Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Ultrafast probing of transient electric fields from optical field ionized plasmas using picosecond electron deflectometry ZHAOHAN HE, JOHN NEES, BIXUE HOU, KARL KRUSHELNICK, ALEC THOMAS, Univ of Michigan - Ann Arbor — Femtosecond bunches of electrons with relativistic to ultra-relativistic energies can be robustly produced in laser plasma wakefield accelerators (LWFA). Scaling the electron energy down to sub-relativistic and MeV level using a millijoule laser system will make such electron source a promising candidate for ultrafast electron diffraction (UED) the applications due to the intrinsic short bunch duration and perfect synchronization with optical pump. Electrons with sub-relativistic ($\sim$100 keV) energies can be used to probe transient electric field generated in laser plasmas with very high sensitivity. In a proof-of-principle experiment, we measured field evolution from plasma produced by focusing femtosecond laser pulses into a gas jet at intensities up to 10^{17} W/cm^2. Due to the energy spread in laser plasma generated electrons, dipole magnets are used to record a streaked electron image such that the temporal evolution can be mapped in a single shot. This technique allows for probing irreversible processes such as melting of crystalline samples.

Zhaohan He
Univ of Michigan - Ann Arbor

Date submitted: 24 Jul 2015 Electronic form version 1.4