第４回トポロジカル物質科学セミナー
Topological Materials Science Seminar (4)

Odd frequency spin-triplet superconductivity at magnetic / superconductor interfaces

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Place: Room 525, Department of Physics, Kyoto University
Date: Monday, 21 Dec 2015
Time: 10:00 ~~11:00~~ - 12:00

Abstract: In superconductors charge flows in the absence of dissipation but, since the Cooper pairs consist of electrons with antiparallel spins, charge currents cannot carry a net spin. Furthermore, since Cooper pairs are easily disrupted by magnetism, the coupling of superconductivity and ferromagnetism might appear useless for applications in spintronics. However, during the past few years a series of discoveries have shown that, not only can magnetism and superconductivity be made to cooperate, but in carefully engineered superconductor/magnet systems new functionality can be created in which spin, charge and superconducting phase coherence can work together (1, 2, 3). By combining these different degrees of freedom a whole new spectrum of exciting predictions is waiting to be explored experimentally.

This talk is split into two parts. In the first part I will introduce the topic of the triplet proximity effect in superconductor / ferromagnetic (S-F) heterostructures and will discuss my group's recent progress in this field, including: spin-selectivity of triplet Cooper pairs in F-S-F superconducting spin-valves (4) and evidence for the formation of a spin-polarized odd frequency superconducting densities of state in an s-wave superconductor proximity coupled to a magnetically inhomogeneous antiferromagnet (5). In the second part, my student will report depth-resolved muon measurements of Au/Ho/Nb trilayers and will present results that demonstrate an inversion of the Meissner effect from diamagnetic to paramagnetic screening in Au due to the stabilization of an odd frequency spin-triplet superconducting state (6).

1. J. Linder and J.W.A. Robinson. *Nature Physics* **11**, 307 (2015).
2. JWA Robinson, JDS. Witt, MG Blamire. *Science* **329**, 59 (2010).
3. C. Klose *et al. Phys. Rev. Lett.* **108**, 127002 (2012).
4. N Banerjee, C Smiet, R Smits, A Ozaeta, S Bergeret, M Blamire, JWA Robinson. *Nature Com.* **5**, 3048 (2014).
5. A Di Bernardo, S Diesch, Y Gu, J Linder, M Blamire, E Scheer, JWA Robinson. *Nature Com* **6**, 8053 (2015).
6. A Di Bernardo, Z Salman, X Wang, M Amado, M Egilmez, M Flokstra, A Suter, S Lee, J Zhao, T Prokscha, E Morenzoni, MG Blamire, J Linder, JWA Robinson, *Phys. Rev. X* **5**, 041021 (2015).

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