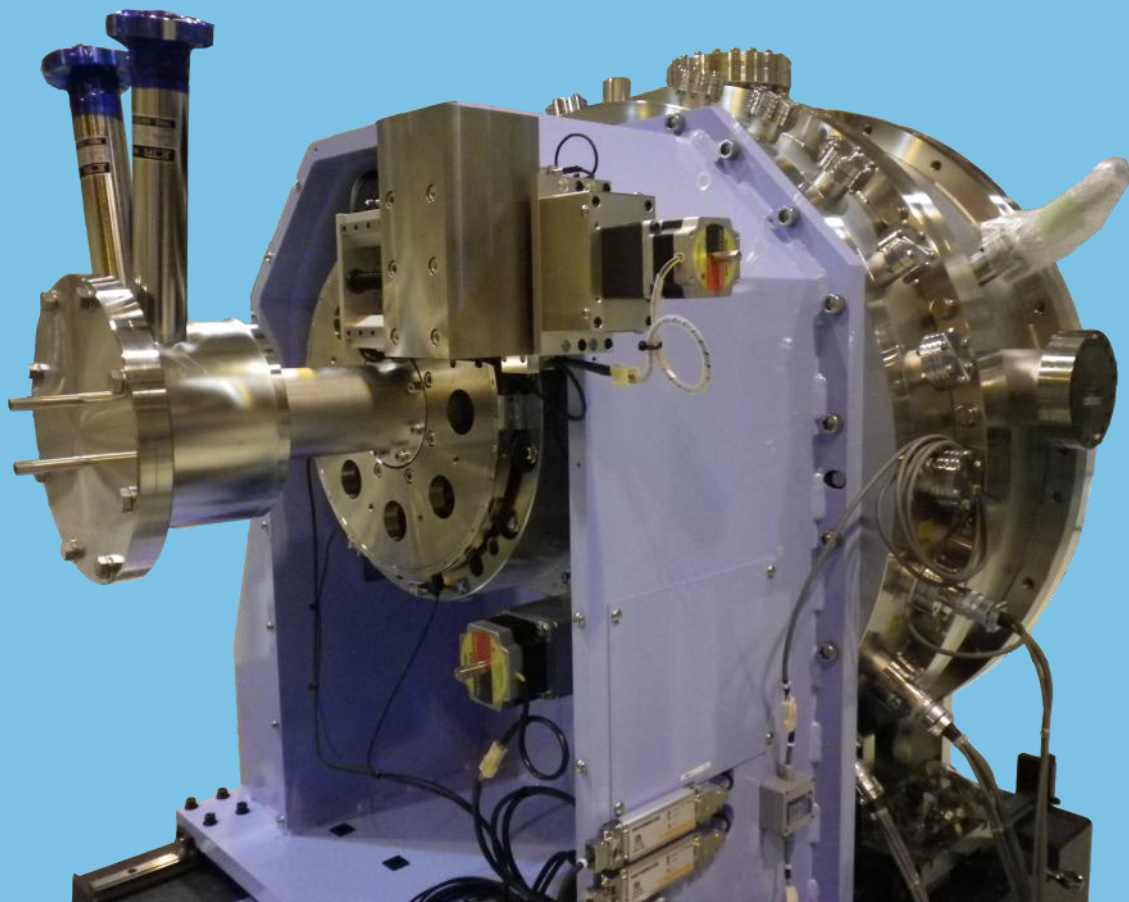


Pioneering New Horizons in Science

TOYAMA

*Hard X-Ray Double Crystal
Monochromator - DCM*



www.toyama-en.com

Hard X-Ray Double Crystal Monochromator

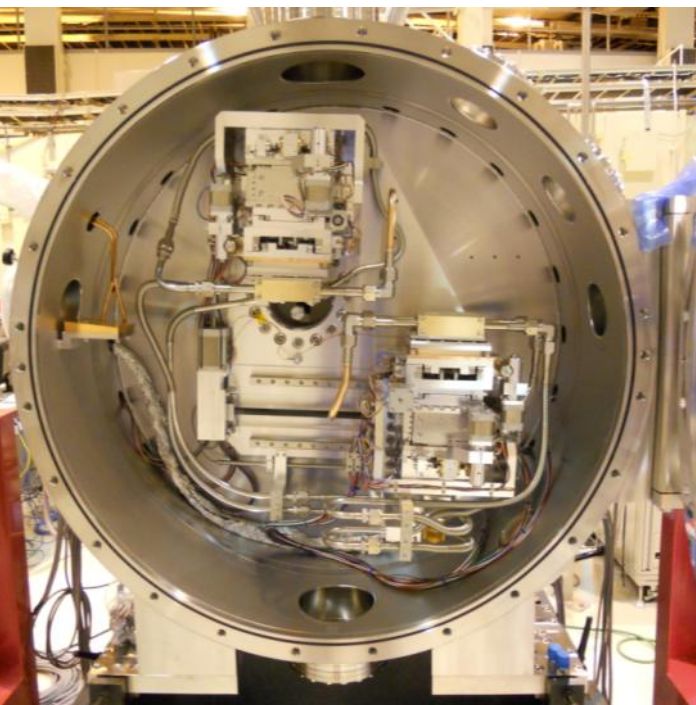
Hard X-Ray DCM

The hard X-ray Double Crystal Monochromator (DCM) with true UHV specification and full numerical control builds on Toyama's extensive experience in synchrotron beamline design to realise a new standard in state-of-the-art hard x-ray monochromators. The instrument has been designed to accommodate the requirements of the 3rd generation light sources for beam position and energy stability.

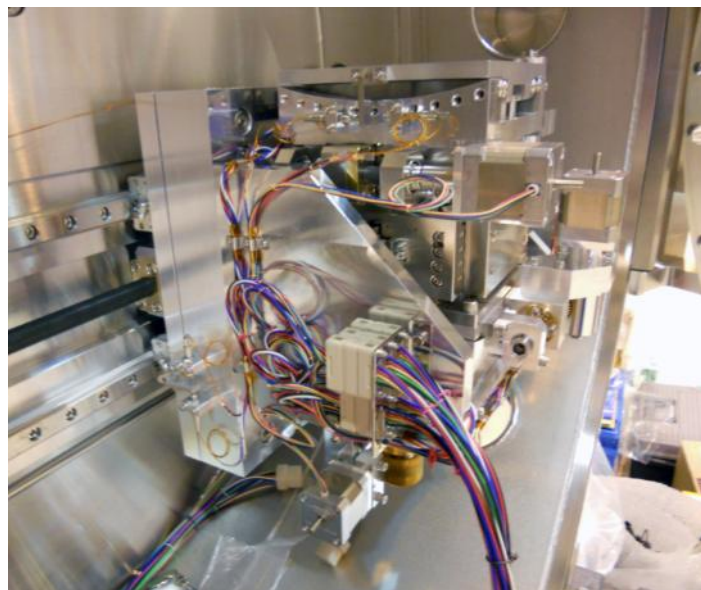
Advances in control technology allow successful operation over wide energy ranges with high position stability, whilst ongoing developments in cooling system design and temperature control result in significant improvements in vibration stability and significant reduction in intensity fluctuations.

