Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Imaging studies of hole-electron asymmetry observed in a lightly-doped high-T_c superconductor $Ca_{2-x}Na_xCuO_2Cl_2$ YUHKI KOHSAKA, CHRISTIAN LUPIEN, CURRY TAYLOR, LASSP, Cornell University, TETSUO HANAGURI, RIKEN, MASAKI AZUMA, MIKIO TAKANO, Kyoto University, HIDENORI TAKAGI, Univerisity of Tokyo, SEAMUS DAVIS, LASSP, Cornell University — We have reported spectroscopic imaging on the electronic state intervening between the Mott insulator and the d-wave superconductor [1]. The electronic state with $|E| < 100$ meV shows complex spatial modulations with $4a_0 \times 4a_0$ (a_0: in-plane lattice constant) correlations. Moreover, the tunneling spectra show characteristic hole-electron asymmetry, which is thought to be related to the approach of the Mott insulator [2]. Here we report on new studies of imaging the 'Mottness' through mapping the asymmetry in tunneling spectra associated with high energies $|E| > 100$ meV. Spectroscopic mapping of the asymmetry reveals strong $4a_0 \times 4a_0$ periodic modulation up to several hundreds meV. However the $4a_0/3 \times 4a_0/3$ component, which appears in the Fourier transform of the checkerboard pattern observed at $|E| < 100$ meV, is negligle. This spatial modulation of the 'Mottness' may indicate that hole density is modulated with the $4a_0 \times 4a_0$ periodicity. This would imply that the $4a_0/3 \times 4a_0/3$ periodicity observed at lower energies may arise from umklapp scattering due to the hole density modulation. [1] T. Hanaguri *et al.*, Nature 430, 1001 (2004). [2] P. W. Anderson and N. P. Ong, cond-mat/0405518.

Yuhki Kohsaka
LASSP, Cornell University

Date submitted: 01 Dec 2004 Electronic form version 1.4