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Simulation for the Production of Technetium-99m Using Monte Carlo N-Particle Transport Code[1] COURTNEY KAITA, U of Michigan, CHARLES GENTILE, PPPL, JENNIFER ZELENTY, U of Chicago — The Monte Carlo N-Particle Transport Code (MCNP) is employed to simulate the radioisotope production process that leads to the creation of Technetium-99m (Tc-99m). Tc-99m is a common metastable nuclear isomer used in nuclear medicine tests and is produced from the gamma decay of Molybdenum-99 (Mo-99). Mo-99 is commonly produced from the fission of Uranium-235, a complicated process which is only performed at a limited number of facilities. Due to the age of these facilities, coupled with the critical importance of a steady flow of Mo-99, new methods of generating Mo-99 are being investigated. Current experiments demonstrate promising alternatives, one of which consists of the neutron activation of Molybdenum-98 (Mo-98), a naturally occurring element found in nature. Mo-98 has a small cross section (.13 barns), so investigations are also aimed at overcoming this natural obstacle for producing Tc-99m. The neutron activated Mo-98 becomes Mo-99 and subsequently decays into radioactive Tc-99m. The MCNP code is being used to examine the interactions between the particles in each of these situations, thus determining a theoretical threshold to maximize the reaction's efficiency. The simulation results will be applied to ongoing experiments at the PPPL, where the empirical data will be compared to predictions from the MCNP code.

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