Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Tunable topological crystalline insulators"

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Abstract: Topological crystalline insulators (TCIs) in the Pb1-xSnxSe class are exemplary topological systems. Their surface and bulk band structure consists of symmetric electron-hole bands with a widely tunable energy gap and nearly isotropic Fermi surface. TCIs grown by molecular beam epitaxy exhibit high mobilities (>1m^2/Vs) and low carrier densities ($10^{17}cm^{-3}$) allowing the observation of Landau levels at fields as low as 2T and up to temperatures close to 200K. This unprecedented material quality has allowed us to perform a systematic mapping of the topological phase diagram of $Pb_{1-x}Sn_xSe$ bulk epilayers and quantum wells using magnetooptical infrared spectroscopy. In this seminar, I will go over two of our most recent results. I will first discuss our observation of an avoided crossing of the 3D band edges at the critical topological state in TCIs versus increasing temperature, Sn-content and magnetic field. Secondly, I will discuss our experimental measurement of the tuning of the TCI surface-state hybridization gap versus temperature over a range exceeding 50meV. In addition to the fundamental questions that we tackle, our results show that Pb1-xSnxSe is technologically ready for optical applications.

12:00pm noon
Tuesday, March 12, 2019
Duboc Room (4-331)

Host: Liang Fu