

# NCD-SWEET Beamline Upgrade

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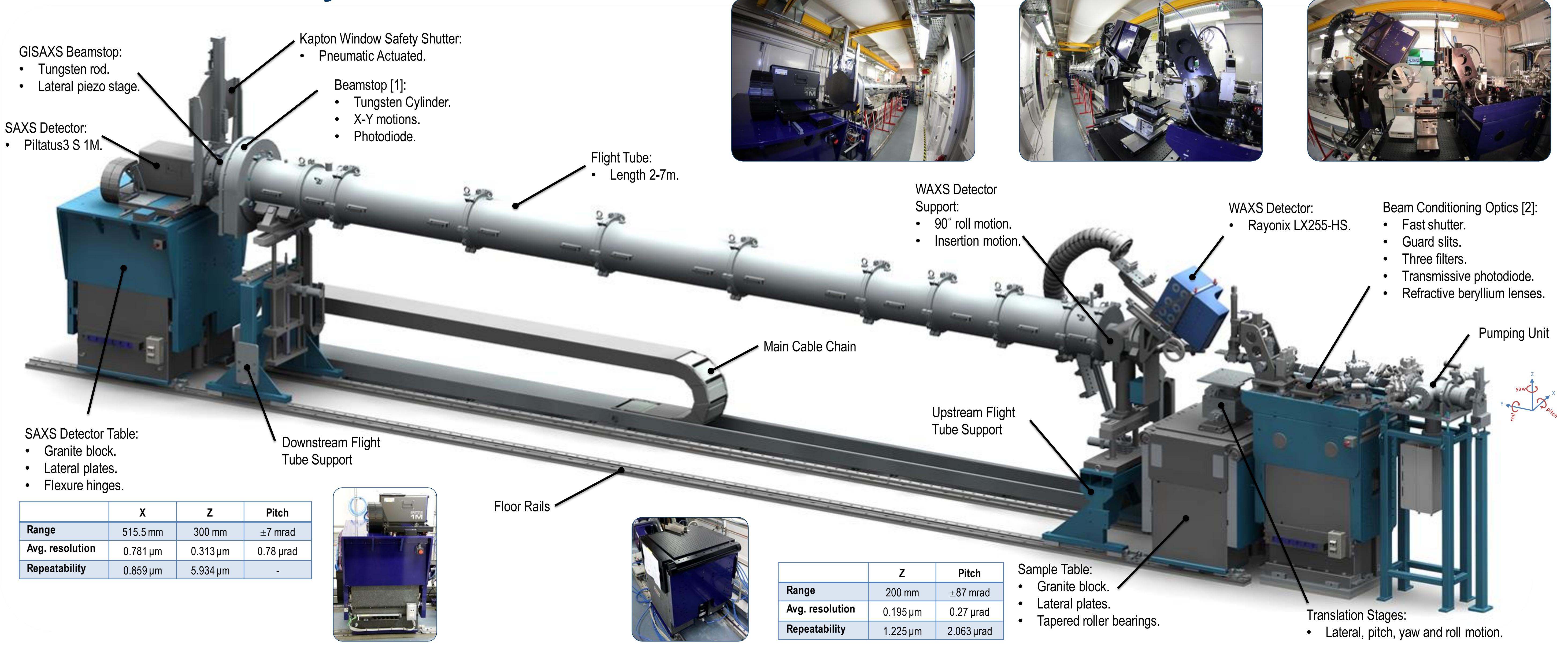
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## Abstract

The SAXS/WAXS Experimental End Station (NCD-SWEET) at ALBA Synchrotron has undergone major improvements in three main areas, beam performance, SAXS detector data quality and beamline operability, in order to perform state-of-the-art SAXS/WAXS experiments. A new channel-cut monochromator system has improved the beam quality and stability, with current vibration amplitudes under 1% of the beam size. Two sets of refractive beryllium lenses have been installed for focussing the beam. One of the sets allows to microfocus the beam size. Besides this, the former SAXS CCD detector has been replaced by a single-photon counting pixel detector, a Pilatus3 S 1M. In the end

