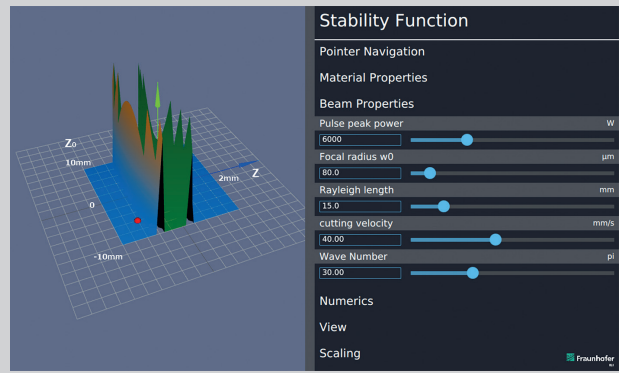


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## SIMULATION TOOLS FOR THE USAGE IN INDUSTRIAL EVERYDAY TASKS

### Task

In the face of ever-increasing market demands and the associated increasingly complex processes, process simulations have become an indispensable tool for industrial process design and process optimization. This applies in particular to laser processing methods. Due to excessive calculation times, however, only a small part of the parameter range can usually be examined with currently available simulation tools. For this reason, integration of process simulations into everyday industrial life, such as digital support at the manufacturing level, is not yet in sight. The task in the development of future simulation tools is thus to enable in particular the non-simulation expert easy use and at the same time to ensure a profitable use in everyday industrial life due to low calculation times and resource requirements.

### Method

Based on model reduction approaches, the Fraunhofer ILT has developed »fast« process simulations, which allow to study much larger areas of the parameter space on economically reasonable time scales. In order to make the most intuitive use possible, the simulation tools are equipped with a graphical user interface (GUI). The values of individual process parameters can be set using sliders, while the simulation result is displayed online in an adjacent window.

### Results

The first applications that have been developed are reduced models for drilling metallic materials with long pulsed laser radiation and for describing the stability properties of the melt film and the associated ripple formation during fusion cutting. The models were implemented in the real-time simulation apps »AsymptoticDRILL« (Figure 1) and »StabCUT« (Figure 2). The apps can be executed on both classic end devices and smart devices such as tablets or smartphones, and are offered as licensed software by the Fraunhofer ILT.

### Applications

The methodology of reduced modeling is applicable to all processes. Future fields of application include drilling with ultrashort pulsed laser radiation or additive manufacturing.

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- 3 GUI of AsymptoticDRILL. Slider for parameter adjustment (ri.), simulated hole shape (le.).
- 2 GUI of StabCUT. Slider for parameter adjustment (ri.), stability of the melt film over the cutting depth and the focal position (le.).