

Status of NFPS MX Beamlines at SSRF

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National Facility for Protein Science in Shanghai

/Shanghai Synchrotron Radiation Facility

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Shanghai Synchrotron Radiation Facility

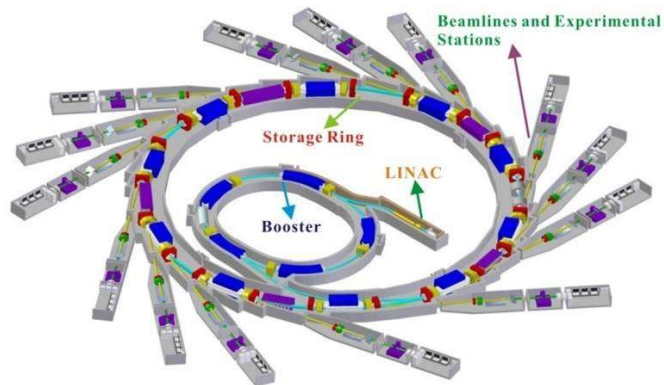
SSRF Ring Parameters

Electron Energy: 3.5 GeV

Electron Current: 300 mA

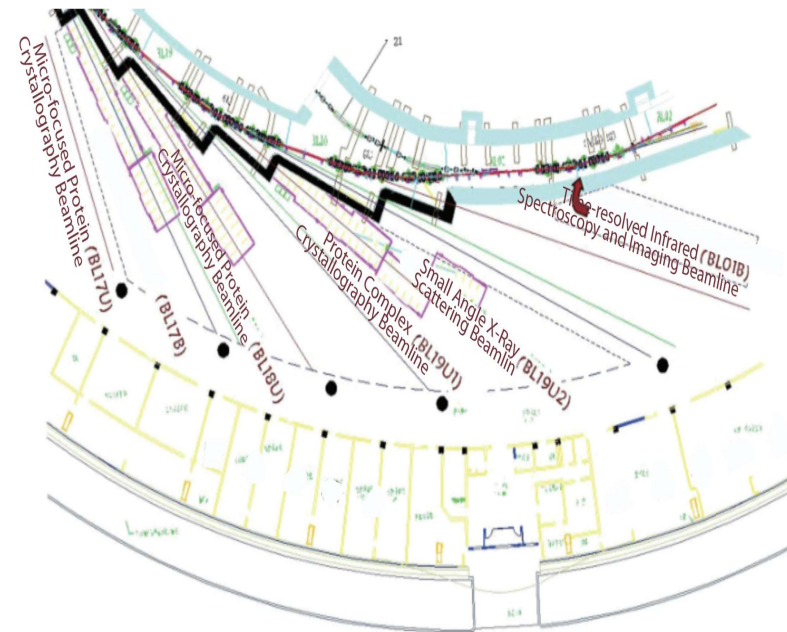
Circumference: 432 m

Straight sections: 20

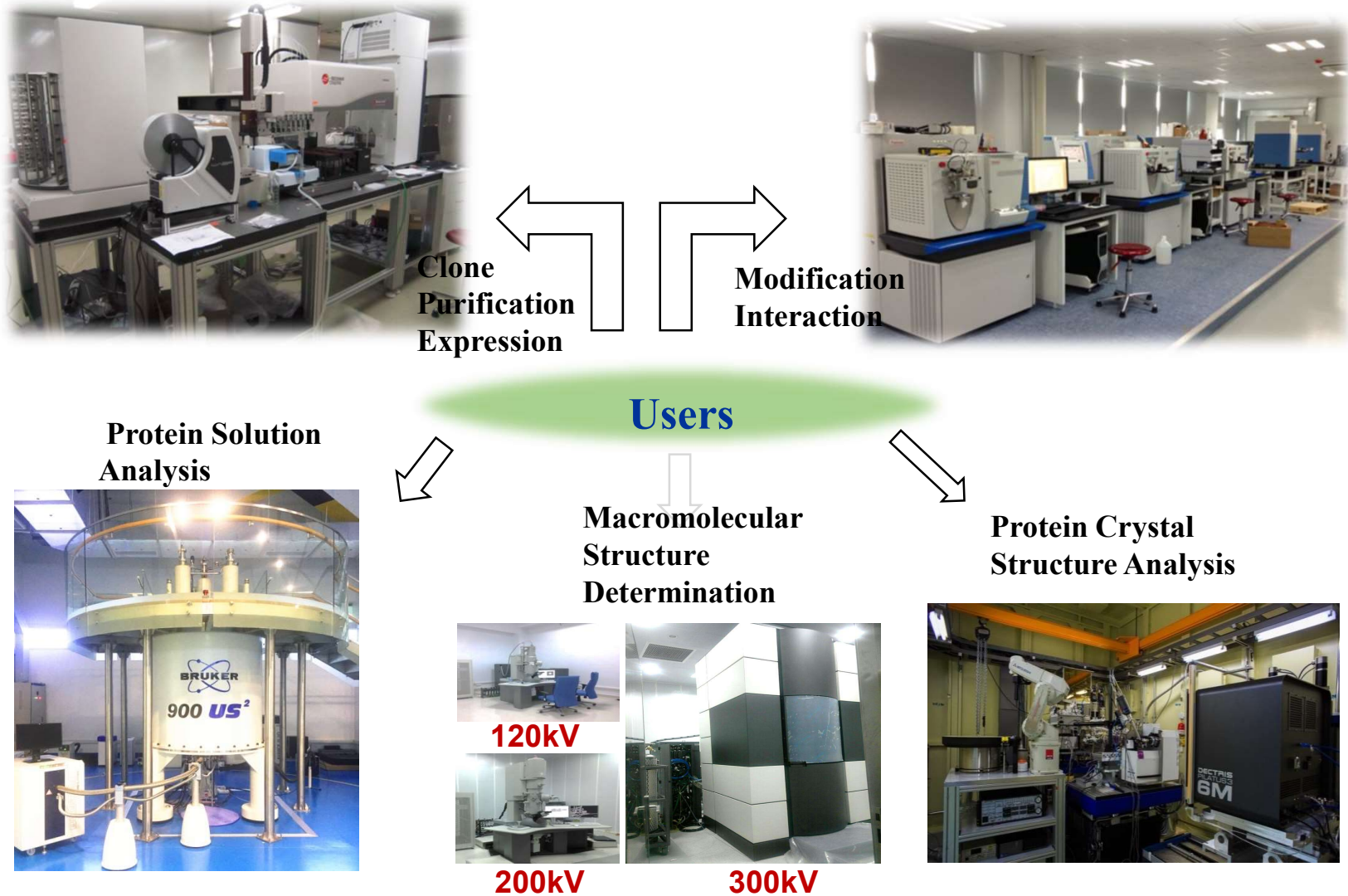


National Facility for Protein Science . Shanghai

- NFPS passed the National Acceptance Review, and formally opened to the users in July 2015.
