Condensed Matter Seminar

Dynamical generation and signatures of Majorana fermions

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Majorana fermions can be realized as equal superposition of electrons and holes bound to vortices or edges of a topological superconductor. They exhibit a number of interesting properties, such as non-Abelian exchange statistics and non-local correlations, that are expected to be useful for fault-tolerant quantum computation. In this talk, I describe our recent theoretical work on the dynamical generation and signatures of Majorana fermions in periodically driven systems. In particular, we propose a system of coupled quantum dots in proximity to a superconductor and driven by separate ac potentials to realize and detect dynamically generated Majorana fermions. We show that their appearance can be finely controlled in the expanded parameter space of the drive frequency, amplitude, and phase difference across the two dots. Next, I outline the experimental signatures of dynamical Majorana fermions in transport measurements where their presence is signaled by a conductance sum rule over discrete values of lead bias differing by multiple absorption or emission energies at drive frequency.

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