THE PHENOMENON OF DIFFRACTION RISE OF CROSS SECTIONS IN THE FORWARD HEMISPHERE OF ANGLES AS THE EFFECT OF NUCLEAR AND CLUSTER INTERFERENCE

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Meitner has proposed in 1921 the idea that the main structural unit of the nucleus is an alpha particle. Rutherford also adhered to the concept Meitner, assuming that the core consists of alpha particles [1].

The clustering of nuclear structure is understood in two ways in modern physics of clusters. First, the wave function of the nucleon associations can be "spread" over the entire volume of the nucleus with an increased probability of correlated motion of nucleons, regardless of their spatial localization in the nucleus. At the same time an effective amount of alpha-clusters in the nucleus is much more than *A*/4 [2]. Secondly, from the inception of the concept of clusters been attempts detections nucleon associations based on the concept of separate clusters in the volume of the nucleus. For example, the irradiation of light nuclei by high-energy protons observed dominant to fly alpha particles.

In this paper we attempt to search for the effects of separate clusters in the angular distributions of elastic scattering at the wavelength variation of the incident alpha particles is $\lambdabar \le R_\alpha < R$. There is well known phenomenon of the rise of differential cross sections in the forward hemisphere of angels in physics of the elastic scattering of light ions on light nuclei. To explain the effect of rise the cross section based on the consideration of light nuclei as much alpha-clustered structures: ^{12}C nucleus consists of three alpha clusters ^{16}O - four alpha-clusters and so on until the nucleus ^{40}Ca. Description cross section multi-cluster structure of the nucleus in the spatial differentiation of alpha-clusters can be represented in a simplified manner without Coulomb amplitude as the square of the sum of the amplitudes of scattering particles on the absorbent black core and absorbing black components - alpha-clusters

$$\sigma'(\theta) = D_0 \left| \sum_{i=1}^{n} A_i(R_i, \theta) \right|^2 = D_0 \left| \sum_{i=1}^{n} a_i \cdot J_1(kR_i\theta) \right|^2,$$

where D_0 - the normalization factor; $A_i(R_i, \theta)$ – amplitude at the *i*-th cluster substructure of the nucleus; a_i – relative statistical weight of diffraction scattering at the *i*-th cluster of the nucleus; *n* - number of cluster structures in the nucleus. A global analysis of the angular distributions, apparently, clearly shows the existence of spatially separate alpha clusters evident in the effect of rise cross sections.

1. G.A.Hakimbaeva. Historical Review. 1975. 105 p.
2. V.G.Neudachin *et al.* Nucleon Associations in Light Nuclei. 1968. 414 p.