Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

High-brightness electron beams for ultrafast electron microdiffraction and imaging TIANYIN SUN, FARAN ZHOU, KISEOK CHANG, ZHENSHENG TAO, JOE WILLIAMS, CHONG-YU RUAN, Michigan State University, MSU UEM COLLABORATION — Currently the ultrafast electron diffraction has achieved sub-picosecond temporal resolution and atomic resolution. However, direct ultrafast imaging of a nanometer scale specimen through coherent single-particle diffraction has not been achieved largely due to insufficient intensity when tuned to a coherence length that matches the size of the specimen under the projected phase space density. Utilizing a recently implemented high-brightness electron source with flexible optical design, we test the performance of ultrafast electron microdiffraction and coherence imaging. We demonstrate the feasibilities of single-shot microdiffraction on a single micrometer-sized domain in Highly Ordered Pyrolytic Graphite (HOPG) and coherent diffractive imaging of 10 nm scale charge-ordered domain structures in single-crystal complex materials, as validated by the measured brightness at the sample plane. These initial results show that source-limited performance even from a sub-relativistic electron beamline can drastically improve the current performance of ultrafast electron imaging and diffraction.

Chong-Yu Ruan
Michigan State University

Date submitted: 06 Nov 2015 Electronic form version 1.4