



Weekly Seminar

Charge/Spin Transport and Superconductivity at Spin-Split Surface States

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Time: 4:00pm, Dec. 23, 2015 (Wednesday)

时间: 2015年12月23日 (周三) 下午4:00

Venue: w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Due to break down of space-inversion symmetry at surfaces of crystals and strong spin-orbit coupling, some materials such as Rashba systems and topological insulators have spin-split surface electronic states. This results in interesting phenomena such as spin-polarized current [1] and pure spin current flowing at the surfaces states (current-induced spin polarization (CISP) and spin Hall effect). Superconductivity at such surface states is also an emergent topic in surface physics, not only because it is an ultimately thin two-dimensional superconductor, but also because singlet- and triplet- Cooper pairs can be mixed at such surface states (parity-broken superconductivity). Then we can expect a flow of supercurrent carrying net spin. This is an exciting phenomenon for “superconducting spintronics”. In my talk I will show some experimental results of transport at the surface states measured *in situ* in ultrahigh vacuum with microscopic four-point probes; CISP at surface of Bi thin films measured with a magnetic tip in a four-tip scanning tunneling microscope[1], and superconductivity of a monolayer of Tl+Pb on Si(111) surface [2] and Ca-intercalated bilayer graphene [3]. Preliminary results of spin Hall effect of a micro-fabricated ultrathin film of topological insulator Bi_2Se_3 will be also shown.

References

- [1] T. Tono, T. Hirahara, and S. Hasegawa, *New J. Phys.* **15**, 105018 (2013).
- [2] A.V. Matetskiy, S. Ichinokura, *et al.*, *Phys. Rev. Lett.* **115**, 147003 (2015).
- [3] S. Ichinokura, *et al.*, <http://arxiv.org/abs/1508.07079>

About the Speaker

Shuji Hasegawa obtained the B.S. degree in physics, and the Ph.D. degree in condensed matter physics from University of Tokyo, Japan in 1983 and 1991, respectively. He joined in Department of Physics, University of Tokyo as a research associate in 1990, and became a full professor there in 2010. His research interests include Surface Physics, Topological surfaces and Electronic/spin transport at surfaces. Currently, Prof. Shuji is a Member of International Advisory Committee of *J. Phys.: Cond. Matter*, (IOP), Associate Editor of *e-Journal of Surface Science and Nanotechnology*, Member of Executive Board of *The Surface Science Society of Japan*, Member of Executive Board of *The Vacuum Society of Japan*, and Vice-President of NPO *The Japan Committee of Physics Olympiad*.