nortus Systronic GmbH

MEMBER OF EPIC
EUROPEAN PHOTONICS INDUSTRY CONSORTIUM

D7 Interferometer a Milestone in Optical Metrology

EPIC Members
New Product Release April 2024

Juergen Kreis
Partner

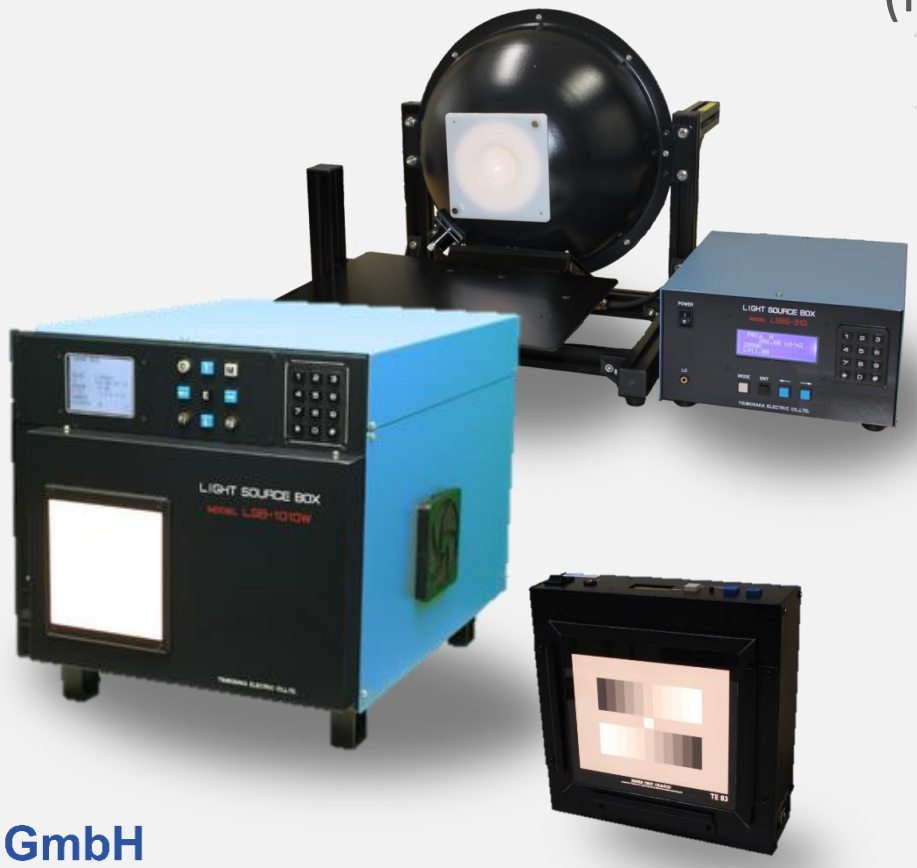
nortus Systronic – Our Mission

Together with our sister company, nortus-Optronic, we aim to identify technological truffels

nortus-Systronic – Some of our Solutions

Handheld Spectrometer

Calibration Sources, Ulbricht spheres, …



Test systems (here: ToF/LIDAR)

Bi-telecentric lenses

nortus Systronic GmbH

Your expert partner in advanced system solutions

Introducing the D7 Interferometer

PSPDI Technology

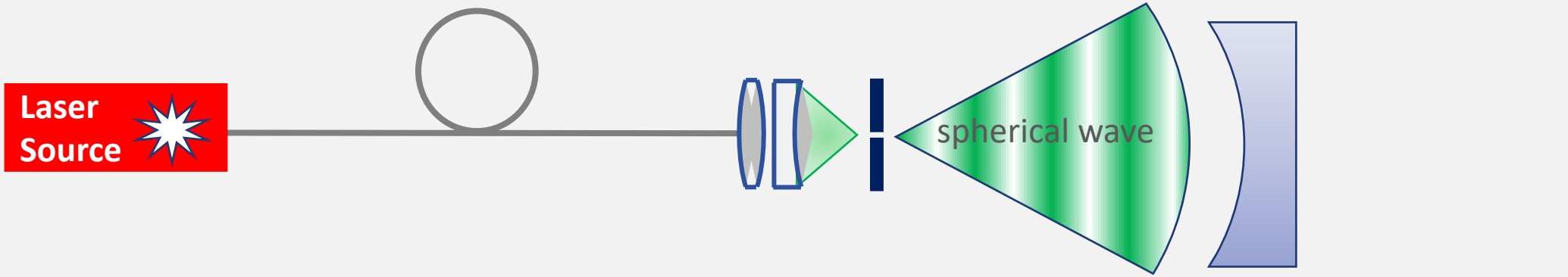
PSPDI: Phase Shifting Common Path Point Diffraction Interferometer

innovative interferometer principle for measuring and testing optical surfaces

Working Principle:

Two wavefronts are generated by pinhole diffraction
→ coherent beam paths: test wavefront + reference wavefront

WORKING PRINCIPLE OF THE D7:
PHASE SHIFTING COMMON PATH POINT DIFFRACTION INTERFEROMETRY (PSPDI)



DuT
here: concave surface

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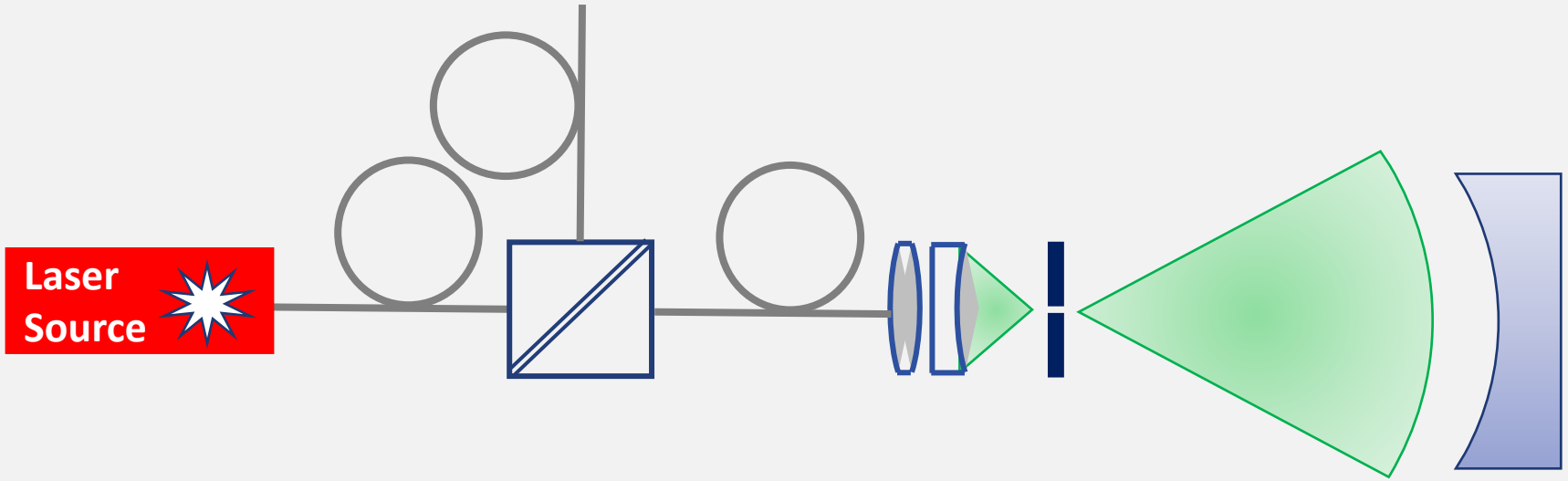

