



Current status of MX beamlines and EIGER implementation at Photon Factory

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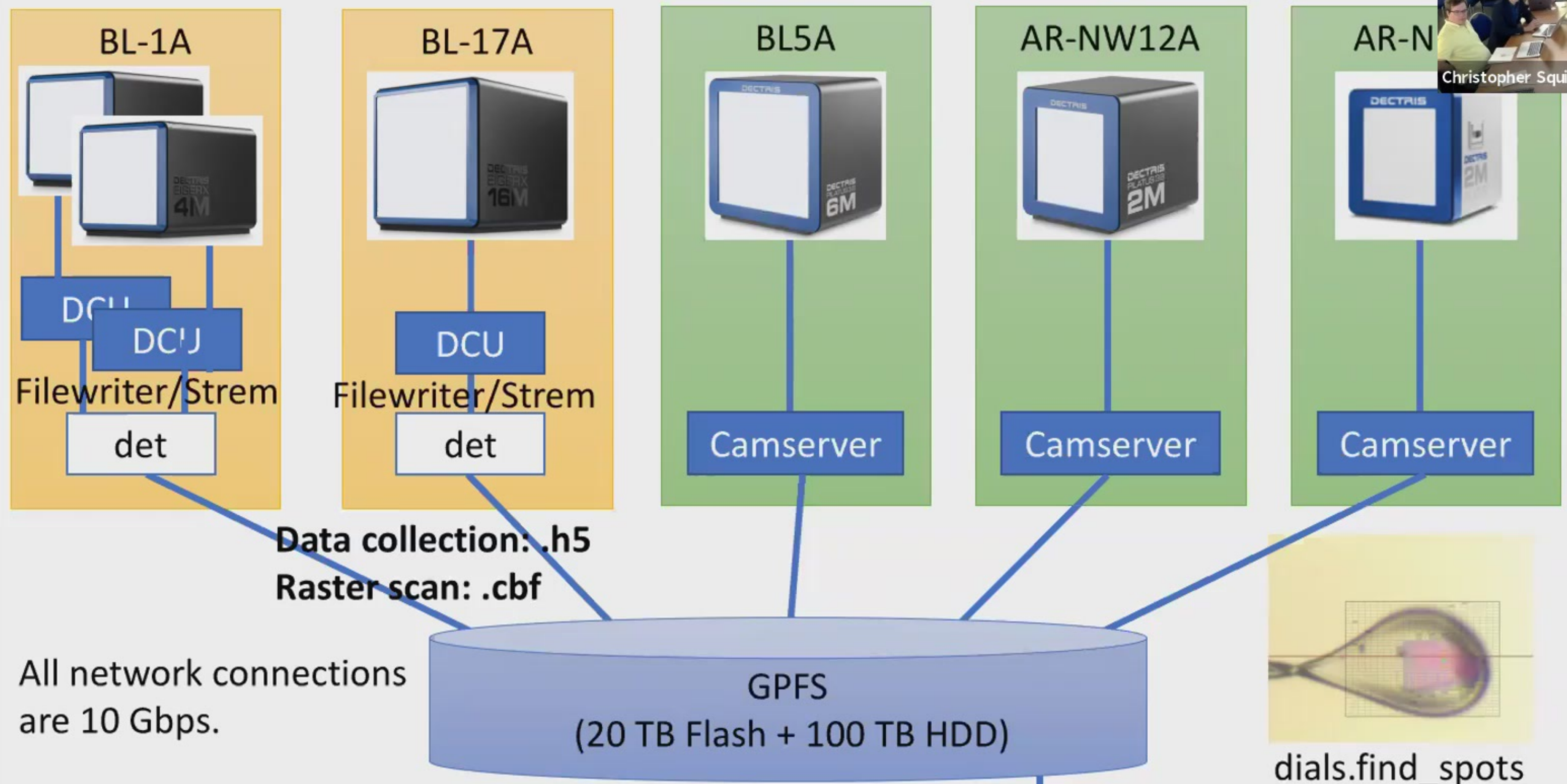
MX beamlines at Photon Factory



