Characteristics of position-sensitive plastic scintillation detectors

S.B. Dabylova[1,2,*], N. Simbirtseva[1,3], D.N. Grozdanov[1,4], N.A. Fedorov[1.5], A. Yergashov[1,2], Yu.N. Kopatch[1], P.V. Sedyshev[1], I.N. Ruskov[4], V.R. Skoy[1], T.Yu. Tretyakova[1,6], and TANGRA collaboration

[1] Joint Institute for Nuclear Research (JINR), Dubna, Russia
[2]L.N. Gumilyov Eurasian National University, 010008 Nur-Sultan, Kazakhstan
[3]Institute of Nuclear Physics, Almaty, 050032, Republic of Kazakhstan
[4]Institute for Nuclear Research and Nuclear Power Engineering, Bulgarian Academy of Sciences, Sofia, Bulgaria
[5]M.V. Lomonosov Moscow State University , Faculty of Physics, Moscow, Russia
[6]Federal State Budgetary Educational Institution of Higher Education "Moscow State University named after M.V. Lomonosov", Research Institute named after D.V. Skobeltsyn, Moscow, Russia

**Corresponding author email: dabylova_saltanat@mail.ru*

At the Joint Institute for Nuclear Research (JINR, Dubna, Russia), within the framework of the TANGRA project (TAgged Neutrons and Gamma RAys) [1], experiments aimed at investigation of inelastic scattering of fast neutrons are continuing [2]. Various types of detectors are used to study reactions with neutrons, including plastic scintillators. Obtaining reliable experimental results always relates to choice, careful preparation and adjustment of equipment.

The present work is devoted to the calibration of plastic scintillation detectors and the comparison of their parameters. Long plastic detectors with PMTs at either end were chosen for the study. The choice stems from the goal to obtain a position resolution using the timing information from both PMTs.

The measurements were carried out for two types of detectors with the same dimensions (5×10×100cm), but different manufacturers: (1) by «EPIC CRYSTAL», Shanghai, China[3], equipped with the PMTs, model CR105 from HAMAMATSU [4] and (2) by «ELJEN TECHNOLOGY», USA [5], equipped with the PMTs, model ETEL 9266KEB from ELECTRON TUBES [6].

The purpose of this study was to determine the main characteristics of the detector: gamma and neutron efficiency, energy, time and position resolution, selection of the optimal voltage on the PMTs. The tests were carried out with point-size standard ^{137}Cs and ^{60}Co gamma-ray sources, a portable neutron generator ING-27 and a PuBe / AmBe neutron source. For the acquisition and preliminary analysis of data, the digitizer - DSR-2/32 was used.

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