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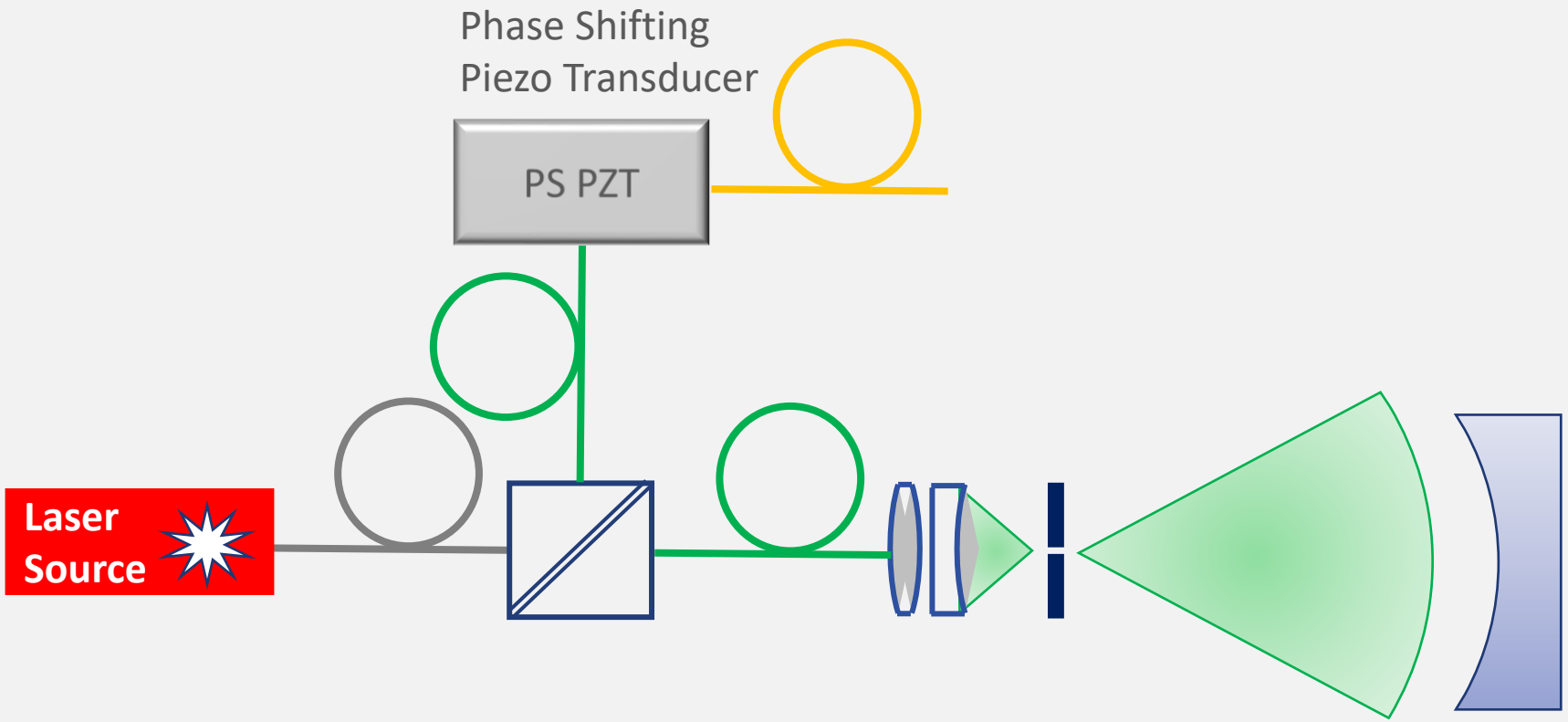

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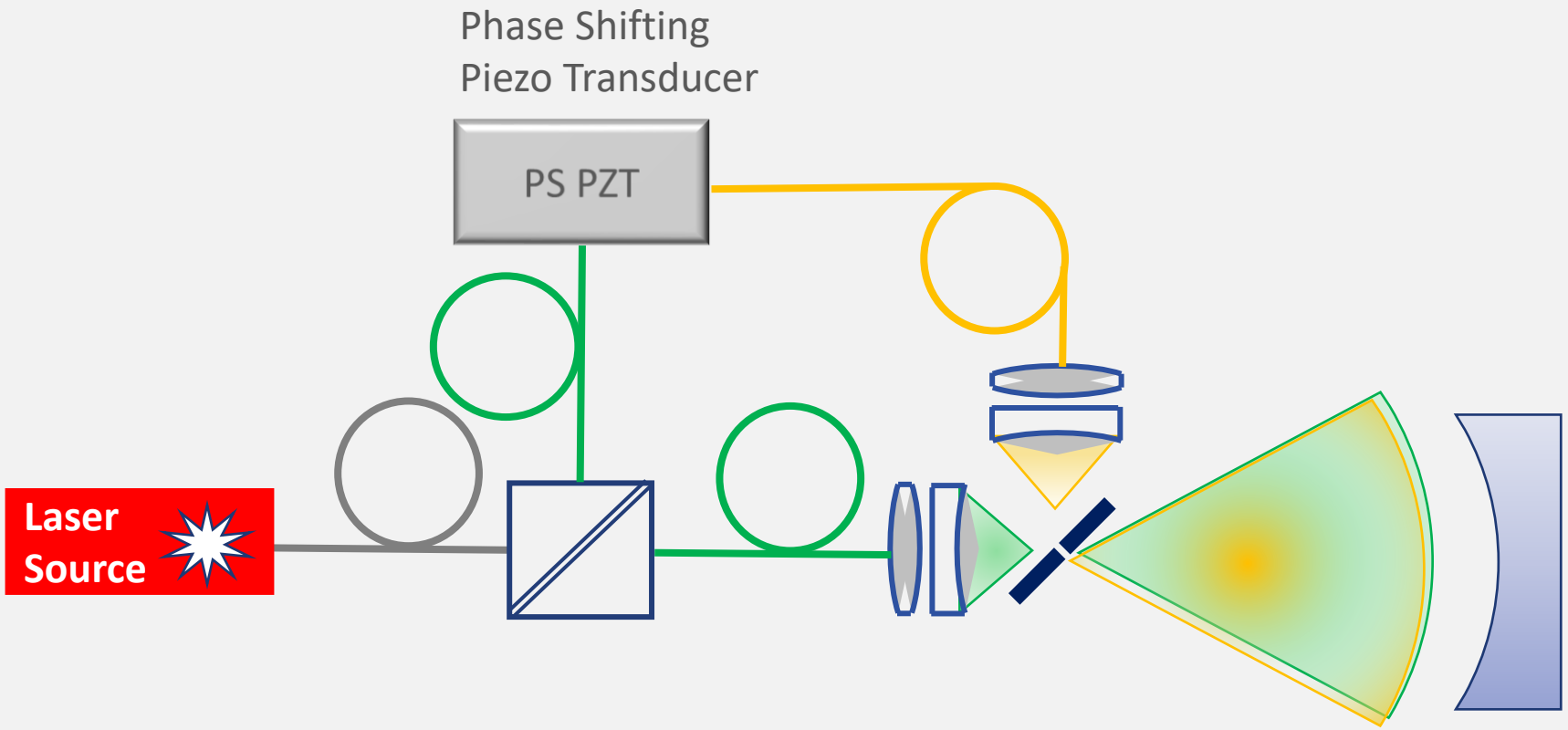

