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A new avenue for probing the Higgs self-coupling through Higgs pair production in multi-lepton final states with the ATLAS detector

A search is presented for non-resonant Higgs boson pair production decaying to multi-lepton final states using 140 fb⁻¹ of proton-proton collision data at centre-of-mass energy 13 TeV, recorded with the ATLAS detector during Run 2 of the LHC. By combining nine distinct channels characterized by varying multiplicities of electrons, muons, taus, and photons, this analysis represents a novel and competitive approach to probing the Higgs self-coupling modifier, $\kappa\lambda$. The observed (expected) limit on the signal strength is found to be 17 (11) times the Standard Model prediction. The observed (expected) 95% confidence interval constraints on $\kappa\lambda$, are $-6.2 < \kappa\lambda < 11.6$ ($-4.5 < \kappa\lambda < 9.6$), making this analysis the third most sensitive channel for constraining the Higgs self-interaction. A projection of the sensitivity of this analysis to non-resonant Higgs boson pair production to the High Luminosity LHC (HL-LHC) is also presented, assuming a centre-of-mass energy 14 TeV and integrated luminosities up to 3000 fb⁻¹.

Secondary track

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