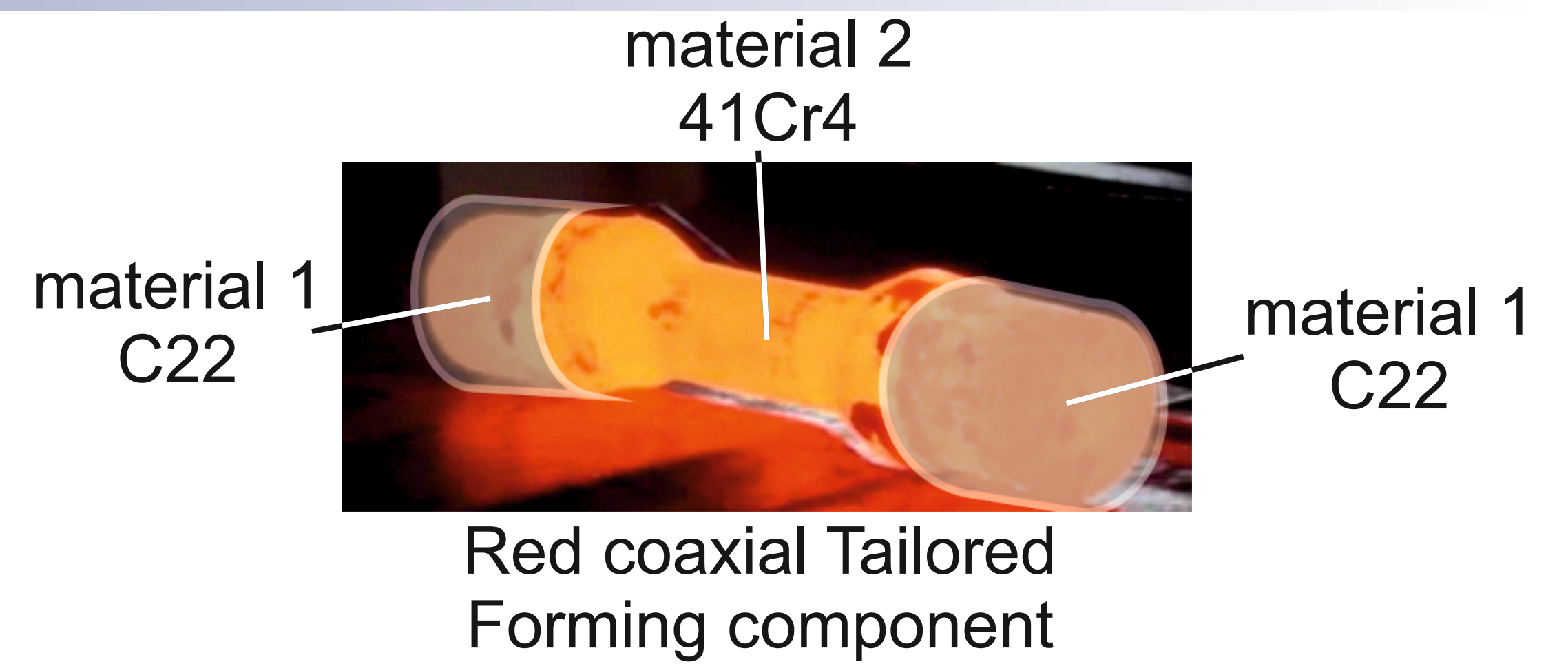


3D Geometry Measurement of Hot Specimen in Different Ambient Pressure Situations

Motivation and Objective

Inline 3d geometry inspection of hybrid components

- Between hot forming process steps
- Localisation and characterisation of the joining zone
- Non-destructive prediction of residual stresses
- Optical non-contact measurements

