

Abstract Submitted
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Analytical and Simulation Study of Laser-Ionized Plasma¹

GEORGE RODRIGUEZ, NATALIA KRASHENINNIKOVA, MARK SCHMITT, LANL — Terahertz generation inside ionization filaments produced by self-focusing of high-intensity short laser pulses in the atmosphere is a complex multi-dimensional nonlinear phenomena [1]. We are modeling these effects in 3-D using the PULSE [2] code that includes both ionization and nonlinear optics physics models. The relative ionization effects from multi-photon, tunneling and collision-driven avalanche ionization have been investigated. Nonlinear optics effects include Kerr self-focusing and self-phase modulation, group velocity dispersion, plasma defocusing and inverse Bremsstrahlung. To validate our models and facilitate a more complete understanding of the physical mechanisms at play, we have studied the effects of experimental parameters including gas species, gas pressure, and laser pulse energy on filament generation. A detailed description of the model and a comparison of our simulation results with experimental results are presented.

[1] M. J. Schmitt, J. Opt. Soc. Am. B 20 719 (2003).

[2] K. Y. Kim et al., Nat. Photonics 2 605-609 (2008).

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