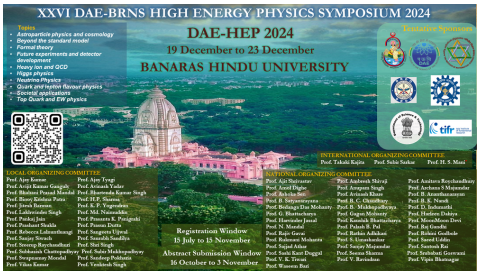

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Scalar Leptoquarks and Neutrinoless Double Beta Decay

We perform a comprehensive analysis of neutrinoless double beta decay and its interplay with low-energy flavor observables in a radiative neutrino mass model with scalar leptoquarks $S_1(\bar{3}, 1, 1/3)$ and $\widetilde{R}_2(3, 2, 1/6)$. We carve out the parameter region consistent with constraints from neutrino mass and mixing, collider searches, as well as measurements of several flavor observables, such as muon and electron anomalous magnetic moments, charged lepton flavor violation and rare (semi)leptonic kaon and B-meson decays, including the recent anomalies in $R_{D^{(*)}}$ and $B \to K\nu\bar{\nu}$ observables. We perform a global analysis to all existing constraints and show the (anti)correlations between all relevant Yukawa couplings satisfying these restrictions. We find that the most stringent constraint on the parameter space comes from $\mu \to e$ conversion in nuclei and $K^+ \to \pi^+\nu\bar{\nu}$ decay. We also point out a tension between the muon and electron $(g-2)$ anomalies in this context. Taking benchmark points from the combined allowed regions, we study the implications for neutrinoless double beta decay including both the canonical light neutrino and the leptoquark contributions. We find that for normal ordering of neutrino masses, the leptoquark contribution removes the cancellation region that occurs for the canonical case. The effective mass in presence of leptoquarks can lie in the desert region between the standard normal and inverted ordering cases, and this can be probed in future ton-scale experiments like LEGEND-1000 and nEXO.

Field of contribution

Phenomenology

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