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Partonic Orbital Angular Momentum in QCD

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We show that Generalized Transverse Momentum Distributions (GTMDs) and Generalized Parton Distributions (GPDs) can be connected by Lorentz Invariant Relations (LIRs). The GTMDs have an explicit dependence on the partonic intrinsic transverse momentum and the case of unpolarized quarks in a longitudinally polarized proton is known to connect to Orbital Angular Momentum (OAM) through the GTMD F14. In a separate approach, the GPD E˜2T can be shown to connect to OAM. However, since GPDs are collinear we need to look at a higher twist GPD (like E˜2T) that includes implicit quark gluon interaction to imitate the effects of intrinsic transverse momentum in GTMDs. We show that these two definitions are infact connected by an LIR. These relations are valid for other GTMDs and GPDs as well such as the GTMD G11 which describes quark spin orbit correlations in the proton.

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