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$W\gamma\gamma$ Production in Proton-Proton Collisions at the Large Hadron Collider with the ATLAS Detector

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The Large Hadron Collider (LHC) at CERN has been colliding protons at an unprecedented centre of mass energy of 13 TeV since 2015. ATLAS, a general-purpose particle detector located at one of the LHC's interaction points, has collected nearly 140 fb^{-1} of the resulting data, allowing scientists to perform some of the most stringent tests of the Standard Model (SM) of particle physics to date. This data set offers a newfound sensitivity to rare and yet unobserved processes such as the SM production of a W boson and two photons. This process represents an important test of the electroweak sector since any deviation from the predicted self couplings of the gauge bosons would indicate the presence of new physics phenomena at yet unprobed energy scales. The measurement of this process does not come without its challenges however. Multiple background sources are expected to contribute to this process's signature in the detector. Though some can be modeled through simulation, events where a hadronic jet is reconstructed as either a lepton or photon must be estimated using data-driven techniques. This is due to the numerous sources of jets and the complex nature of their interaction with the detector which are poorly modeled. The estimation of these backgrounds will be crucial to achieving the first observation of $W\gamma\gamma$ production in proton-proton collisions and the precise measurement of its production cross section to test its agreement with SM predictions.

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Please select: Experiment or Theory

Experiment

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