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| Title: | Combined explanations of the b→sμ+μ− and b→cτ−¯ν anomalies: A general model analysis |
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| Abstract: | There are four models of tree-level new physics (NP) that can potentially simultaneously explain theb→sμþμ−andb→cτ−ν̄anomalies. They are theS3,U3andU1leptoquarks (LQs), and a triplet ofstandard-model-like vector bosons (VB's). Under the theoretical assumption that the NP couplespredominantly to the third generation, previous analyses found that, when constraints from other processesare taken into account, theS3,U3andVBmodels cannot explain theBanomalies, butU1is viable. In thispaper, we reanalyze these models, but without any assumption about their couplings. We find that, even inthis most general case,S3andU3are excluded. For theU1model, constraints from the semileptonic lepton-flavor-violating (LFV) processesB→Kð Þμ τ∓,τ→μφandY→μτ, which have been largely ignoredpreviously, are found to be very important. Because of the LFV constraints, the pattern of couplings of theU1LQ is similar to that obtained with the above theoretical assumption. Also, the LFV constraints renderunimportant those constraints obtained using the renormalization group equations. As for theVBmodel, itis excluded if the above theoretical assumption is made due to the additional constraints fromB0s-B̄0smixing,τ→3μandτ→μνν̄. By contrast, we find a different set of NP couplings that both explains theb→sμþμ−anomaly and is compatible with all constraints. However, it does not reproduce the measuredvalues of theb→cτ−ν̄anomalies—it would be viable only if future measurements find that the centralvalues of these anomalies are reduced. Even so, thisVBmodel is excluded by the LHC bounds on high-mass resonant dimuon pairs. This conclusion is reached without any assumptions about the NP couplings |
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