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Electron heating effect on self-induced transparency in relativistic intensity laser-plasma interaction

The effective increase of critical density associated to the interaction of relativistically intense laser pulses with nominally overcritical plasmas, known as self induced transparency (SIT), is a mechanism of great importance for laser-solid interaction. Restricting attention to circularly-polarized pulses, we undertake a systematic comparison of 1D-3V PIC-simulation results to predictions of a cold-fluid model for the transparency threshold. We find that kinetic effects, such as electron heating, dominate the process for higher laser intensity, causing electrons to escape into the vacuum and leading to an increase of the effective critical density.