Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Pairing associated with a single quantum critical energy in superconducting electron-doped cuprates KUI JIN, NICHOLAS BUTCH, KEVIN KIRSHENBAUM, PAUL BACH, JOHNPIERRE PAGLIONE, RICHARD GREENE, Center for Nanophysics & Advanced Materials and Department of Physics, University of Maryland, College Park, MD 20742, USA — Though a comprehensive study of magnetotransport on electron-doped $La_{2-x}Ce_xCuO_4$ thin films, we show that an envelope of spin fluctuations yielding non Fermi liquid behavior ($\rho = \rho_0 + AT$) surrounds the superconducting dome in the overdoped region (x =0.15 to 0.21). This behavior survives to zero temperature over a range of fields exceeding the upper critical field. For example, the resistivity of x = 0.15 is linear in temperature over three decades down to 20 mK at 7.5 T. We demonstrate that all of the relevant energy scales in this system: those determining superconducting pairing, spin correlations, and the Fermi liquid metallic state, emanate from one common critical point at the end of the superconducting dome. These observations suggest that the superconductivity pairing is associated with spin fluctuations and with a single quantum critical energy in electron-doped cuprates. This work was partially supported by NSF-DMR 0653535.

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Date submitted: 12 Nov 2010 Electronic form version 1.4