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Proton radiography measurements and models of ejecta structure in shocked Sn[1] J.E. HAMMERBERG, W.T. BUTTLER, A. LLOBET, C. MORRIS, J. GOETT, R. MANZANARES, A. SAUNDERS, D. SCHMIDT, A. TAINTER, W. VOGAN-MCNEIL, C. WILDE, Los Alamos National Laboratory — We discuss experimental validation of ejecta source mass and velocity models using proton radiography. We have performed ejecta measurements at the Los Alamos proton radiography facility on 7 mm thick 81 mm diameter Sn samples driven with a plane-wave high explosive lens (PBX9501+ TNT). The surface of the Sn, in contact with He gas at an initial pressure of 7 atmospheres, was machined to have 4 concentric sinusoidal features with a wavelength of λ =2 mm in the radial direction and amplitude h_0 =0.159 mm ($kh_0 = 2\pi h_0/\lambda$ =0.5). The shock pressure was 27 GPa. 42 images were obtained between 0 and 14 μs from the time of shock breakout at 275 and 400 ns intervals. The Abel inverted density profiles evolve to a self-similar density distribution that depends on a scaling variable $z/v_s t$ where v_s is the spike tip velocity, z is the distance from the free surface and t is the time after shock breakout. Both the density profiles and the time dependence of the mass per unit area in the evolving spikes are in good agreement with a Richtmyer-Meshkov instability based model for ejecta production and evolution.

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