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High-energy neutron counting deep underground
RAUL HENNINGS-YEOMANS, DANIEL AKERIB, MICHAEL DRAGOWSKY, MATTHEW HARRISON, Case Western Reserve University, HARRY NELSON, University of California at Santa Barbara — Dark matter is concentrated in the halos of galaxies, including the Milky Way. If WIMPs make up these halos they can be detected via scattering from atomic nuclei in a terrestrial detector. Experiments that search for WIMPs are one of the critical science drivers for a Deep Underground Science and Engineering Laboratory in the United States. Nuclear recoils from fast neutrons in underground laboratories are one of the most challenging backgrounds to WIMP detection and are estimated using Monte Carlo simulations. We present the design of an instrument capable of benchmarking the Monte Carlos by measuring the high energy >60 MeV muon-induced neutron flux deep underground. The instrument is based on applying Gd-loaded liquids to measure the rate of multiple low-energy neutron events produced in a Pb target and from this measurement to infer the rate of high energy neutron events. We will present design studies of the instrument as well as the current status and prospects for the construction and deployment of the instrument at the deep site.

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