

# SAXS Instrumentation at SAXSMAT Beamline for Materials Research at PETRA III

Saskia Pfeffer

MEDSI, Beijing, 6<sup>th</sup> – 10<sup>th</sup> November 2023

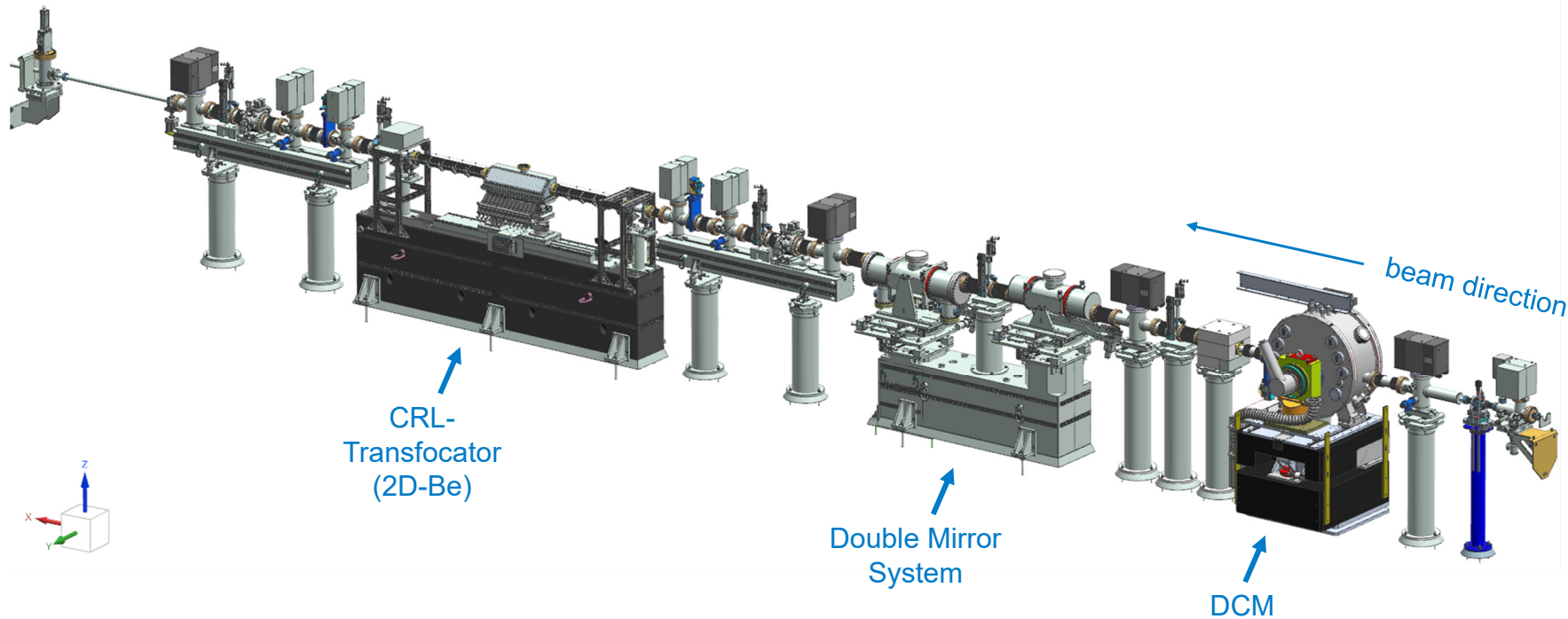
# Deutsches Elektronen-Synchrotron DESY

## A Research Centre of the Helmholtz Association



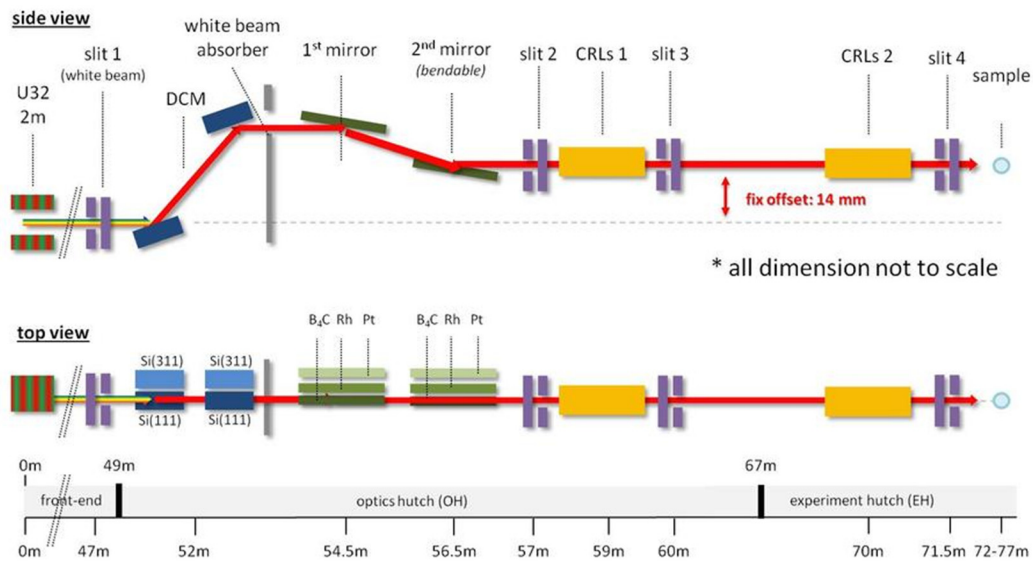
# Brief overview of the beamline P62

## Optics



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## Optics

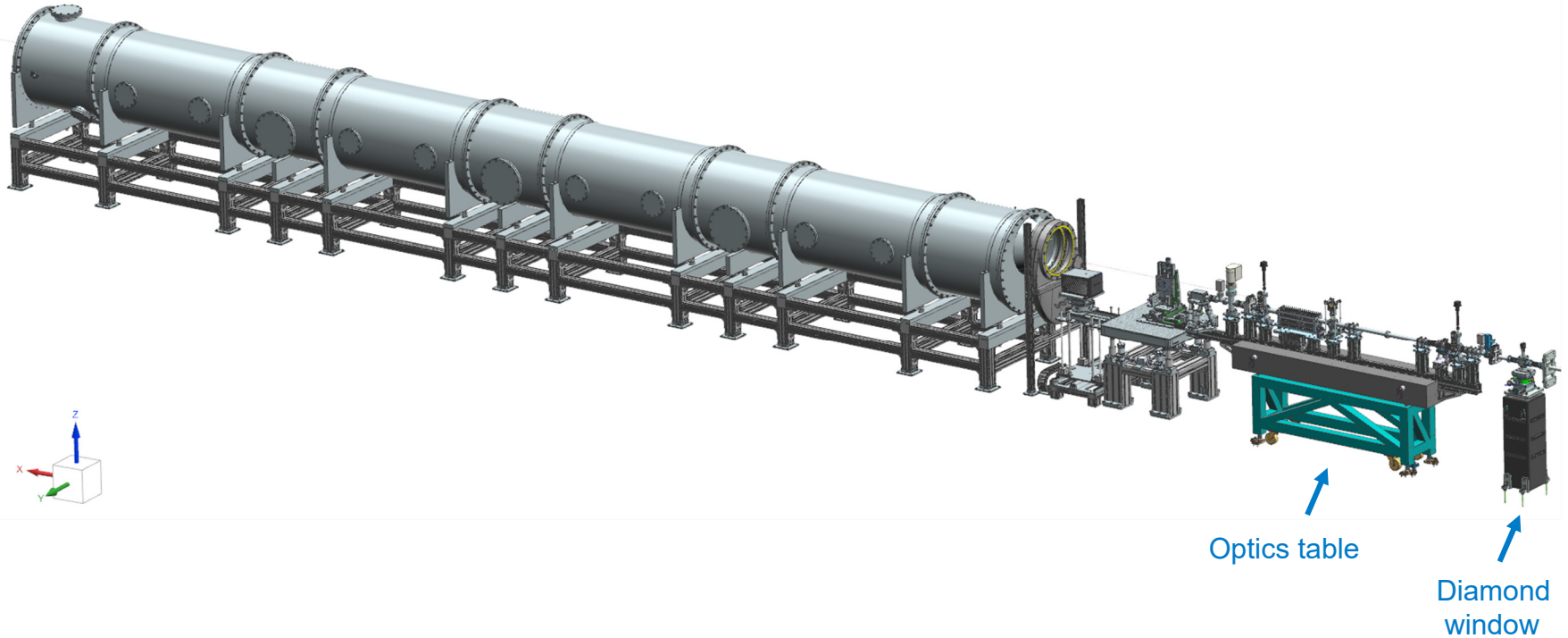


Parameter	Specification
Photon source	U32 Undulator
Energy Range (keV)	3.5 - 35
Monochromator	DCM (double-crystal (Si(111) and (Si(311)), cryo-cooled)
Mirror Chamber	Mirrors with B <sub>4</sub> C, Rh and Pt
Flux (photons s <sup>-1</sup> @12 keV at 120 mA)	1.2 x 10 <sup>13</sup>
Focus size at sample (H x V) (μm)	10 x 10 to 500 x 500