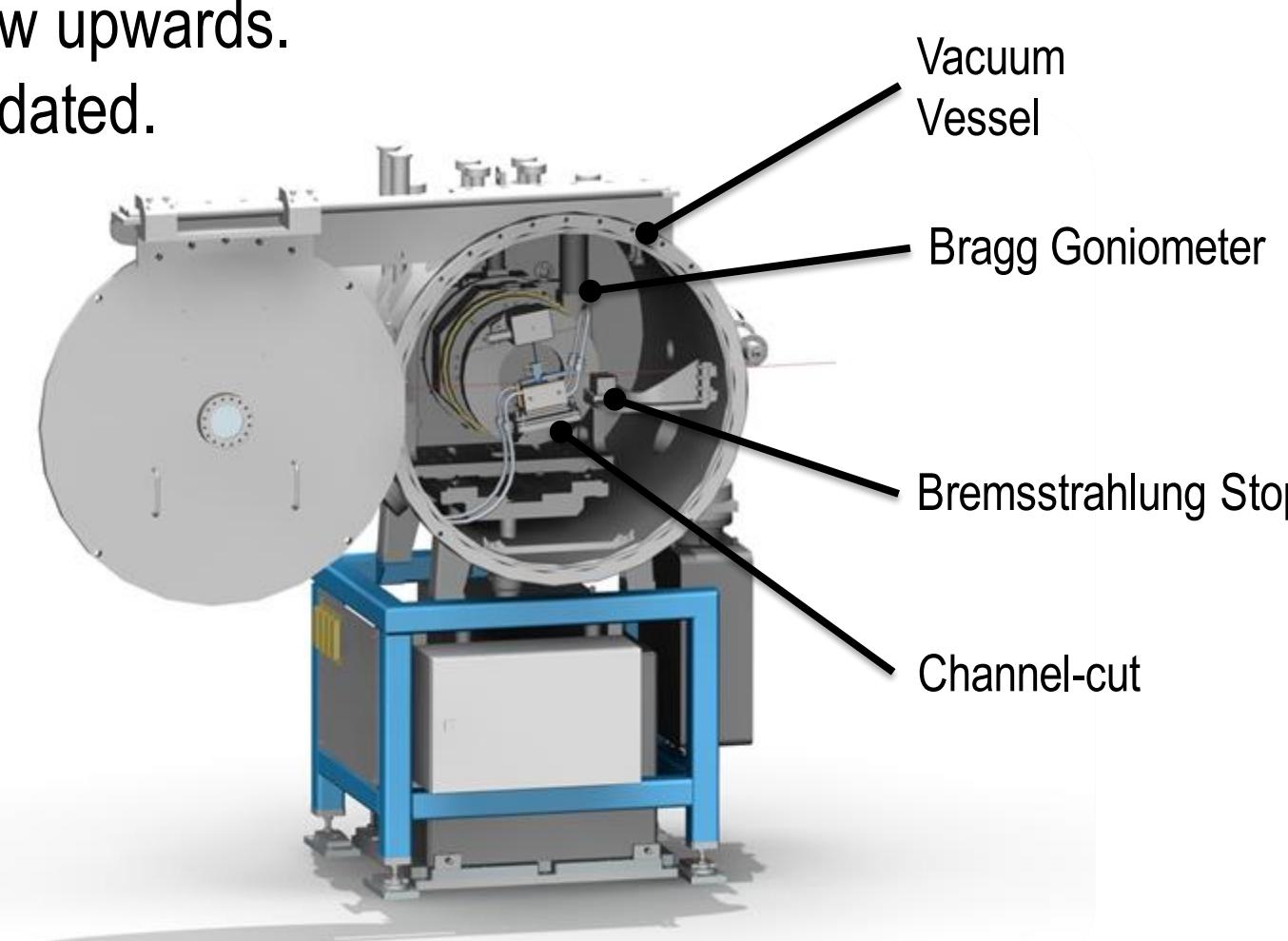
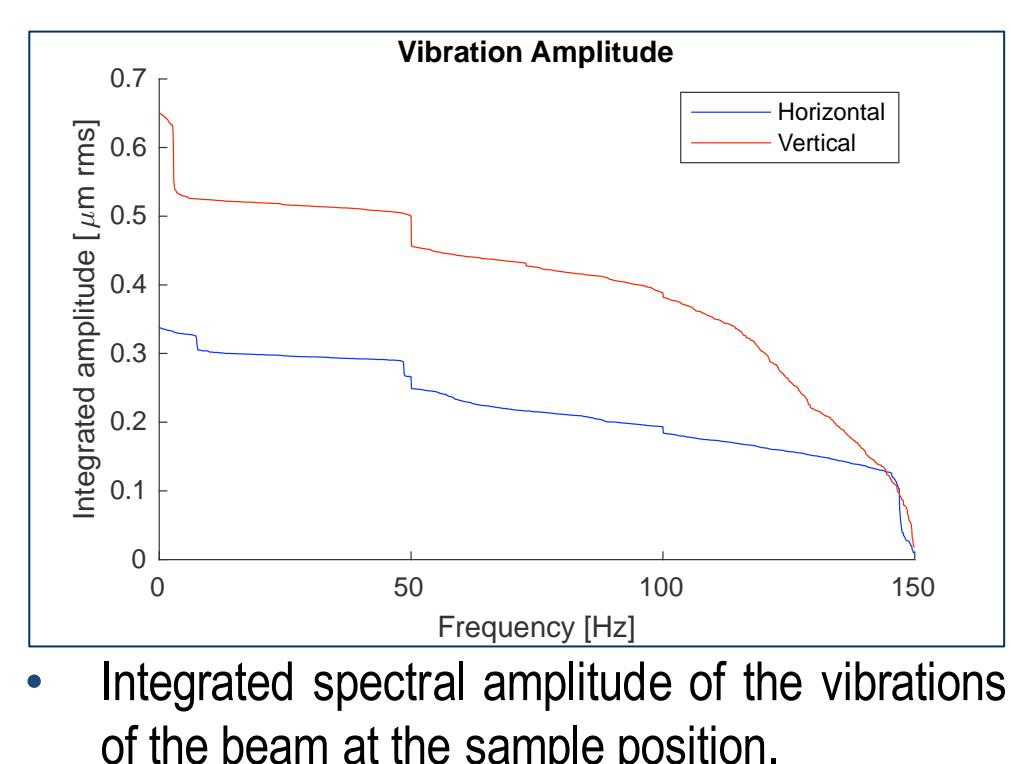
station, a full re-design of the mechanical elements with sub-micron resolution movements together with the installation of new equipment has been completed, resulting in an improved beamline configuration, and a faster and safer rearrangement of the flight tube length. New upgraded configuration also allows for GISAXS experiments. Finally, other auxiliary improvements have been done in areas like radiation protection, air conditioning, health and safety, cable management, electronics and control.

