

STUDY OF THE INTERACTION OF α -PARTICLES WITH THE ^9Be NUCLEUS WITHIN THE FRAMEWORK OF THE COUPLED CHANNEL METHOD AT AN ENERGY OF 45 MEV

Maulen Nassurlla^{1,2}, N. Burtebayev^{1,2}, L.I. Galanina³, S.B. Sakuta⁴, S.K. Sakhiyev¹, Marzhan Nassurlla¹, D.A. Issayev^{1,2}, Duysebayev B.A.¹, Khojayev, R.A.¹, A.Sabidolda¹, K.A. Talpakova¹

¹ Institute of Nuclear Physics, Ministry of Energy of Republic of Kazakhstan, Almaty 050032, Kazakhstan

² Department of Physics and Technology, Al-Farabi Kazakh National University, Almaty 050040, Kazakhstan

³ НИИЯФ им. Д. В. Скобелъцына, МГУ имени М. В. Ломоносова, Москва 119991, Россия

⁴ NRC “Kurchatov Institute”, Moscow 123182, Russia

The ^9Be nucleus is one of the most famous exotic nuclei. Its properties - spectroscopy, electron scattering form factors, matrix elements of electromagnetic transitions and beta decays - have been well studied experimentally [1]. This makes it possible to test various models of the nucleus and neutron periphery on it in theoretical calculations. New experimental angular distributions of elastic scattering α -particles were measured on the extracted beams of the U-150M isochronous cyclotron of the Institute of Nuclear Physics of the Republic of Kazakhstan at an energy $E_{\alpha} = 45$ MeV. The metal foils made of beryllium were used as a target, the thickness of which was determined by weighing, as well as by the energy loss of α -particles of the radioactive source ^{241}Am , ^{243}Am , ^{244}Cm and ^{239}Pu with an accuracy of 7%. Registration and identification of scattered α -particles was carried out using the standard ΔE -E technique, implemented on the basis of a PC/AT personal computer. After processing the energy spectra, differential cross sections for the scattering of α -particles in center-of-mass systems at an energy of 45 MeV were obtained for the following levels of the ^9Be nucleus: the ground state ($3/2^-$), as well as for the excited states 2.43 MeV ($5/2^-$) and 6.38 MeV ($7/2^-$) in the angle range up to 166° (for elastic scattering).

An analysis of elastic and inelastic scattering of α -particles was carried out within the framework of the optical model and the coupled channel method using the FRESCO program [2]. Good agreement between the calculated data and the experimental differential cross sections has been achieved.

Funding: This work was supported by the program #BR23891530 (Development of integrated scientific research in nuclear and radiation physics on the basis of Kazakhstan’s accelerator complexes) of the Ministry of Energy of the Republic of Kazakhstan.

References:

1. F. Ajenberg-Selove, Nuclear Physics A 490, 1-225 (1988)
2. I.J. Thompson FRESCO, Department of Physics, University of Surrey, July 2006, Guildford GU27XH, England, version FRESCO 2.0, <http://www.fresco.org.uk/>

Section

Nuclear physics (Section 1)

Primary author: Dr NASSURLLA, Maulen (INP KZ)

Presenter: Dr NASSURLLA, Maulen (INP KZ)

Track Classification: The V International Scientific Forum “Nuclear Science and Technologies”: Nuclear physics (Section 1)