



Contribution ID: 993

Type: **Poster Presentation**

Neutrino spin precession and oscillations in transversal matter currents

It was shown for the first time in [1] (see also [2,3]) that neutrino spin (and spin-flavor) precession can be engendered not only by neutrino interaction with the transversal magnetic field but also by neutrino interaction with matter

when there is a transversal matter current or matter polarization. Recently this effect has attracted reasonable interest within studies of neutrino fluxes from supernovae (see [4] and references therein). In the proposed presentation we present a rigorous derivation of neutrino spin and spin-flavor evolution effective Hamiltonians accounting for interactions with magnetic fields and matter transversal currents. The effect of the transversal matter current as an origin for neutrino spin oscillations has been also checked and confirmed on the basis of the exact solution for the Dirac equation for a neutrino wave function in moving matter (see also [7]). The neutrino spin and spin-flavor oscillation probabilities are obtained for different cases that are of interest for astrophysical applications.

- [1] A. Studenikin, Neutrinos in electromagnetic fields and moving media, *Phys. Atom. Nucl.* 67 (2004) 993.
- [2] A. Studenikin, Neutrino spin and spin-flavour oscillations in transversally moving or polarized matter, *Journal of Physics: Conference Series* 718 (2016) 062076; arXiv: 1610.06563.
- [3] A. Studenikin, From neutrino electromagnetic interactions to spin oscillations in transversal matter currents, *PoS (NOW2016)* 070.
- [4] A. Dobrynina, A. Kartavtsev and G. Raffelt, Helicity oscillations of Dirac and majorana neutrinos, *Phys. Rev. D* 93 (2016) 125030.
- [5] P. Pustoshny, Neutrino flavor oscillations in a magnetic field and arbitrary moving matter, Bachelor thesis, Department of Theoretical Physics, Moscow State University, 2017.
- [6] A. Popov, Neutrino spin oscillations in moving matter, Bachelor thesis, Department of Theoretical Physics, Moscow State University, 2017.
- [7] I. Balantsev, A. Studenikin, *Int.J.Mod.Phys.A* 30 (2015) 1530044.

Experimental Collaboration

Primary authors: Mr POPOV, Artem (master student at Department of Theoretical Physics of Moscow State University); Mr PUSTOSHNY, Pavel (master student, Department of Theoretical Physics, Moscow State University)

Co-authors: BALANTSEV, Ilya (Moscow State University); STUDENIKIN, Alexander

Presenter: Mr POPOV, Artem (master student at Department of Theoretical Physics of Moscow State University)

Session Classification: Poster session

Track Classification: Neutrino Physics