Kenyon College

Department of Physics

DR. FENGYUAN YANG

Professor of Physics
The Ohio State University

Friday, April 28, 2017 - 3:10 pm

Franklin Miller, Jr. Lecture Hall
(Hayes Hall 109)
Reception to follow.

FMR-Drive Pure Spin Transport in Metals and Magnetic Insulators

Spintronics relies on the generation, transmission, manipulation, and detection of spin current mediated by itinerant charges or magnetic excitations. Ferromagnetic resonance (FMR) spin pumping is a powerful technique in understanding pure spin currents. Building on the high-quality $Y_3Fe_5O_{12}$ (YIG) films grown by our UHV off-axis sputtering technique and the large inverse spin Hall effect (ISHE) signals enabled by these films, we have characterized pure spin currents in several classes of materials with different magnetic structures, including: nonmagnetic (NM) metals, ferromagnetic (FM) metals, nonmagnetic insulators, and antiferromagnetic (AF) insulators. The spin Hall angles determined for a series of 3d, 4d, and 5d NM metals show that both atomic number and d-electron count play important roles in spin Hall physics. By inserting an insulating spacer of various materials between YIG and Pt, we are able to probe the mechanism of spin pumping and the spin propagation. More interestingly, we observed robust spin current from YIG to Pt across AF insulators, which initially enhances the ISHE signals and can transmit spin currents up to 100 nm thickness, demonstrating highly efficient spin transport through an AF insulator carried by magnetic excitations. This will open a wide range of new opportunities for spintronics.