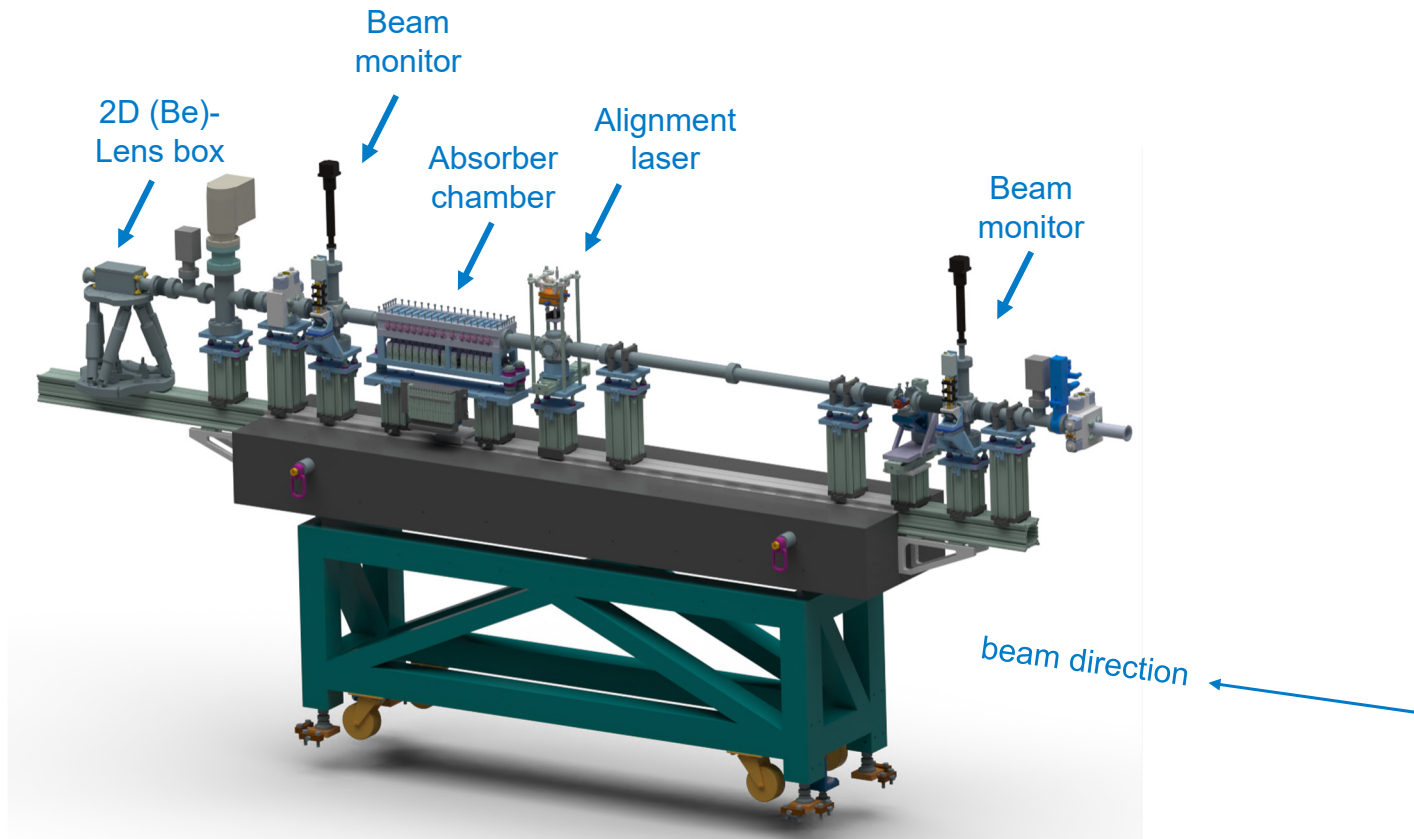
# Brief overview of the beamline P62

## Experiment



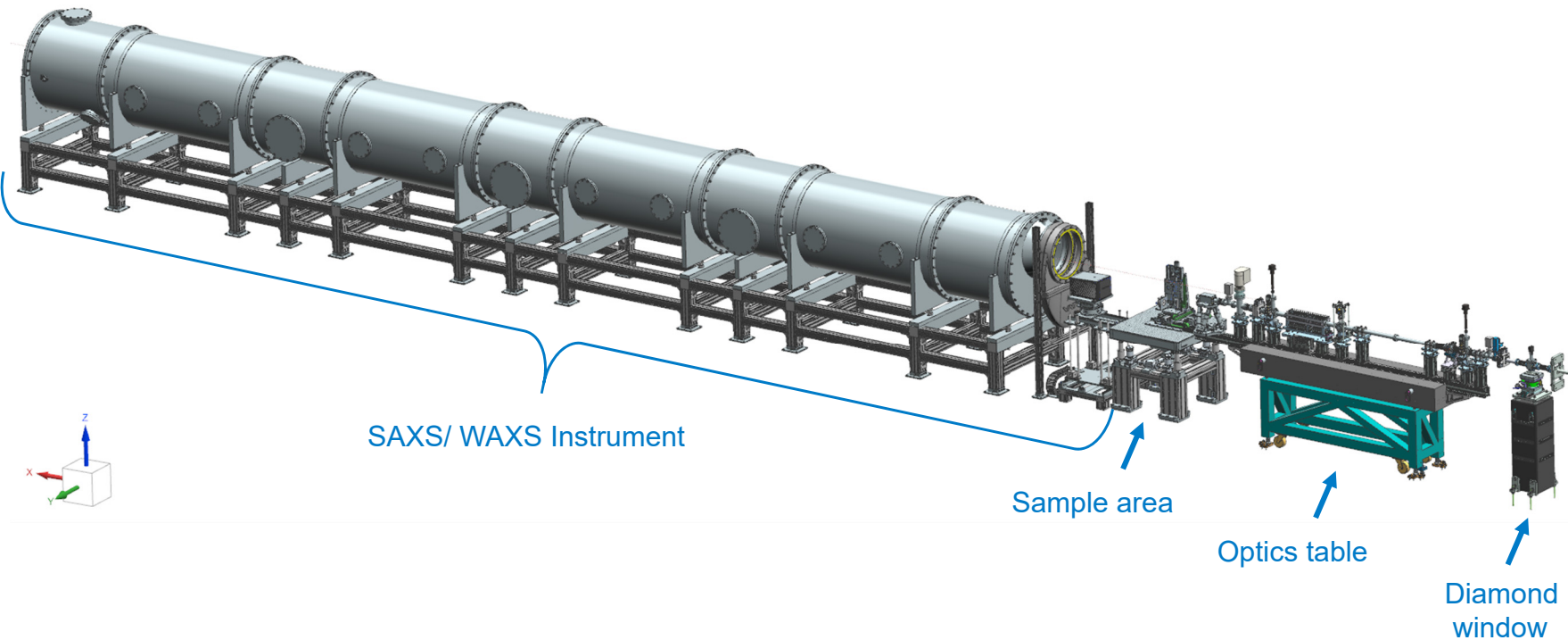
# Brief overview of the beamline P62

## Optics table



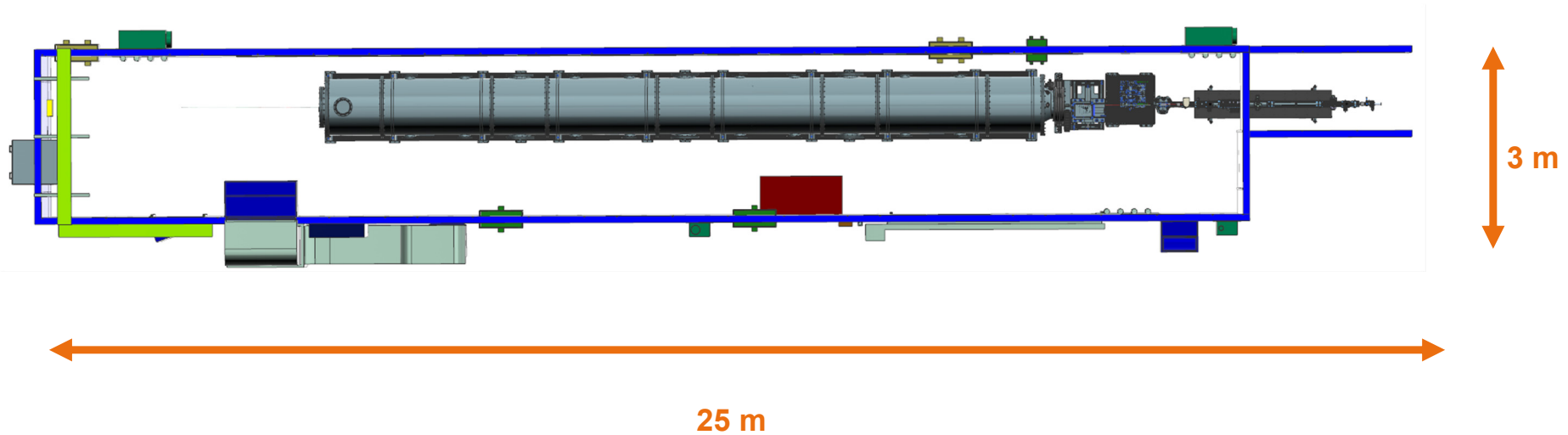
# Brief overview of the beamline P62

## Experiment



# SAXS-Instrument

## Area



# Comparison three different Instrumentation Concepts

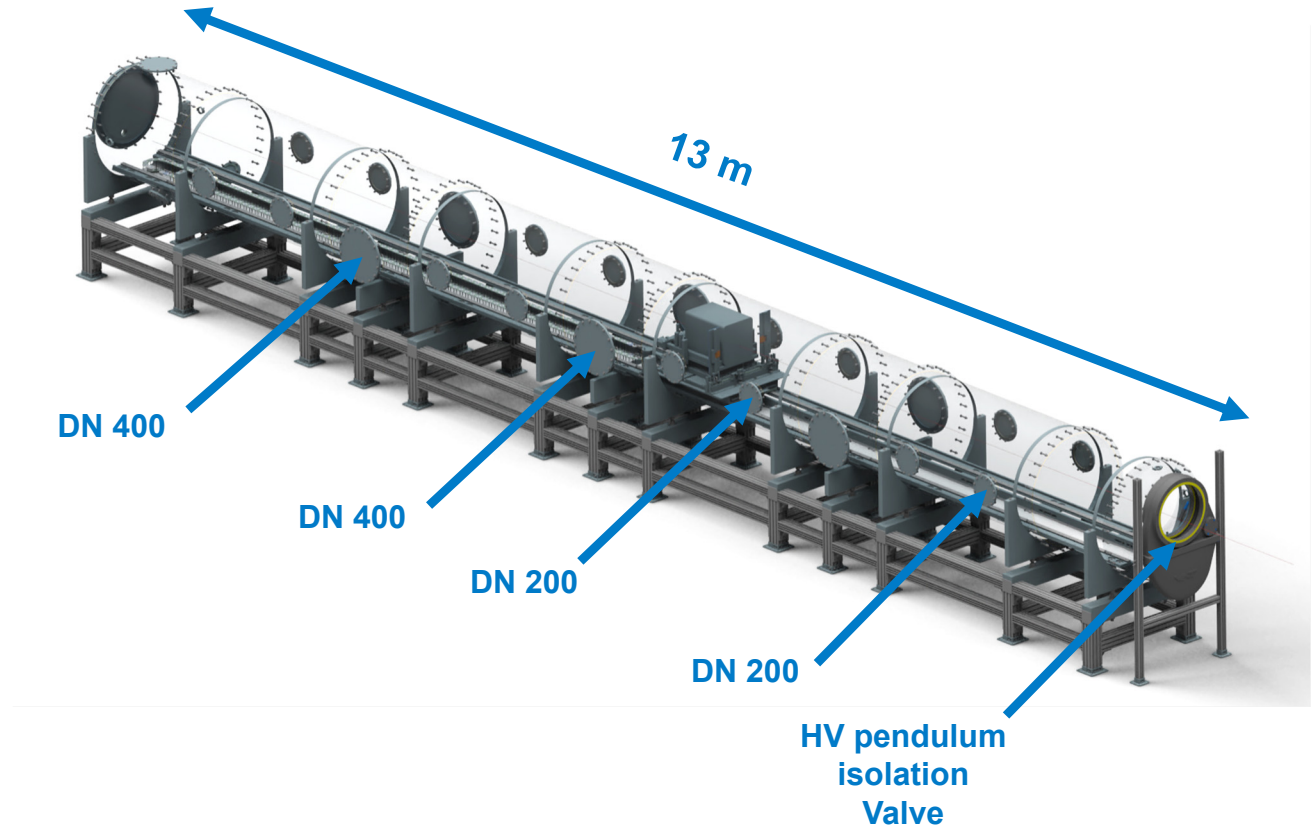
## SAXS Detector inside/outside Vacuum

	Modular Tube- System with detector outside vacuum	Welded Bellow- System with detector outside vacuum	Tube-System with detector inside vacuum
Components:	Small	Max. 400 mm	Large
Diameter Tube- modules	→ As small as diagonal of SAXS-Detector	→ Welded bellow are quite expensive and have a limited lifetime	→ due to detector, cabling, stages etc.
Assemble and Maintenance	easy	easy	complicated
Sample- to- Detector distance	Discrete  → Changing tubes costs a lot of time	Continuous  → Breaking the Vacuum is only needed to large distances	Continuous  → Changing the distance without breaking the vacuum is possible

# SAXS-Tube

## Components

- The 13 m long tube with 4 x 2 m and 5 x 1 m modules
- flange openings over the entire length
- HV pendulum valve in front of the SAXS tube