- NFPS is composed of 9 technology systems with state-of-the-art instruments in its Haik Road Campus and 5 Beamlines within the Shanghai Synchrotron Radiation Facility.

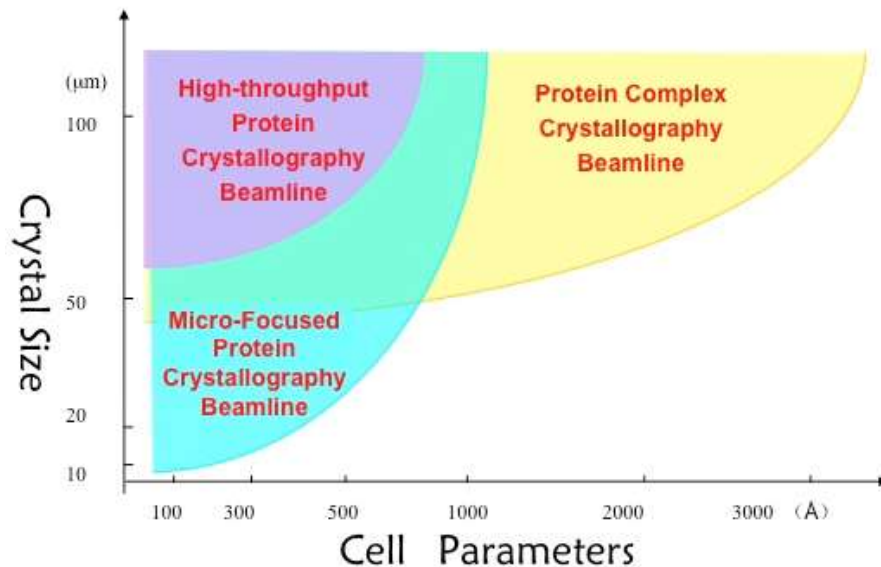


Integrative Research at NFPS



NFPS-MX Beamline Overview

- There are three protein crystallography beamlines to meet various requirements of structural determination for different types of crystals.
- Protein micro-crystallography beamline for small crystals.
- Protein complex crystallography beamline for crystals with big unit cell parameters.
- High-throughput crystallography beamline for high throughput screening.