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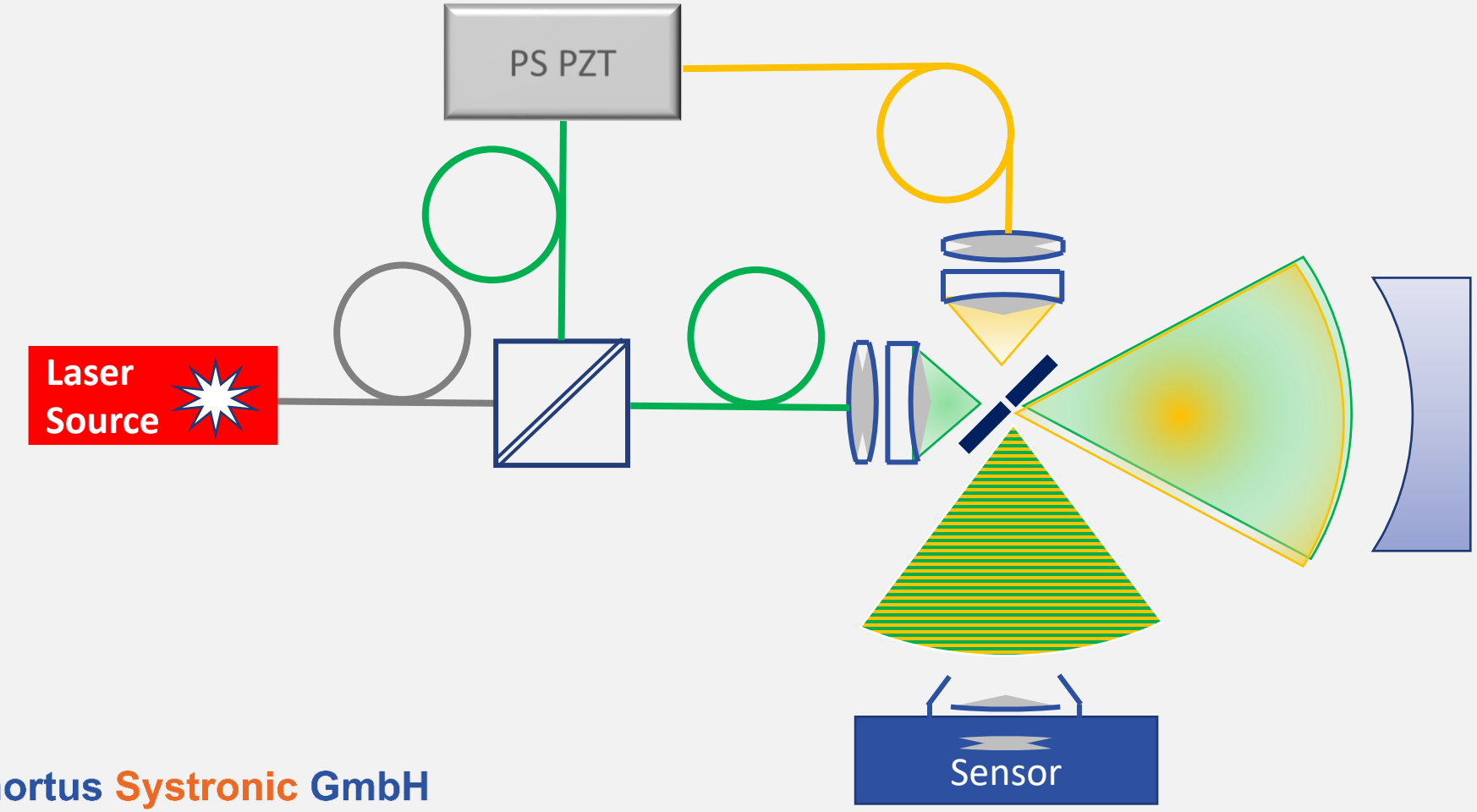


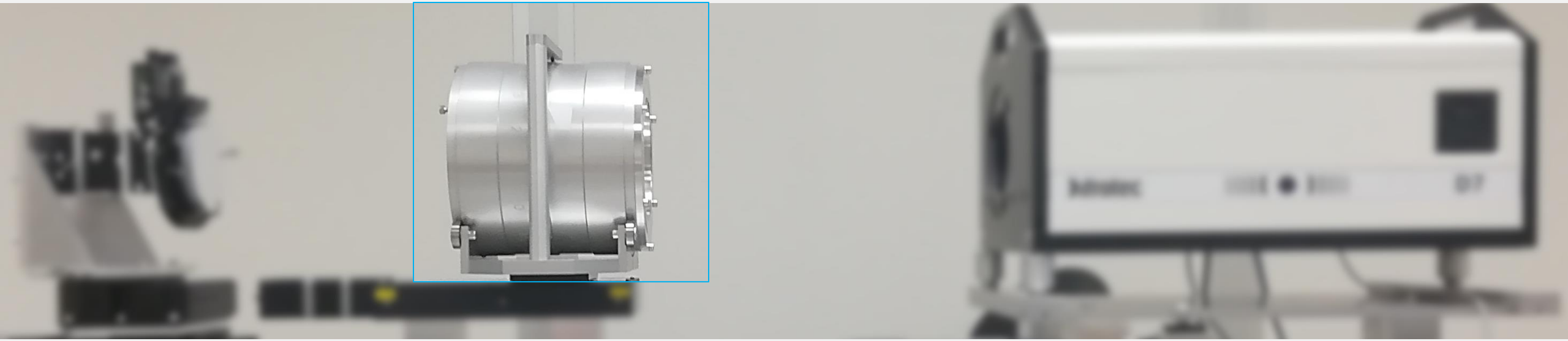
Basic Setup

- Compact Design
- for concave test objects
  no additional optical components nececcary
- Min f# 0.9 / NA 0,55
- Min CC radius 45 mm
- Max CC radius → … ∞

Using flat or convex test objects

For CX / Flats, the optional DA1 optical collimator between the test surface and the pinhole:

No influence on the reference wavefront, easy compensation of the properties of this optical subsystem



