Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

A Unified Description of the Electronic Structure and Dynamics in the Doped Mott Insulator Sr_2IrO_4 DANIEL DESSAU, YUE CAO, HAOXIANG LI, XIAOQING ZHOU, Univ of Colorado - Boulder, RAJENDRA DHAKA, Department of Physics, Indian Institute of Technology Delhi, NICHOLAS PLUMB, Swiss Light Source, Paul Sherrer Institut, QIANG WANG, Department of Physics, University of Colorado, Boulder, TONGFEI QI, JASMINKA TERZIC, Department of Physics and Astronomy, University of Kentucky, XIUWEN ZHANG, ALEX ZUNGER, RASEI, University of Colorado, Boulder, GANG CAO, Department of Physics, University of Colorado, Boulder — An important mission of modern condensed matter physics is to forge the link between the local high energy electronic interactions and the emergent collective excitations at lower energies and longer wave lengths. This can be a daunting task when electrons are strongly correlated, e.g. in the evolution of the electronic structure as a Mott insulator is doped into a Fermi liquid. We show the asymmetrical electronic structure evolution in the hole and electron-doped Mott insulator Sr_2IrO_4 using angle-resolved photoemission spectroscopy. There is a ubiquitous momentum transfer (π, π) connecting the dynamically inequivalent parts of the electronic structure near the Fermi level. By parameterizing first-principles calculations, we associate this momentum transfer with an energy scale $V_{\pi\pi}$ that smoothly connects the electronic structure between the Mott insulator and Fermi liquid limits, allowing us to understand many novel aspects of the physics of these materials.

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Date submitted: 11 Nov 2016 Electronic form version 1.4