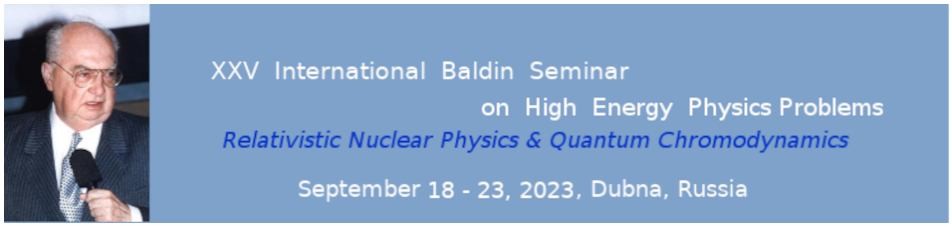

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The Development of High Granular Neutron Time-of-Flight Detector for the BM@N Experiment

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The HGN (High Granular Neutron) detector is being developed for the BM@N (Barionic Matter at Nuclotron) experiment on the extracted beam line of the Nuclotron (JINR, Dubna) to measure the azimuthal flows of neutrons with energy range 400 - 4000 MeV produced in heavy-ion collisions at the beam energies 2 –4 AGeV. This data together with data of azimuthal flows of charged particles, which will be measured separately in the BM@N magnet spectrometer are necessary to study the EoS of isospin-symmetric dense nuclear matter, which is crucial for studying astrophysical phenomena like neutron stars and their mergers.
The HGN detector has a high granular structure with using about 2000 plastic scintillation detectors with a size of 4×4×2.5cm3 arranged in 16 layers of 11×11 detectors placed between 3cm copper absorber plates. The light detection from each scintillation detector is provided with one SiPM with active area 6x6 mm2. Multi-channel TDC board developed on Kintex FPGA chip with 100ps time bin width will be used to perform precise timestamp and amplitude measurement using Time-over-Threshold (ToT) method. Good spatial resolution due to the high granularity together with a time resolution of 100-150ps ensures neutron energy reconstruction with 5-10% relative energy resolution.
The design of the detector as well as results of simulations will be discussed. Measured time resolution of the samples of scintillation detector with different types of scintillators and SiPMs will be presented.

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