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Prospects for new physics in tau decays to l-mu-mu at current and future colliders

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The discovery of lepton flavour violating interactions will be striking evidence for physics beyond the Standard Model. Focusing on the three decays $\tau^{\mp} \longrightarrow \mu^{\pm}\mu^{\mp}\mu^{\mp}$, $\tau^{\mp} \longrightarrow e^{\pm}\mu^{\mp}\mu^{\mp}$ and $\tau^{\mp} \longrightarrow e^{\mp}\mu^{\mp}\mu^{\pm}$, we evaluate the discovery potential of current and future high-energy colliders to probe lepton flavour violation in the τ sector. Based on this potential we determine the expected constraints on parameters of new physics in the context of the Type-II Seesaw Model, the Left-Right Symmetric Model, and the Minimal Supersymmetric Standard Model. The existing and ongoing 13 TeV run of the Large Hadron Collider has the potential to produce constraints that outperform the existing e+e− collider limits for the $\tau^{\mp} \longrightarrow \mu^{\pm}\mu^{\mp}\mu^{\mp}$ decay and achieve a branching fraction limit of ⊠10−8. With a future circular e+e− collider, constraints on the $\tau \longrightarrow l\mu\mu$ branching fractions could reach as low as a few times 10−12.

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