



Weekly Seminar

Spin hydrodynamic generation

mamoru matsuo

Japan Atomic Energy Agency

Time: 4:00pm, April 27, 2016(Wednesday)

时间: 2016年4月27日 (周三) 下午4:00

Venue: Room W563, Physics Building, Peking University

地点: 北京大学物理楼 西563

Abstract

Spin current, the flow of spins, is a key concept in spintronics. To generate spin currents, two couplings have been basically utilized: the spin-orbit coupling and the exchange coupling [1]. Recently, an alternative scheme has been proposed where the spin-rotation coupling is exploited for generating spin currents [2,3]. The spin-rotation coupling allows the angular momentum conversion between electron spin and mechanical angular momentum. In this talk, we will present our recent study on mechanical generation of spin current and show that vorticity-gradient created in a liquid metal flow can be utilized for spin-current generation [4]. We will also present our experimental results, where fluid vorticity in a fine pipe flow of liquid metals, such as Hg and GaInSn alloy are used and the measured electric voltage signals are well-fitted by a scaling law predicted from our theory [4].

[1] S. Maekawa, S. Valenzuela, E. Saitoh, and T. Kimura, (eds.), "Spin current", Oxford Univ. Press (2012).

[2] M. Matsuo et al., Phys. Rev. Lett. 106, 076601 (2011).

[3] M. Matsuo et al., Phys. Rev. B 87, 180402(R) (2013).

[4] R. Takahashi et al., Nature Physics (2015) DOI:10.1038/NPHYS3526.

About the Speaker

In 2008, mamoru matsuo received the Dr.Sc.(Hadron physics) degrees in theoretical physics from the University of Tokyo. In 2009, he started to develop theory for mechanical generation of spin current in Maekawa lab at IMR, Tohoku University. Since 2010, he has been with Advanced Science Research Center at Japan Atomic Energy Agency. He is currently senior scientist in ASRC and a research leader in an ERATO-JST project, "ERATO SAITOH Spin Quantum Rectification", directed by Prof. Eiji Saitoh.