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A Comparative Study of Searching for Charged Lepton Flavor Violation at future lepton colliders

Interest in searches for Charged Lepton Flavor Violation (CLFV) has persisted over the past few decades, as the observation of CLFV would indicate new physics beyond the Standard Model (BSM). Several future high-luminosity lepton colliders have been proposed, which will enable CLFV searches to reach unprecedented precision. This work performs a detailed comparative study of CLFV searches at future lepton colliders using both extra Z' gauge boson model and R-parity-violating (RPV) Minimal Supersymmetric Standard Model (MSSM) . We conduct Monte Carlo simulations for CLFV processes at a 240 GeV circular electron-positron collider (CEPC) and a TeV-scale muon collider. Our results show that future colliders will significantly improve the sensitivity of τ-related CLFV couplings, surpassing current constraints from low-energy and high-energy experiments.

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