

Incoherent solar neutrino scattering off Thallium isotopes

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The neutral current neutrino-nucleus scattering process is currently used to probe various nuclear-structure parameters and to constrain physics within and beyond the standard model. Motivated by the observation of coherent elastic neutrino-nucleus scattering (CE ν NS) at the COHERENT experiment, in this article we perform realistic nuclear-structure calculations in the framework of the nuclear shell model. Focusing on the promising ^{203}Tl and ^{205}Tl isotopes –which are the detector dopants of CsI[Tl] and NaI[Tl] crystals, currently in use by several experimental collaborations –we present the expected event rates for both the coherent and incoherent neutrino-nucleus scattering channels. We furthermore present the standard neutrino scattering formalism in terms of the nuclear recoil energy for a more convenient comparison of the results with experimental data and compare our event rates with the corresponding results obtained by using phenomenological nuclear form factors.

Primary author: Dr PAPOULIAS, Dimitrios (National and Kapodistrian University of Athens)

Presenter: Dr PAPOULIAS, Dimitrios (National and Kapodistrian University of Athens)

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