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Calibration and Operation Plans for SBC's first 10 kg Argon Bubble Chamber

The bubble chamber is a vetted technology for low background low energy nuclear recoil detection, which has for the past decade been employed primarily in the search for spin-dependent dark matter, for WIMP masses above ~10 GeV. New technology is being developed by the Scintillating Bubble Chamber (SBC) collaboration to bring liquid noble bubble chambers to the search for low-mass dark matter (~1 GeV) and Beyond-the-Standard-Model neutrino physics with CEνNS at reactors. A small chamber filled with xenon has already demonstrated electron-recoil blindness and scintillation-channel veto power with a noble liquid, aspects of the technology crucial to background reduction. We are now building a 10 kg chamber with argon target fluid, which will be used to perform calibrations at Fermilab to confirm the efficacy of this technology at a larger scale. I will describe the suite of proposed measurements which will be used to calibrate nuclear recoils down to 100 eV, including scattering of low-energy neutrons from photoneutron sources, Thomson scattering of gammas, and gamma emission recoils following thermal neutron capture. We will also test the superheated argon's electron recoil response with gamma sources over a range of gamma energies and detector conditions, and demonstrate the power of argon's scintillation properties to veto alpha decays, cosmic backgrounds, and high energy neutron backgrounds.

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