

# Current Status of PF SAXS beamlines

07/23/2014

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# BL-6A

- Detector
  - SAXS: PILATUS3 1M
  - WAXD: PILATUS 100K
- Wavelength
  - 1.5Å (Fix)
- Camera Length
  - 0.25, 0.5, 1.0, 2.0, 2.5 m
  - +WAXD Chamber: 0.75, 1.0, 1.5, 2.5m
- Beam Size
  - S1 slit (Size-definition):  $1.0 \times 1.0 \sim 0.3 \times 0.3$ mm
  - Standard@S1 slit:  $0.6 \times 0.6$ mm
- Beam Stopper Size (S1 slit= $0.6 \times 0.6$ mm)
  - $\Phi 7$ mm or  $V5 \times H7$ mm@Camera Length=2.5m
  - $\Phi 6$ mm@Camera Length=2.0、 $\Phi 5$ mm @1.0~0.25m
- Measurement System
  - SAXS/WAXD、GI-SAXS/WAXD、SAXS



# Photon Flux @BL-6A

$1.0 \times 10^{12}$  phs/s @ slit full-open

$1.1 \times 10^{11}$  phs/s @  $1.0 \times 1.0 \text{mm}^2$

$3.6 \times 10^{10}$  phs/s @  $0.6 \times 0.6 \text{mm}^2$

# Detector Information@6A

<b>PILATUS3 1M</b>	<b>Detective area (mm<sup>2</sup>)</b>	<b>W168.7 × H179.4</b>
	Pixel size (μm <sup>2</sup> )	172 × 172
	No. of pixels	H981 × V1043
	Max. frame rate (Hz)	500
	Readout time (ms)	0.95

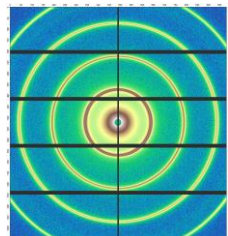
<b>PILATUS 100K</b>	<b>Detective area (mm<sup>2</sup>)</b>	<b>W83.8 × H33.5</b>
	Pixel size (μm <sup>2</sup> )	172 × 172
	No. of pixels	H487 × V195
	Max. frame rate (Hz)	300
	Readout time (ms)	2.3

	<b>Counter depth</b>	2 <sup>20</sup> = 1,048,576
	<b>Max. counts per sec</b>	~300,000@HighG
	<b>Point-spread function</b>	1 pixel (FWHM)

# SAXS Detectable Area

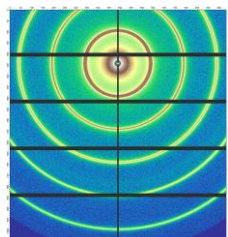
## ● SAXS

### ➤ Center



Camera Length (mm)	BS size (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
250	5	1.10	20.72	4.2	78.4	0.0801	1.5065
500	5	0.38	13.71	6.3	226.1	0.0278	0.9998
1000	5	0.17	6.70	12.8	499.3	0.0126	0.4894
2000	6	0.10	3.39	25.4	897.3	0.0070	0.2475
2500	7	0.09	1.80	47.7	976.6	0.0064	0.1316

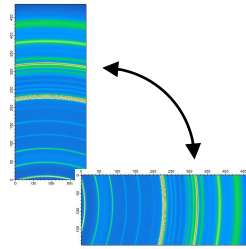
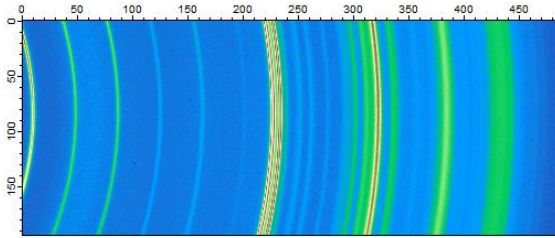
### ➤ OFFSET



Camera Length (mm)	BS size (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
250	5	1.10	32.58	2.7	78.4	0.0801	2.3496
500	5	0.39	17.59	4.9	219.3	0.0287	1.2811
1000	5	0.17	8.27	10.4	503.0	0.0125	0.6042
2000	6	0.10	3.81	22.6	897.3	0.0070	0.2785
2500	7	0.09	3.08	27.9	976.6	0.0064	0.2252

# WAXS Detectable Area

## ● WAXD



The angle of WAXD detector can be set at 0° or 90°.

