

Area Seminar

Title Majorana fermions in condensed matter systems

Date and Time 04/01/2011 16:00:00

Speaker Dr. Pavan Hosur

UC, Berkeley

Area Theoretical Physics

Venue Room No. 469

Majorana fermions, despite having been in the news for several decades, have not been observed conclusively so far. Although they were first proposed as candidates for neutrinos in high-energy physics, a rather different kind of realization of them has been discussed lately in condensed matter physics, where they can appear in certain superconductors. Most of these proposals, though, either require considerable amount of engineering or involve types of materials that have not yet been discovered. In our work, we propose a way to obtain Majorana states simply by passing a magnetic field through some superconductors, and give several real material examples. An easy route towards obtaining these superconductors is by doping insulators known as 'topological insulators', which have attracted tremendous theoretical and experimental recent attention in the condensed matter community themselves. However, we derive more general criterion which will allow even non-topological insulator-based superconductors to give rise to Majorana states. Additionally, the phase transition between phases with and without Majorana modes takes place through a vortex in the superconductor, which to our knowledge, is the first example of a phase transition inside a topological defect.