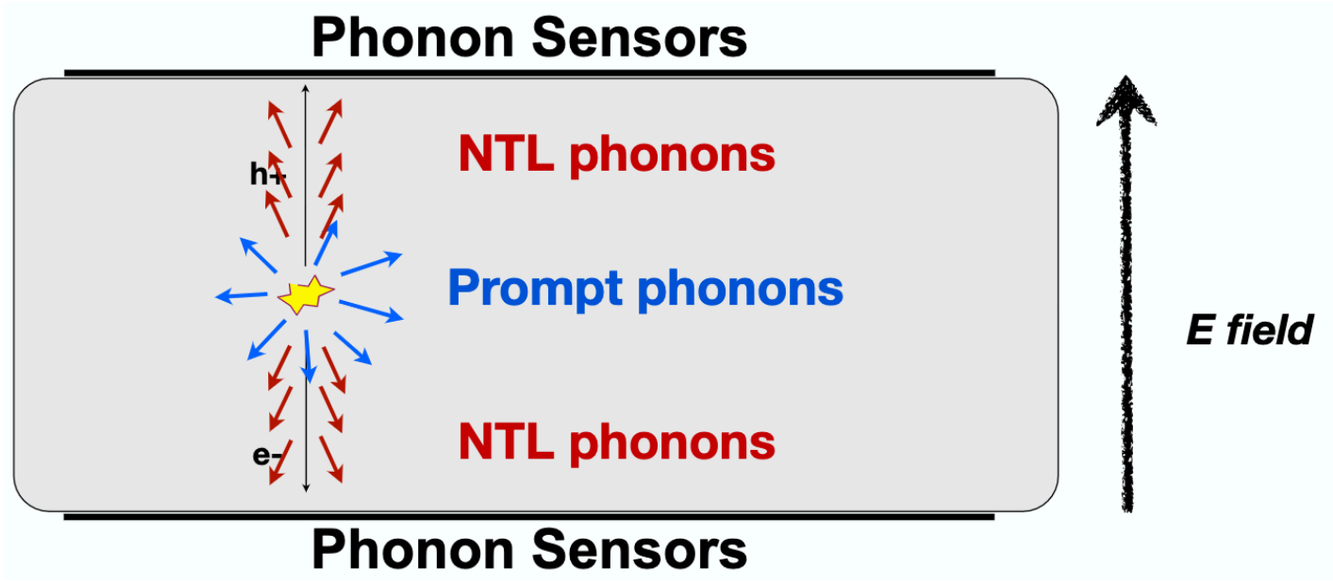
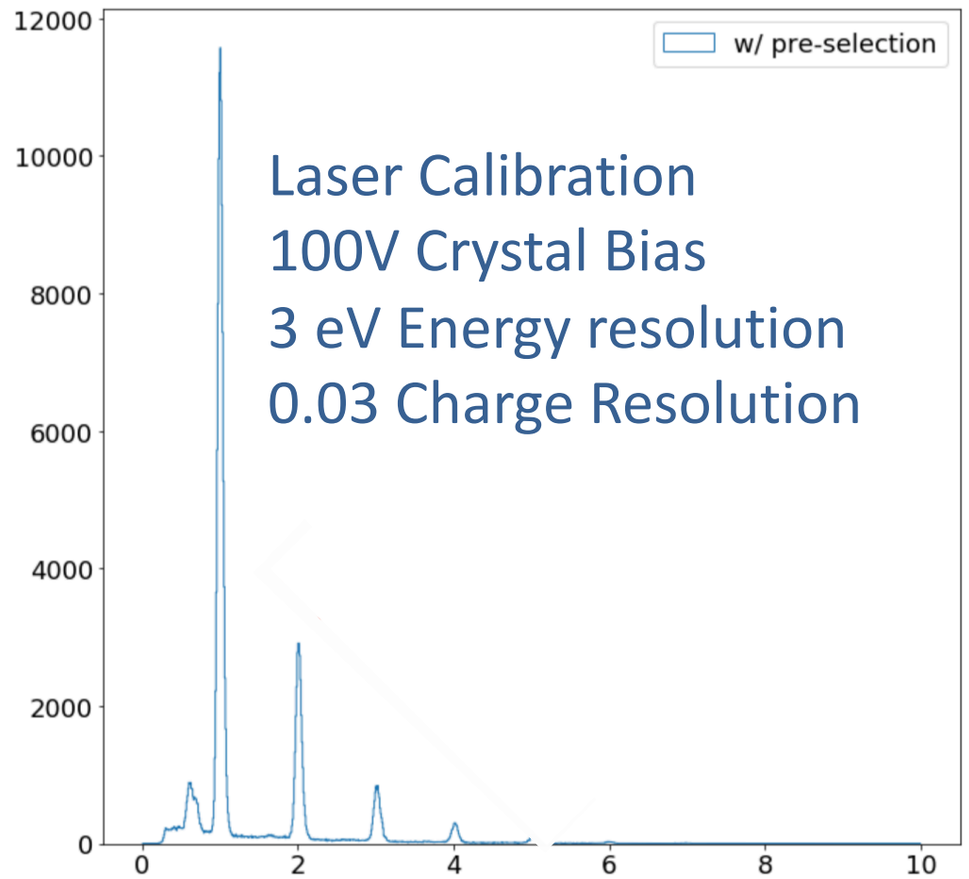
