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Up-scattering production of a sterile fermion at neutrino experiments

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We consider the possible production of a new MeV-scale fermion at the COHERENT, LZ and XENONnT experiments, and the future DUNE detector. The new fermion, belonging to a dark sector, can be produced through the up-scattering process of neutrinos off the nuclei and the electrons of the detector material, via the exchange of a light mediator. We explore the possibility of generalized interactions, that is a scalar, pseudoscalar, vector, axial or tensor mediator. We perform a detailed statistical analysis of the COHERENT, LZ and XENONnT datasets and obtain up-to-date constraints on the couplings and masses of the dark fermion and mediators. Likewise, we include sensitivities for the DUNE detector. Finally, we briefly comment on the stability of the dark fermion.

Abstract

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