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Probing non-standard neutrino interactions with low energy neutrino-electron elastic scattering in reactor experiments

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Reactor experiments provide an excellent platform to investigate the atomic ionization effects induced by the unexplored neutrino interaction channels. Including the atomic effects in our calculations, we study the neutrino-electron scattering by reactor anti-neutrinos in low-energy electron recoil detectors such as Si/Ge in light of neutrino non-standard interactions with leptons. We find that the atomic and crystal effects in Si/Ge yields a sizable suppression to the neutrino-electron scattering rate when compared to the free-electron approximation. We present our sensitivity results for the light vector and scalar mediator case. The explanation of the excess in the recent Xenon1T result can also be investigated at the reactor experiments since the reactors have a similar energy flux profile to solar neutrinos with characteristic neutrino energies <1 MeV.

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