John Adams Institute for Accelerator Science

John Adams Institute for Accelerator Science Lecture Series

Thursday 18th February 2016 at 4:15 pm
Fisher Room, Denys Wilkinson Building

Visualising the Dynamics of a Plasma-Based Electron Accelerator

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Abstract:
Relativistic plasmas generated by high-power laser pulses are a potential candidate for future compact electron accelerators. In such a plasma-electron accelerator, the driving laser pulse generates a high-amplitude plasma wave forming the electric field structure (the „wakefield“) which can trap and accelerate electrons to several GeV energies over distances of a few centimetres only. The properties of the generated electron pulses (their energy spectrum, pulse duration, lateral dimensions, emittance…) strongly depend on the parameters and the evolution of this accelerating structure. Therefore, a complete understanding of the physical phenomena underlying the acceleration process is mandatory to improve the controllability of the electron pulses, which will determine their potential applicability in the future. This presentation will discuss the status of laser wakefield accelerators, discuss suitable diagnostic tools [1] and present experimental results on the characterisation and evolution of the electron pulses [2] and of the plasma wave [3,4].

[1] M. B. Schwab *et al.*, Applied Physics Letters **103,** 191118 (2013)
[2] A. Buck *et al.*, Nature Physics **7,** 543 (2011)
[2] A. Sävert *et al.*, Physical Review Letters **115,** 055002 (2015)
[3] E. Siminos *et al.*, submitted (2015)

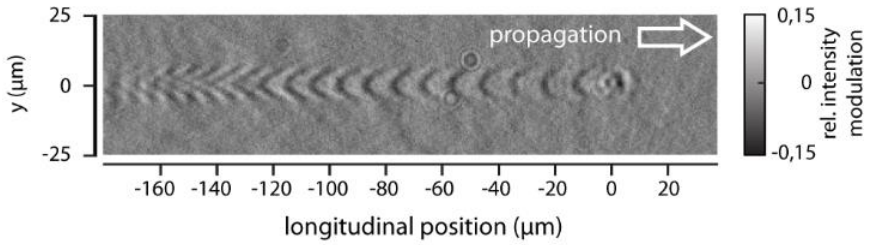

Image of a laser-driven plasma wave in a laser-based plasma electron accelerator (from [1])

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