### ➤ Type I (SAXS/WAXD)

Distance from sample to WAXD chamber : 40 mm@Drawing

Distance from sample to WAXD detector : 260 mm@Drawing



Detector Angle: 18°

Camera Slide Position (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
0	9.37	27.63	3.1	9.2	0.6843	2.0005
63	23.12	40.33	2.2	3.7	1.6788	2.8880

### ➤ Type II (GI-SAXS/WAXD)

Distance from sample to WAXD chamber : 40 mm@Drawing

Distance from sample to WAXD detector : 265 mm@Drawing

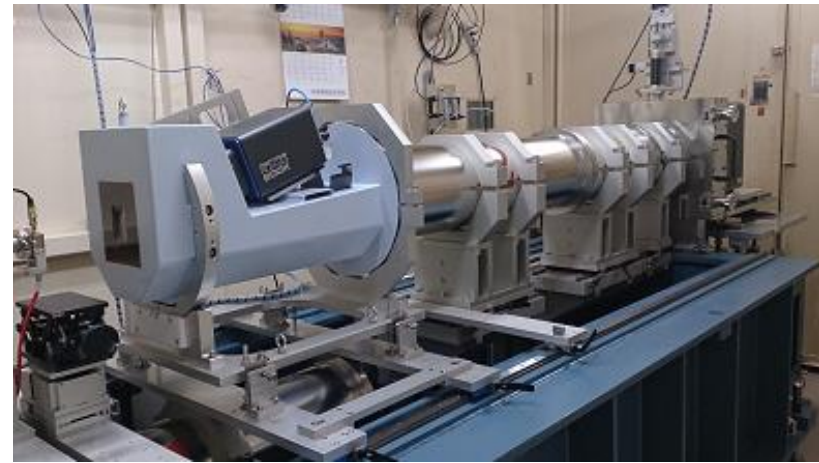


Detector Angle: 29°

Camera Slide Position (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
0	20.00	37.92	2.3	4.3	1.4548	2.7219
13	22.79	40.68	2.2	3.8	1.6552	2.9120

