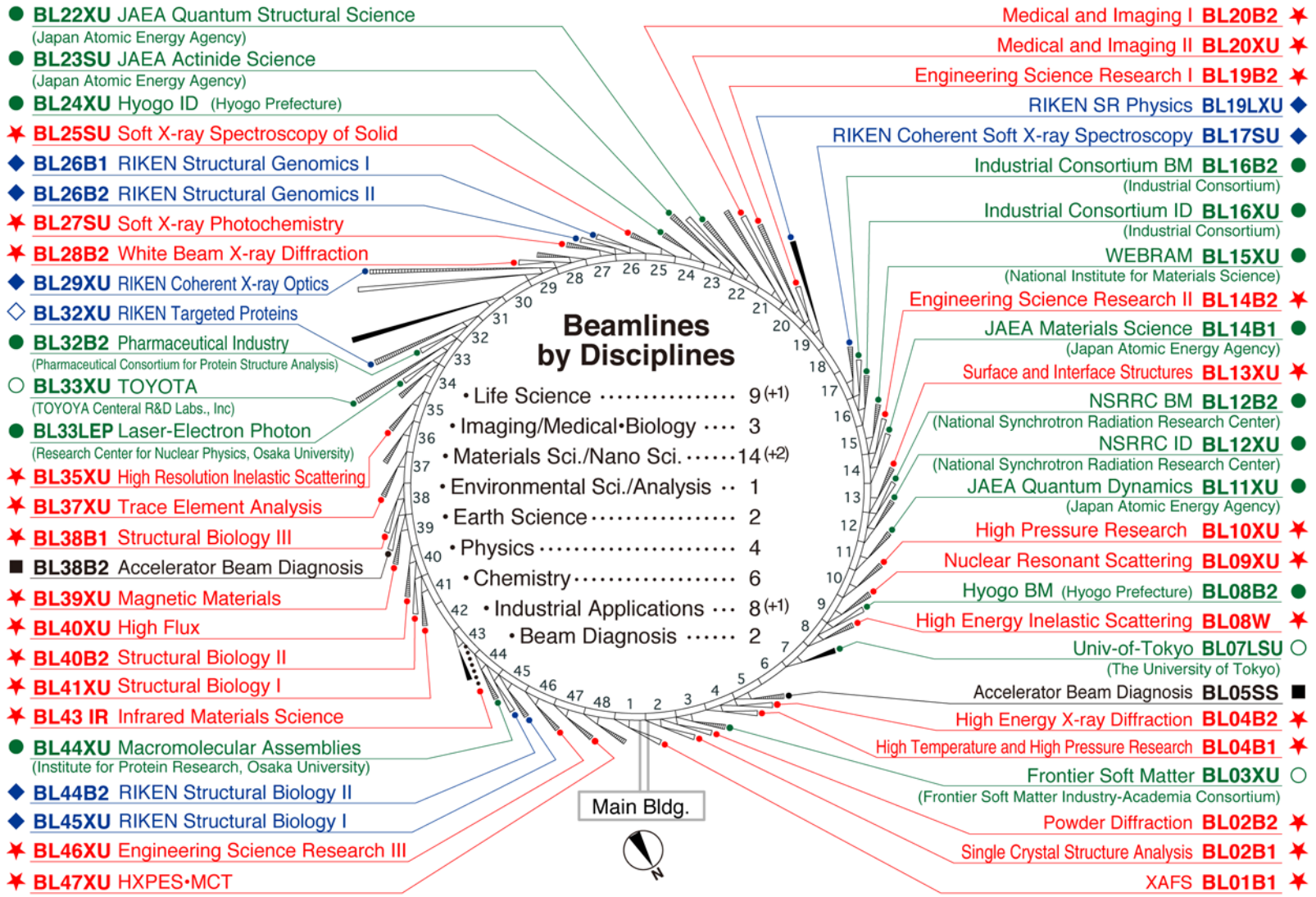
Present Status of the SPring-8 Beamline

3W Meeting at APS/ANL

March 18-19,2008

Hideo Ohno

JASRI/SPring-8



STATUS	BEAMLINES				TOTAL
	Public BL	Contract BL	RIKEN BL	Beam Diag.	
Operational	26	14	7	2	49
Under Const.	0	3	1	0	4
TOTAL	26	17	8	2	53

Total Number of Beamlines : 62 (61+1)

- Insertion Device (6 m) : 34
- Insertion Device (30 m) : 4
- Bending Magnet : 23
- Others : 1

★ : Public Beamlines
● : Contract Beamlines
◆ : RIKEN Beamlines
■ : Accelerator Beam Diagnostic Lines
☆ ○ ◇ □ : Planned or Under Construction

Strategy of the Operation of the Beamlines at SPring-8

(1) Complete the Vacant Ports(13) as soon as possible

Capacity: 62 beamlines ; Operated: 49 beamlines

13 beamlines are available

- **30m long undulator BL(3)**
- **6m long undulator BL (8)**
- **Bending magnet BL(2)**

4 Beamlines have been determined for construction

(2) Scientific Use and Industrial Application (Ratio)

Accepted Research Proposals using 26 public beamlines

- **80%: Scientific Users**
- **20%: Industrial Users**

3 Public Beamlines are dedicated to the Industrial Users

- **BL19B2(Thin Film, Surface &Interface, Powder Diffraction, X-ray Imaging)**
- **BL14B2(XAFS)**
- **BL46XU(HEPES etc.)**

Public Beamline Review

22 public beamlines were reviewed from 2002 through 2006

2002

High Energy Inelastic Scattering (BL08W)
XAFS (BL01B1)
Single Crystal Structure Analysis (BL02B1)
Structural Biology I (BL41XU)
High Pressure Research (BL10XU)

2003

Magnetic Materials (BL39XU)
Soft X-ray Spectroscopy of Solid (BL25SU)
Nuclear Resonant Scattering (BL09XU)
High Temperature and High Pressure Research (BL04B2)
Soft X-ray Photochemistry (BL27SU)

2004

Powder Diffraction (BL02B2)
Structural Biology II (BL40B2)
White Beam X-ray Diffraction (BL28B2)
Medical and Imaging I (BL20B2)
High Energy X-ray Diffraction (BL04B2)

2005

High Resolution Inelastic Scattering (BL35XU)
High Flux (BL40XU)
Infrared Materials Science (BL43IR)

2006

Surface and Interface Structures (BL13XU)
Engineering Science Research (BL19B2)
Medical and Imaging II (BL20XU)
Trace Element Analysis (BL37XU)

Review Committee Recommendations

New Beamlines

(1) XAFS (BL01B1) RC;
Expand the capacity for XAFS in SPring-8
→ A new BL for XAFS, BL14B2 dedicated to industrial research

(2) Engineering Science Research (BL19B2) RC;
Build an insertion-device beamline for industrial research
→ BL46XU, converted to industrial research

(3) High Resolution Inelastic Scattering (BL35XU) RC;
Build a long undulator beamline

Review Committee Recommendations

Research Directions

(1) High Pressure Research (BL10XU) RC;
Dedicated to high pressure research using DAC
→ move the high-brilliant XAFS program to BL37XU

