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Time-resolved measurements with streaked diffraction patterns from electrons generated in laser plasma wakefield ZHAOHAN HE, JOHN NEES, BIXUE HOU, KARL KRUSHELNICK, ALEC THOMAS, University of Michigan, USA, BENOÎT BEAUREPAIRE, VICTOR MALKA, JÉRÔME FAURE, CNRS-Ecole Polytechnique, France — 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) applications due to the intrinsic short bunch duration and perfect synchronization with the optical pump. Recent results of electron diffraction from a single crystal gold foil, using LWFA electrons driven by 8-mJ, 35-fs laser pulses at 500 Hz, will be presented. The accelerated electrons were collimated with a solenoid magnetic lens. By applying a small-angle tilt to the magnetic lens, the diffraction pattern can be streaked such that the temporal evolution is separated spatially on the detector screen after propagation. The observable time window and achievable temporal resolution are studied in pump-probe measurements of photo-induced heating on the gold foil.

Zhaohan He
University of Michigan, USA

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