Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **2600** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

Modelling Cherenkov in DEAP-3600

Wednesday 5 June 2019 14:00 (15 minutes)

The DEAP-3600 experiment searches for spin-independent interactions of weakly interacting massive particle (WIMP) dark matter candidates. The detector utilizes a 3279 kg mass of liquid argon as the dark matter target, which is contained in a spherical acrylic vessel. Results from the analysis of data taken during the first year of operation were released in February 2019. The analysis of this 758 tonne-day exposure requires a thorough understanding and modelling of all backgrounds capable of mimicking a WIMP signal.
DEAP-3600 uses pulse shape discrimination to distinguish between nuclear recoils, which produce prompt scintillation signals, and electromagnetic recoils, which produce slow scintillation signals. Most backgrounds in DEAP-3600 produce slow scintillation signals whereas WIMPs would generate fast scintillation signals. Cherenkov light, similar to WIMPs, produces very fast pulses of light and it is therefore important to characterize and understand Cherenkov events in the detector.
Validation of Monte Carlo simulation has been performed by comparing simulation results to data taken using DEAP-3600. This talk will focus on the modelling of background events produced by Cherenkov in acrylic, including details of understanding optical interfaces and parameters in Monte Carlo simulation.

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Session Classification: W2-5 Dark matter searches (PPD) | Recherche de matière sombre (PPD)

Track Classification: Particle Physics / Physique des particules (PPD)