

Measurements of W^+W^- production cross-sections in pp collisions at 13TeV with the ATLAS detector

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Measurements of $W^+W^- \rightarrow e^\pm \nu \mu^\mp \nu$ production cross-sections are presented, providing a test of the predictions of perturbative quantum chromodynamics and the electroweak theory. The measurements are based on data from pp collisions at $\sqrt{s} = 13$ TeV recorded by the ATLAS detector at the Large Hadron Collider in 2015-2018, corresponding to an integrated luminosity of 140 fb^{-1} . The number of events due to top-quark pair production, the largest background, is reduced by rejecting events containing jets with b -hadron decays. An improved methodology for estimating the remaining top-quark background enables a precise measurement of W^+W^- cross-sections with no additional requirements on jets. The fiducial W^+W^- cross-section is determined in a maximum-likelihood fit with an uncertainty of 3.1%. The measurement is extrapolated to the full phase space, resulting in a total W^+W^- cross-section of $127 \pm 4 \text{ pb}$. Differential cross-sections are measured as a function of twelve observables that comprehensively describe the kinematics of W^+W^- events. The measurements are compared with state-of-the-art theory calculations and excellent agreement with predictions is observed. A charge asymmetry in the lepton rapidity is observed as a function of the dilepton invariant mass, in agreement with the Standard Model expectation. A CP-odd observable is measured to be consistent with no CP violation. Limits on Standard Model effective field theory Wilson coefficients in the Warsaw basis are obtained from the differential cross-sections.

Primary author: 赵, 梓含 (University of Science and Technology of China)

Presenter: 赵, 梓含 (University of Science and Technology of China)

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