ULTRASHORT-PULSE LASER EXCITATION OF DIELECTRIC MATERIALS: EXPERIMENTS AND MODELING

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The excitation of dielectric materials by ultrashort laser pulses is a topic of strong interest. From a fundamental viewpoint, its description represents an intriguing combination of strong-field excitation, charge multiplication and rapidly changing optical properties; for a recent review, see Balling and Schou (2013 *Reports on Progress in Physics* **76**, 036502). From an applied viewpoint, the ability to modify the bulk and surfaces of a dielectric opens up for diverse applications as refractive-index modifications, micro-fluidics, thin-film production etc. The present paper will account for recent efforts to obtain new insight into the material-excitation dynamics for dielectrics by comparing extensive experimental observations with advanced simulations.

The starting point for the theoretical description is the so-called multiple-rate-equation description of dielectric excitation originally proposed by Rethfeld (2004 *Phys. Rev. Lett.* **92**, 187401) and extended by us to include a self-consistent description of light-propagation effects, see Christensen and Balling (2009 *Phys. Rev. B* **79**, 155424). The experimental approach combines time-resolved reflectivity and spectral interferometry with ablation-depth measurements in order to achieve observables over a large intensity span in one comprehensive experiment, see Wædegaard *et al.* (2014 *Europhysics Letters* **105**, 47001) and (2014 *Appl. Phys. A* **117**, 7).