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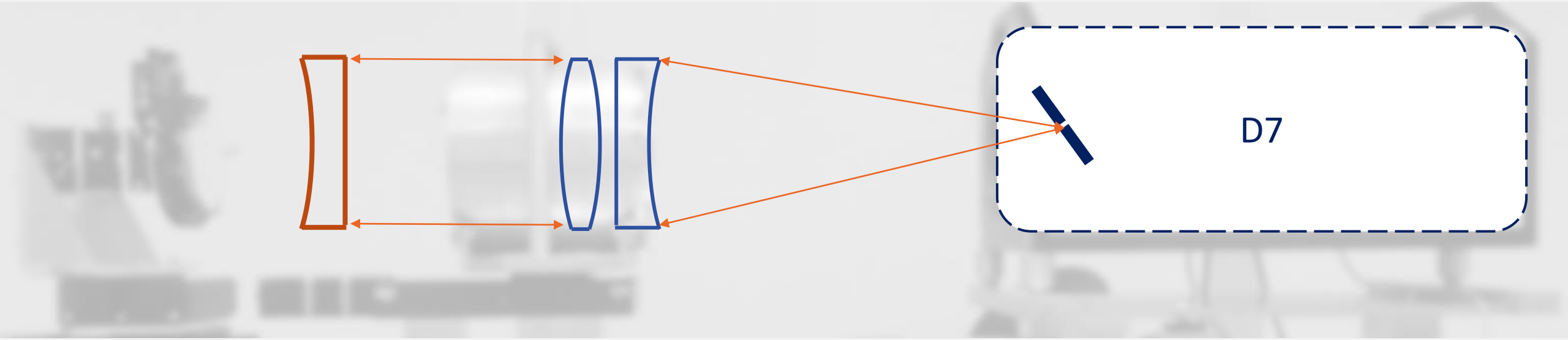

with DA1 (subsystem)
suitable for flats up to 220mm diameter

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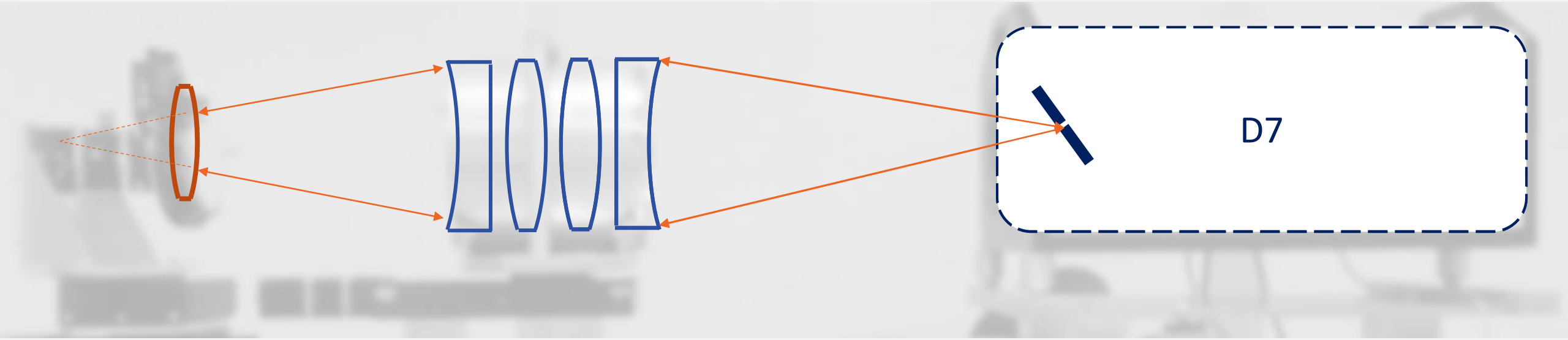
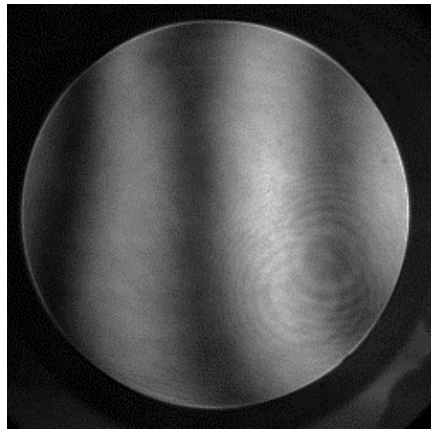


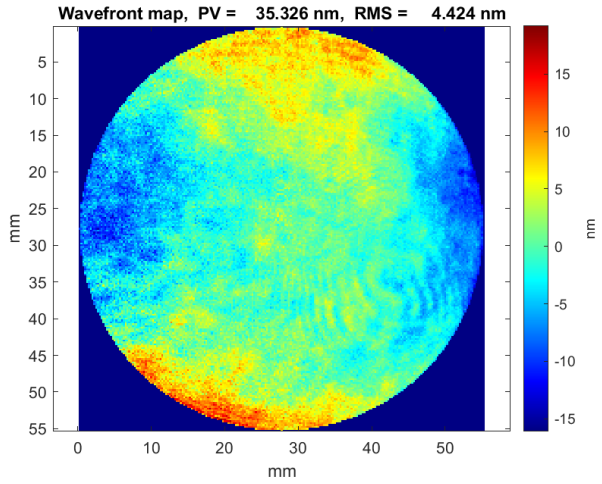
with DA1 (subsystem)