Features

- Compact design
- Bragg angle rotation range up to 80°
- Granite mount to minimise low-frequency vibration
- Crystal cage mounted on rigid drive shaft for high stability
- Size of crystal 90(L) x 50(W) x 35(H)mm (typical)
- Water and/or LN2 cooling system
- True UHV design
- Advanced temperature control for improved stability
- Software for wide range pseudo-channel cut operation
- EXAFS mode scanning speed 0.2 deg/sec available



Internal view of the Hard X-ray DCM delivered to SPring-8

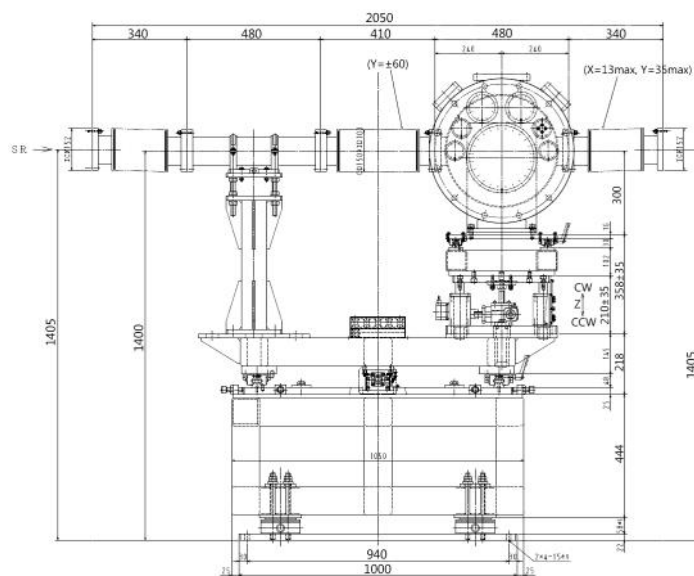


First crystal mechanism includes translation along beam direction, fine pitch correction together with roll and yaw adjustments (rotation axis on centre of 2nd crystal)

Quick EXAFS Monochromator

The QEXAFS monochromator from Toyama uses a torque motor for rapid positioning and accurate control of the Bragg rotation axis. The direct readout angle encoder gives a fast position output to the data acquisition system.