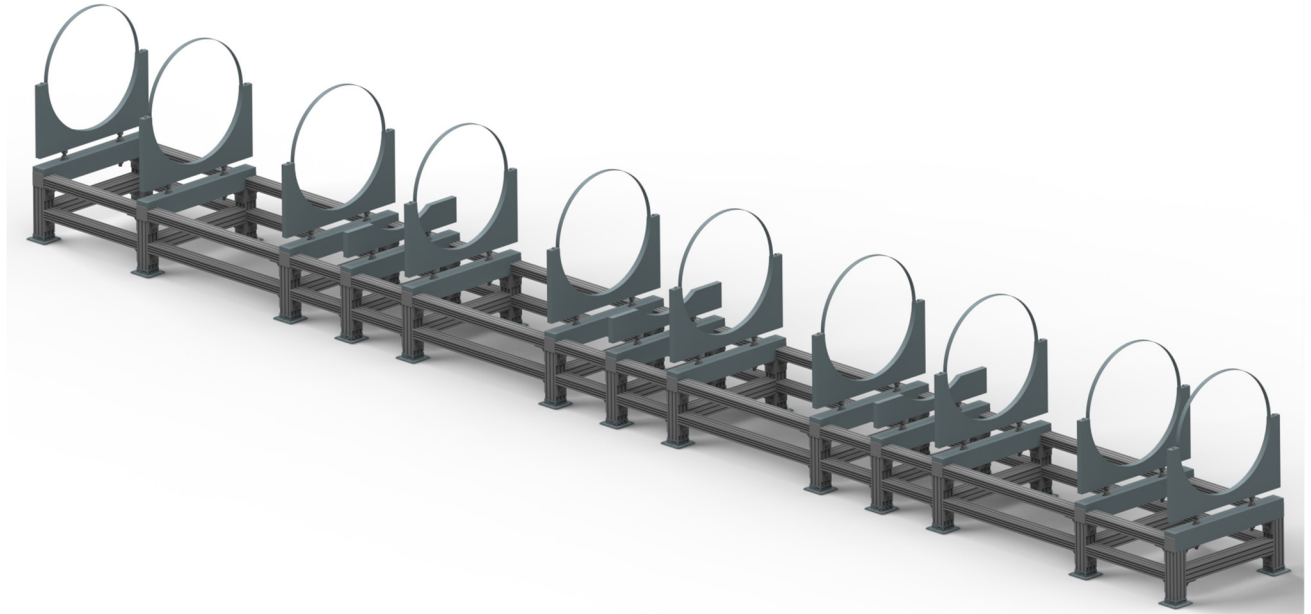


# SAXS-Tube

## Components

Support of Tube-System:

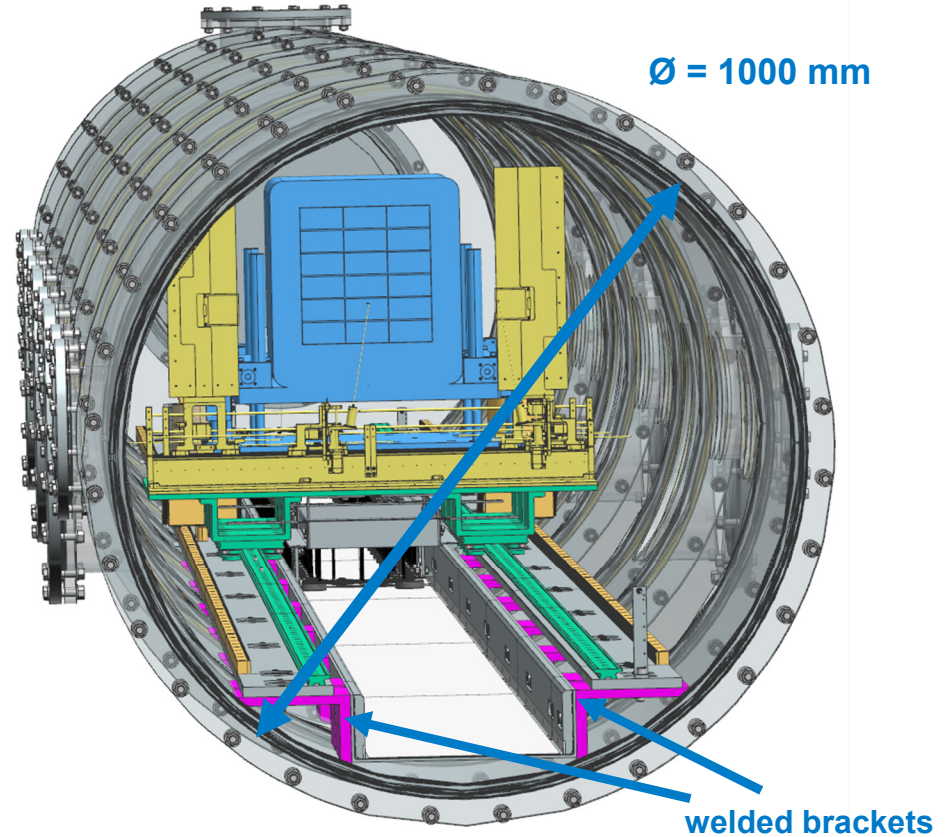
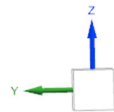
- Aluminum-profile-frame (Rose+Krieger)
- Tube Support:  
manufactured by  
Aluminum



