Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Imaging Doped Holes in a Cuprate Superconductor with High-Resolution Compton Scattering B. BARBIELLINI, Northeastern U. (NU), Y. SAKURAI, M. ITOU, JASRI, SPring-8, P.E. MIJNARENDS, NU and Delft University of Technology, R.S. MARKIEWICZ, NU, S. KAPRZYK, NU and AGH Krakow, J.-M. GILLET, Ecole Centrale Paris, S. WAKIMOTO, Quantum Beam Science Directorate, Japan Atomic Energy Agency, M. FUJITA, Tohoku University, S. BASAK, Y.J. WANG, W. AL-SAWAI, H. LIN, A. BANSIL, NU, K. YAMADA, Tohoku University — The high-temperature superconducting cuprate $La_{2-x}Sr_xCuO_4$ (LSCO) shows several phases ranging from antiferromagnetic insulator to metal with increasing hole doping. To understand how the nature of the hole state evolves with doping, we have carried out high-resolution Compton scattering measurements at room temperature together with first-principles electronic structure computations on a series of LSCO single crystals in which the hole doping level varies from the underdoped (UD) to the overdoped (OD) regime [1]. Holes in the UD system are found to primarily populate the O 2px/py orbitals. In contrast, the character of holes in the OD system is very different in that these holes mostly enter Cu d orbitals. High-resolution Compton scattering provides a bulk-sensitive method for imaging the orbital character of dopants in complex materials.

[1] Y. Sakurai *et al.* Science **332**, 698 (2011).

Bernardo Barbiellini
Northeastern U.

Date submitted: 15 Dec 2011 Electronic form version 1.4