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Heavy Neutral Lepton at Future Muon Collider

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The future high-energy muon colliders, featuring both high energy and low background, could play a critical role in our searches for new physics. The smallness of neutrino mass is a puzzle of particle physics. Broad classes of solutions to the neutrino puzzles can be best tested by seeking the partners of SM light neutrinos, dubbed as heavy neutral leptons (HNLs), at muon colliders.
We can parametrize HNLs in terms of the mass m_N and the mixing angle with ℓ-flavor U_ℓ. In this work, we focus on the regime $m_N > O(100)$ GeV and study the projected sensitivities on the $|U_\ell|^2 - m_N$ plane with the full-reconstructable HNL decay into a hadronic W and a charged lepton. The projected reach in $|U_\ell|^2$ leads to the best sensitivities in the TeV realm.

Authors: LI, Peiran (University of Minnesota); LIU, Zhen; LYU, Kunfeng (University of Minnesota)

Presenter: LI, Peiran (University of Minnesota)

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