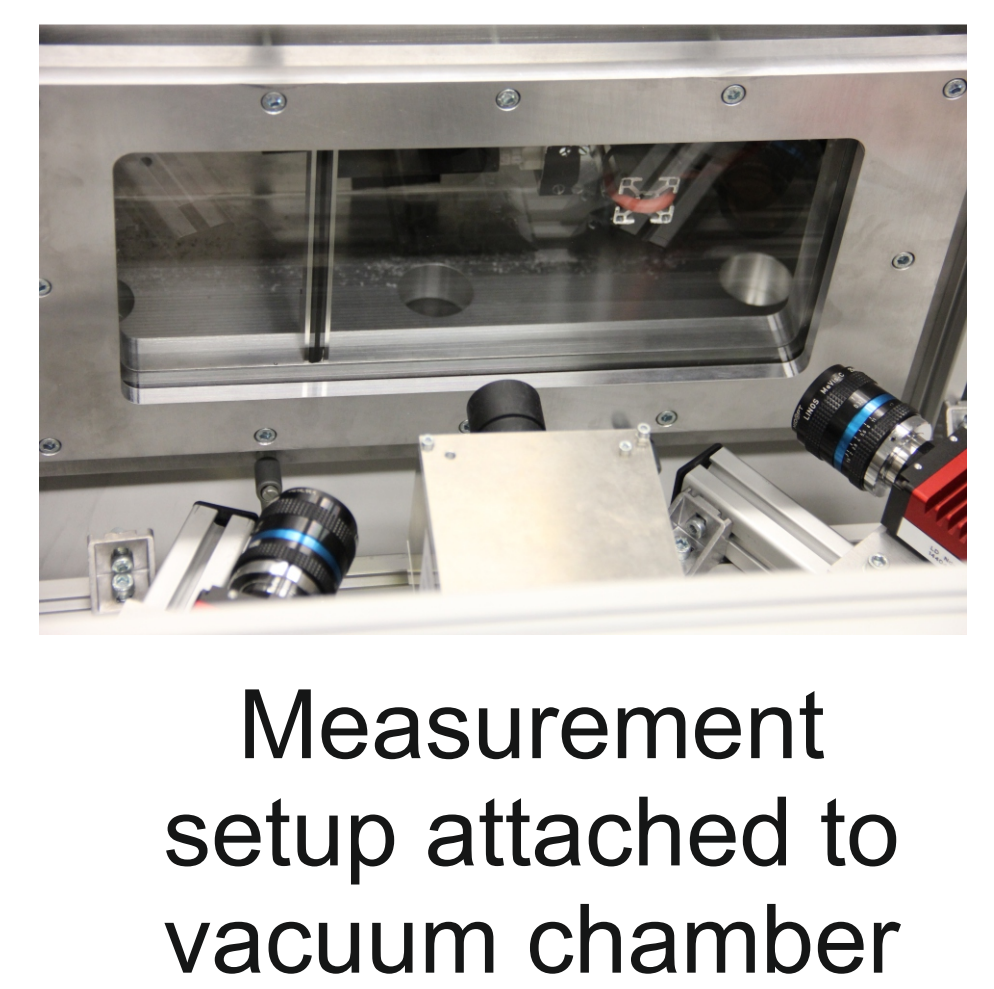
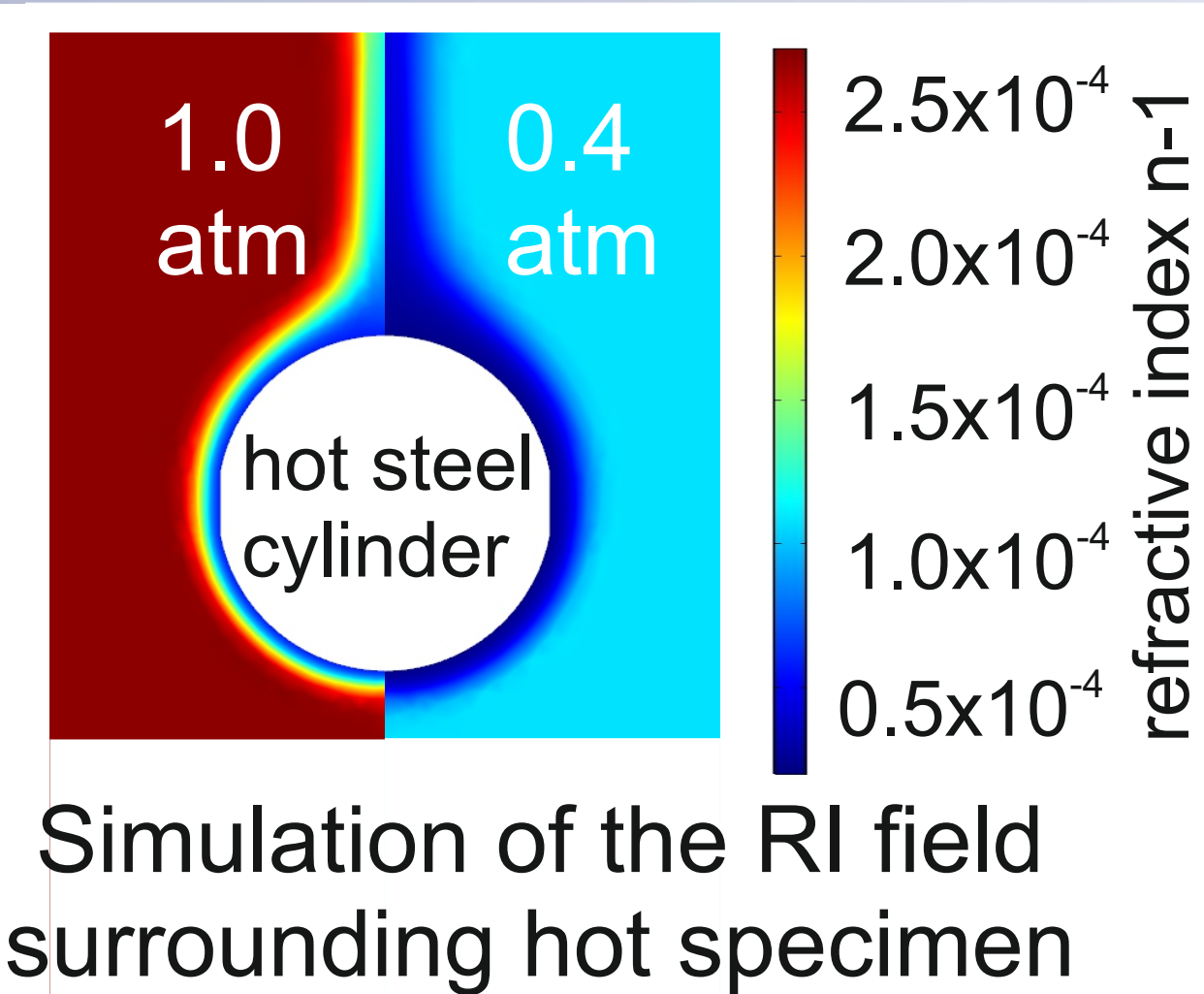


