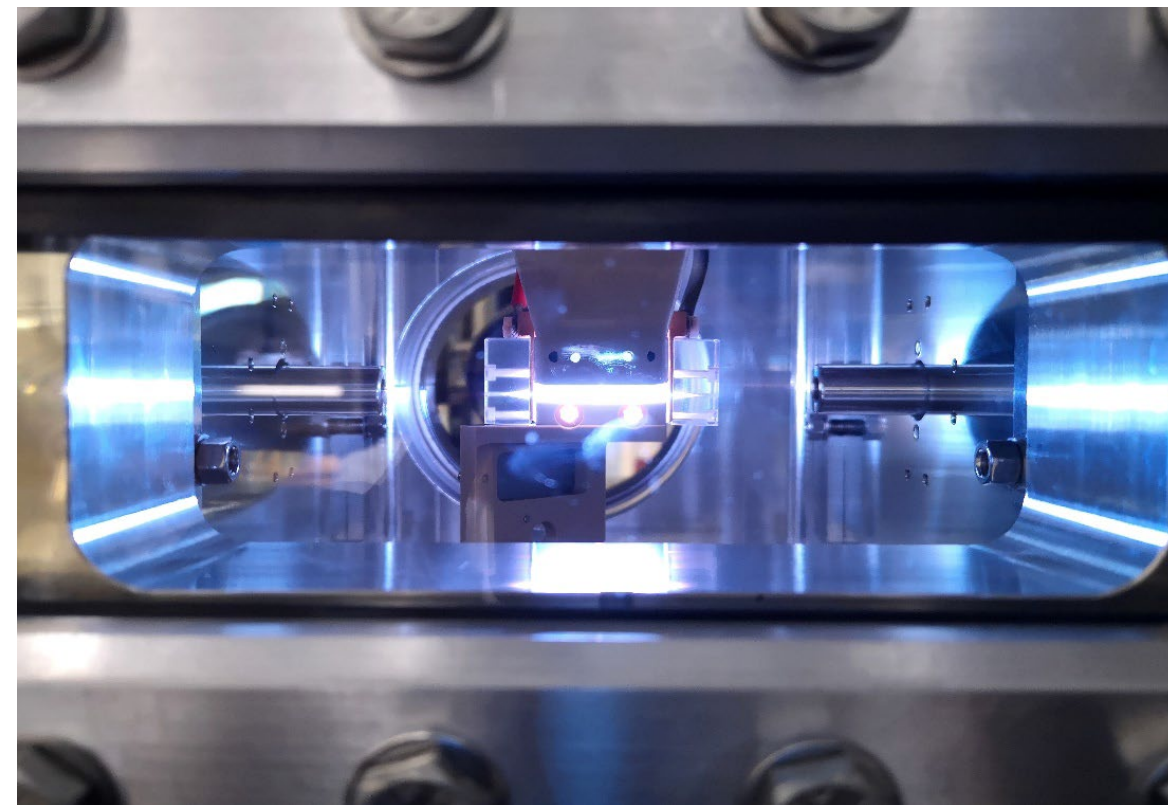


*EuPRAXIA – PP
WP10 Plasma components
and technologies*

A. Biagioni

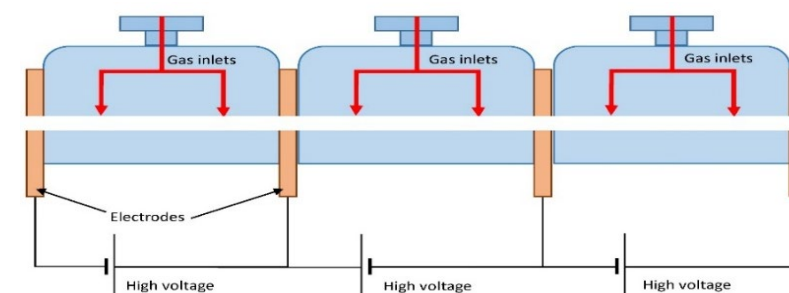


Plasma module for EuPraxia project

- **1.1 GeV** (1.5 GV/m 40cm capillary - density 10^{16} cm⁻³)
 - Direct plasma discharge for 40cm long capillary
 - Stability
 - Longitudinal profiles
 - Plasma sources operating at 100 (400) Hz
 - Vacuum system
 - Study on material science to increase capillary's longevity
 - High-voltage sources for plasma formation
- Segmented capillary
 - Plasma sources larger than 40 cm (m-scale)
 - Longitudinal density modulation
 - **5 GeV** case for EuPRAXIA (1.5 GV/m m-scale capillary - density 10^{16} cm⁻³)

