

ACCELERATION AND TWISTING OF NEUTRAL ATOMS BY STRONG ELECTROMAGNETIC PULSES

V.S. Melezhik¹, S. Shadmehri²

¹*Bogoliubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Dubna, Moscow Region 141980, Russia*

²*Meshcheryakov Laboratory of Information Technologies, Joint Institute for Nuclear Research, Dubna, Moscow Region 141980, Russia*
melezhik@theor.jinr.ru

One of the hot areas at present is the physics of twisted photons and electrons due to the potentially interesting applications [1]. For example, electron vortex beams have been used to study chirality, magnetization mapping and transfer of angular momentum to nanoparticles [2]. Several proposals have been made to create vortex beams of composite particles (neutrons, protons, and atoms). It is supposed that twisting to alter the fundamental interactions of such particles and to enable probing their internal structure. However, until recently only one successful experiment for creation of a vortex beam of atoms was realized: in work [3] a beam of twisted helium atoms was obtained with a fork diffraction grating. My work discusses the possibility of producing twisted accelerated hydrogen atoms using specially polarized laser pulses. The calculation was performed within the framework of the quantum-semiclassical approach [4, 5], in which the Schrödinger equation for the electron wave function is simultaneously integrated with the coupled classical Hamilton equations for the center-of-mass motion.

References

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