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Neutrino mass ordering sensitivities at DUNE, HK and KNO in presence of scalar NSI

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The limitations of the Standard Model in explaining neutrino masses and neutrino mixing leads to the exploration of frameworks beyond the Standard Model (BSM). The possibility of neutrinos interacting with fermions via a scalar mediator is one of the interesting prospects. The study of neutrino non-standard interactions (NSI) is a well-motivated phenomenological scenario to explore new physics beyond the Standard Model. These new interactions may alter the standard neutrino oscillation probabilities, potentially leading to observable effects in experiments. It also allows for the exploration of absolute neutrino masses via oscillation experiments. It can modify the oscillation probabilities, which in turn can affect the physics sensitivities in long-baseline experiments. The linear scaling of the effects of scalar NSI with matter density also motivates its exploration in long-baseline (LBL) experiments.

We will present our study on the impact of a scalar-mediated NSI on the mass ordering (MO) sensitivities of three long-baseline neutrino experiments, i.e., DUNE, HK and KNO. We study the impact on MO sensitivities at these experiments assuming that scalar NSI parameters are present in nature and are known from other non-LBL experiments. The presence of scalar NSI can notably impact the MO sensitivities of these experiments. Furthermore, we analyze the potential synergy by combining data from DUNE with HK and HK+KNO, thereby exploring a broader parameter space.

Working Group

WG 1: Neutrino Oscillation Physics

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