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**N. Burtebayev[1], Zh.K. Kerimkulov[1,3], D.K. Alimov[1,2], A.M. Otarbayeva[3], Y.S. Mukhamejanov[1,2], D.M. Janseitov[1,2]**

[1]INP, Almaty, Kazakhstan; [2]al-Farabi KazNU, Almaty, Kazakhstan;
[3]L.N. Gumilev ENU, Astana, Kazakhstan,
e-mail: Diliyo@mail.ru

# STUDY OF ELASTIC SCATTERING OF DEUTERONS FROM $^6$Li AT ENERGY 18 MeV

**Abstract.** Differential cross sections of elastic scattering of deuterons from $^6$Li nuclei at energy 18 MeV were measured at U-150M accelerator. The measurements were performed with an accuracy of no more than 10%. One minimum and one maximum of cross sections are clearly seen in the angular distributions at small angles. The obtained data were analyzed within optical model, distorted wave method with a finite interaction radius and coupled reactions channel method. The optimal values of the optical interaction potential and spectroscopic factor were determined. It is shown that the potential scattering forms cross section only at low and medium angles. In the range of large angles cross sections are formed by α-cluster transfer mechanisms.

**Key words:** elastic scattering, light charged particles, optical potential, FRESCO, cluster transfer, spectroscopic factor.

**Introduction.** The study of the interaction of charged particles with lithium nuclei is of considerable interest in the light of that role to be played by these nuclei in nuclear technology, fusion energy and astrophysics. So, 6Li nucleus is one of the most important elements of the fuel cycle in the most promising projects of fusion reactors using deuterium-tritium fusion. In tritium reproduction it is assumed that lithium is included in the nearest shell to the plasma combustion region. This technique requires highly accurate data on the sections of different particles interaction with lithium nuclei, which can be obtained as by experimentation, and by calculations within certain nuclear models. Astrophysical aspect of relevance is connected primarily with questions of nucleosynthesis of light nuclei at the initial stage of evolution of the universe and the problem of unexpectedly high prevalence of lithium (and beryllium and boron) in cosmic rays, has on order above, as opposed to their theoretical estimates.

**Experimental procedure and measurement results.** Experiments were carried out in the isochronous cyclotron U-150M [1] of the Institute of Nuclear Physics of the Republic of Kazakhstan. The differential cross sections of elastic scattering of deuterons on 6Li nuclei were measured at an energy of 18 MeV in the angular range from 10° to 170° in the center-of-mass system. The total error of the data did not exceed 10%.

Charged particles in a cyclotron are formed in the source, located in the central part of the camera in an arc discharge when applying the appropriate gas (hydrogen, deuterium, helium-3, helium-4). Their accelerating happens in the interpolar space of 1.5-meter magnet at the time of flight of the particles between the dees.

When installing the operating parameters of particle acceleration special attention is given to the operating mode of the ion source, its duty cycle, microstructure of the current pulse and beam quality of the wiring on the target. This optimization of spatial and temporal characteristics of the beam made it possible to significantly reduce the level of various noise, uneven loading of electronic equipment.

The energy and the energy dispersion in the beam is determined by measuring the energy spectrum of the particles elastically scattered by thin gold targets set out in the laboratory cell scattering of low-energy