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Searching for heavy neutral lepton and LNV through VBS at muon colliders

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High-energy muon collider can play as an emitter of electroweak gauge bosons and thus leads to substantial vector boson scattering (VBS) processes. In this work, we investigate the production of heavy neutral lepton (HNL) N and lepton number violation (LNV) signature through VBS at high-energy muon colliders. They provide clean and robust LNV signatures to tell the nature of Majorana HNLs and thus have more advantageous benefits than direct $\mu\mu$ annihilation. We analyze the potential of searching for Majorana HNL and obtain the exclusion limits on mixing $V_{\ell N}$. Based on this same-sign lepton signature, we also obtain the sensitivity of muon collider to the Weinberg operator.

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