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Signatures of many-body localization of quasiparticles in a flat band superconductor

Wednesday 4 September 2024 17:00 (2 hours)

We construct a class of exact eigenstates of the Hamiltonian obtained by projecting the Hubbard interaction term onto the flat band subspace of a generic lattice model. These exact eigenstates are many-body states in which an arbitrary number of localized fermionic particles coexist with a sea of mobile Cooper pairs with zero momentum. By considering the dice lattice as an example, we provide evidence that these exact eigenstates are, in fact, a manifestation of local integrals of motions of the projected Hamiltonian. In particular, the spin and particle densities retain memory of the initial state for a very long time if localized unpaired particles are present at the beginning of the time evolution. This shows that many-body localization of quasiparticles and superfluidity can coexist even in generic two-dimensional lattice models with flat bands, for which it is not known how to construct local conserved quantities. Our results open new perspectives on the old condensed matter problem of the interplay between superconductivity and localization.

References

Signatures of many-body localization of quasiparticles in a flat band superconductor, Koushik Swaminathan, Poula Tadros, and Sebastiano Peotta, Phys. Rev. Research 5, 043215

Short bio (50 words) or link to website

https://fi.linkedin.com/in/koushikswaminathan

Relevant publications (optional)

Signatures of many-body localization of quasiparticles in a flat band superconductor, Koushik Swaminathan, Poula Tadros, and Sebastiano Peotta, Phys. Rev. Research 5, 043215

Career stage

Student

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