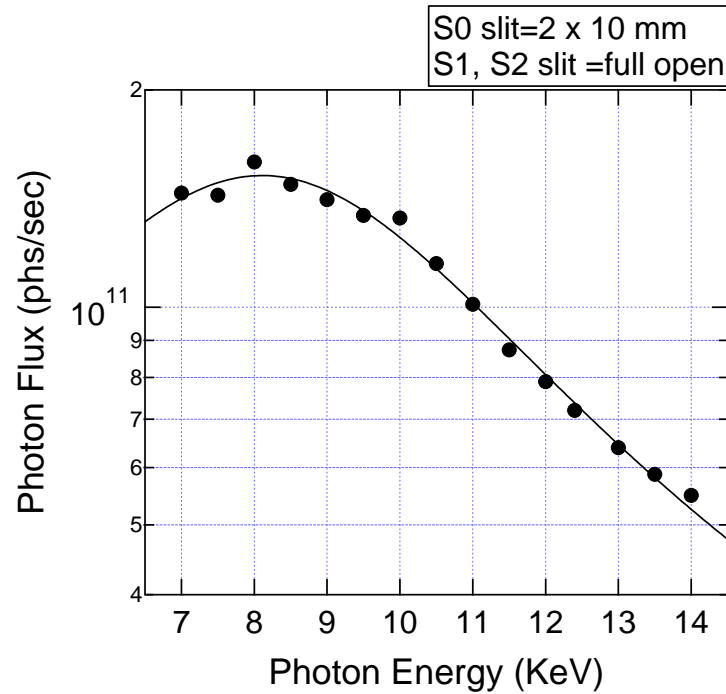
# BL-10C

- Detector
  - SAXS: PILATUS3 2M
  - WAXD1: PILATUS3 200K (300KW optional)
  - WAXD2: Flatpanel (From 2014 November)
- Wavelength
  - 0.886~1.771Å (Standard)
  - Users can change wavelength easily.
  - The wavelength over 1.771Å is optional.
- Camera Length
  - 0.25, 0.5, 1.0, 2.0, 3.0 m
  - +WAXD Chamber: 0.9, 1.15, 1.65, 2.65m
- Beam Size
  - S1 slit (Size-definition): V1.0 × H2.0~V1.0 × H0.9mm
  - Standard@S1 slit: V1.0 × H1.5mm
- Beam Stopper Size (Standard)
  - Φ6~5mm@Camera Length=2.5~2.0m
  - Φ5mm @2.0~1.0m
  - Φ4mm @1.0~0.25m
- Measurement System
  - SAXS/WAXD、GI-SAXS/WAXD、SAXS

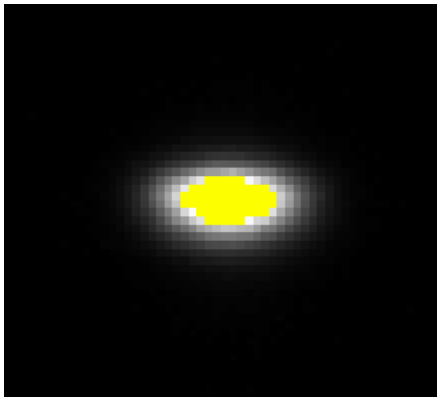


# Basic properties of new BL-10C

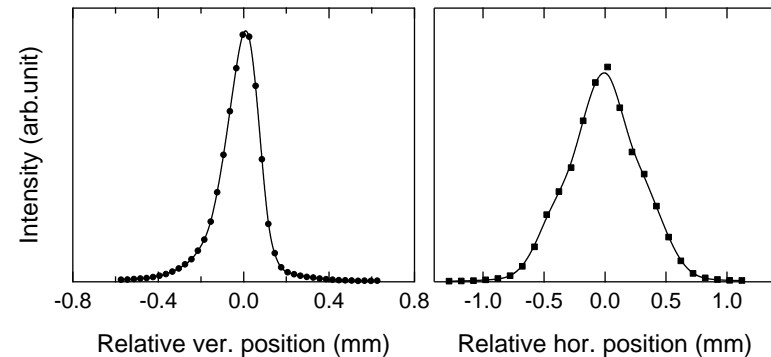
Photon Flux at the sample position



Beam Shape at the focal position (on the detector)



$\lambda=1\text{\AA}$   
Flatpanel  
Attenuator: Al 2mm



V0.18 × H0.63 mm (FWHM)

(V0.15 × H0.59 mm@Raytrace)



# Detector Information

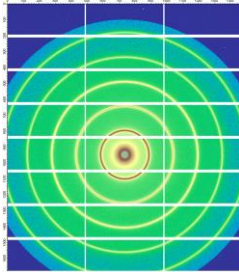
<b>PILATUS3 2M</b>	<b>Detective area (mm<sup>2</sup>)</b>	<b>W253.7 × H288.8</b>
	Pixel size (μm <sup>2</sup> )	172 × 172
	No. of pixels	H1475 × V1679
	Max. frame rate (Hz)	250
	Readout time (ms)	0.95

<b>PILATUS3 200K</b>	<b>Detective area (mm<sup>2</sup>)</b>	<b>W83.8 × H70.0</b>
	Pixel size (μm <sup>2</sup> )	172 × 172
	No. of pixels	H487 × V407
	Max. frame rate (Hz)	500
	Readout time (ms)	0.95

	<b>Counter depth</b>	2 <sup>20</sup> = 1,048,576
	<b>Max. counts per sec</b>	~300,000@HighG
	<b>Point-spread function</b>	1 pixel (FWHM)

# SAXS Detectable Area

## ● SAXS



➤  $\lambda = 1.488 \text{ \AA}$

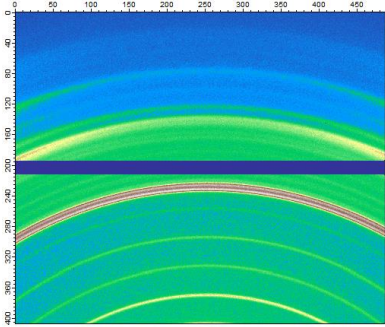
Camera Length (mm)	BS size (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
246	4	0.99	32.58	2.7	85.7	0.0733	2.3686
542	4	0.29	17.64	4.9	297.8	0.0211	1.2947
1028	5	0.13	8.03	10.6	668.5	0.0094	0.5914
2027	6	0.09	3.77	22.6	907.8	0.0069	0.2781
3025	6	0.06	2.47	34.6	1352.4	0.0046	0.1817