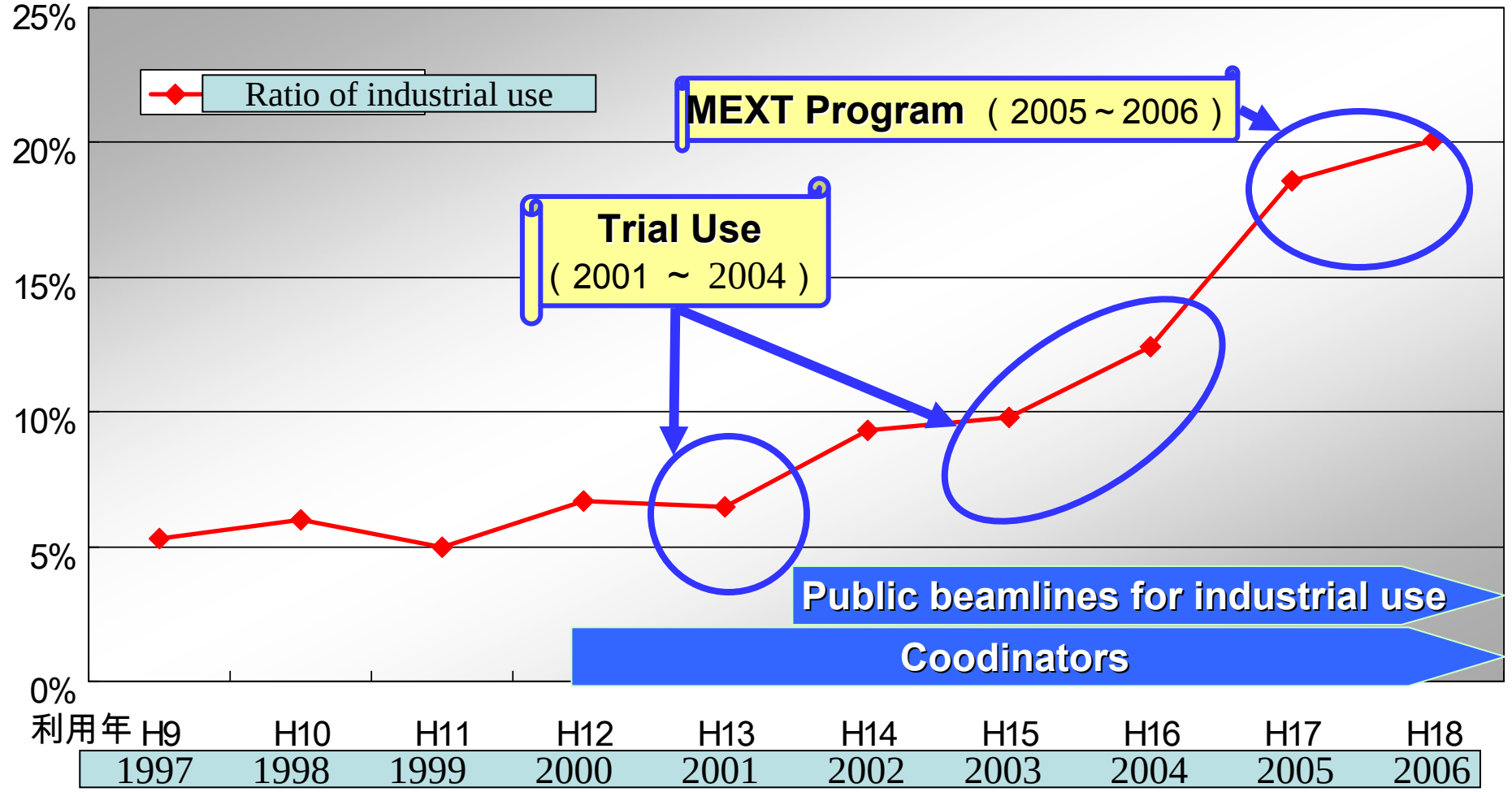
(2) Magnetic Materials (BL39XU) RC;
Intensify XMCD for nano science or under extreme conditions

(3) Infrared Materials Science (BL43IR) RC;
Focus on infrared microscopy
→ cut the surface and absorption-measurement activities

(4) Soft X-ray Spectroscopy of Solid (BL25SU) RC;
Encourage high-energy photo-emission spectroscopy (PES)
→ build high-energy PES stations at BL46XU and BL47XU

(5) Structural Biology II (BL40B2) RC;
Focus on small-angle scattering
→ move the protein crystallography program to BL38B1

Strategic Promortion for Industrial Application



Industrial Users and Research Fields at SPring-8

More than 180 companies are joined

Electronics

三洋電機、住友電工、ソニー
東芝、NEC、日立、富士通研、
富士電機総研、松下電器、
三菱電機、NTT、キヤ
リコー　など

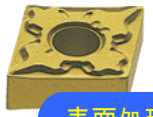
Display

Semi-conductor

Memory materials

Materials（Metals、Polymers）

Steel



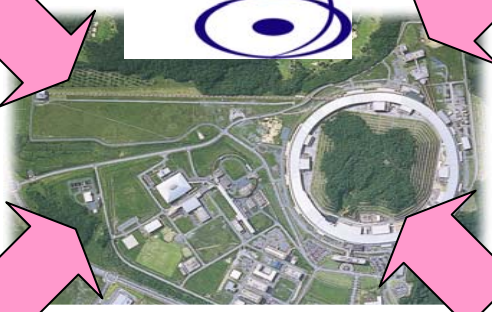
表面処理

川崎重工、神戸製鋼、
新日鐵、住友金属、
住友電工、ダイソー、
三菱マテリアル　など

Rubber

繊　維

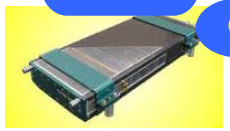
旭化成、クラレ、
住友ゴム、帝人、
東洋紡、三菱レイヨン、
三菱化学、ユニチカ　な



Environment, Energy

豊田中研、ダイハツ、
関西電力、東京ガス、
松下電池、東邦ガス、
JFEスチール　など

Fuel Cell



Catalysis for cars

battery

Medicine Health Care

蛋白コンソーシアム21社

武田薬品、第一三共、
大塚製薬、塩野義製薬、
アステラス製薬、
中外製薬、大正製薬、
持田製薬、キリンビール
ロシュ　など

資生堂、花王、P&G、
カネボウ、赤穂化成、
アース製薬、大関化学
など

海洋深層水

medicine

Hair-care

Construction of new beamlines

Contract Beamline

Frontier Soft Matter Beamline(BL03XU)

(Frontier Soft Matter Beamline Consotium)

University of Tokyo Beamline(BL07LSU)

(Outstation Program of University of Tokyo)