	Small beam		High-throughput		
Beamline	BL-1A	BL-17A	BL-5A	AR-NW12A	AR-NE3A
Starting year	2010	2006	2004	2003	2009
Wavelength available (Å)	0.96 - 1.1 2.7 - 3.3	0.9 - 2.2	0.75 - 1.9	0.75 - 1.9	0.75 - 1.9
Energy resolution ($\Delta E/E$)	-	2.5×10^{-4}	2.5×10^{-4}	2.5×10^{-4}	2.5×10^{-4}
Typical beam size (H x V, μm^2)	13 x 13	40 x 16	200 x 150	200 x 130	200 x 130
Photon flux (photons/sec)	0.9×10^{11} (@ 1.1 Å)	3.1×10^{11} (@ 0.98 Å)	2.0×10^{11} (@ 1.0 Å)	3.9×10^{11} (@ 1.0 Å)	1.2×10^{12} (@ 1.0 Å)
Detector	Eiger X4M (x2) (PAD)	Eiger X16M (PAD)	Pilatus3 S6M (PAD)	Pilatus3 S2M (PAD)	Pilatus 2M-F (PAD)
Detector distance (mm)	30 - 450	185 - 750	60 - 950	60 - 950	60 - 500
Detector vertical offset (mm)	-	-	0 - 150	0 - 120	0 - 150
Sample exchanger	PAM-HC	PAM	PAM	PAM	PAM
Target	Native-SAD	Native-SAD In-situ	High resolution	Spectroscopy	Fully automated



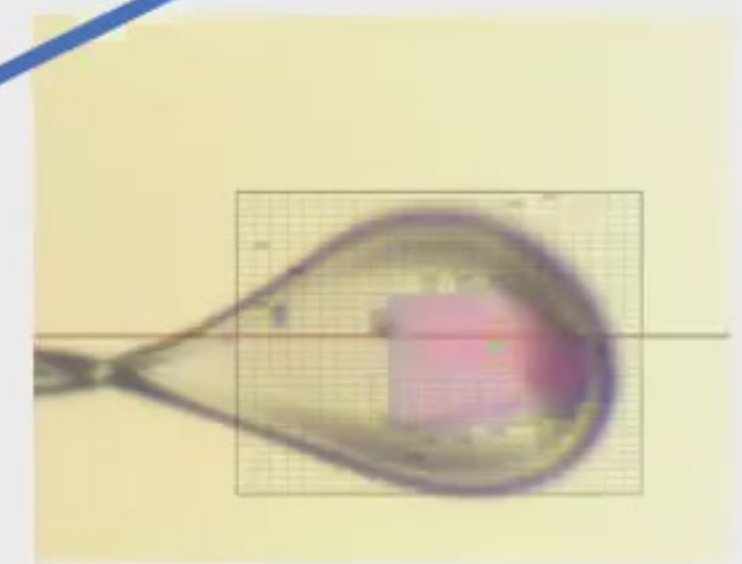
Christopher Squire



Data collection: .h5
 Raster scan: .cbf

All network connections
 are 10 Gbps.

GPFS
 (20 TB Flash + 100 TB HDD)



dials.find_spots

Reduction .h5 file (366 MB -> 46 MB)

```
yamtbx.eiger_reduce_master ¥
  replace=true ¥
  remove_detectorModule_data=flatfield+pixel_mask+trimbit ¥
  <master file>
```

