Critical self-focusing power in natural and synthetic diamonds

Kuzmin E V[1,@], Danilov P A[1], Stsepuro N G[1,2], Smirnov N A[1], Krasin G K[1,2], Kudryashov S I[1], Gulina Y S[1] and Kovalev M S[1,2]

[1] Lebedev Physical Institute of the Russian Academy of Sciences, Leninsky Avenue 53, Moscow 119991, Russia
[2] Bauman Moscow State Technical University, 2nd Baumanskaya Street 5, Moscow 105005, Russia

[@] e.kuzmin@lebedev.ru

Ultra-short laser pulses are perfect instrument for precice machining and plays significant role in dielectric processing [1]. Unlike surface treatment, that depends mainly of material properties, bulk treatment may be difficult due to influence of nonlinear effects, one of which is Kerr self-focusing [2]. This is quite a significant effect, appears when the laser radiation exceeds a certain threshold intensity and depends both of the irradiation (polarization, wavelength, pulse duration) and bulk properties, which stays unexplored for many materials yet. In conjunction, diamond bulk treatment is used in many applications: to make individual marks [3]; to produce microstructures [4]; to find and control optical centers [5]; etc. In this work, the critical power of self-focusing was experimentally determined for natural and synthetic diamonds at various experimental conditions. This research is supported by Russian Science Fund (project No. 21-79-30063).

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