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Electronic ground state properties of Iridate oxides from x-ray absorption spectroscopy[1] DANIEL HASKEL, M.A. LAGUNA MARCO, N.M. SOUZA-NETO, J.C. LANG, Argonne National Laboratory, G. FABBRIS, Washington University in St. Louis and Argonne National Laboratory, G. CAO, University of Kentucky, M. VAN VEENENDAAL, Northern Illinois University and Argonne National Laboratory — Element (Ir)- and orbital (5d)-specific $L_{2,3}$ edge x-ray absorption and magnetic circular dichroism measurements are used to probe the nature of the electronic ground state in magnetic insulators $BaIrO_3$ [1] and Sr_2IrO_4 [2,3]. A spin-only description of the magnetic ground state is directly ruled out by the measurements. Instead, the measurements show spin-orbit entanglement in $5d$ states resulting in a larger orbital (L_z) than spin (S_z) contribution to the magnetic moment, even in the presence of strong crystal field and band effects. Measured x-ray absorption cross sections at spin-orbit split $L_{2,3}$ edges impose constraints on the nature of the ground state [3]. Experiments under chemical- (doping) and applied-pressure conditions provide evidence for a delicate interplay between electronic bandwidth and Coulomb interactions leading to the gapped, spin-orbit coupled ground state of these complex oxides.

[1] M. A. Laguna Marco et al., Phys. Rev. Lett. 105, 216407 (2010).
[2] B. J. Kim et al., Phys. Rev. Lett. 101, 076402 (2008).
[3] L. C. Chapon and S. W. Lovesey, J. Phys. Condens. Matter 23, 252201 (2011).

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