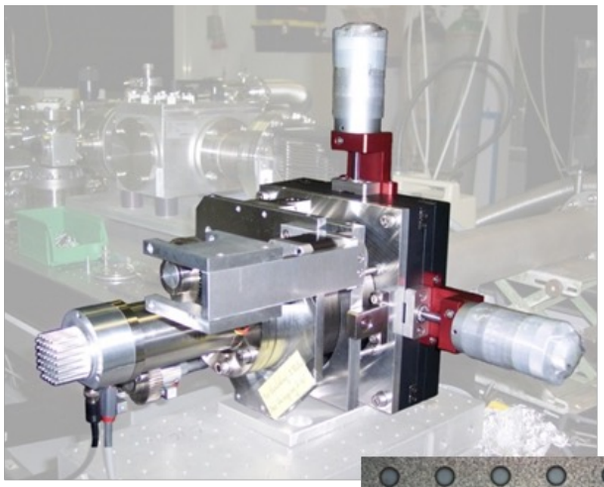
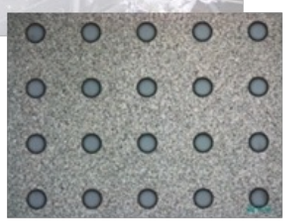
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EUV/X-ray Wavefront Sensor

Features

- Hartmann wavefront sensor for coherent and incoherent radiation
- Compact and self-supporting
- Achromatic
- Actinic characterization of: EUVL plasma sources, Free Electron Lasers, HHG beams
- Real-time optics adjustment
- Single-pulse repeatability λ/116 (wrms) for EUV (λ =13.5 nm)

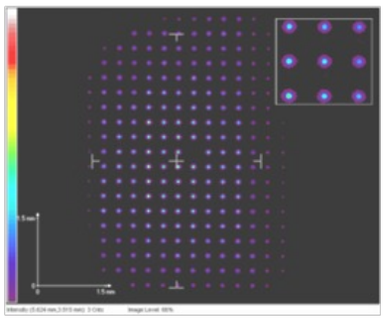




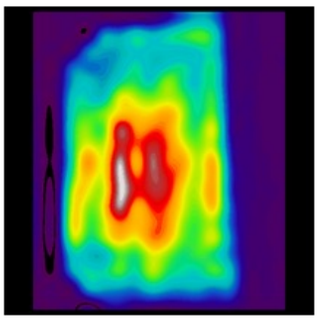
▶ Hartmann plate (pinhole array)

Specifications

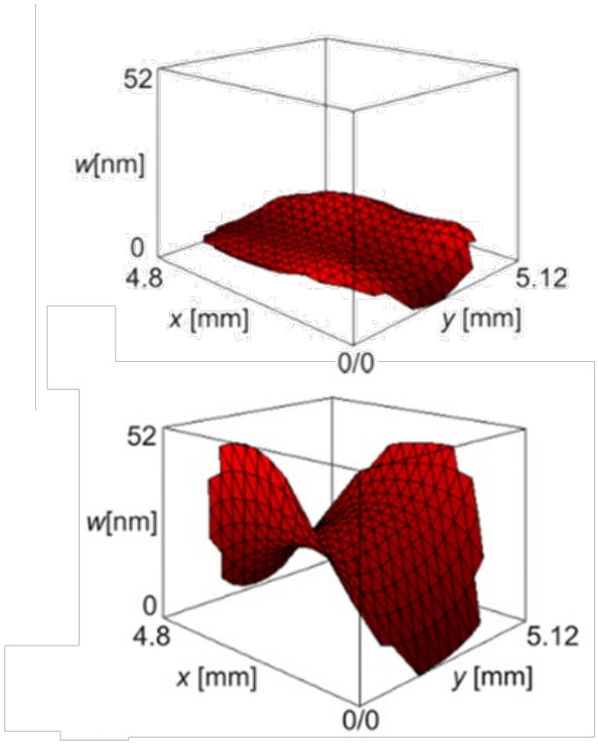
▶ Wavelength range	< 1 nm ... 60 nm (quantum converter)
▶ Field of view 9.0mm x 6.7 mm	(larger on request)
▶ Dynamic range	14 bit
▶ Hartmann plate	precision pinholes Ø75µm, 250µm pitch
▶ Tilt range	±10°
▶ x/y translation range	±10mm
▶ UHV compatible, mounted on CF63 flange	



▲ Spot pattern @ λ=1.5 nm (LCLS / Stanford)



