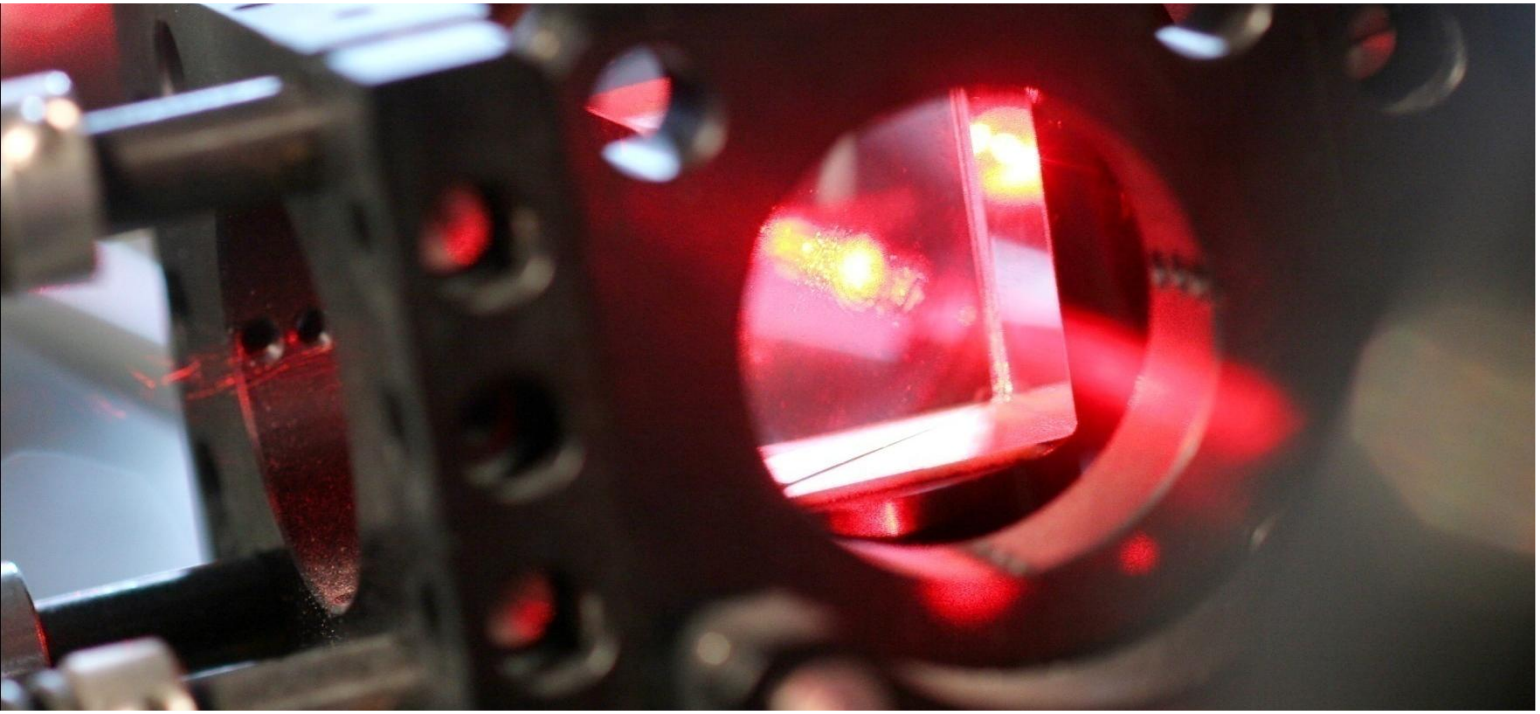
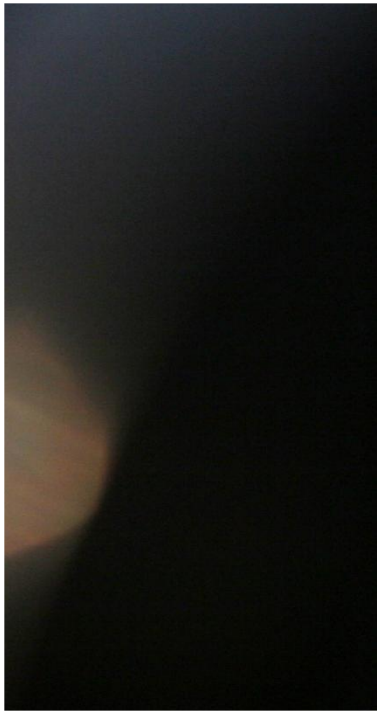
NTB
INTERSTAATLICHE HOCHSCHULE
FÜR TECHNIK BUCHS

