

Hadron and prompt photon production in pA collisions at the LHC from the Color Glass Condensate

Thursday, 31 May 2012 15:20 (20 minutes)

I will show the results of our recent investigation of the inclusive hadron and prompt photon production in proton (deuteron)-nucleus (pA) collisions at RHIC and the LHC within the Color Glass Condensate (CGC) framework. We investigate the contribution of inelastic and elastic processes to single inclusive hadron production in proton-proton and pA collisions at RHIC and the LHC. Using the hybrid formulation which includes both elastic and inelastic contributions, supplemented with the running-coupling Balitsky-Kovchegov equation, we get a good description of RHIC data. It is shown that inclusion of the inelastic terms makes the transverse momentum dependence of the production cross section steeper in the mid-rapidity region but does not affect the cross section in the very forward region. The inelastic processes also lead to a sharper increase of the nuclear modification factor $R_{\{pA\}}$ with increasing p_T . For the inclusive (and semi-inclusive) prompt photon production, we divide the k_t factorized cross-section obtained in the CGC approach to the direct and fragmented part and investigate which part is more sensitive to the gluon saturation. We also investigate azimuthal photon-hadron correlations at the LHC and RHIC at various rapidities. We show predictions for the nuclear modification factor for both inclusive hadron and prompt (and isolated) photon production in pA collisions at the LHC at various rapidities. We will compare the predictions for $R_{\{pA\}}$ for both inclusive hadron and prompt photon production coming from the collinear and the k_t factorization approach at the LHC. The forthcoming day-one LHC measurement of hadron multiplicity in pA collisions is a crucial test of the k_t factorization and gluon saturation based models. We provide quantitative predictions for the pseudo-rapidity distribution of charged particles produced in minimum bias pA collisions at the LHC based on the idea of gluon saturation in the CGC framework.

My talk is based on the following papers:

- 1: J. Jalilian-Marian and A. H. Rezaeian, "Hadron production in pA collisions at the LHC from the Color Glass Condensate", Phys. Rev. D85, 014017 (2012) [arXiv:1110.2810].
- 2: A. H. Rezaeian, "Charged particle multiplicities in pA interactions at the LHC from the Color Glass Condensate", Phys. Rev. D85, 014028 (2012)[arXiv:1111.2312].
- 3: J. Jalilian-Marian and A. H. Rezaeian, "Prompt photon production and photon-hadron correlations at RHIC and the LHC", To be published.

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