



Seminar

Manipulate the spin states of Cooper pairs and its application in Majorana fermions

Xin Liu

Condensed Matter Theory Center, University of Maryland

Time: 4:00pm, Jan. 5, 2015 (Monday)

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Venue: Conference Room 607, Science Building 5

地点: 理科五号楼607会议室

Abstract

Manipulating the spin states of particles has triggered many innovational fields such as spintronics and topological insulators which focus on the single electron spin. Besides electron, Cooper pairs also have their spin states which are known as spin-singlet and spin-triplet states. In this talk, I first give a unified theory of the spin-singlet and spin-triplet Cooper pairs in the presence of either magnetization or spin-orbit coupling. Then I will show that Majorana fermions on the boundary of topological superconductors only have spin-triplet superconducting correlation. This is universal for all TSCs. This spin-triplet condensate results in the spin-orbit coupling (SOC) controlled oscillatory critical current without $0-\pi$ transition in the TSC/SOC-semiconductor/TSC Josephson junction. The observation of this unique current-phase relation can serve as the signal of Majorana fermions. Moreover, our study may open a new way to manipulate Majorana fermions based on their spin-triplet superconducting correlation.

About the Speaker

Dr. Xin Liu is currently a postdoctoral researcher in Condensed Matter Theory Center (CMTC) at University of Maryland, College Park. His research interests are focused on topological superconductor, spin-triplet superconductivity, topological insulator and spintronics. Dr. Xin Liu got his B.S. degree in Nankai University and M.S. degree in Chern Institute of Mathematics, Tianjin. He received his Ph. D. from Texas A&M University in 2012. After graduation, he had worked as a postdoctoral researcher in the Pennsylvania State University from 2012 to 2014. He joined CMTC in July, 2014.