➤  $\lambda = 0.986 \text{ \AA}$

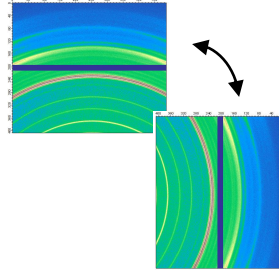
Camera Length (mm)	BS size (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
246	4	0.99	32.58	1.8	56.8	0.1106	3.5730
542	4	0.29	17.64	3.2	197.4	0.0318	1.9530
1028	5	0.13	8.03	7.0	443.2	0.0142	0.8922
2027	6	0.09	3.77	15.0	601.8	0.0104	0.4196
3025	6	0.06	2.47	22.9	896.5	0.0070	0.2742

# WAXS Detectable Area

## ● WAXD



✘PILATUS3 300KW will be able to be used at BL-10C during XAFS mode (BL-15A1 mode) of BL-15A.



The angle of WAXD detector can be selected between 0° and 90°.

### ➤ Type I (SAXS/WAXD)

Distance from sample to WAXD chamber : 40 mm@Drawing

Distance from sample to WAXD detector : 243 mm@Drawing



Detector Angle: 19°

### • $\lambda = 1.488 \text{ \AA}$

Camera Slide Position (mm)	$2\theta_{\min} (^{\circ})$	$2\theta_{\max} (^{\circ})$	$D_{\min} (\text{\AA})$	$D_{\max} (\text{\AA})$	$Q_{\min} (\text{\AA}^{-1})$	$Q_{\max} (\text{\AA}^{-1})$
0	9.10	25.22	3.4	9.4	0.6699	1.8437
73	26.01	41.03	2.1	3.3	1.9005	2.9596

### • $\lambda = 0.986 \text{ \AA}$

Camera Slide Position (mm)	$2\theta_{\min} (^{\circ})$	$2\theta_{\max} (^{\circ})$	$D_{\min} (\text{\AA})$	$D_{\max} (\text{\AA})$	$Q_{\min} (\text{\AA}^{-1})$	$Q_{\max} (\text{\AA}^{-1})$
0	9.10	25.22	2.3	6.2	1.0106	2.7812
73	26.01	41.03	1.4	2.2	2.8669	4.4646

# WAXS Detectable Area

## ● WAXD

### ➤ Type II (GI-SAXS/WAXD)

Distance from sample to WAXD chamber : 40 mm@Drawing

Distance from sample to WAXD detector : 248 mm@Drawing



Detector Angle: 27°

- $\lambda = 1.488 \text{ \AA}$

Camera Slide Position (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
0	18.30	34.18	2.5	4.7	1.3429	2.4818
28	24.63	40.35	2.2	3.5	1.8012	2.9126

- $\lambda = 0.986 \text{ \AA}$

Camera Slide Position (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
0	18.30	34.18	1.7	3.1	2.0259	3.7438
28	24.63	40.35	1.4	2.3	2.7172	4.3938

