

# Analytical, Computational, and Experimental Study of Discharge Plasma Capillaries for Laser Plasma Wakefield Acceleration

*Friday, 7 November 2025 16:20 (20 minutes)*

Laser Plasma Wakefield Acceleration (LPWA) is a promising way to achieve ultra-high accelerating gradients, relying on plasma channels to guide intense laser pulses over long distances. In this study, we explore discharge plasma capillaries as a potential solution for stable laser guiding and precise control of plasma density. We start by using Computational Fluid Dynamics (CFD) simulations to understand how the neutral gas distributes inside capillaries of different shapes before ionization, and then examine how plasma channels form, taking into account discharge settings, capillary geometry, and gas pressure. At the same time, we are developing an experimental setup to study the plasma directly through Stark broadening spectroscopy. By combining analytical, computational and experimental approaches, this work provides a foundation for developing optimized plasma channels for LPWA.

**Presenter:** BEHTOUEI, Mostafa (Centro de Láseres Pulsados (CLPU))