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Generation of energetic electrons in laser-irradiated foil targets
ALEXEY AREFIEV, BORIS BREIZMAN, VLADIMIR KHUDIK, Institute for Fusion Studies, The University of Texas at Austin — The ability to generate copious energetic ions is critical for a number of applications. One way to generate energetic ions is via irradiation of solid targets with intense laser beams. We consider a foil target with dimensions greater than the laser wavelength irradiated by a laser with an ultra-relativistic intensity. We investigate the regimes where the laser creates a two-component electron distribution with a cold majority and an energetic collisionless minority. The work examines mechanisms generating the energetic electron population and discusses the effect of this population on ion acceleration. We consider a target with a relatively thick underdense preplasma at its front surface produced by the laser prepulse. The hot electrons are generated near the critical surface and in the preplasma. They spread out inside the target and eventually emerge at the surface. The electrons set up a sheath, whose electric field confines some of them inside the target. The confined electrons may undergo additional stochastic heating when they re-emerge at the surface of the target irradiated by the laser.

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