Beamline	Micro-focused Protein Crystallography Beamline	Protein Complex Crystallography Beamline	High-throughput Protein Crystallography Beamline
Energy Range	5~18 keV	7~15 keV	5~20 keV
Energy Resolution	$\leq 2 \times 10^{-4}$ @12keV	$\leq 2 \times 10^{-4}$ @12keV	$\leq 2 \times 10^{-4}$ @12keV
Intensity (@12keV @300mA)	$\geq 6 \times 10^{11}$ phs/s	$\geq 2 \times 10^{12}$ phs/s	$\geq 3 \times 10^{11}$ phs/s
Beam Size (@12keV) (H×V)	25×15 ~ 10×5 μm^2	$\leq 130 \times 80 \mu\text{m}^2$	$\leq 150 \times 180 \mu\text{m}^2$
Divergence (@12 keV) (H×V)	$\leq 0.7 \times 0.25 \text{mrad}^2$	$\leq 0.7 \times 0.25 \text{mrad}^2$	$\leq 1.5 \times 0.2 \text{mrad}^2$

BL19U1- Protein complex crystallography beamline

Source: U20 in vacuum undulator

Focusing: $120 * 80 \mu\text{m}^2$

Tunable: 7-15 keV

Flux: $2 * 10^{12} \text{phs/s}@12\text{keV}@300\text{mA}$

Area Detector: Pilatus 3-6M

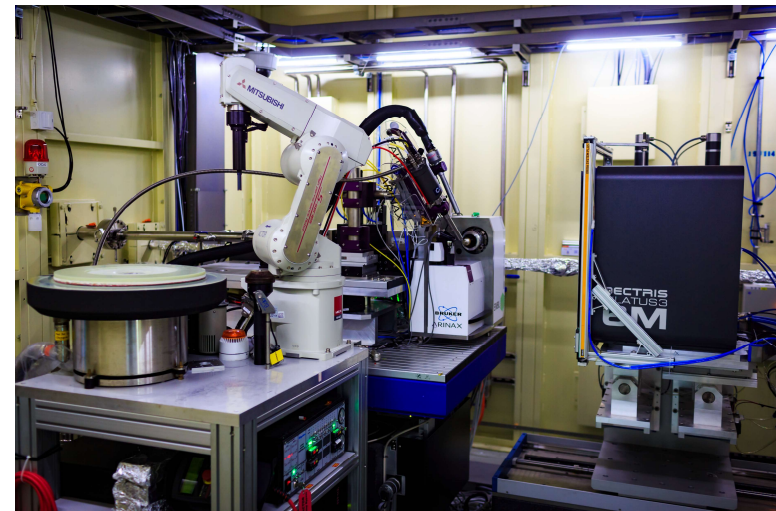
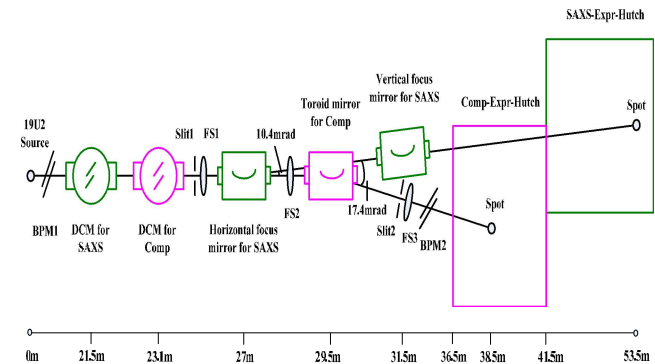
Goniometer: MD2

