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Observation of light-by-light scattering and measurements of photon-photon collisions at ATLAS

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We present the observation of the light-by-light scattering process, γγ → γγ, in lead-lead collisions at √sNN = 5.02 TeV. The analysis is conducted using 1.73nb-1 of data collected in November 2018 by the ATLAS experiment at the LHC. Light-by-light scattering event candidates are selected in events with two photons produced exclusively, with small diphoton transverse momentum and small acoplanarity. After applying all selection criteria, 59 candidate events are observed for a background expectation of 12 ± 3 events. An excess of events over the expected background is found with an observed significance of 8.2 standard deviations. The fiducial cross section is also measured and compared to the theoretical predictions.
In addition, we present the measurements of γγ → W+W- and γγ → ⊠+⊠- in proton-proton collisions at ATLAS. The production of γγ → ⊠+⊠- was measured at a centre- of-mass energy of 13 TeV using 3.2 fb-1. Fiducial and differential cross sections are compared to theoretical predictions both with and without corrections for absorptive effects. Exclusive production of W+W- consistent with the Standard Model prediction was found with 3⊠ significance using 20.2 fb-1 of data at a centre-of-mass energy of 8 TeV. The fiducial cross section was measured and found to be in agreement with Standard Model predictions. Constraints were placed on anomalous quartic gauge boson interactions.

Summary

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