Overview of the SuperCDMS Experiment

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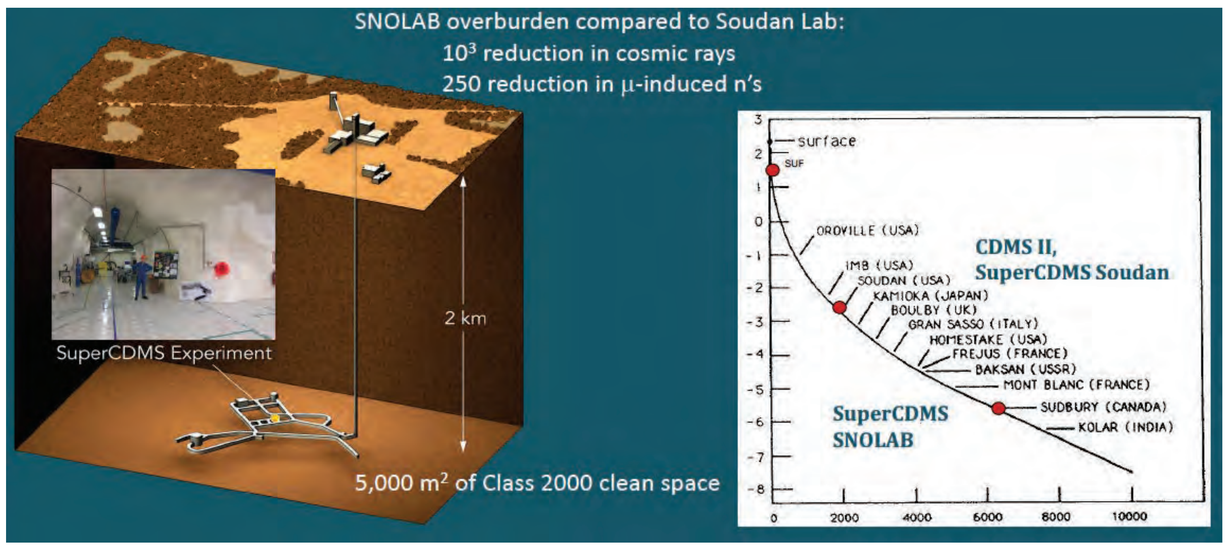
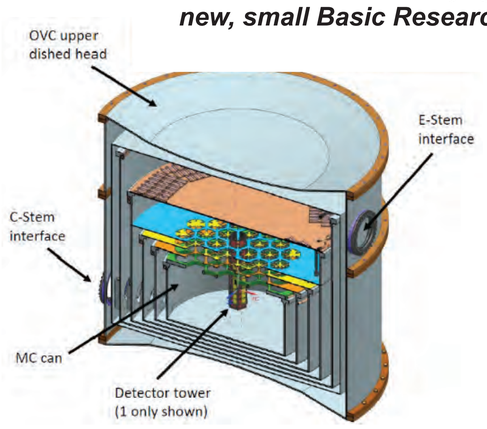
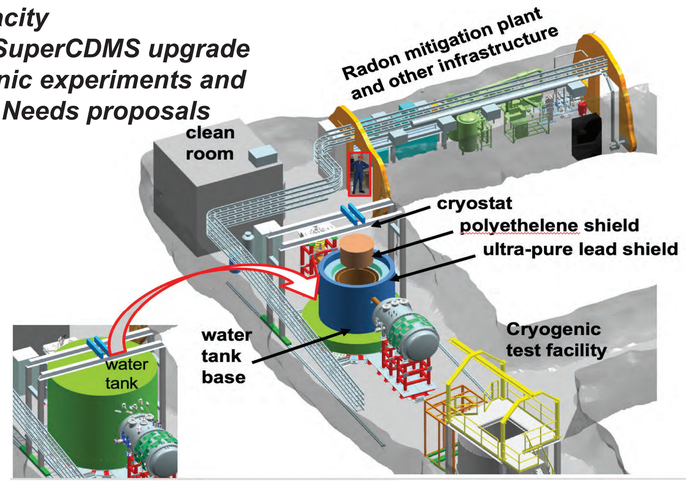
SuperCDMS SNOLAB

