

Ultrafast physics and applications of Bessel beam interaction with solid dielectrics

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The relentless pursuit of novel materials and nano-structures to cater to the needs of next-generation technologies necessitates innovative processing strategies to overcome current limitations. To this end, the use of complex and structured light, modulated in phase, amplitude, and polarization, has emerged as a promising approach to control laser-matter interactions. The unique capabilities of ultrafast laser pulses in generating extreme states of matter at nanometric scales are further enhanced through the shaping of ultrafast laser pulses, thereby creating new avenues for material processing.

This talk will focus on revisiting the interaction between femtosecond Bessel beams and the nano-plasma induced by the pulse onset. We will report here on experimental and numerical investigations on the rich physics at play, that leads to extreme energy density deposition inside the solid, formation of plasma double layer, second harmonic and terahertz generation. This impacts on the development of unconventional processing strategies.