# Investigation of laser-material interaction in high-power laser processing

## General Information

Project type:    Master thesis, internship or combined

Lab/Group:    Intelligent manufacturing group (LAMP, www.empa.ch/web/s204)

Supervisor:    Dr. Roland Richter

Location:    EMPA, Feuerwerkerstrasse 39, 3603 Thun

Starting date:    ASAP

Duration:    6 months

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## Project description:

At the Laboratory for Advanced Materials Processing (LAMP) we are investigating beam-based metal manufacturing methods, combining fundamental process studies with in-situ monitoring and control.

This project will focus on high-power laser–material interactions, where current numerical methods for predicting the process dynamics are investigated, and further developed. The numerical predictions are compared with experimental data to improve the models and in parallel advance the understanding of the process.

We welcome motivated students from Materials Science, Mechanical Engineering, Computational Science, Physics, or related fields. The thesis offers hands-on experience in designing, implementing, and validating multi-physics simulations with real-world validation while contributing to cutting-edge research.

## Tasks:

- Literature research
- Improvement/development of laser-material interaction model
- Comparison and validation of developed models with processed samples

## Relevant skills:

- Proficiency in programming for multi-physics simulations (e.g. Python/Matlab/C++ or similar) or e.g. OpenFOAM
- Data processing
- (Optional) Basic understanding of laser-material interaction