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Measurements of multi-jet production in pp, p+Pb and ultra-peripheral Pb+Pb collisions with the ATLAS detector

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Beams of relativistic heavy ions are accompanied by a large flux of equivalent photons, and photon-induced reactions are the dominant interaction mechanism in heavy-ion collisions when the colliding nuclei have transverse separation larger that the nuclear diameter. In these ultra-peripheral collisions (UPC) the photon can provide a clean probe of the partonic structure of the nucleus analogous with deep inelastic scattering. This talk presents measurements of dijet production in ultra-peripheral Pb+Pb collisions performed with the ATLAS detector. Events are selected using requirements on rapidity gaps and forward neutron production to identify the photo-nuclear processes. The relatively clean environment of these events allows for measurements in a region of x and Q^2 where significant nuclear PDF modifications are expected to be present and not strongly constrained by previous measurements.

This talk also presents measurements of four-jet cross sections in pp and p+Pb collisions over a large kinematic range. In addition to higher order QCD effects, the four-jet cross section receives contributions from so-called double parton scatterings (DPS) in which two independent hard scattering processes occur in the same collision. Thus measurements of DPS, which have already been performed in 7 TeV pp collisions, can yield new information on the spacial and momentum correlations between partons in a nucleon beyond single parton distributions. In p+Pb collisions, additional mechanisms for DPS are possible when two partons in the proton scatter off partons in different nucleons in the nuclear target, leading to an enhancement in the four jet rate and a different sensitivity to the underlying correlations. Differential cross sections as well as measurements of momentum and angular correlations, which help disentangle the single and double parton scattering contributions, will be presented.

Preferred Track

Initial State Physics and Approach to Equilibrium

Collaboration

ATLAS

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