NONLINEAR PHASE QUASI-MATCHING AT THE THIRD HARMONIC GENERATION UNDER THE TWO-PHOTON RESONANCE

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S u m m a r y

The third harmonic generation (THG) under the conditions of a two-photon resonance is investigated for various nonlinear polarizabilities as a function of wave Δk and frequency $\Delta\omega$ mismatches from the resonance when taking into account the change of populations of resonant states. It is shown that, at a nonlinear phase quasi-matching (NPM), when the nonlinear wave mismatch at $\Delta\omega \neq 0$ is compensated by a linear one Δk, the efficiency of THG can increase approximately by 2 times in comparison with the case of $\Delta k = \Delta\omega = 0$ and reaches 60%. It is found that the fixed pump field approximation does not allow one to describe the NPM phenomenon, and it is necessary to use the fixed intensity approximation. It is shown analytically and numerically that, in the case of NPM, the wave and frequency mismatches can have both identical and different signs. In a spectrum of harmonics, a gap caused by backward Raman scattering can appear, which is getting deeper at large pump intensities due to the saturation of the populations of resonant states.