



Contribution ID: 88

Type: poster

Laser-Assisted Discharge Ignition for Plasma Waveguides

Wednesday, 27 September 2017 19:30 (1 hour)

In the process of laser wakefield acceleration electrons can be accelerated by the huge longitudinal electric fields ($>100\text{GV/m}$) of a plasma wave structure, reaching GeV-energies on a centimeter-scale. To efficiently use these longitudinal fields of the plasma wave, the wave has to survive over the whole acceleration length meaning the laser intensity has to remain sufficiently high throughout the whole length. This can be achieved by guiding the laser pulse in a preformed plasma channel generated by a high-voltage discharge in a hydrogen filled capillary.

We present the results of a stabilization analysis of a high voltage discharge in a hydrogen filled capillary. In the experiment, the influence of preionization of the gas with an intensive femtosecond laser pulse on the discharge as well as the guiding properties of the plasma waveguide are investigated.

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Session Classification: Wine and Poster Session 2 (WG4-WG5-WG6-WG7)

Track Classification: WG5 - High-Gradient Plasma Structures/Advanced Beam Diagnostics