Bulletin of the American Physical Society

63rd Annual Meeting of the APS Division of Plasma Physics
Volume 66, Number 13
Monday–Friday, November 8–12, 2021; Pittsburgh, PA

Session JO05: Relativistic High-Energy-Density Physics and High Field Physics
2:00 PM–5:00 PM, Tuesday, November 9, 2021
Room: Rooms 306-307

Chair: Alex Arefiev, University of California, San Diego

Abstract: JO05.00015 : Wavelength scaling of the high-intensity laser pulse compression dynamics in gas-filled capillaries *
4:48 PM–5:00 PM

← *Abstract*

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The multimodal carrier-resolved unidirectional pulse propagation equation is solved to study the wavelength-dependent (λ = 1, 2, 3 and 4 μm) spatio-temporal dynamics, particularly pulse self-compression during high-intensity laser pulse propagation in gas-filled capillaries. We find that pulse self-compression in gas-filled capillaries due to plasma is more efficient for short wavelengths in contrast to wavelength-dependent pulse self-compression in laser filamentation [1]. To explain our finding, a detailed analysis is performed by quantifying the contributions of higher-order modes and calculating the temporal delay among modes, which reveals that pulse self-compression at longer wavelengths does not occur due to larger group velocity mismatch between the fundamental and higher-order modes for longer wavelengths [2]. Our study has important implications for the various fields of high-intensity nonlinear optics in gas-filled capillaries such as supercontinuum generation and high-order harmonic generation [3].[1] L. Bergé et al., Phys. Rev. A **88**, 023816 (2013). [2] G. Nagar and B. Shim, submitted. [3] T. Popmitchev et al. Science **336**, 1287 (2012).

*Funded by National Science Foundation (NSF) (PHY-2010365) and Air Force Office of Scientific Research (AFOSR)(FA9550-18-1-0223).