

# Searches for Higgs boson pair production in the $\tau\tau+\tau\nu$ final state with 139 fb<sup>-1</sup> of pp collision data with the ATLAS detector

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The Higgs boson ( $H$ ) was discovered at the Large Hadron Collider (LHC) in 2012, by the ATLAS and CMS collaborations. Many of its properties have been measured (mass, width, branching ratio), but the ultimate test of electroweak symmetry breaking is to reconstruct the Higgs potential, which can be determined from the Higgs boson trilinear self-coupling. This is uniquely accessible in the as-yet-unobserved Di-Higgs production, which is one of the primary physics goals for the High Luminosity LHC (HL-LHC). In this talk, I will present the results of searches for Higgs boson pair production in the  $\tau\tau+\tau\nu$  final state at ATLAS. The searches use 139 fb<sup>-1</sup> of pp collision data with  $\sqrt{s} = 13$  TeV recorded by the ATLAS experiment at the LHC between 2015 and 2018. The semi-leptonic and fully hadronic di-tau final states are considered. Upper limits are set on the non-resonant di-Higgs production cross-section assuming Standard Model kinematics and on the resonant di-Higgs production cross-section as a function of the resonance mass.

**Primary author:** 李, 致源 (Peking University)

**Presenter:** 李, 致源 (Peking University)

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