Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Finite-temperature Dynamics and Quantum Criticality in a Model for Insulating Magnets JIANDA WU, WANG YANG, CONGJUN WU, UC San Diego, QIMIAO SI, Rice University — Theoretical understanding of the finite-temperature dynamics in quantum critical systems is a challenging problem, due to the mixing of thermal and quantum fluctuations. Recently, neutron scattering experiments in the three-dimensional quantum dimmer material TlCuCl3 under pressure tuning have mapped out the magnetic dynamics at finite temperatures in the quantum critical regime [1], thereby providing the opportunity for systematic understandings. In this work, we calculate the spin spectral function of an $O(n)$ symmetric field theory using a field-theory procedure to two loops. We calculate the temperature dependence of the energy and damping rate of the spin excitations in the quantum critical regime, demonstrate a good agreement with the experimental results, and determine the parameter regime of the field theory that is appropriate for TlCuCl3. From our calculations we can also suggest further experimental means to test the applicability of the underlying field theory in this and related systems. [1] P. Merchant, B. Normand2, K.W. Krmer, M. Boehm, D. F. McMorrow and Ch. Regg, Nat. Phys. 10, 373 (2014).

Jianda Wu
UC San Diego

Date submitted: 05 Nov 2015 Electronic form version 1.4