

Data acquisition system of the highly granular time-of-flight neutron detector of the BM@N experiment at the NICA accelerator complex

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The new high granular time-of-flight neutron detector (HGND) [1] is being developed for the BM@N (Baryonic Matter at Nuclotron) experiment to identify and measure neutrons energies in nucleus-nucleus collisions at ion beam energies up to 4 AGeV.

The detector structure, its layout at the BM@N and integration into the BM@N data acquisition system will be presented. The HGND consists of about 2000 scintillator detectors (cells) with a size of 40X40X25 mm³ and with individual light readout with EQR15 11-6060D-S photodetectors .

At present, the fully functional 33-channel HGND prototype has been constructed. It features a readout system with a 100 ps FPGA-based TDC [2] (Time-to-Digital Converter), a time synchronization system based on White Rabbit, and utilities such as SiPM temperature and threshold control. The functionality, geometry and construction layout of the prototype fully match the final HGND design. The prototype laboratory and beam tests will be discussed.

[1] S. Morozov, et al., “The Highly-Granular time-of-flight Neutron Detector for the BM@N experiment”, Nucl.Instrum.Meth.A 1072 (2025) 170152, DOI: 10.1016/j.nima.2024.170152

[2] D. Finogeev, et al., “Development of a 100 ps TDC based on a Kintex 7 FPGA for the high granular neutron time-of-flight detector for the BM@N experiment”, Nucl.Instrum.Meth.A 1059 (2024) 168952, DOI: 10.1016/j.nima.2023.168952

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