

Universität  
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# Uncertainty estimation in a non-null metrology system

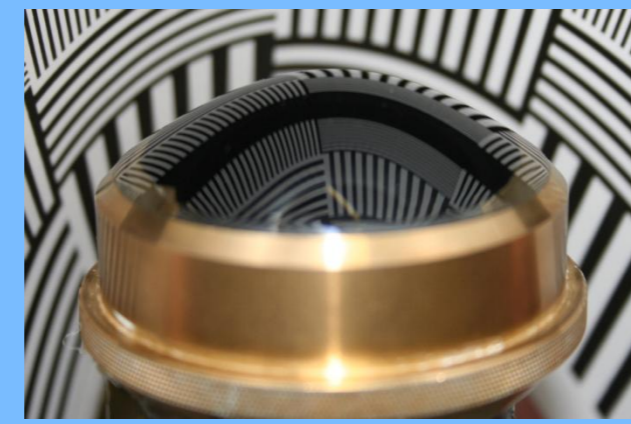
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Technische Optik

## Measurement of aspheric and freeform surfaces

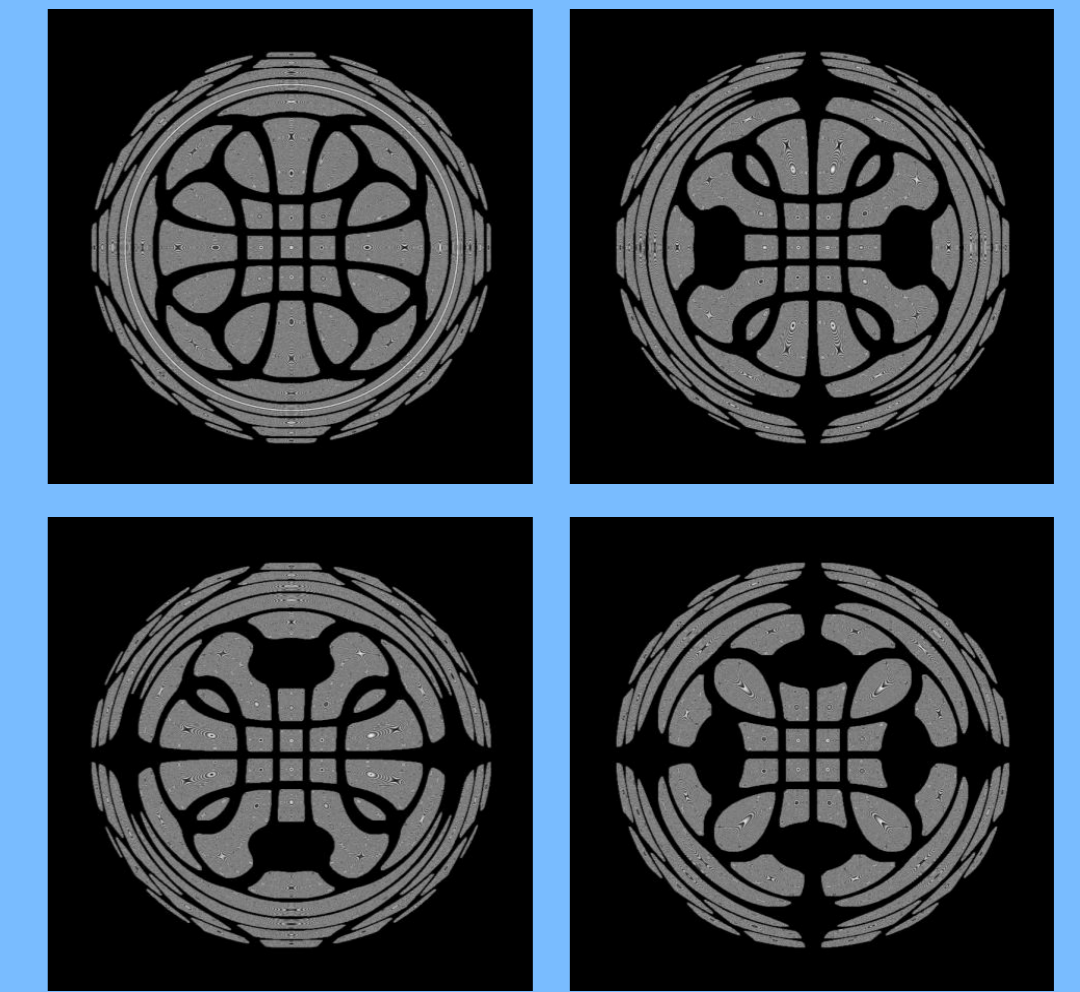
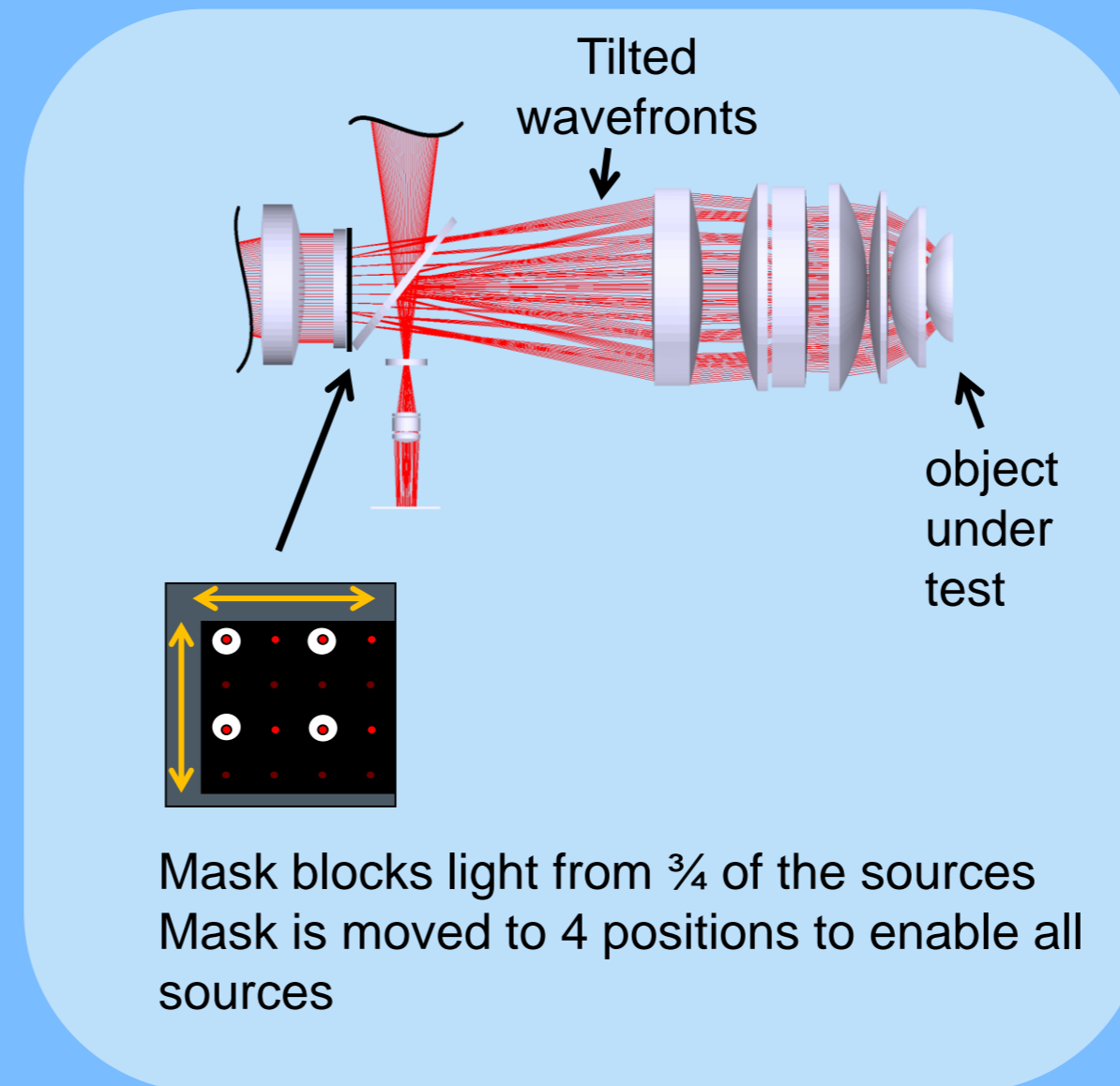
A method to characterize the uncertainties in an optical system for the measurement of aspheric and freeform surfaces in a non-null measurement is presented. Even though non-null test arrangements allow for increased measurement flexibility the evaluation of the measurement results becomes much more complex. The problem becomes then the identification of small phase deviations caused by the test surface in the presence of systematic system aberrations. In this work we present an approach to estimate the measurement uncertainties of the setup.



