Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Experimental Demonstration of Synthetic Lorentz Force on Cold Atoms by Using Radiation Pressure[1] TICIJANA BAN, Institute of Physics, NEVEN SANTIC, TENA DUBCEK, Department of Physics, University of Zagreb, DAMIR AUMILER, Institute of Physics, HRVOJE BULJAN, Department of Physics, University of Zagreb — The quest for synthetic magnetism in quantum degenerate atomic gases is motivated by producing controllable quantum emulators, which could mimic complex quantum systems such as interacting electrons in magnetic fields [1, 2]. Experiments on synthetic magnetic fields for neutral atoms have enabled realization of the Hall effect, Harper and Haldane Hamiltonians, and other intriguing topological effects. Here we present the first demonstration of a synthetic Lorentz force, based on the radiation pressure and the Doppler effect, in cold atomic gases captured in a Magneto-Optical Trap (MOT). Synthetic Lorentz force on cold atomic cloud is measured by recording the cloud trajectory. The observed force is perpendicular to the cloud velocity, and it is zero for the atomic cloud at rest. The proposed concept is straightforward to implement in a large volume and different geometries, it is applicable for a broad range of velocities, and it can be realized for different atomic species. The experiment is based on the theoretical proposal introduced in [3]. [1] I. Bloch, J. Dalibard, and S. Nascimbene, Nat. Phys. 8, 267 (2012). [2] J. Dalibard, F. Gerbier, G. Juzeliunas, and P. Ohberg, Rev. Mod. Phys. 83, 1523 (2011). [3] T. Dubcek, N. Santic, D. Jukic, D. Aumiler, T. Ban, and H. Buljan, Phys. Rev. A 89, 063415 (2014).

[1]This work was supported by the UKF Grant No. 5/13 and Croatian MZOS

Ticijana Ban
Institute of Physics

Date submitted: 30 Jan 2015 Electronic form version 1.4