

Probing Non-Standard Neutrino Interactions with Interference: Insights from XENONnT and Borexino Experiments

Neutrino-electron scattering experiments play a crucial role in investigating the non-standard interactions of neutrinos. In certain models, these interactions can include interference terms that may affect measurements. Next-generation direct detection experiments, designed primarily for dark matter searches, are also getting sensitive to probe the neutrino properties. We utilise data from XENONnT, a direct detection experiment, and Borexino, a low-energy solar neutrino experiment, to investigate the impact of interference on non-standard interactions. Our study demonstrates that interference between standard and non-standard neutrino interactions can lead to a transition between different non-standard interaction models in the relevant energy range of XENONnT and Borexino experiments. This transition can be used to distinguish between the considered models if any signal is observed at direct detection or neutrino experiments. Our findings underscore the importance of accounting for interference and incorporating both direct detection and solar neutrino experiments to gain a better understanding of neutrino interactions and properties.

Secondary category for the parallel session (optional)

Neutrino Physics

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Session Classification: Parallel: Neutrino 1

Track Classification: Parallel Sessions: Dark Matter Physics