

INVESTIGATION OF $T(^1\text{H}, \gamma)^4\text{He}$ REACTION IN THE ASTROPHYSICAL ENERGY RANGE

Saturday 17 October 2020 12:10 (25 minutes)

The study of reaction $T(^1\text{H}, \gamma)^4\text{He}$ is of interest both for nuclear physics and nuclear astrophysics. In nuclear astrophysics, it is necessary to get more accurate data about the rates of primordial synthesis reactions, which cause the synthesis of ^4He [1,2]. In nuclear physics, there are several theoretical predictions of this reaction cross-section and S-factor behavior in tens of keV energy range, which are in significant disagreement [3]. Therefore, it is necessary to provide more accurate experimental study of this reaction cross-section in the astrophysical energy range.

The reaction $T(^1\text{H}, \gamma)^4\text{He}$ was investigated in $E_{lab} = 12 - 34$ keV ($E_{cm} = 7.8 - 20.1$ keV) energy range using pulse Hall accelerator (Tomsk, Russia) with placed solid state TiT target. Produced γ -quanta with energy $E_\gamma = 19.8$ MeV are registered by the assembly of 8 NaI(Tl) detectors placed radially around the target chamber.

In order to determine the efficiency of γ -quanta registration by detectors assembly, a Geant4 simulation was performed. This simulation was also used to imitate the experimental spectrum taking into account the neutron background. To estimate the possible influence of residual gases in vacuum chamber on the value of neutron background generated in neutron-producing reactions, a quadrupole mass analyser was used.

The experimental cross-sections values for different energies of proton are used to determine the behavior of the $T(^1\text{H}, \gamma)^4\text{He}$ reaction S-factor in dependence on energy. Our results do not correspond with theoretical results presented in [3]. The details of the experimental setup and simulation, as well as the results of the experiment will be presented.

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3. B.Dubovichenko, A.V.Dzhazairov-Kakhramanov, N.V.Afanasyeva. // Nucl. Phys. A. 2017. V.963. P.52–67

Authors: Mr VARLACHEV, V. (National Research Tomsk Polytechnic University); Mr DUDKIN, G. (National Research Tomsk Polytechnic University); Mr NECHAEV, B. (National Research Tomsk Polytechnic University); Mr PEN'KOV, F. (Institute of Nuclear Physics, Ministry of Energy, al-Farabi Kazakh National University); PHILIPPOV, Alexandr (Joint Inst. for Nuclear Research (RU)); FILIPOWICZ, M. (Faculty of Energy and Fuels, University of Science and Technologies, Krakow, Poland); FLUSOVA, D. (National Research Tomsk Polytechnic University, Tomsk, Russia); Mr CHUMAKOV, D. (National Research Tomsk Polytechnic University); SHUVALOV, E.N. (National Research Tomsk Polytechnic University, Tomsk, Russia)

Presenter: Mr CHUMAKOV, D. (National Research Tomsk Polytechnic University)

Session Classification: Section 2. Experimental and theoretical studies of nuclear reactions

Track Classification: Section 2. Experimental and theoretical studies of nuclear reactions.