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Measurement of the spallation neutron spectrum by unfolding at 180° from 3-GeV protons and natHg with the 209Bi(n,xn) reactions/209Bi(n,xn) 反応を用いたアンフォールディング法による 3-GeV 陽子と水銀の反応で 180 度方向に生成する核破砕中性子スペクトルの測定

Thursday, 16 November 2023 15:00 (2 hours)

Neutron source term is required for shielding design of accelerator facilities. A Time-of-Flight (TOF) technique is applied to get the source term. When TOF cannot be utilized at accelerator facilities (e.g., Continuous Wave (CW) operation), an unfolding method is useful. However, the validity of unfolding is not completely understood.
One of the accelerator facilities where CW operation will be used is Accelerator-Driven System (ADS) [1]. At the ADS facility designated by JAEA, 1.5-GeV proton beam is provided to a Lead-Bismuth Eutectic (LBE) alloy target. Transmutation of minor actinides is performed by neutrons produced by reactions between incident protons and nuclei in LBE. As with other accelerator facilities, radiation shielding is important for the facility. According to the shielding design [2], there is a high-dose-rate area at 180° attributed to a streaming of a beam duct. Thus, it is required that we study the neutron spectrum at 180°.
At J-PARC, high-intensity neutron beam at 180° is available by the reaction between 3-GeV protons and ^{nat}Hg. The neutron spectrum at 180°, which is similar to the spectrum by the reaction between proton and LBE, was already measured with TOF [3].
To evaluate the neutron source term at facilities where TOF cannot be used, confirming the reliability of the unfolding is necessary. Thus, the purpose of this study is to acquire the neutron energy spectrum by the unfolding with the ^{209}Bi(n,xn) reactions and response functions (JENDL/HE-2007 [4] or TALYS [5]).
In our poster, we present our activation measurement at J-PARC, the unfolding, and the comparison with the TOF-spectrum and calculation results.

References
[1] T. Sugawara, Y. Eguchi, H. Obayashi et al., Conceptual design study of beam window for accelerator-driven system with subcriticality adjustment rod, Nucl. Eng. Des., 331, (2018), pp. 11-23.
[2] H. Iwamoto, S. Meigo, K. Nakano et al., Radiation Shielding Analysis of the Upper Structure of an Accelerator-driven System, JAEA-Research 2021-012, (2022), Japanese.
[3] H. Matsuda, H. Iwamoto, S. Meigo et al., Measurement of thick target neutron yield at 180° for a mercury target induced by 3-GeV protons, Nucl. Instrum. Meth. B 483, (2020), pp. 33-40.
[4] Y. Watanabe, K. Kosaka, S. Kunieda et al., Status of JENDL high energy file, J. Korean Phys. Soc., 59 (2011), pp. 1040-1045.
[5] A.J. Koning, S. Hilaire, and M.C. Duijvestijn, TALYS-1.0, Proc. Of International Conference on Nuclear Data for Science and Technology 2007, pp. 211-214.

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