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Searching for Majorana neutrinos at a same-sign muon collider

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Majorana properties of neutrinos have long been a focus in the pursuit of possible new physics beyond the standard model, which has motivated lots of dedicated theoretical and experimental studies. A future same-sign muon collider is an ideal platform to search for Majorana neutrinos through the Lepton Number Violation process: $\mu^+ \mu^+ \rightarrow W^+ W^+$. Specifically, this t-channel kind of process is less kinematically suppressed and has a good advantage in probing Majorana neutrinos at high mass regions up to 10TeV. We perform a detailed fast Monte Carlo simulation study by examining three different final states: 1) pure-leptonic state with electrons or muons, 2) semi-leptonic state, and 3) pure-hadronic state in the resolved or merged categories. Furthermore, we perform a full simulation study on the pure-leptonic final state to validate our fast simulation results.

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