Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Increased electron beam energy using structured targets at the Scarlet laser facility[1] DEREK NASIR, ANTHONY ZINGALE, NICK CZAPLA, Department of Physics, The Ohio State University, Columbus Ohio 43210, USA, JOSEPH SNYDER, Department of Mathematical and Physical Sciences, Miami University, Hamilton Ohio 45011, USA, CHRISTOPHER WILLIS, Amplitude Laser, REBECCA DASKALOVA, Department of Physics, The Ohio State University, Columbus Ohio 43210, USA, LINN VAN WOERKOM, Amplitude Laser, DOUGLASS SCHUMACHER, Department of Physics, The Ohio State University, Columbus Ohio 43210, USA — Electron and ion beams accelerated from ultra-intense laser systems have versatile applications including target heating, time resolved probes of EM field structure, and precise imaging of dense material. We describe the use of structured targets to increase the yield and energy of laser accelerated electrons, including a new experiment on the Scarlet laser utilizing arrays of 5 um diameter tubes that are 100 or 300 um long, composed of a glass substrate with both undoped and Ni-doped versions. These structures enhance electron acceleration by generating a sufficiently dense medium to supply electrons but not inhibit laser propagation, resulting in better coupling of laser energy. The Scarlet laser is a 1 shot/min Ti:Sapphire based system capable of producing 10 J, 30 fs pulses with focal spot diameter of 2.4 um (full width at half maximum). A plasma mirror was used for this experiment to improve the <1 ns contrast, resulting in an on-target energy of 6 J and peak intensity >4x10^{21} W/cm^2. We observe an increase in the electron cutoff energy from 20 MeV with 2 um copper to 50 MeV with the 100 um-long undoped glass structure.

[1]This work is supported in part by the U.S. Department of Energy (DOE) under Contract No. DE-SC0019283.

Derek Nasir
Ohio State University

Date submitted: 03 Jul 2019 Electronic form version 1.4