Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Experimental and theoretical study of wavelength dependence of plasma dynamics in laser filamentation in solids.[1] GARIMA NAGAR, DENNIS DEMPSEY, BONGGU SHIM, Binghamton University — We experimentally and theoretically investigate plasma dynamics in laser filamentation in fused silica by varying the driver wavelength from 1.2 to 2.3 μm covering the near-zero to the anomalous group-velocity dispersion regimes. First, we perform femtosecond time-resolved interferometry to measure plasma densities in filaments, which unexpectedly reveals that plasma densities are not monotonically decreasing with increasing wavelength. This result is in sharp contrast to recent theoretical work in filamentation in air/gases [1,2] as well as our own numerical simulations in fused silica in which the electron collision time is assumed to be constant for all the wavelengths. Therefore, to investigate further, we also perform time-resolved shadowgraphy which, combined with interferometry, enables us to determine the electron collision time in plasma [3]. We find out that the electron collision time is not a constant for different wavelengths, which can change the plasma dynamics in filamentation significantly.[1]L. Bergé et al., Phys. Rev. A 88, 023816 (2013).[2]Y. E. Geints et al., Appl. Opt. 56, 1397–1404 (2017).[3]A. Couairon et al., Eur. Phys. J-Spec. Top. 199, 76 (2011).[4]Q. Sun et al., Opt. Lett. 30, 3 (2005).

[1]Funded by National Science Foundation (NSF) (PHY-1707237), Air Force Office of Scientific Research (AFOSR)(FA9550-18-1-0223), and the Integrated Electronics Engineering Center (IEEC) at Binghamton University.

GARIMA NAGAR
Binghamton University

Date submitted: 03 Jul 2019 Electronic form version 1.4