Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Study of self-generated electric field at shock front by broadband proton probing and soft X-ray emission RUI HUA, UCSD, HONG SIO, MIT, SCOTT WILKS, LLNL, CHRISTOPHER MCGUFFEY, MATHIEU BAILLY-GRANDVAUX, UCSD, BOB HEETER, LLNL, FARHAT BEG, UCSD, GILBERT COLLINS, YUAN PING, LLNL, MIT COLLABORATION, LLNL COLLABORATION, UCSD COLLABORATION — Self-generated electric fields arise from gradients in the electron pressure at shock fronts. We report observations of such E-fields from experiments conducted on OMEGA EP. In the experiments, strong shock waves were generated in low density gas under a quasi-planar geometry and diagnosed by broadband proton radiography. The broad proton spectrum allows energy-dependent measurements of deflection from which one can quantitatively constrain the electrical potential and field thickness. Three UV beams delivering up to 6.4 kJ energy in 2ns were used for shock generation and a short laser pulse of energy up to 850 J, 10 ps duration, was used to accelerate the broadband proton beam for point-projection radiography. Observations show the existence of electric fields with potential ˜300 V at the front of a Mach 9 shock in helium gas. A Mach 16 shock is also studied, from which both the field thickness and electric potential are reproduced. Simultaneous spatially resolved soft-x-ray spectroscopy provided additional measurements of shock velocity, particle velocity and thermal emission.

Rui Hua
UCSD

Date submitted: 17 Jul 2017 Electronic form version 1.4