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Late-time plasma dynamics in the relativistic transparency regime via self-generated fields[1] CHENGKUN HUANG, C.D. GAUTIER, J.C. FERNANDEZ, S. PALANIYAPPAN, Los Alamos Natl Lab — The interaction of a high intensity laser with ultra-thin foils and low density foams often results in relativistic transparency. In this regime, the volumetric laser-plasma interaction, upon the onset of the relativistic transparency, converts the laser energy into electrons' thermal and directional motion with increased efficiency. The thermal motion leads to further target expansion while the directional motion is responsible for a longitudinal electron current that emerges at the backside of the target. The electron sheath from the expanded target and the current on the order of the Alfvén limit set up large self-generated quasi-static plasma electric and magnetic fields. When the laser exists the plasma, the accelerated bulk ions can further interact with the electron flow sustained by the front sheath field and regulated by the self-generated azimuthal magnetic and longitudinal electric fields. We present detailed Particle-In-Cell simulations that reveal such electron-ion coupling assisted by the self-generated plasma fields in this second step, leading to high energy ions with smaller energy spread that may be useful for various applications.

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