Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

The Phase Effect in perturbative nonlinear optics CI-LING PAN, National Tsing Hua University, RUEI-YIN LIN, National Chiao Tung University, WEI-JAN CHANG, National Tsing Hua University, CHAO-KUEI LEE, National Sun yat-sen University — Waveform control is essential for ultrafast nonlinear optical processes such as high-order harmonic generation (HHG). For example, a sawtooth-like waveform can enhance the kinetic energies of the electrons such that the cutoff of HHG is extended. In this work, we show that relative phase of the two-color driving laser can affect the outcome of perturbative nonlinear optical processes such as lower-order harmonic generation. Consider the third-harmonic signal generated in argon by the fundamental and second-harmonics of a pump laser with frequencies of ω_1, and ω_2. A cross-term emerges due to interference of four-wave mixing signals of $(\omega_1 + \omega_1 + \omega_1)$ and $(\omega_{2+}\omega_2 - \omega_1)$. When the intensities of two-color pump at ω_1 and ω_2 are equal, the modulation in the third-harmonic signal by the cross-term is about 30% of the DC term. As the relative phase between ω_1 and ω_2 varies, a sinusoidal modulation in output intensity at $3\omega_1$ is expected. We have also calculated the phase effects for fifth, seventh and ninth harmonic generation, which show more complicated behavior.

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Date submitted: 17 Nov 2011 Electronic form version 1.4