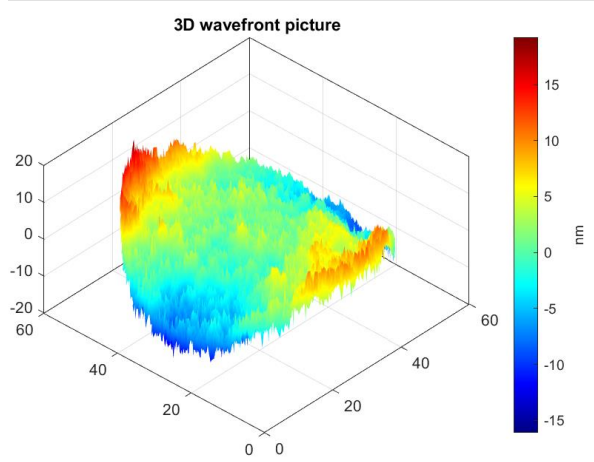
Max Diameter 210 mm, Max Radius 700 mm

Example: Measurement using different wavelengths

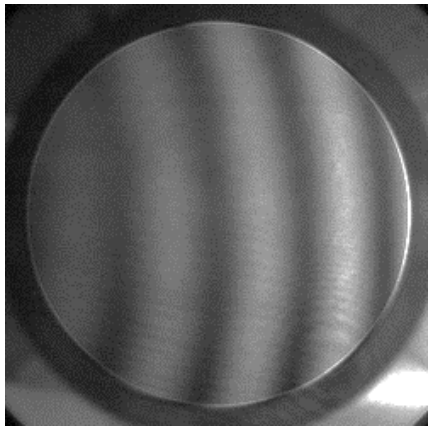
Green Laser
λ = 532 nm

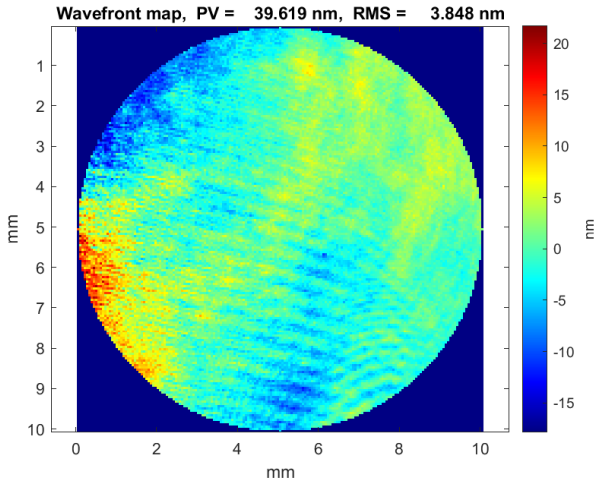


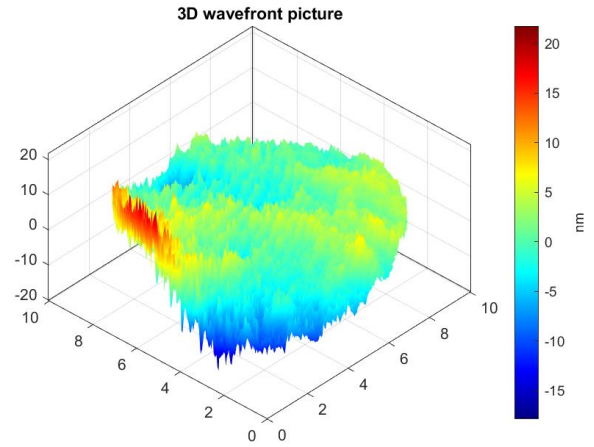




Red laser
λ = 633 nm
(Note:
DuT twisted by 45°)

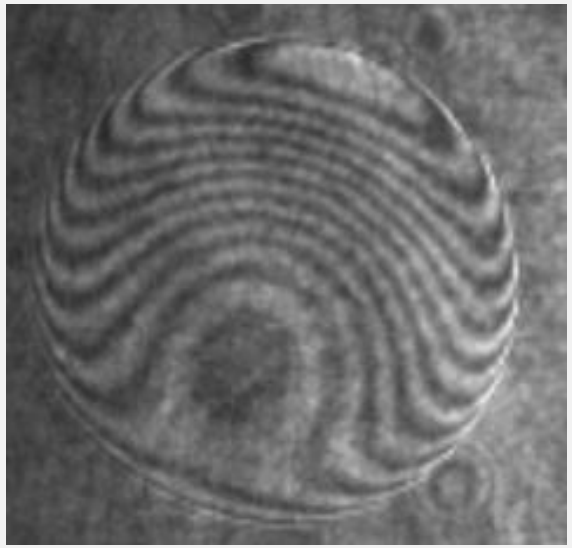




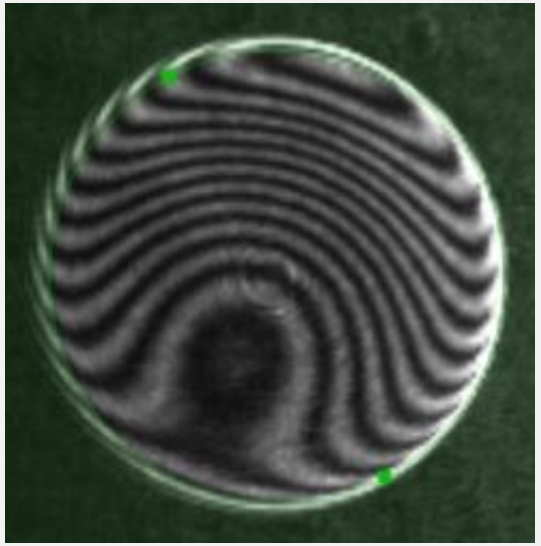


Example: Measurement of optical lens systems

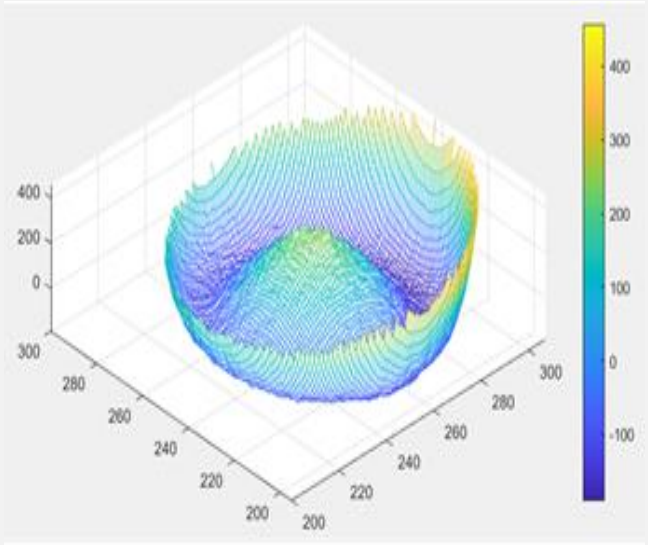
AR-coated surface with low reflection < 0.5%
located in the mounted lens and is measured by lenses placed between the interferometer and the surface to be tested.



