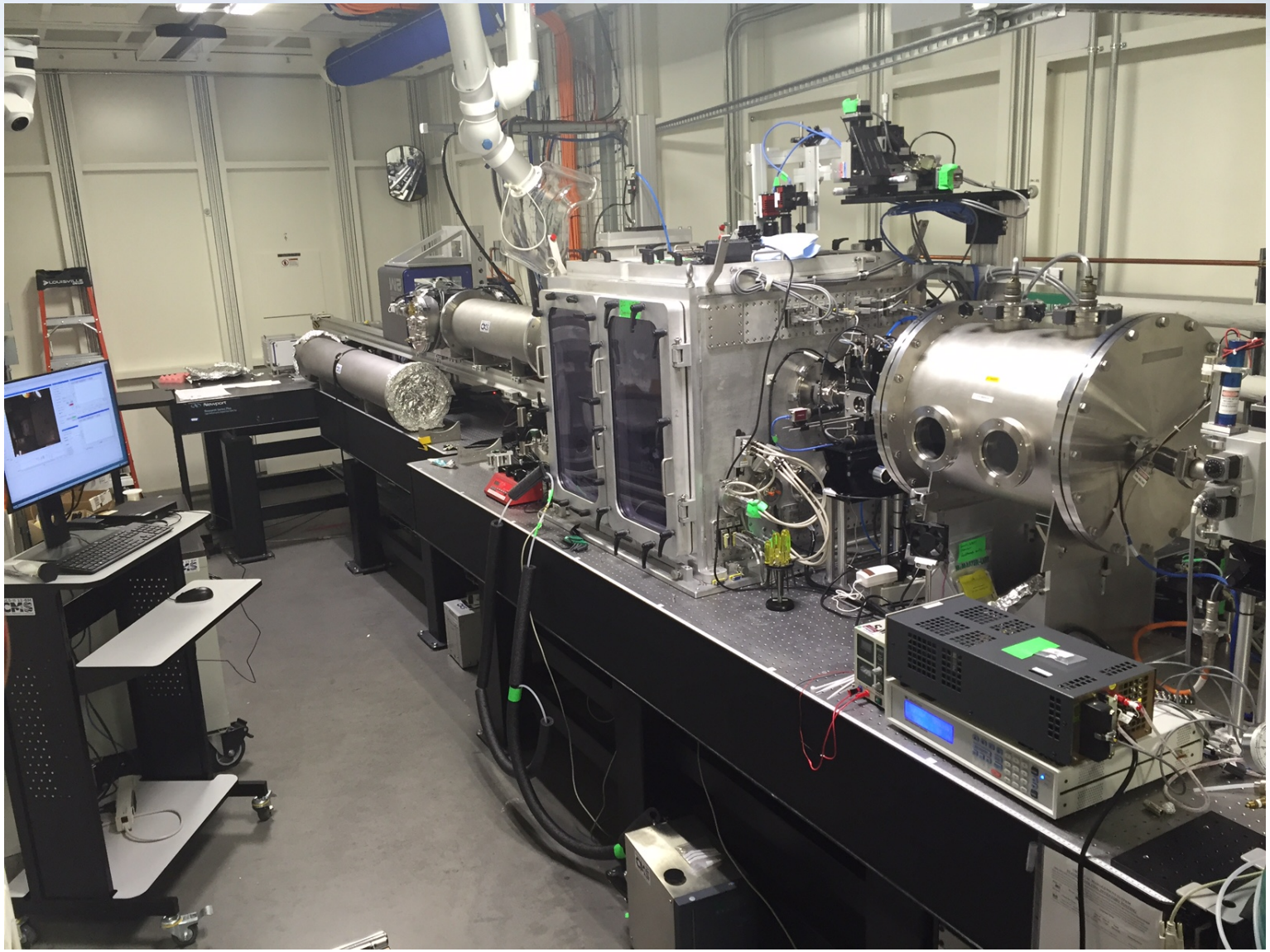
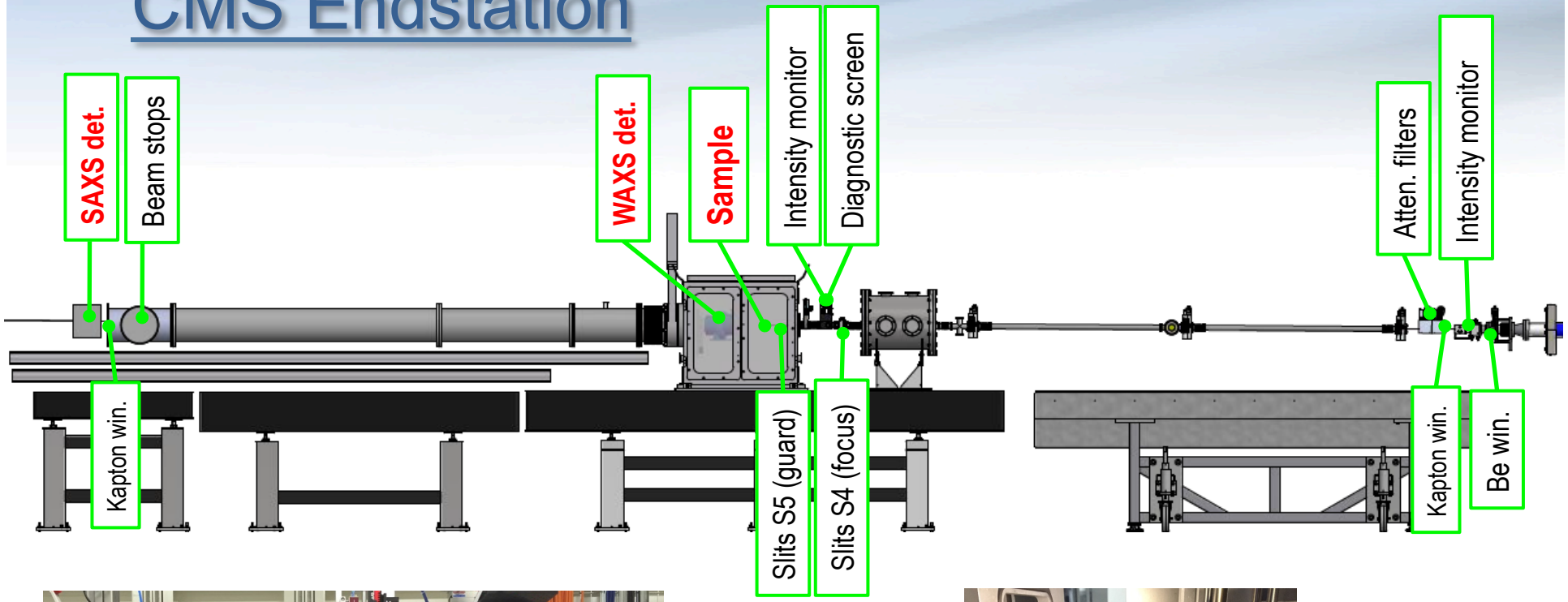
