Contribution ID: **99** Type: **talk**

High-Quality Electron Beams from Ionization-Induced Self-Trapping in the Strong Blow-out Regime of Beam-Driven Plasma Wakes.

Wednesday, 5 June 2013 19:00 (15 minutes)

A new strategy for controlled ionization-induced trapping of electrons in beam-driven plasma wakes is proposed.
The method exploits the strong wakefields excited by a longitudinally asymmetric ultra-relativistic electron-beam driver operating in a strong blow-out regime in order to selectively tunnel-ionize and trap electrons from a dopant species of high ionization potential. This work demonstrates the injection mechanism by means of 3D particle-in-cell simulations using the code OSIRIS. In these simulations an electron beam with a triangular current profile propagates through a precreated plasma of density 5x1017 cm-3 and excites strong wakefields. When these wakes cross a thin plasma column of 1000 µm doped with neutral helium, they trigger ionization and trapping of 3.8 pC of electrons in a 700 attoseconds long region of the wakefields phase-space.
The trapped electron bunch is subsequently accelerated within a distance of 75.2 mm to energies of up to 4 GeV with a relative energy spread of 1%, normalized transverse emittances of 1 µm and a peak current of 3 kA.

Primary author: Dr MARTINEZ DE LA OSSA, Alberto (DESY)

Co-authors: Dr BEHRENS, Christopher (DESY); Dr OSTERHOFF, Jens (Deutsches Elektronen-Synchrotron DESY); Dr GREBENYUK, Julia (DESY); Mr MEHRLING, Timon (DESY)

Presenter: Dr MARTINEZ DE LA OSSA, Alberto (DESY)

Session Classification: WG1+6

Track Classification: WG1+6