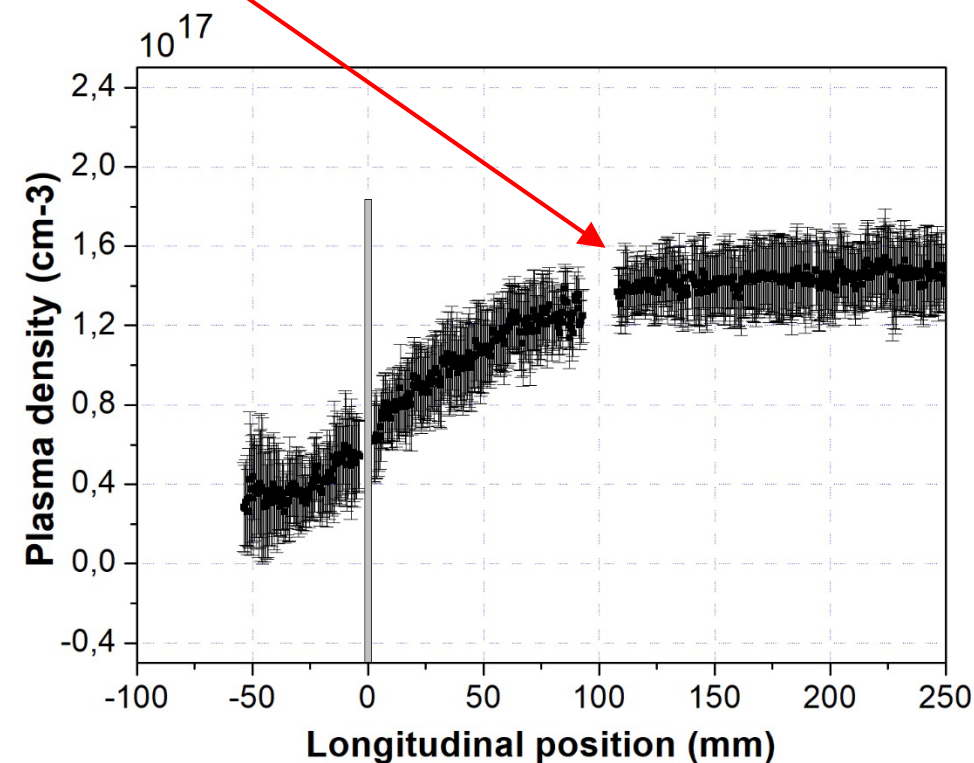
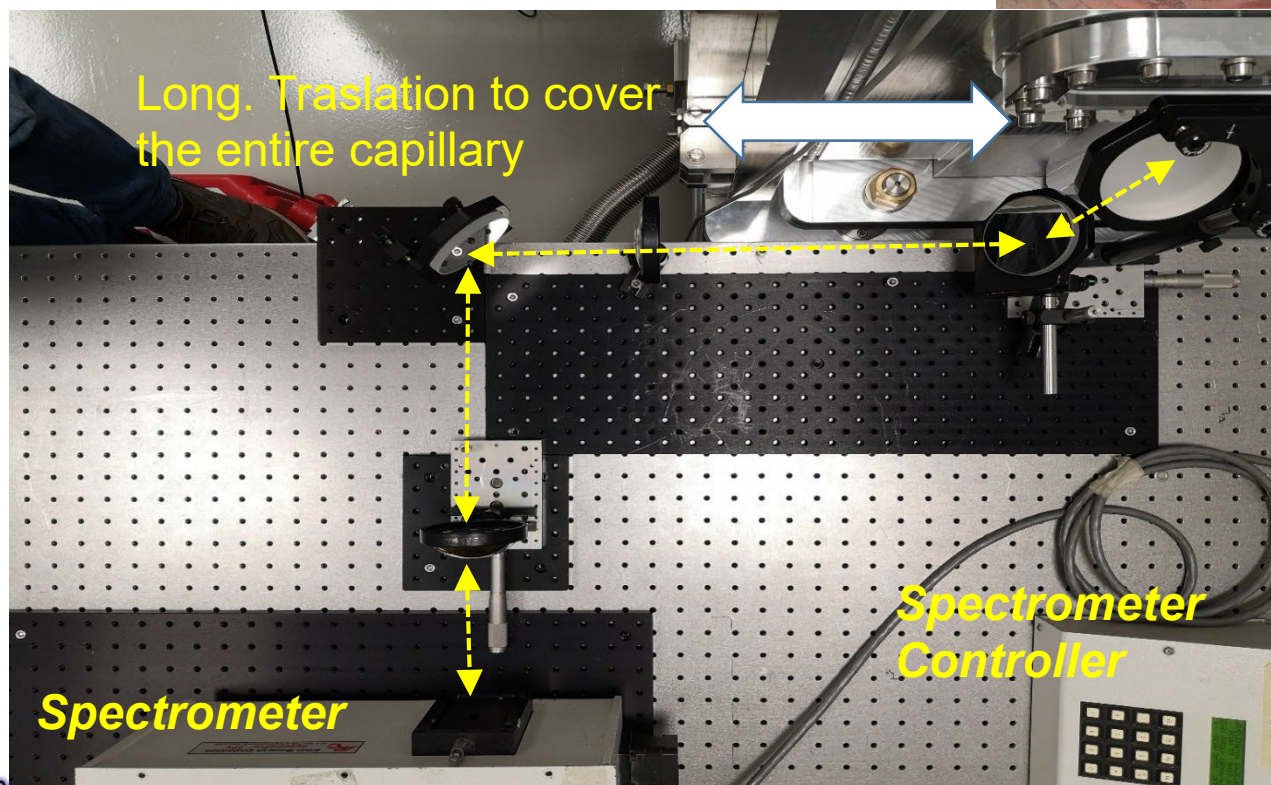