Initial Challenges and Proposed Solutions

Red glowing specimen effects optical 3d measurements

- Radiation from self-emission reduces contrast
 - Light deflection by refractive index (RI) gradient
- Proposed solutions

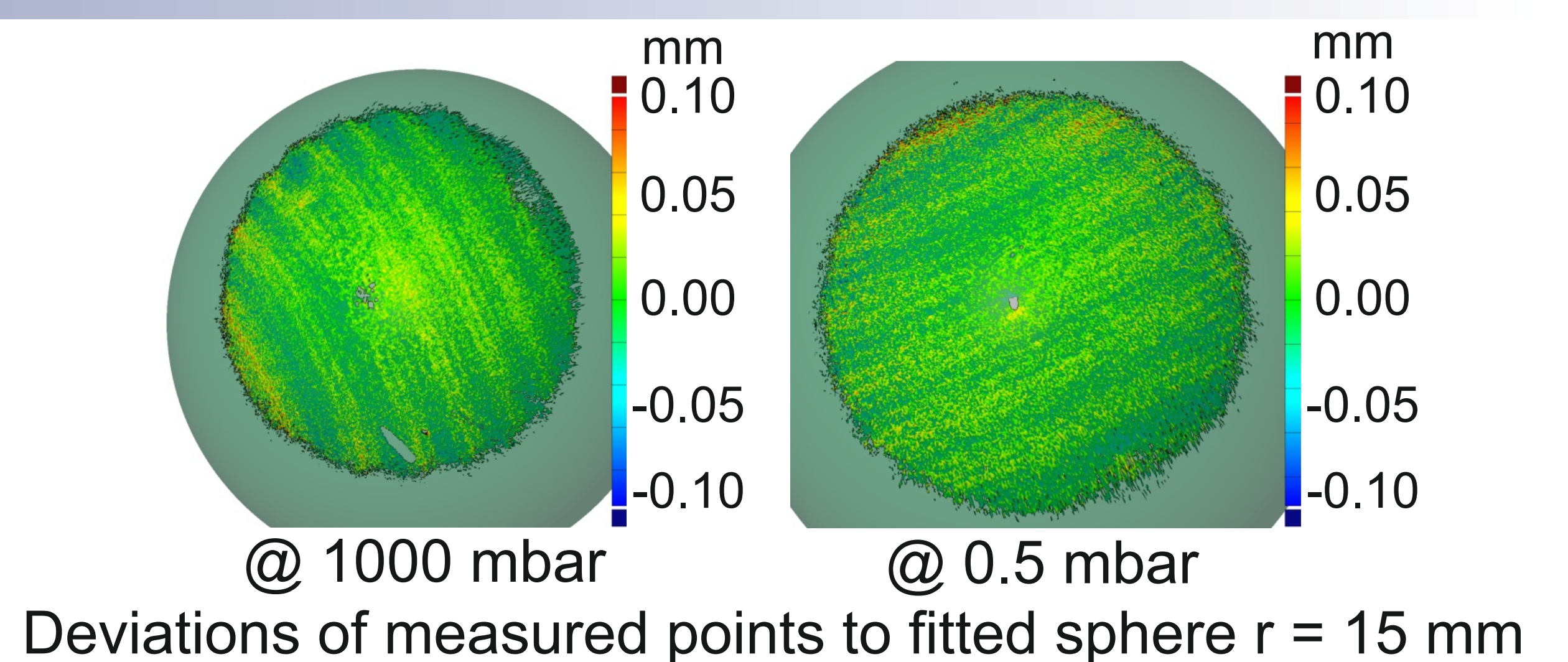
- Bandpass filter on camera lens
- Reduction of RI gradient through coarse vacuum