## End Station Layout

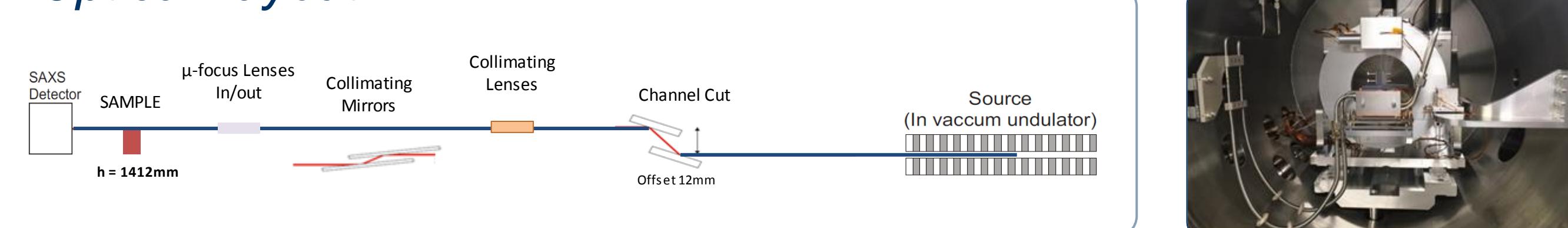


## Channel-cut Monochromator

- A channel-cut mechanism replaced a former DCM monochromator.
- Beam path downstream of monochromator is now upwards.
- Some radiation protection shielding elements updated.



