GAMMA-RAY PRODUCTION CROSS SECTIONS FOR NEUTRON-INDUCED REACTIONS IN TELLURIUM

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Neutrinoless double beta decay (0ν/DBD) is a lepton-number violating process that can occur only for a massive Majorana neutrino. The search for 0ν/DBD is currently the only practical experimental way to determine whether neutrinos are identical to their own antiparticles (Majorana neutrinos) or have distinct particle and anti-particle states (Dirac neutrinos). In addition, the observation of 0ν DBD can provide information about the absolute mass scale of the neutrino. The Cryogenic Underground Observatory for Rare Events (CUORE) will search for 0ν /DBD of ^{130}Te with a ton-scale array of 988 natural isotopic composition TeO_2 bolometers. The expected sensitivity of a 5-year run with CUORE is to a 90% confidence level lower limit on the 0ν DBD half life of ^{130}Te of approximately 10^{26} years. Because of the extreme low background requirements for CUORE, it is important that all potential sources of background in the 0ν /DBD peak region at 2528 keV are well understood. One such potential background source is neutron-induced gamma-ray production in the detector itself. Neutrons can be produced underground both by (alpha,n) reactions and by fast cosmic-ray muon interactions. We report the gamma-ray production cross sections for interactions of neutrons on the abundant stable isotopes of tellurium measured with the GEANIE detector array at the Los Alamos Neutron Science Center. Based on the results of our measurements, we expect the neutron induced background to be negligible for CUORE.