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Floquet Topological Insulators and Negative Resistance Catastrophe in Irradiated Graphene

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Topological matter is one of the most notable examples of quantum materials. Although various classes of topological matter have been studied, such as topological insulators, Dirac and Weyl semimetals, and nodal-line semimetals, most of the research has focused on equilibrium physics. In this talk, we will explore the possibility of generating a new type of topological matter under nonequilibrium conditions by periodically driving topologically trivial systems. Specifically, we will analyze the phase diagram of Floquet topological insulators in irradiated graphene exposed to circularly polarized light. Our analysis predicts the emergence of a negative resistance catastrophe, which could lead to a novel nonequilibrium zero-resistance state.