Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Exotic magnetism on the FCC lattice of $5d^n$ double perovskites D.D. MAHARAJ, E. KERMARREC, C.A. MARJERRISON, Department of Physics and Astronomy, McMaster University, Hamilton, Ontario, L8S 4M1, Canada, C.M. THOMPSON, Department of Chemistry, McMaster University, Hamilton, Ontario, L8S 4M1, Canada, K. LEVIN, S. KROEKER, Department of Chemistry, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada, G.E. GRANROTH, Neutron Data Analysis and Visualization Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA, R. FLACAU, Z. YAMANI, Canadian Neutron Beam Centre, AECL, Chalk River, Ontario, K0J 1J0, Canada, J.E. GREEDAN, Department of Chemistry, McMaster University, Hamilton, Ontario, L8S 4M1, Canada, B.D. GAULIN, Department of Physics and Astronomy, McMaster University, Hamilton, Ontario, L8S 4M1, Canada — In the search for exotic quantum states, the impact of strong spin-orbit interaction has been recently underlined with the discovery of the $J_{eff} = \frac{1}{2}$ spin-orbital Mott state in the $5d^5$ layered perovskites iridates. The double perovskite structure can accommodate numerous $5d$ ions and therefore offers a playground for systematic studies of the exotic ground states stabilized by strong spin-orbit coupling (SOC). Here, we report time-of-flight neutron scattering measurements on the antiferromagnetic (AF), frustrated system, Ba_2YOsO_6. This $5d^3$ system undergoes a magnetic transition to a long range ordered AF state below T_N = 70K. Our results reveal a large spin gap Δ = 18(2)meV, unexpected for an orbitally quenched d^3 system. We compare this result to the recent observation of a Δ = 5meV spin gap in the related $4d^3$ system, Ba_2YRuO_6, and conclude to an effect of enhanced SOC.

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Date submitted: 14 Nov 2014 Electronic form version 1.4