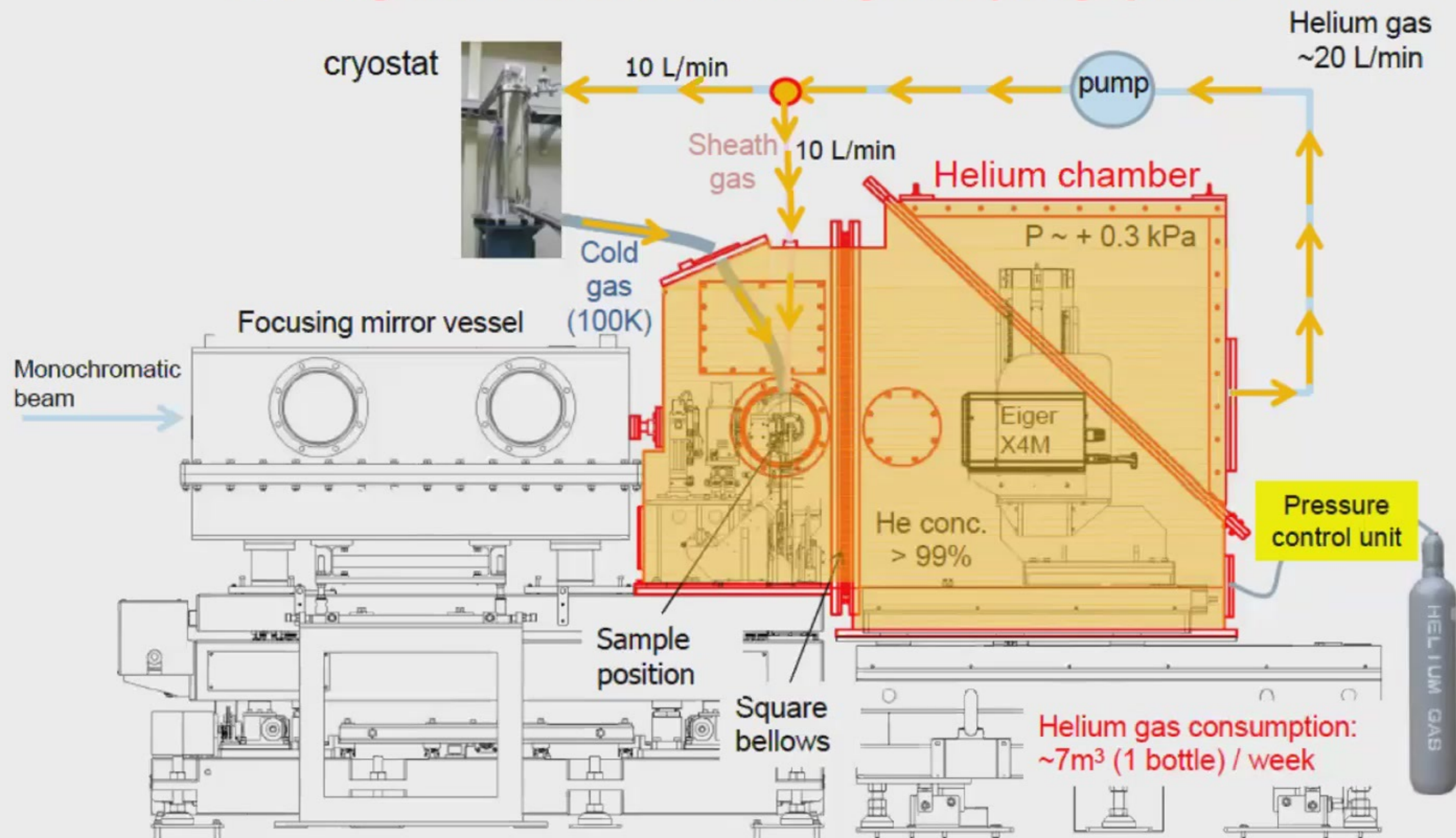
<https://github.com/keitaroyam/yamtbx/>

Cluster of workstations
 (14 nodes)
 3 nodes: findspots
 6 nodes: Fast data reduction
 7 nodes: Other analysis(job
 scheduling)

