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Session TO8: Plasma Acceleration: Computation, Beam Driven, Mid-IR lasers
9:30 AM–12:30 PM, Thursday, November 8, 2018
OCC Room: C120-122

Chair: Jessica Shaw, Laboratory for Laser Energetics, Rochester, NY

Abstract ID: BAPS.2018.DPP.TO8.14

Abstract: TO8.00014 : Plasma-assisted light bullets and wavelength scaling of laser filamentation in the long-wavelength infrared*

12:06 PM–12:18 PM

← Abstract →

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We model laser filamentation in ZnSe in the mid-infrared (Mid-IR, wavelengths λ = 4 and 6 μm) and the long-wavelength infrared (LWIR, λ = 8 and 10 μm) using carrier-resolved unidirectional pulse propagation equations (UPPE) [1]. We predict an unprecedented propagation regime at λ = 8 μm that supports light bullets [2], which are spatio-temporally non-spreading electromagnetic pulses. Furthermore, in contrast to the previous report in air in the mid-IR [3], we predict that LWIR light bullets in solids critically rely on plasma-mediated dispersion, which dynamically evolves during multiphoton and tunneling ionization as peak plasma densities reach $\rho \sim 6.6 \times 10^{18}$ cm^{-3}. Finally, the plasma-assisted light bullets propagate with sub-cycle pulse durations and peak intensities $I \sim 1.1 \times 10^{12}$ W/cm^2, making them useful for high-harmonic generation and attosecond pulse generation. [1] M. Kolesik and J. V. Moloney, Phys. Rev. E 70, 036604 (2004). [2] Y. Silberberg, Opt. Lett. 15, 1282 (1990). [3] P. Panagiotopoulos, P. Whalen, M. Kolesik, and J. V. Moloney, Nat. Photon. 9, 543 (2015).

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