Contribution ID: **908** Type: **Poster**

Searching for the gluon saturation scale at $x \sim 10^{-}5$ with the LHCb detector using direct photons

Wednesday, 6 April 2022 18:46 (4 minutes)

Because of the increasing gluon density towards small-x, a regime where these densities reach a saturation ($Q_{\rm sat}$) is expected. The observation of this gluon saturated matter has several consequences to particle production and is a matter of an entire effective field theory, the Color Glass Condensate. The Large Hadron Collider beauty (LHCb) experiment has a privileged geometry for the search of the gluon saturation achieving an unprecedent small-x coverage. The most direct measurement of gluon densities and kinematics in hadronic collisions is the inverse Compton process ($q + g \rightarrow \gamma + q$). The LHCb experiment measured pairs of isolated photons correlated with hadrons from the quark fragmentation in pPb and Pbp collisions at 8.16 TeV probing a Bjorken-x between $10^{-5} < x < 10^{-1}$ with a scale down to 5 GeV^2, well below the expected lower-limit $Q_{\rm sat}$ in Pb nucleus. This poster will detail the measurement and discuss it in the scope of the gluon saturation and competing effects such as partonic shadowing. A discussion on future LHCb upgrades towards the extension of the gluon saturation search will also be presented.

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Session Classification: Poster Session 2 T07_2

Track Classification: Correlations and fluctuations