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Probing small- x gluons with gamma+hadron correlations in the forward rapidity with the LHCb detector

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Gluon nuclear PDFs still have large uncertainties in the small- x ($x < 10^{-3}$) and small virtuality $Q^2 < 50$ (GeV/c)² region. Yields from particles coming from these gluons obtained in nuclear collisions are suppressed relative to $p+p$ collisions because of initial-state effects such as shadowing, energy loss and gluon saturation. Precise measurement of yields coming from small- x , small- Q^2 gluons are essential to understand these effects which have a significant contribution to the suppressions observed in A+A collisions at RHIC and LHC. The inverse Compton process $q+q \rightarrow \gamma+q \rightarrow \gamma+h$ is one of the few which can access and provide information on the gluon x and Q^2 in the region where nPDFs are not well constrained. The LHCb detector can measure photons through the Electromagnetic Calorimeter or photon conversion to dielectrons in the pseudorapidity range $2 < \eta < 5$, covering $x > 5 \times 10^{-6}$ and $Q^2 > 2 \text{ GeV}^2$ in the case of inverse Compton processes. This unique coverage allow us to search for the gluon saturation scale, the transition between dilute and saturated gluons, predicted by the Color-Glass Condensate effective theory. This presentation will show the status of the isolated γ +hadron correlation analysis using data collected in $p+\text{Pb}$ and $\text{Pb}+p$ collisions at 8.16 TeV and $p+p$ collisions at 8 TeV. New techniques will also be presented to identify isolated photons and subtract the large background from neutral meson decays.

Author: MUKHERJEE, Maitreyee (Central China Normal University CCNU (CN))

Presenter: MUKHERJEE, Maitreyee (Central China Normal University CCNU (CN))

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