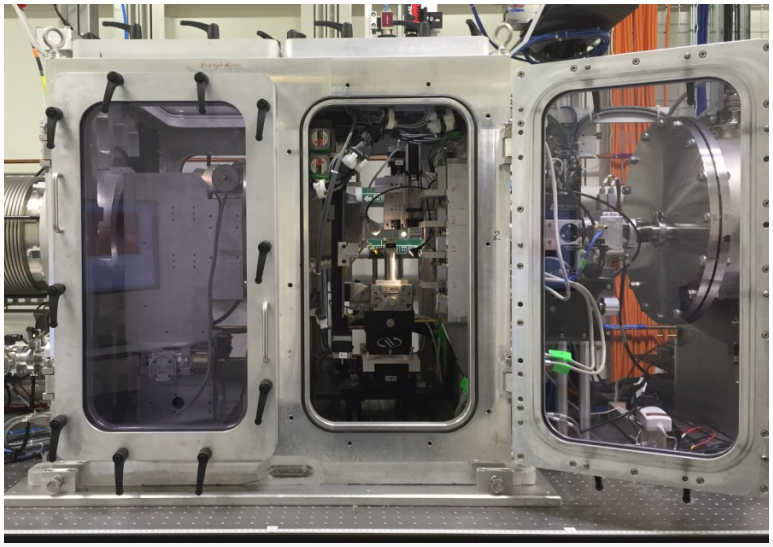
CMS Endstation

