Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Evolution of Quantum Critical Behavior In A Concentrated Ternary Solid Solution: $NiCoCr_x$ BRIAN SALES, KE JIN, HONGBIN BEI, MALCOLM STOCKS, GERMAN SAMOLYUK, ANDREW MAY, MICHAEL MCGUIRE, Oak Ridge National Laboratory — The face centered cubic (fcc) alloy $NiCoCr_x$ with x near 1 is found to be close to the Cr concentration where the ferromagnetic transition temperature, T_c goes to 0. Near this composition these alloys exhibit a resistivity linear in temperature to 2 K, a perfectly linear magnetoresistance, and an excess -TlnT contribution to the low temperature heat capacity. As the Cr concentration is decreased from 1, the Curie temperature and the saturation magnetization, M_0, both increase exponentially with x. For x = 0.5, $T_c \approx 217$ K, but M_0 is only 0.26 Bohr magnetons/atom, indicating highly itinerant ferromagnets for 0.5 <x <0.8. All of the low temperature electrical, magnetic and thermodynamic properties of the alloys with compositions near x=1 are not typical of a Fermi liquid and suggest strong magnetic fluctuations associated with a quantum critical region. This new class of concentrated solid solution fcc alloys are ideal model systems to study the effects of chemical disorder on emergent properties near a quantum critical point. Research supported by the DOE Office of Science, Materials Science and Engineering Division, and the Energy Dissipation to Defect Evolution EFRC.

Brian Sales
Oak Ridge National Laboratory

Date submitted: 04 Nov 2015 Electronic form version 1.4