Contribution ID: **61** Type: **Poster Contribution**

A new scattering chamber for conducting precision experiments on the heavy-ion reaction cross sections at the accelerator DC-60 (Astana, Kazakhstan) at low energies

Within the framework of the long-term program of cooperation between JINR, ENU and Institute of Nuclear Physics (INP), joint experiments connected with the peculiarities of the interaction of lithium nuclei (6-9,11Li) at energies near the Coulomb barrier will be conducted on the U-400M cyclotron of G.N. Flerov Nuclear Reaction Laboratory (FLNR JINR) and on the DC-60 accelerator (Astana) of the INP. To obtain new experimental information on the properties of weakly bound (cluster and exotic) lithium nuclei (the entire chain of lithium isotopes) and their manifestation in interaction with other nuclei, the features of the angular distributions of elastic and inelastic scattering cross sections, the energy dependences of the total reaction cross sections (σR(E) and cross sections of individual dominant reaction channels; the corresponding reaction mechanisms in the previously unexplored region of energy will be studied.
Experiments in Astana (Kazakhstan) are supposed to be carried out at the DC-60 using a new scattering chamber and corresponding detector systems and nuclear electronics, which was manufactured at the FLNR JINR. The new dispersion chamber for the DC-60 is a completely new modern installation, which includes a new electronic system for collecting and processing experimental information FASTER.
Control experiments using the new camera will be conducted on beams 6,9,11Li at the FLNR JINR and on 7Li nuclei – on the DC-60. These nuclei (6,7,9Li) have a weakly bound cluster structure, and the 11Li nucleus is an exotic nucleus with a very low binding energy (Ebind = 0.3 MeV). In such experiments, we are expected to detect the features of their manifestation in nuclear reactions near the Coulomb barrier: subbarrier fusion, an increase in the cross section for cluster transfer reactions, features in the angular distributions of elastic and inelastic scattering, and features in σR(E. The obtained information is of great importance for fundamental nuclear physics and in other fields of science, for example, for describing the scenario of nucleosynthesis in astrophysics.

Summary

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