

The Polarized Target for Polarized DY Experiment in COMPASS at CERN

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A COMPASS (Common Muon Proton Apparatus for Structure and Spectroscopy) group researches hadron structure and hadron spectroscopy with high intensity muon and hadron beams.

In 2015, COMPASS performed a polarized DY experiment to measure transverse momentum dependent parton distributions. A π^- beam with momentum 190 GeV/c and a transversely polarized proton target (PT) were used.

The COMPASS PT system consists of a dilution cryostat, polarization measurement system, solenoid and dipole magnets. Solid ammonia beads with paramagnetic centers are used as a proton target material. The ammonia beads are contained in 2 target cells of 55 cm long and 4 cm diameter. The target cells are put on beam line with 20 cm gap. The dilution cryostat can cool down to 50 mK and achieve the high cooling power 350 mW at 300 mK. High polarization about 80 - 90% can be obtained by dynamic nuclear polarization method. The polarization is measured by nuclear magnetic resonance.

In the polarized DY experiment, targets were polarized to longitudinal direction with the 2.5 T solenoid magnet. The maximum polarization was about 80% in 24 hours. After polarization, the direction of the polarization was rotated to transverse direction by changing the field of the solenoid and the 0.6 T dipole magnet. The polarization was kept with the dipole magnet while physics data taking. The polarization was decreased exponentially in this duration. The relaxation time was typically 1000 hours. It was the first attempt to irradiate high intensity hadron beam on PT at COMPASS and the effect of secondly particles on the maximum polarization and the relaxation time was observed.

In this talk, the proton polarization, the COMPASS PT, results of the polarized DY experiment will be discussed.