Condensed Matter Theory Center Seminar

Tuesday, January 28
11:00 am to 12:30 pm, 2205 Physics Building

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"Theory of Proximity Induced Triplet Superconductivity in Spin-orbit-coupled Systems "

The observation of long range proximity effect in a superconductor/ferromagnet junction is, at first, surprising because superconductivity with spin singlet Cooper pairs is incompatible with Zeeman spin splitting induced by ferromagnetic order. This has given rise to suggestions that the induced superconductivity is of spin triplet character. Because spin-orbit coupling can also lift spin degeneracy, it is natural to ask what is the nature of proximity induced superconductivity in a material with strong spin-orbit coupling.

Here, we study proximity induced triplet superconductivity in a spin-orbit-coupled system, and show that the d-vector of the induced triplet superconductivity undergoes precession that can be controlled by varying the relative strengths of Rashba and Dresselhaus spin-orbit couplings. In particular, a long range triplet-helix mode is predicted when the two spin-orbit couplings have equal strengths. We also study the Josephson junction geometry and show that a transition between 0- and pi- junctions can be induced by controlling the spin-orbit coupling with a gate voltage. An experimental setup is proposed to verify these effects. Conversely, the observation of these effects can serve as a direct confirmation of triplet nature of superconductivity.

(All are welcome to attend)

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