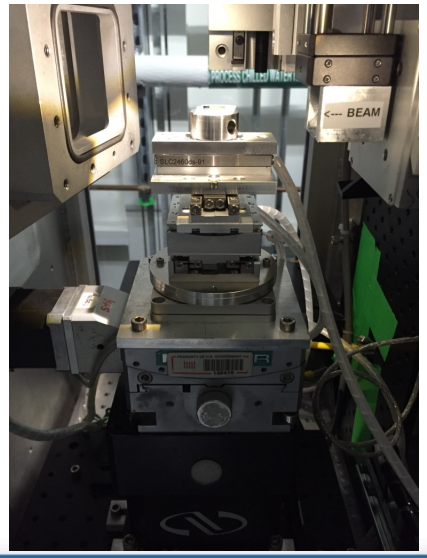


CMS Endstation



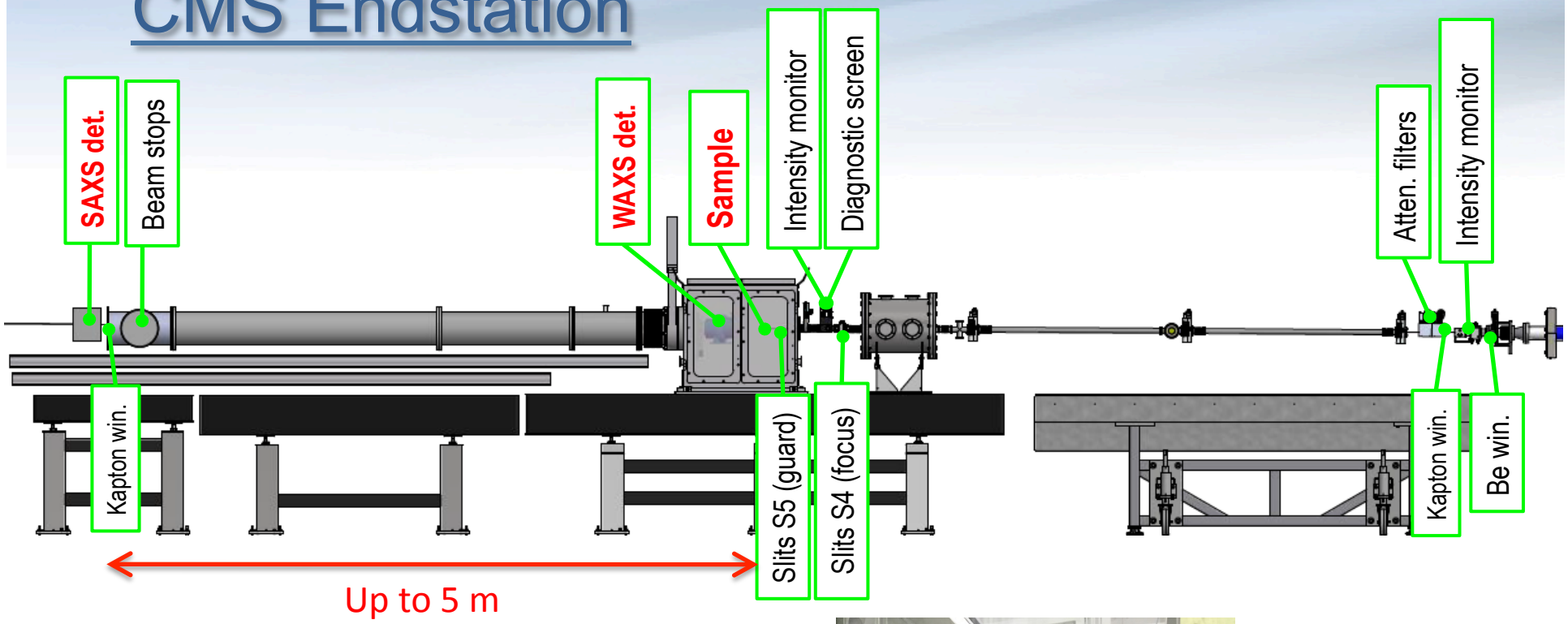


Upstream sample compartment can be **in air/gas or *under vacuum*** → Background reduction for weakly scattering systems