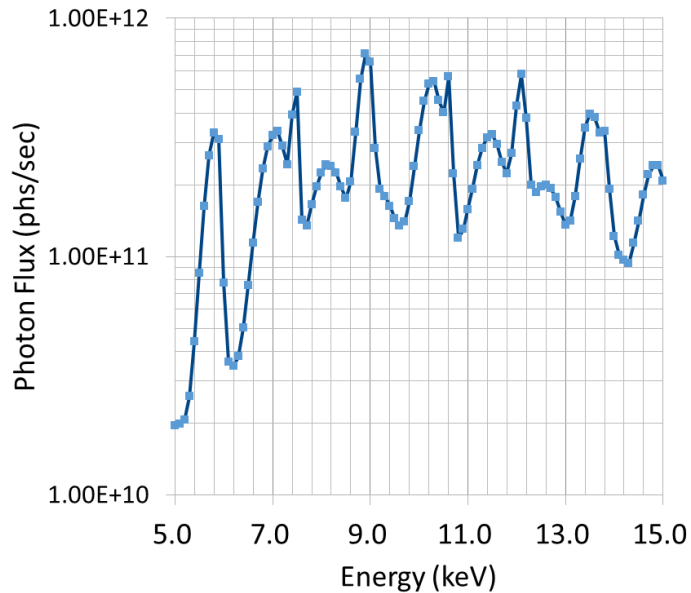
# BL-15A2 -Standard-

- Detector
  - SAXS: PILATUS3 2M
  - WAXD: PILATUS3 300KW
- Wavelength
  - 0.827~2.175Å (Standard)
  - The operation of change of wavelength is limited.
- Beam Intensity
  - The intensity is changed by ID harmonics.
- Camera Length
  - 0.25, 0.5, 1.0, 1.5, 2.5, 3.5 m
  - +WAXD Chamber: 0.95, 1.2, 1.7, 2.2, 3.2m
- Beam Size
  - S4 slit (Size-definition): V0.5 × H0.5 ~ V0.1 × H0.1mm
- Beam Stopper Size (Standard)
  - Φ3mm (fix)
- Measurement System
  - SAXS/WAXD、GI-SAXS/WAXD、SAXS



# Photon flux and Beam size

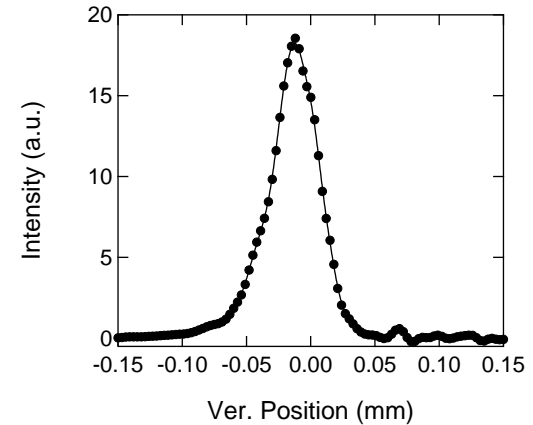
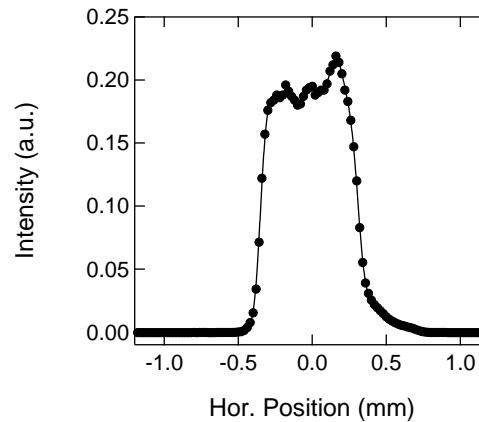
- This flux data was measured at BL-15A1 (2014.Feb.).



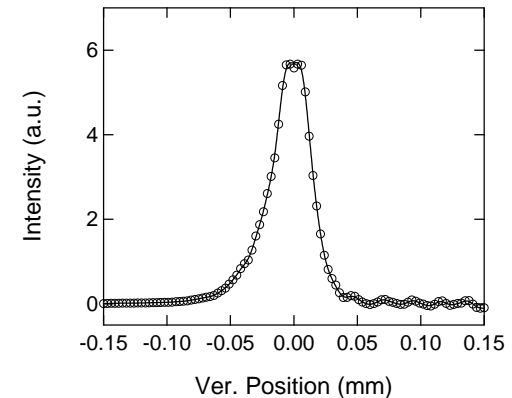
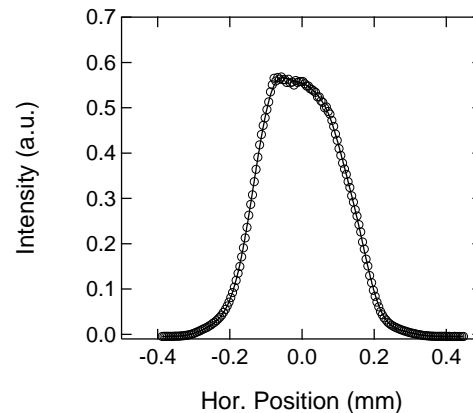
- Beam size@Focal point

