SPIN CORRELATION IN ELASTIC SCATTERING OF 605 MeV POLARIZED PROTONS ON PROTONS

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In the present work, carried out on the synchrocyclotron of the Laboratory of Nuclear Problems of the JINR, the spin-correlation coefficients C_{nn}, C_{kp}, and C_{qkn} for elastic scattering of polarized 605-MeV protons by protons at a 90° angle in the center-of-mass system (the index q refers to the direction of the polarization vector of the incident beam) were measured.

A polarized beam with an energy of 605 MeV and a transverse polarization $P_1 = 0.43 \pm 0.03$ was used. This beam fell on a polyethylene target of the measuring installation, which was set up in such a way that the direction of polarization of the beam lay in the plane of the studied scattering.

Scattered protons and recoil protons were recorded by coupled telescopes of scintillation counters connected for coincidence, and fell upon identical spark chambers. Each chamber consisted of 25 aluminum electrodes, which played the role of analyzing targets.

Only those tracks, which corresponded to scattering of protons on both analyzers by angles lying in the interval $9° \leqslant \theta \leqslant 30°$, were used in the determination of the components of the correlation tensors. The total number of cases recorded on the processed part of the film was 1530.

To determine the spin-correlation coefficients when processing the experimental results, the method of maximum likelihood was used. For proton-proton scattering at an angle $\theta_{CM} = 90°$ the probability function has the form

$$L = \prod_i^N [1 + C_{nn}\pi_1(\theta_i)\,\pi_2(\theta_i)\cos\varphi_{1i}\cos\varphi_{2i} + C_{kp}\pi_1(\theta_i)\,\pi_2(\theta_i)\sin\varphi_{1i}\sin\varphi_{2i} + C_{qkn}P_1\pi_1(\theta_i)\,\pi_2(\theta_i)(\sin\varphi_{1i}\cos\varphi_{2i} + \cos\varphi_{1i}\sin\varphi_{2i})]. \quad (1)$$

where i is the number of the correlation event; $\pi_1(\theta)$ and $\pi_2(\theta)$ are the analyzing powers of the analyzer targets. The indices 1 and 2 correspond to a scattered proton and to a recoil proton, respectively.

In writing the expression for L, use was made of the following property of the spin-correlation coefficients: $C_{qkn}(90°) = -C_{qnp}(90°)$. We obtained

$$C_{nn}(90°) = 0.43 \pm 0.34;$$
$$C_{kp}(90°) = 0.25 \pm 0.33;$$
$$C_{qkn}(90°) = 0.47 \pm 0.56.$$

The values of $C_{nn}(90°)$ and $C_{kp}(90°)$ do not contradict within the error limits the values obtained in [1, 2].

REFERENCES

1. Golovin B. M. et al. JETP, **41**, 83 (1961).
2. Nikanorov V. I. et al. JETP, **42**, 1209 (1962).