Abstract Submitted
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Development of a laser wakefield acceleration platform at the National Ignition Facility[1] FELICIE ALBERT, PAUL KING, NUNO LEMOS, DAN KALANTAR, BRUCE REMINGTON, NEIL OSE, STEVEN ROSS, GEORGE SWADLING, Lawrence Livermore Natl Lab, JESSICA SHAW, DAN HABERBERGER, Laboratory for Laser Energetics, University of Rochester, KEN MARSH, CHAN JOSHI, UCLA — We present the development of a laser-wakefield electron acceleration experimental capability by focusing one beamlet (1 ps, 250 J) of the Advanced Radiographic Capability (ARC, LLNL) onto a gas tube target filled with helium. When a picosecond, 10^{18} W/cm^2 intensity laser pulse is focused on a gas target with a plasma electron density of about 10^{19} cm^{-3}, electrons are accelerated to multi-100 MeV energies by the interplay of self-modulated laser wakefield and direct laser acceleration. Applications include hard x-ray sources using betatron, Compton scattering and bremsstrahlung mechanisms. We performed experiments with the OMEGA-EP short pulse focused at intensities around 10^{18} W/cm^2 onto a 3 mm plastic gas tube filled with helium at atmospheric pressure, as well as with the ARC beam at LLNL in similar conditions. The gas tubes are closed with 1 m thick mylar windows that are blown off with long pulses 5-10 ns before the short pulse. We measured the plasma density at the entrance of the gas tube with the 4-omega probe diagnostic at OMEGA-EP and Optical Thomson Scattering at NIF. EPPS (electron proton positron spectrometer), measured accelerated electron energies in the 10-150 MeV range.

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