UDC 539.1

Study of the reaction $^{11}B(p,\alpha)\alpha\alpha$ in the 0.15-2.2 MeV proton beam energy range

A. A. Shuklina[1, 2]

[1] Budker Institute of Nuclear Physics, Novosibirsk
[2] Novosibirsk State University

The credible value of the $^{11}B(p,\alpha)\alpha\alpha$ reaction cross-section is essential for the proton therapy of cancer, the thermonuclear fusion and the nuclear astrophysics. Despite the relevance, the mechanism of the reaction is still an open question. The goal of the study consists in acquiring new knowledge about the reaction, updating and clarification of the preliminary studies data in the 0.15-2.2 MeV proton beam energy range.

Thick boron carbide target was irradiated with protons of 0.3-2.15 MeV energy at the Vacuum Insulated Tandem Accelerator or VITA (Budker Institute of Nuclear Physics) which can generate proton beam with the energy 0.1-2.2 MeV keeping a high energy stability of 0.1 % and the beam current from 1 μA to 5 mA with high current stability 0.4 %. The spectra of the emitted α-particles and backscattered protons were measured using the silicon semiconductor α-spectrometer PDPA-1K (Institute of Physical and Technical Problems, Dubna, Russia) at 135° with respect to the beam moment. The obtained results proved that the reaction $^{11}B(p,\alpha)\alpha\alpha$ has two channels – $^{11}B(p,\alpha_1)^8Be^*$ and $^{11}B(p,\alpha_0)^8Be$ with different cross-sections which agrees with modern ideas.

Thin boron target was irradiated with protons of 0.15-2.2 MeV energy. We measured differential cross-sections at 135° and 168° with respect to the beam moment and obtained total cross-sections for both channels of the reaction: $^{11}B(p,\alpha_1)^8Be^*$ and $^{11}B(p,\alpha_0)^8Be$.

The research was supported by Russian Science Foundation, grant No. 19-72-30005.

Supervisor – PhD E. O. Sokolova