The system is installed on the Toyota Motor Company's beamline BL33XU at SPring-8 and can produce well defined spectra at up to 50Hz (10ms per spectrum, 0.2 degree Bragg angle = 100eV scan range).

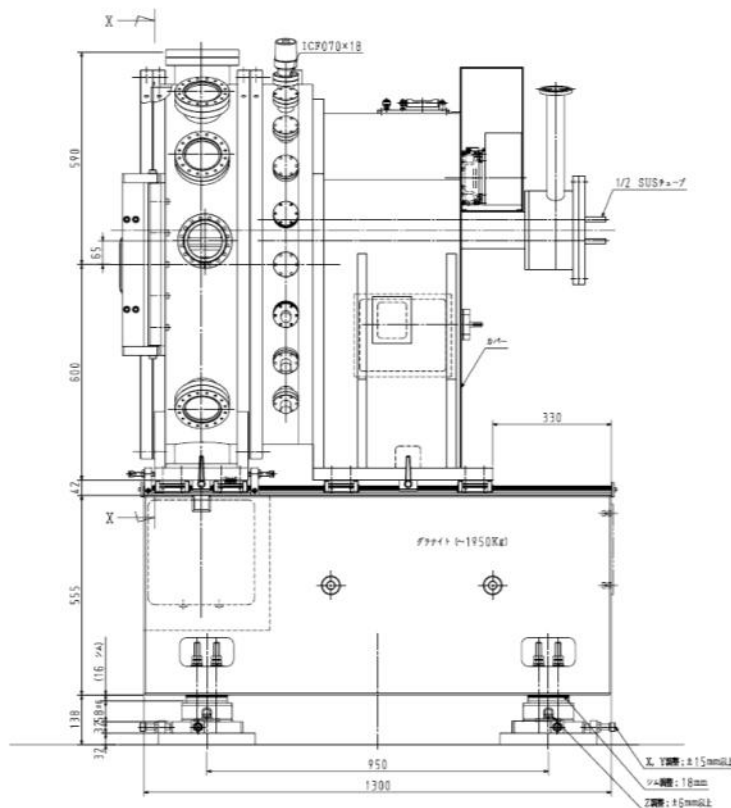
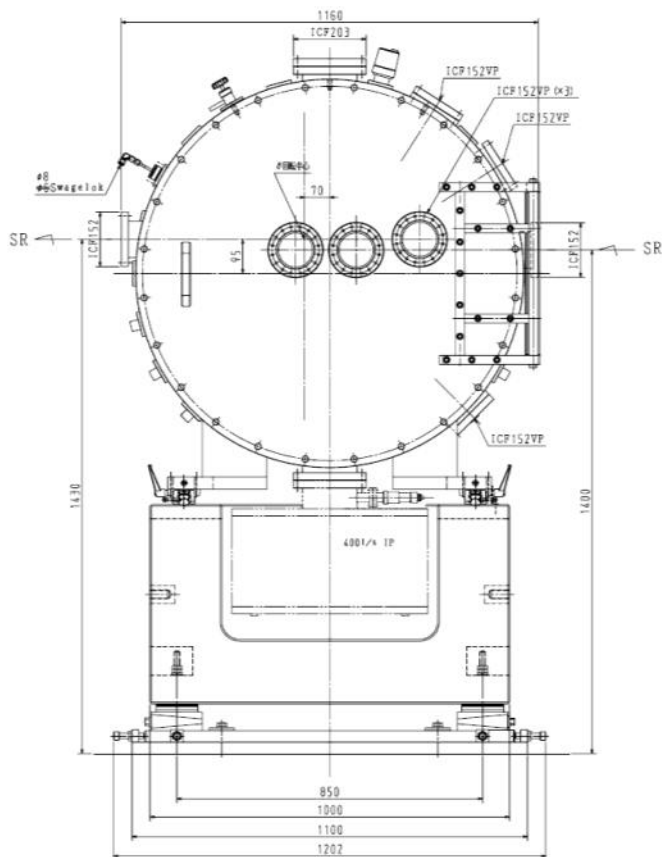


