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Muon g – 2 and scalar leptoquark mixing

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The observed muon anomalous magnetic moment deviates from the Standard
Model (SM) predictions. There are two scalar leptoquarks with simultaneous cou-
plings to the quark-muon pairs of both chiralities that can singly explain this discrepancy. We discuss an alternative mechanism that calls for mixing of two scalar leptoquarks of the same electric charge through the interaction with the Higgs field, where the two leptoquarks separately couple to the quark-muon pairs of opposite chirality structures. Three scenarios that satisfy this requirement are S1 & S3, S1 & S3,and R⊠2 & R2, where the first scenario is realised with the up-type quarks running in the loops while the other two scenarios proceed through the down-type quark loops.
We constrain the leptoquark mixing parameters with oblique corrections and introduce only two non-zero Yukawa couplings to quarks and muon, at the time, to study ability of these three scenarios to explain (g – 2)μ and be in accord with existing constraints. We find that the S1 & S3 scenario with the (charm) top quark loops is ⊠(not) viable, whereas the S1 & S3 and R2 & R2 scenarios require at least one of the two Yukawa couplings to be an O(1) parameter to accommodate the (g – 2)μ discrepancy. If Yukawa couplings are to remain perturbative for the S1 & S3 scenario with the top quark loops, we find an upper bound on the leptoquark mass scale to be at 15TeV.

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