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Displaced vertex signature of type-I seesaw

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A certain class of new physics models includes long-lived, electrically charge-neutral particles. A displaced vertex is a spectacular signature to probe such particles productions at the high energy colliders, with almost zero background. In the context the minimal gauged B - L extended Standard Model (SM), we consider a pair creation of Majorana right-handed neutrinos (RHNs) at the high energy colliders through the production of the SM and the B - L Higgs bosons and their subsequent decays into RHNs. With parameters reproducing the neutrino oscillation data, we show that the RHNs are long-lived and their displaced vertex signature can be observed at the next generation displaced vertex search experiments, such as HL-LHC, MATHUSLA, LHeC, and FCC-eh. We find that the lifetime of the RHNs is controlled by the lightest light neutrino mass, which leads to a correlation between the displaced vertex search and the search limit of the future neutrinoless double beta-decay experiments.

Summary

displaced vertex searches at collider

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