CMP Seminar
Michigan State University

Carl Boone
Boston University

Magnetodynamics and Spin Transport in Spintronic Thin Film Heterostructures

Spintronics is an emerging set of technologies whose devices rely on manipulation of the electrons' spin degrees of freedom, which is directly related to the collective magnetic moment in solid-state materials. Development of spintronic devices, such as Magnetoresistive RAM (MRAM) and racetrack memory, thus requires knowledge of the dynamics of magnetic moments in ferromagnetic materials, especially the effects of damping. Spintronic devices will utilize electron transport to function, so design also requires knowledge of the couplings of electron spin, momentum, and charge. Recent theoretical and experimental developments have identified new interfacial phenomena that can manipulate magnetic moments, introducing new driving and damping terms, via transfer of spin from one material to another. In this talk I will discuss ferromagnetic dynamics and some basic applications for spintronics, I will define some key spin transport parameters necessary for device design and the metrologies to measure them. I will review my recent work at NIST towards developing new methods to manipulate ferromagnetic damping and measure important spin transport parameters, such as the spin diffusion length, in metals at room temperature. Our experiments are precise enough to probe previously inaccessible regimes and test competing hypotheses of spin transport in heavy metals.

Carl Boone received his B.S. from the University of California, Santa Barbara (UCSB) and Ph.D. from the University of California, Irvine (UCI), both in physics. He worked as a postdoctoral researcher at Hitachi Global Storage Technologies for two years before accepting a National Research Council Postdoctoral Fellowship at the National Institute of Standards and Technology (NIST) in Boulder, CO.

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Prof. Jack Bass - Host