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Beyond Floquet theory: new paradigms for robust topological phenomena in strongly driven systems MARK RUDNER, Harvard/Ohio State University, MICHAEL LEVIN, University of Maryland, EREZ BERG, Harvard — The discoveries of the quantized Hall effect [1] and Thouless' quantized adiabatic pumping [2] revealed the existence of a new class of extremely robust quantum phenomena which can be observed with high fidelity, largely independent of sample details. The immunity of these remarkable effects to a variety of perturbations can be understood in terms of a topological structure associated with the systems' wave functions. The rapid development of powerful tools for controlling solid state and atomic systems over the last decade has motivated the exploration of topological phenomena in driven systems. Recently, Kitagawa and coworkers [3] discussed analogs of previously known topological phenomena in terms of the Floquet operators of periodically-driven systems. Intriguingly, this work also revealed new robust phenomena, such as the existence of robust chiral edge modes in a 2D system with vanishing Chern numbers for all bulk Floquet bands. Here we construct the topological invariant which distinguishes phases with and without chiral edge modes, and discuss generalizations to other 1D and 2D systems.

[1] K. von Klitzing, G. Dorda, and M. Pepper, Phys. Rev. Lett. 45, 494 (1980).
[2] D. J. Thouless, Phys. Rev. B 27, 6083 (1983).
[3] T. Kitagawa, et al., Phys. Rev. B 82, 235114 (2010).

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