Dual-wave optical coherent tomograph based on femtosecond Cr:forsterite laser for investigation of light pulse propagation in strongly scattering media

Abstract

In the work possibilities of effective SHG in the field of low energetic femtosecond laser radiation with energy of about 1 nJ for single pulse were analyzed. The efficiency of SHG conversion about 9% for focused laser radiation was experimentally obtained. The scheme of dual-wave femtosecond optical heterodyne measuring instrument (optical coherent tomograph), which uses either fundamental wave (1.25 mkm) or SHG wave (0.625 mkm) of femtosecond Cr:forsterite laser was developed. The dynamics of ultrashort laser pulses propagation in paper sheet at two different wavelengths (1.25 mkm and 0.625 mkm) were made. The mean photon's lifetime in paper of 90-mkm thickness was obtained (τ_0=2.14 ps for 1.25 mkm wavelength and τ_0=7.8±2,1 ps for 0.625 mkm wavelength). Reduced scattering coefficients were estimated (μ'_S=249.1 ± 0.9 mm $^{-1}$ for 1.25 mkm wavelength and μ'_S=800±200 мм$^{-1}$ for 0.625 mkm wavelength).

Analyzing experimentally obtained data, one can make a conclusion that in case of short-wave radiation scattering coefficient inside strongly scattering medium (paper sheet) increases and mean transport path in medium decreases.