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Improving spatial resolution in experiments with tagged 14.1 MeV neutron beams

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One of the issues studied in the frame of the TANGRA project (TAgged Neutrons and Gamma-RAys) is the development of a method for position-sensitive elemental analysis of various samples. This method is based on the detection of prompt γ-rays emitted in the (n, xγ) reactions induced by fast 14.1 MeV neutrons. Position sensitivity is achieved through the tagged neutron method, which is based on the detection of the secondary α-particles resulting from the 3H(d,n)4He reaction which are accompanying the neutron emission, using a special position-sensitive detector (PSD) built in the neutron generator. So, the information about the direction and time moment of neutron emission from the tritium target can be obtained. In this case, spatial resolution is provided by both the solid angle covered by individual pixel of the PSD and the size of the deuteron beam spot on the tritium target. In the presentation the experimental and calculated data on spatial resolution of the setup for elemental analysis based on the neutron generator ING-27, as well as the method for its improvement based on the unfolding algorithms will be presented. The present study was supported by the Russian Science Foundation (grant no. 23-12-00239).

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