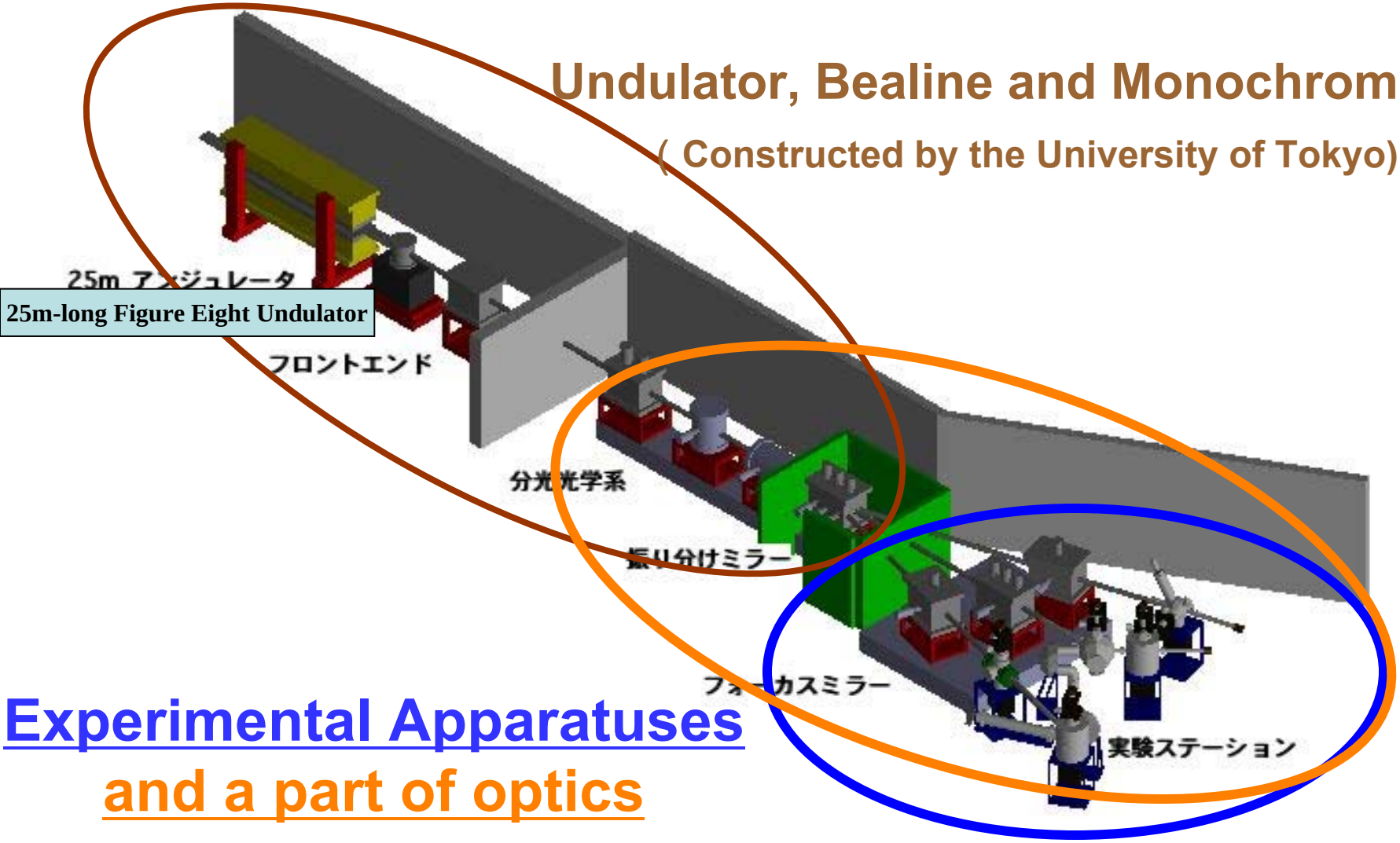
Toyota Beamline(BL33XU)

(TOYOTA Central R&D Labs.,Inc)

RIKEN Beamline

RIKEN Target Proteins Beamline(BL32XU)

Schematics of high brilliance undulator beamline at SPring-8



Experimental Apparatuses and a part of optics

Characteristics of the beamline

○ **Soft X-ray ndulator (Figure eight undulator)**

- type： polarization controlled soft X-ray undulator
- fundamental： 250 eV - 2 keV
- brillliance： 10^{19} photons/sec/mm^2/mrad^2 <
- polarization： hor.-, ver.-, circular-, various polarization

○**Beamline and monochromator**

- optics：pre-mirror sys., monochtomator, post-f.-mirror sys.
- energy range： 250eV - 2keV
- resolution： E/ΔE > 10,000
- beam size：< 10μ mx10μm

○**Experimental apparatuses**

With coopreration with nation-wide user community

- nono-beam 3D analyses of electronic states --- Dr. Kumigashira *et al.*
- soft X-ray emission spectroscopy ---------- Dr. Haraga *et al.*
- time-resolved experiments (PES, SXE, PEEM etc.) Dr. Matsuda *et al.*
- photoelectron microscopy ---------- Dr. Okuda *et al.*
- soft X-ray imaging ---------- Dr. Ono *et al.*

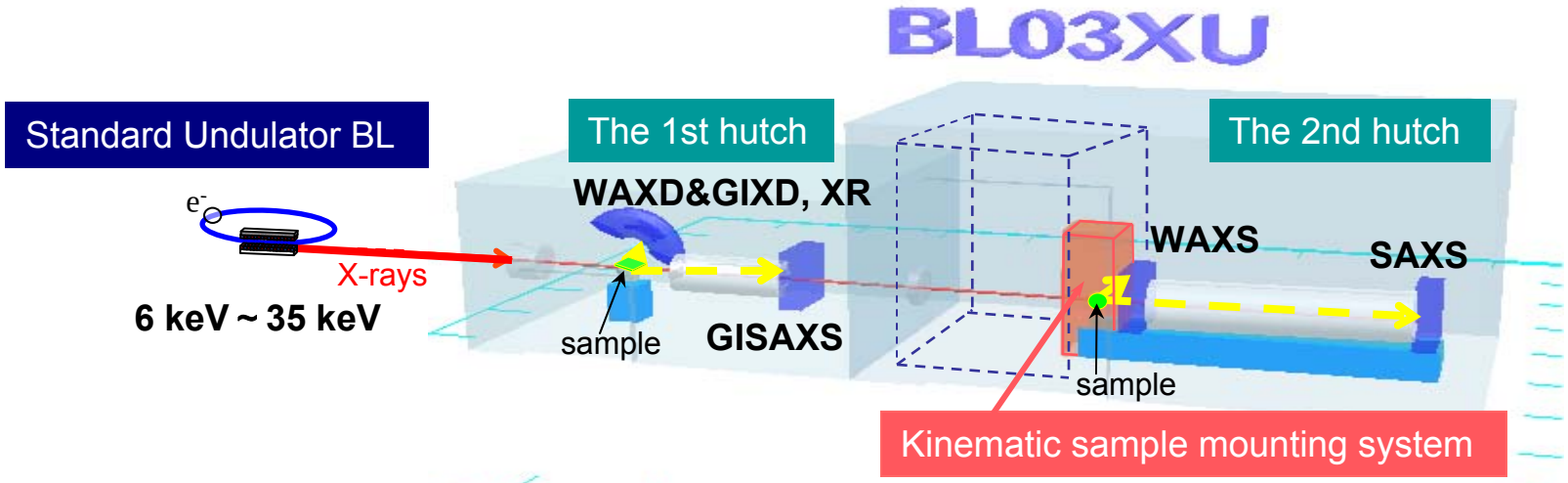
Frontier Soft Matter Beamline (FSM BL)

The mission of the FSM BL is to clarify nano-to-meso scale structure-property relationships of polymers and soft matter in the bulk and thin-film states from industrial and academic points of views for development of the next-generation materials on the basis of nano- and micro-technologies.