Computer-controlled sample stages for positioning and orientation

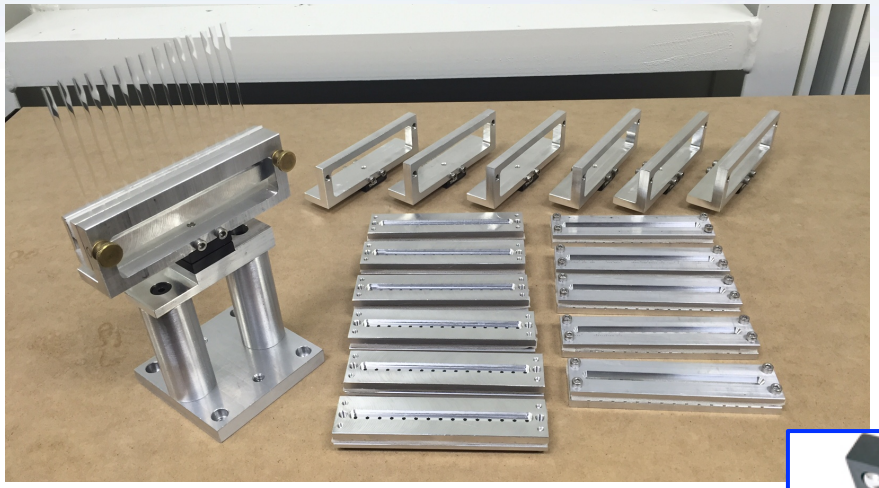
CMS Endstation



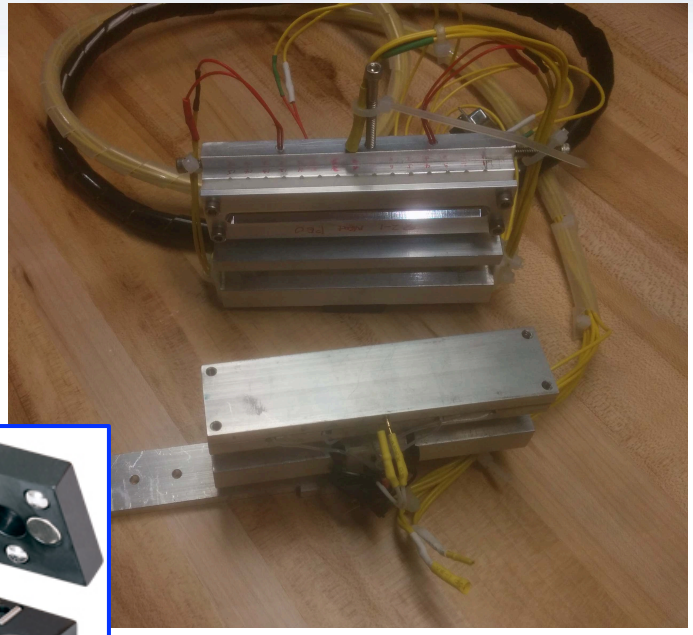
SAXS: Pilatus 2M on XY stages

WAXS: In-vacuum CCD, as viewed from back side

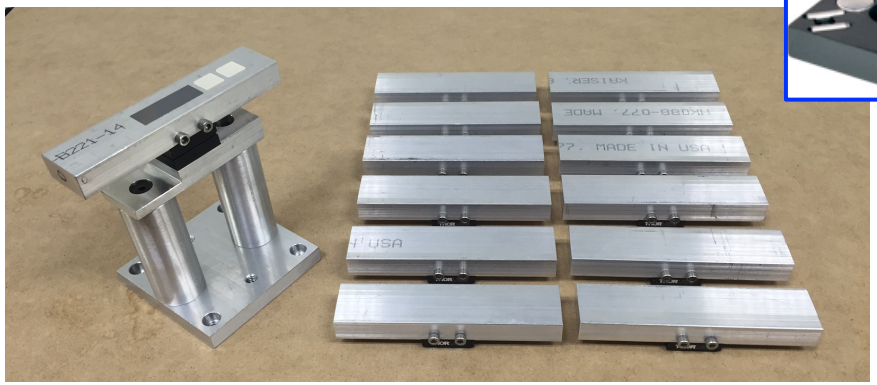
Standard ex-situ and in-situ thermal annealing sample holders for multiple capillaries and thin-film substrates



