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The anomalous Floquet-Anderson insulator as a non-adiabatic quantized charge pump. PARAJ TITUM, Institute for Quantum Information and Matter, Caltech, Pasadena, California 91125, USA, EREZ BERG, The Weizmann Institute of Science, Rehovot, 76100, Israel, MARK S. RUDNER, Niels Bohr International Academy and Center for Quantum Devices, University of Copenhagen, 2100 Copenhagen, Denmark, GIL REFAEL, Institute for Quantum Information and Matter, Caltech, Pasadena, California 91125, USA, NETANEL H. LINDNER, Physics Department, Technion, 320003 Haifa, Israel — Periodically driven quantum systems provide a novel and versatile platform for realizing topological phenomena. Among these are analogs of topological insulators and superconductors, attainable in static systems; however, some of these phenomena are unique to the periodically driven case. Here, we show that disordered, periodically driven systems admit an anomalous two dimensional phase, whose quasi-energy spectrum consists of chiral edge modes that coexist with a fully localized bulk - an impossibility for static Hamiltonians. This unique situation serves as the basis for a new topologically-protected non-equilibrium transport phenomenon: quantized non-adiabatic charge pumping. We identify the bulk topological invariant that characterizes the new phase (which we call the anomalous Floquet Anderson Insulator, or AFAI). We provide explicit models which constitute a proof of principle for the existence of the new phase. Finally, we present evidence that the disorder-driven transition from the AFAI to a trivial, fully localized phase is in the same universality class as the quantum Hall plateau transition.

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