Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Nonlinear I-V Curve at a Quantum Impurity Quantum Critical Point HAROLD BARANGER, Duke Univ, CHUNG-HOU CHUNG, CHAO-YUN LIN, Chiao-Tung Univ and Natl Center for Theoretical Sciences, Taiwan, GU ZHANG, CHUNG-TING KE, GLEB FINKELSTEIN, Duke Univ — The nonlinear I-V curve at an interacting quantum critical point (QCP) is typically out of reach theoretically. Here, however, we provide a striking example of an analytical calculation of the full nonlinear I-V curve at the QCP. The system that we consider is a quantum dot coupled to resistive leads – a spinless resonant level interacting with an ohmic EM environment in which a QCP similar to the two-channel Kondo QCP occurs. Recent experiments studied this criticality via transport measurements: the transmission approaches unity at low temperature and applied bias when tuned exactly to the QCP (on resonance and symmetric tunnel barriers) and approaches zero in all other cases. To obtain the current at finite temperature and arbitrary bias, we write the problem as a one-dimensional field theory and transform from electrons in the left/right leads to right-going and left-going channels between which there is weak two-body backscattering. Drawing on dynamical Coulomb blockade theory, we thus obtain an analytical expression for the full I-V curve. The agreement with the experimental result is remarkable.

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Date submitted: 06 Nov 2015 Electronic form version 1.4