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Gauged Lepton Number and Implications for Collider Physics

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Lepton number has a deep connection with the neutrino mass generation. A new minimal anomaly-free gauged $U(1)_l$ lepton-number model, with four exotic chiral leptons, is studied. Motivated by phenomenology, we discuss a simplified case which has the universal Yukawa couplings. It agrees with all the experimental constraints and predicts $m_e, m_\mu \ll m_\tau$, and the latter is of the electroweak scale. Due to the interference between the SM and $U(1)_l$ gauge interactions, this model robustly predicts that e, μ, τ have distinctive forward-backward asymmetries at the e^+e^- colliders. It can be searched for at the e^+e^- machine with $\sim$ TeV center-of-mass energy and an integrated luminosity $\sim ab^{-1}$.

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