

Students' Annual Seminar

Conductance Measurement in proximity induced Superconductivity and Realisation of topological superconductors

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With the progress made in the recent years in the field of condensed matter physics, topological insulators became an important discovery for its application in spintronic devices. Doping these materials or putting thin film of superconductor on top of it renders them superconducting because of proximity effect. The resulting phase of matter is called a topological superconductor, whose hallmark signature would be the presence of Majorana fermions which can be observed as zero bias conductance peak (ZBCP) in the conductance measurements. These Majorana fermions are protected against disorder and decoherence and pose a possible candidate for realization of qubits in quantum computing. In this presentation, I will talk about superconductivity and BCS theory and its conductance measurement which tells us about the BCS density of states and how it changes when we move to a topological superconductor as ZBCP creeps in. I will also talk about the Andreev reflection spectroscopy and BTK model which is used for this kind of metal/superconductor junctions to explain the physics behind it. There are studies which shows that the appearance of ZBCP is all because of Majorana fermions but conclusive study is still lacking, and hence towards the end, I will talk about the proposed experiments that we want to perform in the lab, which is about fabricating simple structures and through conductance measurements answer more elementary questions before addressing bigger research problems on Majorana fermions.

Friday, Feb 16th 2018

04:00 PM (Tea/Coffee at 03:30 PM)

Seminar Hall, TIFR-H