

Fast large-area multi-beam micro/nanostructuring at HiLASE

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Fabrication of functional surfaces drew a lot of attention in recent years since it allowed surfaces to attain innovative surface properties such as diffraction patterns for goods protection, friction reduction surfaces, superhydrophobicity, self-cleaning or anti-bacteria and many more. Optimal design of surface micro and nanostructures can add such functionality on common materials. Fabrication of functional surfaces by laser direct writing has been demonstrated many times. However, the main drawback of this method is the long processing time in a range of minutes per square centimetre. Therefore, upscaling the fabrication speed is necessary. In recent years, development of new high-power laser systems facilitated large area micromachining applications on macroscopic areas with high throughputs meeting industry requirements. In this work, we demonstrate the potential of HiLASE high-power ultrashort laser systems for rapid large-scale multi-beam processing utilizing state of the art multi-beam approaches including beam splitting with diffractive elements, a novel method of large-beam interference patterning with 2 and 4 beams and dynamic beam-shaping with special light modulator combined with galvo scanner.