

Muon and electron $g-2$ in a Z' model with vector-like fermions

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We consider a simple renormalisable and gauge-invariant model in which a massive new Z' boson has couplings only to the electron and muon and their associated neutrinos, arising from mixing with a heavy vector-like fourth family of leptons. Within this model, we discuss the contributions to the electron and muon anomalous magnetic moments from Z' exchange, subject to the constraints from $\mu \rightarrow e\gamma$ and neutrino trident production. Using analytic and numerical arguments, we find that such a Z' model can account for either the electron or the muon $g-2$ anomalies while remaining consistent with the experimental constraints from $\mu \rightarrow e\gamma$ and neutrino trident production, but not both simultaneously.

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