

Controlled pairing symmetries in a Fermi-Hubbard ladder with band flattening

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Band flattening has been identified as key ingredient to correlation phenomena in Moiré materials and beyond. Here, we examine strongly repulsive fermions on a ladder – a minimal platform for unconventional d -wave pairing – and show that flattening of the lower band through an additional diagonal hopping term produces non-Fermi liquid behavior, evidenced by the violation of Luttinger’s theorem, as well as axial d -wave pairing correlations. Alternatively, plaquette ring exchange can also generate pairing, albeit with a distinct diagonal d -wave pairing symmetry. Hence, our finding showcases a competition of different unconventional pairing channels, and demonstrates via a simple model how band geometry can induce fermionic pairing. This offers broadly relevant insights for correlated flat-band systems, ranging from ultra-cold atoms to strongly interacting electrons in solids.

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