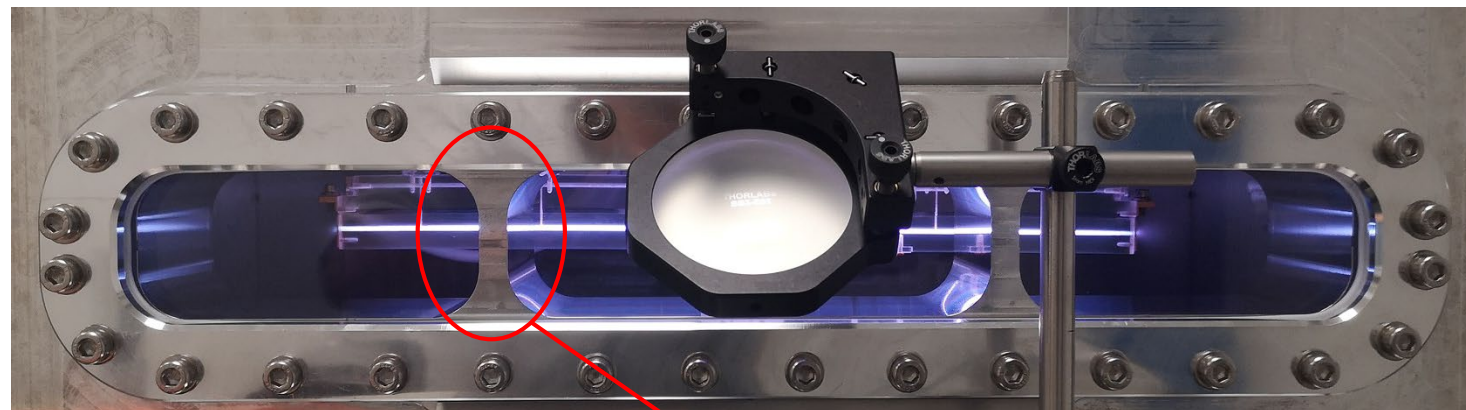


