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High speed nonlinear optical harmonic generation rotational anisotropy measurements for sensitive detection of crystallographic and electronic symmetry breaking LAUREN NIU, Institute for Quantum Information and Matter, California Institute of Technology, ANTONI WOSS, University of Cambridge, JOHN HARTER, DARIUS TORCHINSKY, DAVID HSIEH, Institute for Quantum Information and Matter, California Institute of Technology — The rotational anisotropy of optical nonlinear harmonic generation (NHG) from a crystalline material can be used to probe the symmetries of both its lattice structure and underlying ordered electronic phases. Presently however, low temperature experimental setups require both optics and detectors to be mechanically rotated during measurement [1], which makes the data collection slow and thus susceptible to low frequency sources of noise. We present a new method to perform rotational anisotropy measurements based on a triple beam-splitter setup and a spatially sensitive detection scheme. This method increases the data collection frequency by over three orders of magnitude by removing nearly all rotating parts from the experiment. We will report the improved sensitivity to symmetry changes in a material and discuss the potential to carry out wavelength dependent and time-resolved NHG measurements using this method.

[1] D. H. Torchinsky, H. Chu, T. Qi, G. Cao and D. Hsieh, Rev. Sci. Instrum. 85, 083102 (2014).

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