Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Front surface structured targets for enhancing laser-plasma interactions[1] JOSEPH SNYDER, KEVIN GEORGE, LIANGLIANG JI, The Ohio State University, SASIR YALAMANCHILI, ETHAN SIMONOFF, California Institute of Technology, GINEVRA COCHRAN, REBECCA DASKALOVA, PATRICK POOLE, CHRISTOPHER WILLIS, The Ohio State University, NATHAN LEWIS, California Institute of Technology, DOUGLASS SCHUMACHER, The Ohio State University — We present recent progress made using front surface structured interfaces for enhancing ultrashort, relativistic laser-plasma interactions. Structured targets can increase laser absorption and enhance ion acceleration through a number of mechanisms such as direct laser acceleration and laser guiding. We detail experimental results obtained at the Scarlet laser facility on hollow, micron-scale plasma channels for enhancing electron acceleration. These targets show a greater than three times enhancement in the electron cutoff energy as well as an increased slope temperature for the electron distribution when compared to a flat interface. Using three-dimensional particle-in-cell (PIC) simulations, we have modeled the interaction to give insight into the physical processes responsible for the enhancement. Furthermore, we have used PIC simulations to design structures that are more advantageous for ion acceleration. Such targets necessitate advanced target fabrication methods and we describe techniques used to manufacture optimized structures, including vapor-liquid-solid growth, cryogenic etching, and 3D printing using two-photon-polymerization.

[1]This material is based upon work supported by the Air Force Office of Scientific Research under award number FA9550-14-1-0085.

Joseph Snyder
Ohio State Univ - Columbus

Date submitted: 15 Jul 2016 Electronic form version 1.4