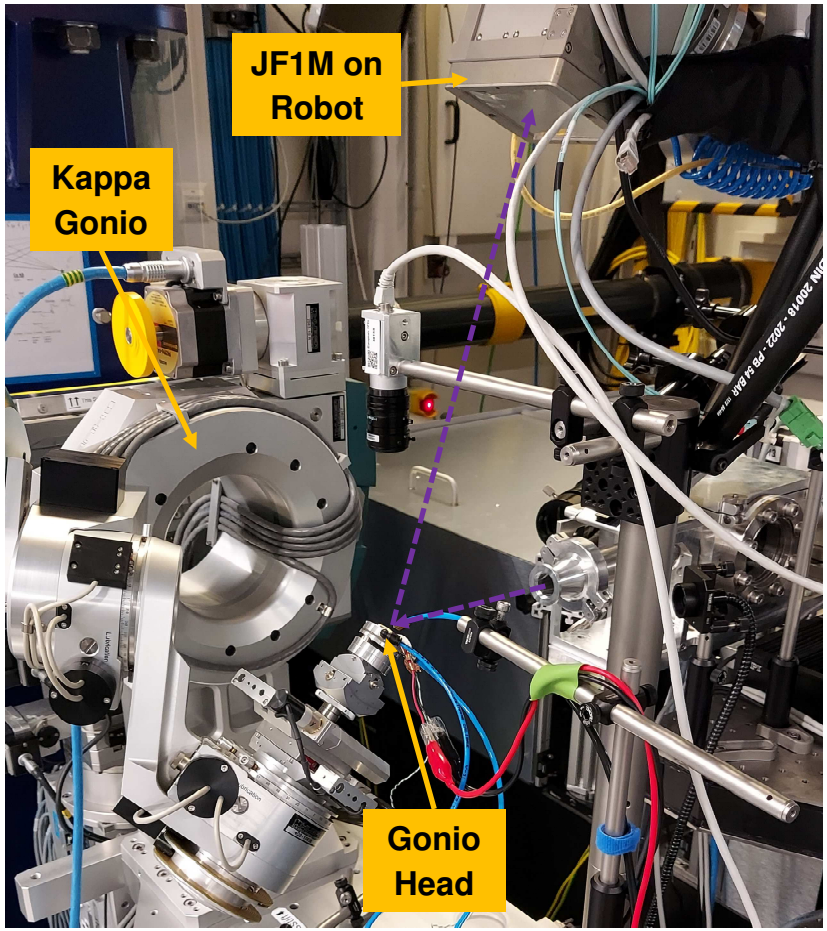
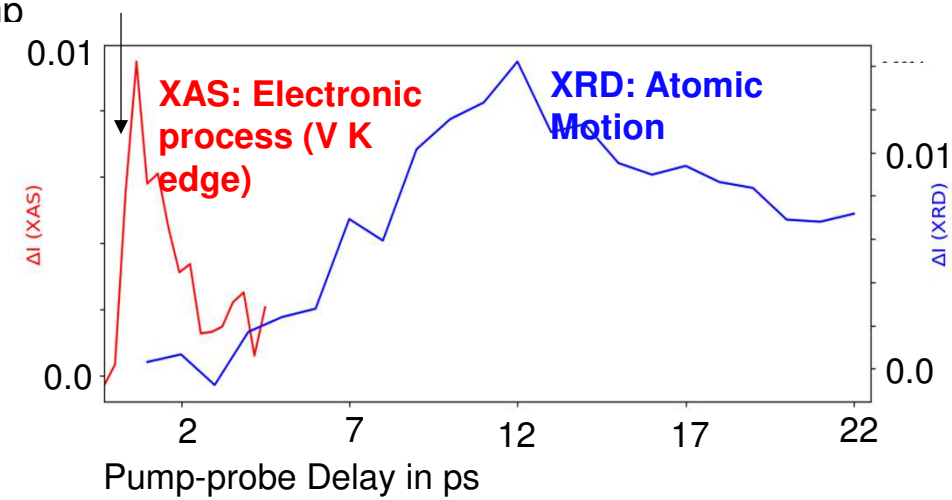
FXE instrument summary:
Solid State Sample Environments and –Techniques for grazing incidence experiments