Measurement Setup and Accuracy on Cold Standards

Setup

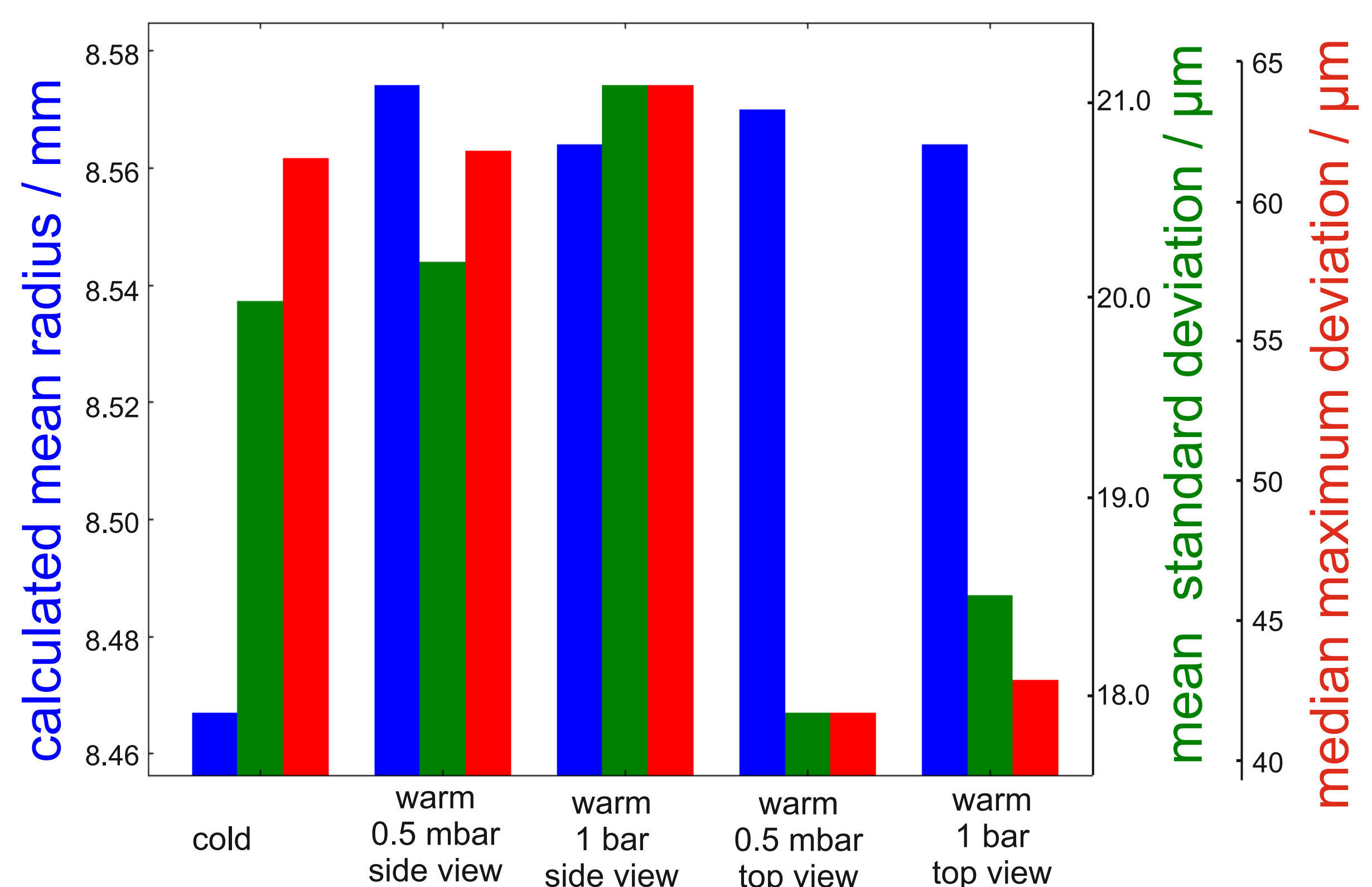
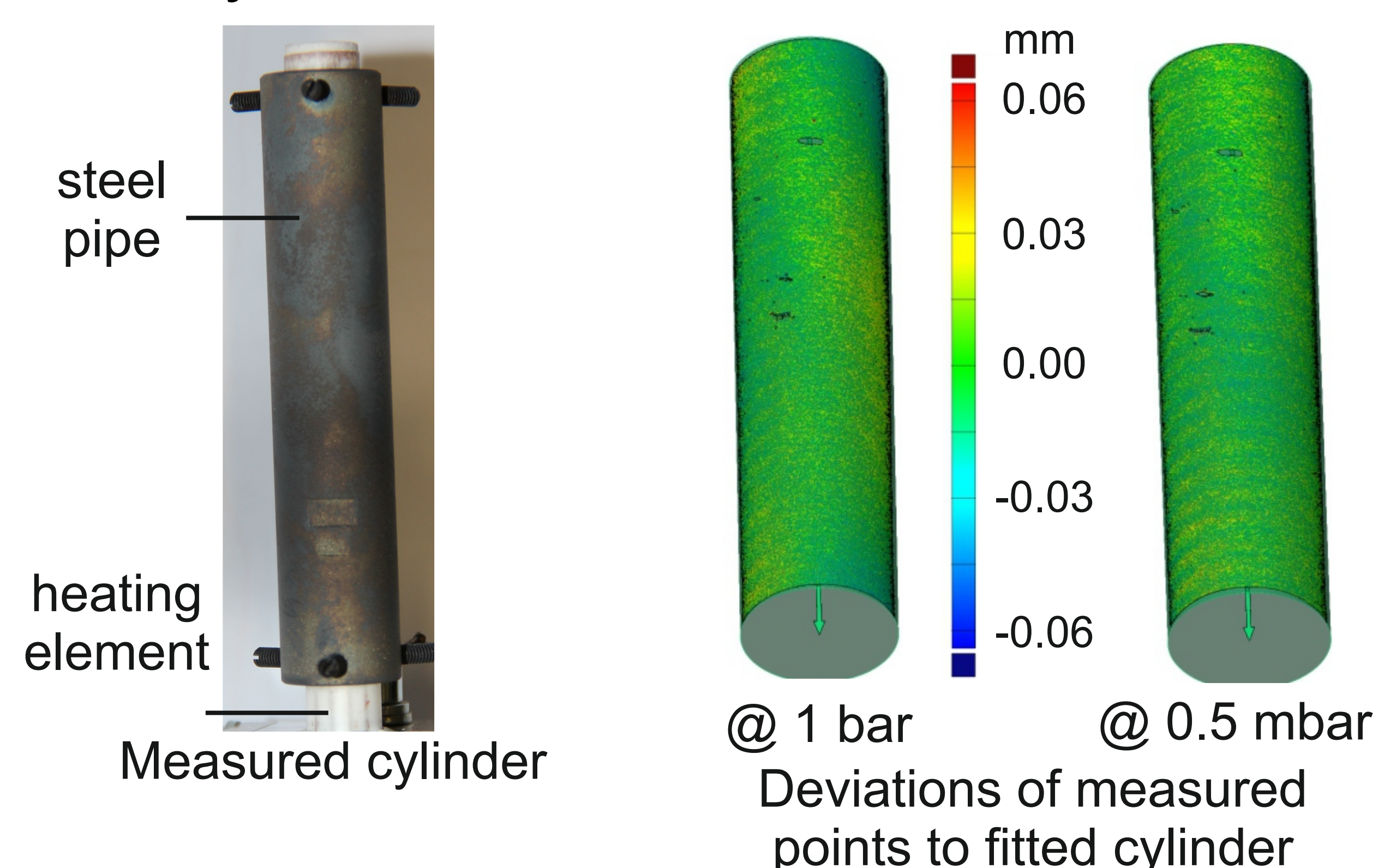
- High-power green-LED (525 nm) DLP projector
- AV Prosilica GT camera with Linos MeViS-C lens
- MidOpt bandpass filter (525 nm +/- 10 nm)
- Multi-frequency phase-shift patterns



