Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Quantum Oscillations in the Underdoped Cuprate $YBa_2Cu_4O_8$[1]
EDWARD YELLAND, University of St Andrews, UK, JOHN SINGLETON, CHUCK MIELKE, NEIL HARRISON, FEDOR BALAKIREV, LANL, BOGDAN DABROWSKI, Northern Illinois University, MARCIN MATUSIAK, JOHN COOPER, University of Cambridge — The quantum oscillations (QOs) seen in the underdoped cuprate superconductor $YBa_2Cu_4O_8$ (Y124) in magnetic fields up to B=85T [1] are strong evidence for a well-defined Fermi surface (FS) in Y124 at low temperature T and high B. The QO frequency F=660±15T, implies a FS pocket with 2.4% of the full Brillouin zone (BZ) area. Taken with earlier work [2], our data suggest FS pockets are generic to underdoped CuO_2 planes and give the first hint of doping dependence of the FS. We discuss the carrier concentration implied by the QOs within various models. Comparison of the T-linear specific heat γ (from QO quasiparticle mass m*) to γ estimated from zero-field specific heat measurements constrains the number of FS pockets present in the BZ and supports a reduced BZ due e.g. to a charge/spin density wave or ordered orbital currents. [1] E. A. Yelland et al, arXiv:0707.0057. [2] N. Doiron-Leyraud et al, Nature 446, 565 (2007)

[1]Thanks to EPSRC (U.K.) for financial support. Work supported by DoE grants LDRD-DR-20070085 and BES fieldwork grant, "Science in 100T". Work at NHMFL is performed under the auspices of the National Science Foundation, DoE and the State of Florida

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Date submitted: 27 Nov 2007 Electronic form version 1.4