

Constraining Right Handed Gauge Boson Mass from Lepton Number Violating Meson Decays in a Low Scale Left Right Model

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We analyze the lepton number violating (LNV) meson decays that arise in a TeV scale Left Right Symmetry model. The right handed Majorana neutrino N along with the right handed or Standard Model gauge bosons mediate the meson decays and provide a resonant enhancement of the rates if the mass of N (M_N) lies in the range $\sim (100 \text{ MeV} - 5 \text{ GeV})$. Using the expected upper limits on the number of events for the LNV decay modes $M_1^+ \rightarrow \ell^+ \ell^+ \pi^-$ ($M_1 = B, D, D_s, K$), we derive constraints plausible on the mass of the right handed charged gauge boson by future searches at the ongoing NA62 and LHCb experiments at CERN, the upcoming Belle II at SuperKEK, as well as at the proposed future experiments, SHiP and FCC-ee. These bounds are complimentary to the limits from same-sign dilepton search at Large Hadron Collider (LHC). The very high intensity of Charmed mesons expected to be produced at SHiP will result in a far more stringent bound, $M_{W_R} > 18.4 \text{ TeV}$ (corresponding to $M_N = 1.46 \text{ GeV}$), than the other existing bounds from collider and neutrinoless double beta decay searches.

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