

ELASTIC PROTON SCATTERING BY NUCLEI ${}^7\text{Be}$ AND ${}^8\text{B}$ AT ENERGY 700 MeV

Tuesday, 12 July 2022 17:30 (20 minutes)

In this paper, based on Glauber's diffraction theory, we analyze the results of a recent experiment [1] on the scattering of protons by ${}^7\text{Be}$ and ${}^8\text{B}$ nuclei at an energy of 0.7 GeV/nucleon, in the range of momentum transfer $0.002 \leq |t| \leq 0.05$ (GeV/c)². The experiments were carried out by the GSI-PNPI collaboration (Germany-Russia) on the GSI radioactive beam (Darmstadt, Germany) in inverse kinematics.

In our calculations, the internal state of the ${}^7\text{Be}$ and ${}^8\text{B}$ nuclei under study are described on the basis of (α - τ) two- and (α - τ -p) three-particle cluster models, respectively. The wave functions of these nuclei [2], obtained on the basis of the above cluster models, describe well their static characteristics.

The parameters of the elementary NN- and $N\alpha$ -amplitudes required for our calculations are taken from other works. However, there are currently no data on elementary $N\tau$ amplitudes in the scientific literature. In this connection, we separately considered elastic $p^3\text{He}$ scattering in the kinematic region in which it corresponds to our calculations for proton scattering by ${}^7\text{Be}$ and ${}^8\text{B}$. We succeeded in describing satisfactorily the experimental data on $p^3\text{He}$ scattering [3]. Further, the calculation scheme used here was transferred to calculations on $p^7\text{Be}$ and $p^8\text{B}$ scattering.

Our calculations of proton scattering by ${}^7\text{Be}$ and ${}^8\text{B}$ are in good agreement with the data of [1]. However, these experiments were performed for small scattering angles. We carried out calculations up to scattering angles of $\sim 50^\circ$ and determined the contributions to the cross section from one-, two-, and three-fold scattering. At small angles, single scattering dominates, the contribution of double scattering is compared with it in the region of 25° . The contribution of triple scattering in elastic $p^8\text{B}$ scattering appears at 40° . In the future, it is planned to carry out similar calculations on the scattering of π - and K-mesons and to carry out a comparative analysis of the obtained calculations.

This work is carried out within the framework of the scientific project AP08855589

1. A.V. Dobrovolsky et al. / Distribution of nuclear matter in proton-rich ${}^7\text{Be}$ and ${}^8\text{B}$ nuclei by elastic scattering of protons of intermediate energies in inverse kinematics/ Nuclear Physics A 989 (2019) 40–58
2. Dubovichenko S.B. (2011) Thermonuclear processes of the Universe. Almaty, Fesenkov V.G. Astrophysical Institute "NTsRT" NSA RK, 402. (in Russian).
3. Abdramanova G.B., Imambek O., Nadir A., Myrzabaeva M. / Elastic scattering of protons on ${}^3\text{He}$ nuclei at intermediate energies / Proceedings of the Academy of Sciences of the Republic of Kazakhstan 1 (341) (2022) 117-123

The speaker is a student or young scientist

No

Section

1. Experimental and theoretical studies of nuclear reactions

Primary author: IMAMBEK, Onlassyn

Presenter: IMAMBEK, Onlassyn

Session Classification: Experimental and theoretical studies of nuclear reactions