

Colloquium

Department of Physics

Shining a light on High T_c superconductivity

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Abstract

Photoemission has developed into a powerful probe of condensed matter. Modern technical developments enable the study of not only the single particle spectra but also the interaction with collective excitations. In this talk we present an overview of the modern photoemission experiment, followed by demonstrations of its application to the high T_c cuprate superconductors. We discuss insights into the complex phase diagram of the latter materials offered from photoemission studies. We show that in the underdoped pseudogap regime of the cuprates the Fermi surface is characterized by pockets and that these pockets evolve into a large Fermi surface beyond a critical doping of 0.2. The latter representing a transition from a doped Mott Insulator to a more metallic like material. However the overdoped regime is also characterized by superconducting fluctuations resulting in a gap still evident in the spectra at temperatures above T_c and suggestive of granular superconductivity in these systems. A refinement of the photoemission technique, pump-probe or two photon photoemission, is used to further investigate the character of the Fermi surface. By using ultrafast photo-doping and examining the system in non-equilibrium we are able to confirm the presence of hole-pockets in the underdoped region. Finally a more recent and powerful development in condensed matter physics has been the realization of the role of topology. In detailed studies of the more modern Fe based superconductors we examine systems where topology appears to interface with the world of high T_c superconductivity.

Monday, March 19, 2018 at 3:00 pm

SERC, Room 116

Refreshments will be served at 2:45 pm