BL-1A A complete helium environment



Standing helium chamber with the gas recycling system

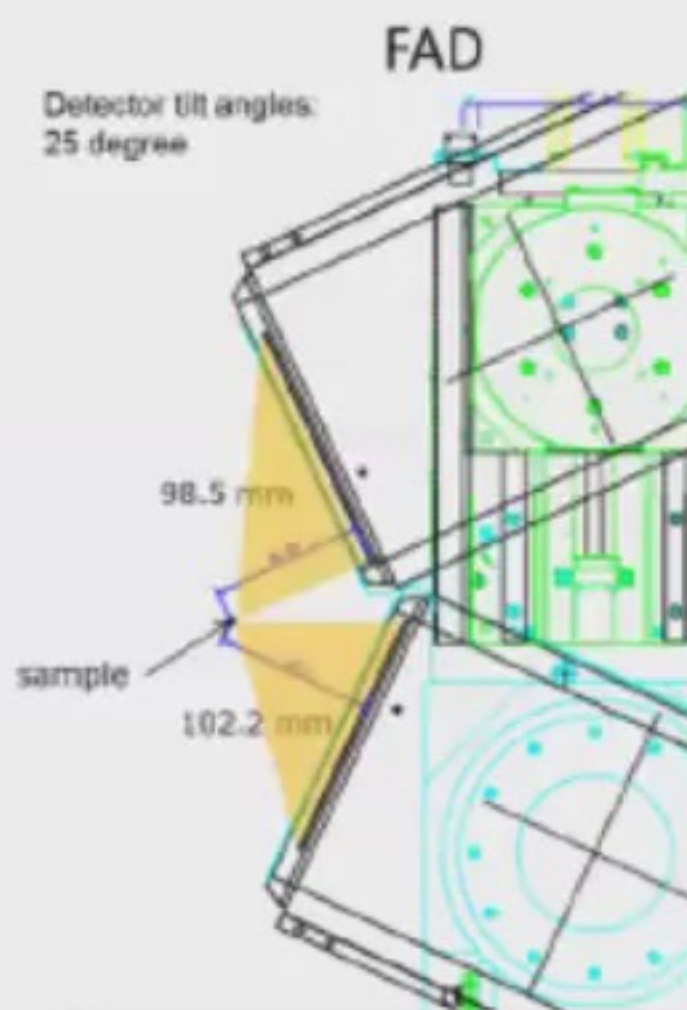
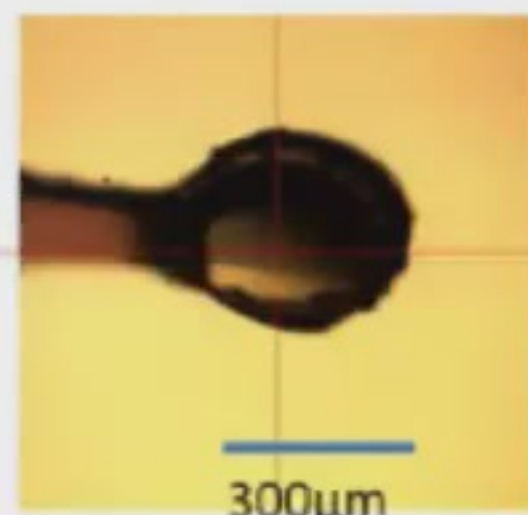


