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Quenching factor for low energy nuclear recoils in Si and Ge

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The nuclear recoil ionization efficiency or "quenching factor" (QF) plays a crucial role in low-threshold ionization type detectors used in dark matter searches, CEνNS detection, and in searches for new physics through this channel. We study the ionization efficiency of nuclear recoil in pure materials using a model based on Lindhard´s theory. We include the effect of atomic binding energy, as well as improved modeling of electronic stopping and other improvements. Our model describes available QF data in silicon and can also accommodate the effects observed in recent germanium data, predicting QF behavior up to the Frenkel pair production energy scale (40 eV)

Authors: SARKIS MOBARAK, Youssef (Instituto de Ciencias Nucleares UNAM); AGUILAR-AREVALO, Alexis (Instituto de Ciencias Nucleares, UNAM); D'OLIVO, JUAN CARLOS (INSTITUTO DE CIENCIAS NUCLEARES, UNAM)

Presenter: SARKIS MOBARAK, Youssef (Instituto de Ciencias Nucleares UNAM)

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