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Double-Spin Asymmetries in Polarized p+p Collisions and k_T Factorization at Small x

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Double spin asymmetries for particle and jet productions in longitudinally polarized proton-proton collisions have been the flagship measurements at RHIC to study proton's spin content originating from gluons. Conventional theoretical framework used to extract gluons' helicity distribution relies on the collinear factorization framework which is applicable primarily when there exists a large external momentum. In this talk, I will discuss a transverse momentum dependent framework developed to be applicable at small x and derived a formula for the double-spin asymmetry of gluon productions at the central rapidity region of p+p collisions. The formula is projectile and target symmetric. Expressed in a k_T factorized form, the formula involves a convolution of the gluon helicity TMDs and twist-3 helicity-flip TMDs originating from both the projectile and the target. It is further argued that small x evolution can be effectively included by evolving these TMDs in the double logarithmic approximation.

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