Abstract Submitted
for the APR21 Meeting of
The American Physical Society

A 350 keV Monoenergetic Neutron Source using a DD-Neutron Source and a Deuterated Scintillator Neutron Reflector CASEY RHYNE, WILL TAYLOR, Brown University, DONGQING HUANG, University of Michigan, AUSTIN VAITKUS, JEANNE BANG, SAMUEL CHAN, XIN XIANG, EAMON HARTIGAN-O'CONNOR, ANNA ZUCKERMAN, RICHARD GAITSKELL, Brown University — Nuclear recoil (NR) calibrations are vital for understanding detector responses to dark matter candidates and neutrino-nucleus signals in direct detection experiments. Low-mass (<5 GeV) dark matter candidates and ^{8}B neutrinos drive the need for high-statistics/low-systematic calibrations at even lower NR energies. We report the results of measurements made at Brown University demonstrating the effectiveness of an Adelphi Technologies Inc. DD neutron generator and deuterated scintillator in a carefully shielded geometry to shift the neutron beam energy from 2.45 MeV (94 keV FWHM) to 350 keV (85 keV FWHM). This low energy, monoenergetic source is fully portable and usable in situ to measure NR events in a range of detector technologies. The lower neutron speed allows the tagging of distinct S1 signals for multiple scatters within tonne-scale liquid noble time projection chambers (TPCs) and permits direct in situ measurement of light yield (L_y) independent of charge yield (Q_y). The scintillator reflector allows per-neutron energy determination via time-of-flight (ToF) and pulse size measurements, providing a powerful calibration source with few systematic uncertainties. A ToF-based hydrogen reflector source with a tunable neutron energy from 10-100 keV is also discussed.

Casey Rhyne
Brown University

Date submitted: 08 Jan 2021 Electronic form version 1.4