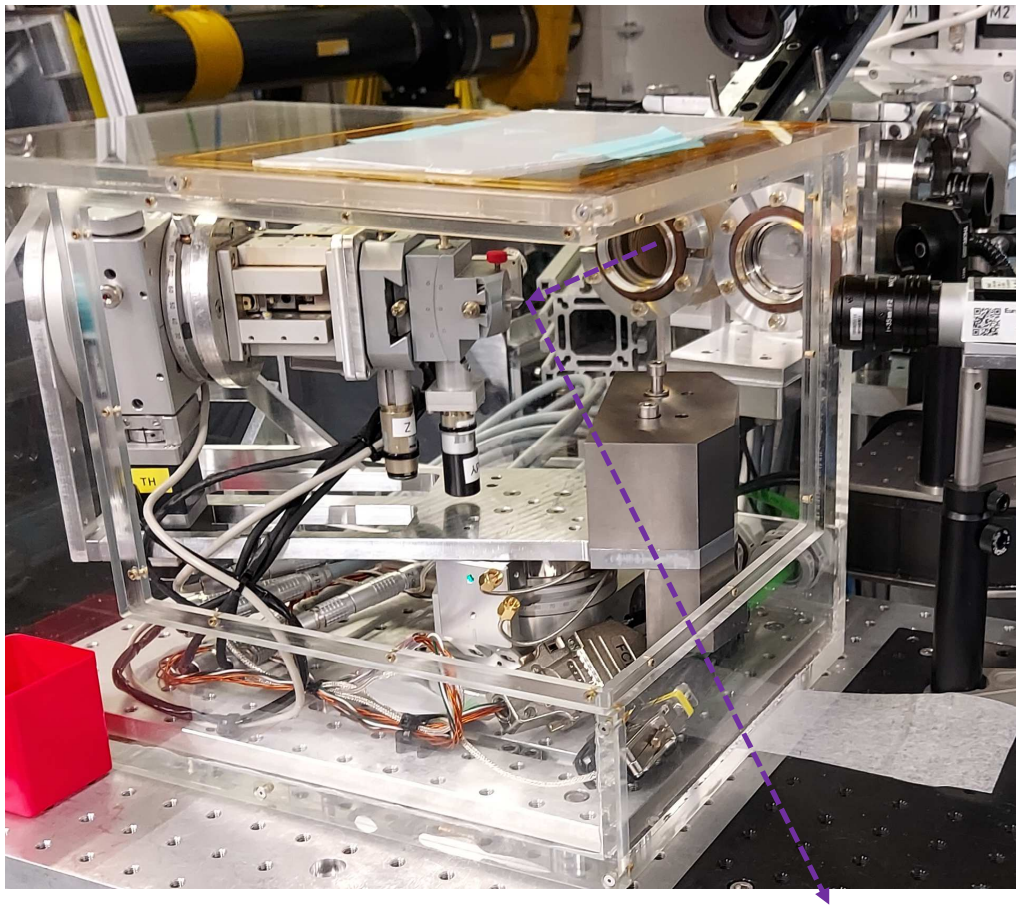
Standard Setup: Kappa Goniometer for Simultaneous XRD & XAS/XES



- Diffraction angles 2θ from 0-160°, radius up to 0.6 m
  - Sample orientation from grazing incidence to -exit
- s- or p-polarized diffraction
- Can be combined with either Johan or von Hamos spectrometer (if $E_{ph,\ emission}$ > ~8 keV)
- JF1M dictates train structure: 16 pulses @ 94 kHz
- Sample microscopes along 3 axes
- Cryo-blower as an option
- Colinear pump

