Micromachining with femtosecond laser in GHz-burst mode

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Abstract

Micromachining with femtosecond lasers operating in the GHz-burst regime has recently attracted increasing attention. Indeed, this temporal beam-shaping technique is a powerful tool for microprocessing of various materials. I will present our advances on drilling and cutting of dielectrics with an ultrafast laser source which can operate either in the MHz- or in the GHz-burst regime. A comparison of top-down percussion drilling in glasses with a Gaussian beam in both burst regimes will be given. The GHz-burst mode allows for obtaining crack-free holes with an outstanding surface quality of the inner walls and featuring an almost cylindrical shape without shifting the beam focus nor the sample. Moreover, combining temporal and spatial beam shaping allows for cutting of transparent dielectric materials with a Bessel beam. A comparison of the cutting results in both burst operation regimes will be shown illustrating the influence of the laser beam parameters on the machining quality of the cutting plane. In both regimes, dust- and chipping-free cutting has been achieved for glass samples of up to 1 mm thickness. However, the best cutting plane quality in terms of surface roughness is obtained in the GHz-burst regime.

Short biography:

Inka Manek-Hönninger obtained her Ph.D. in Physics from the University of Heidelberg, Germany, in 1999 and spent a year as post-doc at the University of Bordeaux 1, France. Moreover, she worked four years in German industry (Marquardt GmbH in Rietheim-Weilheim and JT Optical Engine GmbH + Co. KG in Jena). She is full professor at the Center for Intense Lasers and Applications (CELIA) at the University of Bordeaux in France where she leads the Short-pulse Lasers: Applications and Materials (SLAM) group. Her research focuses on ultrafast laser – matter interaction for micromachining and materials modification.