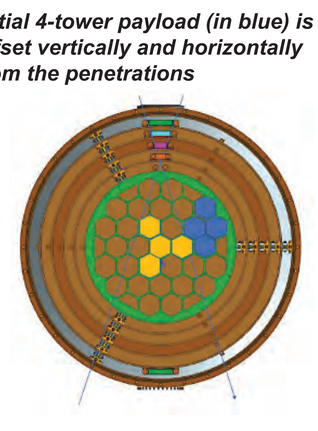


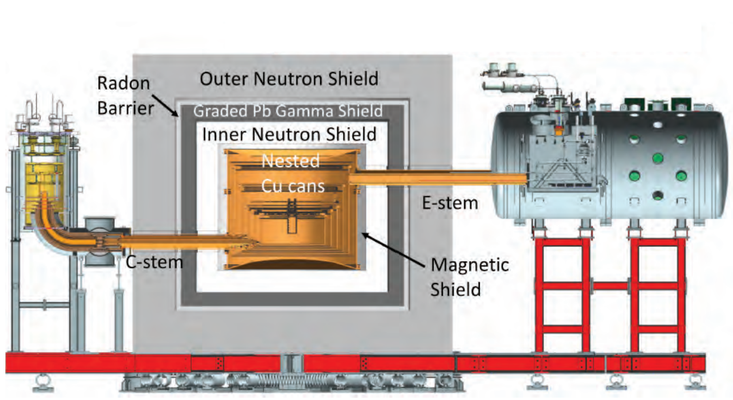
31 Tower capacity
Reach the neutrino floor with SuperCDMS upgrade
Collaborate with other cryogenic experiments and new, small Basic Research Needs proposals



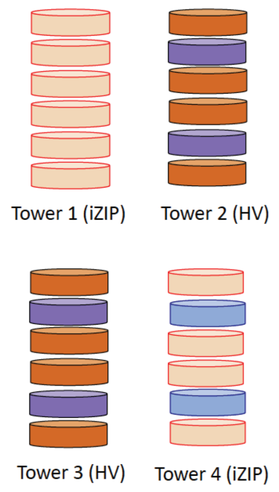


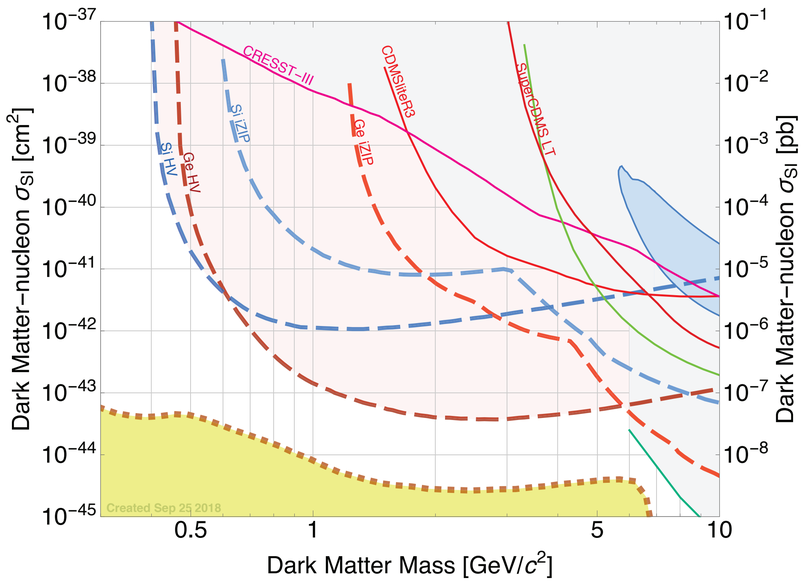
Initial 4-tower payload (in blue) is offset vertically and horizontally from the penetrations



