

Exactly Stable Protons with a Muonic Force

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Scalar leptoquarks are popular mediators in new physics explanations of the experimental anomalies in $b \rightarrow s\mu^+\mu^-$ decays and the muon $g - 2$; however, the non-observation of charged lepton flavor violation and proton decay impose severe constraints on their interactions. We present a novel protection mechanism in the form of a gauged, lepton-flavored $U(1)$ symmetry, which is broken by a scalar condensate to accommodate neutrino masses with a type-I seesaw. An exact remnant discrete Z_9 symmetry renders the proton exactly stable to all orders in the effective field theory expansion. This framework easily accommodates leptoquark explanations of the aforementioned anomalies without the dangerous interactions.

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