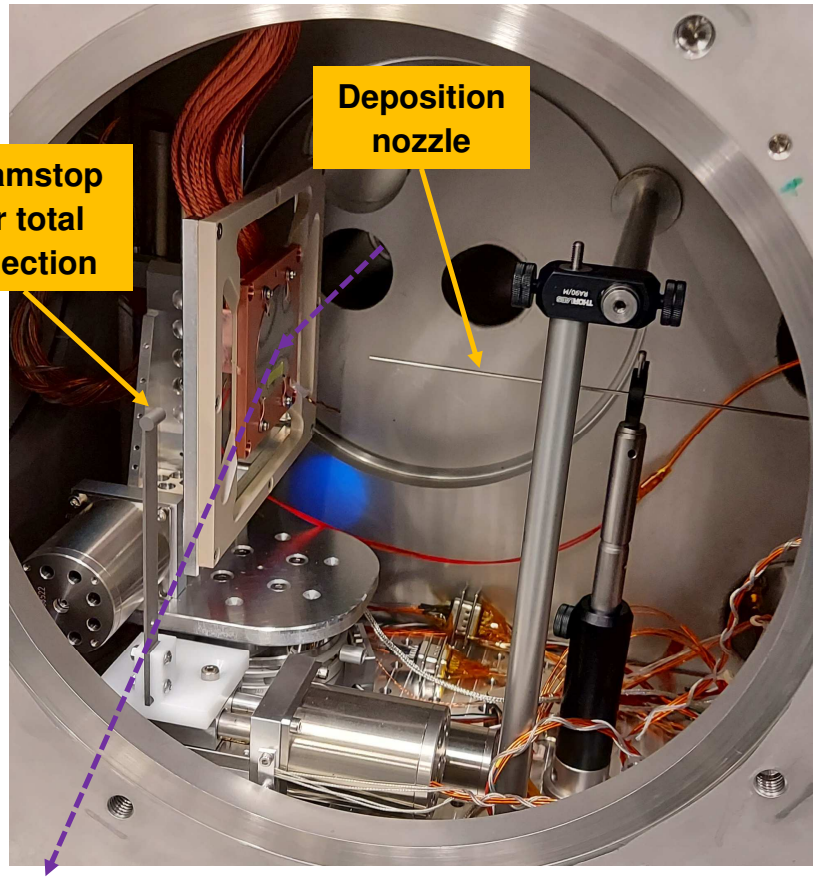


Standard Setup: Helium Goniometer for Simultaneous XRD & XAS/XES



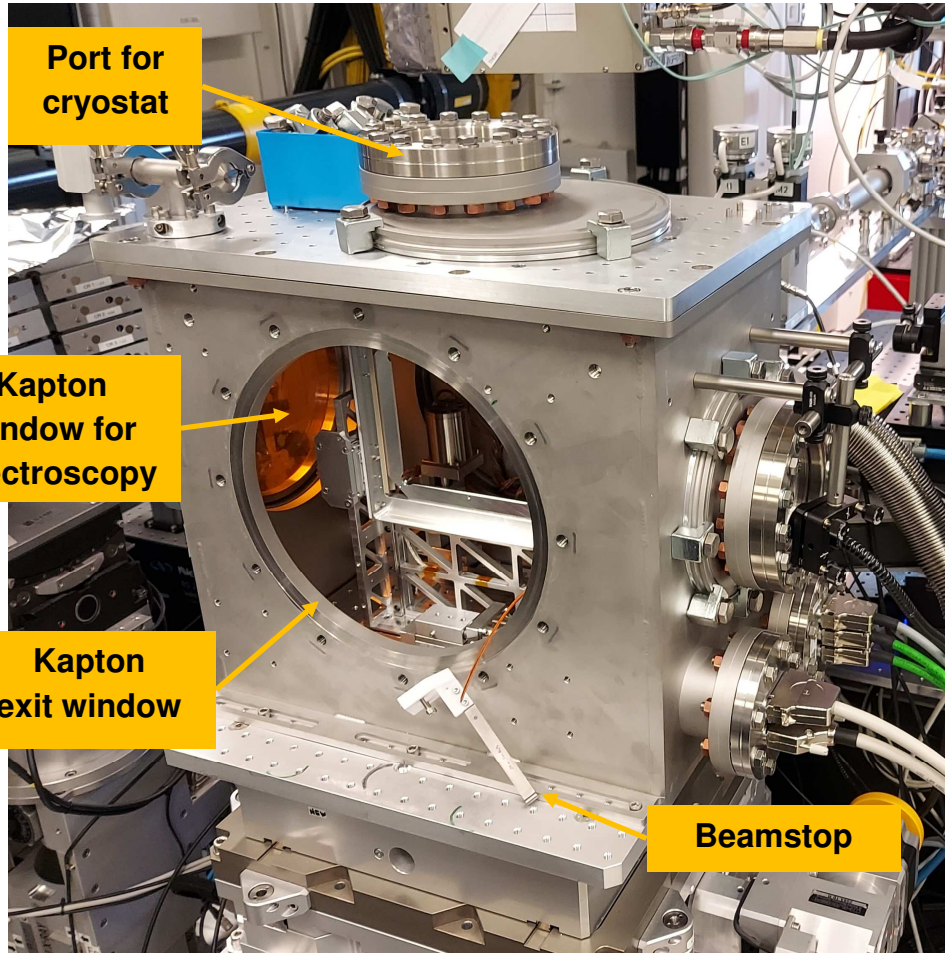
- Mostly in combination with spectroscopy at <~8 keV
- Diffraction angles 2θ from 0 to ~60°
  - p-polarized diffraction only (at present)
  - s-polarized diffraction gives better stability
- Can be combined with von Hamos spectrometer or TFY detection
  - He path available for $E_{ph,\ emission}$ > ~5 keV
- JF1M or LPD
- Colinear pump
- Sample microscopes along 2 axes
- No option for PAM (currently)

