Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Exploring Quasiparticles in High-T_c Cuprates Through Photoemission, Tunneling, and X-ray Scattering Experiments EMANUELE DALLA TORRE, YANG HE, DAVID BENJAMIN, EUGENE DEMLER, Harvard University — One of the key challenges in the field of high-temperature superconductivity is understanding the nature of fermionic quasiparticles. Experiments consistently demonstrate the existence of a second energy scale, distinct from the d-wave superconducting gap, that persists above the transition temperature into the "pseudogap" phase. One common class of models relates this energy scale to the quasiparticle gap due to a competing order, such as the incommensurate "checkerboard" order observed in scanning tunneling microscopy (STM) and resonant elastic X-ray scattering (REXS). In this paper we show that these experiments are better described by identifying the second energy scale with the inverse lifetime of quasiparticles. We develop a minimal phenomenological model that allows us to quantitatively describe STM and REXS experiments and compare them with angle-resolved photo-emission spectroscopy (ARPES). Our study refocuses questions about the nature of the pseudogap phase to the study of the origin of inelastic scattering.

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Date submitted: 10 Nov 2013 Electronic form version 1.4