Contribution ID: **7** Type: **not specified**

Simulation of low energy events for DAMIC-M

Saturday 27 April 2024 09:20 (20 minutes)

DAMIC-M (Dark Matter in CCDs at Modane) is a near-future experiment aiming to search for low-mass dark matter particles through their interactions with silicon atoms in the bulk of charge-coupled devices (CCDs). DAMIC-M will feature a detector mass of about 1 kg, employing 208 (1.5k x 6k) skipper CCDs. Skipper amplifiers will enable DAMIC-M CCDs to achieve a sub-electron readout noise, thereby allowing to extend the experimental energy threshold to the eV-scale. Strengthened by these characteristics, DAMIC-M will reach unprecedented sensitivities to dark matter candidates of the so-called hidden sector, while continuing the search for low mass WIMPs.

DAMIC-M largely relies on Geant4 simulations for the background estimation and calibration to nuclear recoils.
Detailed measurements with skipper CCDs have been conducted to characterize the spectrum of Compton scattered electrons, a predominant source of background at low energy. Notably, Geant4 fails to faithfully reproduce the experimental data in the low energy regime (<0.3 keV). In light of this limitation, alternative simulation codes have been evaluated. Ab-initio calculations have proven capable of accurately representing the observed data when appropriately tuned.
A measurement of the nuclear recoil ionization efficiency down to <20 eV electron equivalent has also been made using a photo-neutron source. GEANT4 and MCNP simulations were key in the analysis, with both yielding similar results in the energy range of interest.

In this talk we compare DAMIC-M calibration measurements with Geant4 results, providing insight into the challenges inherent in the simulation of low-energy phenomena.

Author: DE DOMINICIS, Claudia (CNRS, LPNHE)

Co-authors: CASTELLO-MOR, Nuria (IFCA (CSIC-UC)); YAJUR, Rachana (KICP, UChicago)

Presenter: DE DOMINICIS, Claudia (CNRS, LPNHE)

Session Classification: Workshop