# SAXS-Tube

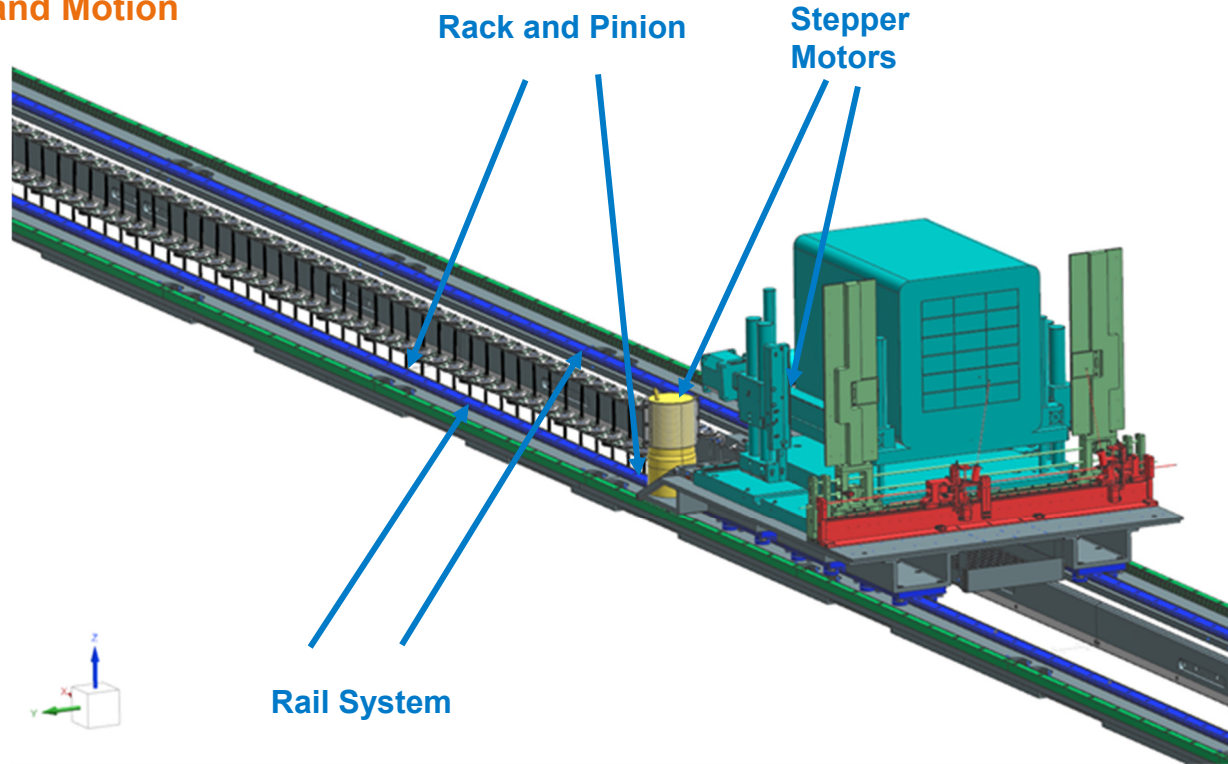
## Components

- Tube-diameter: 1000 mm
- Wall thickness: 15mm
- Material: Stainless Steel (1.4301)



