Deuteron Polarimetry at COSY

D. Chiladze^{1,2}, K. Grigoriev^{1,3}, A. Kacharava^{1,4}, F. Rathmann¹, C. Wilkin⁵, and H. Ströher¹ for the ANKE Collaboration

¹ Institut für Kernphysik, Forschungszentrum Jülich, 52428 Jülich, Germany
² High Energy Physics Institute, Tbilisi State University, 0186 Tbilisi, Georgia
³ High Energy Physics Department, Petersburg Nuclear Physics Institute, 188350 Gatchina, Russia
⁴ Physikalisches Institut II, Universität Erlangen-Nürnberg, 91058 Erlangen, Germany
⁵ Physics and Astronomy Department, UCL, London WC1E 6BT. U.K.

The vector P_z and tensor P_{zz} polarizations of a deuteron beam have been measured using elastic deuteron-carbon scattering at 75.6 MeV and deuteron-proton scattering at 270 MeV. After acceleration to 1170 MeV inside the COSY storage ring, the polarizations of the deuterons were remeasured by studying the analyzing powers of a variety of nuclear reactions. For this purpose a hydrogen cluster target was employed at the ANKE magnetic spectrometer, which is situated at an internal target position in the ring. The overall precisions obtained were about 4% for both P_z and P_{zz} . Although all the measurements were consistent with the absence of any depolarization during acceleration, only an upper limit of about 6% could be placed on such an effect. For polarization measurements at higher energies, the polarization export technique will be used.

The aim of our experimental programme is the direct reconstruction of the spin-dependent amplitudes, including relative phases, of large angle neutron-proton elastic scattering, through the study of the p(d, 2p)n charge-exchange reaction, up to the highest available deuteron energy at COSY (2.3 GeV).