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Shaped Laser Short-Pulses for Manipulating Time-Dependent Particle Acceleration[1] DEREK MARISCAL, Lawrence Livermore Natl Lab, J. KIM, UC San DIego, S.C. WILKS, A. KEMP, G. COCHRAN, J. PARK, T. MA, Lawrence Livermore Natl Lab — Laser pulse shaping at the nanosecond level has enabled lasers to become one of the best tools available for studying plasmas and high-energy-density (HED) systems. Typical short-pulse laser experiments deliver sub-picosecond laser pulses that are often not well characterized and assumed to be Gaussian-like. In this work we examine the possibilities of laser pulse-shaping at the sub-ps level to precisely influence time-dependent laser-particle acceleration. Modeling suggests that the use of a shaped short-pulse could enhance laser coupling to MeV electrons and manipulate ion acceleration physics to boost maximum ion energies [J. Kim, et al., PoP 25, 083109 (2018)]. Pseudo shaped short-pulses can be delivered by combining separate short-pulse beams. Experiments conducted at the Omega EP facility demonstrated a concept similar to the simulated case and showed a significant enhancement in laser coupling to 1+ MeV electrons and an increase in maximum proton energy compared to single pulses. The experimental data will be presented and compared with modeling in order to elucidate the time-dependent nature of the particle acceleration physics.

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