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Group Velocity Measurements in Laser-Heated Capillary Discharge Waveguides for Laser-Plasma Accelerators[1] C.V. PIERONEK, Lawrence Berkeley National Laboratory; University of California-Berkeley, J. DANIELS, Lawrence Berkeley National Laboratory; Eindhoven University of Technology, A.J. GONSALVES, C. BENEDETTI, W.P. LEEMANS, Lawrence Berkeley National Laboratory — To date, the most energetic electron beams from laser-plasma accelerators have been produced using gas-filled capillary discharge waveguides, which increase the acceleration length by mitigating diffraction of the driving laser pulse. [1] To reach higher electron beam energies, lower plasma density is required to reduce bunch dephasing. However, confinement of the driver is reduced for lower plasma density, reducing the acceleration length. A laser-heated capillary discharge waveguide, where the discharge is heated by a coaxial laser pulse, was proposed to create a steeper density gradient at lower density. [2] Here the first measurements of group velocity in laser-heated capillary discharges, obtained via spectral interferometry, are presented. Increase of the driver group velocity and reduction in on-axis plasma density by laser-heating are shown.

[1] W.P. Leemans, et al, Physical Review Letters 113, 245002 (2014).
[2] N.A. Bobrova, et al., Physics of Plasmas 20, 020703 (2013).

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