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Measurement of q_T-weighted transverse-spin-dependent azimuthal asymmetries at COMPASS

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COMPASS is a fixed-target experiment in operation at the CERN North Area (SPS, M2 beam-line) since 2002. An important part of its broad physics programme is dedicated to the exploration of the transverse spin-structure of the nucleon studying target spin-(in)dependent azimuthal asymmetries arising in the Semi-Inclusive DIS (SIDIS) and Drell-Yan (DY) cross-sections. Recently, COMPASS has also extracted the transverse spin-dependent azimuthal asymmetries (TSAs) weighted with the transverse momentum of the detected hadron (SIDIS, $p_{T,h}$) and the virtual photon (DY, q_T). In the transverse momentum dependent (TMD) QCD approach, the conventional TSAs are interpreted as convolutions of the beam pion and of the transversely polarized target proton TMD parton distribution functions (PDFs), while the q_T-weighted TSAs can be interpreted directly in terms of their products.

In 2015 and 2018 the Collaboration performed two years of Drell-Yan data taking with a 190 GeV/c π^- beam impinging on a transversely polarized NH_3 target. The analysis of the q_T-weighted TSAs performed on these two data-sets is presented in this paper. The results are then compared with the expectation based on the weighted Sivers asymmetry measured in the SIDIS process. Similarly, also the Boer–Mulders function of the pion and proton are investigated.

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