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light by light scattering in heavy ions collisions with the ATLAS detector

Light-by-light scattering ($\gamma\gamma\rightarrow\gamma\gamma$) is a quantum-mechanical process that is forbidden in the classical theory of electrodynamics. This reaction is accessible at the Large Hadron Collider thanks to the large electromagnetic field strengths generated by ultra-relativistic colliding lead (Pb) ions. Using $480\ \mu\text{b}^{-1}$ of Pb+Pb collision data recorded at a centre-of-mass energy per nucleon pair of 5.02 TeV by the ATLAS detector, the ATLAS Collaboration reports evidence for the $\gamma\gamma\rightarrow\gamma\gamma$ reaction. A total of 13 candidate events are observed with an expected background of 2.6 ± 0.7 events. After background subtraction and analysis corrections, the fiducial cross section of the process $\text{Pb}+\text{Pb}(\gamma\gamma)\rightarrow\text{Pb}^*(\gamma)+\text{Pb}^*(\gamma)\gamma\gamma$, for photon transverse energy $E_T>3$ GeV, photon absolute pseudorapidity $|\eta|<2.4$, diphoton invariant mass greater than 6 GeV, diphoton transverse momentum lower than 2 GeV and diphoton acoplanarity below 0.01, is measured to be 70 ± 24 (stat.) ± 17 (syst.) nb, which is in agreement with Standard Model predictions.

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