Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Non-Fermi Liquid behavior at the Orbital Ordering Quantum Critical Point in the Two-Orbital Model[1] KA WAI LO, WEI-CHENG LEE, PHILIP PHILLIPS, University of Illinois at Urbana-Champaign — The critical behavior of a two-orbital model with degenerate d_{xz} and d_{yz} orbitals is investigated by multidimensional bosonization. We find that the corresponding bosonic theory has an overdamped collective mode with dynamical exponent $z = 3$, which appears to be a general feature of a two-orbital model and becomes the dominant fluctuation in the vicinity of the orbital-ordering quantum critical point. Since the very existence of this $z = 3$ overdamped collective mode induces non-Fermi liquid behavior near the quantum critical point, we conclude that a two-orbital model generally has a sizable area in the phase diagram showing non-Fermi liquid behavior. Furthermore, we show that the bosonic theory resembles the continuous model near the d-wave Pomeranchuk instability, suggesting that orbital order in a two-orbital model is identical to nematic order in a continuous model. Our results can be applied to systems with degenerate d_{xz} and d_{yz} orbitals such as iron-based superconductors and bilayer strontium ruthenates $Sr_3Ru_2O_7$.

[1]DE-AC0298CH1088, NSF-DMR-1104909

Ka Wai Lo
University of Illinois at Urbana-Champaign

Date submitted: 19 Oct 2012 Electronic form version 1.4