

Frequency modulation optimization of nonlinear optical Z-scan by high repetition rate femtosecond laser

ABSTRACT

Nonlinear optical properties of 2-(2-hydroxyethyl)-6-(morpholin-4-yl)-1H-benzo[de]isoquinoline-1,3(2H)-dione pigment material is investigated with frequency modulation of 250 MHz femtosecond high repetition rate (HRR) laser by an optical chopper. Thermal lensing formation on the material due to thermal build up from HRR laser leads to measurement ambiguity of nonlinear refractive index (NLRI) and two-photon absorption cross section (TPACS). Optimized optical chopper frequency range of 50% duty cycle modulated laser beam effectively reduces laser contact time on the material and resulted in improved NLRI and TPACS of -8.23×10^{-18} m²/W and 2.96 GM respectively.

Keyword: Nonlinear refractive index; Two-photon absorption cross-section; Z-scan; Thermal lensing