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New technologies for the vertex detectors at the NICA collider experiments

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In modern high energy physics and elementary particle physics experimental research, one of the important problems is connected with the study of the yields of the hadrons containing heavy quarks. These hadrons practically do not interact (low interaction cross sections) with the nuclear medium and, therefore can provide undistorted information about the states of nuclear matter arising in the relativistic nuclei collision processes. Thus, an effective registration of strange and charmed particles by the experimental setup in the nucleus-nucleus collisions at the NICA collider plays a key role in the analysis of possible nuclear matter evolution and its phase transitions mechanisms. In addition, at relatively low energies of the colliding nuclei at the NICA collider ($\sqrt{s_{NN}}$ = 4 - 11 GeV) [1], it becomes possible to study inside the nuclei the different clusters of dense nuclear matter [2].
The number of secondary particles produced in central collisions of relativistic ions can reach several thousand in the energy range of the NICA collider. For precise registration of these events we need the vertex detector systems, which allow reconstructing the tracks of primary charged particles and products of their decays. These detector systems should provide the ability to reconstruct the decay vertices of short-lived multi-strange and charmed hadrons with high spatial resolution at minimum material budget. Therefore, the leading high energy and elementary particle physics experiments: ALICE, ATLAS, CMS at the Large Hadron Collider (LHC), STAR at the Relativistic Heavy Ion Collider (RHIC) are using now the silicon pixel sensors as the main element of the whole tracking system [3].
In present overview the technologies for the vertex detectors at the NICA collider experiments together with new ultra-light radiation-transparent carbon fiber support structures as basic elements for these detectors and CMOS monolithic active pixel sensors are discussed. To investigate the efficiency and main characteristics of the proposed carbon fiber support structures and pixel sensors, the comprehensive studies with gamma, beta sources, with cosmic rays and also with different cooling systems were carried out.

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1. V.Kekelidze, V.Matveev, I.Meshkov, A.Sorin, G.Trubnikov, Physics of Particles and Nuclei, Vol. 48, No. 5, pp. 727–741 (2017).
2. V.I. Zherebchevsky, V.P. Kondratiev, V.V. Vechernin, S.N. Igolkin, Nuclear Inst. and Methods in Physics Research, A 985,164668 (2021).
3. ALICE collaboration, Technical design report for the upgrade of the ALICE Inner Tracking System, Journal of Physics G: Nuclear and Particle Physics, vol. 41, iss. 8, P087002 (2014).

Primary author: Dr ZHEREBCHEVSKY, Vladimir (St Petersburg State University (RU))

Co-authors: NESTEROV, Dmitrii (St Petersburg State University (RU)); Dr MALTSEV, Nicolai (Saint-Peresburg State University); Dr FEOFILOV, Grigory (St Petersburg State University (RU)); IGOLKIN, Sergey (St Petersburg State University (RU)); Prof. KONDRATIEV, Valeriy (Saint-Peresburg State University); LAZAREVA, Tatiana (St Petersburg State University (RU)); BELOKUROVA, Svetlana (St Petersburg State University (RU)); PROKOFIEV, Nikita (St.Petersburg State University); RAKHMATULLINA, Alina (St Petersburg State University (RU)); Prof. VECHERNIN, Vladimir (St. Petersburg State University)

Presenter: Dr ZHEREBCHEVSKY, Vladimir (St Petersburg State University (RU))

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