Spectral features of nonlinear response of high temperature superconductor film to picosecond exitation in methods of biharmonic pumping and degenerate tetra-photon spectroscopy.

Diploma thesis abstract

The present work is devoted to the modelling of spectral features in the nonlinear response of an HTSC film to picosecond optical excitation in methods of degenerate four-photon spectroscopy (equal frequencies $\omega_1 = \omega_2$ pumping wave, DFPS) and biharmonic pumping ($\omega_1 \neq \omega_2$, BP). Assuming that HTSC nonlinear response is determined by inter-band transitions in the electronic spectrum with a meta-stable energy gap, it is shown that:

1) The position of the Fermi level and the reference temperature of the electronic subsystem varies stepwise with changes in HTSC samples temperature T_0 in the vicinity of phase transition point $T_0 \simeq T_c$

2) The model that is being used explains the abrupt changes in the dependence of amplitude of the nonlinear response in BP on detuning $\Delta\omega = \omega_1 - \omega_2$ when varying the T_0 near the $T_0 \simeq T_c$ point.

3) The Stokes and the anti-Stokes components of the HTSC response to a picosecond biharmonic pumping are asymmetrical and the self-diffraction in two directions, corresponding to these components, is of different efficiency when the frequency detuning of the excitation pulses is more than $100\ cm^{-1}$

4) Temperature features of the nonlinear response in DFPS method remain virtually the same as in femtosecond spectroscopy while spectral feature are inverted.

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