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Overview of COMPASS Experimental Program for GPDs and TMDs

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COMPASS is a fixed target experiment at the CERN SPS taking data since 2002. A major part of the COMPASS program at CERN is dedicated to the investigation of the 3 dimensional structure of the nucleon which can be reached measuring the spin and transverse momentum dependent distributions (TMDs) and generalized parton distributions (GPDs).
TMDs have been investigated at COMPASS in semi-inclusive processes (SIDIS) using scattering of 160 GeV longitudinally polarized muons on transversely polarized targets. This includes the measurements of the Collins and Sivers asymmetries observed in production of single pions or kaons on both proton and deuteron targets, as well as all the other six asymmetries in the case of non identified hadrons. The large statistics cumulated with the proton target allows multidimensional analysis to investigate for example Q2 evolution. The similarity of Collins effects induced by single and di-hadron production will be discussed. New results on the Sivers gluon asymmetry on protons and deuterons will also be given. Finally the first-ever polarized Drell-Yan experiment using scattering of 190 GeV pions on a transversely polarized target which is presently performed at COMPASS in 2015 will be presented. This will allow the measurement of the TMDs functions in both SIDIS and DY and the study of their universality in the same kinematical domain with a same apparatus.
GPDs are experimentally accessible via lepton-induced exclusive reactions, in particular the Deeply Virtual Compton Scattering (DVCS) and Deeply Virtual Meson Production (DVMP). A complete measurement of the eight asymmetries for exclusive rho0 and omega productions have already been performed by COMPASS at the same time than the SIDIS studies using the transversely polarized target but without any recoil particle detection. Results which involve GPD H and E and also chiral-odd or transverse GPDs will be presented. In 2016 and 2017 DVCS and DVMP will be investigated using the muon beam of 160 GeV and a 2.5 m long liquid hydrogen target. In order to optimize the selection of exclusive reactions at those energies, the target will be surrounded by a newly built barrel-shaped time-of-flight system to detect the recoiling particles. The option to change simultaneously the charge and polarization of the muon beam in the DVCS process will allow to access both real and imaginary parts of the Compton form factor related to the dominant GPD H. Moreover the xBj-dependence of the nucleon transverse size will be investigated via the pure DVCS or meson cross sections. In parallel to the DVCS and DVMP, SIDIS measurements will provide clean cross section data for the extraction of multiplicities and possibly of the Boer Mulders function from the azimuthal modulations.

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