Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

ECFL in the limit of infinite dimensions EDWARD PEREPELITSKY, DANIEL HANSEN, Physics Department, University of California, Santa Cruz, California 95064,USA, ANTOINE GEORGES, Centre de Physique Théorique (CPHT) École Polytechnique 91128 Palaiseau Cedex France, SRIRAM SHASTRY, Physics Department, University of California, Santa Cruz, California 95064, USA
— Novel techniques for strongly correlated matter are of great importance. Here we compare two recent and independent methods that show considerable promise, and have overlapping regimes of applicability. We evaluate in infinite dimensions the leading order (i.e. $O(\lambda^2)$) equations from the theory of Extremely Correlated Fermi Liquids of the tJ model and compare the resulting Greens functions with recent results from the dynamical mean field theory of the Hubbard model, valid at large U/t that are broadly in the same parameter range where the tJ model is valid. Using the Schwinger equations of motion of the tJ model, we also show exactly that in infinite dimensions a suitably defined Dysonian self energy for the tJ model is independent of the wave vector, while the two self energies of the ECFL theory $\Phi(\vec{k}, i\omega_n)$ and $\Psi(\vec{k}, i\omega_n)$ are respectively linear in $\varepsilon_{\vec{k}}$ and independent of $\vec{k}$ in a minimal description. In particular, we prove that in the minimal theory $\Psi(\vec{k}, i\omega_n) = \Psi(i\omega_n)$ and $\Phi(\vec{k}, i\omega_n) = \chi(i\omega_n) + \varepsilon_{\vec{k}}\Psi(i\omega_n)$.

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Date submitted: 10 Dec 2012 Electronic form version 1.4