Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Probing the structural evolution across the metal-to-insulator transition in thin film VO2 using nonlinear optics[1] HAO CHU, Applied Physics, California Institute of Technology, DARIUS TORCHINSKY, Department of Physics, California Institute of Technology, SIMING WANG, JUAN GABRIEL RAMIREZ, IVAN K. SCHULLER, Department of Physics and Center for Advanced Nanoscience, University of California San Diego, DAVID HSIEH, Department of Physics, California Institute of Technology — Time-resolved pump-probe studies on VO2 have demonstrated that a phase transition in both the electronic and structural degrees of freedom can be induced using sub-picosecond light pulses. However, typically the electronic and structural degrees of freedom are separately measured using time-resolved optical and diffraction based techniques respectively. Therefore the timescales of electronic and structural dynamics are typically compared across different samples and different experimental setups. Here we introduce the use of rotational anisotropy nonlinear optical generation spectroscopy as a method to probe the structural symmetry of VO2 purely optically. We demonstrate that the low temperature monoclinic and high temperature rutile phases in a VO2 thin film grown on r-cut sapphire (1-102) are clearly resolved using our technique and compared favorably with calculations. We will discuss how a simultaneous probe of ultrafast electronic and structural dynamics in VO2 can be realized using this technique.

[1]David Hsieh acknowledges support from the Army Research Office Grant Nos. W911NF-13-0059 and (ARO-DURIP) W911NF-13-1-0293. Ivan K. Schuller acknowledges support from the AFOSR Grant No. FA9550-12-1-0381.

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Date submitted: 13 Nov 2013 Electronic form version 1.4