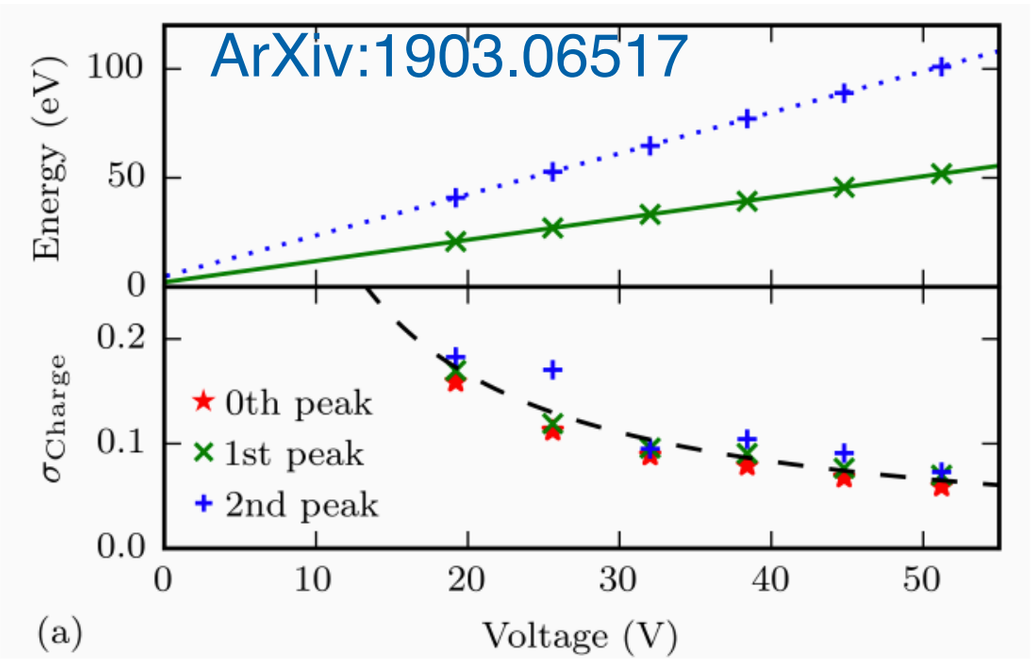
Charge Readout with Low Phonon Resolution