Sample Changer: Rigaku ACTOR

XRF Detector: Hitachi Vortex®-90EX

HClab for humidity control

Experiment-control software: Blulce



BL18U- Protein micro-crystallography beamline

Source: U25 in vacuum undulator

Focusing: $25 \times 15 \sim 10 \times 5 \mu\text{m}^2$

Tunable: 5-18 keV

Flux: 6×10^{11} phs/s@12keV@300mA

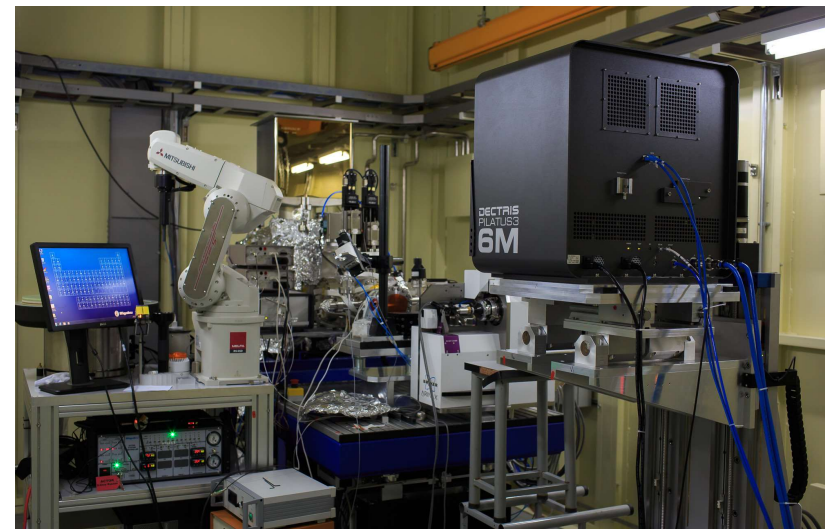
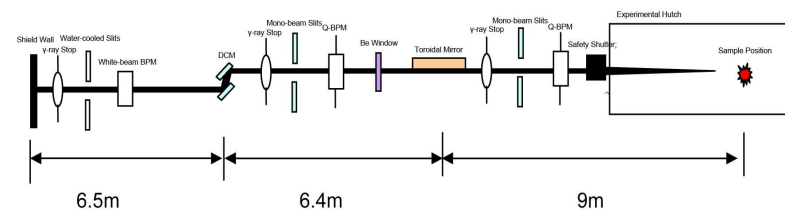
Area Detector: Pilatus 3-6M

Goniometer: MD2

Sample Changer: Rigaku ACTOR

XRF Detector: Hitachi Vortex®-90EX

Experiment-control software: Blulce



BL17B- High-throughput crystallography beamline

Source: Bending Magnet

Focusing: $120 * 80 \mu\text{m}^2$

Tunable: 5-20 keV

Flux: $3 * 10^{11}$ phs/s@12keV@300mA

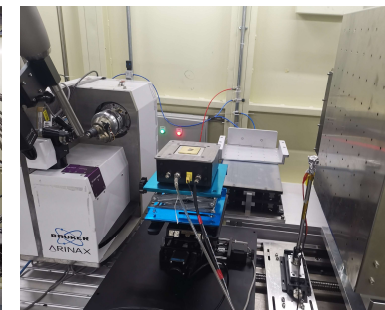
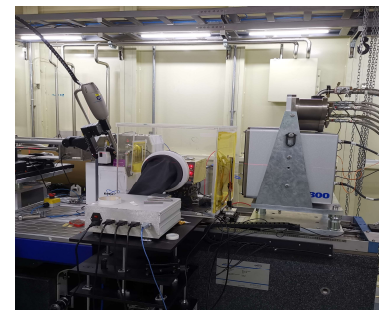
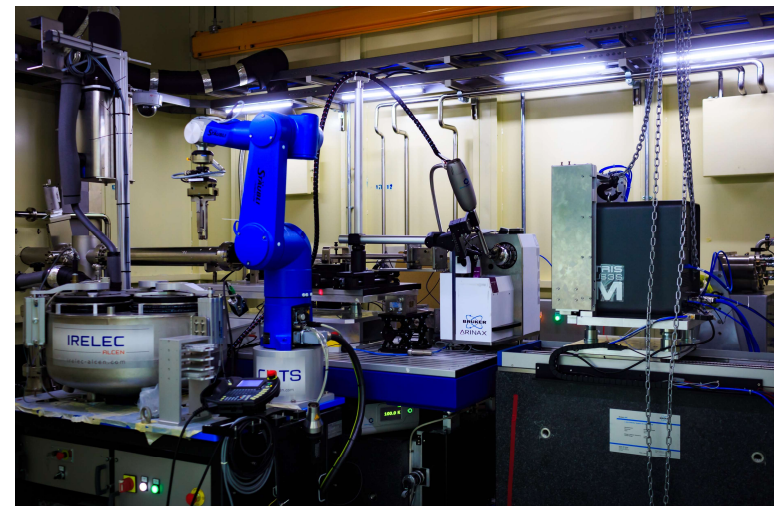
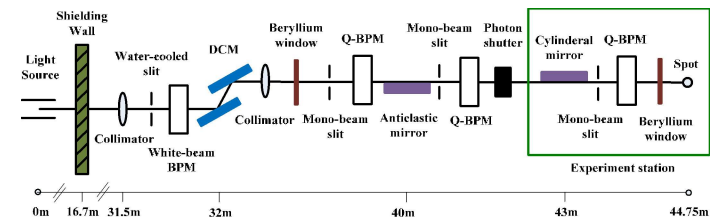
Area Detector: Pilatus 3-2M