In order to construct an undulator BL as a modern and powerful analytical tool for polymers and soft matter, the industry-academic joint consortium (FSM BL consortium) was organized by 17 corporate groups consisting of companies and academic researchers each in February, 2008.

Construction of the FSM BL will be started in spring, 2008. This contract BL will be opened for the consortium users around winter, 2009 after commissioning. The academic members will lead the consortium to new polymer and soft-matter science utilizing synchrotron radiation.

Features of Frontier Soft Matter BL



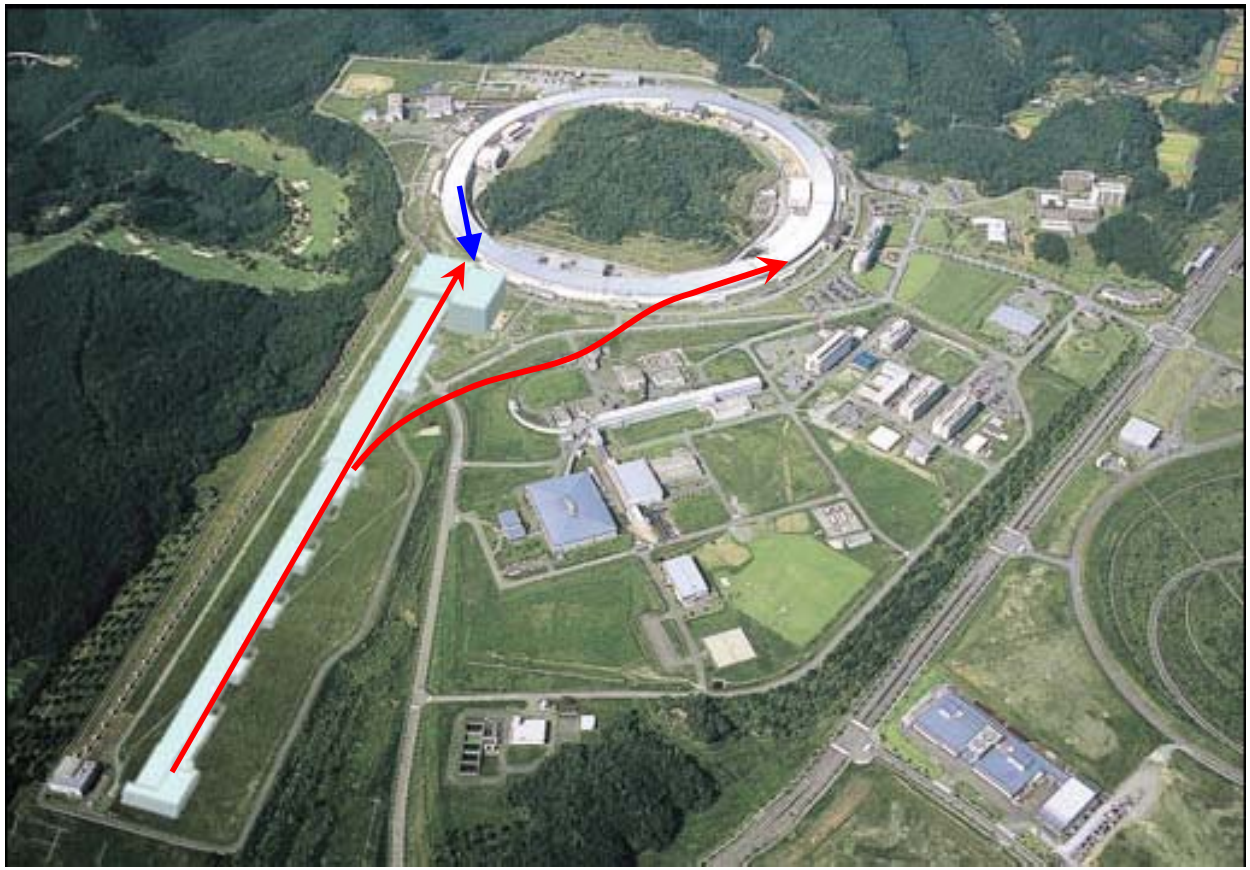
[the 1 st hutch, thin-film structure science]

- **The BL is equipped with the systems of time-resolved GIXD and GISAXS measurements for thin films of polymers and soft matter.**

[the 2 nd hutch, dynamic nano・meso-structure science]

- **The SAXS resolution is max. 0.7 μm (1.0 μm).**
- **The BL is equipped with the systems of time-resolved WAXS/SAXS measurements and microbeam WAXS and SAXS measurements for the bulk samples of polymers and soft matter.**
- **A space of 3 m (*l*) x 3 m (*w*) x 4 m (*h*) is reserved as sample one for large and industrial processing or casting machines.**
- **A kinematic sample mounting system is designed to exchange samples in a quick and easy way in the BL.**

Near Future of SPring-8



XFEL + SR Beamline

以下参考資料

Target Protein project;

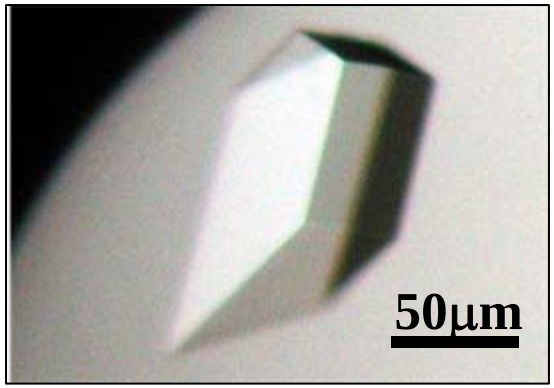
Micro beam Beamline for Protein crystallography - BL32XU -

