MAR16-2015-000373

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Proximity induced topological superconductivity and Majorana fermions

CARLO BEENAKKER, Leiden University

Topological states of matter are a source of low-energy quasiparticles, bound to a defect or propagating along the surface. In a superconductor these are Majorana fermions, described by a real rather than a complex wave function. The absence of complex phase factors promises protection against decoherence in quantum computations based on topological superconductivity. The early theoretical models that produced Majorana fermions relied on an exotic superconducting order, with spin-triplet Cooper pairs in a chiral p-wave orbital state. A recent alternative is to start from a conventional spin-singlet superconductor and use the proximity effect to induce a topologically nontrivial superconducting state in a material with strong spin-orbit coupling. In this talk we give an overview of some of the manifestations of a real Majorana wave function that are waiting to be observed. In particular, we discuss how shot noise measurements can provide for a purely electrical method of detection of charge-neutral Majorana edge modes.