Abstract Submitted
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Shock front field structure in low-density systems[1] RUI HUA, CHRISTOPHER MUCGUFFEY, FARHAT BEG, UCSD, HONG SIO, MIT, YUAN PING, SCOTT WILKS, BOB HEETER, RIP COLLINS, LLNL — It is known that a shock front is not a simple discontinuity in density and temperature as depicted in commonly used hydro codes but also consists of self-generated fields associated with gradients in the electron pressure. A quasi-planar platform using broadband proton radiography has been developed to study this field structure at a shock front. The broad bandwidth offers energy-dependent measurements which quantitatively constrain both the potential and field width at the shock front. Experiments were conducted on the OMEGA EP, where three long pulse beams delivered 6 kJ in 2 ns for shock initiation in a tube filled with either pure Helium or mixture of Helium and Neon, and a short pulse of 850 J, 10 ps generated broadband protons for point-projection radiography. Simultaneous spatially resolved soft-x-ray spectroscopy provided shock velocity, particle velocity and thermal emission measurements, constraining density and temperature for the field generation. The data and modeling indicate that a multi-KeV potential was present at the shock front where a strong electron pressure gradient existed.

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