College of Science
Department of Physics & Astronomy

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Weekly Calendar

September 28 – October 2, 2015

Departmental Colloquium

"Complex wave vector band structure for quantum transport"

3:30 PM Thursday, October 1, 2015

109 Nicholson Hall

Xiaoguang Zhang
University of Florida, Gainesville

HOST: Rongying Jin

• Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall •

Quantum mechanically forbidden states in a solid can exist as exponentially decaying states at surfaces and interfaces. These decaying states are described by complex wave vectors whose imaginary parts determine their rates of decay. The energy dependence of these complex wave vectors for a solid, the so-called complex band structure, can help us determine quantum transport properties of the material entirely from first-principles (i.e., without adjustable parameters that are fit to experiments). Here I will show how the complex band structure is used (1) to predict the giant tunneling magnetoresistance in magnetic tunnel junctions, (2) to estimate resistance of twin grain boundaries in copper, and (3) to calculate electron mobility in silicon. Comparison with experiments shows that complex band structure provides a powerful and accurate method for quantum transport.

Publications:

1. "Loop quantum cosmology, non-Gaussianity, and CMB power asymmetry," **Ivan Agullo**, Phys. Rev. D 92, 064038 (2015).