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Baryon Number Fluctuations and Quark Correlations in the CGC Framework

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We calculate the two particle correlation function for the net baryon number fluctuations using the saturation/Color Glass Condensate (CGC) framework in proton-nucleus and heavy-light ion collisions. We show that the main contribution to the net baryon number fluctuations at mid-rapidity comes from $q\bar{q}$ pair production in the transverse plane. There are three intrinsic length scales associated with this process: the transverse size of the baryon fluctuation $r_\perp$, the inverse of the saturation scale Q_s^{-1} and the inverse of the mass $M_{q(\bar{q})}^{-1}$ for heavy massive quarks. We identify two regimes determined by the dominant scale $R_{max} = \max(Q_s^{-1}, M^{-1})$ and discuss in detail the properties of each regime as one varies the transverse scale of the baryon fluctuation $r_\perp$. In proton-nucleus collisions the net baryon correlation function is suppressed when $r_\perp > R_{max}$, while for heavy-light ion collisions this correlation extends up to the typical transverse size of the nucleus. These baryon number fluctuations generate non-trivial correlations which may propagate into the subsequent hydrodynamical evolution of the expanding fireball.

On behalf of collaboration:

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