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# Geant4 simulations of sub-keV electron energy loss in $CaWO_4$ and $Al_2O_3$ by ELOISE

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$CaWO_4$ and $Al_2O_3$ are well-known target materials for cryogenic detectors deployed in experiments searching for rare events like coherent elastic neutrino-nucleus scattering (CE$\nu$NS) with NUCLEUS or hypothetical dark matter-nucleus scattering with CRESST. With detection thresholds in the sub-keV range, these experiments need verified and reliable simulations of background components at such energies, which are challenging for general purpose simulation codes like Geant4.

The ELOISE project aims to assess the reliability of Geant4 simulations of electromagnetic (EM) processes in $CaWO_4$ and $Al_2O_3$ at sub-keV energies and, if needed, to improve it. Currently, we are studying the agreement of dedicated Electron Energy Loss Spectroscopy (EELS) of $CaWO_4$ and $Al_2O_3$ samples, which were provided by TU Munich, with Geant4 simulations. We simulate the energy loss with each relevant EM physics implementation provided by Geant4 and assess its compatibility with the EELS measurements.

In this contribution, I will motivate the challenge of sub-keV simulations and outline the scope of ELOISE. Afterwards I will introduce the EELS reference data set and discuss the observed spectral features. Subsequently, I will report the simulations of ionisation energy loss in $CaWO_4$ and $Al_2O_3$ based on Geant4's unmodified EM physics implementation. Finally, I will give a preliminary assessment of the compatibility between Geant4 simulation and measured reference data.

## Submitted on behalf of a Collaboration?

No

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