

## Transport dynamics in optical lattices with flux

A. Hudomal<sup>1</sup>, I. Vasić<sup>1</sup>, H. Buljan<sup>2</sup>, W. Hofstetter<sup>3</sup>, and A. Balaž<sup>1</sup>

<sup>1</sup>*Scientific Computing Laboratory, Center for the Study of Complex Systems,  
Institute of Physics Belgrade, University of Belgrade, Serbia*

<sup>2</sup>*Department of Physics, University of Zagreb, Croatia*

<sup>3</sup>*Institut für Theoretische Physik, Johann Wolfgang Goethe-Universität,  
Frankfurt am Main, Germany  
e-mail: ana.hudomal@ipb.ac.rs*

Recent cold atom experiments have realized artificial gauge fields in periodically modulated optical lattices [1,2]. We study the dynamics of atomic clouds in such systems by performing numerical simulations using the full time-dependent Hamiltonian and compare results with the semiclassical approximation. Under constant external force, atoms in optical lattices with flux exhibit an anomalous velocity in the transverse direction. We investigate in detail how this transverse drift is related to the Berry curvature and Chern number, taking into account realistic experimental conditions.

### REFERENCES

- [1] G. Jotzu, M. Messer, R. Desbuquois, M. Lebrat, T. Uehlinger, D. Greif, T. Esslinger, *Nature* **515**, 237 (2014).
- [2] M. Aidelsburger, M. Lohse, C. Schweizer, M. Atala, J. T. Barreiro, S. Nascimbène, N. R. Cooper, I. Bloch, N. Goldman, *Nat. Phys.* **11**, 162 (2015).