Ex-situ capillary holders for SAXS/WAXS (15 capillaries per holder)



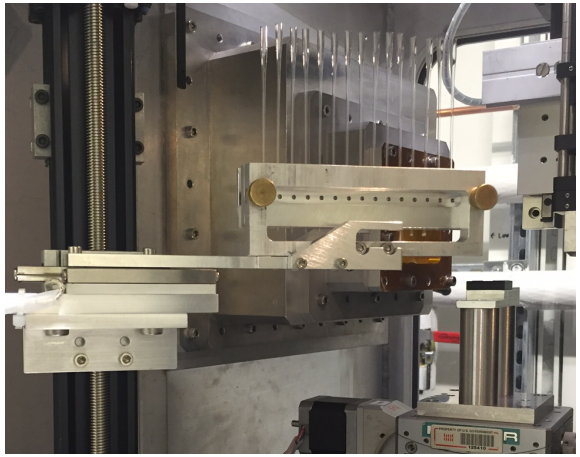
In-situ thermal annealing versions of capillary holders (top, tested to 80 °C in air) and thin-film substrate holders (bottom, tested to 220 °C in vacuum).



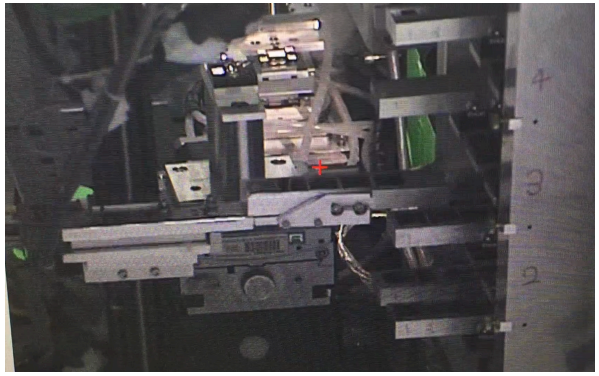
Ex-situ thin-film substrate holders for GISAXS/ GIWAXS (~10 substrates per holder)

