"MULTI" SET-UP FOR SPECTROSCOPY NUCLEAR REACTIONS

Stukalov S.S.[1], Penionzhkevich Yu.E.[1,2], Siváček I.[1,3], Sobolev Yu.G.[1]
[1] Joint Institute for Nuclear Research, Dubna, Russia; [2] National Nuclear Research University MEPhI, 115 409 Moscow, Russia; [3] Nuclear Physics Institute, ASCR, Řež, Czech Republic
E-mail: stukalov@jinr.ru

The detector setup "MULTI" is a multi-module 4-π γ-spectrometer designed for spectroscopy nuclear reactions and nuclear spectroscopy studies. Spectrometer is consist of γ part (9 $CeBr_3$–NaI(Tl) phoswitch scintillation detectors), neutron part (16 ^{3}He counters with hydrogenous moderators for decreasing energy of neutrons) (Fig. 1).

To measure the total cross sections, as well as the outputs of individual reaction channels, the addition of a $CeBr_3$–NaI(Tl) detectors 12 with a modular γ-spectrometer built at FLNR is provided. Spectra and response functions on n-γ radiation will be presented. In particular, it is planned to carry out measurements on the MAVR installation [1].

The spectrometer is continuously developed for achieving better detection parameters. Previous upgrade raised detection efficiency. Actual aim is to enhance gamma identification with precise, high-resolution gamma detectors for spectroscopy of prompt gamma. Parameters of the setup with ^{3}He counters and $CeBr_3$ detectors in various geometries (Fig. 1) are investigated with Monte Carlo method in Geant4. The efficiency of He_3 neutron counters is about 13% for neutrons with energy of 10 MeV (Fig. 2). Efficacy $CeBr_3$–NaI(Tl) detector was about 64% for gamma rays with an energy of 2 MeV. The efficiency at the peak of the total absorption is about 15% for 2MeV gamma quanta.

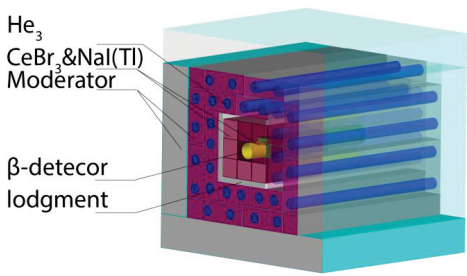

Fig. 1. Various geometries MULTI.

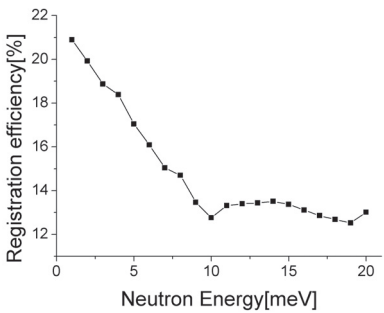

Fig.2. Efficiency of registration of neutrons of various energies.

1. G.D.Kabdrakhimova, Yu.G.Sobolev, I.N.Kuhtina, K.A.Kuterbekov, K.O.Mendibaev, Yu.E.Penionzhkevich // Phys. Atom. Nucl. V.80. P.32; Yad. Fiz. 2017. V.80. P.33.