Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Femtosecond laser induced structural dynamics and melting of Cu (111) single crystal. An ultrafast time-resolved x-ray diffraction study. RUNZE LI, OMAR A. ASHOUR, PETER M. RENTZEPIS, Texas AM University — Femtosecond, 8.04 KeV x-ray pulses are used to probe the lattice dynamics of 150 nm Cu (111) single crystal on mica substrate irradiated with 400 nm, 100 fs laser pulses. At pump fluencies below the damage and melting threshold, we observed lattice contraction due to the formation of a blast force, and coherent acoustic phonons with a period of ˜69 ps. At larger pump fluence, solid to liquid phase transition, annealing, and recrystallization were measured in real time by monitoring the evolution of the probing fs x-ray diffraction intensities. Experimental data suggest the melting process is a purely thermal phase transition. This study provides, in real time, an ultrafast time-resolved detailed description of the significant processes that occurs after femtosecond laser pulse interacting with the Cu (111) crystal surface.

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Date submitted: 11 Nov 2016 Electronic form version 1.4