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Sensitivity of Lepton Number Violating Meson Decays in Different Experiments

We study the discovery prospect of different three body lepton number violating (LNV) meson decays $M_1^- \rightarrow \ell_1^- \ell_2^- M_2^+$ in the framework of right handed (RH) neutrino extended Standard Model (SM) at NA62, LHCb at CERN, Belle II, SHiP, MATHUSLA and FCC-ee. We consider the effect of parent mesons velocity, as well as, the effect of finite detector size. Using the expected upper limits on the number of events for the LNV decay modes, $M_1^- \rightarrow \ell_1^- \ell_2^- \pi^+$ ($M_1 = B, B_c, D, D_s$ and K), we analyze the sensitivity reach of the mixing angles $|V_{eN}|^2$, $|V_{\mu N}|^2$, $|V_{\tau N}|^2$, $|V_{eN} V_{\mu N}|$, $|V_{eN} V_{\tau N}|$ and $|V_{\mu N} V_{\tau N}|$ as a function of heavy neutrino mass M_N . We show that, inclusion of parent meson velocity can account to a large difference for active-sterile mixing compare to existing bounds, specially for D, D_s meson decay at SHiP and K meson decay at NA62.

Mini-abstract

It's important to take into account the parent meson momentum for LNV meson decay at experiments

Experiment/Collaboration

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