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Hardware Upgrades and Background Mitigation in DEAP-3600

Thursday, 21 May 2026 16:45 (30 minutes)

The DEAP-3600 experiment is one of the world's most sensitive liquid-argon (LAr) dark-matter search, operating 2 km underground at SNOLAB with a 3.3-tonne LAr target. The experiment continues to collect WIMP-search data and will resume extended data acquisition following completion of its current detector-upgrade campaign. In this talk, I will present a detailed overview of the recently completed hardware upgrades, the characterization of alpha-induced backgrounds in DEAP-3600, and data taken after the upgrades.

A central focus will be the characterization of alpha-induced backgrounds from the acrylic vessel and associated surfaces. Particular emphasis will be placed on the neck background population, originating from alpha decays on the flow-guide and adjacent surfaces where the optical geometry produces highly asymmetric light collection patterns. I will discuss how these populations are modeled, identified, and constrained within the full background framework.

I will then describe detector-upgrade measures that will have been completed prior to the conference and are targeted at mitigating both neck and dust-related alpha backgrounds. These include coating the neck flow guide with a slow wavelength shifter (Pyrene) to shift prompt alpha induced scintillation into a PSD-favorable regime, and installing a dedicated dust extraction pipe and recirculation line to remove alpha emitting particulates dispersed throughout the LAr volume. Such degraded alpha contaminated dust cannot be rejected through fiducialization or position reconstruction alone, making active removal essential.

These upgrades and associated performance studies provide key insights for next-generation detectors such as ARGO.

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