Low-Order Harmonic Generation in Gases with Femtosecond, Short-Wave and Mid-Wave Infrared Laser Pulses

P Polynkin[1]

[1] *College of Optical Sciences, University of Arizona, Tucson AZ, USA. Contact Phone: +15204053767*
Contact Email: ppolynkin@optics.arizona.edu

The on-going developments of high peak-power laser sources in short- and mid-wave infrared enable the investigations of the highly nonlinear propagation of intense laser pulses in gaseous media in those new wavelength regimes. I will discuss experimental results on laser filamentation of ultrashort-pulse lasers at 1.7, 2.5 and 3.9 micrometer wavelengths in gases. The particular emphases of these investigations have been on the generation of the low-order harmonics of the infrared driver, on the spectral interference of those harmonics, and on the effects related to the carrier-envelope phase of the driver pulse. Plans for the extension of these studies into the long-wave infrared will be outlined.

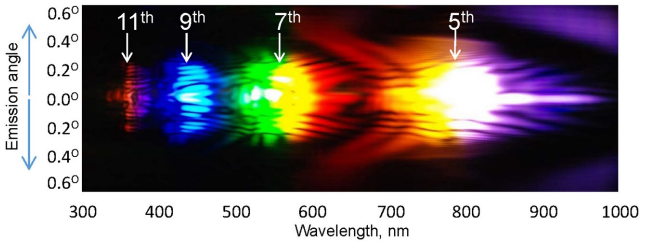

Figure 1: Angularly-resolved spectrum of odd harmonics generated on propagation of an intense, ultrashort laser pulse at 3.9 μm wavelength in air. The diagonal features that are present in this spectral map contain information about plasma density in the mid-infrared laser filament. Spectral interference in the regions of overlap of the adjacent harmonics can be used for the single-shot characterization of the carrier-envelope phase of the mid-infrared driver pulse

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