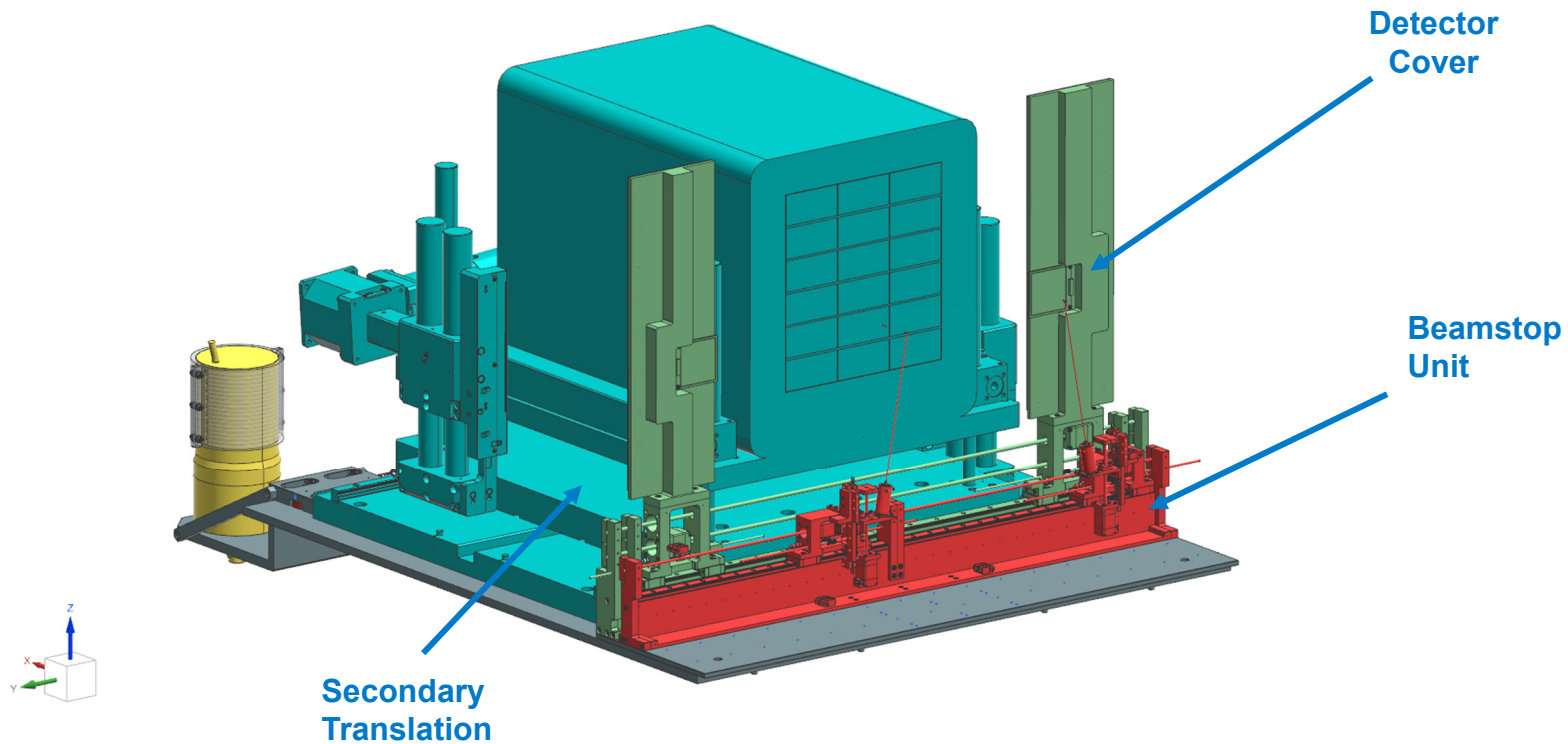
# SAXS-Tube

## Rail system and Motion



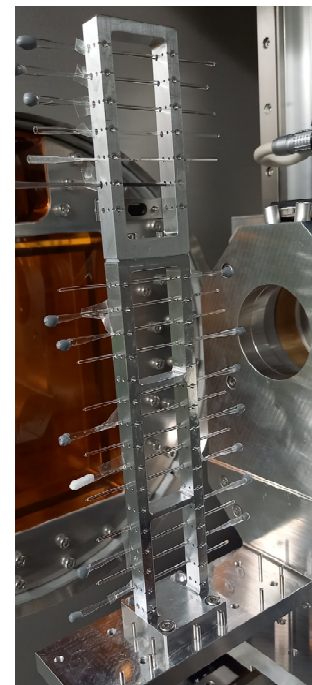
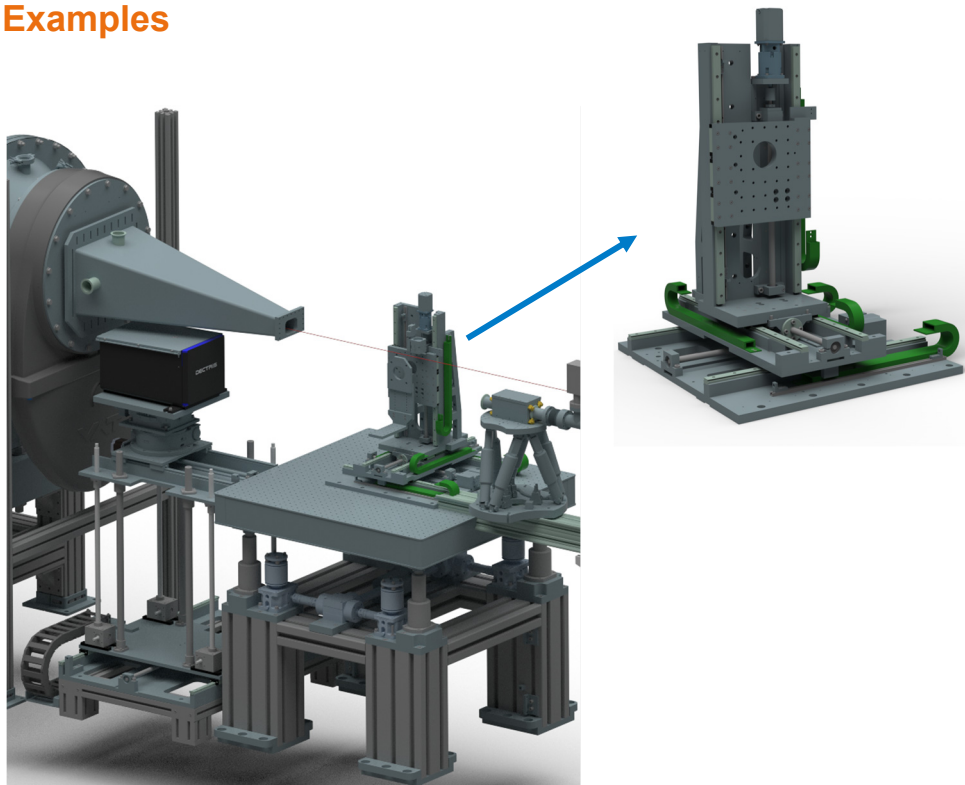
# SAXS-Tube

## Secondary translation, densimet cover and Beamstops



# Experimental Environment

## Examples

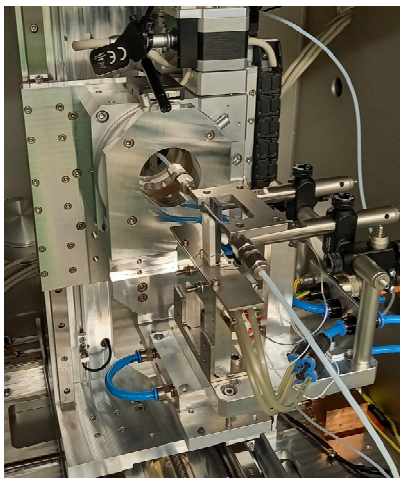




