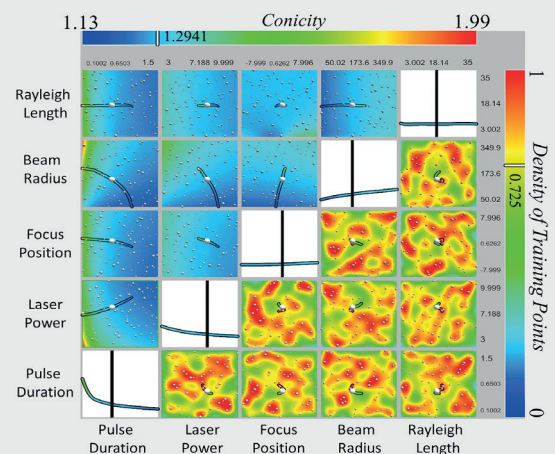


1



2

## INTERACTIVE SIMULATION OF DRILLING WITH LASER RADIATION

### Task

Given the ever increasing market requirements and thus complex processes caused by them, simulation is noticeably becoming an indispensable tool for process design and process optimization. This is especially true for laser manufacturing processes. However, usually only a small part of the parameter range can be investigated with current simulation tools because computing capabilities are still limited. In addition, process simulation has not yet been completely integrated into the everyday industrial environment. For example, an interactive and useful process simulation is still not available to assist the machine operator.

### Method

Based on reduced models, Fraunhofer ILT has developed »fast« process simulations, which make it possible to study much larger areas of the parameter range. Using the thus generated »dense« simulation data (so-called training data), the institute has created »process maps« (so-called meta-models), which allow, on the one hand, intuitive visualization of parameter dependencies and, on the other, which support

the development of process optimization. Both the meta-models and the »fast« simulations allow operators to use them interactively and are designed specifically for use on the customer PC/laptop or smart devices.

### Result

As an application example, a reduced model has been developed for the final ablation contour during drilling with long pulsed laser radiation. This model has been implemented in a usable interactive simulation tool (AsymptoticDrill, see Figure 1). Moreover, on the basis of AsymptoticDrill, a meta-model has been developed (Figure 2). Fraunhofer ILT offers both simulation tools as licensed software.

### Applications

Both the methodology of the reduced modeling (controlled reduction of model complexity) as well as the techniques of meta-modeling are applicable to all areas of modeling and thus to all processes (not only in the field of laser technology).

### Contacts

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- 1 *AsymptoticDrill: Interactive simulation tool for final ablation contour when drilling with long pulsed laser radiation.*
- 2 *Meta-model based on »AsymptoticDrill«.*