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Exotic magnetism on the frustrated FCC lattice of 4d and 5d double perovskites

Lundi 8 Décembre 14h30

Salle de conférence 15 – Bâtiment 563

In the search for new exotic quantum states, the impact of strong spin-orbit interaction has been recently underlined with the discovery of the $J_{\text{eff}} = 1/2$ spin-orbital Mott state in the $5d^5$ layered perovskites iridates [1]. The double perovskite structure, where the magnetic ions form a face-centered-cubic (fcc) sublattice, can accommodate a large variety of 5d transition metal elements, and therefore offers an ideal playground for systematic studies of the exotic magnetic and non-magnetic ground states stabilized by strong spin-orbit coupling [2].

Here, we report time-of-flight neutron scattering measurements on the antiferromagnetic, frustrated, cubic double perovskite system Ba_2YOsO_6 [3]. Its non-distorted fcc lattice is decorated with magnetic Os^{5+} ($5d^3$) ions which undergo a magnetic transition to a type I fcc long range ordered antiferromagnetic state below $T_N = 70$ K. Our inelastic data reveals a large spin gap to the spin-wave excitations $\Delta = 18(2)$ meV, unexpected for an orbitally quenched, d^3 electronic configuration. We will discuss our results in the context of other recently studied cubic double perovskites, where exotic magnetic and non-magnetic phases are expected.

[1] B. J. Kim *et al.*, Phys. Rev. Lett. **101**, 076402 (2008).

[2] G. Chen, R. Pereira and L. Balents, Phys. Rev. B, **82**, 174440 (2010).

G. Chen and L. Balents, Phys. Rev. B, **84**, 094420 (2011).

[3] E. Kermarrec *et al.*, arXiv:1410.0725 (2014).

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