Abstract Submitted
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Fast long-range coherent transport in hybridized Floquet-Bloch bands[1] KURT FUJIWARA, KEVIN SINGH, ZACHARY GEIGER, MIKHAIL LIPATOV, DAVID WELD, Univ of California - Santa Barbara — Floquet band engineering uses driving in a lattice to hybridize and tune the properties of the original static Bloch bands. Here we discuss the experimental exploration and characterization of hybridized Floquet-Bloch bands using ultracold lithium atoms in an amplitude-modulated 1D optical lattice. In the absence of driving, we report the first experimental observation of position-space center-of-mass Bloch oscillations, which allow direct imaging of the band structure. Strikingly, when a drive is applied, we observe that the interplay of momentum-space and real-space evolution in a Floquet-Bloch band leads to large-scale rapid coherent atomic transport across thousands of lattice sites. This "giant Floquet-Bloch oscillation" can be understood as a consequence of reversible Landau-Zener tunneling to and from higher bands with relativistic dispersion. Transport can be precisely regulated via the drive frequency and strength, offering a simple and powerful tool for atomic control and opening up the possibility of more complex band hybridization schemes.

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