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Search for a new spin-0 scalar and a spin-1 boson using Run2 ATLAS detector data

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We present a search for a spin-1 boson together with a spin-0 scalar wherer the additional scalar decays into a four lepton final state ($\ell = \mu$~or e) via two intermediate dark vector bosons in the folllowing decay channel $S \rightarrow Z_d Z_d \rightarrow 4\ell$. In this scenario, the targeted additional scalar (S) mass ranges is between 20 GeV and 1 TeV where we exclude the Higgs boson mass window of 115 $GeV < m_S < 130\ GeV$ while the dark vector boson has a mass between 15 and 300 GeV. The search is conducted using $p-p$ collison data collected using the ATLAS detector at the LHC which corresponds to a center of mass energy of $\sqrt{S} = 13TeV$ and an integrated luminosity of 139 fb^{-1}. There were no significant excesses observed. Therefore, a 95\% upper limit was set on the cross-section $\times$ branching ratio as a function of the mass of both particles m_S and m_{Z_d}.

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