

Elastic and inelastic scattering of 14.1 MeV neutrons on ^{12}C

Tuesday 12 October 2021 16:30 (15 minutes)

As part of the TANGRA project [1], we had measured angular distribution of γ -quanta, arising from the reaction of inelastic scattering of 14.1 MeV neutrons on the ^{12}C nucleus [2]. Due to the properties of ^{12}C , the information on its nuclear level structure that can be obtained by the registering γ -rays from the $^{12}\text{C}(n,n'\gamma)$ reaction is very limited. It was decided to register the probe particles, neutrons, instead of γ -quanta in the hope of additionally studying the second (0_2^+ , 7.65 MeV) and third (3_1^- , 9.64 MeV) excited states of ^{12}C . The Hoyle state at 7.65 MeV is of particular interest in this respect because of its importance for the description of nucleosynthesis [3].

The angular distributions of neutrons scattered on carbon nuclei were measured with the TANGRA facility using tagged neutrons and time-of-flight methods. The data obtained were compared with results from previous experiments on the scattering of 114 MeV neutrons by ^{12}C . Optical model calculations (with coupled-channels approach), carried out using TALYS 1.9 nuclear reaction code [4], were used to describe the experimental data.

1. Project TANGRA, <http://flnph.jinr.ru/en/facilities/tangra-project>
2. D.N. Grozdanov *et al.*, *Yadernaya Fizika*, **81**, 548 (2018)
3. M. Freer, H.O.U. Fynbo, *Prog. Part. Nucl. Phys.*, **78**, 1 (2014)
4. A.J. Koning and D. Rochman, *Nucl. Data Sheets*, **113**, 2841 (2012)

Primary author: DASHKOV, Ilya (JINR, MSU SINP)

Co-authors: FEDOROV, Nikita (JINR; SINP MSU); GROZDANOV, Dimitar (JINR); KOPATCH, Yuri (Joint Institute for Nuclear Research); RUSKOV, Ivan (INRNE); Dr SKOY, Vadim; Dr TRETYAKOVA, Tatiana; DABYLOVA, Saltanat (Laboratory of neutron physics); ERBOLOT, Askar (Joint Institute for Nuclear Research)

Presenter: DASHKOV, Ilya (JINR, MSU SINP)

Session Classification: Nuclear Physics

Track Classification: Experimental Nuclear Physics