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Enhanced ion acceleration in the transition regime from opaque to transparent plasmas ROHINI MISHRA, FREDERICO FIUZA, SIEGFRIED GLENZER, SLAC — Using particle in cell (PIC) simulations, we investigate ion acceleration in high-intensity laser-plasma interactions in targets that become transparent during the interaction process. A theoretical model is developed to derive an optimal target electron areal density 'n.L' as a function of laser normalized intensity and the pulse duration in the laser transparent regime. A large schematic parametric scan for a wide range of target electron density (n) and thickness (L) is performed and shown to be consistent with analytical theory. Ion acceleration in optimal conditions relies on the re-heating of the expanding sheath electrons by the laser and enhancing the Target Normal Sheath Acceleration (TNSA) electric field after the plasma becomes transparent to the laser light. This enhanced TNSA field decays slower compared to conventional TNSA resulting in significantly higher proton energies.

Rohini Mishra
SLAC

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