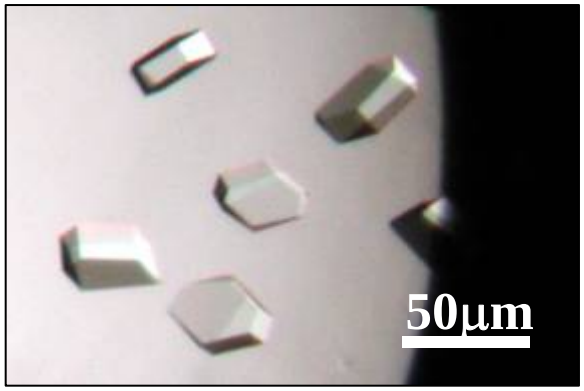
Masaki Yamamoto
RIKEN SPring-8 Center

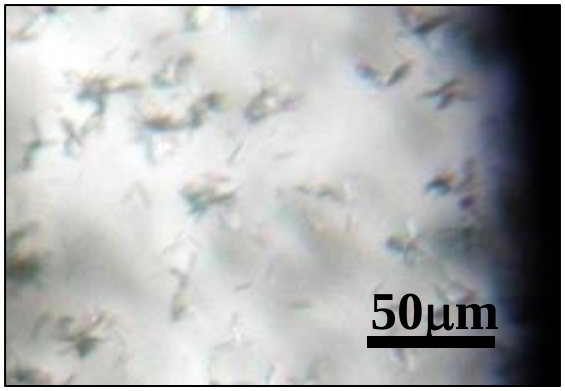
Micro-beam optimized for Micro-crystal

Target Protein Project

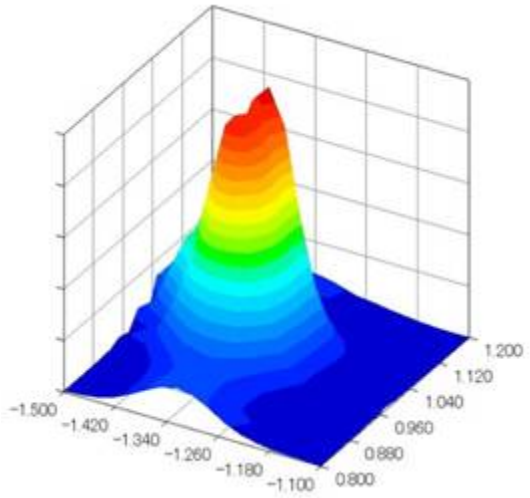
Standard	Current Limit	Micro-crystal
>50μm	20~30μm	<10μm







Next Target



Beam profile of SPring-8 BL41XU

Micro-beam optimized for Micro-crystal

	Now	Target	
• Beam Size	100×100	1×1	μm^2
• Flux density	10^{13}-10^{14}	10^{16}	Photons/Sec./mm^2

Target Protein Research project

R&D Proposal from SPring-8

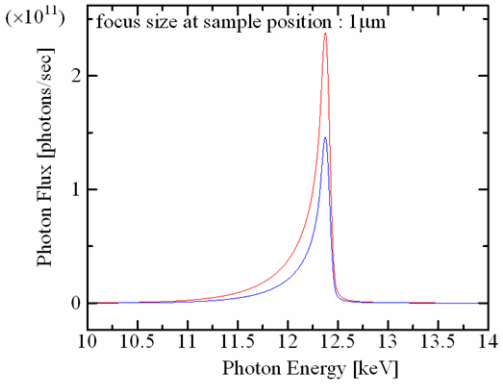
Micro focus beamline

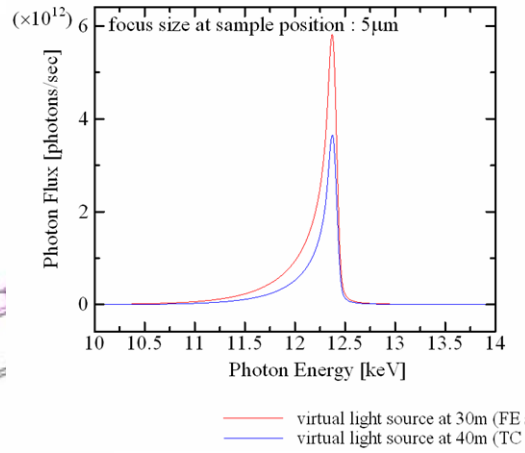
- Target beam size : < 5 μm
- Flux density : > 10^{16}photons/mm^2/sec.

New BL construction

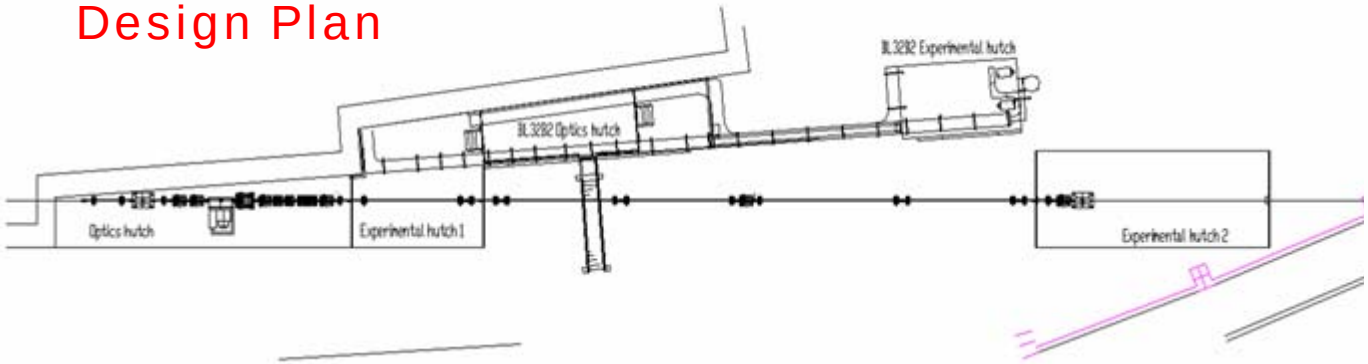
(BL32XU / Medium length Beamline)