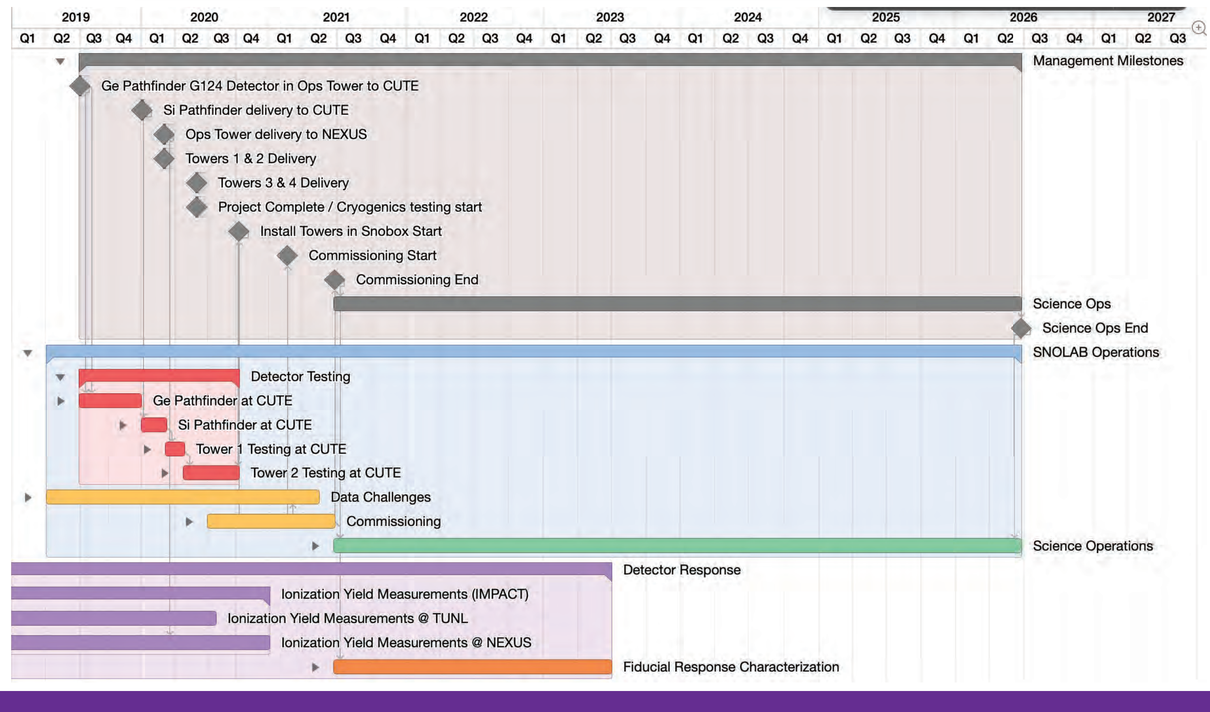


Complementary Targets and Multiple Functionality





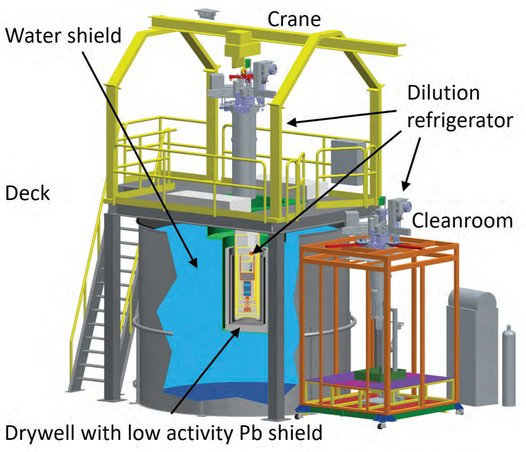
	Germanium	Silicon
HV	Low Threshold for low-mass DM σ_{ph}~5eV Larger Exposure, no ^{32}Si bkg.	Low Threshold for low-mass DM σ_{ph}~10eV Sensitive to lowest DM masses
iZIP	Nuclear Recoil Discrimination Understand Ge Backgrounds Sensitive to ^{8}B solar neutrinos	Nuclear Recoil Discrimination Understand Si Backgrounds

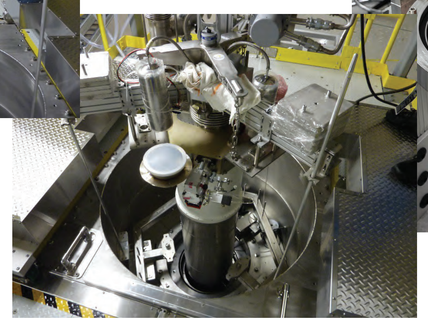


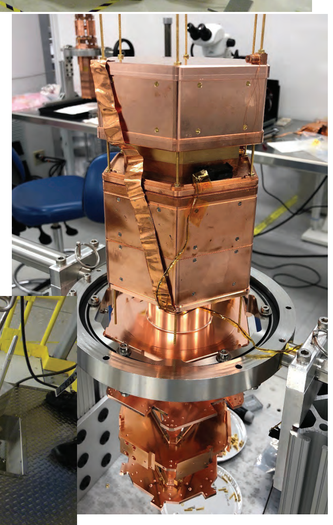
SuperCDMS SNOLAB: Happening Now

Detector Testing

The CUTE (Cryogenic Underground Testing Facility) at SNOLAB has been comissioned and will provide early testing and debugging of SuperCDMS towers and detectors, with potential for early science. The first SuperCDMS Ge HV detector has been delivered to CUTE and is undergoing initial testing. Fabrication of SuperCDMS detectors is ongoing, and the first full production tower will be delivered to CUTE in early 2020. The SuperCDMS cryostat will begin its comissioning in 2020 as well, with first science in 2021.