Sample exchanger and garage for ex-situ sample holders inside sample chamber

→ air- and vacuum-compatible



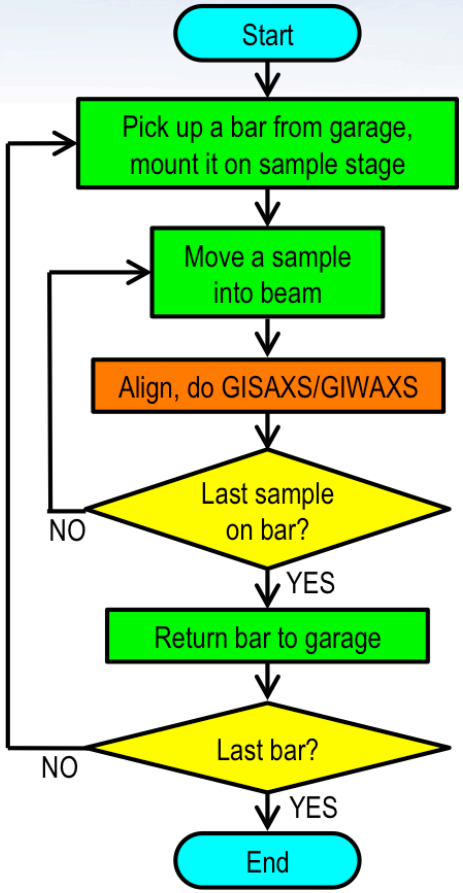
Capillary holder on sample exchanger

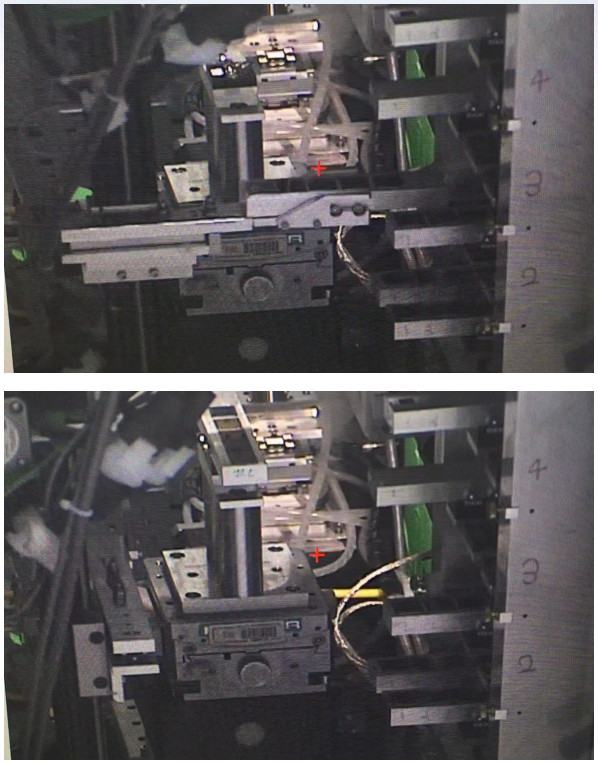


Substrate holder on sample exchanger

Sample exchanger (left) and garage (right) inside sample chamber

Robotic sample exchanger





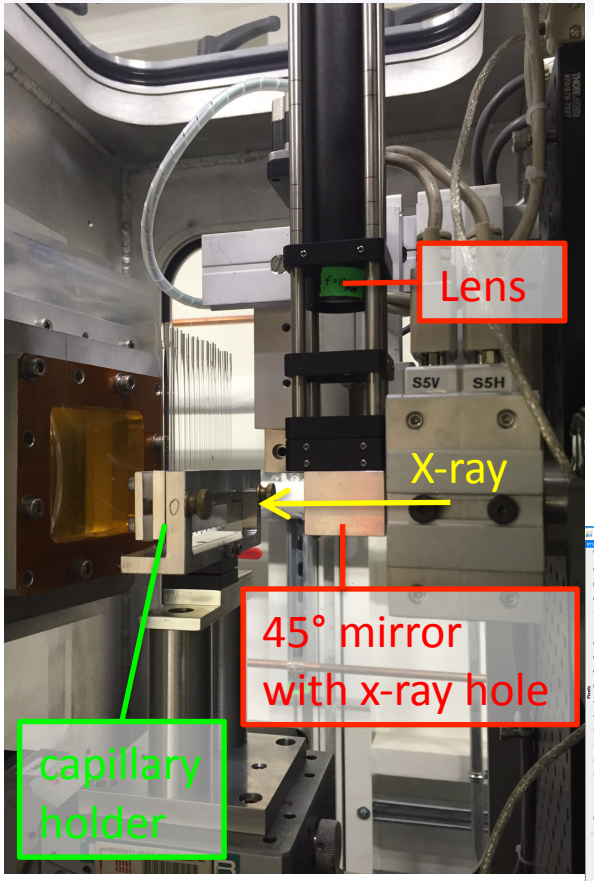
A bar containing multiple samples is picked up from a garage and mounted on sample stage

