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Features of data analysis in the experiments on measuring the cross-sections of γ-ray emission from (n, xγ) reactions induced by 14.1 MeV neutrons

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The TANGRA (TAgged Neutrons and Gamma-RAys) project [1, 2] is aimed at studying the interaction of fast 14.1 MeV neutrons with various nuclei for both fundamental and applied purposes. One of the recent modifications [3] of the setup for measuring the differential and total cross-sections of γ-ray emission was made in order to reduce the measurement time and increase counts statistics. The close geometry of the detectors leads to the appearance of a number of systematic effects associated with multiple scattering and absorption of incident and secondary particles in the sample and the materials of the experimental setup, as well as with the sample beam coverage. The contributions of these effects are interrelated and cannot be considered separately from each other, as well as separately from the detectors efficiency. In this presentation we will consider an approach that allows us to take into account all these effects together. The analysis procedure will be demonstrated using the results for the cross-sections of the γ-ray production in the (n, xγ) reactions induced by 14.1 MeV neutrons in the TiO2 sample. The present study was supported by the Russian Science Foundation (grant no. 23-12-00239).

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[2] I. Ruskov, Yu. Kopach, V. Bystritsky, V. Skoy, D. Grozdanov, N. Fedorov, T. Tretyakova, F. Aliev, C. Hramco, V. Slepnev, N. Zamyatin, A. Gandhi, D. Wang, A. Kumar, E. Zubarev, E. Bogolubov, Y. Barmakov, TANGRA collaboration, TANGRA multidetector systems for investigation of neutron-nuclear reactions at the JINR Frank Laboratory of Neutron Physics, EPJ Web Conf. 256 (2021) 00014, https://doi.org/10.1051/epjconf/202125600014.
[3] А. В. Андреев, Н. А. Федоров, Д. Н. Грозданов, П. С. Прусаченко, Ю. Н. Копач, Т. Ю. Третьякова, Г. В. Пампушик, К. Храмко, А. П. Зуев, П. Г. Филончик, П. И. Харламов, И. Н. Русков, В. Р. Ской и коллаборация TANGRA, Изучение углового распределения и сечения излучения гамма-квантов в ядрах Si и O в реакциях с быстрыми нейтронами, Известия РАН. Серия физическая, принята к публикации.

Primary authors: PRUSACHENKO, Pavel (Flerov Laboratory of Nuclear Reactions, Joint Institute for Nuclear Research); GROZDANOV, Dimitar (Joint Institute for Nuclear Research); FEDOROV, Nikita (Joint Institute for Nuclear Research); KOPATCH, Yuri (Joint Institute for Nuclear Research); SKOY, Vadim (Joint Institute for Nuclear Research); RUSKOV, Ivan (Joint Institute for Nuclear Research); TRETYAKOVA, Tatiana (Joint Institute for Nuclear Research); KHARLAMOV, Petr (Joint Institute for Nuclear Research); ANDREEV, Alexander (Flerov Laboratory of Nuclear Reactions, Joint Institute for Nuclear Research); PAMPUSHIK, Grigorii (Joint Institute for Nuclear Research); HRAMCO, Constantin (Joint Institute for Nuclear Research); FILONCHIK, Polina (Joint Institute for Nuclear Research)

Presenter: PRUSACHENKO, Pavel (Flerov Laboratory of Nuclear Reactions, Joint Institute for Nuclear Research)

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