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Etude paramétrique d'un faisceau d'électrons annulaire de haute énergie issu d'un accélérateur laser plasma

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Laser wakefield accelerators commonly produce on-axis, low-divergence, high-energy electron beams. However, a high charge, annular shaped beam can be trapped outside the bubble and accelerated to high energies. Here we present a parametric study on the production of low-energy-spread, ultra-relativistic electron ring beams in a two-stage gas cell. Ring-shaped beams with energies higher than 750 MeV are observed simultaneously with on axis, continuously injected electrons. Often multiple ring-shaped beams with different energies are produced and parametric studies to control the generation and properties of these structures were conducted. Particle tracking and particle-in-cell simulations are used to determine properties of these beams and investigate how they are formed and trapped outside the bubble by the wake produced by on-axis injected electrons. These unusual femtosecond duration, high-charge, high-energy, ring electron beams may find use in beam driven plasma wakefield accelerators and radiation sources.

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