Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Field-induced thermal transport in BEC antiferromagnets[1]
SASHA CHERNYSHEV, UC Irvine, CRISTIAN BATISTA, LANL — Recent experiments in BEC quantum magnets exhibit a dramatic evolution of the thermal conductivity of these materials in magnetic field. By considering various relaxation mechanisms of bosonic excitations in the vicinity of the BEC quantum-critical point at finite temperature we provide a detailed explanation of several unusual features of the data. We identify the leading impurity-scattering interaction and demonstrate that its renormalization due to quantum fluctuations of the paramagnetic state compensates the related mass renormalization effect. This explains the enigmatic absence of the asymmetry between the two critical points in the low-T thermal conductivity data, while such an asymmetry is prominent in many other physical quantities. The observed characteristic "migration" of the peak in thermal conductivity away from the transition points as a function of temperature is explained as due to a competition between an increase in the number of heat carriers and an enhancement of their mutual scattering. An important role of the three-boson scattering processes within the ordered phase of these systems is also discussed. Other qualitative and quantitative features of the experiment are clarified and the future directions are sketched.

[1]supported by the DoE

Sasha Chernyshev
UC Irvine

Date submitted: 19 Nov 2010 Electronic form version 1.4