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ELOISE –Measured electronic stopping power in CaWO₄ and Al₂O₃ at sub-keV in comparison with Geant4 simulation

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CaWO₄ and Al₂O₃ are well-known target materials for experiments searching for rare events like CE ν NS with NUCLEUS or hypothetical dark matter-nucleus scattering with CRESST. Pushing the detection threshold down to sub-keV energies, experiments are in need for verified and reliable simulations of radioactive background components at sub-keV energies, e.g. based on the widely used Geant4 toolkit.

The ELOISE project aims to tackle this issue for electromagnetic particle interactions in both materials. We are currently in the process of evaluating Geant4's accuracy by comparing benchmark simulations with data from extended literature research and dedicated measurements. As sub-keV data on the electronic stopping power is rare or totally missing, ELOISE conducted dedicated Electron Energy Loss Spectroscopy (EELS) on CaWO₄ and Al₂O₃ to obtain their optical energy loss function. From this, we deduced preliminary electronic stopping powers and tentatively compare them with Geant4 simulations of electron energy loss in both materials. In this contribution, I will briefly describe the problem and outline the scope of ELOISE. Afterwards, I will report the results of ELOISE's reference measurements and the obtained stopping powers. Finally, I will discuss our preliminary comparison with Geant4 simulations of CaWO₄ and Al₂O₃ at sub-keV energies.

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