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Searching for Scalar Leptoquarks at the LHC/FCC and a Muon Collider

We present the search strategies for two different leptoquark models at the present and future colliders. A model containing a singlet and a doublet scalar leptoquark can generate neutrino mass at one-loop while contributing to the muon (g - 2) experimental measurement. Signatures of this model, in benchmark scenarios that simultaneously satisfy neutrino mass and oscillation data, muon (g-2) excess as well as CLFV bounds, are studied from the pair production at the LHC/FCC, with complementary final states that distinguish the leptoquark mass eigenstates. A non-trivial mixing exists between the singlet and the doublet, which can be probed by an asymmetric pair production. Next, we consider a singlet and a triplet scalar leptoquark separately, motivated by their contribution to *B*-decay ratios and associated observables. A benchmark-independent study is performed the 5σ probe of a very minimal set of Yukawa couplings at the LHC/FCC from the single production of leptoquarks. A complementary study from the pair production is performed at a multi-TeV muon collider, which leads to cleaner signal and better reach.

Refs: [1] Phys.Rev.D 106 (2022) 9, 095040., arXiv:2209.05890 [hep-ph]. [2] Eur.Phys.J.C 82, 916 (2022), arXiv:2108.06506 [hep-ph].

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