- Two prototype detectors achieved 3 eV phonon resolution
  - 1mm (0.25g) thick contact free design (top)
  - 4mm (1g) thick contact electrode design (bottom)
- Contact electrode design capable of up to 220V bias before breakdown
- 0.03 electron-hole pair resolution achieved in contact design
  - 0.01 charge resolution achieved at higher bias
- Very low dark counts (< 1 Hz/g, ~10 mHz/mm^2)
- DM search with 4mm thick (1g) detector in progress, results expected by September 2019



Fermilab

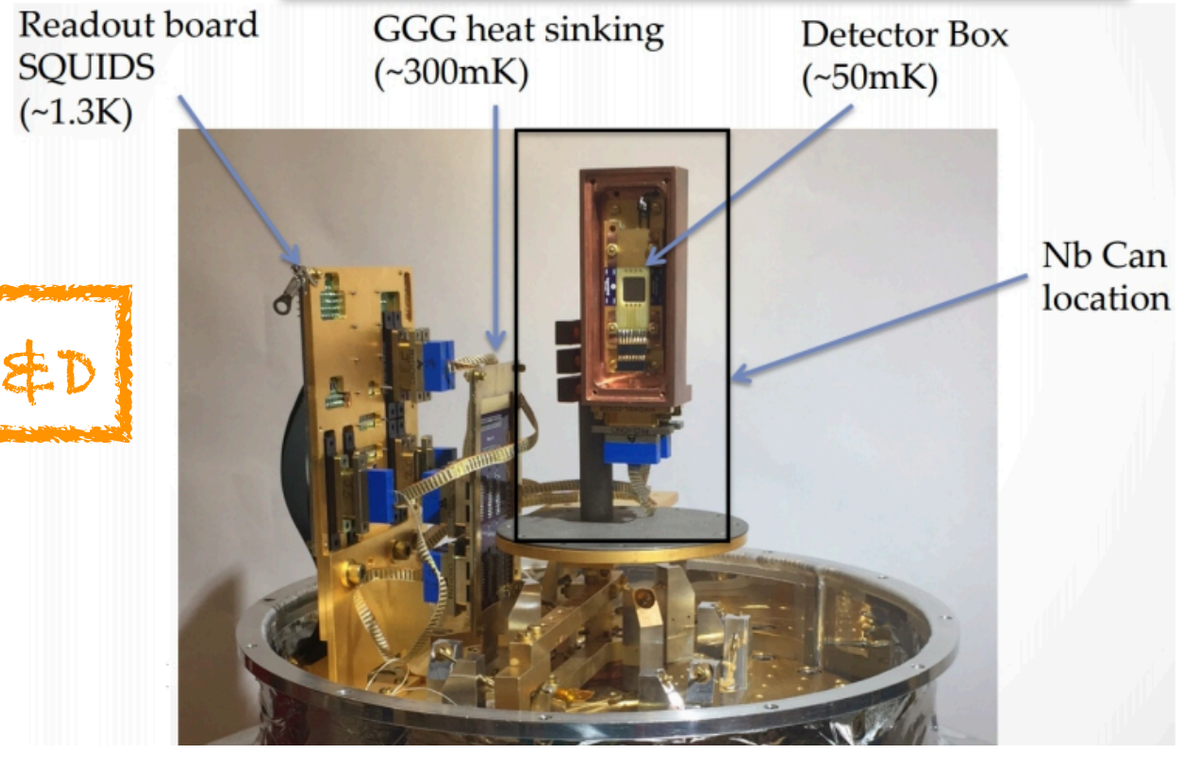
NEXUS Si/Ge R&D Plan

Also see Poster by R. Ren,
"NEXUS @ FNAL"
(1-85) for more details

- Now (Animal ADR Demonstrator): 1 gram
  - 1 gram, 4 eV resolution (20 eV threshold)
  - 0.05 electron-hole pair resolution (<1 e-h threshold)
  - 4 eV to 4 keV in energy
  - DM search with 1 gram-week

- Late Summer 2019: 10 grams,
  - 2-4 ~4g detectors
  - 4 eV resolution (20 eV threshold),
  - 0.05 electron-hole pair resolution (<1 e-h threshold)
  - 4 eV to 40 keV in energy
  - DM search with 1 gram-month

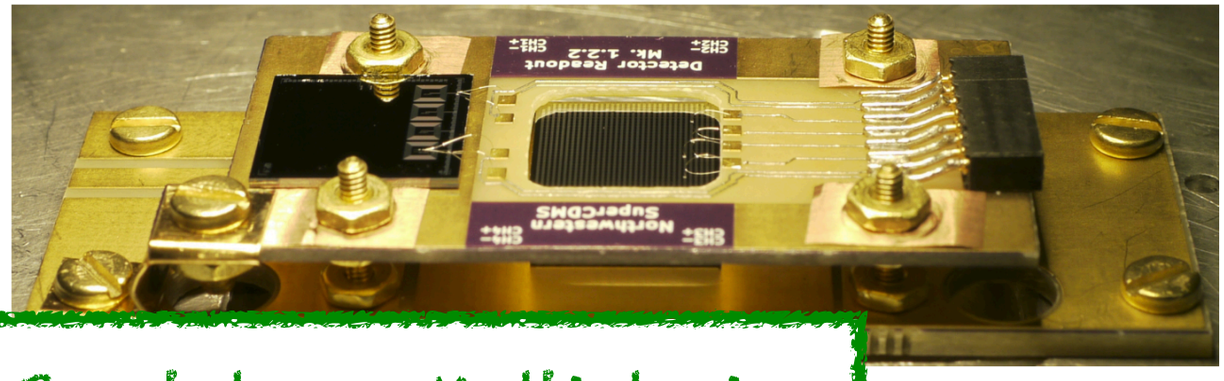
Leakage R&D

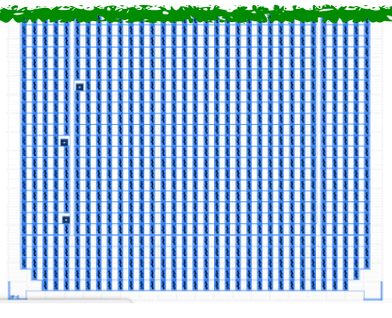


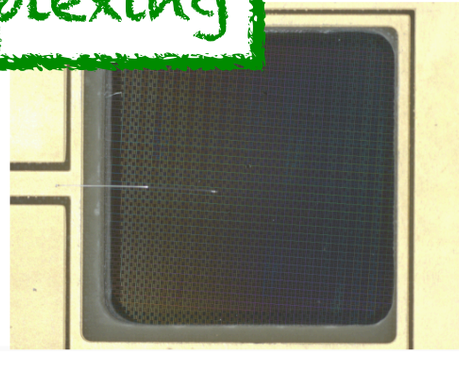
- Fall 2019-Winter 2020: 30-100 grams,
  - 4 eV resolution (20 eV threshold)
  - 0.01 electron-hole pair resolution
  - 4 eV to 40 keV in energy
  - DM search with 1-10 gram-year (~kg day)

- Late 2020 - Early 2021: 10 kg payload
  - <20 eV threshold
  - Up to 60 keV in energy
  - 0.01 electron-hole pair resolution
  - DM search/***neutrino physics*** with 1 kg-year of exposure

Larger Crystals or Multiplexing







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