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Proposed Realization and Signatures of Floquet Topological Superconductors and Insulators[1]

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As understood recently, a topological state may be generated dynamically in an otherwise normal combination of materials by a periodic driving force. These states can only occur when the system is driven out of equilibrium. A Floquet topological insulator can be realized, for example, in a two-dimensional system of Dirac fermions, such as graphene, irradiated by a circularly polarized laser [1]. It is characterized by steady state edge modes and *two* separate integer-valued topological invariants. A Floquet topological superconductor, on the other hand, is characterized by two types of Floquet Majorana fermions—steady states of equal superposition of electrons and holes—with a period that is the same or twice that of the drive [2]. I introduce these concepts and present our recent theoretical work on the realization and detection of these Floquet topological states. First, I discuss how Floquet Majorana fermions can be realized in a highly tunable setup consisting of two coupled quantum dots and detected by a third probe dot [3]. More generally, Floquet Majorana fermions can be detected by measuring a quantized conductance sum rule over discrete values of lead bias differing by multiples of drive frequency [4]. This quantized sum rule is robust against weak disorder. Finally, I present an effective theory of Floquet topological insulators and use it to study their transport signature [5]. Remarkably, we find that disorder can enhance transport at certain Floquet topological transitions by several orders of magnitude.

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