Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Theory of the Normal State of the Copper-Oxide Superconductors[1] TING PONG CHOY, ROBERT G. LEIGH, PHILIP PHILLIPS, University of Illinois at Urbana Champaign — We show here that many of the normal state properties of the cuprates are consequences of the new charge 2e boson which we have recently (Phys. Rev. Lett. **99**, 46404 (2007) and arXiv:0707.1554) shown to exist in the exact low-energy theory of a doped Mott insulator. In particular, the 1) mid-infrared band, 2) the T^2 contribution to the thermal conductiivty, 3) the pseudogap, 4) the bifurcation of the electron spectrum below the chemical potential as recently seen in angle-resolved photoemission, 5) insulating behaviour away from half-filling, 6) the high and low-energy kinks in the electron dispersion and 7) T-linear conductivity all derive from the charge 2e boson. We also calculate the inverse dielectric function and show that it possesses two dispersing particle-hole branches as a function of momentum in the lightly doped regime. The second of the two branches is mediated by a new charge e composite excitation formed from the charge 2e boson and represents a distinctly new prediction of this theory. We propose that electron energy loss spectroscopy at finite momentum and frequency can be used to probe the existence of the second particle-hole branch.

[1]We thank the NSF DMR-0605769 for partial support. This research was also supported in part by the NSF PHY05-51164.

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Date submitted: 26 Nov 2007 Electronic form version 1.4