Goniometer: MD2

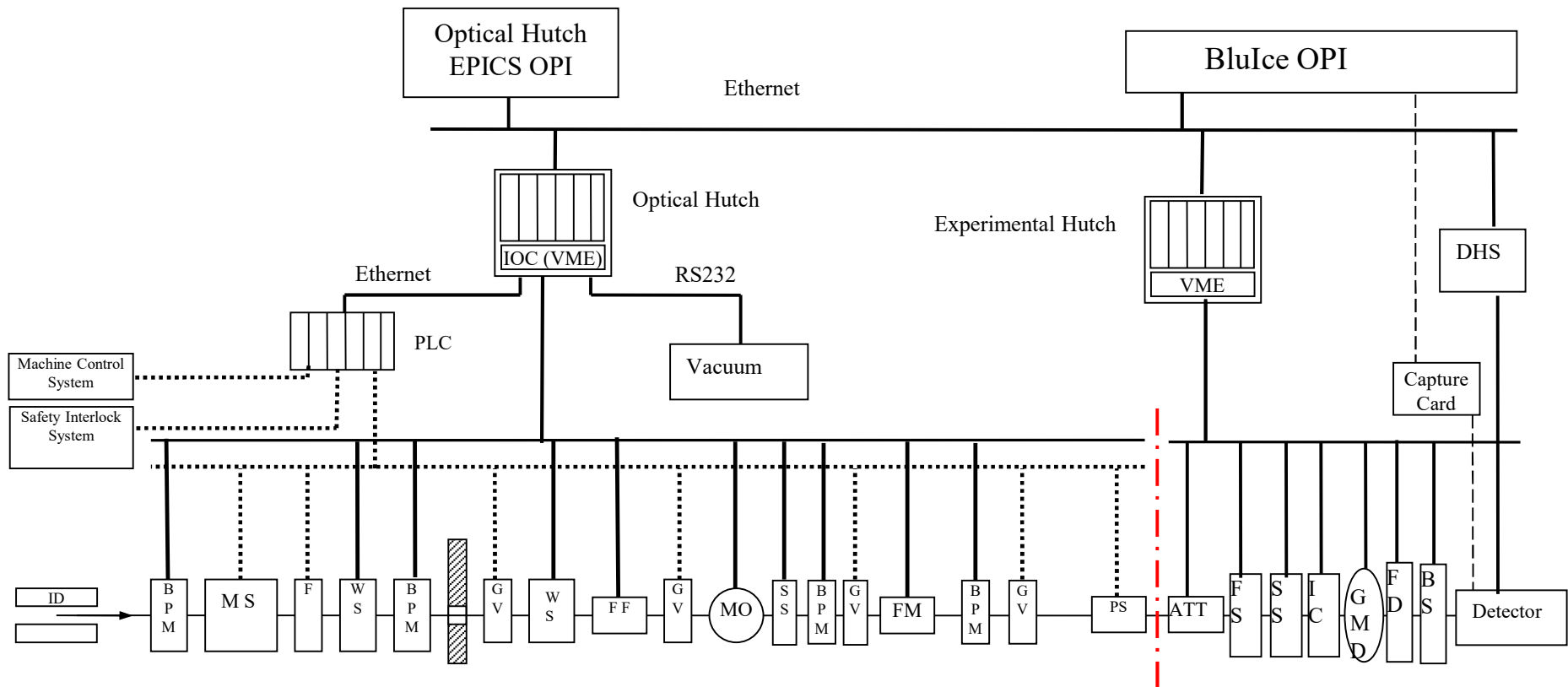
Sample Changer: Irelec-CATS

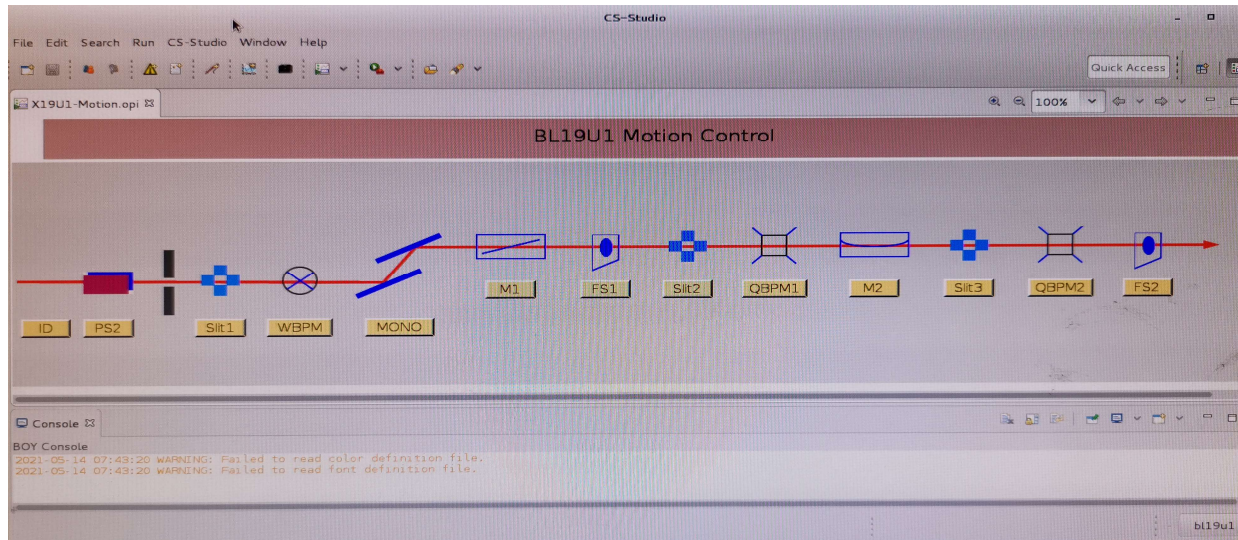
XRF Detector: Hitachi Vortex®-90EX

Experiment-control software: Blulce



Beamline-control software(EPICS+Bluice)





/home/bl19u1/BL19U1-OP1/X19U1-EPS.edt

Storage Ring

Energy	3.5 GeV
Beam Current	200.024 mA
Life Time	6.532 Hrs
Up Stream Gap	0.709 mm
Down Stream Gap	0.800 mm
Taper	0.001 mm
Topup	ON

BL19U1-FB-EPS

	V1	PreM	PS1	FM1	FS	V2	FV	QBPM	PS2	SS1	V3	ID Gap
Status	Opened		Opened		Up	Opened	Opened		Opened	Opened	Opened	Unlock
Water Flow												
Temperature	27.4 26.8	27.7 28.0	1572.0 28.8 28.6 29.1 29.3	27.4	27.4		28.0		32.8 27.0 28.8			
Vacuum	9.1e-10		0.8e-10									

