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Background in the DEAP-3600 Experiment

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The DEAP-3600 experiment is searching for Dark Matter with a 3600 kg single phase liquid argon (LAr) target and a projected exclusion sensitivity to the spin-independent 100 GeV WIMP-nucleon cross-section of 10^{-46} cm² after a background-free exposure of 3000 kg.yr.

The experimental signature are keV-scale WIMP recoils producing 128 nm LAr scintillation photons which are wavelength shifted and observed by 255 PMTs. To reach the large background-free exposure, a combination of careful material selection, passive shielding, active vetoes, fiducialization and pulse shape discrimination (PSD) is used. The main concept of the background rejection in DEAP is the powerful PSD, employing the large difference between fast and slow component of LAr scintillation light to achieve an electronic and nuclear recoils separation in the order of 10^{10} ; this can successfully reject ³⁹Ar beta-decays with an activity of about 1 Bq/kg in argon with natural isotopic composition.

The design background goal for DEAP-3600 are 0.2 events from external neutrons, 0.2 events from surface alphas and 0.2 events from ³⁹Ar in the WIMP region in a 1 tonne fiducial volume within 3 yr. The experiment was filled in November 2016 and is currently taking data. This talk will present a reevaluation of the background projection with the current run conditions and report on the current understanding of the background in DEAP based on first data.

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Session Classification: R1-5 Low Background Detectors (DIMP/PPD/DNP) | Détecteurs à faibles interférences (DPIM/PPD/DPN)

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