Contribution ID: **102** Type: **talk**

Theoretical and experimental studies of plasma generation for beam-driven plasma wakefield accelerators

Monday, 25 September 2017 16:36 (18 minutes)

Plasma targets required for wakefield acceleration rely on establishing specific electron density distributions in longitudinal and sometimes transverse direction to allow for control over the quality of accelerated electron bunches. The complex fragmentation dynamics of molecular gases in strong electric fields can have a crucial impact on target as well as injection properties in plasma wakefield acceleration. The importance of dissociative fragmentation during ionisation will be discussed in this contribution on the example of hydrogen. Especially in complex scenarios, in which multiple gas-species can be involved, the strength of the plasma generating source may be adjusted to accommodate for the species-specific ionisation thresholds to e.g. generate strong gradient down ramps. To predict the theoretical electron density distribution across the target, we compute the ionisation behaviour based on rate equations and ADK theory in strong electric fields. Here, the fragmentation dynamics governed by various dissociation and ionisation pathways play a crucial role in generating specific profiles. Results from these methods are benchmarked experimentally employing a multi-TW short-pulse laser. The developed understanding of the underlying processes of plasma generation allows for tailoring the electron density distribution by manipulating the focusing geometry and thus spatial laser-intensity evolution.

Primary authors: Mrs TAUSCHER, Gabriele (DESY); Dr SCHAPER, Lucas (DESY)

Co-authors: Dr OSTERHOFF, Jens (DESY); Mr GOLDBERG, Lars (DESY); Mr QUAST, Martin (DESY); Mr BOHLEN, Simon (DESY)

Presenter: Mrs TAUSCHER, Gabriele (DESY)

Session Classification: WG1_Parallel

Track Classification: WG1 - Electron Beams from Plasmas