Institut für Produktionsmesstechnik,
Werkstoffe und Optik (PWO)
www.ntb.ch/pwo



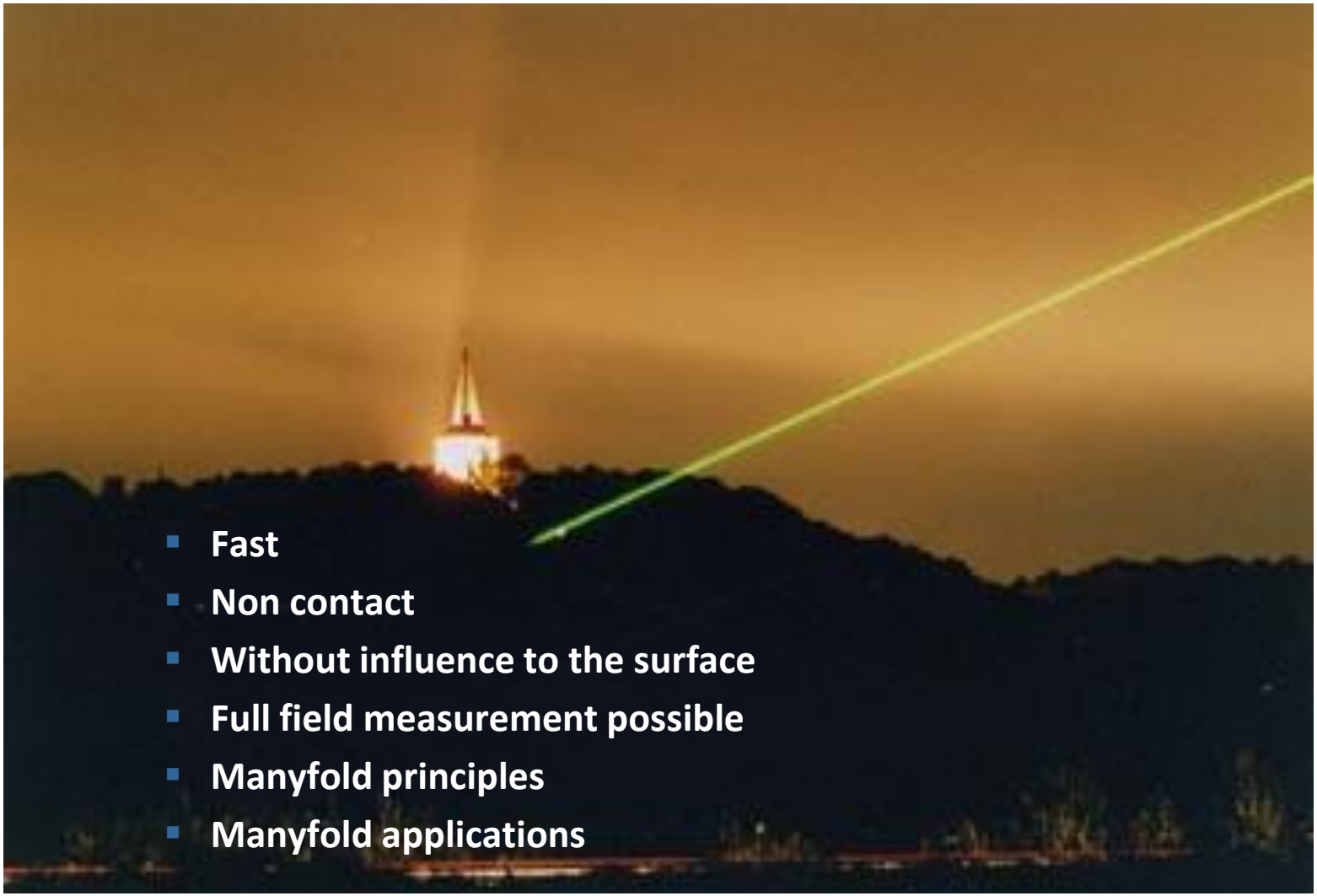


Optical 3D Measuring

Short Overview about different principles

Näher dran
am System
der Technik
der Zukunft

Why Optical Measurement ?



