

Probing lepton number violating interactions in rare kaon decays

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We investigate the possibility to probe lepton number violating (LNV) operators in the rare kaon decay $K \rightarrow \pi \nu \nu$. Performing the analysis in the Standard Model effective field theory with only light active Majorana neutrinos, we determine the current limits on the corresponding LNV physics scale from the past E949 experiment at BNL as well as the currently operating experiments NA62 at CERN and KOTO at J-PARC. We focus on the specific signature of scalar currents in $K \rightarrow \pi \nu \nu$ arising from the LNV nature of the operators and study the effect on the experimental sensitivity, stressing the need for dedicated searches for beyond the SM currents. We find that the rare kaon decays probe high operator scales $\Lambda_{\text{LNV}} \approx 15$ to 20 TeV in different quark and neutrino flavours compared to neutrinoless double beta decay. Furthermore, we comment that the observation of LNV in kaon decays can put high-scale leptogenesis under tension.

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