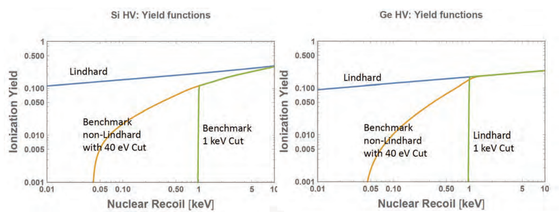


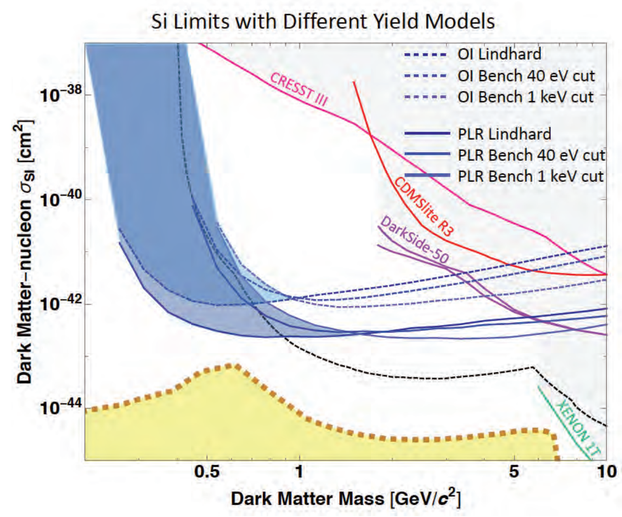


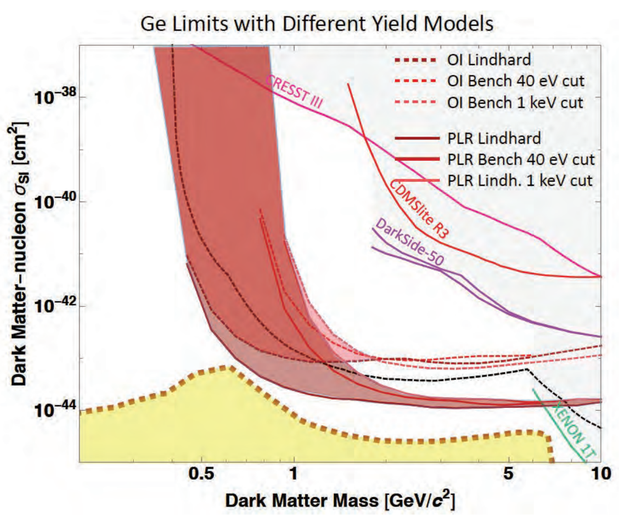


Detector Response

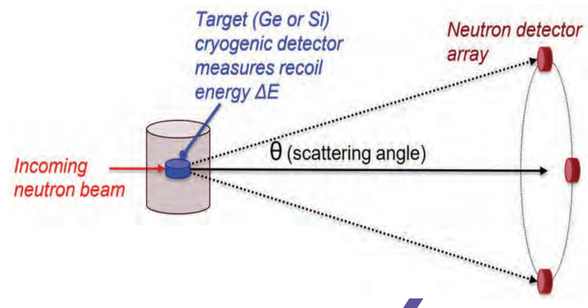
The SuperCDMS HV detectors will be sensitive to dark matter - nucleon recoils to very low (~100 eVnr) thresholds. The HV detectors measure ionization using Luke-Neganov phonons under a high crystal bias voltage. Thus the calibration from measured ionization signal to nuclear recoil energy is crucial to establish a dark matter signal or limit. Data for ionization yields of silicon and germanium at these low nuclear recoils is scarce. The IMPACT (Ionization Measurement with Phonons At Cryogenic Temperatures) program will measure the yield at these energies with SuperCDMS detectors.







We will also plan a detector response and characterization campaign with a variety of gamma, beta, and neutron sources to map and understand detector behavior and as input to our Detector Monte Carlo. These will take place at the NEXUS facility (see poster 187) and CUTE (see left).



Poster 86: IMPACT

Poster 187: Northwestern NEXUS Experimental Underground Site @Fermilab