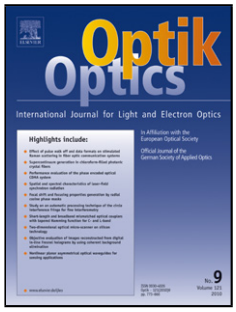

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PII: S0030-4026(18)30512-6
DOI: https://doi.org/10.1016/j.ijleo.2018.04.027
Reference: IJLEO 60755

To appear in:

Received date: 8-3-2018
Accepted date: 4-4-2018

Please cite this article as: Sayrac M, Pressure dependence of high order harmonic generation in nitrogen molecule and atmospheric air, *Optik* (2010), https://doi.org/10.1016/j.ijleo.2018.04.027

Pressure dependence of high order harmonic generation in nitrogen molecule and atmospheric air

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Abstract

Dependence of the variation of the gas pressure on the high harmonic generation (HHG) from nitrogen molecule (N_2) and atmospheric air using ultrashort intense laser pulses is measured. The optimum pressure point for generation of maximum harmonic signal is found for both sample. Enhancement and extension of the HH orders are observed at around optimum pressure value. A theoretical calculation based on one-dimensional model is used to explain this effect.

Keywords: High-order harmonic generation (HHG); XUV radiation; Phasematching; Conversion efficiency; Femtosecond laser; Pressure optimization

Introduction

To generate efficient extreme ultraviolet (XUV) radiation is much needed tool for imaging of matter by short wavelength and observation of coherence properties of matter. One of the prominent source to generate for this radiation is high harmonic generation (HHG). HHG is a unique nonlinear process in which atoms/molecules ionized by an intense laser field at frequency ω_0 produces radiations of higher frequencies $q\omega_0$ where q is an odd integer. HHG driven by IR lasers can span a frequency range from UV to soft X-ray regions [1, 2] and it has various applications in physics, chemistry, and biology [2, 3]. HHG is usually realized by using an amplified femtosecond laser pulses that can be produced from a table top laser systems. For this