RECENT DEVELOPMENTS OF LINEAR POSITION-SENSITIVE NEUTRON DETECTORS IN DSC FLNP

A.V. Churakov[1,2], A.A. Bogdzel[1] and E.I. Litvinenko[1]

[1]*Joint Institute for Nuclear Research, Dubna, Russia*
[2]*Dubna State University, Dubna, Russia*

E-mail: churakov@nf.jinr.ru

Linear position-sensitive neutron detectors (LPSD) are used to measure the spatial distribution of neutron beams in various types of experiments. However, along with the advantages, the currently used counters have certain disadvantages, the main of which are the limitation on load and service life in high-power neutron beams. The new high-flux neutron sources raises the requirements for detecting part of scientific installations. The Department of the Spectrometers Complex of the Frank Laboratory of Neutron Physics (DSC FLNP) is conducting research aimed at evaluating the perspectives of using LPSDs, based on helium proportional position-sensitive counters (PSC) with a resistive anode.
Theoretical calculations and simulations have shown the possibility of distortion of the amplitude spectrum with a decrease in the diameter of the counter less than 6 mm. This is due to the fact that the ranges of primary ionization particles do not fit into the counters volume. This effect decrease the signal-to-noise ratio and leads to a deterioration in the characteristics of the counters.
To test the capabilities of industrial detectors with a resistive anode, a test module of 2 position-sensitive counters made by Toshiba was designed. Measurements were carried out on the channel number 9 of the IBR-2 research reactor. Experimental results have shown the possibility of using counters on modern pulse reactors in the time-of-flight mode. The measured spatial resolution was about 0.5% of the counter length.
As a result of cooperation between JINR and the St. Petersburg Nuclear Physics Institute (PNPI, Gatchina, Russia), the development of linear position-sensitive neutron detectors has started. The counters were developed at the production base of LLC “SPF Consensus” (Zaprudnya, Russia). Thermal neutron LPSDs of various lengths, 8 mm in diameter, have been developed and are ready for industrial production. Test modules assembled from these counters were tested at the IR-8 research reactor of the Kurchatov Institute (KI), Moscow, Russia.
On the basis of SPF Consensus counters, a typical module was developed for use in detector systems of neutron scattering experimental facilities used in nuclear and condensed matter physics. The detector system can consist of one or more modules, the modules can be connected to each other without gaps along the axis perpendicular to the anode.
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