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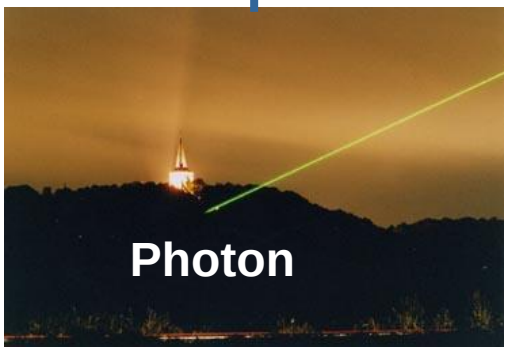
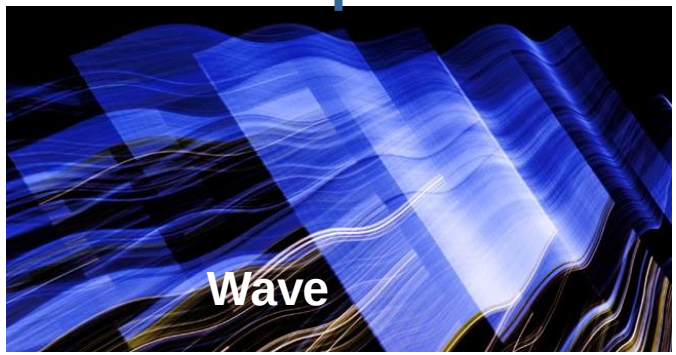
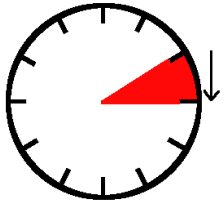
Optical Measurement - Principles

