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Transverse momentum weighted transverse spin asymmetries at COMPASS

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The hadron structure is commonly described by transverse momentum dependent (TMD) parton distribution functions (PDFs), which encode all possible correlations between the hadron spin, the parton spin and the transverse component of the parton momentum k_T . They have been studied by COMPASS in semi-inclusive deep inelastic scattering (SIDIS) and Drell-Yan (DY) reactions with transversely polarised proton targets by measuring the transverse spin asymmetries (TSAs). The TSAs in SIDIS contain convolutions over the transverse momentum of TMD PDFs and TMD fragmentation functions (FFs). Similarly, the TSAs in DY are interpreted as convolutions of the TMD PDFs of the target and beam hadrons. To extract the TMD PDFs, an ansatz for their dependence on k_T^2 is needed. Different observables –the transverse momentum weighted TSAs – were proposed a long time ago. Instead of convolutions, they contain products of various k_T^2 -moments of the TMD PDFs and FFs. To measure the weighted TSAs, one needs to weight the events with correct powers of the transverse momentum of the final state hadron in SIDIS or of the dimuon in DY. COMPASS has recently measured the weighted TSAs in both SIDIS and DY to complement its results on the standard TSAs. Thanks to their straightforward interpretation, the Sivers functions measured in SIDIS and DY can be directly compared. Additionally, COMPASS also obtains information on the pion valence Boer-Mulders function, the correlation of the parton transverse spin and its k_T .

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