The Gamma Ray Production Cross Section of $^{134}Xe(n, n'\gamma)^{134}Xe$ Reaction

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A new nuclear level that decays to the ground state was recently discover in ^{134}Xe emitting a 2485.7 keV gamma ray using neutrons inelastically scattered off a $^{134}XeF_2$ target. This discovery is particularly important in neutrinoless double-beta decay ($0\nu\beta\beta$) experiments as the energy of this emitted gamma ray is highly proximal to the region of interest of $0\nu\beta\beta$ decay (2457.8 keV), and it is crucial to minimize the limit of background in the search for $0\nu\beta\beta$ decay.

Two experiments, KamLAND-Zen and EXO-200, are studying $0\nu\beta\beta$ decay of ^{136}Xe using a highly enriched source material of ^{136}Xe. However, significant fractions of ^{134}Xe still remain (8.89% ^{134}Xe and 19.1% ^{134}Xe for KamLAND-Zen and EXO-200, respectively). The experimenters' need to account for the fractions of ^{134}Xe underscores the importance of our knowledge of backgrounds in ^{134}Xe even further.

To contribute to the understanding of potential neutron-induced backgrounds on ^{134}Xe, I used data collected at Triangle Universities Nuclear Laboratory (TUNL) to calculate the cross section of $^{134}Xe(n, n'\gamma)^{134}Xe$ reaction at incident neutron energies of 4MeV, 8MeV, and 10 MeV.