

Estimation of nonlinear absorption coefficients of 515 and 1030 nm ultrashort laser pulses in CaF₂

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It is known that in dielectric materials, including CaF₂, multiphoton absorption is the key initial process of the energy deposition at low and moderate intensities of ultrashort laser pulses [1, 2]. Experimental measurement of the main parameters of multiphoton photoionization, such as multiphoton absorption coefficients, is of great interest [3]. An experimental study of nonlinear absorption process of ultrashort laser pulses in bulk of CaF₂ has been carried out. The results of experimental studies on measuring the nonlinear transmission of 1-mm thick plane-parallel plate made of CaF₂ irradiated with focused (NA = 0.55 with a focal length $f' = 5$ mm) 515 and 1030 nm laser pulses with 0.3–3.5 ps durations are presented. It is shown that in this sample the main mechanism of 515-nm ultrashort laser pulses attenuation at intensities not exceeding filamentation threshold (≈ 20 – 30 TW/cm²) is five-photon absorption and for 1030-nm pulses is ten-photon absorption. This research is supported by the Russian Science Foundation (project No. 22-72-10076).

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