Quantum Simulation with Superradiance Lattices

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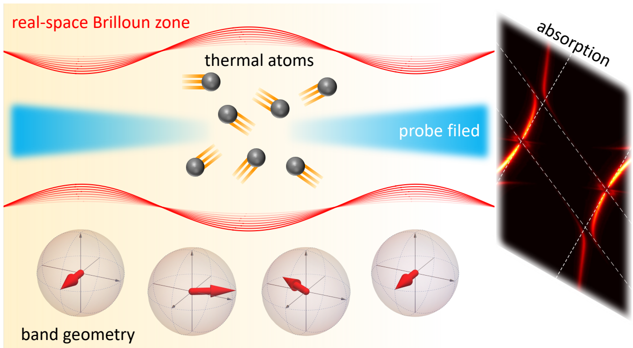

Figure 1: The schematic of the experiment setup

Cold atoms in optical lattices provide a widely used platform to simulate the electrons in solids, as a new tool for understanding many-body interactions in condensed matter and synthesizing novel topological states. However, these cold atom experiments, which rely on the atomic motion, require extremely low temperatures, and therefore are prone to thermal noise. Here we introduce a room-temperature atomic quantum simulator, termed superradiance lattices. The momentum-space tight-binding lattices are composed of collective excitations of atoms, and can be constructed in a multi-coupling-laser configuration of electromagnetically induced transparency. In experiments, we study the band structure and transport properties of the superradiant lattices by probing the optical transmission and reflection spectra. This talk will present the basics of the superradiant lattices, as well as the latest experimental progress on chiral edge currents, flatband localization, dynamical (de)localization, and spectroscopic measurement of the Zak phase in superradiance lattices.

References

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