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Evidence for light-by-light scattering in ultraperipheral PbPb collisions at root S-NN=5.02 TeV

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Abstract

Evidence for light-by-light (LbL) scattering, $\gamma\gamma \rightarrow \gamma\gamma$, in ultraperipheral PbPb collisions at a nucleon-nucleon center-of-mass energy of 5.02 TeV is reported. LbL scattering processes are selected in events with just two photons produced, with transverse energy $E_T(\gamma) > 2$ GeV, pseudorapidity $|\eta(\gamma)| < 2.4$; and diphoton invariant mass $m(\gamma\gamma) > 5$ GeV, transverse momentum $p_T(\gamma\gamma) < 1$ GeV, and acoplanarity $(1 - \Delta\phi(\gamma\gamma)/\pi) < 0.01$. After all selection criteria, 14 events are observed, compared to 11.1 ± 1.1 (theo) and 3.8 ± 1.3 (stat) events expected for signal and background processes respectively. The significance of the signal excess over the background-only hypothesis is 4.10σ . The measured fiducial LbL scattering cross section, $\sigma(\text{fid})(\gamma\gamma \rightarrow \gamma\gamma) = 122 \pm 46$ (stat) ± 29 (syst) ± 4 (theo) nb is consistent with the standard model prediction.

Keywords

Author Keywords: Light-by-light scattering; Heavy ions; Ultraperipheral collisions; CMS; LHC

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