

XIV Polish Workshop on Relativistic Heavy-Ion Collisions: Interplay between soft and hard probes of heavy-ion collisions



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Light-by-light scattering in lead-lead collisions in the ATLAS experiment - from evidence to observation

Saturday 6 April 2019 17:00 (15 minutes)

Light-by-light (LbyL) scattering, $\gamma\gamma \rightarrow \gamma\gamma$, is a quantum-mechanical process, forbidden by the classical theory of electrodynamics, but possible in Quantum Electrodynamics via a loop diagram. Despite the small cross-section, it is theoretically possible to observe this process in ultra-peripheral high energy heavy-ion collisions. Based on 0.48 nb^{-1} of 2015 Pb+Pb data, a first direct evidence of LbyL scattering was established by the ATLAS Collaboration in 2017 with 4.4σ significance over the background-only hypothesis. The observation of LbyL scattering was reported by ATLAS Collaboration in 2019, based on 2018 Pb+Pb dataset corresponding to integrated luminosity of 1.73 nb^{-1} . In total, 59 events were found in the signal region with a background expectation of 12 ± 3 events. The observed signal significance over the background-only hypothesis amounts to 8.2σ . The measured fiducial cross-section is 78 ± 13 (stat.) ± 8 (syst.) nb.

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