BL-1A: Data collection with 2 EX4Ms



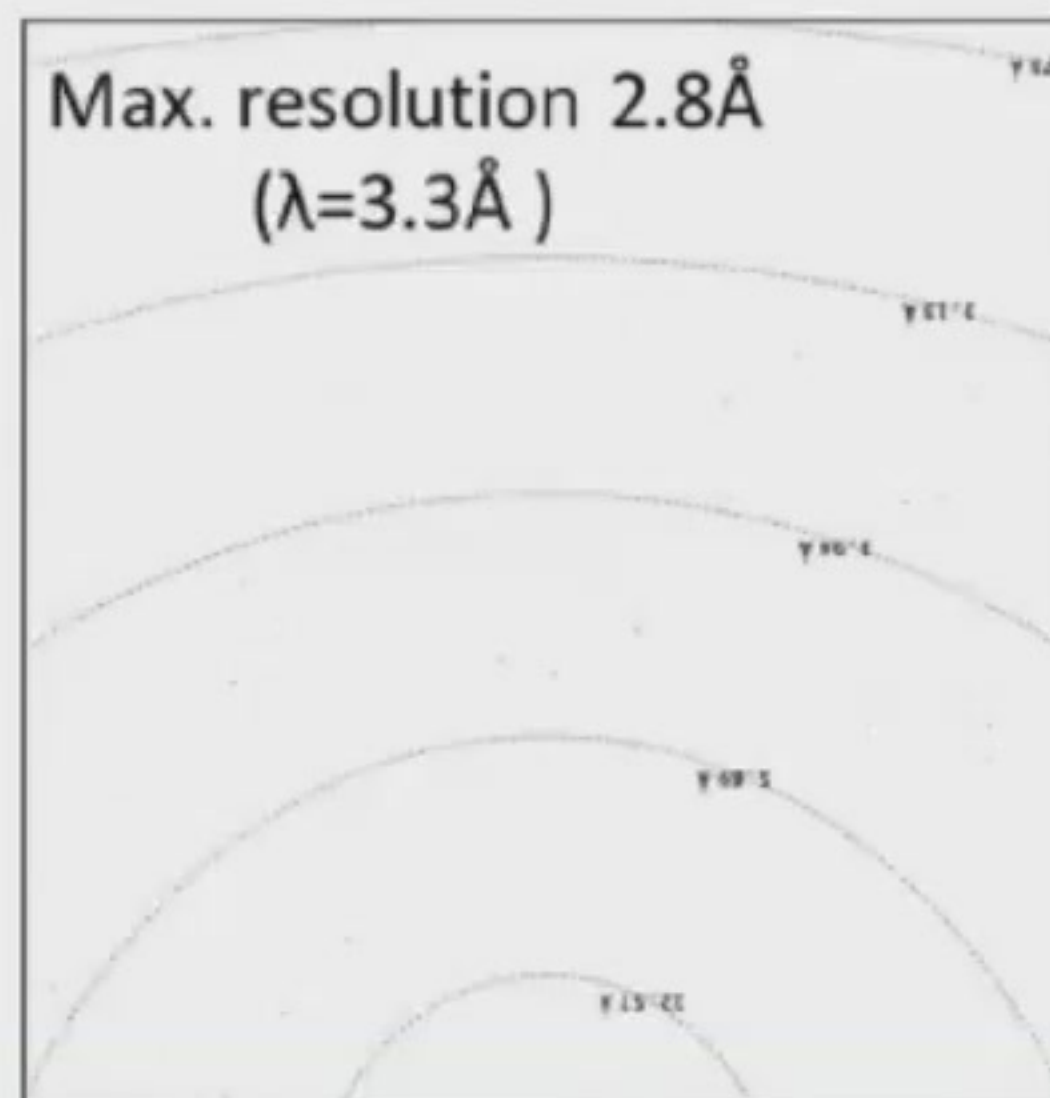
Crystal: ferredoxin reductase (BphA4)

Number of residues	408
Number of sulfur atoms	9 (4 Cys + 5 Met)
Space group	P6122
Cell dimensions (Å)	a=b=98, c=170
Number of molecules / ASU	1
Co-factor	FAD