Measurement Results

Stainless steel 1.4571 pipe heated from the inside

- Temperature of pipe 482 °C
- Measurement from above and the side
- Radius analysis via GOM cylinder fit
- Analysis of 20 measurements each



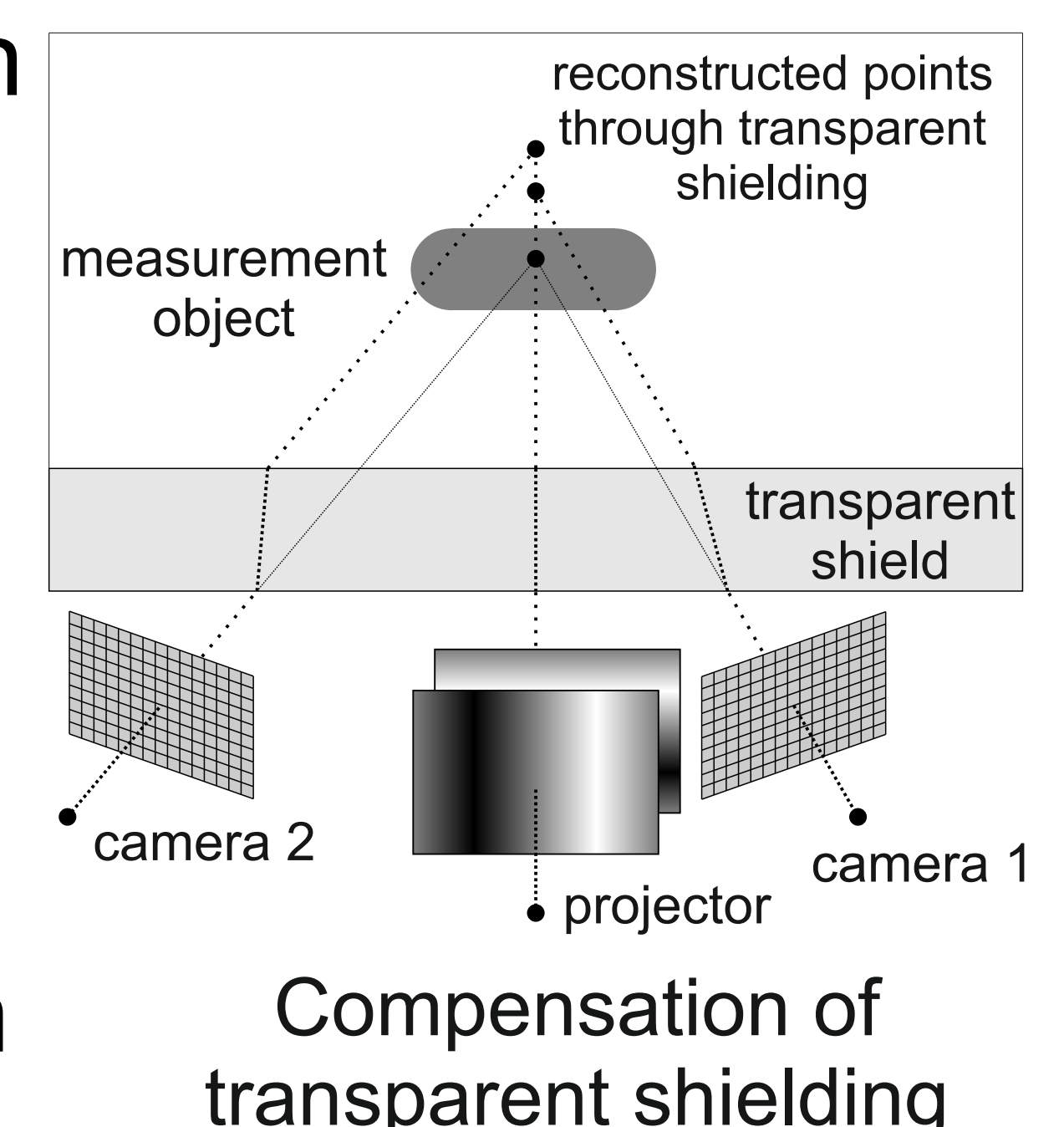
Future Work

Algorithmic compensation

- Multi camera setup
- Based on ray tracing simulations

Estimation of RI field

- Background Oriented Schlieren setup
- Integration into vacuum chamber



Acknowledgements

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