



Initial Algorithm Selection, infrastructure and hardware analysis

In the FLASH-IANUS platform, the machine learning algorithm will be key in optimising processing regimes by predicting the best-fitted combination of parameters to produce high-quality outcomes. The selected algorithm will be trained and will rely on a range of material property data, machine laser type, and the environmental footprint of the laser processes to replace time-consuming trial-and methods with data-driven insights to improve production efficiency, reduce operational costs and environmental impact.

Algorithm implementation models and selection

COS has focused on two main modelling strategies to determine how to best train and implement the algorithm: Forward Modelling (with optimisation) and Inverse Modelling. All initial screenings and tests were run with dummy data, which is removed from the models' real-world applications but can still be utilised to show apparent patterns and aid in constructing the characteristics of each algorithm option, preparing the test versions for historical data trials.

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Assembly and Testing of the unit as a module

The optical system has now entered a critical phase of integration and testing. At its core are three lasers, combined and routed via a fibre switch to three independent beam delivery heads. This setup is further enhanced with integrated acoustic and optical sensors, enabling real-time monitoring of the laser process. Each of these technologies presents challenges individually, but this ambitious project brings them together in a single machine.

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