40cm capillary is working



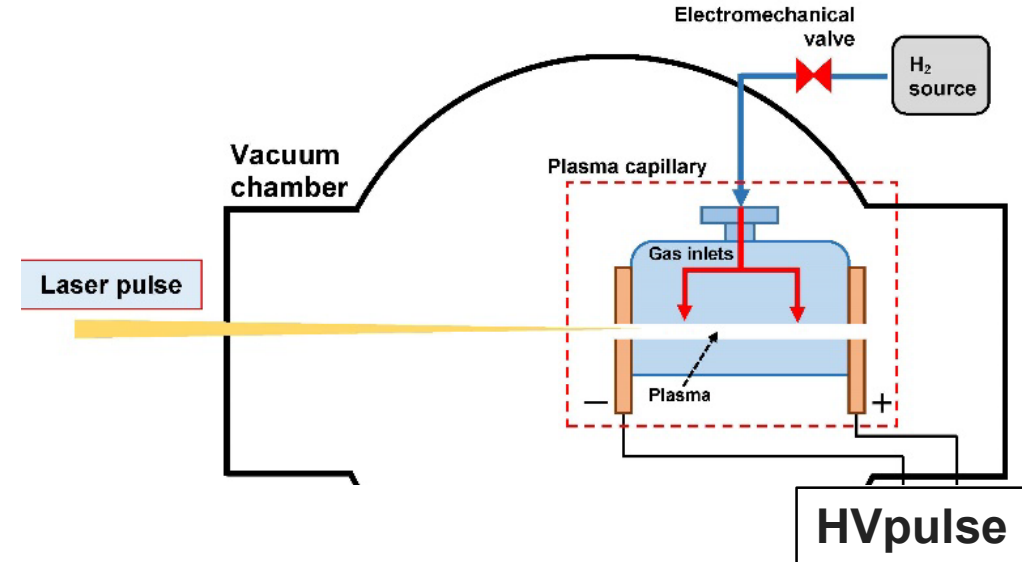
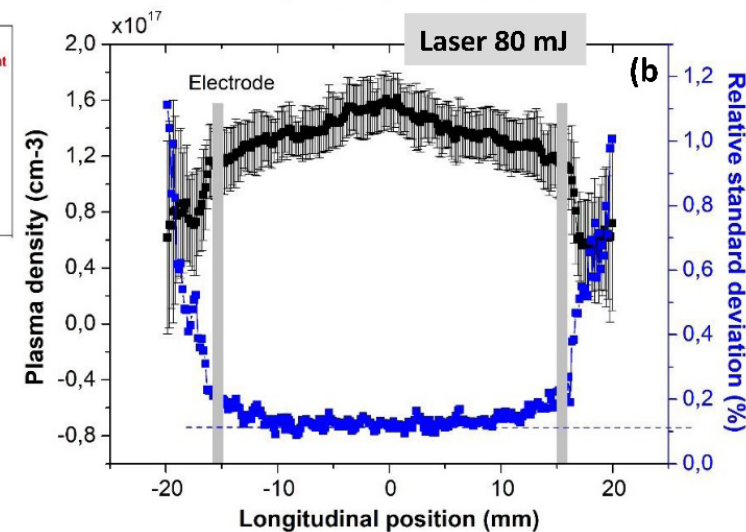
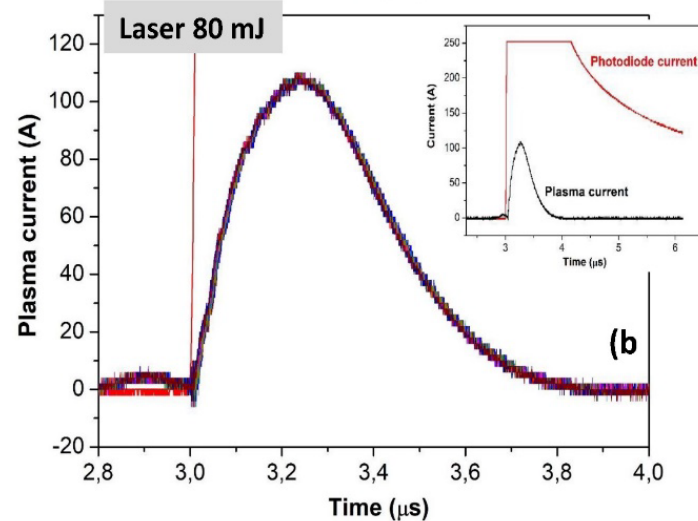
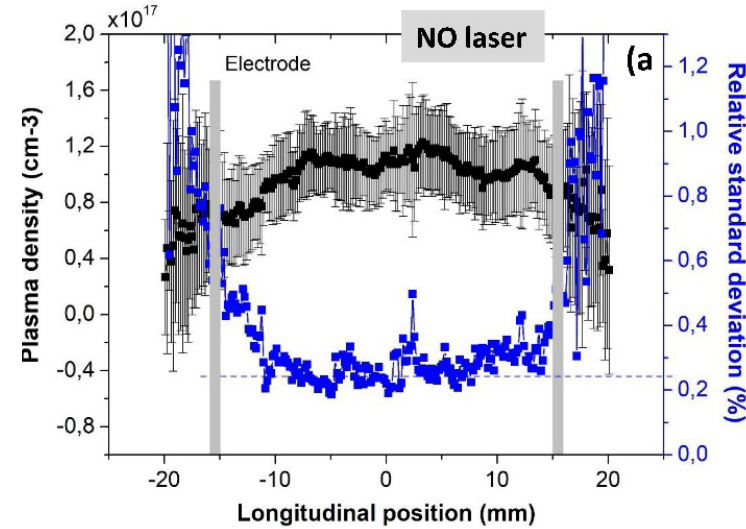
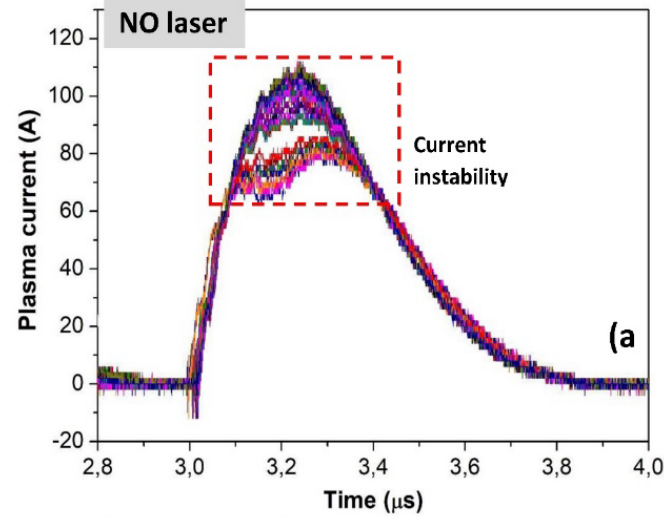
40 cm long Discharge capillary