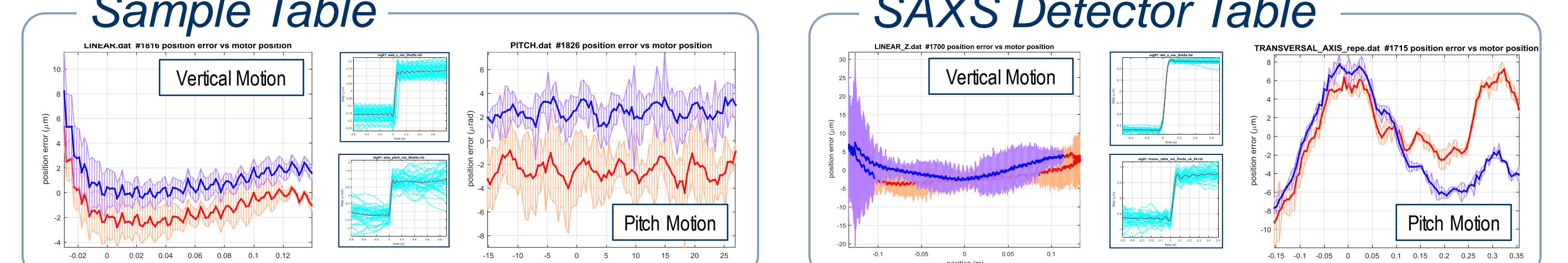
### Optical Layout



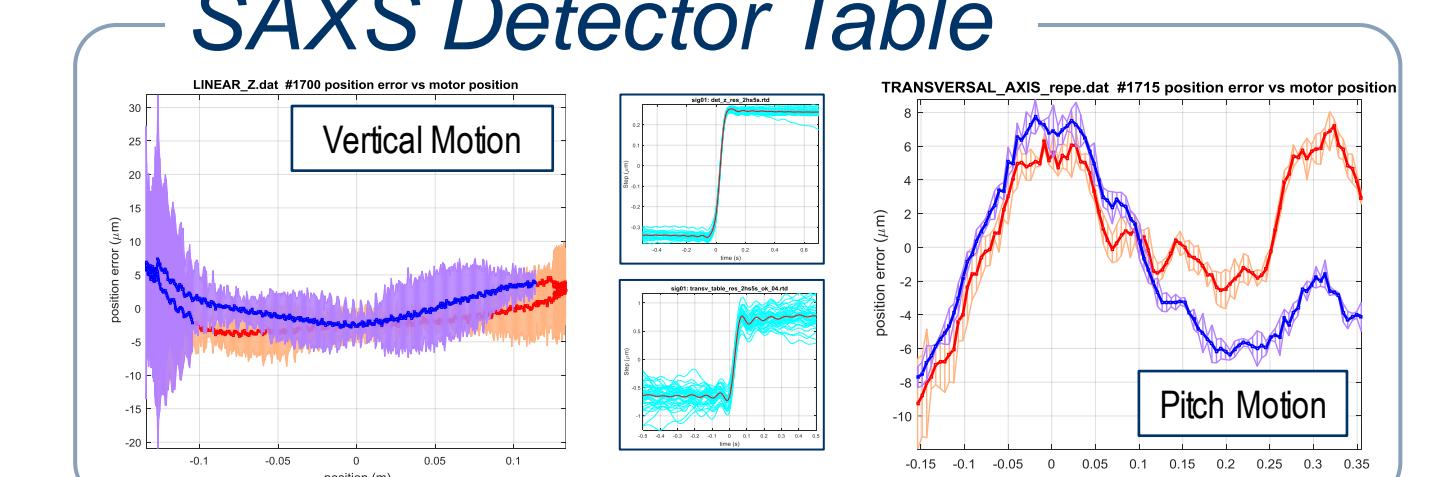
## Metrology Tests

- Position error vs motor position measured with a Renishaw ML10 interferometer in open loop.
- Resolution tests in dynamic mode performed to test the mechanical response of the system to the minimum achievable step size.

