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Measurements of neutron spectra underground relevant for remote detection of antineutrinos CALEB ROECKER, Univ of California - Berkeley, PETER MARLEAU, MARK GERLING, Sandia National Labs, JIM BRENNAN, Sandia National Lab, WATCHMAN COLLABORATION — High energy neutrons ($\geq$100 MeV) created through muon spallation have the potential to bypass the shielding of large rare event detectors. As such they present an unknown background for the long range antineutrino detector WATCHMAN. We have built and are operating a capture-gate Gd-doped scintillation detector for measuring the background neutron spectrum at the Kimbalton Underground Research Facility (KURF). The detector measures the joint response of high energy neutron scatter events and neutron capture events allowing for a large dynamic range of neutron energies from 30 to hundreds of MeV. To amplify the number of neutrons for capture we use a lead multiplier in the center of the detector. At KURF we plan on taking measurements at $\sim$300, 600, and 1450 m.w.e. Using the measured and Geant4[1,2] simulated response we plan on unfolding the neutron energy spectrum and rate as a function of overburden. This information will allow for the calculation of an important background for WATCHMAN and provide a lower bound on the depth requirement for future remote reactor monitoring deployments.

[1]S. Agostinelli, et al. Nucl. Inst. And Meth. A., **53**, 250 (2003)
[2]J. Allison, et al. IEEE Trans. Nucl. Sci., **53**, 270 (2006)

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