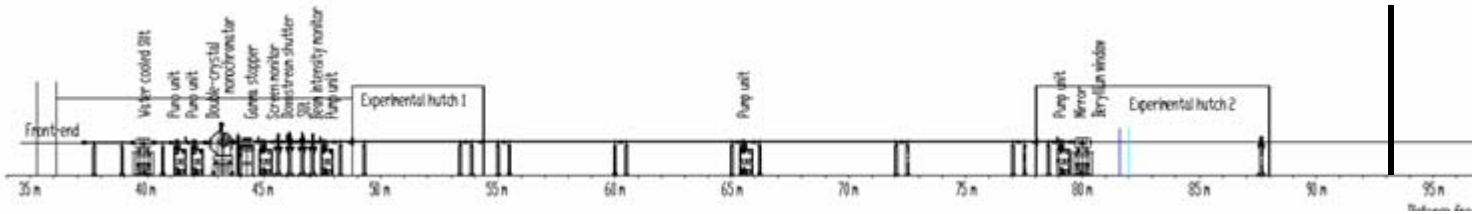
Calculated Flux





Design Plan





TOYOTA Beamline : Aim

SPring-8, RIKEN
▽
High Emittance, COE

Tapered Undulator
Micro Beam

+

Contract Beamline
▽
Own Sample Environment

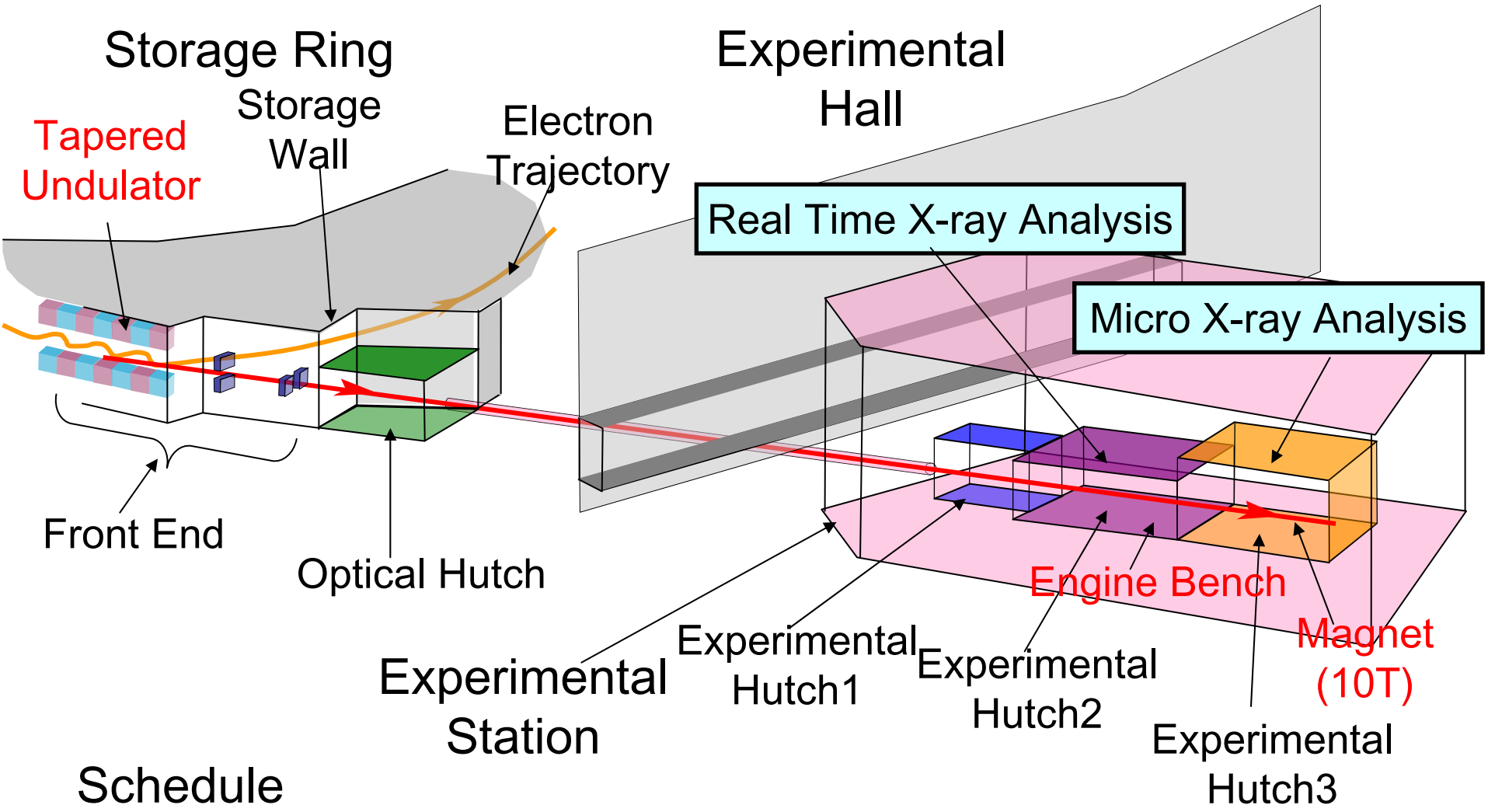
Engine Bench
Super Conducting Magnet

⇨ **Unique Analytical Tool**

	Real Time X-ray Analysis	Micro X-ray Analysis
feature	Time Resolved-XAFS resolution 100msec ~ 1msec (current ~ sec) ↓ In situ, dynamic reaction	3D X-ray Diffraction Microscope resolution 100nm (current μm) ↓ In situ, interior texture
research theme	・ catalytic reaction ・ chemical reaction	・ plastic deformation ・ stress distribution ・ domain structure

Engine Bench, Micro Beam → Long Beamline
Construction of Experimental Station

TOYOTA Beamline : Plan



Schedule

<1st Term> Real Time X-ray Analysis	<2nd Term> Micro X-ray Analysis
Oct. 2008 Experimental Station Apr. 2009 Commissioning	2010 or 2011

Present status of the Outstation Project of the University of Tokyo

Synchrotron Radiation Research Organization of the University of Tokyo

(01.05.2006 -)

Materials Science Division

Life Science Division

Beamlines for structural biology

Materials science using high brilliance soft X-ray beamline

Materials science using high flux synchrotron radiation

Advantages of beamlines in 3rd generation SR facilities

1. High patial resolution

Spectroscopy utilizing high brilliance and low emittance
atomic structure and eelctronic states analyses of
micro-crystals (new exotic mateirals), atom aggregats at surfaces,
nano-structure materials (2D, 1D and dotts) , etc.
photoelectron microscopy (PEEM), microbeam and microscanning, STM
with spatial resolution better than 1 nm.

2. Precise time resolution

Time-resolved spectroscopy utilizing a new operation of light source (accelerator), and combination with laser irradiation
dynamic processes in
chemical reactions, photo-induced phase transition,
magnetic domain structures, etc.
time-resolved XAFS, time-resolved spectroscopy with lasers, etc.
with time resolution better than 1 ps.

3. High coherence in SX region

Soft X-ray diffraction microscopy

Materials Science Division

High brilliance and high photon flux beamlines in existing SR facilities to promote advanced materials science

○ SPring-8 (3rd generation X-ray SR facility)

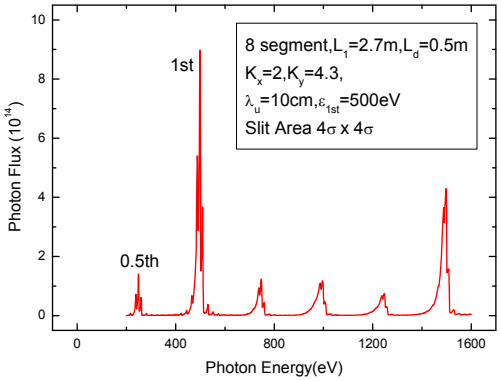
25 m-long undulator beamline
the highest brilliance in SX region (ca. 10^{+19} @ 400-2000 eV)

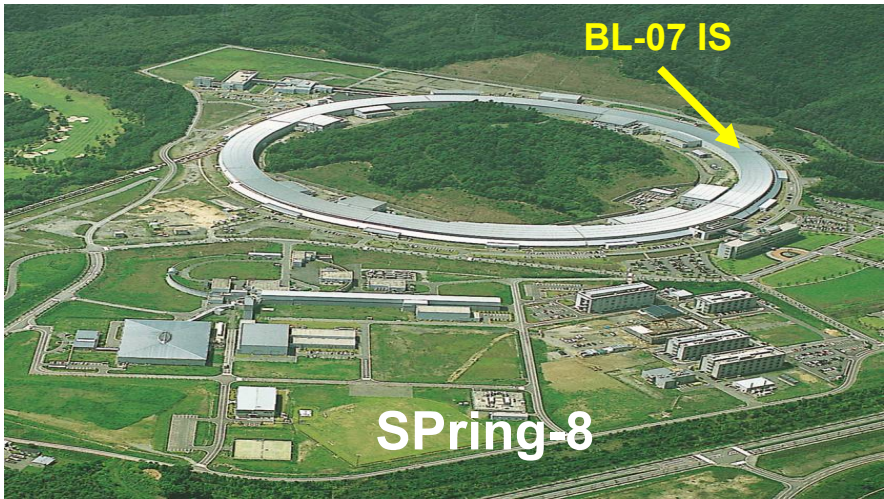
○ Photon Factory (2nd generation SR facility)

undulator beamlines with high photon flux (ca. 10^{+12} @ R 10^{4})
renovation of existing undulator beamlines