▲ Reconstructed intensity profile



Wavefront measurement of Free Electron Laser FLASH (DESY/Hamburg) at λ=13.5nm, before (above) and after (below) adjustment of beam line optics (B. Flöter, K. Mann, K. Tiedtke et al. NIM A 635, S108–S112 (2011))

DESY

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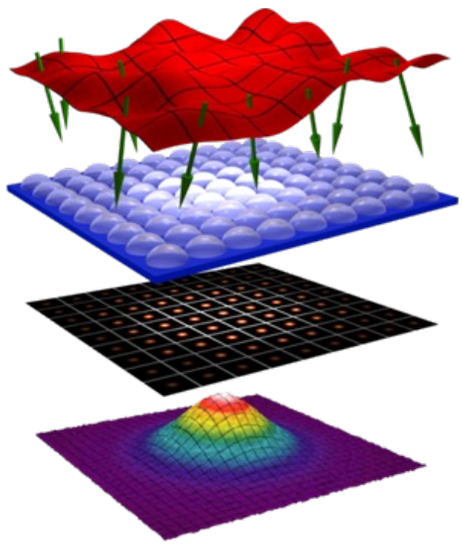
Hartmann-Shack Wavefront Sensor

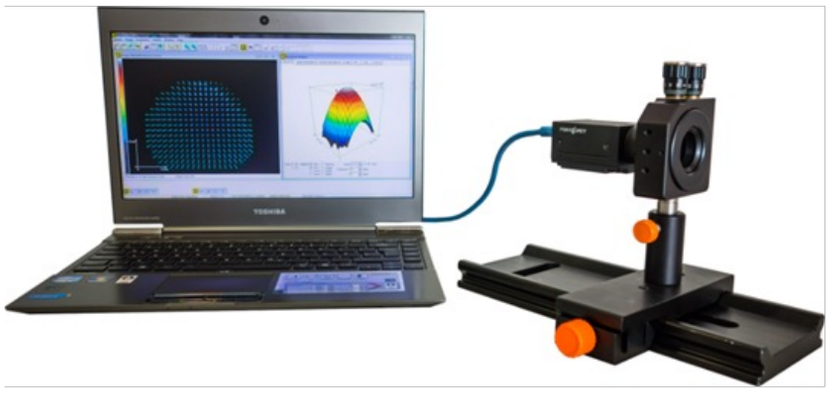
The Hartmann-Shack wavefront sensor was especially designed for comprehensive laser beam characterization. It accomplishes prediction of the propagation behavior of laser radiation as well as M^2 determination for coherent sources in real-time: From the simultaneously registered intensity and phase distribution beam profiles can be computed for any location along the beam path, especially the focal plane, by Fresnel-Kirchhoff integration. The propagated profiles show an excellent agreement with directly measured camera data. This is of particular interest in case of very small foci and for fluctuating sources.

Operation principle

The system uses a micro-lens array for dividing the incoming wave into a large number of sub-rays (cf. figure right). Intensity and position of the individual foci are monitored with a camera, enabling the reconstruction of both beam profile and wavefront from a single measurement.

These data accomplish real-time evaluation of beam propagation parameters (beam width, divergence, M^2) which is especially important for pulsed or fluctuating lasers.

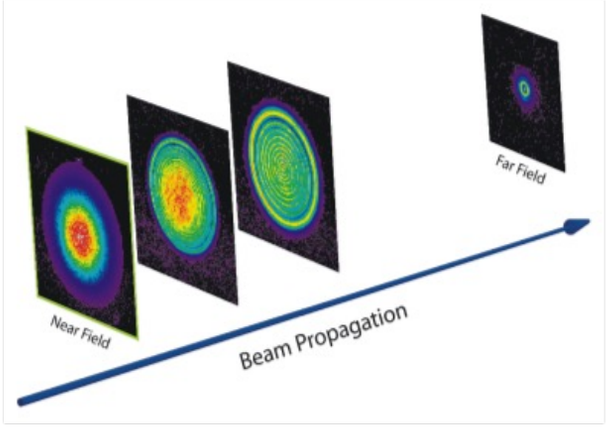




- Beam propagation (NIR ... EUV)
- ISO beam parameters
- M^2 in real-time
- Focus monitor
- Optics testing / Zernike analysis
- Adaptive optics

Features

- All beam parameters from single measurement
- Wide spectral range: 1100 - 1 nm
- Dynamic range: up to 100 λ (@633 nm)
- Sensitivity (optics testing): < 100 pm
- Various micro-lenses and cameras (12 bit - 16 bit)
- USB 3.0 or GigE (ideal for laptop)
- Customized solutions



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