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Study of performance of Fast Beam-Beam Collision monitor system with MC simulations and machine learning methods

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New experiments are being planned at the NICA collider beams aimed to explore the properties of high-density baryonic matter formed in heavy-ion collisions with energies up to $\sqrt{s_{NN}} = 11$ GeV. With the aim of selecting the collision events of interest, it was proposed in [1] to develop a fast beam-beam collision monitor (FBBC) system, which would be capable to determine the time and space of each ion-ion collision.
In this report, we consider a system of 6 segmented ring-shaped detectors based on the microchannel plates (MCP) placed in the vacuum of the beam-pipe at some distance along the beam-line on both sides from the center of the experimental facility. Intrinsic high timing characteristics of MCPs (signal duration below 1 ns) allow to consider the required functionality of the FBBC for monitoring the luminosity of collisions and to provide the event selection, precise event timing information, determination of the event interaction point, and suppression of the beam-gas interaction events.
MC simulations of the beam-beam collisions monitoring system were performed within the DQGSM[2] event generator. Taking into account the information about the multiplicity of registered charged particles and their time-of-flight, the position of the interaction point and multiplicity/centrality in the event were estimated. To perform such estimations, different machine learning methods were used. It is shown that the monitoring system and machine learning algorithms can provide an interaction point position within the acceptance of the experiment with the precision of about ± 1.6 cm at least; also the ability of the system to distinguish peripheral and central collisions is discussed.

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1. A.A. Baldin, G.A. Feofilov, P. Har'yuzov, F.F. Valiev, NIMA958(1), 162154 (2020).
2. K.K. Gudima, S.G. Mashnik, A.G. Sierk, Report LA-UR-01-6804, Los Alamos (2001).

Primary authors: VALIEV, Farkhat (St Petersburg State University (RU)); FEOFILOV, Grigori (St Petersburg State University (RU)); SANDUL, Vladislav (St Petersburg State University (RU))

Presenter: SANDUL, Vladislav (St Petersburg State University (RU))

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