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Search for a heavier Higgs like boson and a dark force boson using ATLAS experiment results

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A search is described for a new boson that lies beyond the standard model is conducted where the progenitor 125 GeV Higgs Boson decays ultimately to four leptons (electrons or muons). The Higgs boson provides a portal into the hidden sector, which contains dark particles. The processes under consideration include $H \rightarrow ZX \rightarrow 4l$ and $H \rightarrow XX \rightarrow 4l$ where X is the dark vector boson Z_{d} or the pseudoscalar boson a , which are part of the two benchmark models used in the analysis. The mass range under consideration for the dark vector boson or the pseudoscalar boson are $1 < X < 60$ GeV. The data under analysis is collected from p-p collisions at the LHC from the ATLAS detector using a centre of mass energy of $\sqrt{s}=14$ TeV with an integrated luminosity of 36^{-1}_{+1} fb. Upper limits at the 95% confidence level are imposed on the fiducial cross sections for the processes under consideration. The subsequent work considers relaxing the Higgs Boson mass constraint upwards, introducing improved filtering and also improvements in the background estimation.

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