The two natures of light

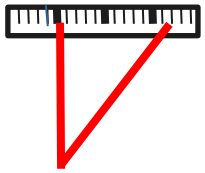




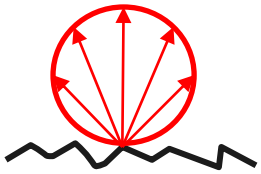
Time of Flight



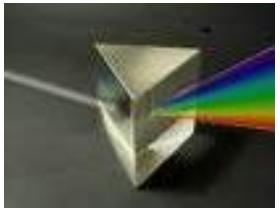
Triangulation



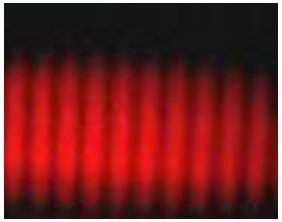
Reflectivity



Color



Interference



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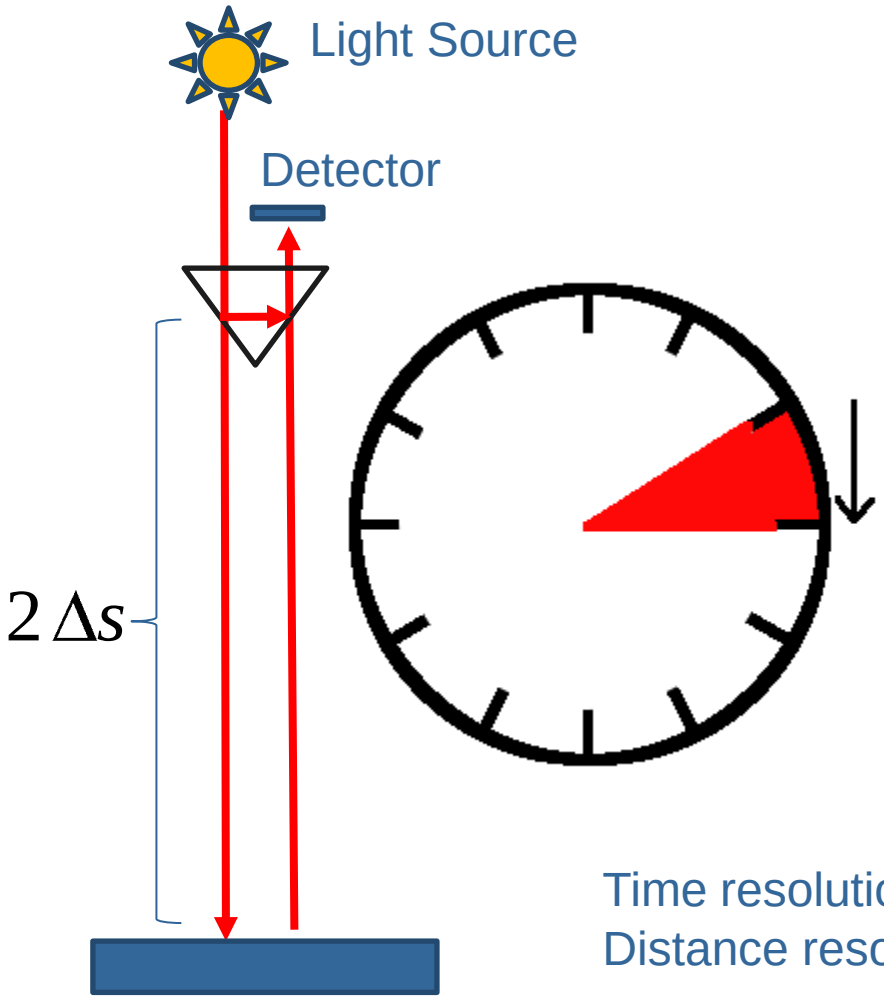
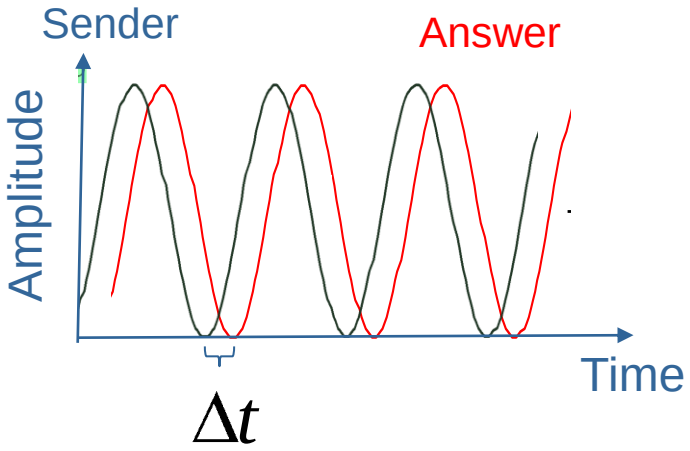
Time Of Flight





Time resolution: ~ ps
Distance resolution: ~ mm

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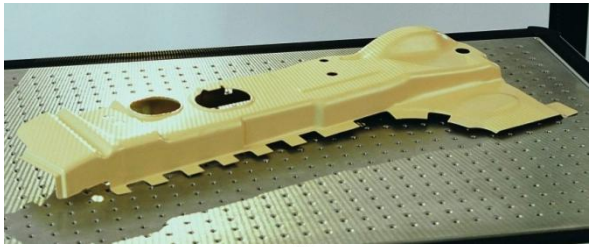
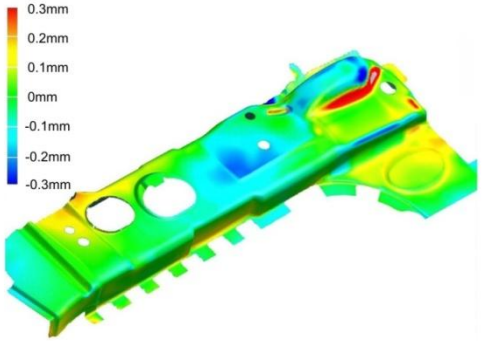
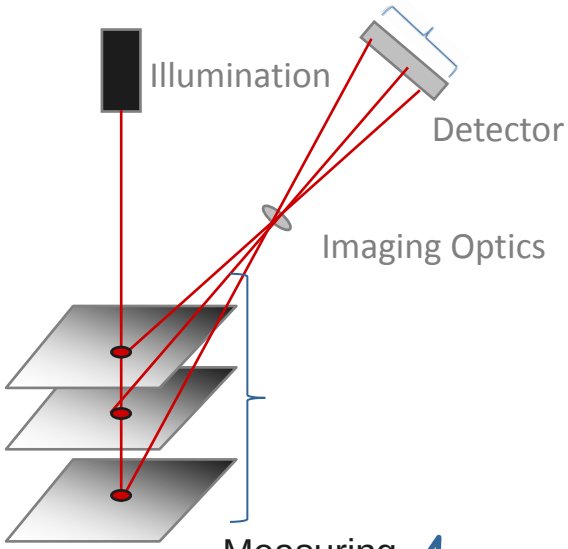
Triangulation

