
Comparative study of infrared laser ablation of thin foils at a pulse duration of $\tau_p = 10$ picoseconds and $\tau_p = 30$ picoseconds

Bachelor / Semester / Master Thesis

Motivation

Current industrially-orientated picosecond laser systems operate at a pulse duration of $\tau_p = 10$ picoseconds. This pulse duration has been associated, with great emphasis, as exhibiting cold ablation characteristics allowing it to virtually process any material, i.e. there are no thermal influences on the workpiece during processing. Accordingly, the laser manufacturing company Onefive GmbH has recently introduced the Katana series of picosecond laser systems which operates at a pulse duration of $\tau_p = 30$ picoseconds. The objective is to determine if there is a difference between the two pulse durations when processing thin metallic foils (thickness = 30-80 μm). Factors such as waviness, oxidation, roughness, heat affected zone and ablation rate are a few of the main indicators commonly used for comparative evaluations.



Fig. 1: Onefive Katana series picosecond laser system

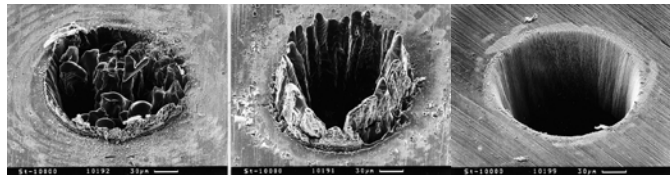


Fig. 2: Laser ablation of holes in 100 μm thick steel foil when $\tau_p =$ nanosecond (L), picosecond (M) and femtosecond (R)

Task

- Literature review of ultrashort pulses
- Develop a design of experiments to compare pulse durations
- Evaluation and optimisation of experiments on stainless steel and brazing foils
- Documentation

Peripherals

The project offers insight into hands-on experimentation, measurement evaluation and new laser technologies. A picosecond laser, scanheads and optical components are available in our laser micromachining lab at Technopark Zurich. Assistance from the company Onefive GmbH will also be provided. An ideal candidate may have interest in experimentation and laser technology. Previous knowledge in one or more of the above mentioned fields is preferred, but not mandatory. Time to become familiar with the topic will be given. Documentation may be in English or German. Teamwork available.

Start

FS 2012 or upon agreement

Contact

Gregory Eberle
Claus Dold
Josef Stirnimann

PFA H43
PFA H43
CLA G7

044 633 79 47
044 633 79 56
044 632 3173

eberle@iwf.mavt.ethz.ch

dold@inspire.ethz.ch

stirnimann@inspire.ethz.ch