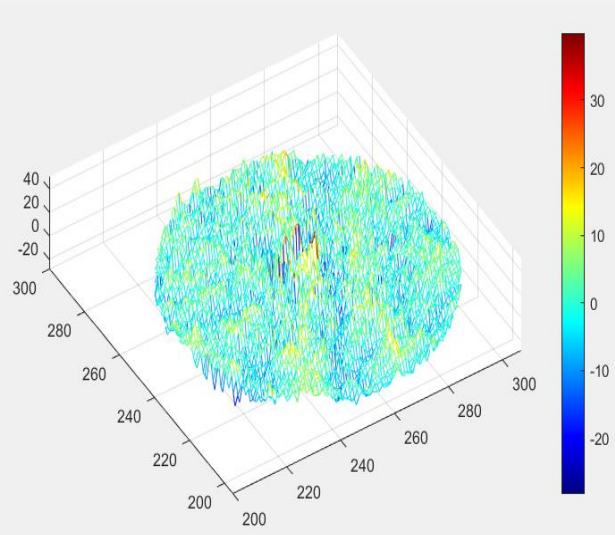
low contrast



with D7



Result: Surface shape

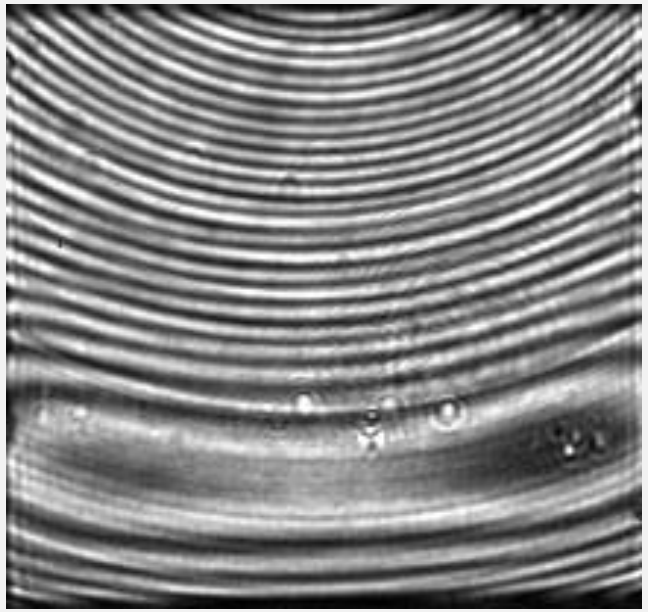


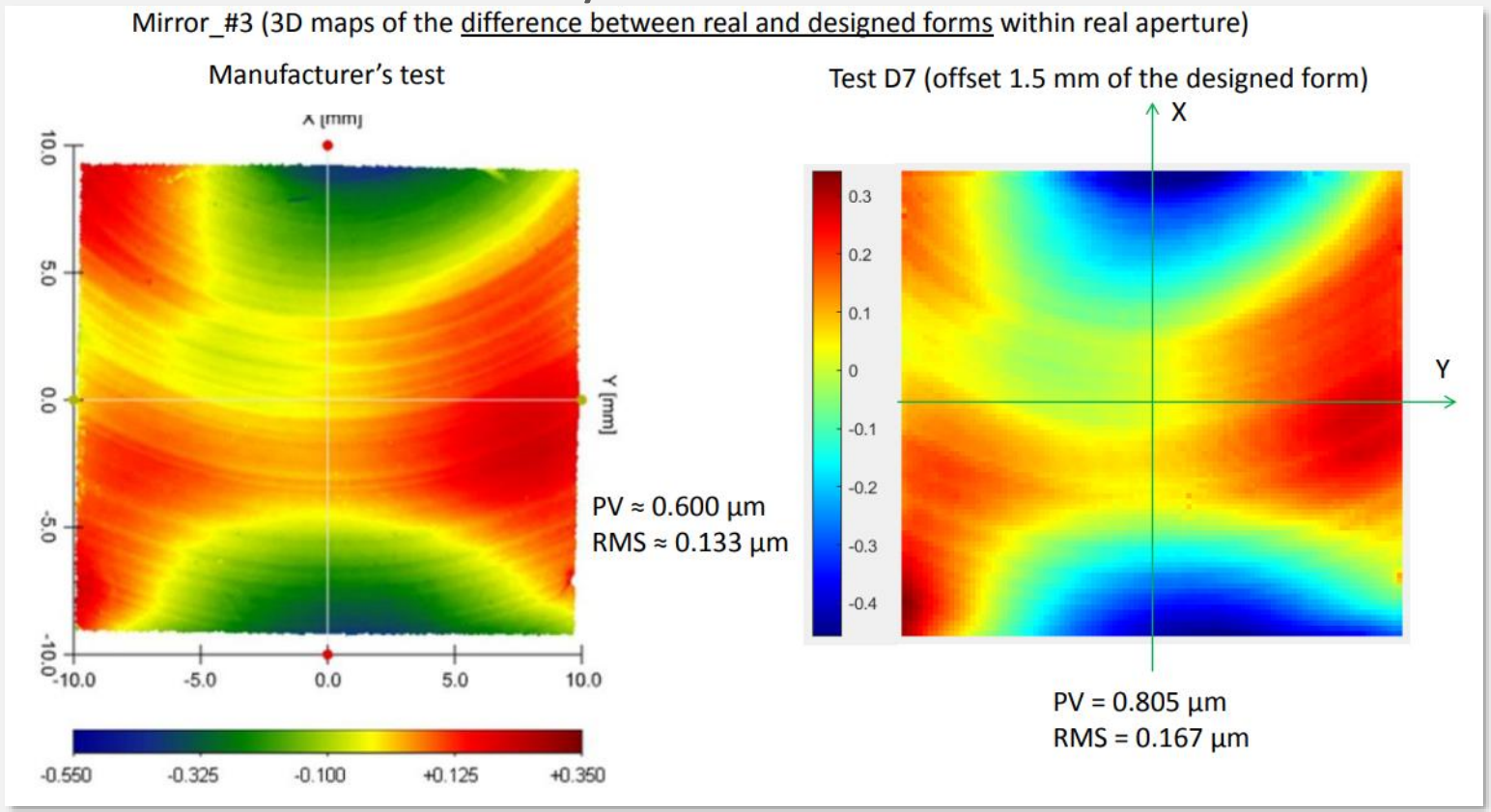
Medium Frequency Features of the Surface

Example: Measurement of an asymmetrical aspherical mirror

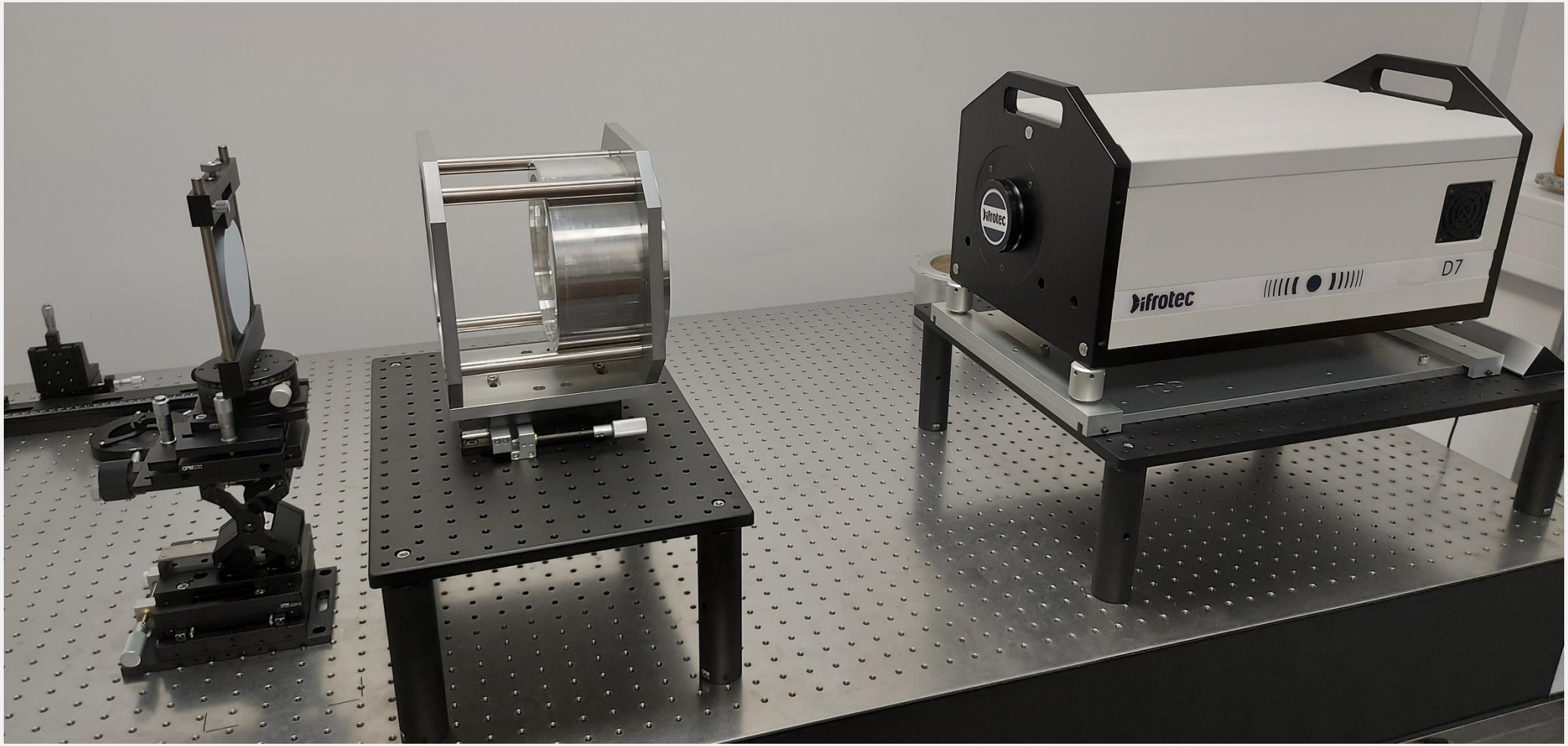
Mirror with aspherical spacing 16 µm, inclination approx. 2 µm/mm

