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SIMULATION OF THE FAST READOUT SYSTEM FOR MCP-BASED BEAM-BEAM COLLISIONS MONITOR FOR NICA EXPERIMENTS

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The event-by-event selection of nucleus-nucleus interactions with well-defined initial conditions of the interaction point (IP) location in the experiment at NICA collider, beam-gas collisions suppression, precise event time definition, as well as control of luminosity, are important both for data collection and for the off-line analysis of the results of upcoming measurements at JINR. For these purposes, the compact Fast Beam-Beam Collisions Monitor (FBBC) based on the micro-channel plates (MCPs) was proposed recently in [1]. Position and time sensitive, multi-anode MCP detectors allow to get, for each bunch crossing, the information on the IP coordinate, on the multiplicity and of arrival times of charged particles formed in the collision.
In the present work, we estimate both the capabilities of the fast, precise timing measurements scheme and, in addition, of the collision centrality determination in AA collisions. The scheme is based on the method of delayed coincidences using high-speed comparators. We carried out the modeling of the system prototype within the framework of the Quartus [2] environment. Results allow us to state that it is possible to determine the response time of the detector with an uncertainty of about 50 ps. Using the coincidence schemes will make it possible to identify the number of spectators and, based on the processing of timing information, to make conclusions about the centrality of interaction in each event.
The estimated speed of the analysis scheme is less than 20 ns per each event. This allows us to propose this FBBC readout system, based on the high-speed comparators, as the fast, bunch-by-bunch crossing pre-trigger, both in terms of the IP position and the class of centrality.
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1. A.A. Baldin et al., Nucl. Instrum. & Meth. A. 958 . 162154 (2020).
2. Intel Quartus Prime Design Software, https://www.intel.ru/content/www/ru/ru/software/programmable/quartus-prime/overview.html

The speaker is a student or young scientist

No

Section

1. Applications of nuclear methods in science and technology

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