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Quantum Wakes in Lattice Fermions[1] MATTHEW WAMPLER, PETER SCHAUSS, EUGENE KOLOMEISKY, ISRAEL KLICH, Univ of Virginia — The wake following a vessel in water is a signature interference effect of moving bodies, and, as described by Lord Kelvin, is contained within a constant universal angle. However, wakes may accompany different kinds of moving disturbances in other situations and even in lattice systems. Here, we investigate the effect of moving disturbances on a Fermi lattice gas of ultracold atoms and analyze the novel types of wake patterns that may occur. We show how at half-filling, the wake angles are dominated by the ratio of the hopping energy to the velocity of the disturbance and on the angle of motion relative to the lattice direction. Moreover, we study the difference between wakes left behind a moving particle detector versus that of a moving potential or a moving particle extractor. We show that these scenarios exhibit dramatically different behavior at half-filling, with the "measurement wake" following an idealized detector vanishing, though the motion of the detector does still leaves a trace through a "fluctuation wake." Finally, we discuss the experimental requirements to observe our predictions in ultracold fermionic atoms in optical lattices.

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