Polarization-controlled soft X-ray undulator

+ Figure eight undulator -> eight 2.7m-long segments
+ Period length 100-120 mm -> 100 mm
+ Maximum K values Kx∽3, Ky ∽6 (optimized Kx/Ky)
+ Polarization -> horizontal, vertical and herical
+ Phase shifter -> R&D





λu = 120mm

Polarization-controlled soft X-ray undulator at SPring-8

Schedule

1) Design study of 25m-long undulaor < 2007.03

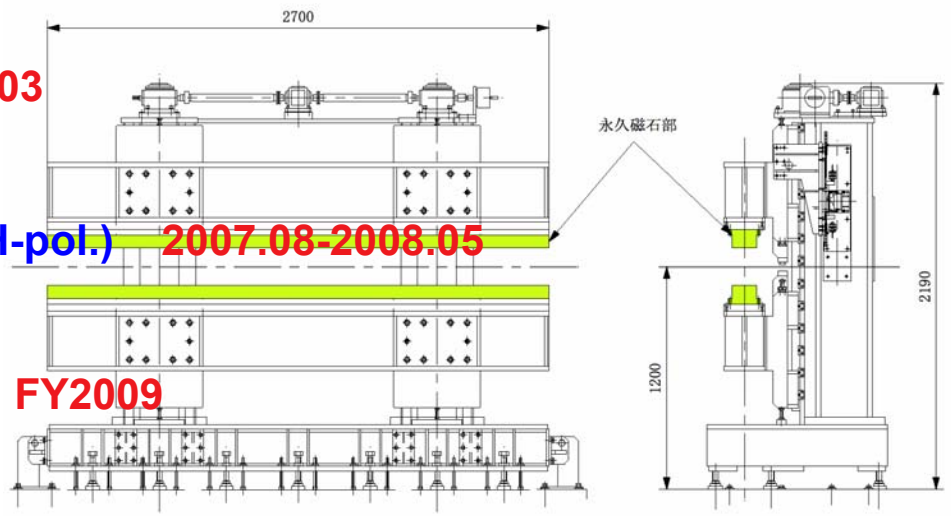
2) Proposal to SPring-8 < 2007.08

3) Construction of 25mx1/2 undulator (4 seg. H-pol.) 2007.08-2008.05

4) Installation to SPring-8 2008.08

5) Extension to 25m undulator (4 seg. V-pol.) FY2009

Available for experiments within FY2008



QuickTimeý Ç²
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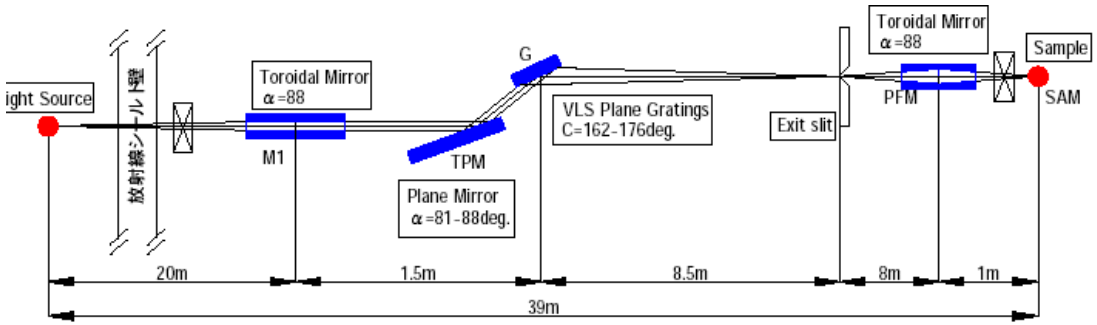
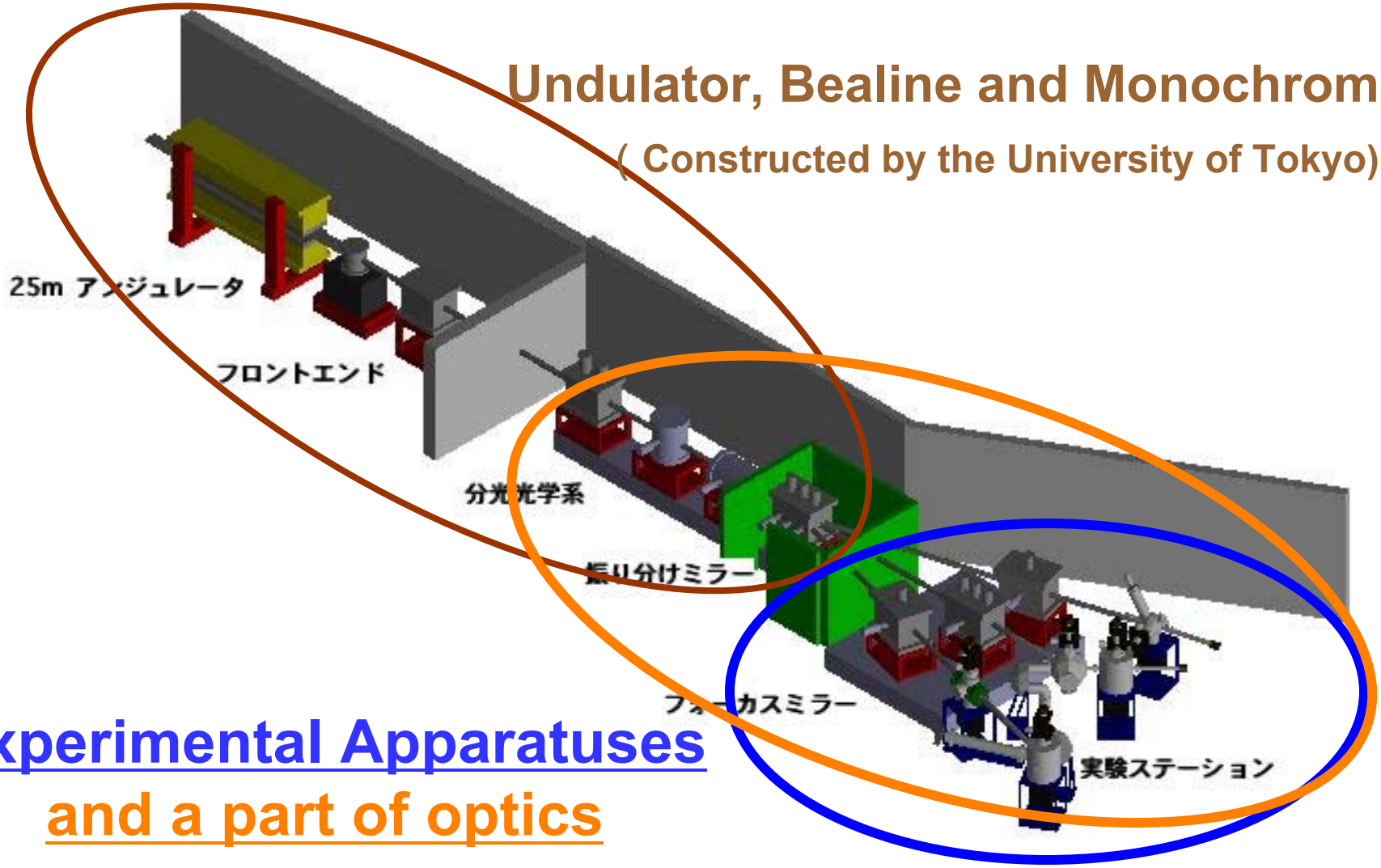
Ç™Ç±ÇÃĖsÉNÉ`ÉÉÇ¾â©ÇÈÇžÇ½Ç…ÇÖïKóvÇ-Ç□ÀB

