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The search for a new scalar and a dark force boson

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The Large Hadron Collider's (LHC) most significant discoveries are: firstly a Higgs Boson (discovered on July 4, 2012) and secondly no physics beyond the Standard Model (BSM). This is despite the fact something BSM is so well motivated from especially astrophysics and theoretical considerations. Searches must become more powerful and extend to regions not yet covered. This paper describes a new search for a scalar particle decaying ultimately to Standard Model (SM) leptons, through a dark vector boson intermediate state. The progenitor could be Higgs-like, but is motivated more generally, by a dark sector, a 2HDM type approach, or the search may simply be model independent. The processes under consideration is $S \rightarrow XX \rightarrow 4l$ where X is the dark vector boson Z_d and S is the new scalar. The mass range under consideration for the new scalar is from 20 GeV to 1 TeV, excluding a window around the SM Higgs. The mass range of the dark vector boson is from 10 GeV to 500 GeV, excluding the SM Z. The search will use the available large dataset the LHC has collected during its second run (Run 2) which took place between 2015 and 2018 and has 150 fb⁻¹ of data. The talk discusses the motivation of the analysis, the search strategy, and the validation of the search strategy.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

PhD

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