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Atomic-resolution tunneling asymmetry mapping in $Ca_{2-x}Na_xCuO_2Cl_2$: charge distribution, crystal distortion and superconducting electronic structure properties of glassy electronic nanodomains Y. KOHSAKA, C. TAYLOR, LASSP, Cornell University, C. LUPIEN, Universite de Sherbrooke, T. HANAGURI, H. TAKAGI, RIKEN, M. AZUMA, M. TAKANO, Kyoto Univerisity, J. C. DAVIS, LASSP, Cornell University — We report spectroscopic imaging on the electronic state in a lightly-doped high-T_c superconductor $Ca_{2-x}Na_xCuO_2Cl_2$. Conductance maps at $|E|$ <100 mV show $4a_0$ correlation 'checkerboard' patterns (a_0: in-plane lattice constant) [1]. At higher energies, the electronic state shows strong hole-electron asymmetry changing with the doping levels. The asymmetry integrated up to 600 mV changes at atomic scale and exhibits spatial patterns with $4a_0$ correlation, consistent with spatial modulation of hole density [2]. At intermediate energies, the asymmetry structures locally break rotational symmetry of background lattice, forming uni-directional and glassy nano-domains with $4a_0$ correlation. In-plane oxygen atoms appear electronically inequivalent, implying oxygen orbitals are key for physics in this energy range. We also discuss atomic motions and relationship of superconductivity to the glassy electronic nano-domains. [1] T. Hanaguri *et al.*, Nature 430, 1001 (2004). [2] M. Randeria *et al.*, PRL 95, 137001 (2005).

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