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The DEAP-3600 Muon Veto System (student talk)

Friday, 16 February 2018 20:00 (15 minutes)

DEAP-3600 is a single-phase liquid argon (LAr) dark matter detector located ∼2 km (∼6000 mwe) underground at SNOLAB near Sudbury, Ontario. Recently, DEAP-3600 published results on 4.44 live-days of data in which a leading limit on the spin-independent interaction cross section for 100 GeV/c Weakly Interacting Massive Particles (WIMPs) on ^{40}Ar was found. In order to achieve maximum sensitivity to the rare nuclear recoils of argon nuclei from WIMP interactions, detector systematics and backgrounds must be well known. One significant background in a WIMP dark matter search is neutrons resulting from interactions of cosmic ray muons with the surrounding rock and detector infrastructure. To mitigate this background, the DEAP-3600 detector is positioned at the center of a water Cerenkov veto tank which is viewed by 48 outward facing Hamamatsu R1408 8" PMTs. Muons that pass through the tank will produce Cerenkov light which is used to veto LAr events in a subsequent time window. The veto tank also serves to moderate neutrons produced from muons that do not interact with the water. The veto PMTs require thorough characterization such that the muon tagging efficiency can be both estimated and optimized. This presentation will provide an overview of the veto hardware and preliminary characterization analysis along with a crude estimate of the underground muon rate.

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