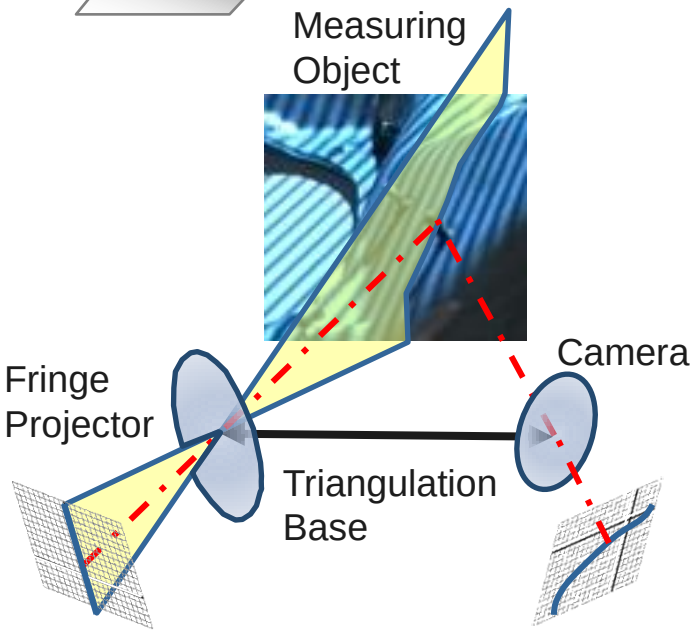
- Change of distance = lateral shift of position
- Resolution: 100 µm … 10 (1) µm

- **Applications:**
- Measurement of free form surfaces
- Reverse engineering
- Quality control









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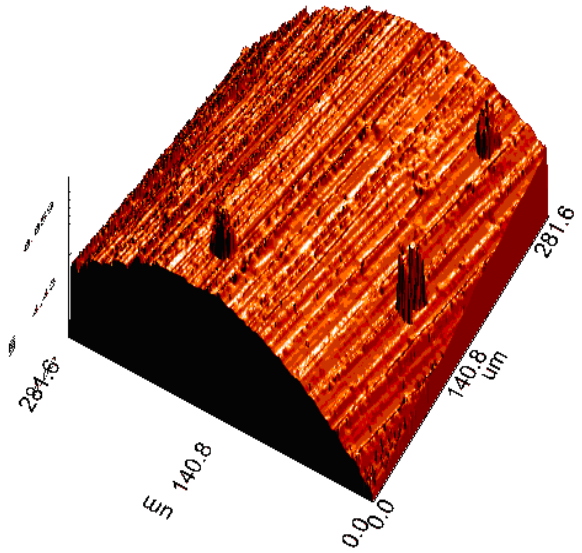
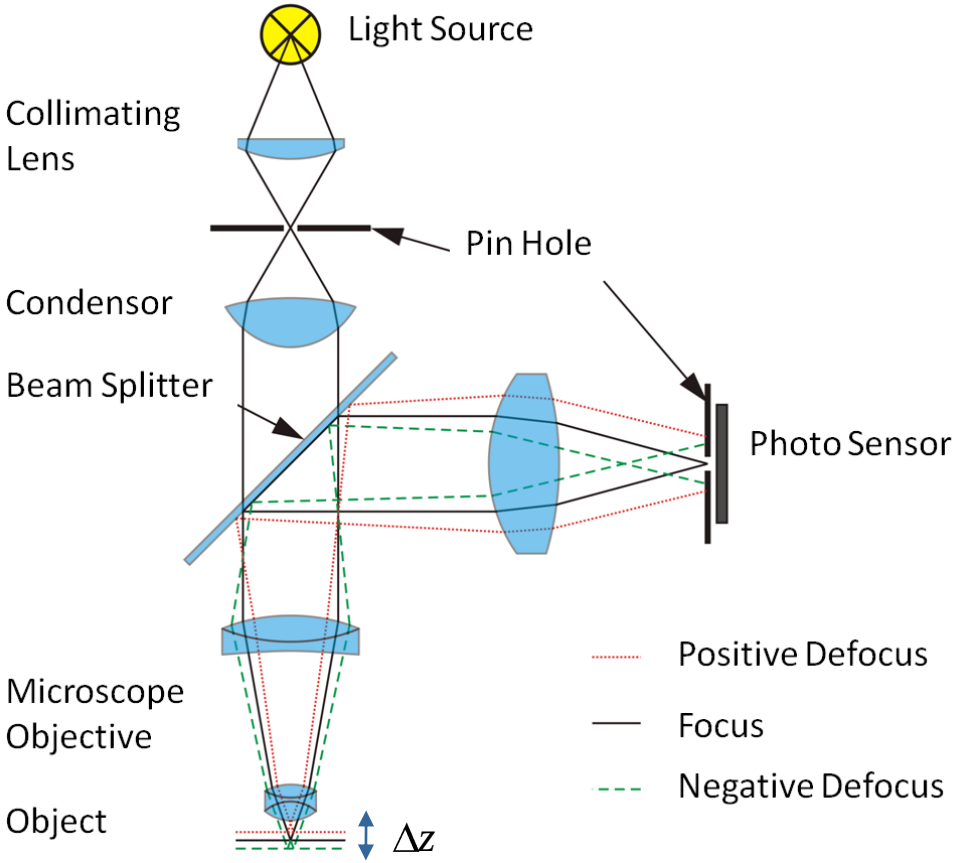
Confocal Microscopy

