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# Features within sheath accelerated proton beams and their implications for electron transport

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In the interaction of high intensity lasers with solid targets, electron heating and transport play a crucial role in the transfer of energy from the laser to an energetic ion beam. When hot electrons traverse the target bulk, measurements have shown that they are subject to filamentation and can be strongly influenced by fields formed at the target rear surface resulting in a non-laminar beam, or in recirculation of the electrons back into the bulk of the target. Recirculation has been inferred from increased target heating in thin targets and an enlarge proton emission region. Here, we present studies of features, including annular rings, within the spatial profile of proton beams generated by the interaction of a high intensity laser (55 J, 0.6 ps) with micron scale metal foils. Particle tracking and fluid simulations are considered to explain the observed structures and to illustrate the importance of control of electron transport for the generation of high quality laminar proton beams for applications.

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