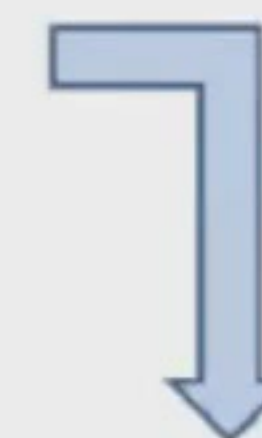


Data collection conditions

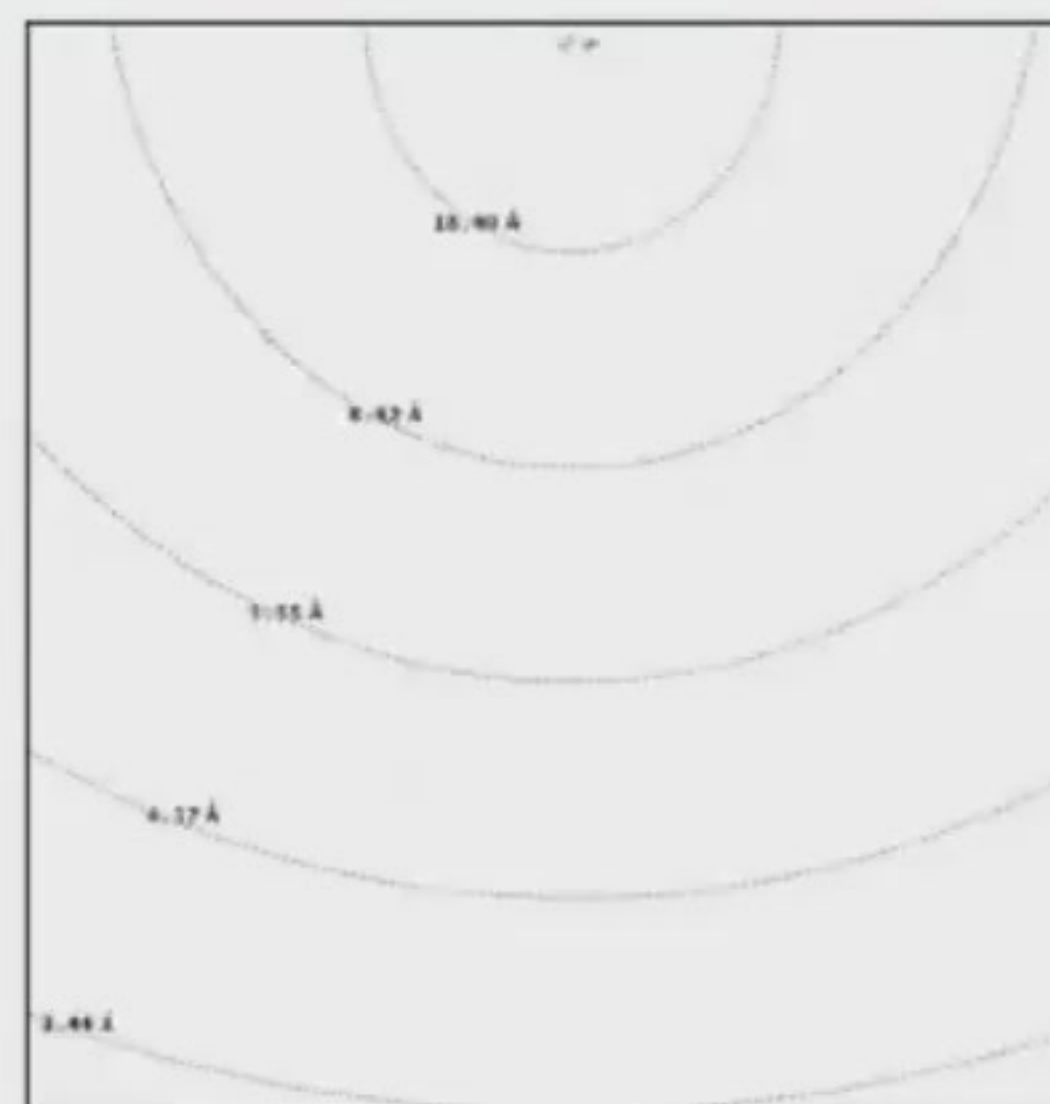
Wavelength (Å)	3.3
Oscillation width (deg)	0.2
No. of frames	1800 x 10
Exposure time (s)	0.1
Transmittance (%)	5 (6x10 ⁹ phs/s)



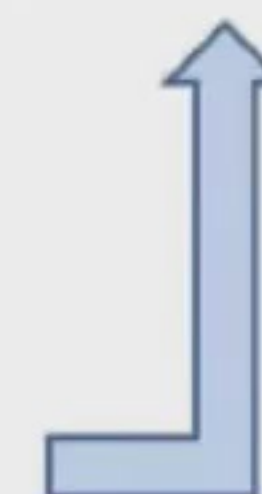
Upper Eiger detector
(upside down)



Upper and lower data sets are independently processed by XDS and merged by XSCALE



