



Seminar

Anomalous Hall effect, Anomalous Nernst effect, and Magneto-optical Kerr effect in antiferromagnets

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Time: 4:00pm, Aug. 1, 2018 (Wednesday)

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Venue: Room W563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Recently, a large anomalous Hall effect (AHE) has been observed in antiferromagnetic Mn_3Sn with negligibly small net magnetic moment[1]. Subsequent studies have revealed that this antiferromagnet also exhibits other ferromagnetic properties such as anomalous Nernst effect (ANE)[2] and Magneto-optical Kerr effect (MOKE)[3]. In this talk, we discuss the theoretical aspects of this material based on the first-principles calculations.

First, we explain the magnetic symmetry of Mn_3Sn and the origin of AHE, ANE and MOKE. To quantify antiferromagnetic structures that give these ferromagnetic properties, we introduce a cluster multipole moment[4] and demonstrate the importance of the cluster octupole moment. Relation to the topological properties of the band structure is also discussed. We also show that such cluster octupole moments commonly exist in antiferromagnetic insulators where the Dzyaloshinskii-Moriya interaction induces weak canted ferromagnetic moment and that the MOKE in these insulators are explained by these octupole moments.

[1] S. Nakatsuji et al. *Nature* **527** 212 (2015).

[2] M. Ikhlas et al. *Nature Physics* **13** 1085 (2017).

[3] T. Higo et al. *Nature Photonics* **12** 73 (2018).

[4] M.-T. Suzuki et al. *Phys. Rev. B* **95** 094406 (2017).

About the speaker

Prof. Takashi Koretsune got his PhD in Physics Department in the university of Tokyo in 2004, and did a postdoctoral research in RILEN in Japan under supervise of Akira Furusaki. From 2006 to 2014, he has been an assistant professor in Tokyo Institute of technology under supervise of Prof. Susumu Saito. From 2014 to 2016, he is a senior scientist in RIKEN under supervise of Ryotaro Arita. Since 2016, he has been an associate professor in tohoku university.