

Title: Low temperature polarized target for spin structure studies of nucleons at COMPASS

Author: Bc. Michael Pešek

Department: Department of low temperature physics

Supervisor of the master thesis: prof. Ing. Miroslav Finger, DrSc.

Abstract: In presented thesis we describe concept of Deep Inelastic Scattering of leptons on nucleons in context of nucleon spin structure studies. Both polarized and unpolarized cases are discussed and concept of Transverse Momentum Dependent Parton Distribution Functions (TMD PDF) is introduced. The possibility of TMDs measurement using Semi-inclusive DIS (SIDIS) is described along with related results from COMPASS experiment. The future Drell-Yan programme at COMPASS is briefly mentioned and its importance is presented on the universality test i.e. change of sign of T-odd TMDs when measured in Drell-Yan and SIDIS. The importance of Polarized Target (PT) for spin structure studies is highlighted and principles of Dynamic Nuclear Polarization (DNP) are given using both Solid effect and spin temperature concept. COMPASS experiment is described in many details with accent given to PT. Finally the thermal equilibrium (TE) calibration procedure is described and carried out for 2010 and 2011 physics runs at COMPASS. The average polarization measurement results from 2010 and 2011 are presented along with relaxation times. Various uncertainties of the polarization measurement are also discussed.

Keywords: spin structure of nucleon, parton distribution function, dynamic nuclear polarization, nuclear polarization measurement