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Neutron Scattering Study of the Double Perovskite FCC Antiferromagnet Ba_2YRuO_6 J.P. CARLO, Villanova University, J.P. CLANCY, University of Toronto, K. FRITSCH, C.A. MARJERRISON, McMaster University, G.E. GRANROTH, Oak Ridge National Laboratory, H.A. DABKOWSKA, B.D. GAULIN, McMaster University — Magnetic cations in the rock-salt ordered double perovskite structure comprise a geometrically frustrated FCC network of edge-sharing tetrahedra. Previous measurements of the $4d^3$ Ru^{5+} system Ba_2YRuO_6 [1] indicated the existence of long-range commensurate antiferromagnetic order below T_N = 36K, a factor f $\sim$ 15 lower than the Curie-Weiss temperature Θ_W = -522K. We report time-of-flight neutron spectroscopy of Ba_2YRuO_6 confirming the existence of the long-range ordered state below T_N. The magnetic inelastic scattering extends over a bandwidth of $\sim$ 15 meV, and develops a $\sim$ 5 meV gap at the [100] magnetic ordering wavevector at and below T_N. Strong spin-orbit coupling in this $4d^3$ system is expected to result in a j_{eff}=3/2 magnetic moment. This is distinct from the $4d^1$, j_{eff}=3/2 moment which arises in its sister antiferromagnetic FCC compound, Ba_2YMoO_6, which displays an apparent singlet ground state and a $\sim$ 28 meV singlet-tripet gap at low temperatures [2], matching its —Θ_W— $\sim$ 300K. [1] T. Aharen et al. Phys. Rev. B 80, 134423 (2009). [2] J. P. Carlo et al. Phys. Rev. B 84, 100404(R) (2011).

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