

Crystal responses to general dark matter-electron interactions

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In this work we develop a formalism to describe the scattering of dark matter (DM) particles by electrons bound in crystals for general forms of non-relativistic DM-electron interactions. Our novel response to the study of DM-electron interactions allows probing DM with mass down to a fraction of an MeV in a model independent way.

Using a state of the art DFT calculation we apply our formalism to the cases of silicon and germanium, materials currently being used in direct detection experiments. We are thus able to predict the rate of electron excitations to the conduction band, and use this to compute exclusion limits for the strength of DM-electron interactions based on the null-results of the SENSEI and EDELWEISS experiments.

Reference to paper (DOI or arXiv)

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