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3D characterization of plasma density in capillary discharges for plasma-based accelerators

Tuesday 3 June 2025 16:00 (2 hours)

Accurate characterization of plasma density profiles is vital for optimizing plasma-based accelerators, as density directly affects beam acceleration and quality. Plasma capillaries also serve as lenses and for beam guiding, highlighting their role in advanced accelerators. This study measures longitudinal and transverse density profiles of plasma capillaries, achieving 3D characterization using Stark broadening techniques.
Two optical lines capture emitted plasma light. Parameters include gas flow rate, operating mode (pulsed/continuous), voltage, capillary type and geometry, gas type, and repetition rate, allowing evaluation of operational impacts on plasma density.
Results show consistent density measurements across various positions, indicating the method's capability to capture spatial variations in plasma density.
Understanding these profiles is crucial for developing and optimizing laser-driven and beam-driven plasma accelerators, as well as enhancing plasma lenses and beam guiding, enabling fine-tuning of parameters to maximize acceleration efficiency and control beam quality.

Footnotes

Paper preparation format

Region represented

Europe

Funding Agency

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