- Focussing a light spot to surface
- Backscattered intensity through pinhole
- $I \sim \frac{1}{(\Delta z)^4}$
- Sensitivity ~nm





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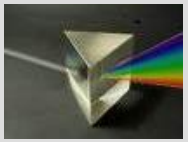
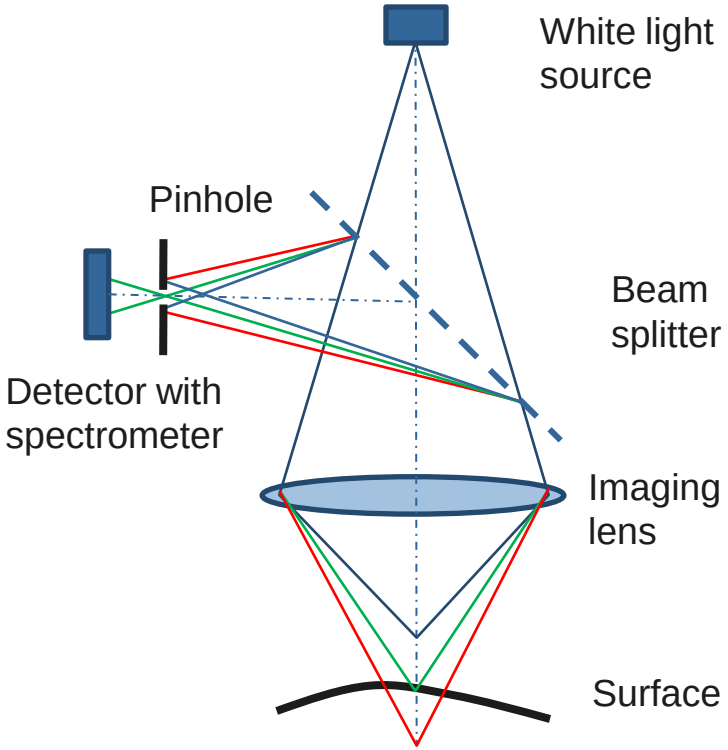


Chromatic Confocal Sensor

- Chromatic aberration generates focus in different positions for different colors
- Spectrometer resolves distance



Features

- No moving components
- Fast
- Can be miniaturized
- Measuring range up to several 10 mm
- Resolution down to nm