- $10^{16} - 10^{17} \text{ cm}^{-3}$ range (EuPRAXIA goal)
- 10 kV – 380 A and 6 inlets of 1 mm in diameter
- Stark broadening for characterization



Capillary discharge stabilization

3cm x 1 mm_5kV – 110A

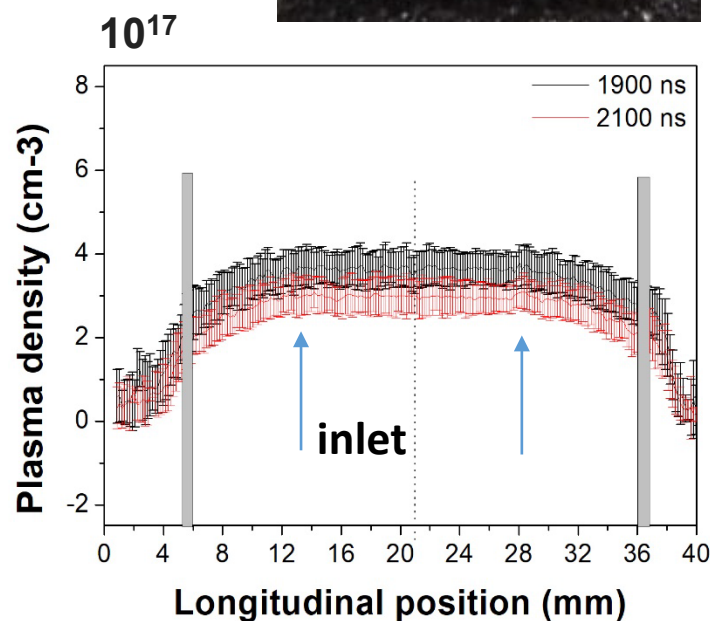
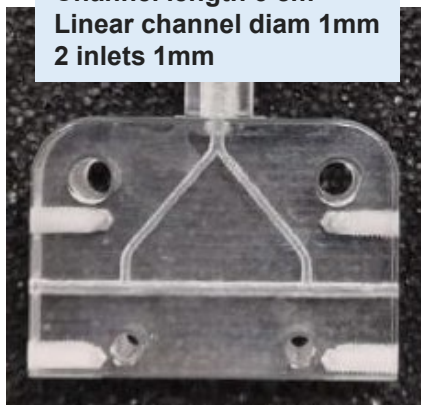


- A gas-filled discharge-capillary where the plasma generation, achieved by ionizing Hydrogen gas with a high-voltage electrical discharge, is stabilized by triggering its ignition with an external laser pulse
- Results show a noticeable stabilization of the resulting plasma density along the capillary and the discharge pulse

