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Measurement of deuteron beam polarization before and after acceleration

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Abstract

Beam polarization measurement in scattering experiments with a high accuracy and the lowest possible cost is an important issue. In this regard, deuteron beam polarization was measured in the low-energy beam line easily with a relatively low cost procedure and in a very short time by Lamb Shift Polarimeter (LSP). Also, the beam polarization has been measured in high-energy beam line with BINA. In low-energy line, a polarized beam of deuterons delivered by POLIS was decelerated and focused on LSP detection system. Three resonances between 52mT and 63mT show the distribution of different spin states of polarized deuteron beam. In high-energy beam line, polarization can be measured employing BINA via the H(d,d)p reaction. The asymmetry ratio σ / σ_0 , was obtained as a function of azimuthal angle, φ , for several polar scattering angles. Knowing values of the analyzing powers, the ratio has been used to extract the polarization results. The obtained results show that polarization of deuteron beam that is accelerated up to the energy of 130 MeV is almost the same before and after acceleration.

Keywords: nuclear spin, polarization, Lamb-shift polarimeter, cross-section, analyzing power, elastic scattering

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