Lower Eiger detector

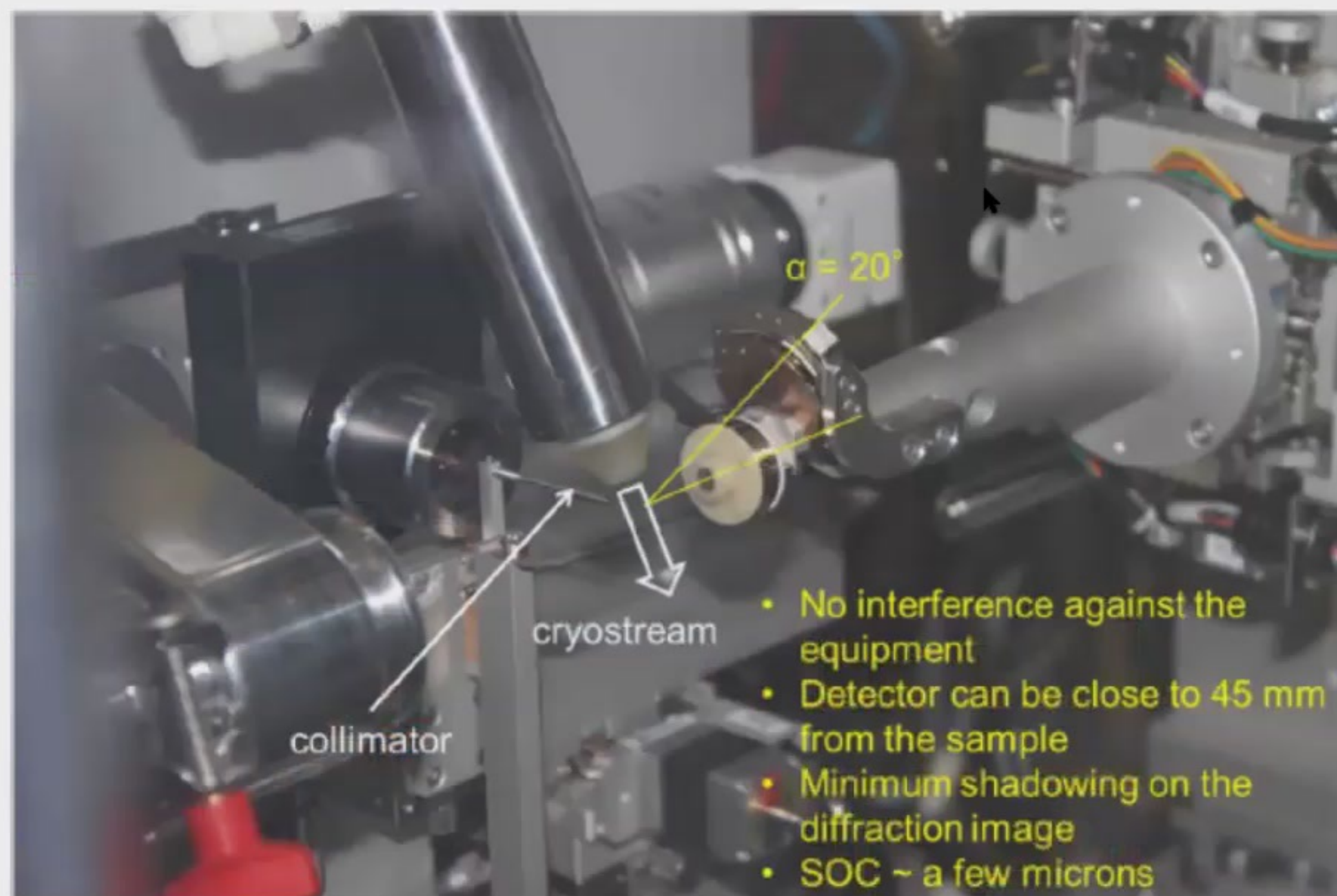


multi-orientation data collection



Multiple data collection with different crystal orientations

Olieric V. et al. Data-collection strategy for challenging native SAD phasing
Acta Cryst. D72(Pt 3):421-9.



Mini-k goniometer at PF-BL-1A

Averaging-out
systematic errors due
to sample X-ray
absorption, detector
inhomogeneity, etc.



True redundancy