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Exploring lepton-quark mixing patterns in non-resonant leptoquark production at the LHC

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Searches for new physics (NP) at particle colliders typically involve multi-variate analysis of kinematic distributions of final state particles produced in a decay of a hypothetical NP resonance. Since the pair-production cross-sections mediated by such resonances are strongly suppressed by the NP scale, this analysis becomes less relevant for

NP searches for masses of the BSM resonance above 1 TeV. On the other hand, t-channel processes are less sensitive to the mass of the virtual mediator and therefore larger phase-space can be potentially probed as well as the couplings between the NP particles and the Standard Model fields. The fact that mixings between different generations of quarks

and leptons may exist, the potential of the search presented in this paper can be used, as a reference guide, to enlarge significantly the scope of searches performed at the LHC to flavour off-diagonal channels, in a theoretical consistent approach. In this work, we study non-resonant production of scalar leptoquarks which have been proposed in the literature to provide a potential avenue for radiative generation of neutrino masses, accommodating as well existing flavour mixings and anomalies. Final states involving just two muons at the LHC ($\mu^+\mu^-$), are used as a case study

Primary author: PINO GONÇALVES, João Pedro (University of Aveiro)

Co-authors: ONOFRE, Antonio (Universidade do Minho/CFUMUP,LIP); MORAIS, António (University of Aveiro); PASECHNIK, Roman (Lund university); POROD, Werner

Presenter: PINO GONÇALVES, João Pedro (University of Aveiro)

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