### Sample Table

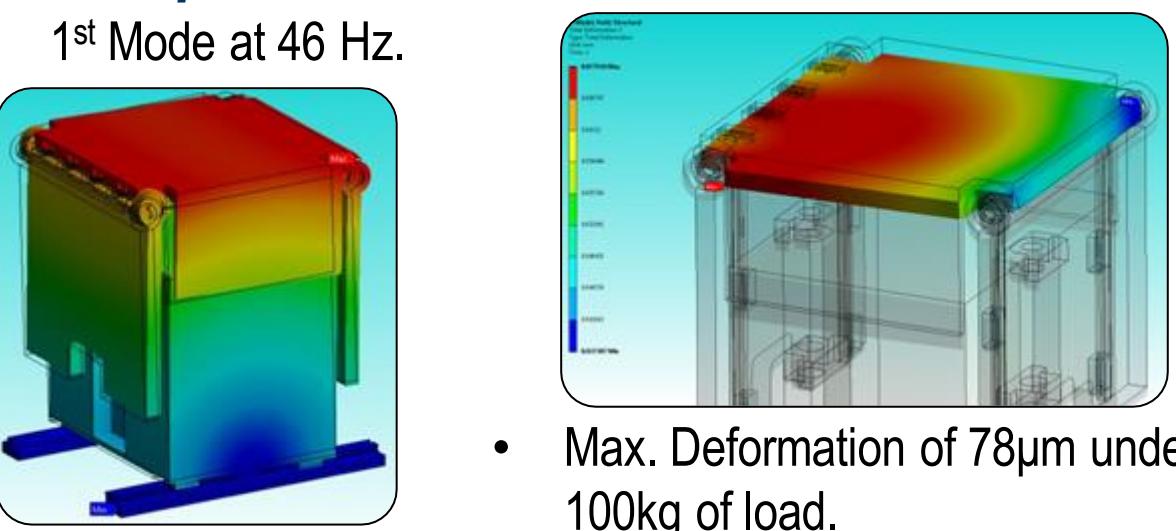


### SAXS Detector Table

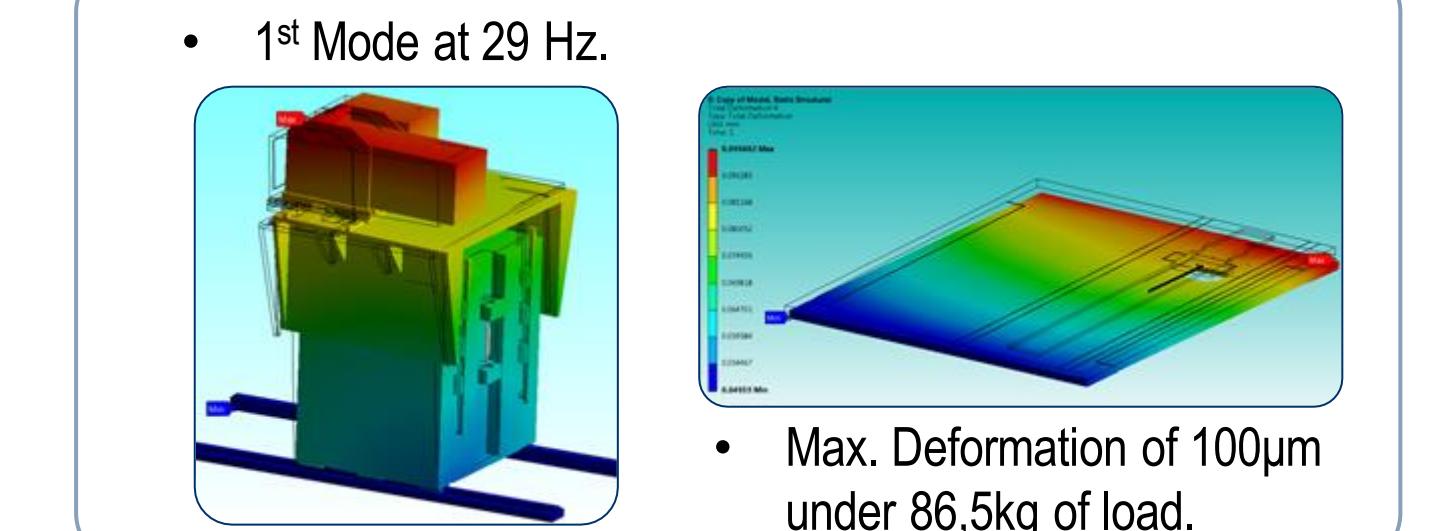


## FEA Simulations

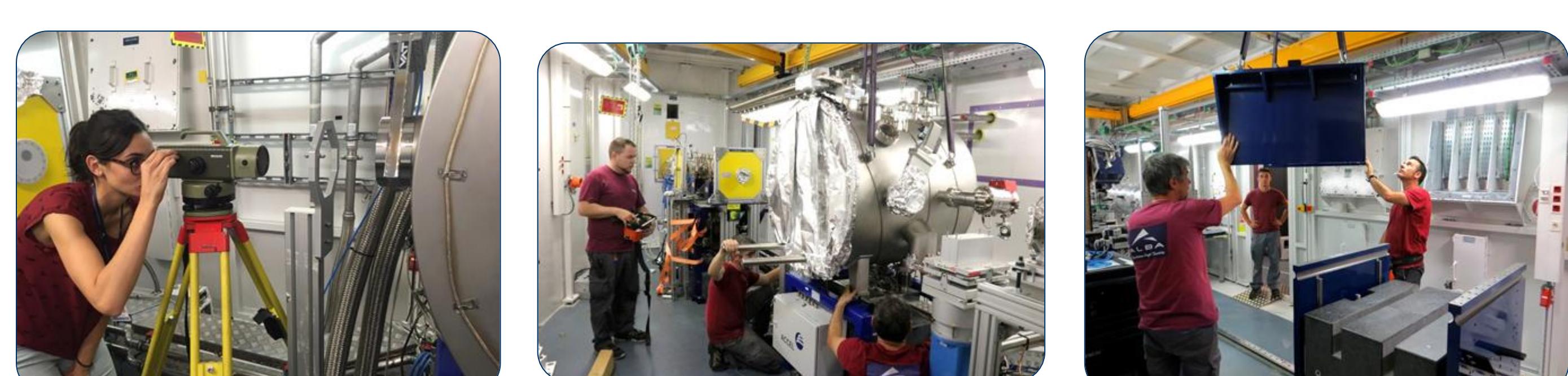
### Sample Table



### SAXS Detector Table



## Installation



## Auxiliary Projects

### Cryogenics

- Cryocooler outside of Optics Hutch.



### Cable Chain

- Main cable chain in the End Station.



### HVAC

- Air sock distribution controls uniformity of temperature.



[1] J. González et al., "Two-rotation Mechanism for an in Vacuum Beamstop", in Proc MEDSI'16, Barcelona, Spain, September 2016, pp. 378-380, doi:10.18429/JACoW-MEDSI2016-WEPE40.

[2] N. González et al., "Beam Conditioning Optics at the ALBA NCD-SWEET Beamline", presented at MEDSI'18, Paris, France, June 2018, paper THPH14.