

Discharge plasma R&D at ELI-Beamlines: simulations and experiments

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Main goal:

- Discharge plasma formation in Sapphire capillary for the LUIS-LWFA setup (modelling and measurement) -
- High-repetition rate operation (5 Hz \rightarrow 20 ... 50 Hz) in the case of a 'short' capillary (10-20 mm)



Gas filling process



Gas pressure along the capillary channel



Simulation activity / MARPLE (3D) code

Discharge plasma formation



Plasma density : (a) along and (b) across the channel



3/15/2023 Date:

Page:

3



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Experimental activity / LUIS Laboratory

Plasma density in the middle of the Sapphire capillary

m CB 10¹⁷, 1.0 × Plasma density 0.5 0.0 250 0

Emission spectroscopy setup

LUIS S2-LAB PLASMA DIAGNOSTICS SETUP VACUUM, GAS AND HV DISCHARGE SYSTEMS H₂ Exhaust Gauge Mass Flow Controller DISCHARGE CIRCUIT 9_K9 500 -25 ă 1000 ≻ 20 1500-15 2000-1000 2000 0

Typical image from Spectrometer

View of the setup inside of the test-vacuum chamber









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Discharge plasma R&D at ELI-Beamlines: simulations and experiments

✓ We develop discharge plasma source for LWFA

✓ We work on discharge plasma diagnostic to study the dynamics of the plasma formation in capillary

Summary

- ✓ We are aiming to incorporate different plasma diagnostic approaches to characterize the plasma density in the longitudinal and transverse planes
- \checkmark We are open to collaborate with EuPRAXIA partners