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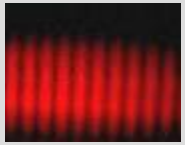
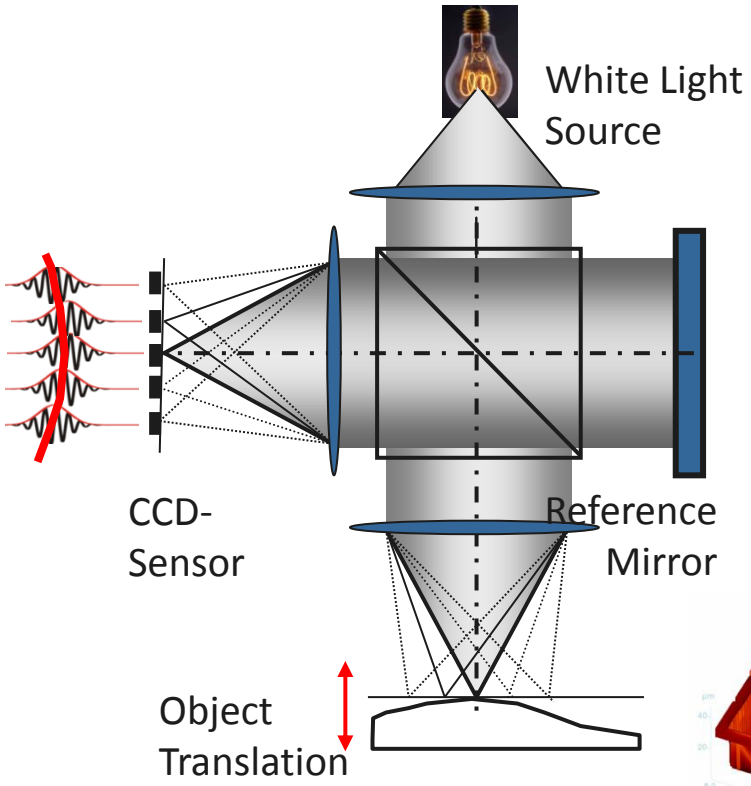
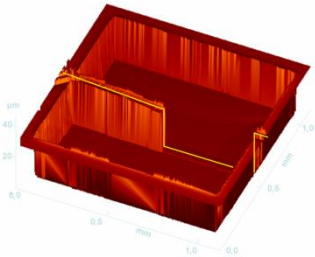


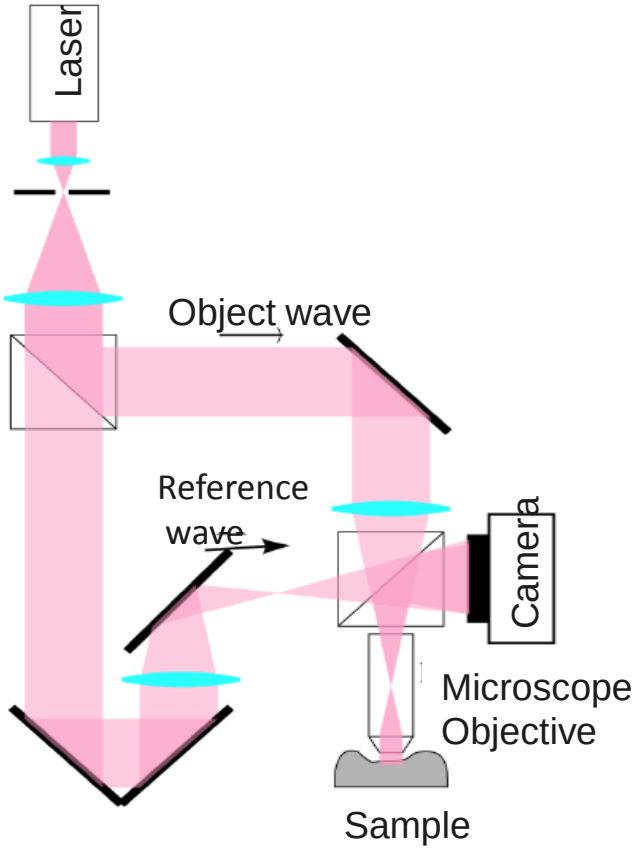
Interferometry

- White Light Interferometry
- Short coherence





- Digital holography
- Reconstruction of complete wavefront



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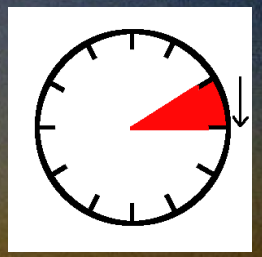
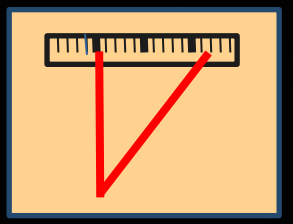
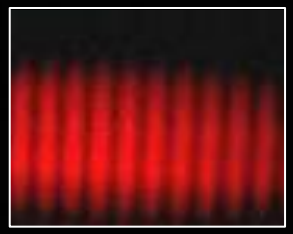
Advantages of Optical 3D Measuring

- Non contact
- Very fast
- Point measurement
- Full field measurement
- High sensitivity







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