Laser Physics 2007 vol.17 N5, pages 647-651

Femtosecond photon echo in a dye-doped polymer film and the possibility of coherent optical cooling

Lobkov V., Petrushkin S., Salikhov K., Samartsev V., Safiullin G., Vorobyev A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The signals of primary and stimulated femtosecond photon echoes are investigated in a dye-doped polymer film at room temperature. The homogeneous S 0 → S 1 spectral line width, which is due to the interaction between the impurity molecules and the quasi-local low-frequency modes, is estimated (≈5 × 10 12 Hz). Special attention is paid to the study of spectra of femtosecond echo signals. The short-wave shifts of these spectra, with respect to the spectrum of femtosecond exciting pulses, are observed. These shifts indicate that the anti-Stokes regime of femtosecond pulse emission is realized. Therefore, the coherent regime of laser cooling of solids appears to be possible. The prospects of using of this new cooling regime in the function of a solid-state optical refrigerator are discussed. © Nauka/Interperiodica 2007.

http://dx.doi.org/10.1134/S1054660X07050076