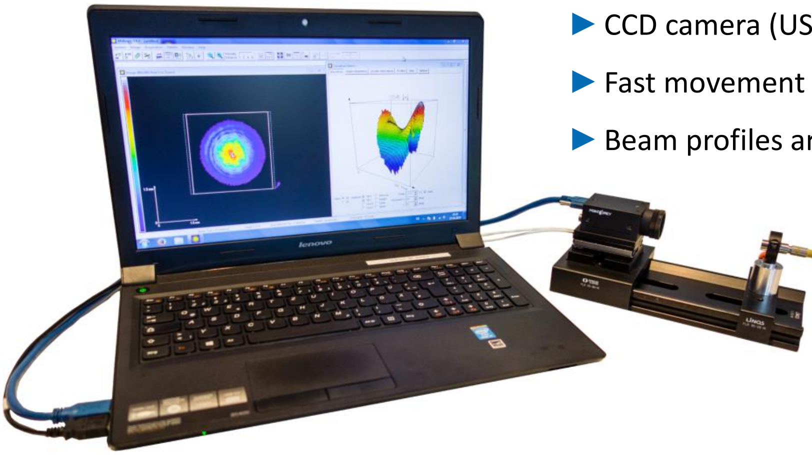
Wavefront Curvature Sensor

Laser-Laboratorium Göttingen e.V.



- CCD camera (USB3) mounted on a piezo driven stage
- Fast movement in beam direction
- Beam profiles are acquired at neighbouring positions
- Wavefront is derived at pixel resolution of CCD
- Beam propagation parameters (M^2, Rayleigh length, waist diameter)
- Aberration control by Zernike analysis
- Online monitoring possible

Principle of operation

Intensity profiles

$I_1(x,y)$ and $I_2(x,y)$

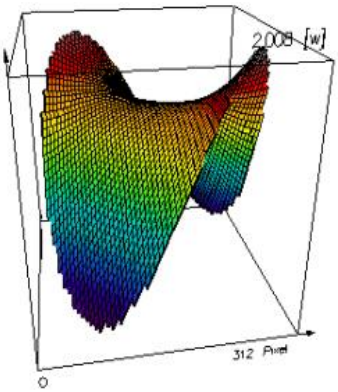
↓

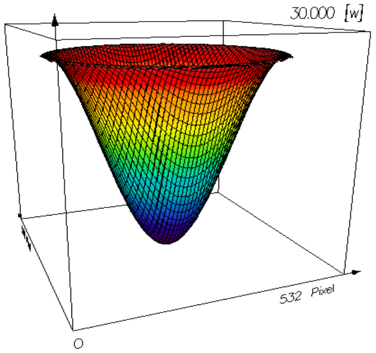
Transport of intensity equation

$$-\partial_z I = \nabla I \cdot \nabla w + I \Delta w$$

↓

Wavefront $w(x,y)$





Specifications

- CCD camera with USB3.0 interface
- Spatial resolution < 10 µm
- Various sensors covering spectral range from 1100nm (NIR) to 1nm (soft x-rays)
- Real-time wavefront analysis
- Supported by software MrBeam (ISO standards)

Features

- Wavefront diagnostics at CCD pixel resolution
- Self-referencing method
- No beam coherence required
- Compact design

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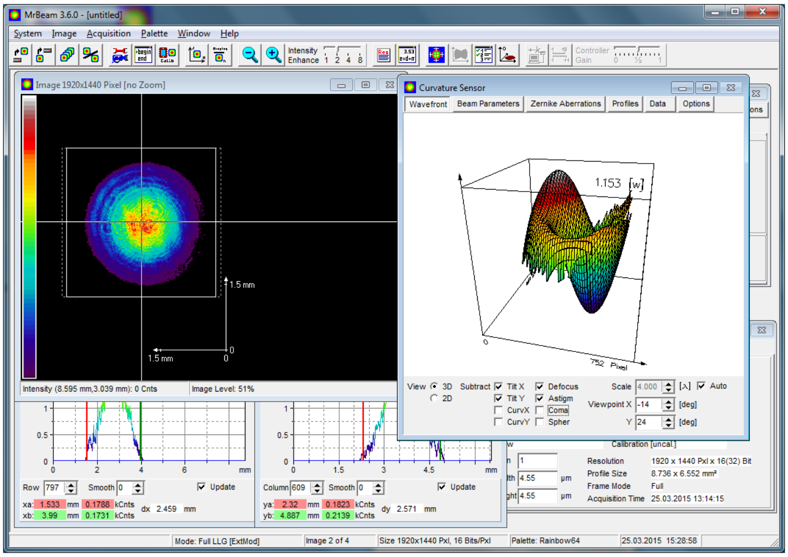
Principle of operation

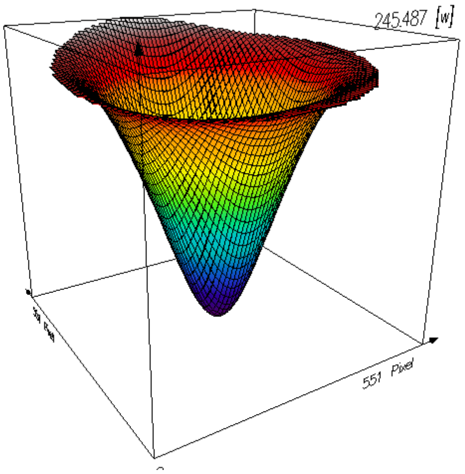
By recording two beam profiles at neighbouring z-positions simultaneously, it is possible to reconstruct the wavefront from the solution of the transport of intensity equation. In contrast to the Hartmann-Shack wavefront sensor, the technique does not require a micro-lens array or pin-hole plate in front of the monitoring camera. Thus, a much higher spatial resolution comparable to interferometers is achieved. In additon, the sensor does not require an external reference wavefront. From wavefront and beam profiles the beam propagation parameters are computed according to ISO standards.



- → **Beam Characterization**
- → **Optics Test (NIR - EUV)**
- → **Surface Topography**

Applications

- Comprehensive beam characterization, in particular at small beam diameters
- Surface topography
- Optics testing
- Absortion control
  ↔ thermal lens effect



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