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Accurate Phonon Transport Across Interfaces in G4CMP for sub-eV Detector Simulations in the BeEST Experiment

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The BeEST experiment searches for physics beyond the standard model (BSM) in the neutrino sector by measuring the recoiling daughter from the electron capture (EC) decay of 7Be. The 7Be is embedded in superconducting tunnel junction (STJ) sensors such that the low-energy (eV-scale) decay products are detected with sub-eV energy resolution. Modelling of low-energy backgrounds in the SiO2/Si substrate as well as phonon-mediated quasiparticle interactions in the STJs themselves is crucial to understanding potential physics beyond the Standard Model (BSM). In order to model these effects using the G4CMP toolkit, phonons transport across interfaces must be included. In this talk, recent development efforts to provide accurate phonon refraction across interfaces will be discussed as well as validation efforts. To ensure a low background environment for the BeEST, as well as other experiments utilizing low threshold detectors, the Colorado Underground Research Institute (CURIE) is a new shallow-underground laboratory located at the Edgar Experimental Mine. CURIE offers a testbed for the development of superconducting qubits and novel detector technologies, as well as for studying backgrounds relevant to rare-event searches, such as those for dark matter and neutrinoless double-beta decay. We welcome new collaborations and users for this facility.

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