

Searching for the LFV $\gamma\gamma e\mu$ interaction at future e^-e^+ colliders

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We investigate the lepton-flavor-violating (LFV) process $e^-e^+ \rightarrow e^-e^+e\mu$ (with $e = e^\pm$ and $\mu = \mu^\pm$) at future circular electron-positron colliders, probing the effective $\gamma\gamma e\mu$ interaction via photon fusion. Using an Effective Field Theory (EFT) framework that respects current theoretical and experimental constraints, we identify three benchmark points (BMPs) where the signal could be observed at the Circular Electron Positron Collider (CEPC, $\sqrt{s} = 240$ GeV) and at the Future Circular Collider (FCC-ee, $\sqrt{s} = 240, 350$ GeV). The most favorable BMP yields a potential 5σ discovery during early running for integrated luminosities as low as 200 fb^{-1} (FCC-ee) and 270 fb^{-1} (CEPC).

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