Aspheric surface



Freeform surface



Calibration data, Algorithms

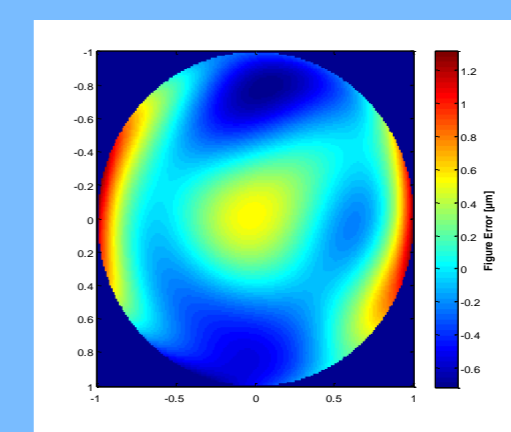
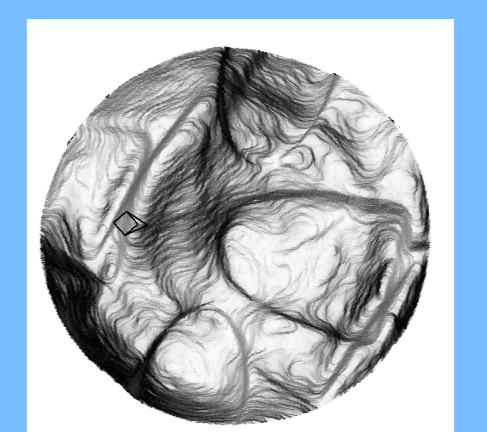
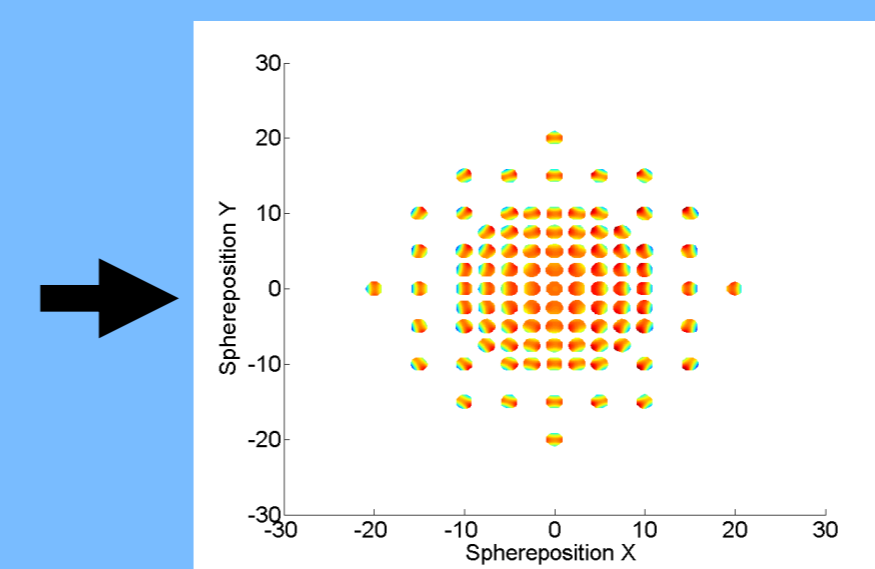
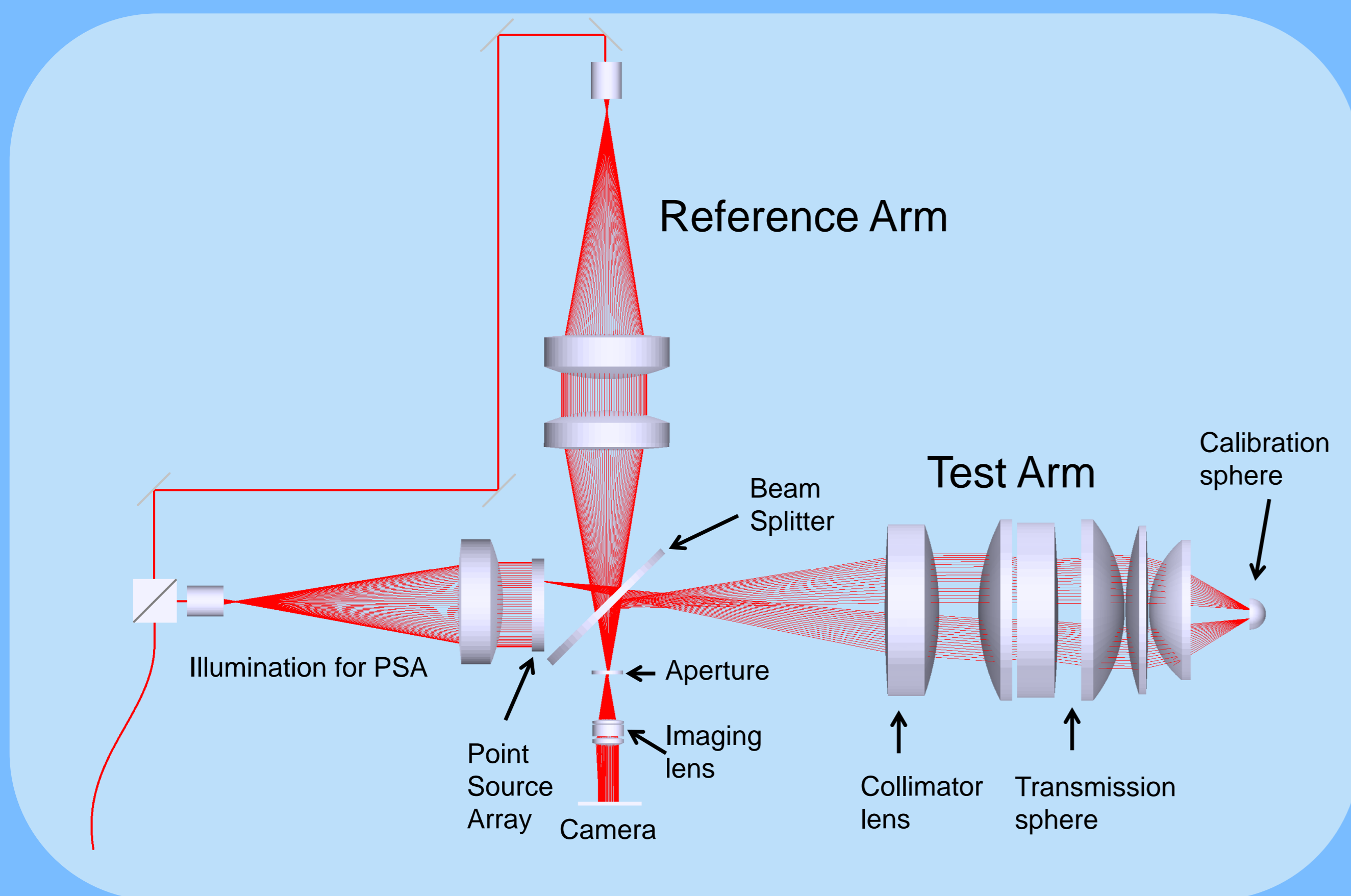


