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Gap Inhomogeneity-Induced Electronic States in Superconducting $Bi_2Sr_2CaCu_2O_{8+\delta}$ ALAN FANG, Stanford University, LUCA CAPRIOTTI, Credit Suisse First Boston, Ltd. (Europe), DOUG SCALAPINO, University of California, Santa Barbara, STEVE KIVELSON, Stanford University, NOBU KANEKO, National Institute of Advanced Industrial Science and Technology (Japan), MARTIN GREVEN, AHARON KAPITULNIK, Stanford University — We use STM to measure nearly optimally doped $Bi_2Sr_2CaCu_2O_{8+\delta}$ in zero field. Focusing on the superconducting gap, we find patches of what appear to be two different phases in a background of some average gap, one with a relatively small gap and sharp large coherence peaks and one characterized by a large gap with broad weak coherence peaks. We compare these spectra with calculations of the local density of states for a simple phenomenological model in which a $2\xi_0 \times 2\xi_0$ patch with an enhanced or supressed d-wave gap amplitude is embedded in a region with a uniform average d-wave gap.

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