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Study and Development of Pulse-shape Discrimination Firmware for Background Mitigation in the DEAP-3600 Experiment

Monday 13 June 2016 16:15 (15 minutes)

DEAP-3600 is particle detector looking for weakly interacting massive particles (WIMPs) as a source of dark matter. Incident particles colliding with the 3600 kg argon target in DEAP will produce excited dimers which decay releasing scintillation light. The proportion of singlet and triplet excited states of the dimers produced depends on the interacting particle type, with the result that events can be characterized by the timing distribution of the scintillation light. The intrinsic Ar-39 in natural argon produces approximately 1 Hz/kg of beta decays. To reduce the background rate from beta decay, the DEAP trigger removes a proportion of these events. It is crucial that potential WIMP events and rare background events are not miscategorized as beta decays by the trigger, and thus the trigger calibration is essential to achieve the dark matter sensitivity goal of the experiment. This talk will explain the trigger algorithm, its parameters, and present results from the trigger calibration.

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