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Influence of GEANT4 Physics List

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A main goal of current low background physics is the search for rare and novel phenomena beyond the Standard Model of particle physics. The researched processes are for example the scattering off of a potential Dark Matter particle inside a CaWO4 crystal of the CRESST experiment or the neutrinoless double beta decay of Ge nucleus for the future Legend experiment. Success of such experiments depends on a reliable background prediction through the use of Monte Carlo simulations to predict the event rate associated with the different background sources. A widely used toolkit to construct these simulations is Geant4, where a wide choice of physics models is available in different predefined physics lists. In this work, we examine the impact of different physics lists on the total energy deposition for several configurations of our test case, i.e., combinations of radioactive contaminants, target material (CaWO4 and Ge) and target thickness. Quantitative comparison between simulated datasets is performed by appropriate statistical tests.

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