Abstract Submitted
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Density characterization of discharged capillaries through common-path spectral-domain interferometry[1] JEROEN VAN TILBORG, ANTHONY GONSALVES, CARL SCHROEDER, WIM LEEMANS[2], CAMERON GEDDES, ERIC ESAREY, Lawrence Berkeley National Laboratory — Pre-formed capillary-based plasma channels are well suited to extend the laser-plasma interaction, benefiting laser plasma accelerators. More recently, discharged plasma structures have been applied to focus relativistic electron beams exploiting the advantages of radial symmetry, tunability, and strong focusing gradients. Knowledge of the on-axis plasma density is of critical importance, since it dominates the plasma response time, self-injection threshold, accelerating field strength, electron beam dephasing length, and beam-driven wakefield effects. In this talk, a novel approach is presented and demonstrated [1-2], based on a common-path two-color interferometer. The approach relies on a single femtosecond laser pulse traveling through a frequency-doubling crystal, thus transforming into fundamental and 2nd-harmonic pulses (the pulses are intrinsically coupled and locked in timing, phase, pointing, and stability). The differences in phase and group velocity in the plasma can be recorded with a spectrometer. This technique allows for sensitive retrieval (from the phase velocity), without the need for phase tracking (from the group velocity). [1] van Tilborg et al. Opt. Lett. 12, 2776 (2018), [2] van Tilborg et al. Phys. Plasmas 26, 023106 (2019)

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