BRAHMS measurements at forward rapidities in d-A collisions at RHIC and the formation of the Color Glass Condensate

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The initial state and early stages of heavy ion collisions at RHIC must be described by partonic degrees of freedom. The energy achieved in present day accelerators is enough to study parton distribution functions at $x \approx 0$. HERA deep inelastic scattering results indicate that as the energy increases, the gluon distribution function saturates and enters a non linear regime as x approaches 0. Recent theoretical work has shown that this limiting behavior can be reached at lower energies with heavier targets because the momentum scale for this saturation grows as a power of A. The description of matter in this new regime is called the Color Glass Condensate (CGC) [1]. Calculations that assume the formation of CGC in the initial state have been succesful in their description of coherent particle production in Au-Au collisions at RHIC [2] and predict, among other effects, a hardening of the transverse momentum distributions in the nucleon fragmentation region in p-A collisions [3]. During Run III, RHIC provided d+Au and p+p collisions at $\sqrt{s_{NN}} = 200GeV$. The BRAHMS collaboration collected large data samples at $\eta = 0$ and 3. In this talk we will present comparisons of transverse momentum distributions between d-Au and p-p collisions for charged hadrons and identified hadrons at these rapidities. These results will also be compared with available model predictions. We will also present rapidity distributions for different ranges of transverse momenta and discuss these results within the context of a possible formation of the CGC at RHIC.

References

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