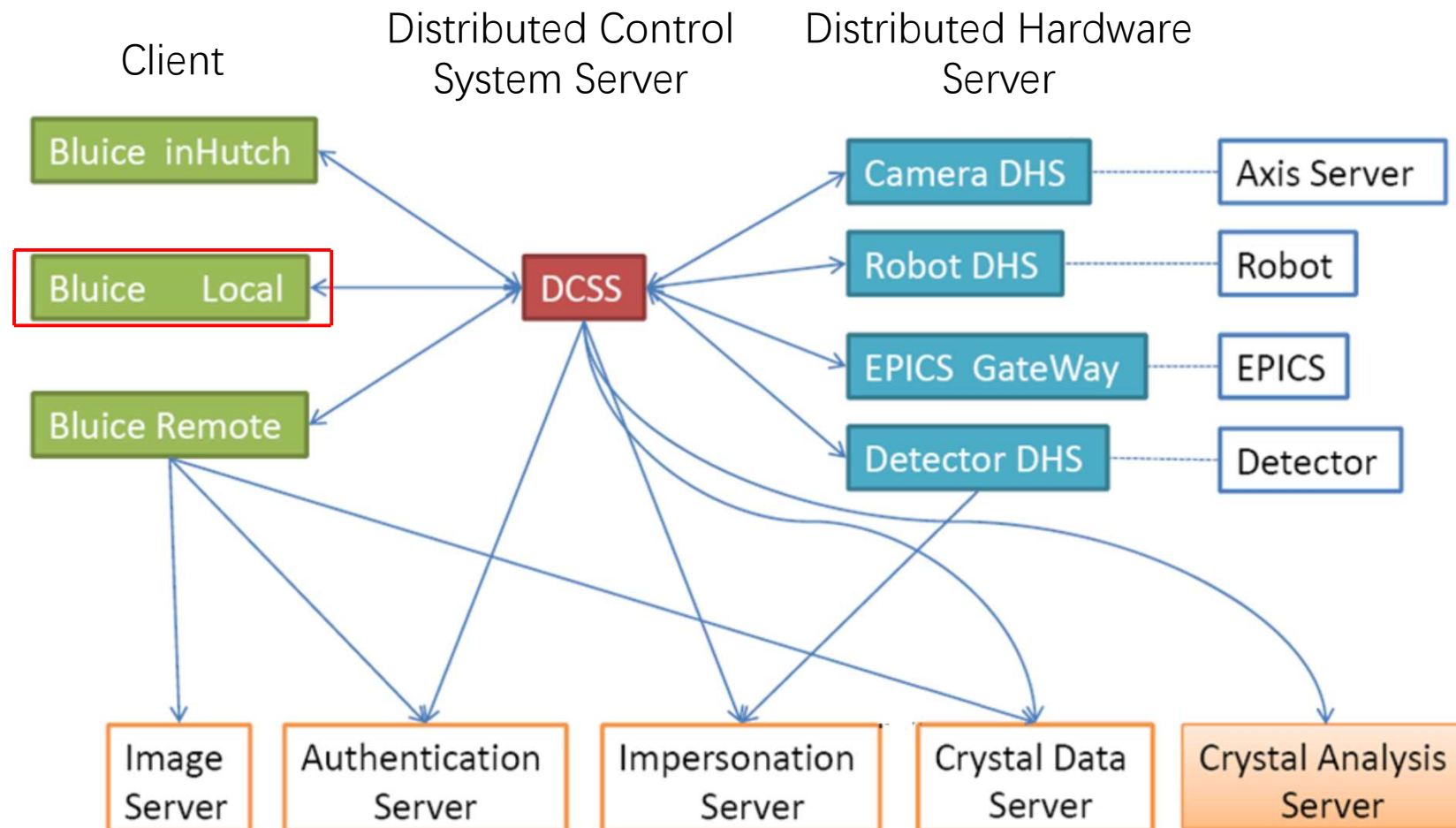
Personal Safety System

OH Inside	ON
OH Outside	ON
EHI Inside	ON
EHI Outside	ON
MainCtrl	ON
Photon Shutter 2	Opened
Safety Shutter 1	Opened
Safety Shutter 2	Closed
OH Door	Closed
EHI Door	Opened

BL19U1-OP-EPS

	Slit1	WBPM	V4	V5	Mono	F1	V6	V7	M1	V8	FS1	V9	Slit2	QBPM	V10	M2	V11	Slit3	QBPM	FS2	SS2	V12	BW	
Status			Opened	Opened			Opened	Opened			Up	Opened			Opened	Opened	Opened				Up	Closed	Opened	
Water Flow																								
Temp	28.7 27.4				PT1 17.9 PT2 -2.1 PT3 16.7 PT4 1.6 PT5 20.3 PT6 -170.9 PT7 070.0 PT8 -168.5	PT9 -163.6 PT10 -178.5 PT11 -180.4 PT12 -33.3 PT13 26.6 PT14 15.8 PT15 25.2 PT16 17.7										24.2 24.3								
Vacuum	4.2E-10				1.1E-09		1.0E-09						7.6E-10		2.4E-09		1.3E-09				2.0E-09			

Experiment-control software(Bluice)