Custom Setup: Grazing Incidence XRD at cryo temperatures



- Ideal for low-background grazing incidence measurements (up to θ ~10°)
- 2θ limited by window geometry to ~60° (10A^{-1} at 20 keV)
- Cryogenic sample holder (100 K to 400 K)
  - Option for in-situ deposition (to be provided by users)
  - Large sample translation range (in case of damage)
- Colinear pump
- Sample microscope along 1 axis
- No option for PAM (currently)

Standard Setup: Vacuum Chamber for Transmission-mode XRD

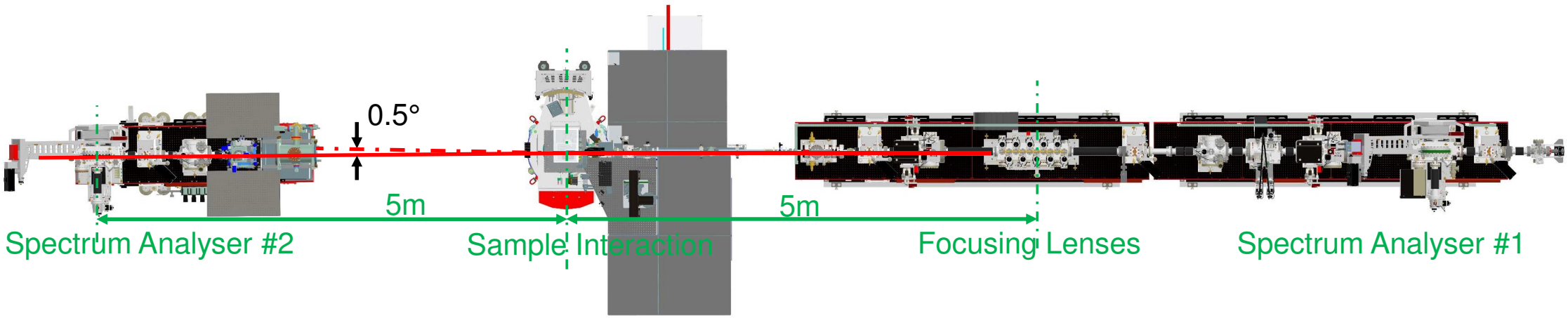


- Ideal for low-background measurements
- Transmission mode scattering using LPD (or JF1M)
- 2θ limited by window geometry to ~50° (8A^{-1} at 20 keV)
- Usually single shot (one pump-probe event per sample spot)
  - Sample scanner* with absolute encoders
  - Scan speed of 1 Hz (limited by Karabo/Karabacon)
- Colinear pump
- Sample microscope along 1 axis
- No option for PAM (currently)

