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Probing strongly-interacting nuclear matter in ultra-peripheral Pb+Pb collisions with ATLAS

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In ultra-relativistic heavy-ion collisions, large rates of γγ processes occur through the interaction of the large electromagnetic fields of the nuclei. In ultra-peripheral collisions (UPCs), characterized by a large impact parameter between the nuclei, the outgoing particles exhibit back-to-back production in the transverse plane, which provides precise and efficient identification. This talk presents an overview of recent ATLAS measurements potentially sensitive to the structure of strongly interacting matter, including the production of J/ψ mesons, coincident UPC processes, and photonuclear jet production. Measurements of J/ψ production use new low-multiplicity track triggering capabilities of the ATLAS detector in Run 3 to constrain the spatial and momentum structure of partons within the nucleus. Measurements of coincident UPC processes are complementary to these studies, providing insights into the importance of exclusivity requirements and constraining the nuclear charge form factors through studies of simultaneous $\gamma\gamma \to \mu^+\mu^-$ and diffractive photonuclear ρ production. Finally, measurements of photonuclear jet production in inclusive UPCs provide a novel method of constraining the nuclear parton distributions with high-precision data in a kinematic region with little existing constraint.

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