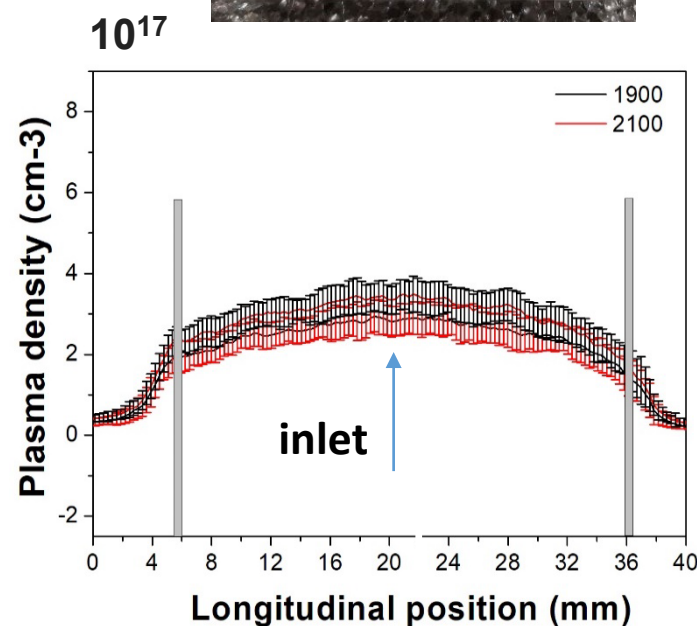
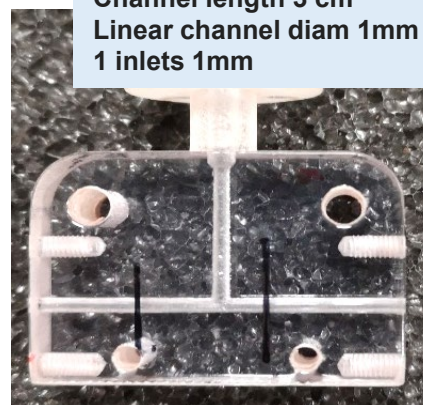
A Biagioni et al 2021 *Plasma Phys. Control. Fusion* 63 115013

Study on longitudinal plasma profiles by changing the geometry of the plasma source

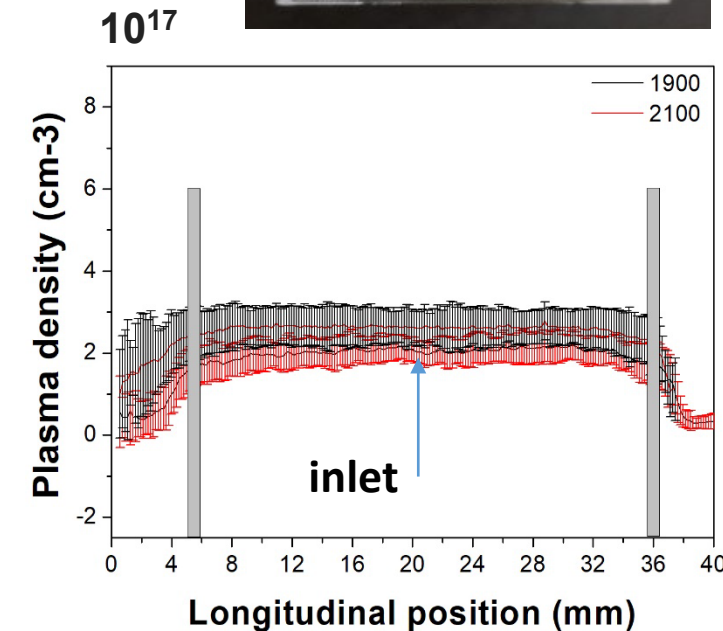
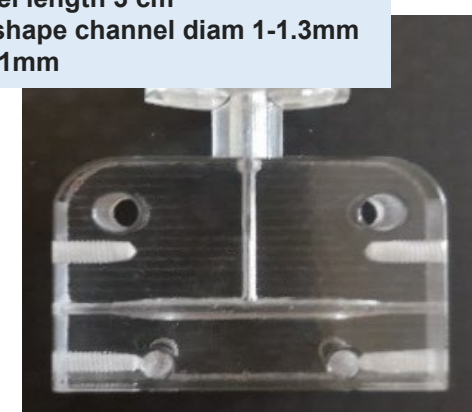
Channel length 3 cm
Linear channel diam 1mm
2 inlets 1mm



