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Interaction of a twisted Dirac particle with a magnetic field in high energy physics

A.J. Silenko[1,2,3], Pengming Zhang[2,4], and Liping Zou[2,4]

1. Joint Institute for Nuclear Research, Dubna 141980, Moscow region, Russia
2. Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou 730000, China
3. Research Institute for Nuclear Problems, Belarusian State University, Minsk 220030, Belarus
4. University of Chinese Academy of Sciences, Yuquanlu 19A, Beijing 100049, China

A relativistic quantum-mechanical description of a twisted (vortex) Dirac particle in a magnetic field (in general, nonuniform) is presented [1-3]. Twisted particles can possess giant intrinsic orbital angular momenta and magnetic moments. Methods for the extraction of a twisted beam with a given orbital polarization and for the beam manipulation [1] are discussed. For twisted electron beams in magnetic storage rings, the effect a radiative orbital polarization (similar to that of a radiative spin polarization for untwisted electrons) takes place [2]. A twisted spin-1/2 particle possesses a tensor magnetic polarizability [3]. We suppose that twisted particles can be created at collision of heavy ions. In this case, the presence of a strong nonuniform magnetic field leads to the Stern-Gerlach-like force which depends on the intrinsic orbital angular momentum and influences a particle motion [2].

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Primary author: Prof. SILENKO, Alexander (JINR, Dubna, Russia)

Co-authors: Dr ZOU, Liping (Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China); Prof. ZHANG, Pengming (Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China)

Presenter: Prof. SILENKO, Alexander (JINR, Dubna, Russia)

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