# Near-THz bursts of pulses for laser micromachining applications

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Recent advances on ultra-short pulsed laser source development have attracted a lot of attention to the bursts of pulses, as high average powers and pulse energies have become available. Bursts of pulses have become a mean to achieve different laser-matter interaction regimes with a single laser source. Splitting a single pulse [1,2] or grouping consequent pulses together [3,4] results in different burst operation modes. Different approaches have shown similar results (i.e. significantly lower ablation threshold) albeit explained with different physical mechanisms, such as heat accumulation [4], incubation [5], or ablation-cooling [3].
Bursts of pulses at near-THz repetition rates (up to 440 GHz) were generated via series of birefringent crystals, similar to our previous work [6]. Experimental setup was designed to allow for versatility, with the femtosecond fiber laser source outputting different pulse durations at constantly high available pulse energies in combination with the multi-crystal setup for burst generation. We have compared the effect of single pulse to a near-THz burst of 2 - 64 pulses through a wide parameter window. Ablation efficiency was observed as a measure of the total throughput in addition to the resulting structure quality (surface roughness, melting and melt ejection). Different materials were investigated with both metallic and dielectric properties (copper, Kapton).

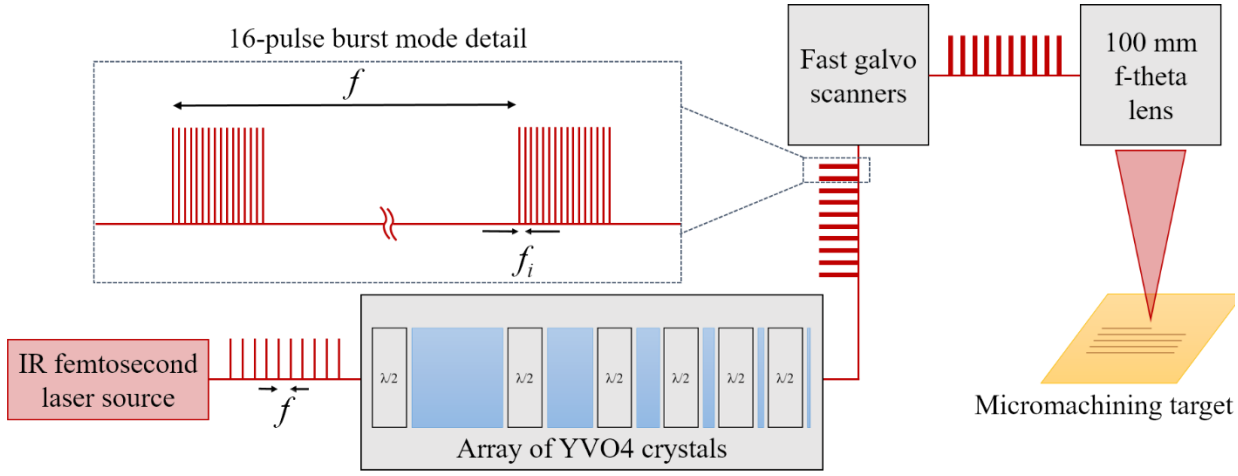


**Figure 1.** Captions in 8 point form. (a) The figure, as well as each axis coordinates and titles must be large enough to be easily read. (b) Figures should have appropriate resolution to ensure proper visibility.

Near-THz bursts of pulses enable an increase of overall energy delivered to the material and have a significant impact on overall laser-matter interaction during ablation processing. We have analysed the suitability of near-THz bursts of pulses for laser micromachining applications, taking into account different inter-burst repetition frequencies, pulse and burst durations, as well as the pulse energy and total burst energy delivered to the samples.

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