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A Spatially Resolved Optical Second Harmonic Generation (SHG) Study of the Perovskite Iridate Sr_2IrO_4 with Bulk Sensitivity[1] LIUYAN ZHAO, HAO CHU, DARIUS TORCHINSKY, Physics, Caltech, TONGFEI QI, GANG CAO, Physics and Astronomy, University of Kentucky, DAVID HSIEH, Physics, Caltech — There has been a lot of recent interest in the layered perovskite iridate, Sr_2IrO_4, owing to its novel spin-orbital entangled Mott insulator ground state and its potential to realize high-Tc superconductivity upon doping. Although its bulk structural and magnetic point group symmetries have been characterized by resonant x-ray and neutron diffraction, these measurements provide spatially integrated information. In fact, recent neutron diffraction studies on Sr_2IrO_4 suggest that such measurements may be averaging over crystallographic domains of reduced symmetry that in turn generate distinct magnetic domains [1]. Therefore, spatial resolution is desirable in order to gain full understanding of the point group symmetries of Sr_2IrO_4. Here, we show that optical SHG can provide a bulk sensitive measurement of the point group symmetries. By performing such SHG measurements in an imaging mode, we study the possible microscopic domain structures recently suggested. More generally, our SHG imaging technique provides an alternative way to probe the point group symmetries of iridate crystals, which are not always amenable to neutron scattering due to their small sample sizes and strong neutron absorption cross section.

[1] F. Ye et al., Phys. Rev. B 87, 140406 (R) (2013); C. Dhital et al., Phys. Rev. B 87, 144405 (2013).

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