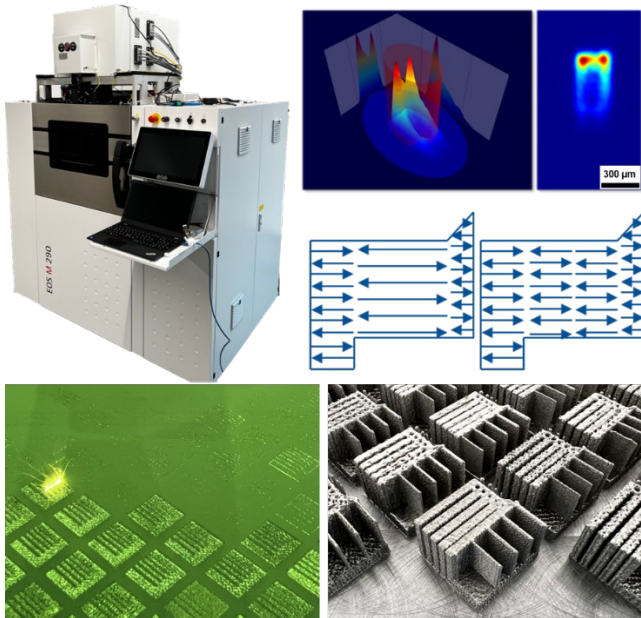


Simulation-Based Determination of Surface Waviness in Powder Bed Fusion of Metals (PBF-LB/M)

Initial Situation

At the Professorship of Laser-based Additive Manufacturing, we conduct research on innovative process strategies, methods, and systems in the field of metal additive manufacturing. Our focus lies on the process Laser-based Powder Bed Fusion of Metals (PBF-LB/M), in which thin layers of metal powder are selectively melted by a laser, building up parts layer by layer. Different laser beam shapes and their influence on key process characteristics are investigated. A key quality characteristic is the surface waviness, which strongly depends on beam shape and path planning.



Objective and Scope of the Thesis

The objective of this thesis is to investigate to what extent waviness can be predicted from metrics of a thermal simulation. For this purpose, a methodology for classifying waviness is developed and correlated with the simulation metrics based on own experiments.

The thesis comprises the following work packages:

1. Literature review on formation, measurement and assessment of waviness in PBF-LB/M
2. Development of a classification methodology (profilometer and microscope data)
3. Configuration of the simulation and derivation of metrics (e.g. remelting ratio)
4. Design and execution of experiments with different beam shapes
5. Evaluation of the experiments and correlation with the simulation metrics
6. Documentation of the results

Candidate Profile

- Initiative and creativity
- Analytical thinking and structured work
- Strong interest in additive manufacturing
- Programming skills (e.g. Python) beneficial
- Enthusiasm for teamwork

Application and Contact

Please send a short motivation letter and your current transcript to the contact below.

- Bachelor's Thesis, Semester Thesis or Master's Thesis (6 months), in English or German
- Part of a student team of 3-4 members – independent thesis with regular exchange within the team
- Application by October 21, 2026
- Feedback by October 26, 2026
- Interviews October 26–30, 2026
- Start from November 1, 2026

Richard Off, M.Sc. | richard.off@tum.de