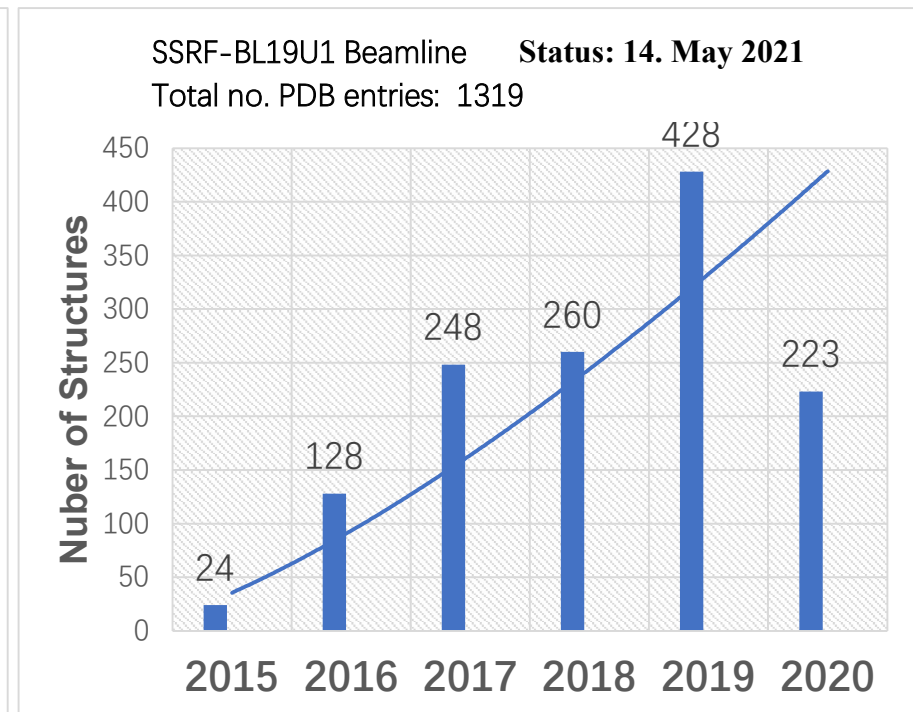
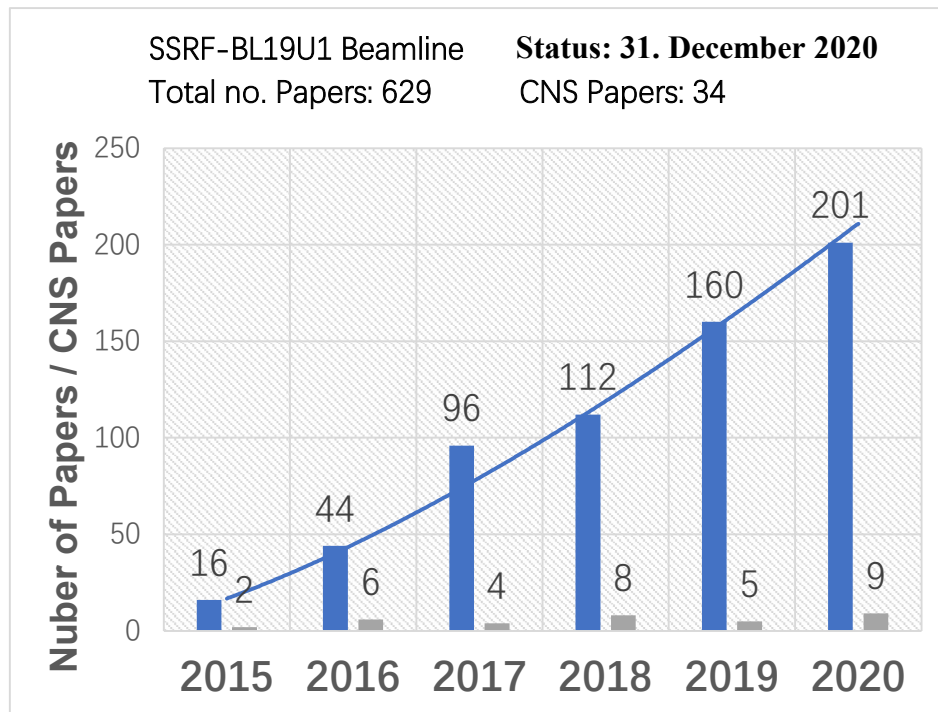


NFPS-MX Beamline User Community

More than 300 user groups,

About 1000 Papers, 43 CNS papers

More than 2000 PDB entries



source: biosync.sbkb.org

MXCUBE Status

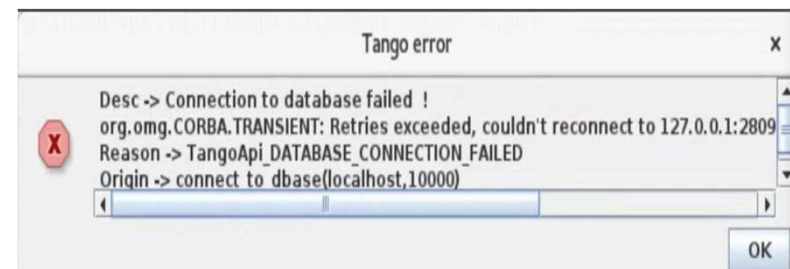
We are at the very beginning!

- ◆ What we did
- ◆ What we tried
- ◆ What we are planning to do

What We Tried

- ◆ Tried to control MD2 through tango server without database
- ◆ Tried to control CATS robot through PyTango and PyCATS
- ◆ Tried to control Pilatus 2M detector with lima-camera-Pilatus-tango
- ◆ Tried to setup tango database

- Although PyCATS /PyTango /lima-camera were installed successfully, we got problems on setup tango database.



What We are Planning to Do

EPICS

- All the Equipment in Optical Hutch (Energy, Mirrors..)
- Detector(Pilatus/MarCCD)
- Detector Distance
- Attenuator
- Fluoresce Detector
- Ion Chamber
- ...

Exporter

- MD2 MiniDiff
- shutter

Tango

- pyCATS—CATS Sample Changer?
- pyTango-ACTOR Sample Changer?

Thank you for your attention!

Acknowledgments:

- - Shanghai Sychrontron Radiation Facility
- - Mikel Eguiraun and Jie Nan from MAX IV
- - Arinax, Dectris, Rigaku, Irelec
- - MXCube community.