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Ion-motion simulations of a plasma-wakefield experiment at FLASHForward

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Plasma-wakefield acceleration shows great promise as a next-generation accelerator technology, able to sustain strong accelerating and focusing fields. This significantly reduces the required length of the accelerator compared to radiofrequency accelerator technology. Electrons are expelled transversely by the electric field of an intense electron bunch, forming a plasma wake that is devoid of electrons. The ions—being significantly more massive—are often assumed to be stationary. However, simulations suggest that for sufficiently dense electron bunches, effects of ion motion occur within the accelerating wake*. We simulate beam-driven plasma wakefields to identify key features, such as longitudinally dependent emittance growth, that could be observed in an experiment using parameters from the FLASHForward facility at DESY.

Footnotes

- Rosenzweig et al. Phys. Rev. Lett 95, 195002 (2005)

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