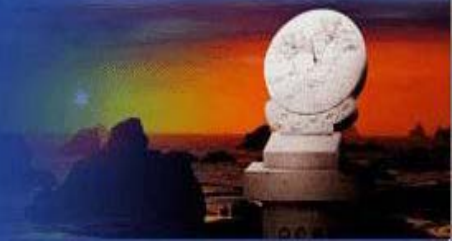




復旦大學

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复旦大学物理系物质科学报告

Physics Department Colloquium

Ising superconductivity and Majorana fermions in superconducting transition metal dichalcogenides

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Ising superconductors with in-plane upper critical fields several times higher than the Pauli limits have been discovered recently in transition metal dichalcogenides such as MoS_2 and NbSe_2 thin films [1-3]. These Ising superconductors have very strong Ising spin-orbit couplings (SOC), in the order of 10 to 100meV, which pin electron spins to the out-of-plane directions. This is in contrast to Rashba SOC which pins electron spins to in-plane directions. Here, we explain how Ising SOC can enhance the in-plane upper critical field of Ising superconductors [1-4]. We also show that Ising superconductors can be used to create Majorana fermions by placing a metal wire on top of the Ising superconductor [5], similar to the case of Rashba wire on top of s-wave superconductors. We further show that an applied in-plane magnetic field can drive a monolayer NbSe_2 [2,5] and into a nodal topological phase with Majorana flat bands when the applied in-plane field is higher than the Pauli limit but smaller than the upper critical field.

References

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- [2] X. Xi, Z. Wang, W. Zhao, J-H Park, K. T. Law, H. Berger, L. Forró, J. Shan, K. F. Mak, Nature Physics **12**, 139-143 (2016).
- [3] Y Saito et al. Nature Physics **12**, 144-149 (2016).
- [4] Benjamin T. Zhou, Noah F.Q. Yuan, Hong-Liang Jiang and K. T. Law, Phys. Rev. B **93**, 180501 R (2016).
- [5] Wen-Yu He, Benjamin T. Zhou, James J. He, Ting Zhang and K. T. Law, arXiv:1604.02867.

Time: 2:00pm, Tuesday, October 25, 2016

Location: Physics Building, Room 221B

(Cookies and coffee are served from 1:30 pm)