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High gain MCPs with monolayers of Al_2O_3 for Fast Beam-Beam Collisions Monitor at NICA

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Tuning of the beam-beam collisions and fast, event-by-event monitoring are essential
both to achieve the high luminosity of colliders and to provide in the experiment the event selection, precise event timing information, determination of the event interaction point and the reaction plane, suppression of the beam-gas interaction events. To meet the challenges of the fast monitoring of the high-intensity beam-beam collisions at NICA at JINR, the compact MCP-based Fast Beam-Beam Collisions (FBBC) detector was proposed in [1]. The FBBC concept is based on the application of the Micro Channel Plates (MCPs) as a detector of charged particles produced in the collisions of the beams. The main characteristic features of the MCPs are very short ($\sim$ 1ns) signals and high intrinsic gain ($\sim 10^6$). It is a well known fact that high precision accuracy for timing requires both sharp rise-time of signals and mitigation of the effects of large spread of signal amplitudes. This could be achieved by a careful optimization of signal readout and by the increase of the MCPs intrinsic gain.
The paper presents the results of experiments to improve the technology for creating a new class of MCPs with higher gain by application of the additional monolayers of aluminum oxide (Al_2O_3). In particular, the original method of deposition on the MCP surface of monolayers of aluminum oxide is proposed which is based on the Atomic Layer Deposition (ALD) technique [2]. This approach allows to increase the amplitude of the signals from the MCP detector by a factor of up to a factor of ˜1.5. Technology features are briefly described and results of tests are discussed.

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