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Search for doubly charged Higgs boson production in multi-lepton final states using 139 fb – 1 of proton-proton collisions at √ s = 13 TeV with the ATLAS detector

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A search for pair production of doubly charged Higgs ($H^{\pm\pm}$) bosons, each decaying into a pair of prompt, isolated, and highly energetic leptons with the same electric charge, is presented. The search uses a proton–proton collision data sample at a centre-of-mass energy of 13 TeV corresponding to 139 fb^{-1} of integrated luminosity recorded during the Run 2 of the Large Hadron Collider by the ATLAS detector. This analysis focuses on same-charge leptonic decays, $H^{\pm\pm} \to \ell^{\pm}\ell'^{\pm}$, where $\ell, \ell' = e, \mu, \tau$ in two-, three-, and four-lepton channels, but only considers final states which include electrons or muons. No evidence of a signal is observed. Corresponding limits on the production cross-section and consequently a lower limit on $m(H^{\pm\pm})$ are derived at 95% confidence level. Under the assumption that the branching ratios to each of the possible leptonic final states are equal, $\mathcal{B}(H^{\pm\pm} \to e^{\pm}e^{\pm}) = \mathcal{B}(H^{\pm\pm} \to e^{\pm}\mu^{\pm}) = \mathcal{B}(H^{\pm\pm} \to \mu^{\pm}\mu^{\pm}) = \mathcal{B}(H^{\pm\pm} \to e^{\pm}\tau^{\pm}) = \mathcal{B}(H^{\pm\pm} \to \mu^{\pm}\tau^{\pm}) = \mathcal{B}(H^{\pm\pm} \to \tau^{\pm}\tau^{\pm}) = 1/6$, the observed lower limit on the mass of a doubly charged Higgs boson is 1080 GeV, which represents an improvement over previous limits.

In-person participation

Yes

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