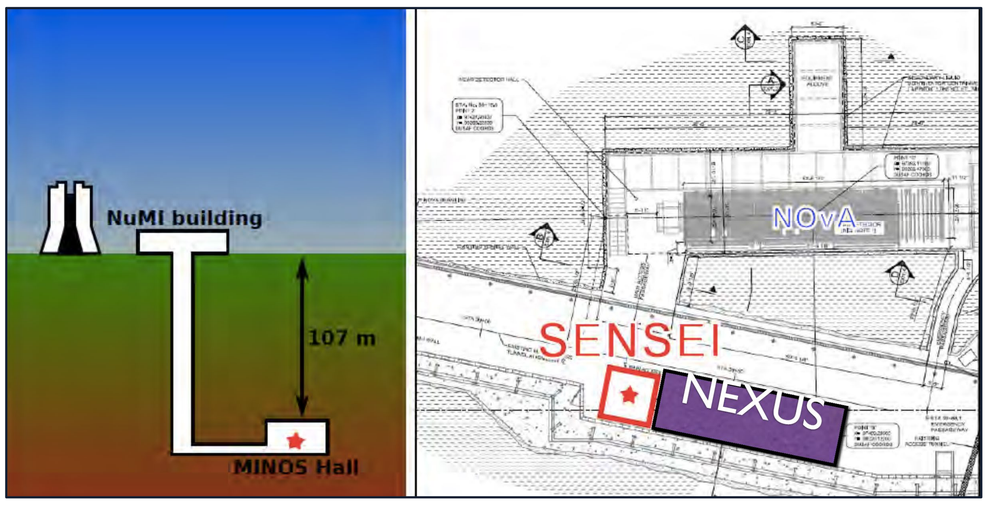
Northwestern Experimental Underground Site (NEXUS)

D. Bauer[a], E. Figueroa-Feliciano[b], J. Gomez[a], M. Hollister[a], Z. Hong[b], L. Hsu[a], N. Kurinsky[a], P. Lukens[a], N. Mast[c], R. Ren[b], G. Spahn[c]

[a]Fermi National Accelerator Laboratory
[b]Department of Physics and Astronomy, Northwestern University, Evanston, IL 60208
[c]School of Physics and Astronomy, University of Minnesota, Minneapolis, MN, 55455

NEXUS: Calibration and Prototyping Facility

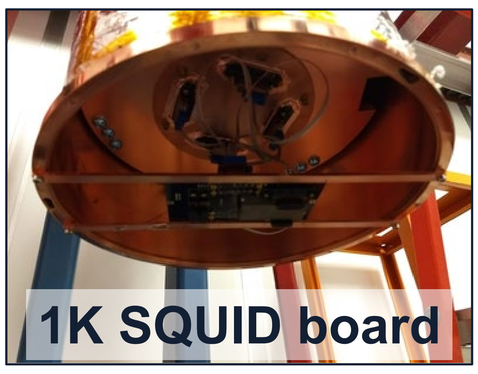
- 106 m depth at Fermilab, 300 mwe overburden
- 100 event/keV/kg/day background level
- Fridge and Pb shield in class 10,000 cleanroom
- Reconfigurable for different detector payloads

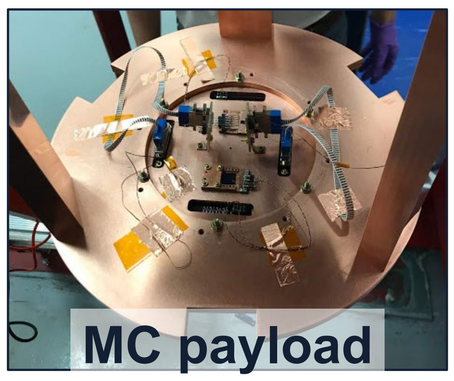


Hardware

Dilution fridge

- CryoConcept HEXADRY UQT-B 200
- 3 uW at 15 mK
- Testing first cold electronics and payload summer 2019





D-D generator

- D + D → n (2.5 MeV) + 3He
- Adelphi DD108
- 1×10^8 neutrons/second production rate
- Shielded to produce a collimated beam

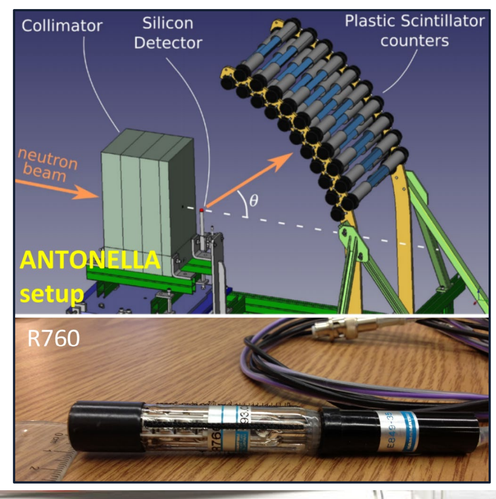
Backing detector array

Large recoil energies:

- Optimize for efficiency
- Scintillator bars with PMTs

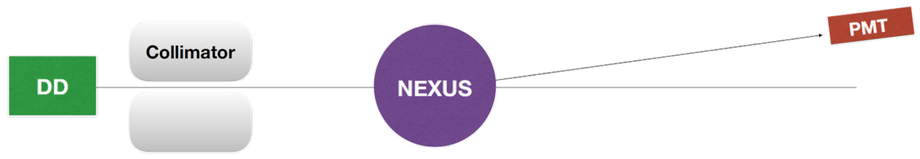
Low recoil energies:

- Optimize for spatial resolution
- Scintillating fibers with SiPMs



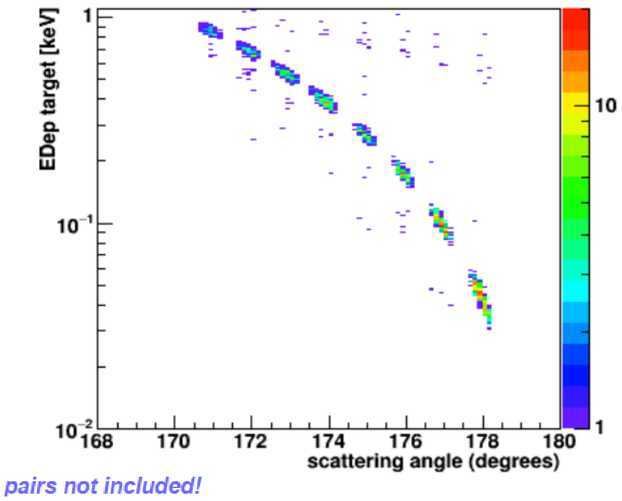
IMPACT @ NEXUS

IMPACT (Ionization Measurement with Phonons At Cryogenic Temperatures) is an ionization yield measurement plan for SuperCDMS Si and Ge detectors at low recoil energy.



Geant4 simulations for 1cm³ Ge target

- 8 scintillator bars
- Estimates of scattering rate and resolution effects due to geometry
- Expect similar statistics for few week operation



Note: statistical fluctuations in e/h pairs not included!