



## BEAM GUIDANCE SYSTEM FOR HIGH-POWER ULTRA-SHORT-PULSE LASERS IN THE CAPS USER FACILITY

### Task

In the Fraunhofer Cluster of Excellence Advanced Photon Sources CAPS, researchers are investigating applications that require an economical use of ultrashort laser pulses (UKP) with a high peak power and at the same time a high average power. Such laser systems can be used in material processing and for the generation of coherent radiation in the XUV range. In the CAPS User Facility, the laser radiation is to be switched and routed from two laser sources to three user laboratories. For reasons of laser safety and to protect the optical systems at extreme laser powers, this is only possible in a sealed beam path. Both heating and ablation processes from scattered radiation must be suppressed as far as possible.

### Method

The CAPS User Facility provides users with a commercially available 1 kW ultrashort-pulse (UKP) source and an experimental UKP source with up to 10 kW average power at pulse powers up to several 100 GW. The beam distribution system currently directs laser radiation from these sources to two user laboratories. Both on the beam source side and on the user side, changes can be made at short notice within the scope of the experimental task. Moving mirrors can be used to switch between the beam sources on the input side

and the exit port on the user side. The beam guidance takes place inside a sealed mirror system, which ensures that the laser operates safely and the beam quality is not disturbed by air fluctuations. To prevent ablations caused by stray light, an inner lining made of glass is used, which is surrounded by an outer metal encasing. Since the laser radiation has to cross escape routes, the corresponding parts of the encasing can be detached; if the encasing system is opened, the beam source is automatically switched off.

### Results

In the CAPS User Facilities, UKP processes can be evaluated with two different beam sources. The facility makes available average powers in the kW range and a maximum pulse energy of about 10 mJ.

### Applications

The developed beam distribution system can be used wherever a switchable beam routing between separated beam sources and applications is required or desired.

### Contact

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2 *Partially opened pipework of the beam guide.*