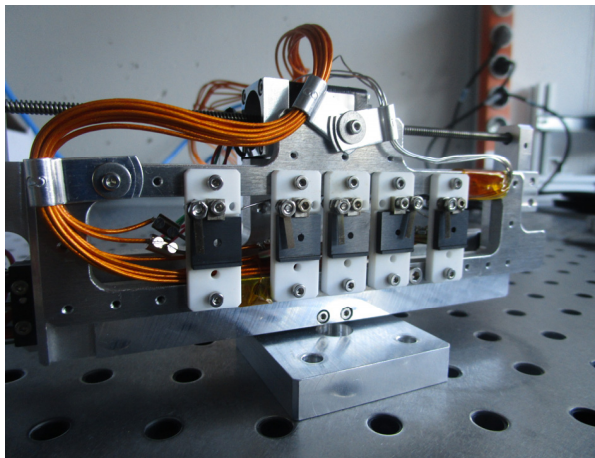
# Experimental Environment

## Examples

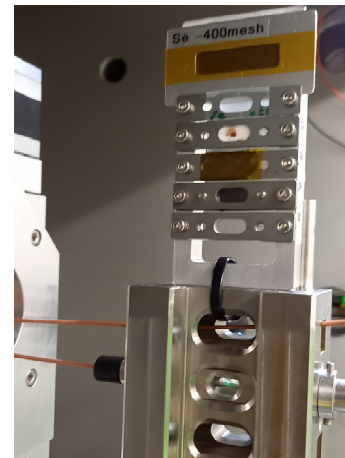
Capillary heater up to  
1000°C with gas flow  
connected



5 individual heaters up to 600°C  
(solid samples)



