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Dilepton production and BSM physics from photon fusion processes in UPC and non-UPC Pb+Pb collisions with the ATLAS detector

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Relativistic heavy-ion beams at the LHC are accompanied by a large flux of equivalent photons, leading to multiple photon-induced processes. This talk presents a series of measurements of dilepton production from photon fusion performed by the ATLAS Collaboration, which provide strong constraints on the nuclear photon flux, its dependence on the impact parameter and photon energy, and can also probe physics beyond the standard model (BSM) using tau leptons. Recent measurements of exclusive dielectron production in ultra-peripheral collisions (UPC) are presented. Comparisons of the measured cross-sections to QED predictions from the Starlight and SuperChic models are also presented. Furthermore, measurements of muon pairs produced via two-photon scattering processes in hadronic (i.e. Non-UPC) Pb+Pb collisions are discussed. These non-UPC measurements provide a novel test of strong-field QED and may be a potentially sensitive electromagnetic probe of the quark-gluon plasma. These measurements include the dependence of the cross-section and angular correlation on the mean-p_{T} of the dimuon pair, the rapidity separation between the muons, and the pair angle relative to the second-order event-plane, all measured differentially as a function of the Pb+Pb collision centrality. The presented results are compared with recent theory calculations. Tau-pair production measurements can constrain the tau lepton's anomalous magnetic dipole moment (g-2), and a recent ATLAS measurement using muonic decays of tau leptons in association with electrons and tracks provides one of the most stringent limits available to date.

Experiment/Theory

ATLAS

Affiliation

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