

NICA facilities for the search for EDM light nuclei

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One of the possible arguments in favor of violation of CP invariance is the existence of nonzero electric dipole moments (EDM) of elementary particles. The idea of searching for the electric dipole moment of the proton and deuteron using polarized beams in the storage ring was originally based on the “frozen spin” method in 3D space and the creation of conditions under which the contribution of the magnetic dipole moment to the change in the direction of the spin would be less than the contribution of the supposedly existing electric dipole moment. The rejection of 3D and the transition to the concept of a “quasi-frozen” spin in 2D space, when the study of the EDM is supposed to be carried out by the Frequency Domain method, made it possible to consider accelerators existing in the world suitable for search the EDM. The article considers a slight modernization of the magneto-optical structure of the NICA collider and the Nuclotron by introducing a bypass with Wien-filters, which will allow accumulating the EDM signal over times of the order of 1000 seconds to a value that can be measured using a polarimeter with a sensitivity of $10^{(-29)} \div 10^{(-30)} e \cdot cm$. At the same time, modulating the spin precession with Wien filters will make NICA a broadband axion antenna. The new role of the bypass as an axion antenna, in addition to searching for the EDM of protons and deuterons, significantly increases the potential of the NICA complex as a unique platform for precision tests of fundamental symmetries in elementary particle physics.

Primary author: SENICHEV, Yury (The Institute for Nuclear Research of the Russian Academy of Sciences)

Co-authors: AKSENTEV, Alexander (NRNU “MEPhI”); Mr KOLOKOLCHIKOV, Sergey (INR RAS); LADYGIN, Vladimir (VBLHEP, JINR); MELNIKOV, Aleksei (INR RAS); NIKOLAEV, Nikolai (Landau Institute for Theoretical Physics); SYRESIN, Evgeny (Joint Institute for Nuclear Researches)

Presenter: SENICHEV, Yury (The Institute for Nuclear Research of the Russian Academy of Sciences)

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