Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, October 12, 2004

(16:00 in Room 459/30b)

Electron Beam Driven Plasma Wakefield Accelerators

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Abstract

Plasma accelerators have made very significant progress in the last year. In particular, the 1 GeV energy gain barrier has been broken for the first time, with an energy gain >3 GeV over approximately 10 cm, and therefore a gradient >30 GeV/m, in an electron beam driven accelerator, or plasma wakefield accelerator (PWFA). In that experiment the ultra–short (<100 fs), high current (>15 kA) bunches of the Stanford Linear Accelerator Center also created their own plasma through field ionization of a lithium vapor. This new self–ionization regime of the PWFA opens the possibility for multi–meter long, >1016 cm^{-3} plasmas to be easily generated. At the same time, numerical codes have shown that an electron bunch can be accelerated by 50 GeV with a narrow energy spread over only three meters of plasma, and with no emittance growth, These and other exciting results demonstrate real progress toward the realization of a plasma accelerator module that would double the energy of a future, multi–kilometer long accelerator over only a few tens of meters. A review of recent PWFA results will be presented, and their relevance to a plasma energy doubler will be discussed.

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