

SPIN OBSERVABLES OF pd ELASTIC SCATTERING AT 20 – 50 GeV/c WITHIN THE GLAUBER MODEL AND pN AMPLITUDES

Saturday, October 17, 2020 10:15 AM (25 minutes)

Spin amplitudes of pp - and pn elastic scattering contain important information on the dynamics of the NN interaction. Systematic information on these amplitudes is accumulated in the SAID data base [1] and available up to kinetic energy 3 GeV for pp and 1.2 GeV for pn scattering. At higher energies there are only non-complete data on pp scattering, whereas information about the pn amplitudes is very poor. In the literature there are some parametrizations for pN amplitudes obtained in the eikonal model [2] and within the Regge phenomenology for 3 - 50 GeV/c [3]. A possible way to check the existing parametrizations is to study spin effects in proton-deuteron (pd) and neutron-deuteron (nd) elastic and quasi-elastic scattering. At high energies and small four-momentum transfer t pd scattering can be described by the Glauber diffraction theory of multistep scattering, which involves as input on-shell pN elastic scattering amplitudes. Application of this theory with spin-dependent effects included [4] demonstrates a good agreement with the pd scattering data at energies about 1 GeV if the SAID data on pN scattering amplitudes are involved into calculations [4,5]. Here we apply the spin-dependent Glauber theory [4] to calculate spin observables of pd elastic scattering at 20 - 50 GeV/c using available pp elastic scattering amplitudes f_{pp} parametrized in Ref. [3] within the Regge formalism. As a first approximation, for pn elastic scattering we use pp amplitudes from [3]. We should note that the Regge formalism allows one to construct pn - (and antiproton N) amplitudes together with the pp amplitudes. However, in view of scarce experimental information about the spin dependent pn amplitudes, and taking into account that the spin-independent parts of the pp - and pn amplitude at high energies are approximately the same, we put here $f_{pn} = f_{pp}$. The calculated vector (A_y^p, A_y^d) and tensor (A_{xx}, A_{yy}, A_{zz}) analysing powers and the spin-correlation coefficients like $C_{y,y}^p, C_{y,yy}^p, C_{x,x}^p$ can be measured at SPD NICA [6] that will provide a serious test of the used pN amplitudes.

1. R.A.Arndt et al., Phys. Rev. C 76 (2007) 025209.
2. S.Wakaizumi, M.Sawamoto, Prog. Theor. Phys. 64 (1980) 1699.
3. A.Sibirtsev et al., Eur. Phys. J. A 45(2010) 357.
4. M.N.Platonova, V.I.Kukulin, Phys.Rev.C 81 (2010) 014004; Eur.Phys.J. A56 (2019) 132.
5. A.A.Temerbayev, Yu.N.Uzikov, Yad. Fiz. 78 (2015) 38.
6. I.Savin et.al., EPJ Web Conf. 85 (2015) 02039.

Primary authors: UZIKOV, Yuriy (JINR); HAIDENBAUER, Johann (IAS, Forschungszentrum Jülich GmbH); TEMERBAYEV, Azamat (Eurasian national university); BAZAROVA, Albina (L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY)

Presenter: UZIKOV, Yuriy (JINR)

Session Classification: Section 4. Relativistic nuclear physics, elementary particle physics and high-energy physics

Track Classification: Section 4. Relativistic nuclear physics, elementary particle physics and high-energy physics.