Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Phase Control of Magnetic Order in (Y,Lu)$BaCo_4O_7$ JOHN MITCHELL, SEVDA AVCI, OMAR CHMAISSEM, Argonne National Laboratory, LAURENT CHAPON, Institut Laue Langevin, DMITRY KHALYAVIN, ISIS Facility, Rutherford Laboratory — The $RBaCo_4O_7$ (R=Ca, Y, Tb-Lu) system provides a novel topology for studying geometric frustration, in which face-sharing tetrahedra of magnetic ions link to form trigonal bipyramids on a Kagomé lattice. Here we describe the structural and magnetic behavior of the Lu member and the solid solution joining Lu to Y as a chemical means to tune between magnetically ordered and disordered ground states. Mean-field models of the generic magnetic phase diagram of $RBaCo_4O_7$ determined recently by our group (D. D. Khalyavin et al. Physical Review B 82, 094401 (2010)) show a variety of magnetic states as a function of two exchange parameters: J_{ab} and J_c, where J_{ab} links Co ions in the Kagomé planes and J_c links Co ions from the Kagome plane to the interleaving triangular layer. Experimentally, we find that $YBaCo_4O_7$ has a long-range ordered antiferromagnetic ground state, while $LuBaCo_4O_7$ appears to be disordered above 2 K with very slow dynamics measured by neutron scattering. We use the solid solution to interpolate between these endpoints and discuss these results with respect to the mean-field phase diagram.

John Mitchell
Argonne National Laboratory

Date submitted: 09 Nov 2011 Electronic form version 1.4