Abstract Submitted
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Interaction-induced chiral trajectories in a ladder governed by the Harper-Hofstadter Model[1] MATTHEW RISPOLI, M. ERIC TAI, ALEXANDER LUKIN, ROBERT SCHITTKO, TIM MENKE, DAN BORGNIA, Harvard University, PHILIPP M. PREISS, Universitaet Heidelberg, FABIAN GRUSDT, ADAM M. KAUFMAN, MARKUS GREINER, Harvard University — The combination of interacting charged particles and magnetic fields can to lead to exotic physics that exhibit both spatial entanglement and topological order. Using optical fields, ultracold neutral atoms can simulate the behavior of charged particles in magnetic fields. This capability has been used to study effects such as edge states, topological band structures, and the quantum hall effect. Thus far, however, these experiments have not yet incorporated inter-particle interactions. I will describe recent experimental results in which we apply microscopy to interacting atoms exposed to a synthetic magnetic field and are confined to a 2xN real-space ladder. We observe the chiral dynamics of both single-particle and two-particle systems with strong, finite interactions. We show the interactions for the two-particle system enable chiral dynamics where they would otherwise be absent. Our observation of a novel form of interaction-induced chirality illustrates the rich physics that can emerge with these ingredients even in the few particle limit. Realizing this combination of elements is essential to advance into the regime of fractional quantum hall physics, as well as to drive explorations for new phenomena with the microscopic tools of AMO systems.

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