# Structural Features of $^6He$ Nucleus in Elastic Scattering of Protons in Inverse Kinematics

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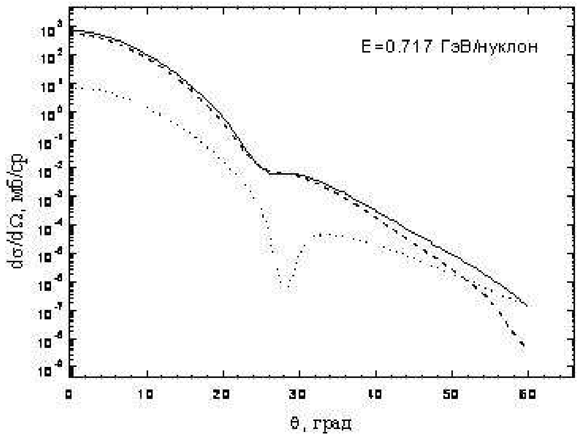
Important information about the structure of radioactive nuclei of unstable isotopes gives the measurement of differential cross sections (DS) of proton scattering on these nuclei in inverse kinematics. These measures led to the discovery of halo, irregularities in the filling of shells, a new type of collective excitations at low energies (soft-dipole resonance), etc. From the analysis of differential and total cross sections of high-energy interaction of $^6$He with light nuclei concluded its structure, consisting of $\alpha$-particle core and 2-neutron halo [1].

In this paper we study the elastic scattering of protons in the nucleus 6 in inverse kinematics, when the beam of radioactive nuclei flies on a resting hydrogen target is. Proton as a target, has the advantage of the interaction, as it is stable and the mechanism of proton - nucleus scattering is relatively simple.

The calculation of the differential cross sections for elastic and inelastic p$^6$He-scattering conducted within Glauber multiple scattering theory. As shown by previous studies [1], the calculation of the differential scattering cross sections for exotic nuclei are very sensitive to input parameters, in particular, to the wave function (WF) of $^6$He. Therefore, the calculation of cross sections was performed with different model wave functions of the nucleus $^6$He: shell-and three-body nn. The latter is calculated in [2] with realistic potentials of intercluster interactions and well reproduces the basic spectroscopic characteristics of the nucleus: the mean square radius, binding energy, the position of low energy levels, magnetic moment, and its electromagnetic formfactors. The wave function of the ground state is defined by two configurations: S-wave, whose weight is $95.7\%$ and P-waves, with a weight of about $4.3\%$. The figure shows the dependence of DS on the contribution of different components of the three-particle wave functions: dot-dashed curve - the contribution of S-waves, the point - the contribution of P-wave, solid - total contribution. The figure shows that the cross section calculated with the S-components, in accordance with its weight makes a major contribution and completely dominates at small scattering angles. However, for large angles the contribution of the P wave is compared with the contribution of S-wave and even exceeds it by filling out the second minimum, which is available




in the section with the S-wave, thus somewhat increasing the total cross section.

## References

[1] Zhukov M.V. et al., *Yadernaya Physica(in russian)*, **65** (2002) 779.

[2] Kukulin V.I. et al., *Nucl. Phys. A*, **453** (1986) 365.