



ID de la contribución : 937

Tipo : **no especificado**

Study of the energy response and position reconstruction with Na-22 source in DEAP-3600

martes, 19 de noviembre de 2024 17:05 (15)

DEAP-3600 is a single-phase liquid argon (LAr) direct-detection dark matter experiment, operating 2 km underground at SNOLAB (Sudbury, Canada). The detector consists of 3.3 tons of LAr contained in a spherical acrylic vessel. At WIMP masses of 100 GeV, DEAP-3600 has a projected sensitivity of 10–46 cm² for the spin independent elastic scattering cross section of WIMPs. External radioactive sources can be used to measure the energy calibration and to test the position reconstruction in the energy region of interest for WIMP signals. One of the most effective sources is Na-22 which is deployed in a tube located around the DEAP steel shell. Na-22 decays to an excited state of Ne-22 via a β^+ -decay, which de-excites by emitting a 1275 keV γ . The positron from the source decay annihilates resulting in the emission of two back-to-back 511 keV γ . The emission of the three γ particles following the Na-22 decay is nearly simultaneous, providing a very effective tagging algorithm for Na-22 decays to distinguish them from backgrounds in DEAP-3600. In this talk I will present the energy response and position reconstruction in DEAP-3600 with the Na-22 source.

Abstract

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Clasificación de la sesión : RENATA (Red Nacional Temática de Astropartículas)

Clasificación de temáticas : Red Temática de Astropartículas (RENATA)