ON THE POSSIBILITY OF STUDYING CLUSTER STRUCTURE OF LIGHT NUCLEI BY PROTON QUASIFREE SCATTERING AT LOW ENERGIES

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Availability of radioactive nuclear beams led to the discovery of unusual structure at the periphery of the nucleus – a neutron or a proton halo. However, even for the most studied ^{6}He halo nucleus the structure of its halo (dineutron or cigar-like configuration) is not completely determined.

In this work, we consider a possibility to study the structure of halo nuclei (^{6}He, ^{8}He) using the reaction of quasifree scattering (QFS) of proton by the clusters composing these nuclei. As clusters of ^{6}He and ^{8}He we considered ^{6}He, ^{4}He, n and ^{2}n. To determine the kinematical regions allowed for proton kinematical calculations were performed for reactions ^{6,8}He + p→ p + C + S, where C and S are clusters constituting the halo nucleus: cluster C is involved in proton QFS, and cluster S is a spectator. By definition, the spectator does not undergo scattering and continues moving with the same total momentum as that which it had in the incident halo nucleus.

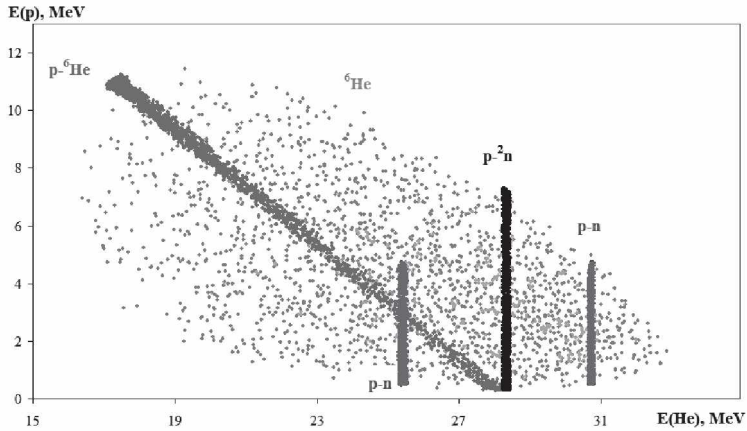

Fig. 1. Two-dimensional plot E_{He}–E_p for proton QFS by clusters of ^{8}He (kor ^{6}He). E_{8He}=40 MeV. Grey dots represent calculation for ^{8}He+p→^{6}He+p+n+n breakup reaction.

The simulation results for proton QFS by ^{6}He, n and ^{2}n clusters of ^{8}He are presented in Fig. 1 as a two-dimensional plot E_{He}–E_p. One can see that events of quasifree proton scattering by different clusters occupy different regions in the two-dimensional Dalitz plot. Thus we can hope that experimental study of proton quasifree scattering by constituents of halo nuclei allows one to determine their cluster structure.