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# Atomic Many-Body Effects in Neutrinos and Dark Matters Detection

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The studies on neutrinos and dark matters rely on the direct detection with detectors composed by pure atom or crystal. As current experimental searches for neutrinos and dark matters have lowered the detector threshold down to the sub-keV regime [1, 2], accurate many-body calculations for atomic ionization are warranted for giving reliable results of experimental comparisons. With the benchmark of comparisons with photoionization data [3] and analytic hydrogen calculations [4, 5], we perform *ab initio* many-body methods [6-9] to show how atomic effects modify the cross sections of neutrino or dark matter scattering with electrons in Ge, Xe and other targets within 5-10% accuracy [10-12]. In this presentation, we apply these methods to study low-energy electronic recoil caused by solar neutrinos in multi-ton xenon detectors [13], which is an important subject not only because it is a source of the irreducible background for direct searches of weakly-interacting massive particles (WIMPs), but also because it provides a viable way to measure the solar *pp* and 7Be neutrinos at the precision level of current standard solar model predictions.

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