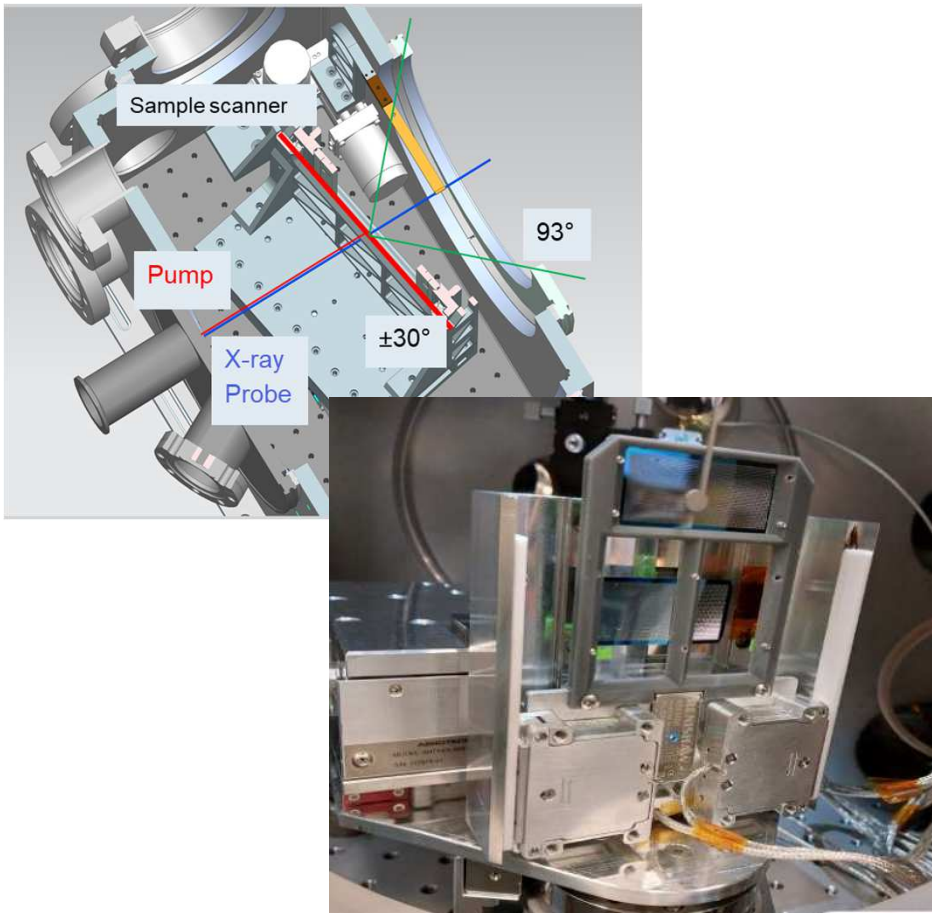
*Sample scanner developed by SEC group

Potential future option: Transmission-mode XAS in grazing incidence

- Using pink beam ➔ efficient data collection (and high resolution)
- Mount thin film sample on goniometer,
  - Total reflection from the (denser) substrate can yield long transmission path
- Yet to be tested (homogeneity of X-ray spectrum?)



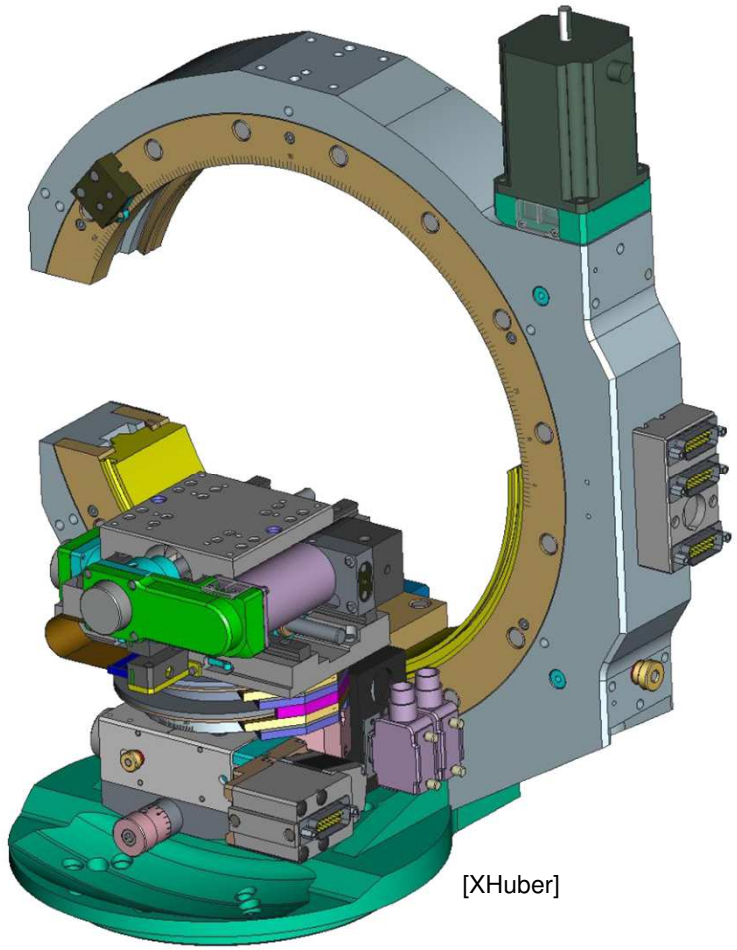
Custom Setup: Transmission-mode scattering with rotation (Xtras RnD)



- Shorter range xy sample scanner*
- Rotation angles +/-30° for epitaxial films
- Colinear pump
- Sample microscope along 1 axis
- No option for PAM (currently)

*Sample scanner developed by SEC group

Foreseen: Helium/Vac compatible Euler goniometer with T-control option



[XHuber]

- Goal: overcome the limited angle of incidence when using Helium sample environment
- Design ongoing with Huber and Kohzu

FXE: Operation Envelope

- Photon Energy 5 to 20 keV (limited by focusing optics, 23 keV limit due to coating of M3)