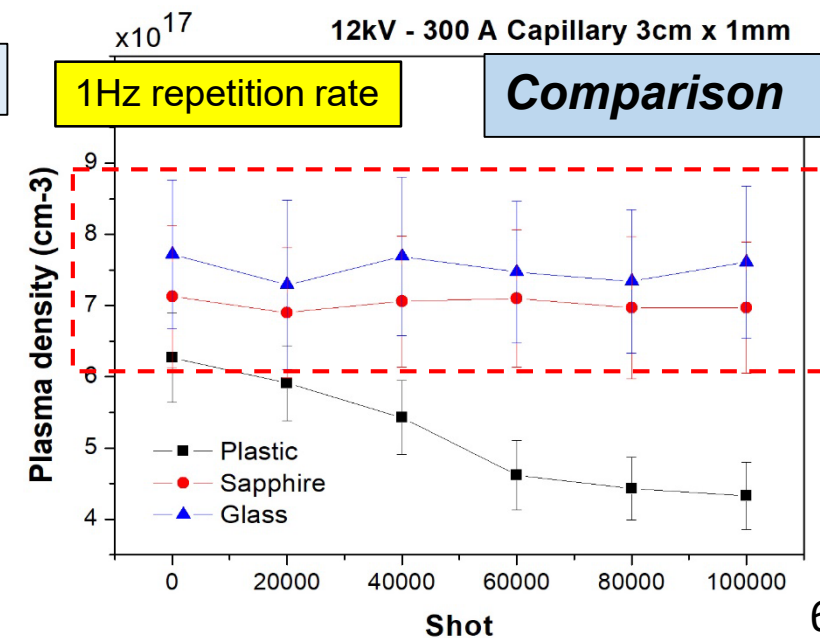
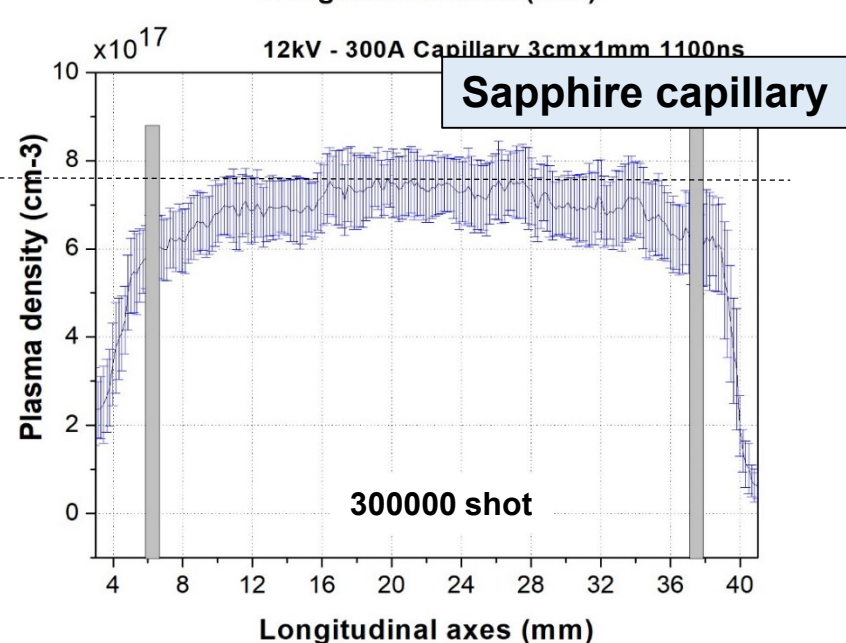
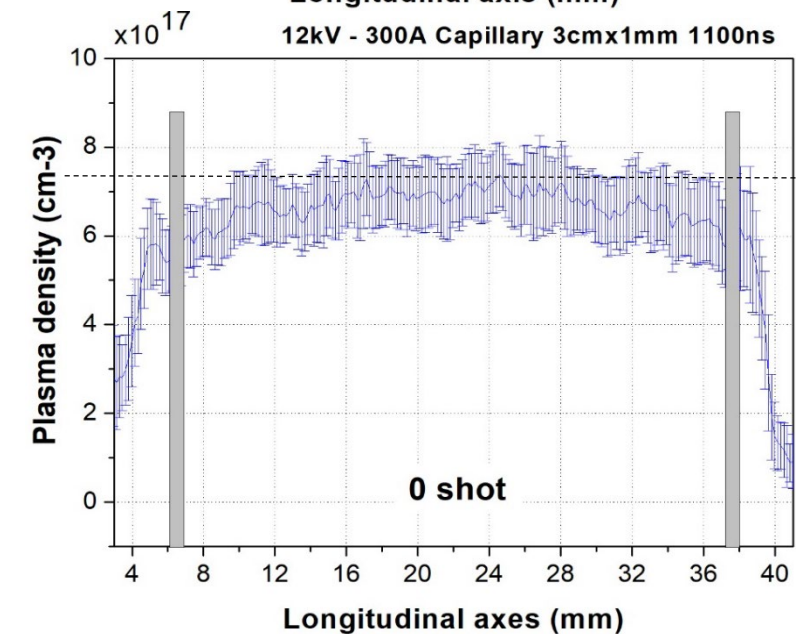
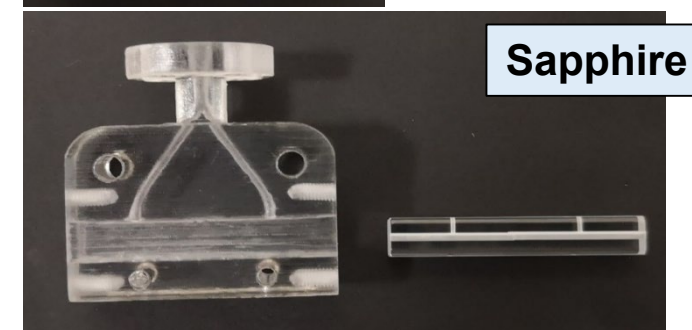
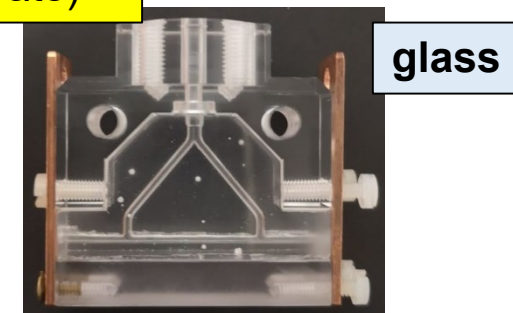
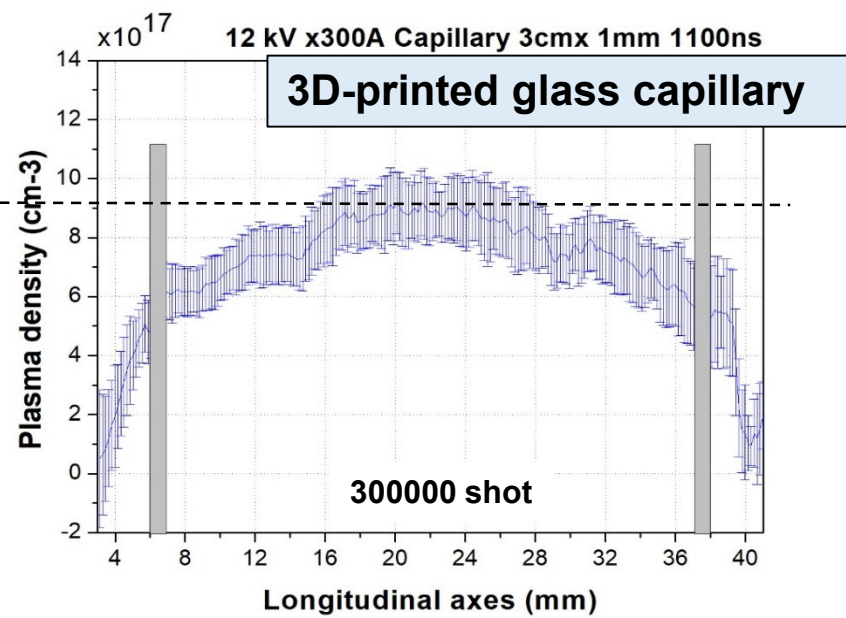
