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Occupation-dependent particle separation in non-Hermitian lattices

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Non-Hermitian skin effect (NHSE) is a distinctive phenomenon in systems described by non-Hermitian Hamiltonians, where “bulk” eigenstates are spatially localized at the boundary of systems. In this talk, I will introduce a mechanism for particle separation based on their occupation conditions in the unit cells, which arises from the interplay between different skin accumulating channels and interactions between particles. Namely, at single-particle level, a directional reversal of NHSE can be induced by a destructive interference of non-reciprocity of different sublattices, which is eliminated for hardcore bosons (or fermions) that fully occupy a unit cell. In this way, “paired” and “unpaired” particles tend to accumulate toward opposite directions, which is demonstrated by both static eigensolutions and dynamical evolution.

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