## Abstract Submitted for the DPP16 Meeting of The American Physical Society

Experimental observation of multiphoton Thomson scattering<sup>1</sup> WENCHAO YAN, GRIGORY GOLOVIN, COLTON FRUHLING, DANIEL ZHAO, CHENG LIU. HADEN, PING ZHANG, JUN ZHANG, BAOZHEN SHOUYUAN CHEN, SUDEEP BANERJEE, DONALD UMSTADTER, University of Nebraska-Lincoln — With the advent of high-power lasers, several multiphoton processes have been reported involving electrons in strong fields. For electrons that were initially bound to atoms, both multiphoton ionization and scattering have been reported. However, for free electrons, only low-order harmonic generation has been observed until now. This limitation stems from past difficulty in achieving the required ultra-high-field strengths in scattering experiments. Highly relativistic laser intensities are required to reach the multiphoton regime of Thomson scattering, and generate high harmonics from free electrons. The scaling parameter is the normalized vector potential (a0). Previous experiments have observed phenomena in the weakly relativistic case ( $a0 \ge 1$ ). In ultra-intense fields (a0 >>1), the anomalous electron trajectory is predicted to produce a spectrum characterized by the merging of multiple high-order harmonic generation into a continuum. This may be viewed as the multiphoton Thomson scattering regime analogous to the wiggler of a synchrotron. Thus, the light produced reflects the electrons behavior in an ultra-intense lase field. We discuss the first experiments in the highly relativistic case (a0  $^{-15}$ ).

<sup>1</sup>This material is based upon work supported by NSF No. PHY-153700; US DOE, Office of Science, BES, DE-FG02-05ER15663; AFOSR FA9550-11-1-0157; and DHS DNDO HSHQDC-13-C-B0036.

Donald Umstadter University of Nebraska-Lincoln

Date submitted: 14 Jul 2016

Electronic form version 1.4