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Excitation of Frequency Harmonics of q-Gaussian Laser Beams Propagating through Radially Inhomogenous Plasma Channel

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We investigate the interplay between self-focusing and higher harmonic generation (HHG) in a pre-formed, collisionless parabolic plasma channel. A q-Gaussian laser beam, with its non-uniform intensity profile, induces a ponderomotive force that reshapes the plasma density distribution. This density gradient drives a plasma wave, which interacts with the laser to generate HHG. Using moment theory, we derive a differential equation describing the laser beam's spot size evolution and numerically solve it to explore the influence of laser intensity, wavefront distortion, plasma density, channel depth, and harmonic order on beam propagation and HHG efficiency. Our results provide valuable insights into the underlying mechanisms governing self-focusing and HHG in parabolic plasma channels, paving the way for optimizing HHG sources for applications such as attosecond pulse generation and coherent extreme ultraviolet radiation.

Type of presence

Presence online

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