



Seminar

Spintronics in Quantum Materials

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Time: 10:00 am, November 20, 2019 (Wednesday)

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Venue: Room W563, Physics Building, Peking University

地点: 北京大学物理楼 西563



Abstract

The research on quantum materials is of the central interest in the field of condensed matter physics. These materials are a class of materials whose quantum properties stem from a complex interplay between factors such as quantum confinement, quantum fluctuations, topology of wavefunctions, relativistic spin-orbit interactions and fundamental symmetries, etc.

In this talk, I will firstly give a brief discussion of the novel interesting spin-dependent physical properties of the quantum materials, which are promising for future spintronics applications [1]. Then, I will discuss new types of spin current, beyond conventional spin-polarized electrons, in recent quantum materials, for which the spin current is mediated by spin superfluids, superconducting (SC) quasiparticles, spin-Triplet pairs, and spinons, etc. Following this, I will mainly show three experimental results to illustrate how spin current could be a unique probe for quantum materials. Firstly, the spin current probe of spin superfluidity ground state in canted antiferromagnetic Cr_2O_3 thin films will be presented [2]. Secondly, spin current as a probe for spin dynamics of an s-wave superconducting NbN film will be discussed [3]. Thirdly, I will discuss how spin current can also be used to probe the spin-Triplet current in ferromagnet/superconductor heterostructures [4]. At the end of my talk, I will present the current status and the outlook of this exciting research direction of spin current as a probe for quantum materials [5].

References

- [1] W. Han*, Y. Otani, and S. Maekawa, npj Quantum Materials, 3, 27 (2018), and references therein.
- [2] W. Yuan, Q. Zhu, T. Su, Y. Yao, W. Xing, Y. Chen, Y. Ma, X. Lin, J. Shi*, R. Shindou, X. C. Xie*, and W. Han*, Science Advances, 4, eaat1098 (2018).
- [3] Y. Yao, Q. Song, Y. Takamura, J. Cascales, W. Yuan, Y. Ma, Y. Yun, X. C. Xie, J. S. Moodera, and W. Han*, Physical Review B 97, 224414 (2018).
- [4] Y. Yao, R. Cai, Y. Tsutsumi, Y. Ma, W. Xing, Y. Ji, X. C. Xie, S.-H. Yang*, S. Maekawa*, and W. Han*, Submitted (2019).
- [5] W. Han*, S. Maekawa and X. C. Xie, Nature Material (2019). DOI: 10.1038/s41563-019-0456-7.