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Getting chirality right: single scalar leptoquark solutions to the (g-2)_{e/mu} puzzle

We identify the two scalar leptoquarks capable of generating sign-dependent contributions to leptonic magnetic moments, $R_2 \sim (\mathbf{3}, \mathbf{2}, 7/6)$ and $S_1 \sim (\mathbf{3}, \mathbf{1}, -1/3)$, as favoured by current measurements. We consider the case in which the electron and muon sectors are decoupled, and real-valued Yukawa couplings are specified using an up-type quark mass-diagonal basis. Contributions to Δa_e arise from charm-containing loops and Δa_μ from top-containing loops – hence avoiding dangerous LFV constraints, particularly from $\mu \to e\gamma$. The strongest constraints on these models arise from contributions to the Z leptonic decay widths, high-p_T leptonic tails at the LHC, and from (semi)leptonic kaon decays. To be a comprehensive solution to the $(g-2)_{e/\mu}$ puzzle we find that the mass of either leptoquark must be < 65 TeV. This analysis can be embedded within broader flavour anomaly studies, including those of hierarchical leptoquark coupling structures. It can also be straightforwardly adapted to accommodate future measurements of leptonic magnetic moments, such as those expected from the Muon $g-2$ collaboration in the near future.

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