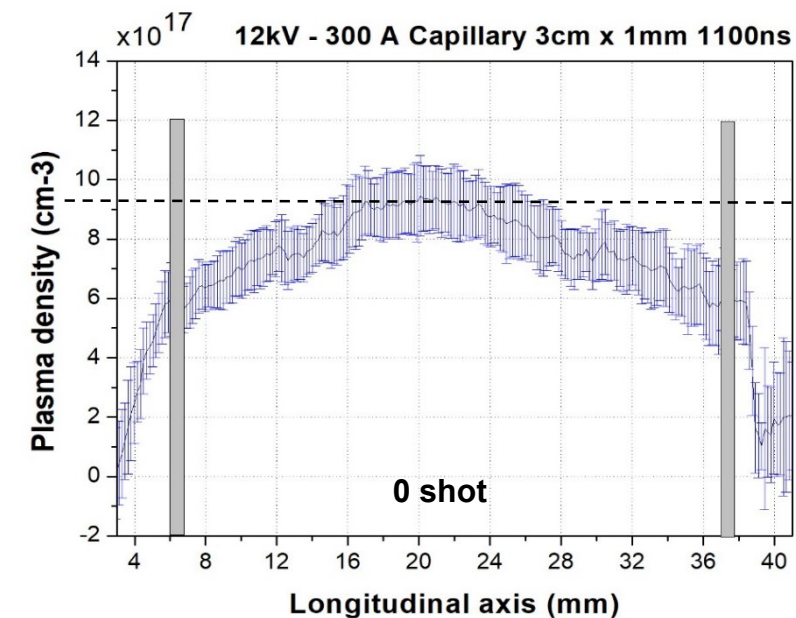
Channel length 3 cm
Linear channel diam 1mm
1 inlets 1mm



Channel length 3 cm
Cigar-shape channel diam 1-1.3mm
1 inlet 1mm



Capillary aging as a function of the number of shots (Study on high repetition rate)



*Thank you for your
attention*