Virtual source slit size @Horizontal: 0.1mm

@Standard stage: FWHM=H0.663 × V0.040mm



@Low-En. GI stage: FWHM=H0.288 × V0.035mm



# Detector Information

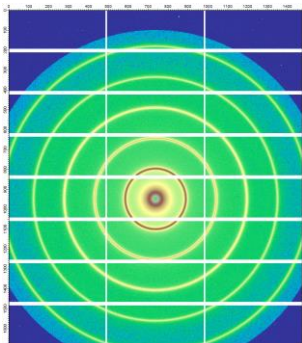
<b>PILATUS3 2M</b>	<b>Detective area (mm<sup>2</sup>)</b>	<b>W253.7 × H288.8</b>
	Pixel size (μm <sup>2</sup> )	172 × 172
	No. of pixels	H1475 × V1679
	Max. frame rate (Hz)	250
	Readout time (ms)	0.95

<b>PILATUS3 300KW</b>	<b>Detective area (mm<sup>2</sup>)</b>	<b>W253.7 × H33.5</b>
	Pixel size (μm <sup>2</sup> )	172 × 172
	No. of pixels	H1475 × V195
	Max. frame rate (Hz)	500
	Readout time (ms)	0.95

	<b>Counter depth</b>	2 <sup>20</sup> = 1,048,576
	<b>Max. counts per sec</b>	~300,000@HighG
	<b>Point-spread function</b>	1 pixel (FWHM)

# SAXS Detectable Area

## ● SAXS



### ➤ $\lambda = 1.190 \text{ \AA}$

Camera Length (mm)	BS size (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
308	3	0.377	27.5	2.5	181	0.0348	2.510
1108	3	0.104	7.49	9.1	655	0.0096	0.690
3657	3	0.028	1.95	34.9	2410	0.0026	0.180

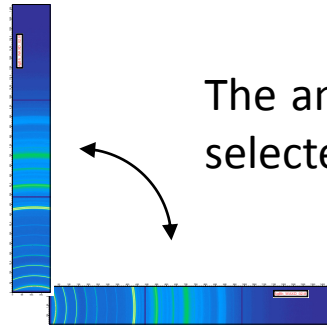
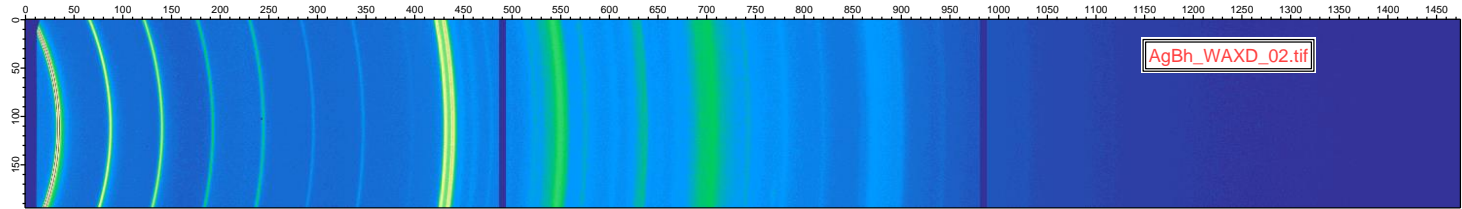
### ➤ $\lambda = 1.653 \text{ \AA}$

Camera Length (mm)	BS size (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
308	3	0.377	27.5	3.5	251	0.0250	1.806
1108	3	0.104	7.49	12.7	911	0.0069	0.497
3657	3	0.028	1.95	48.5	3358	0.0019	0.130



# WAXS Detectable Area

## ● WAXD



The angle of WAXD detector can be selected between 0° and 90°.

