

Melt Pool Monitoring (MPM)

Melt Pool Monitoring (MPM) is an on-axis tool for visualizing the melt pool in the SLM process. The system records the thermal radiation produced from the melt during the entire production process. The thermal radiation is determined on-axis by photodiodes directly on the optical beam path.

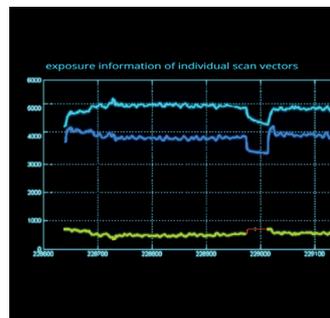
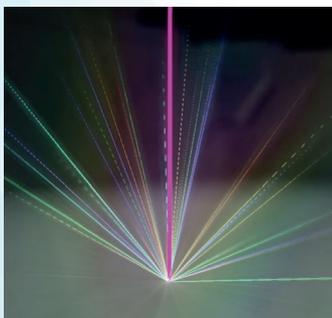
Data from MPM can be used as a resource for efficiently developing and evaluating the process parameters. It also provides important insights about **optimizing the process parameters** of individual component parts. In the production of safety-critical parts, the data collected serves as documentation for **quality assurance in the production process**. The recorded data enables conclusions to be drawn regarding irregularities during fusion, which can lead to anomalies in the components.

The **measurements** are taken with a **measurement task of up to 10 μ s (100 kHz)**. The measurement data is recorded **in real time** and saved layer by layer, and is immediately available for analysis. Further data processing features for future software versions are currently under development.

For multi-laser machines, each beam path is equipped with its own measuring system. This solution can be upgraded in existing SLM machines by remodeling the optical system.

The thermal radiation emitted from the interaction zone is reflected by the beam entry glass, through the X/Y scan system and into the MPM module via a beam splitter. The thermal radiation produced during the melt is recorded in two different wavelength ranges by **a dual photodiode array**. The electrical current measured by the photodiodes is converted into an electrical voltage in an electronics unit.

Using FPGA (Free Programmable Gate Array), the incoming **measurement data is processed in real time at up to 100 kHz**, synchronized with the X/Y position data for the exposed vectors and displayed instantly **in a live mode** in the software.



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