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Diffraction processes in elastic scattering of 4n nuclei on light and medium nuclei

Due to the fact that the influence of cluster states, both excited and ground, quite strongly influences the properties of the light nuclei under study, the study of such multicluster nuclear structures is an urgent task [1-2]. Within the framework of the diffraction theory and under the assumption of complete absorption within the interaction sphere, in this work the results obtained earlier in [3-5] were systematized, and new data were obtained on the expansion of the total amplitudes of the angular distributions of the differential cross sections for elastic scattering of light 4n nuclei (4-He, 12-C, 16-O) on nuclei up to 40-Ca. Studying such diffraction processes using the method [3] makes it possible to identify partial scattering amplitudes and their contribution to the total amplitude, which characterize the multicluster structure of nuclei of either 4n-nuclei or 4n±1 nuclei. For a comprehensive analysis of the multicluster structure of nuclei, an experimental technique for direct detection of cluster structures in a nucleus was proposed in [4]. For other nuclei, the manifestation of cluster states is strongly suppressed by others, for example, shell effects or collective states of nucleons, so that analyzing the contribution of cluster partial amplitudes within the framework of this method does not seem trivial, and for some nuclei, it is not possible.
From the analysis of previous results and the results of this work, it was obtained and shown that basically the interference between cluster partial amplitudes and the amplitude responsible for scattering on the nucleus as a whole has maxima at interaction radii from 0.5 to 1.5 fm.

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Section

Nuclear structure: theory and experiment

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