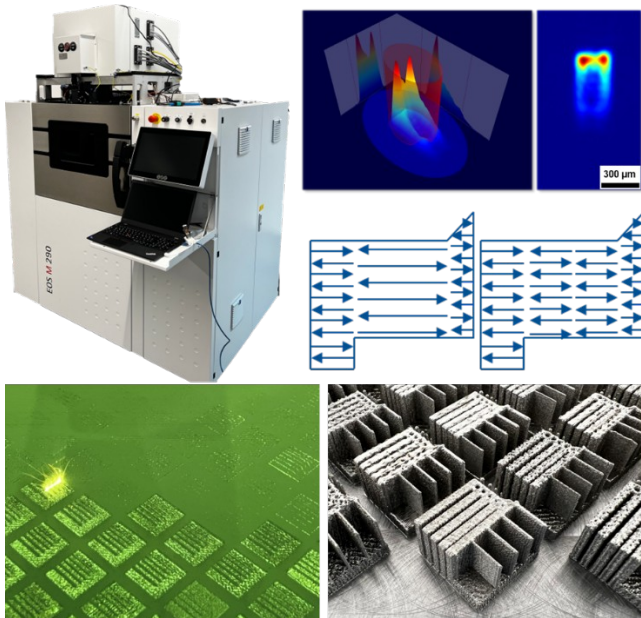


Evaluation of Constraints for Scan Vector Re-Ordering in Powder Bed Fusion of Metals (PBF-LB/M)

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. Re-ordering the scan vectors is a promising lever to control the thermal budget, but in practice it is limited by constraints such as powder denudation or humping.



Objective and Scope of the Thesis

The objective of this thesis is to experimentally investigate and classify the constraints for re-ordering scan vectors. For this purpose, the vector timing of the machine is determined, denudation at vector starts is quantified for

different beam shapes and maximum dwell times are identified.

The thesis comprises the following work packages:

1. Literature review on path planning, powder denudation and humping
2. Measurement of scan, jump and skywriting times and calculation of vector timing
3. Experiments on denudation at vector starts for different beam shapes
4. Determination of maximum dwell times between scan vectors
5. Evaluation and classification of the constraints
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

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