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Model Natural Helium Alternative Fast Neutron Detector Using PHITS Monte Carlo Simulations

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This paper presents a Monte Carlo simulation study aimed at designing a Alternative fast neutron detector based on Helium-4 gas as the detection material. This research focuses on changing the optimal design parameters for a Helium-4 detector when irradiated by a Californium (Cf-252) neutron source. A Monte Carlo simulation model was developed using the Particle and Heavy Ion Transport code System (PHITS) to track neutron interactions with Helium-4 gas within various detector configurations. Specifically, variations in the length, radius, and pressure of the Helium-4 gas inside the detector were implemented to evaluate their impact on detection efficiency.

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