Contribution ID: **5** Type: **Contributed talk**

Imaginary gauge potentials in a non-Hermitian spin-orbit coupled quantum gas

Thursday 5 September 2024 09:40 (40 minutes)

In 1996 Hatano and Nelson proposed a non-Hermitian lattice model containing an imaginary Peierls phase [Phys.˜Rev.˜Lett.˜{\bf 77}˜570–573 (1996)], and subsequent analyses revealed it that is an instance of a new class of topological systems.
We experimentally realize a continuum analog to this model containing an imaginary gauge potential in a homogeneous spin-orbit coupled Bose-Einstein condensate (BEC).
The base spin-orbit coupled Hamiltonian is made non-Hermitian by adding tunable spin-dependent loss by microwave coupling to a subspace with spontaneous emission.
We find that the Heisenberg equations of motion for position and momentum with an imaginary gauge potential depend explicitly on the system's phase-space distribution.
In our experiment we first observed the non-Hermitian skin effect by localizing an initial state at the trap boundary, and verifying that it was stationary.
We then revealed collective nonreciprocal transport in real space, where the acceleration is a decreasing function of BECs spatial extent in agreement with non-Hermitian Gross-Pitaevskii equation simulations.

References

Short bio (50 words) or link to website

ultracolde.jqi.umd.edu

Relevant publications (optional)

Career stage

Professor

Author: SPIELMAN, Ian

Presenter: SPIELMAN, Ian

Track Classification: FINESS