Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Probing Spin-Orbit Coupling in Iridium 5d Compounds with X-ray Absorption Spectroscopy J.P. CLANCY, University of Toronto, N. CHEN, W.F. CHEN, C.Y. KIM, Canadian Light Source, K.W. PLUMB, Y.J. KIM, University of Toronto — Iridium-based transition metal oxides have begun to attract considerable interest following recent proposals of exotic electronic and magnetic ground states (topological insulators, topological semi-metals, spin liquids, and spin-orbital Mott insulators) driven by large spin-orbit coupling effects. We have performed x-ray absorption spectroscopy (XAS) measurements on a series of iridium-based compounds (such as Ir, IrCl3, IrO2, Na2IrO3, Sr2IrO4, and Y2Ir2O7) in order to investigate the magnitude of the spin-orbit interactions in these systems. By determining the branching ratio of the XAS white-line intensities at the Ir L2 and L3 absorption edges, we obtain a direct measure of the expectation value for the spin-orbit operator $\langle L \cdot S \rangle$. These measurements reveal remarkably strong spin-orbit interactions in almost all Ir-based compounds, with branching ratios up to several times larger than the statistical value. The branching ratio is found to be largely independent of electronic properties (metal or insulator), ionization state (Ir^{3+} [$5d^6$] or Ir^{4+} [$5d^5$]), and chemical composition (oxide or halide), although it does appear to be correlated with local Ir site symmetry and Ir-Ir bond distances.

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Date submitted: 22 Nov 2011 Electronic form version 1.4