Physics Colloquium

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Signatures of Dispersing 1D Majorana Fermions in

Condensed Matter Systems

Friday, March 29, 2019

2:30pm—3:30pm

210 Robeson Hall

Dirac discovered that every fundamental particle must also have an anti-particle which has the op-posite charge. When particles and anti-particles meet, they annihilate each other, releasing energy. A Majorana fermion is a special type of fundamental particle which is its own antipar-ticle. The possible realization of these exotic Majorana fermions as quasiparticle excitations in condensed matter physics has created much excitement. Most recent studies have focused on Majorana bound states which can serve as topological qubits. More generally, akin to elemen-tary particles, Majorana fermions can propagate and display linear dispersion. These excita-tions have not yet been directly observed, and can also be used for quantum information pro-cessing. This talk is focused on our recent work in realizing dispersing Majorana modes. I will describe the conditions under which such states can be realized in condensed matter systems and what their signatures are. Finally, I will describe scanning tunneling experiments of domain walls in the superconductor FeSe0.45Te0.55, which might potentially be first realiza-tion of dispersing Majorana states in 1D.