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Tau-lepton pair production via di-photon fusion in ultra-peripheral heavy-ion collisions at the ATLAS detector

In ultra-relativistic heavy-ion collisions, high rates of $\gamma\gamma$ processes occur through the interaction of the large electromagnetic fields of the heavy nuclei. For large impact parameters between the nuclei, i.e. interaction distances larger than the nuclei's radii, the di-photon interaction can be the only one taking place, leading to very clean signatures in the detector. One of the possible signatures in these ultra-peripheral collisions (UPCs) is the production of a τ-lepton pair. The outgoing τ-leptons are back-to-back in the transverse plane, which allows a precise and efficient identification. Processes beyond the Standard Model (BSM) can influence the production cross sections for this process, through modifications of the $\gamma\tau\tau$-vertex, allowing to probe for and constrain their existence. This talk presents the most recent measurement of di-τ production in UPC-events at a centre-of-mass energy of 5.02 TeV, performed using data from the second running period (Run 2) of the Large Hadron Collider (LHC) and recorded with the ATLAS detector. Using final states where one of the τ-leptons decays involving a muon, fiducial differential cross sections for $\gamma\gamma \to \tau\tau$ production are measured for the first time and compared to currently most advanced theory predictions. Constraints on the electromagnetic moments of the τ-lepton which influence the $\gamma\tau\tau$ vertex contained in $\gamma\gamma \to \tau\tau$ production are extracted and the implications on BSM contributions discussed.

Secondary track

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