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## Wakefield-Induced Ionization Injection and Self-Similar Staging in Beam-driven Plasma Wakes.

*Monday, 14 September 2015 18:00 (30 minutes)*

We propose a simple strategy for controlled ionization-induced trapping of electrons in beam-driven plasma accelerators (PWFA) [1]. The presented method exploits the electric wakefields to ionize electrons from a dopant gas and to capture them into a well-defined volume of the accelerating and focusing wake phase, leading to the formation of high-quality witness bunches. This injection principle is explained by example of three-dimensional particle-in-cell simulations using the code OSIRIS. The produced bunches feature multi-kA peak currents,  $\sim 1 \mu\text{m}$  transverse normalized emittances, uncorrelated energy spreads of  $< 1\%$  on a GeV-energy scale, and femtosecond bunch lengths. The hereby generated witness bunches fulfill all the requirements to drive the same injection principle in a largely increased plasma density. This brings up a new concept of staging that has the potential of producing electron beams with unprecedented energy and quality in PWFA.

### References

[1] A. Martinez de la Ossa et al., Phys. Rev. Lett. 111, 245003 (2013).

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

**Co-authors:** Dr OSTERHOFF, Jens (Deutsches Elektronen-Synchrotron DESY); Dr SCHAPER, Lucas (University Hamburg / DESY); Dr STREETER, Matthew (DESY); Dr MEHRLING, Timon (DESY)

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

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