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Peaked transverse ion spectra from picosecond pulses interacting with underdense targets

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We will discuss OMEGA EP experiments of the interaction of a relativistic intensity, picosecond-duration laser pulse with an underdense plasma. A 1200 J, 2.5 ns pulse heated a plastic (or deuterated plastic) target to create an underdense plasma plume target. The ponderomotive force of the laser forms a channel through the plasma. Filamentation of the laser, and therefore filamentation of the created channel, have been observed both with proton and optical probing. High-energy electron beams have been measured along the laser axis, with energies exceeding 400 MeV. Peaked structures were observed in the transverse ion spectra. Two-dimensional particle-in-cell simulations are used to investigate the interaction. In particular, to look for evidence of the peaked ion spectra and the origin of the structures.

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