Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Variable Thickness Liquid Crystal Films for High Repetition Rate Laser Applications[1] PATRICK POOLE, CHRISTOPHER WILLIS, GINEVRA COCHRAN, RANDALL HANNA, C. DAVID ANDERECK, DOUGLASS SCHUMACHER, Ohio State Univ - Columbus — The presentation of a clean target or target substrate at high repetition rates is of importance to a number of photoelectron spectroscopy and free electron laser applications, often in high vacuum environments. Additionally, high intensity laser facilities are approaching the 10 Hz shot rate at petawatt powers, but are currently unable to insert targets at these rates. We have developed liquid crystal films to address this need for high rep rate targets while preserving the planar geometry advantageous to many applications. The molecular ordering of liquid crystal is variable with temperature and can be manipulated to form a layered thin film. In this way temperature and volume control can be used to vary film thickness in vacuo and on-demand between 10 nm and over 10 μm. These techniques were previously applied to a single-shot ion acceleration experiment in P. L. Poole Phys. Plasmas **21**, 063109 (2014), where target thickness critically determines the physics of the acceleration. Here we present an automatic film formation device that utilizes a linear sliding rail to form liquid crystal films within the aforementioned range at rates up to 0.1 Hz. The design ensures film formation location within 2 μm RMS, well within the Rayleigh range of even short f-number systems. Details of liquid crystal films and this target formation device will be shown as well as recent experimental data from the Scarlet laser facility at OSU.

[1]This work was supported by DARPA through a grant from AMRDEC.

Patrick Poole
Ohio State Univ - Columbus

Date submitted: 30 Jan 2015 Electronic form version 1.4