Artificial Gauge Field of One-Dimensional Superradiance Lattices in Ultracold Atoms

Jing ZHANG

Optoelectronics Institute, Shanxi University, China

Email: jzhang74@sxu.edu.cn

There have been significant recent advances in realizing band structures with geometrical and topological features in experiments on cold atomic gases. We experimentally realize one-dimensionally superradiance lattice (SL) with 87Rb Bose-Einstein condensate (BEC) based on electromagnetically induced transparency (EIT). Based on one-dimensional SL in standing wave-coupled electromagnetically induced transparency, a far-detuned standing wave field is introduced to synthesize a magnetic field. The relative spatial phase between the two standing wave coupling fields introduces a magnetic flux in the sawtooth loop transitions of the lattice. This flux determines the moving direction of excitations created in the SL and results in nonsymmetric reactivities when the SL is probed in two opposite directions. Our work demonstrates an in-situ technique to synthesize and detect topological matter in cold atoms.

References:

[1] L. Chen, P. Wang, Z. Meng, L. Huang, H. Cai, D.-W. Wang, S.-Y. Zhu, J. Zhang “Experimental observation of one-dimensional superradiance lattices in ultracold atoms” Phys. Rev. Lett. 120, 193601 (2018)