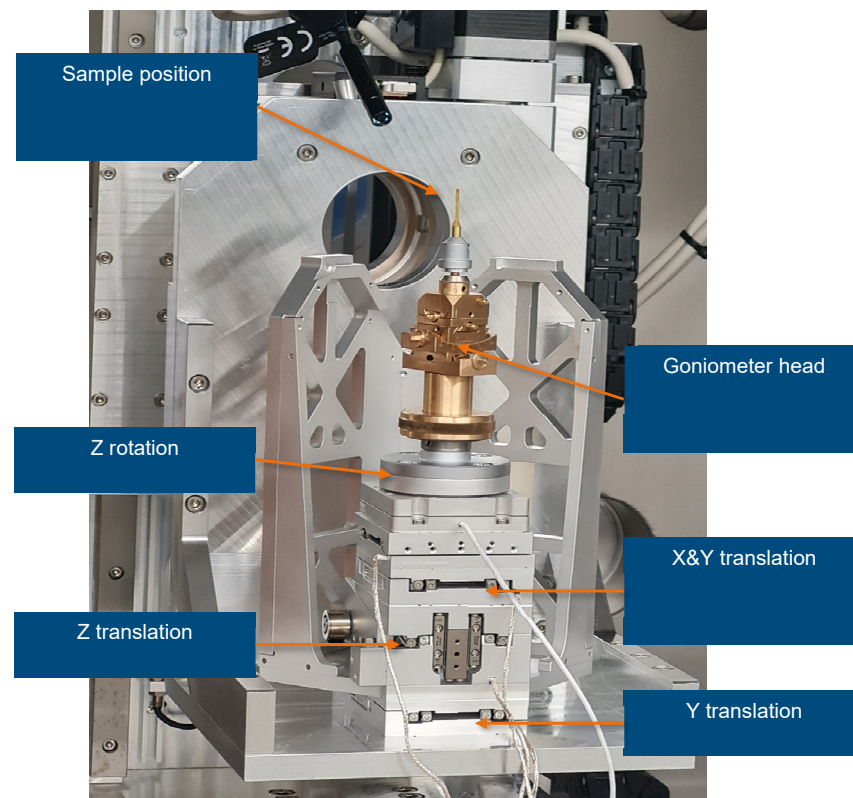
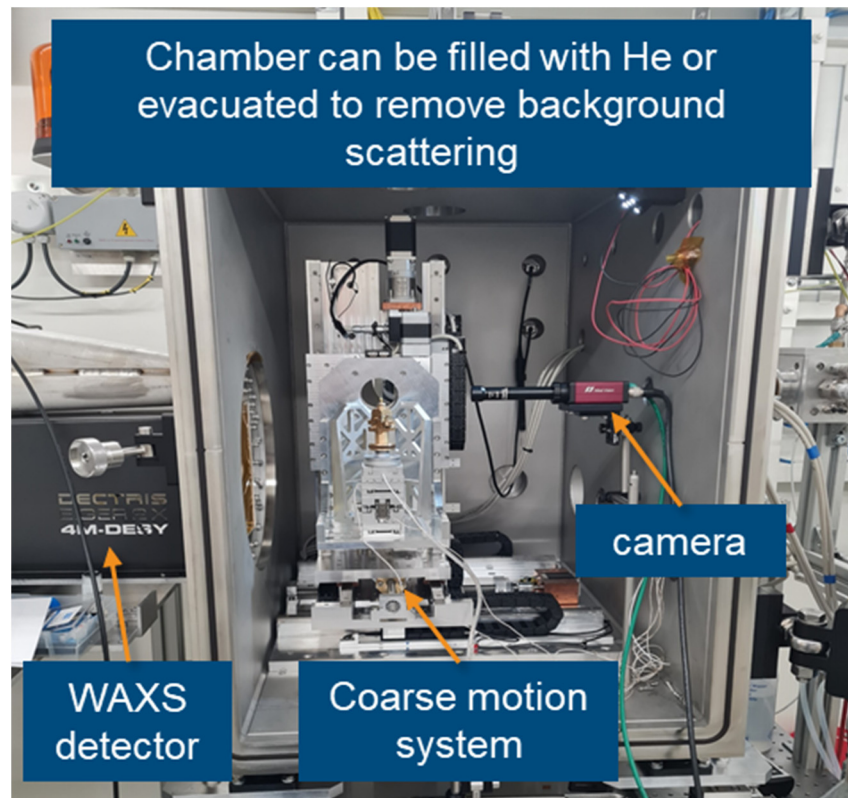
Flow through cell with temperature  
control up to 80°C





# Experimental Environment

## SAXS/WAXS – tensor tomography setup

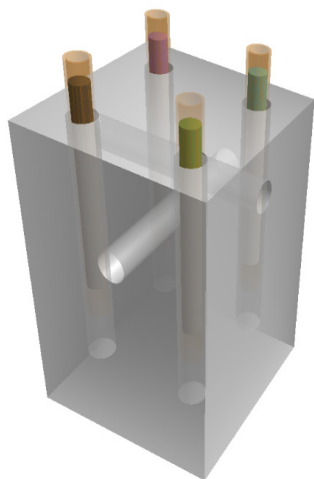


# Results

## SAXS-CT of a phantom sample to improve the reconstructions and analysis pipelines



Kapton tubes filled with samples (Ø 0.2 mm)

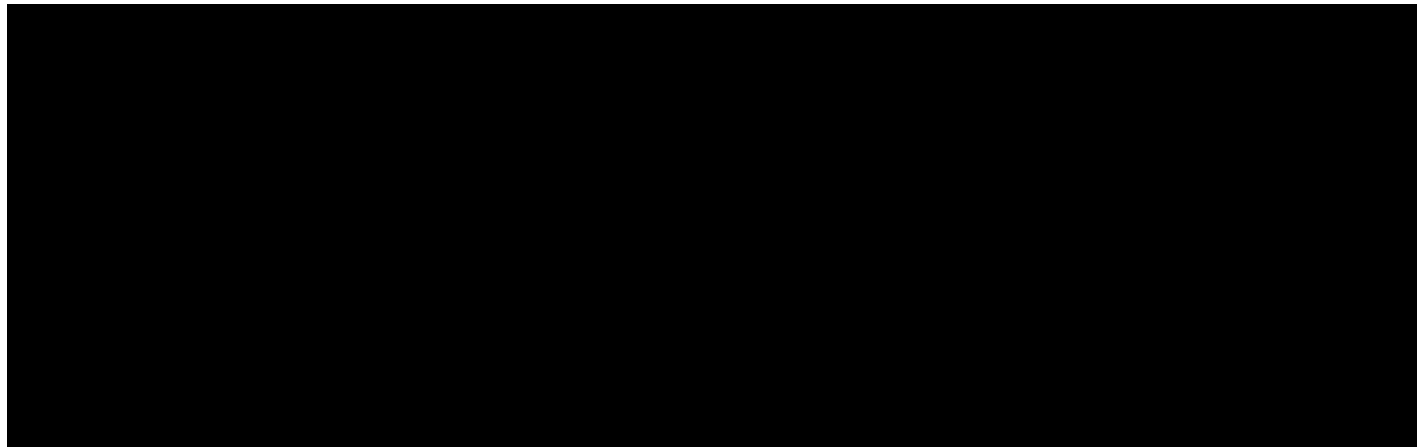


A: Silica NP's    B: collagen  
C: ZnO NP's    D: empty  
E/F: carbon fibers

Transmission

SAXS

WAXS



# Thank you!



**SAXSMAT team:**

Sylvio Haas  
Andre Conceição  
Xiao Sun

**All groups at  
DESY**

Contact:  
[saskia.pfeffer@desy.de](mailto:saskia.pfeffer@desy.de)