sample chamber

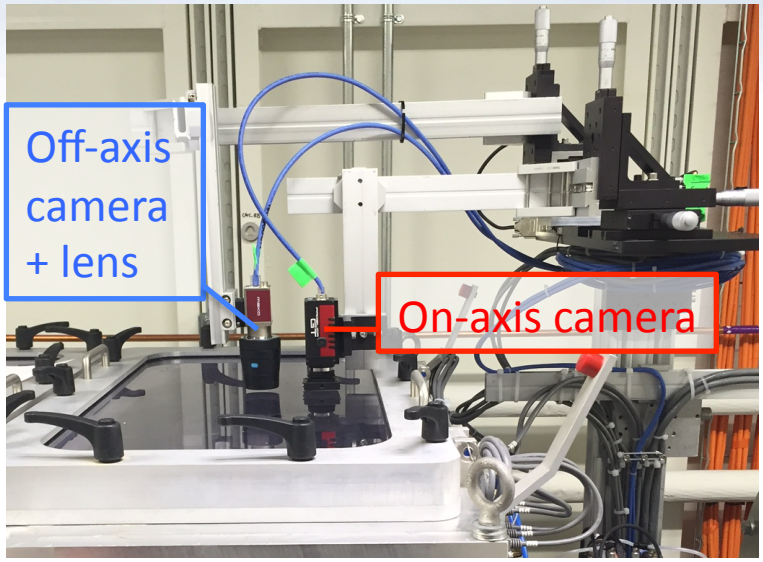
Polymer thin film-coated substrates on bar

- Successfully used in GISAXS/GIWAXS measurements on a series of polymer thin films under vacuum (to minimize background scattering)
- Fully automated from start to end, via Bluesky (Python front end for EPICS control)
- No need to open/close hutch or vent/re-evacuate chamber between samples

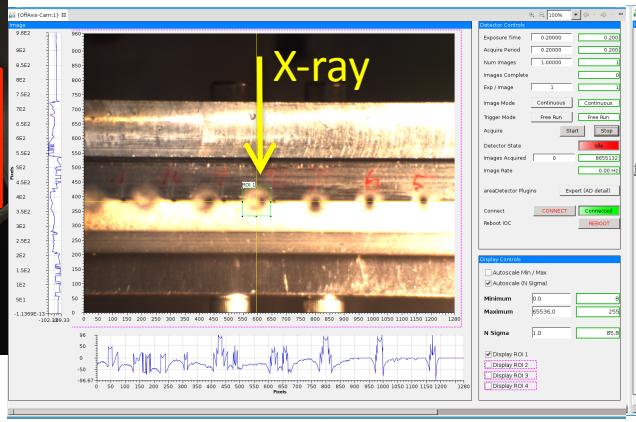
Simultaneous on-axis and off-axis sample viewing