Drawing of the QEXAFS monochromator showing dimensions

Hard X-Ray Double Crystal Monochromator

Specification of a typical Hard X-Ray DCM

	Axis Name	Drive Range	Repeatability	Minimum Feed Stroke	Encoder Resolution	Drive System
Main Axis	Bragg angle θ (Stage rotation angle)	3° - 32° (-1 - 32 deg)	$< 10 \mu\text{rad}$	$1 \mu\text{rad}$	$1 \mu\text{rad}$	Stepper Motor (Air)
First Crystal	Roll TX1	± 0.5 deg	$< 10 \mu\text{rad}$	$5 \mu\text{rad}$	-	Motor (Vacuum)
	Lateral translation X1	± 5 mm	$< 50 \mu\text{m}$	$5 \mu\text{m}$	-	Motor (Vacuum)
	Normal translation to crystal surface ZZ1	± 1 mm	$< 10 \mu\text{m}$	$5 \mu\text{m}$	-	Motor (Vacuum)
	Pitch adjustment $\Delta\theta 1$	± 0.5 deg	$< 0.25 \mu\text{rad}$	$0.05 \mu\text{rad}$	-	Motor (Vacuum) Piezo*
	Vertical translation Z1	-4 - 1 mm	$< 10 \mu\text{m}$	$0.1 \mu\text{m}$	-	Motor (Vacuum)
	Longitudinal translation Y1	270 mm	$< 10 \mu\text{m}$	$1 \mu\text{m}$	0.1 mm	Motor (Vacuum)
Second Crystal	Roll TX2	± 0.5 deg	$< 10 \mu\text{rad}$	$0.5 \mu\text{rad}$	-	Motor (Vacuum)
	Lateral translation X2	± 5 mm	$< 50 \mu\text{m}$	$1 \mu\text{m}$	-	Motor (Vacuum)
	Normal translation to crystal surface ZZ2	± 1 mm	$< 10 \mu\text{m}$	$1 \mu\text{m}$	-	Motor (Vacuum)
	Pitch adjustment $\Delta\theta 2$	± 0.5 deg	$< 0.25 \mu\text{rad}$	$0.05 \mu\text{rad}$	-	Motor (Vacuum)
Mount	Base X	± 5 mm	0.2 mm	$1/20$ mm	-	Manual (Air)
	Base Z	± 5 mm	0.2 mm	$1/20$ mm	-	Manual (Air)

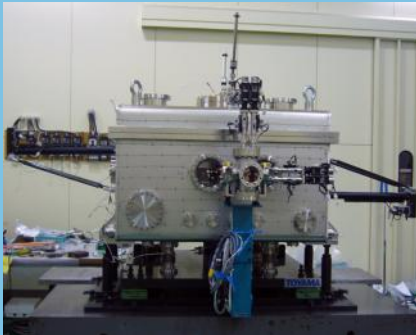


Other areas of Toyama expertise

Synchrotron Applications

Toyama has developed an extensive range of components and systems for synchrotron beamlines and front ends including:

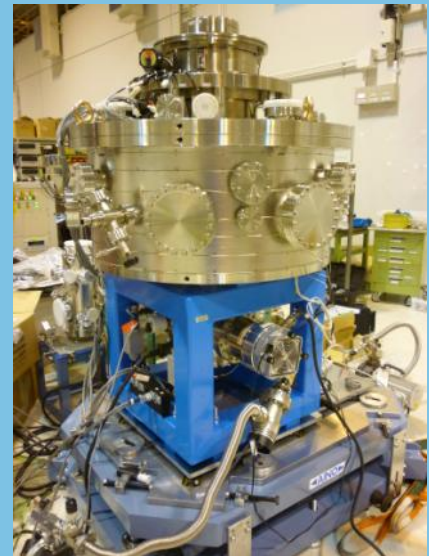
- Soft X-ray Monochromators
- Mirror Systems
- Slits
- High heat load front ends
- Beam Monitors
- End stations such as Ellipsometers, Reflectometers and Diffractometers



Soft X-ray VLSPGM



Liquid nitrogen cooled mirror system



Diffractometer



XFEL Monochromator



Cooled slit



Screen Monitor

XFEL Components

Toyama has developed components for XFEL accelerators and beamlines:

- XFEL Monochromator
- XFEL Mirror Systems
- XFEL Beam Monitors for beam position, beam profile and beam current
- Energy Slits for XFEL accelerator

ISO 9001 and 14001 certification



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