D7 measurements were
compared with contact measurements carried out by the customer





nortus-Systronic Testlab



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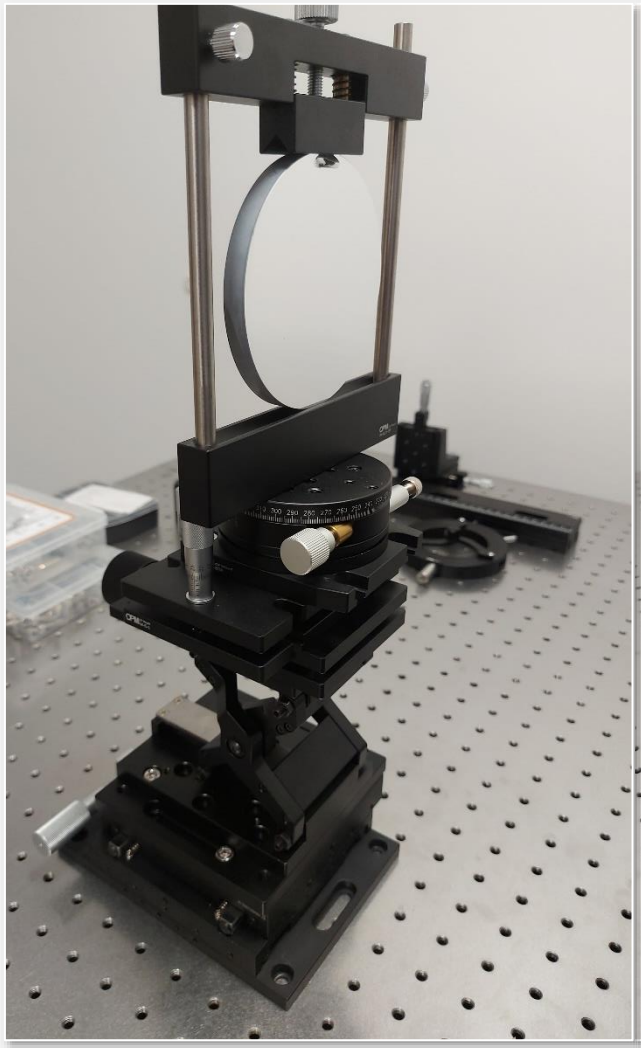
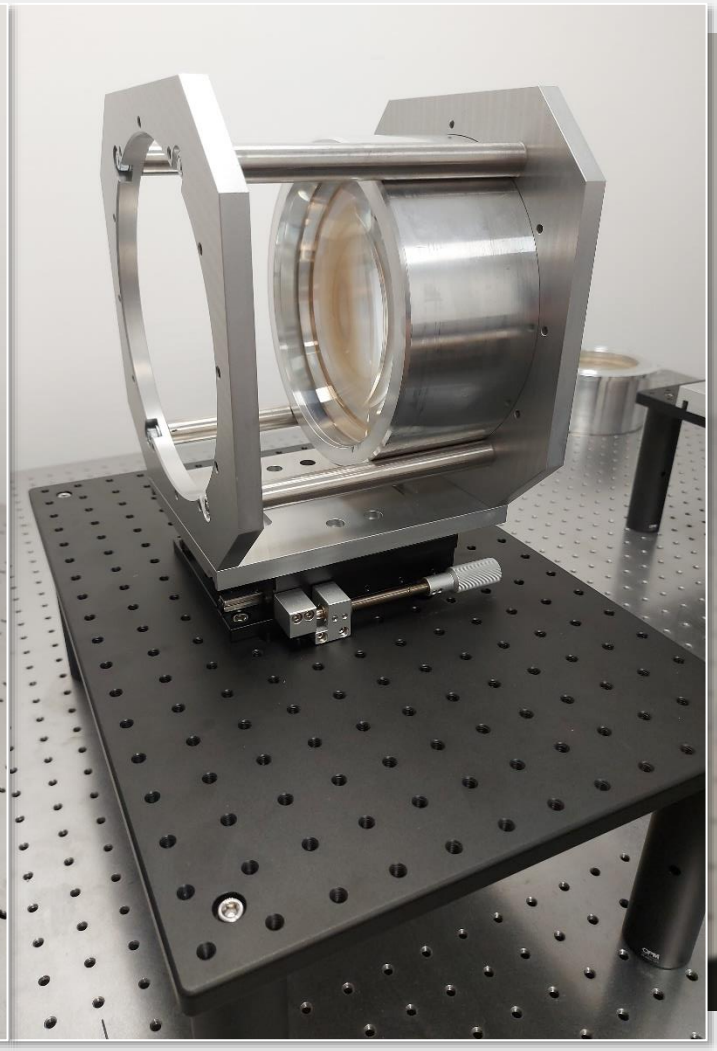
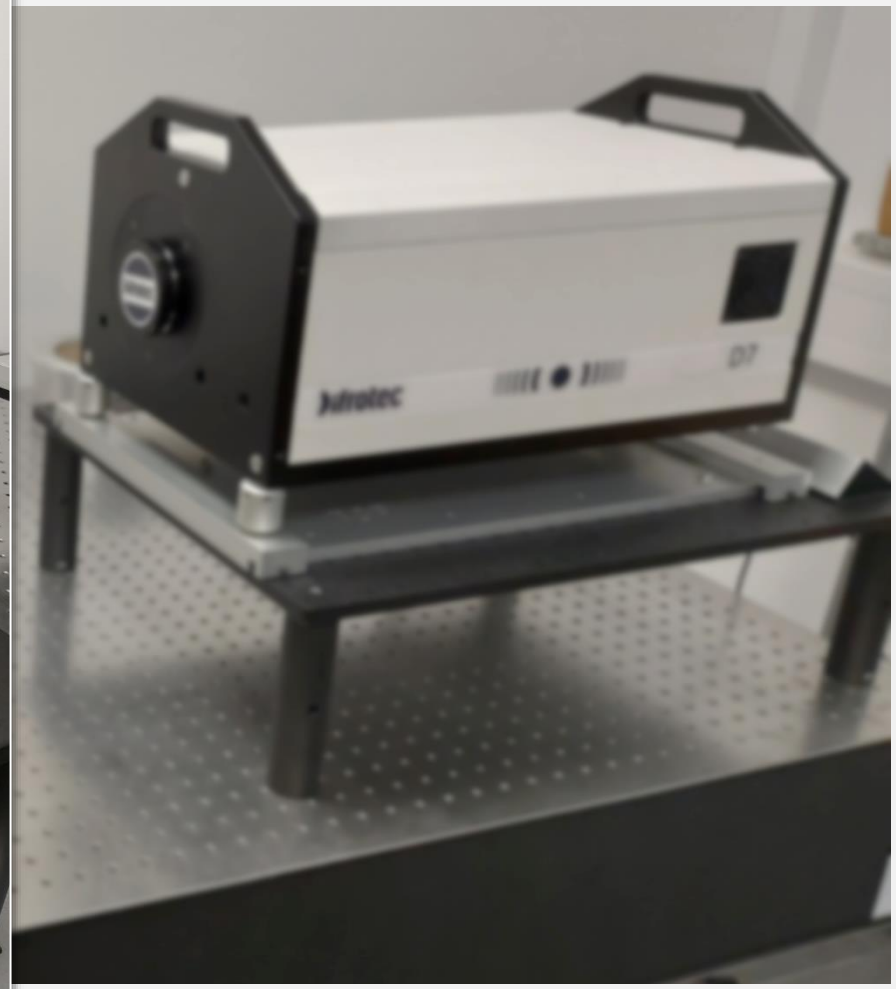






