SHELL MODEL STUDY ON EVENT RATES OF LIGHTEST SUPERSYMMETRIC PARTICLES SCATTERING OFF ^{83}Kr AND ^{125}Te

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In recent cosmic microwave background (CMB) experiments [1, 2], it is evident that normal luminous matter makes up only a small fraction of all the matter in the universe, and most of the matter in our universe is dark. Most of this dark matter is likely to be cold, i.e., nonrelativistic at the time of freeze-out. One of the most feasible candidates to compose the majority of the cold dark matter (CDM) component are nonbaryonic weakly interacting massive particles (WIMPs).

While recognizing the variety of well-motivated theoretical WIMP candidates, we choose to work with supersymmetry (SUSY), which offers a compelling and natural candidate. The lightest supersymmetric particle (LSP), the lightest neutralino, is supposedly charge neutral and (nearly) stable. It also has a suitable relic density to constitute a large portion of the CDM component [3]. Experimental direct detection of a WIMP scattering off a nuclear target would be a giant step towards understanding dark matter, and might also provide proof for supersymmetry.

We investigate the elastic and inelastic scattering of LSP (Lightest Supersymmetric Particle) dark matter off two possible target nuclei, ^{83}Kr and ^{125}Te. For the nuclear-structure calculations we employ the nuclear shell model using recently generated realistic interactions. We have condensed the contribution of nuclear physics in the scattering event rate to a set of nuclear-structure factors that are independent of the adopted supersymmetric (SUSY) model. Total event rates are then easily calculated by combining the nuclear-structure factors with SUSY parameters of choice. The annual modulation of the scattering signal due to the orbital motion of the Earth around the Sun is also included in our results.

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[3] J. Ellis, J. S. Hagelin, *Nucl. Phys. B* **238**, 453–476 (1984).