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Effect of the plasma scale length variation on the extraction of electron beams from a GeV-class wakefield accelerator

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The extraction of a laser driven electron beam from the plasma accelerating structure plays an important role in determining the final beam quality. If properly matched, the extraction mechanism can mitigate beam degradation and minimize emittance growth. Controlling this process poses a challenge for multi-stage acceleration schemes aiming to generate TeV level beams for particle collider applications and for the coupling of laser wakefield accelerated beams into insertion devices such as FELs. Here we present results from experiments at the Astra-Gemini facility investigating how the variation in plasma scale length at the exit of a GeV class wakefield accelerator affects the quality of the accelerated electrons.

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