

XXV International Baldin Seminar on High Energy Physics Problems "Relativistic Nuclear Physics and Quantum Chromodynamics"



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New vertex detector systems for particle registration in high-energy physics and possible use these technologies for NICA experiments

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During past 30 years in high-energy physics experiments, the detector systems have actively exploited technology based on silicon pixel sensors. Today and in the coming years many of collider's experiments use pixel detectors as main part for particle tracks identification.

To solve modern tasks in elementary particle physics field (heavy flavor physics, study of charmonium yields at very low transverse momenta, investigations of the space-time evolution of quark-gluon plasma, exotic heavy nuclear states etc.) the precise registration of short-lived particles produced in nucleus-nucleus collisions is needed. In this case it is critical to improve the spatial resolution on the reconstruction of primary and secondary vertices and increase the efficiency of charged particles identification at low transverse momentum. Therefore, leading mega experiments: ALICE, ATLAS, CMS at the Large Hadron Collider, STAR at the Relativistic Heavy Ion Collider (RHIC), MPD, SPD at the NICA collider are using now and will use in the future the silicon pixel sensors as a main element of the vertex detectors in tracking system. Such detectors should have high granularity, high spatial resolution, lower material budget, and higher readout speed.

The present report outlines the vertex detector of new ALICE Inner Tracking System (ITS-3) together with novel technologies based on silicon monolithic active pixel detectors and possible use these technologies for NICA: MPD, SPD, ARIADNA experiments. Also new ideas and developments for mechanic and cooling systems for such pixel detectors are presented.

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