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## Probing initial state effects in nuclear collisions via dijet and spectator neutron measurements with the ATLAS detector

The measurement of dijets in proton-lead collisions at the LHC provides unique possibilities for investigating both nuclear and nucleon initial state effects as a function of parton scattering kinematics. In particular, color fluctuation effects can significantly alter the average interaction strength of the proton, biasing the number of nucleon-nucleon interactions with the Pb nucleus and, therefore, the event activity. Both event activity and break-up neutrons, detected by Zero Degree Calorimeters, are common estimators used to assess the geometry of the p+Pb collision. This talk presents recent results obtained through the analysis of dijet events in  $\sqrt{s_{NN}} = 8.16$  TeV p+Pb data collected by ATLAS in 2016. ATLAS has measured the sensitivity of both forward transverse energy and zero-degree spectator neutron energy to changes in the Bjorken- $x$  of the parton extracted from the proton ( $x_p$ ) in the hard-scattering. Both these estimators exhibit a systematic negative bias in events characterized by a high  $x_p$ , although the spectator neutron energy is found to be much less sensitive to these selections than the forward transverse energy. By measuring geometry estimators in well-separated regions of rapidity, this result can provide complementary constraints for color fluctuation modeling. Furthermore, the spectator neutron energy is a novel observable that is influenced by the number of wounded nucleons and the dynamics of nuclear evaporation.

### Category

Experiment

### Collaboration (if applicable)

ATLAS Collaboration

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