



# Fundamental Symmetries in Storage Ring Experiments

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## Abstract

Principal aim of this talk is to draw attention of Chinese high energy community to exciting physics Beyond Standard Model (BSM) offered by spin experiments in storage rings (SR). SR based searches for the electric dipole moment of charged particles have a potential of uncovering an origin of the BSM CP-violation badly needed to explain the observed baryogenesis in Universe. I will briefly comment on classic results of JEDY@COSY and ongoing activity of CPEDM@CERN, srEDM@BNL and SPRINT@NICA (JINR) collaborations in this direction. My major focus will be on the spin in SRs as a broadband antenna of axions and axionlike particles. A beauty of SRs is a relativistic enhancement by a factor 1000 of a pseudomagnetic field induced by the axion halo of our Galaxy. I comment on new ideas on search for the SM parity violation based on the JEDI experience with precessing horizontal polarization. Next I move to a so far little explored BSM C-odd and T-odd millistrong interaction postulated in 1965 by Okun, Lee, Wolfenstein, Prentky and Veltman as a source of CP violation. Here precessing polarization would allow systematics-free extraction of the T-violation in pd scattering. As a cherry on cake, I will comment on a unique discovery potential of precessing polarization targets and share my excitement that a remarkably close idea is being pursued by Dr. Boxing Gou of the Institute of Modern Physics, Lanzhou.

## Biography

Nikolai Nikolaevich Nikolaev, born 20.05.1947, Mari El Republic, Russia. Moscow Institute of Physics and Technology (1964-1970), with honors. PhD student (1970-1973) at MIPT, supervisor Lev Borisovich Okun. Since 1973 at the Landau Institute for Theoretical Physics. Other positions: Research fellow at the Theory Division, CERN (1978-1979); Visiting professor at the University of Torino, Italy (1990-1991); Senior researcher, Institut f. Kernphysik, Forschungszentrum Juelich, Germany (1993-2012). Major Research interests: electroweak interactions, formation length in nuclear interactions, pre-QCD parton model, antishadowing phenomenon, QCD formalism for DIS on nuclear targets; QCD theory of color transparency and diffractive DIS; spin filtering in storage rings; quantum collective betatron oscillations, general relativity effects for spins in storage rings, spin dynamics in precision searches for the EDM and axionlike particles in storage ring experiments. H-index 45, 8600+ citations, sample publications:

- N. N. Nikolaev, B. G. Zakharov, Color transparency and scaling properties of nuclear shadowing in deep inelastic scattering, DOI: 10.1007/BF01483577, Z.Phys.C 49 (1991), 607-618.
- S. N. Vergeles, N. N. Nikolaev, Yu. N. Obukhov, A. Ya. Silenko, O. V. Teryaev. General relativity effects in precision spin experimental tests of fundamental symmetries, Usp.Fiz.Nauk 193 (2023) 2, 113-154, DOI: 10.3367/UFNr.2021.09.039074, 10.3367/UFNr.2021.09.039074
- N. N. Nikolaev et al. (JEDI Collaboration), Spin decoherence and off-resonance behavior of radio-frequency-driven spin rotations in storage rings, Phys.Rev.Accel.Beams 27 (2024) 11, 111002, DOI: 10.1103/PhysRevAccel-Beams.27.111002

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