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Beyond Color Glass Condensate: particle production at both low and high transverse momenta

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We propose and develop a new formalism that generalizes the Color Glass Condensate approach to high energy scattering by including both small and large x gluons in the wave function of a target proton or nucleus. This allows one to treat particle production at both low and high transverse momenta on the same footing. We illustrate the formalism by calculating the differential cross section for scattering of a quark (or gluon) on a target proton or nucleus and show that inclusion of both small and large x gluon modes in the target allows one to investigate forward-backward (in rapidity) asymmetries in high energy collisions. It also leads to both even and odd anisotropic flow coefficients v_n in proton-proton and proton-nucleus collisions as well as double spin asymmetry A_{LL} in polarized proton-proton (light nucleus) scattering. We comment on how the formalism can be extended to study jet energy loss in Quark-Gluon Plasma created in high energy heavy ion collisions.

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