Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Relativistic Laser Pulse Intensification with 3D Printed Micro-Tube Plasma Target LIANGLIANG JI, JOSEPH SNYDER, The Ohio State University, ALEXANDER PUKHOV, Heinrich-Heine-Universität Düsseldorf, KRAMER AKLI, The Ohio State University — The potential and applications of laser-plasma interactions (LPI) are restricted by the parameter space of existing lasers and targets. Advancing the laser intensity to the extreme regime is motivated by the production of energetic particle beams and by the quest to explore the exotic regimes of light-matter interaction. Target density and dimensions can always be varied to optimize the outcome. Here, we propose to create another degree of freedom in the parameter space of LPI using recent advances in 3D printing of materials. Fine structures at nm scale with high repetition and accuracy can nowadays be manufactured, allowing for a full precise control of the target. We demonstrate, via particle-in-cell (PIC) simulations, that 3D-printed micro-tube plasma (MTP) targets yield an intensity enhancement factor of 2-5. The novel MTP targets not only act as a plasma optical device to reach the 10^{23}W/cm^2 threshold based on today's intensities, but can also boost the generation of secondary particle and radiation sources. This work demonstrates that the combination of high contrast high power lasers and nano-3D printing techniques opens new paths in the intensity frontier and LPI micro-engineering.

Liangliang Ji
The Ohio State University

Date submitted: 22 Jul 2015 Electronic form version 1.4