Figure error

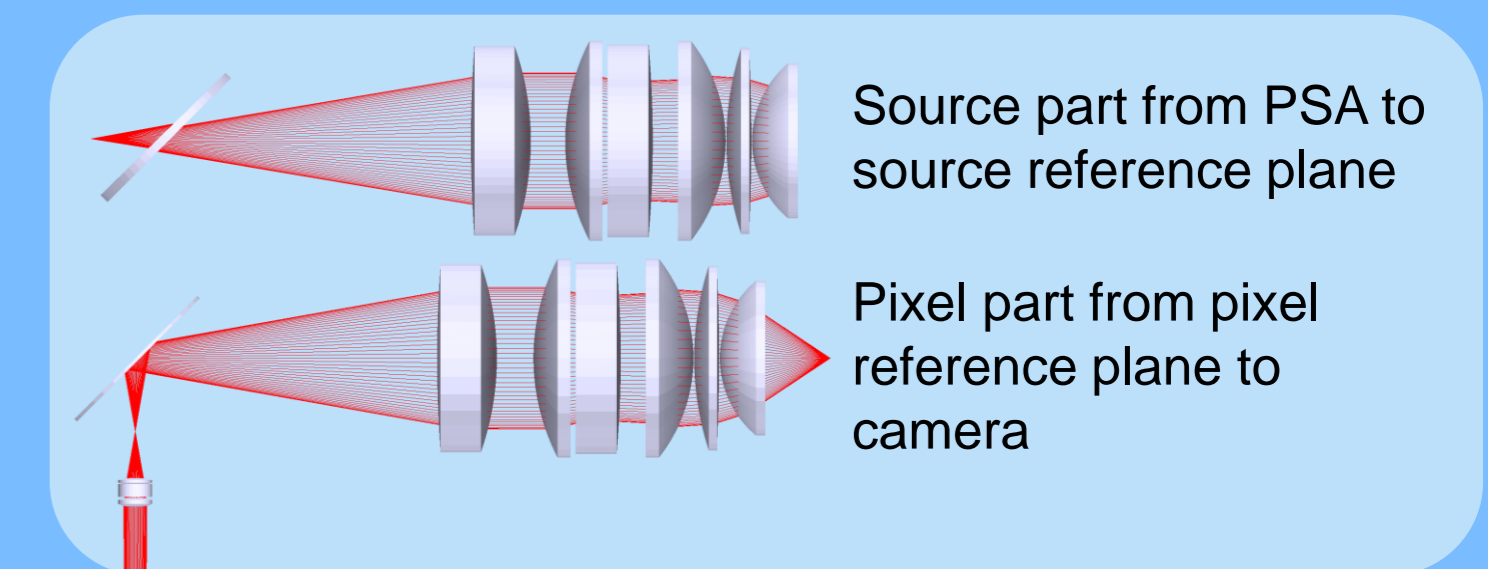


HF error

## Calibration of the interferometer aberrations

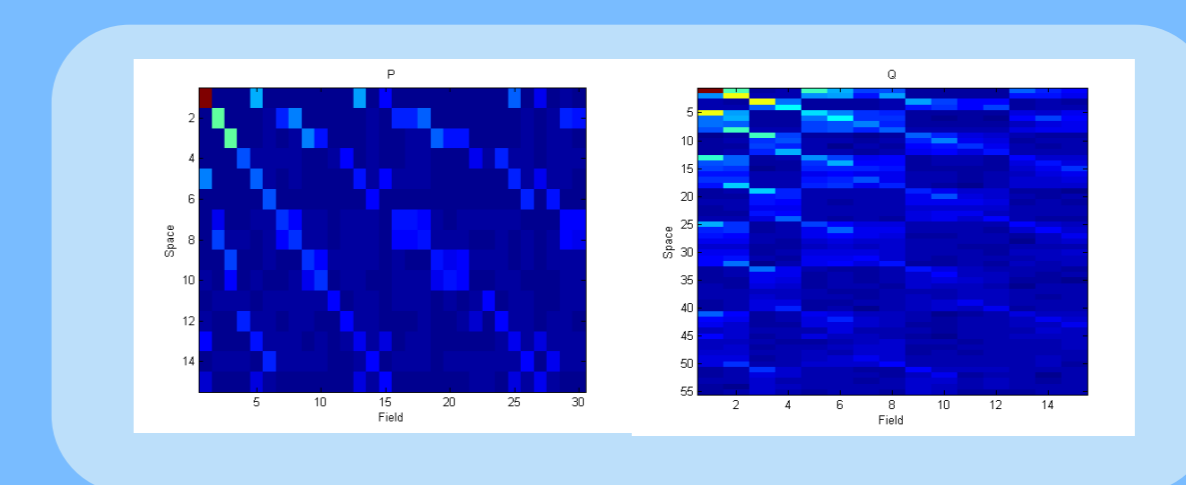


Measured wavefronts on camera for different sources and sphere positions



Nominal interferometer from simulation

$$x = A^{-1}b$$



Final calibration data: Aberrations and field dependencies of aberrations for both parts (Source and Pixel) on their reference plane

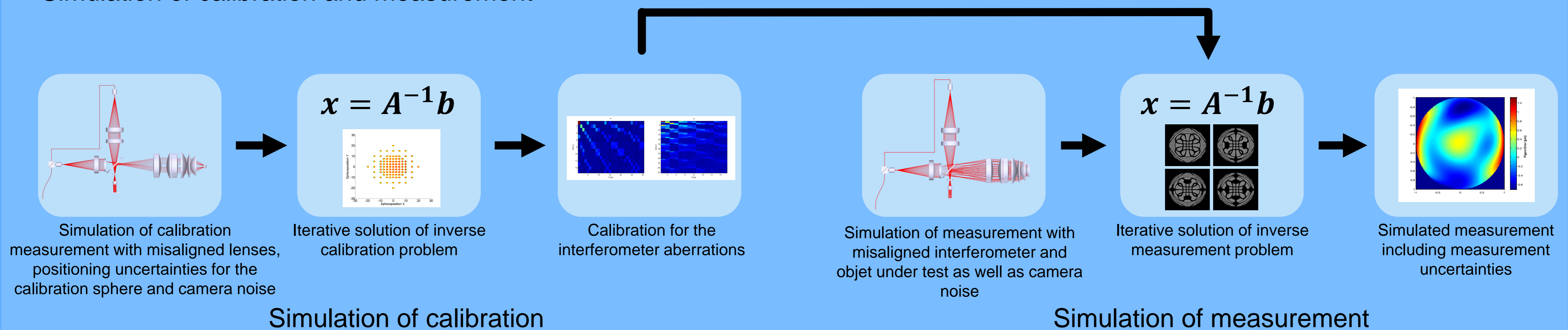
## Error estimation for a measurement

Calibration and measurement process very complex

→ Not possible to estimate measurement uncertainties by simple error propagation.

→ Monte-Carlo like approach

→ Simulation of calibration and measurement



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