### ➤ Type I (SAXS/WAXD)

Distance from sample to WAXD chamber : 40 mm@Drawing

Distance from sample to WAXD detector : 405 mm@Drawing



Detector Angle: 23°

- $\lambda = 1.2189 \text{ \AA}$

Camera Slide Position (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
0	5.88	40.38	1.8	11.9	0.5288	3.5582
311	47.55	70.00	1.1	1.5	4.1563	5.9133

# WAXS Detectable Area

## ● WAXD

➤ Type II (GI-SAXS/WAXD)

Distance from sample to WAXD chamber : 40 mm@Drawing

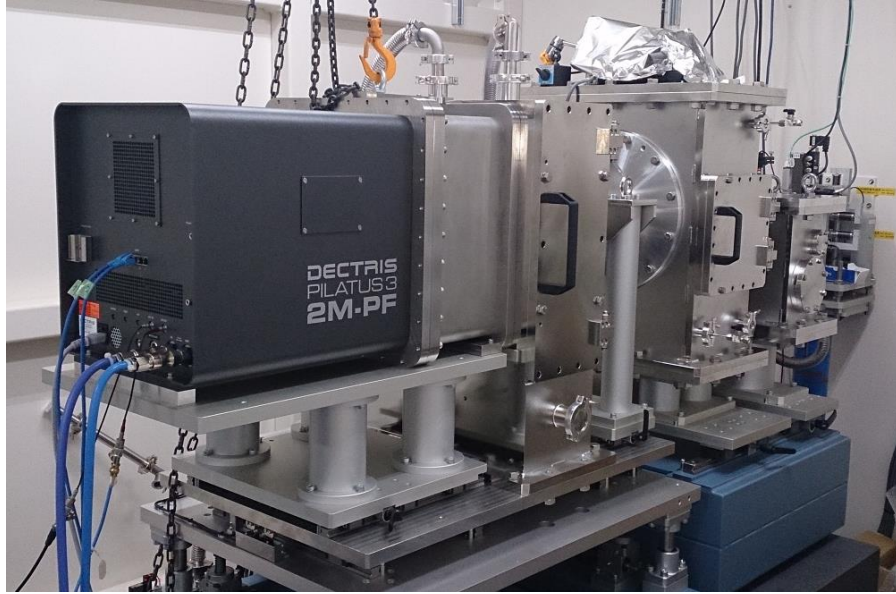
Distance from sample to WAXD detector : 405 mm@Drawing

 Detector Angle: 34°

•  $\lambda = 1.2189 \text{ \AA}$

Camera Slide Position (mm)	$2\theta_{\min}$ (°)	$2\theta_{\max}$ (°)	$D_{\min}$ (Å)	$D_{\max}$ (Å)	$Q_{\min}$ (Å <sup>-1</sup> )	$Q_{\max}$ (Å <sup>-1</sup> )
0	16.70	51.25	1.4	4.2	1.4972	4.4587
171	40.20	70.08	1.1	1.8	3.5430	5.9192

# BL-15A2 -Low-Energy GI-SAXS-



- Condition

Energy : 3.6 ~ 5.4 keV (tentative)

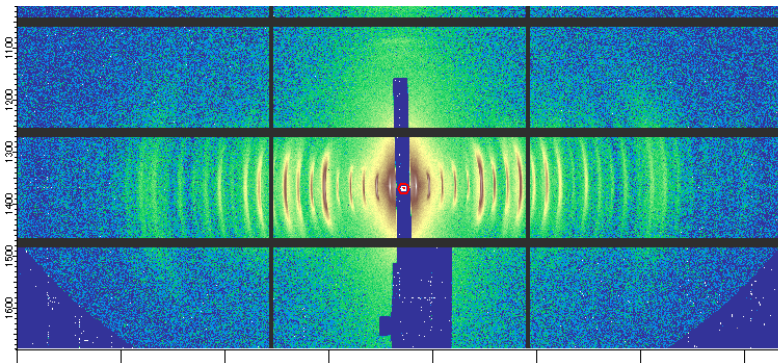
Camera Length : 825 mm

BS size : Wid 4 mm (3 mm is being prepared.)

Small-angle resolution : 1100 Å @ 3.6 keV

※ In order to use this stage, the proposal for using this stage is required.

- Collagen



- Block copolymer ( polystyrene-polymethacrylic acid)

