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A Study of Alpha Particle Backgrounds in the Neck of the DEAP-3600 Detector

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The DEAP-3600 experiment searches for spin-independent interactions of weakly interacting massive particle (WIMP) dark matter candidates. The detector utilizes a 3600 kg mass of liquid argon as the dark matter target, which is contained in a spherical acrylic vessel. There is an opening at the top of the acrylic vessel where the cooling system is located, in the 'neck'of the detector. The decay of alpha particles from components in this region can potentially mimic a WIMP signal, and so it is critically important to understand and mitigate this source of alpha backgrounds. Monte Carlo simulation is used to estimate the rate of such neck background events, employing material radioactivities that were carefully measured and constrained in the construction of DEAP-3600. A likelihood ratio method has been developed to identify and remove alpha particle backgrounds originating in the neck region. This talk will present the results of the Monte Carlo simulation and a preliminary analysis of neck alphas from data taken during DEAP-3600 commissioning with gaseous argon.

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