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Discovery of Light Sterile Neutrinos at the LHC

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We study the purely leptonic W decays $W^+ \rightarrow e + \mu - e + \nu_e$ and $W^+ \rightarrow e + e + \mu - \nu^- \mu$ (or their charge conjugates) produced at the LHC, induced by sterile neutrinos with mass below M_W in the intermediate state. While the first mode is induced by both Dirac or Majorana neutrinos, the second mode is induced only by Majorana neutrinos, as it violates lepton number. We find that, even when the final (anti-)neutrino goes undetected, one could distinguish between these two processes, thus distinguishing the Dirac or Majorana character of the sterile neutrinos, by studying the muon spectrum in the decays.

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