

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

“Emergence of Orbital Chirality
in Multi-orbital Surface Bands”

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Abstract: A common wisdom in surface science is that the inversion symmetry breaking (ISB) at the surface is the origin, together with the spin-orbit effect, of the celebrated Rashba effect on the surface electronic structure. In this talk I will argue that a generic consequence of ISB in multi-orbital bands (such as generated by t_{2g} -orbitals or p-orbitals), even in the absence of any spin-orbit coupling, is the emergence of "orbital chirality". While similar to spin chirality due to the Rashba effect, the proposed orbital chirality splitting occurs in +1, 0, -1 orbital angular momentum (OAM) sectors. The new effect is dubbed the orbital Rashba effect. Circular dichroism (CD) ARPES is shown to be an effective probe of the orbital chirality in the band structure, and I will present recent demonstrations of this in simple surface bands of Cu and Ag. The more challenging case of strongly spin-orbit-coupled bands of Bi₂Se₃ surface will be briefly mentioned, along with several conflicting interpretations surrounding the same sort of CD-ARPES measurements.

As applications of this idea I will talk about possible p-wave-type Kondo pairing in ultrathin Kondo lattice material, orbital analogue of Dzyaloshinskii-Moriya interaction in the Mott limit, and possible relevance in spin-transfer torque measured in ultrathin magnetic films. Time permitting, I will discuss ongoing investigation of the orbital chirality structure in the surface bands of SrTiO₃.

12:00noon
Tuesday, February 25, 2014
Duboc Seminar Room (4-331)