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Controlled Injection in a Multi-Stage Gas Cell

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Controlling the bandwidth of laser accelerated electrons is key challenge for the field of LWFA accelerators. Several approaches have been proposed with most of the research focusing on ionisation injection [1] and downramp injection [2]. Both of these allow precise control of the injected electrons if the the conditions that underly the simulations are closely met. To maximise stability the injection region parameters should ideally be controlled separately from the overall interaction parameters. In particular injection zone width and density should be freely chosen over a significant range to allow the maximum of phase space control. We present results from a multi-stage gas-cell design that allows sharply separated zones of differing density of differing density to be generated and addresses the challenge of independently variable injection zone parameters and provides a basis for highly stable electron beams.

References

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