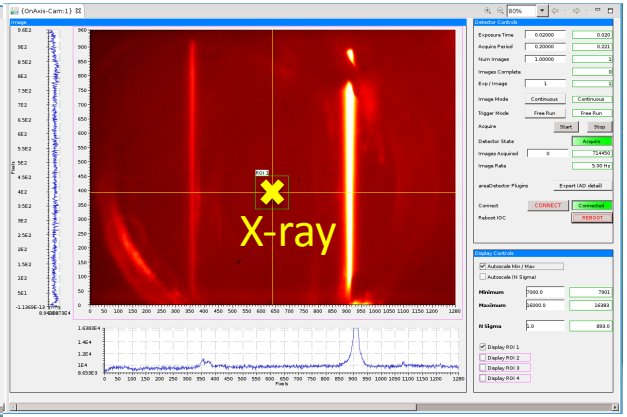
Inside sample chamber



Above sample chamber



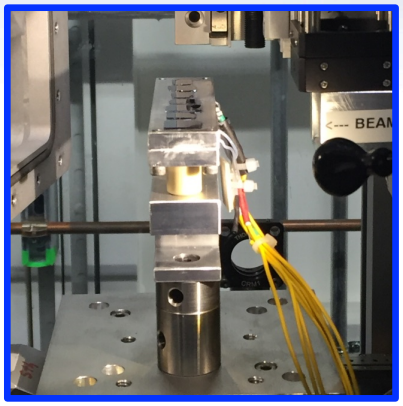
Off-axis/top view of capillary holder



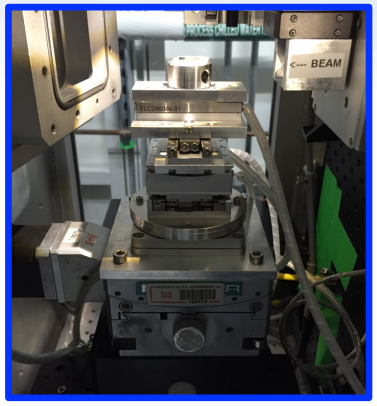
On-axis view of a capillary (1 mm dia.)

Examples of sample setups used by users

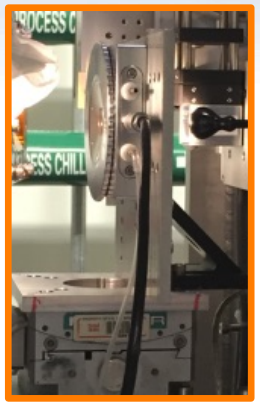
Beamline-developed/commercial/user-developed

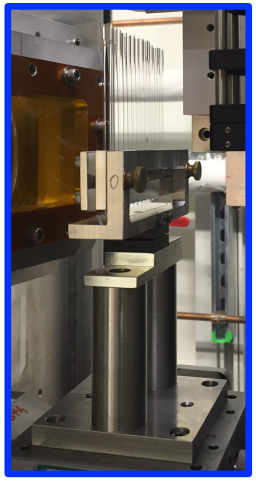
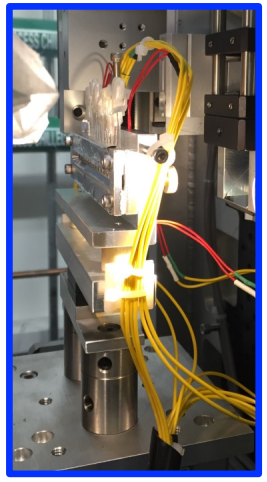
Ex-situ & in-situ T-annealing thin-film bar



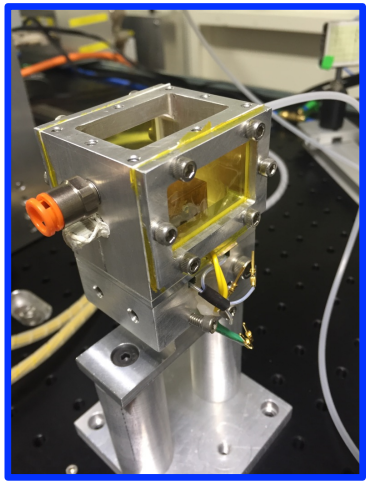
Sample rotation/mapping (CD-SAXS, GISAXS tomo)




Linkam hot stage (HFSX350) & tensile stage (TST350); Instec hot stage (HCS 402)

Ex-situ & in-situ T-annealing capillary holder



Solvent annealing cell for polymer thin films

Electro-spray deposition cell for block copolymers [Osuji group, Yale U.]