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Bosons in a flat band

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Different systems with (nearly) dispersion-free energy bands have appeared in the past years, from magic angle twisted bilayer graphene to optical lattices with exotic lattice geometries, such as the Lieb lattice or the Kagome lattice. Flat bands provide a fascinating arena for strongly correlated many-body phenomena, since their physics is automatically dominated by interactions. In the context of bosonic systems, an intriguing question arises: Will bosons in flat bands condense, and if yes, where? We have analyzed flat band condensates numerically and via a mean-field description. Our results do not only confirm that condensation in the flat band of a Kagome lattice is possible, but also that the condensate may even carry topological properties induced by interactions.

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