Comparison with other interferometer systems

	Fizeau und andere Interferometer	PSPDI D7
External Optical Reference necessary	YES	NO
Optical components required for the measurement of CC objects	YES	NO
Auto-calibration for phase shifting	N/A	YES
Simple tests for low and high reflection surfaces (0.05 – 100%)	???	YES
Near-zero traceability error	(???)	YES
Test of optical systems in transmitted light	(limited)	YES
Use of different wavelengths, easy change	(???)	YES
Use of Low Coherence Light Sources (LC Sources)	(???)	YES

Summary

PSPDI - Phase Shifting Common Path Point Diffraction Interferometer
An innovative interferometer principle for measuring and testing optical surfaces

Principle:
Two wavefronts are generated by pinhole diffraction → coherent beam paths: test wavefront + reference wavefront

Possible applications:
Testing of surfaces with a reflection of 0.05 % to 100 % while maintaining a high contrast of the interferograms
Evaluation of shape and quality of AR coated surfaces alone or in composite optical systems.

Advantages:
No separate reference surfaces as the examined wavefront is compared with self-generated perfect reference spheres
Precision and robustness of the self-referencing approach exceed the capabilities of other existing interferometers.

Typical applications
Testing of optical surfaces for VIS, X-ray and EUV applications ranging from telescopes to small and micro optics including contact lenses with specially shaped surfaces.
The examples show that PSPD interferometry is as easy to use as standard interferometry techniques and yet offers nano and sub-nano precision that exceeds that of other techniques.

Questions, Answers, Contact

nortus Systronic GmbH

Your expert partner in advanced system solutions

D-76744 Wörth am Rhein

Germany

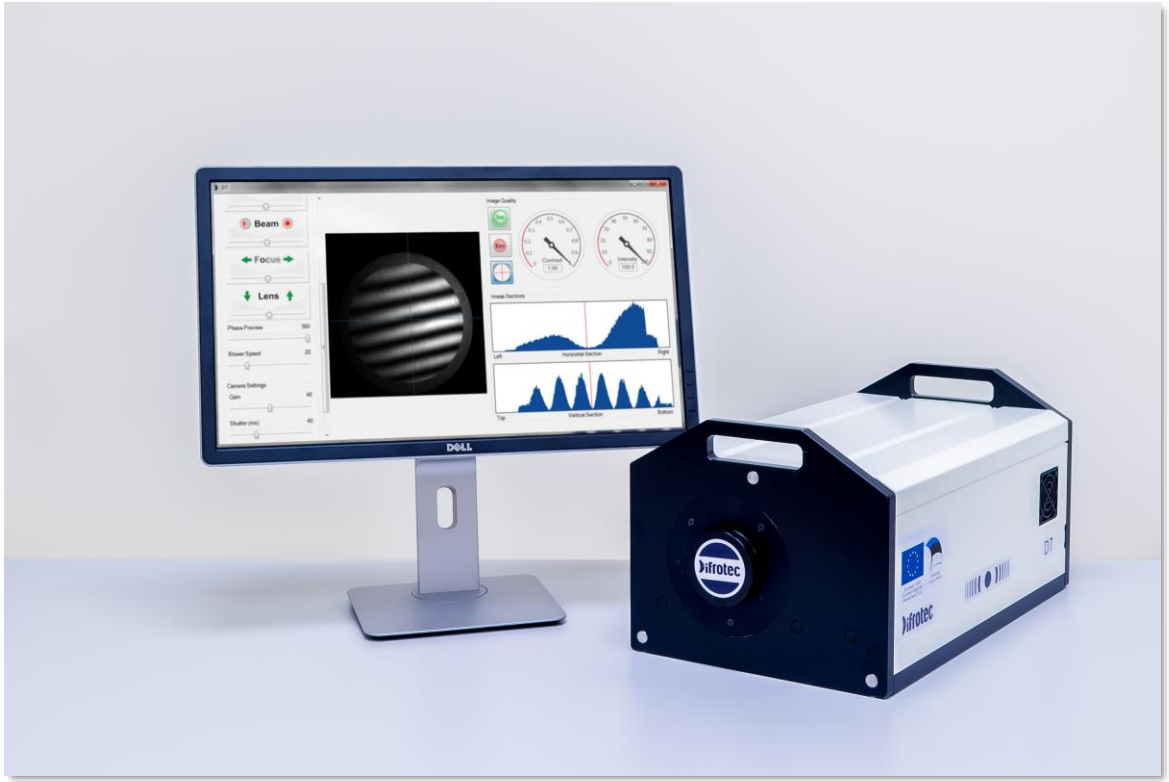
Tel.+49 (7271) 12990-60

Fax +49 (7271) 12990-69

Internet www.nortus-systronic.com

Mr. Bernd Dietz, CEO

bernd.dietz@nortus-systronic.com



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