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Quasi-frozen spin concept to search for the electric dipole moment of the proton and deuteron

Content

One of the possible proofs of CP violation beyond the Standard Model may be the discovery of permanent electric dipole moments (EDM) of elementary particles. To search for the EDM of charged particles, the frozen spin (FS) concept was first proposed at BNL. The implementation of the latter involves the creation of a special storage ring in which the spin vector is preserved along the momentum and precesses due to the EDM only. In a magnetic storage ring initially not dedicated to measure the EDM, it is also possible to study the EDM by inserting electrostatic or E+B elements that compensate for the spin-rotation in the bending magnets. The periodicity of placing E+B inserts along the ring determines the degree of difference between the frozen and quasi-frozen options of the magneto-optical structure. Magneto-optical structures fulfilling the QFS condition can be used in application to study the proton and deutron EDM and for axion search at the NICA accelerator complex. The main features of the implementation of the QFS concept are discussed, the method of measuring the EDM in the frequency domain, as well as the main spin-dynamics properties of the lattice are covered.

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