QuickTimeý Ç²
TIFFÂiLZWÂj êLíŁĖvĖçÉOÉàÉÄ
Ç™Ç±ÇÃĖsÉNÉ`ÉÉÇ¾â©ÇÈÇžÇ½Ç…ÇÖïKóvÇ-Ç□ÀB



High resolution monochromator in VUV region
(developed in Super-SOR project)

Schematics of high brilliance undulator beamline at SPring-8



Undulator, Bealine and Monochromator

(Constructed by the University of Tokyo)

Experimental Apparatuses and a part of optics

(Budget proposed to MEX)

Schedule of the construction of soft X-ray beamline at the SPring-8

Polarization-controlled undulator

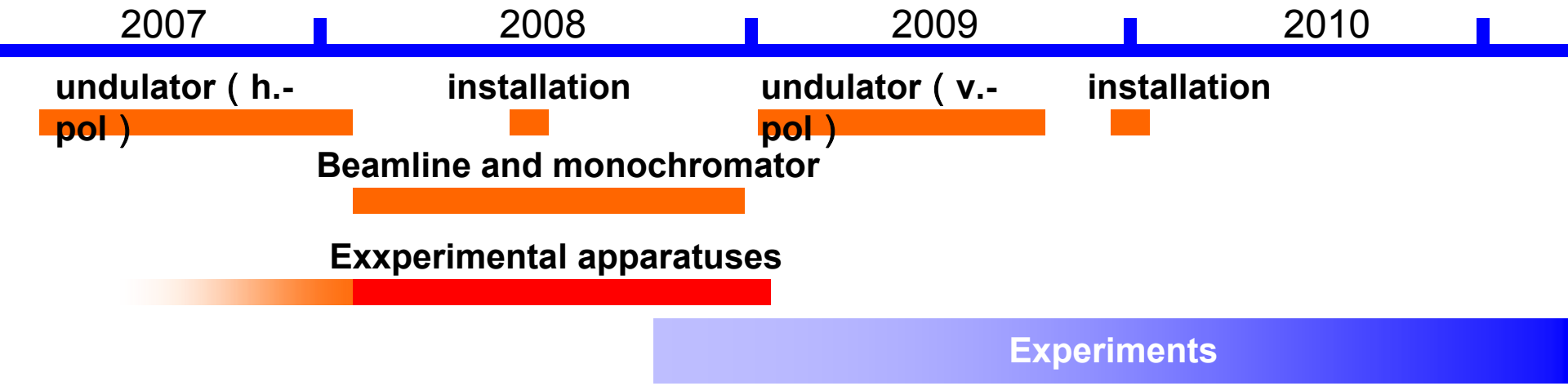
undulator (v.-pol)

controlling system

undulator (h.-pol)

Beamline and monochromator

Exxperimental apparatuses



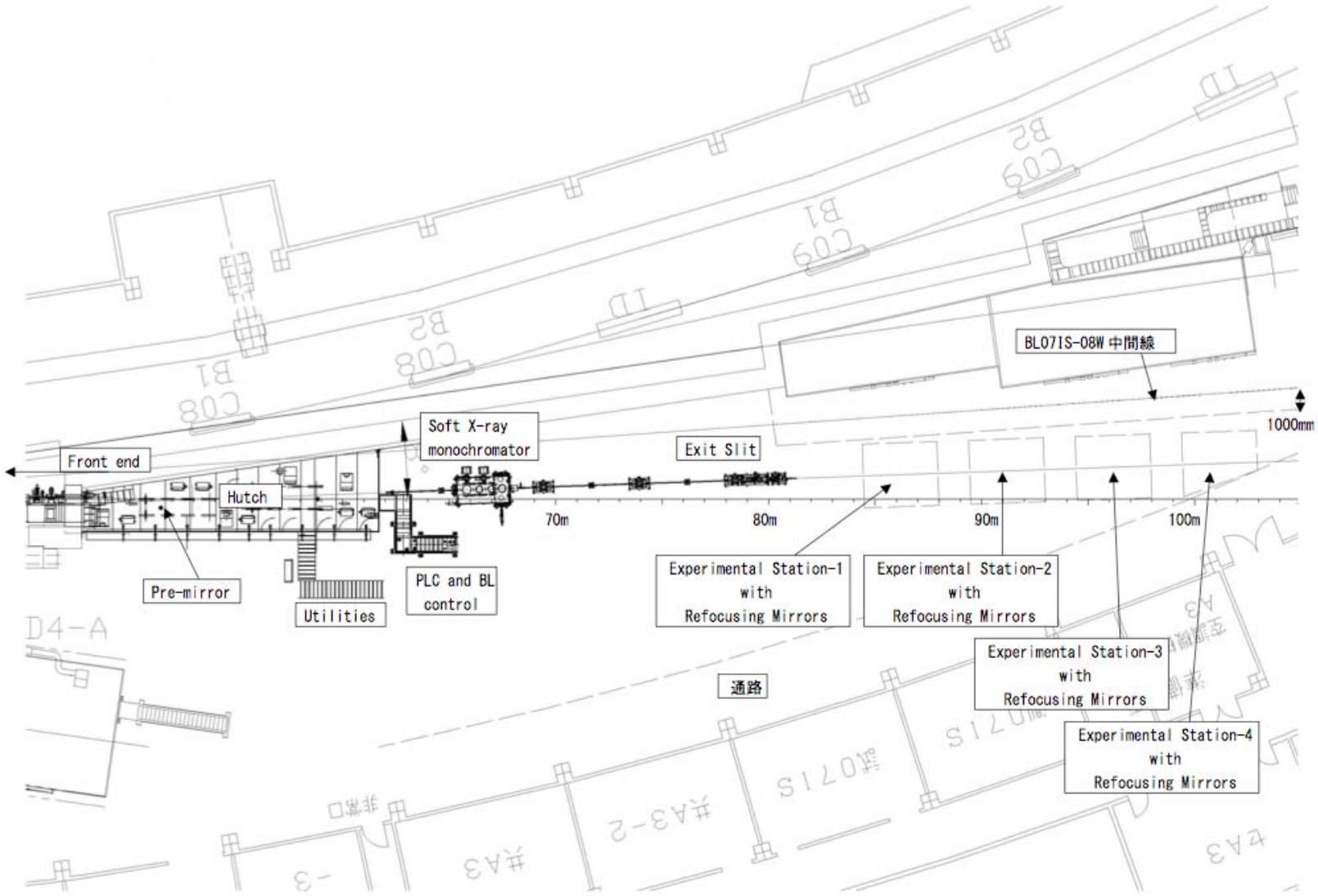


図 3 BL07IS ビームライン全体計画（案）

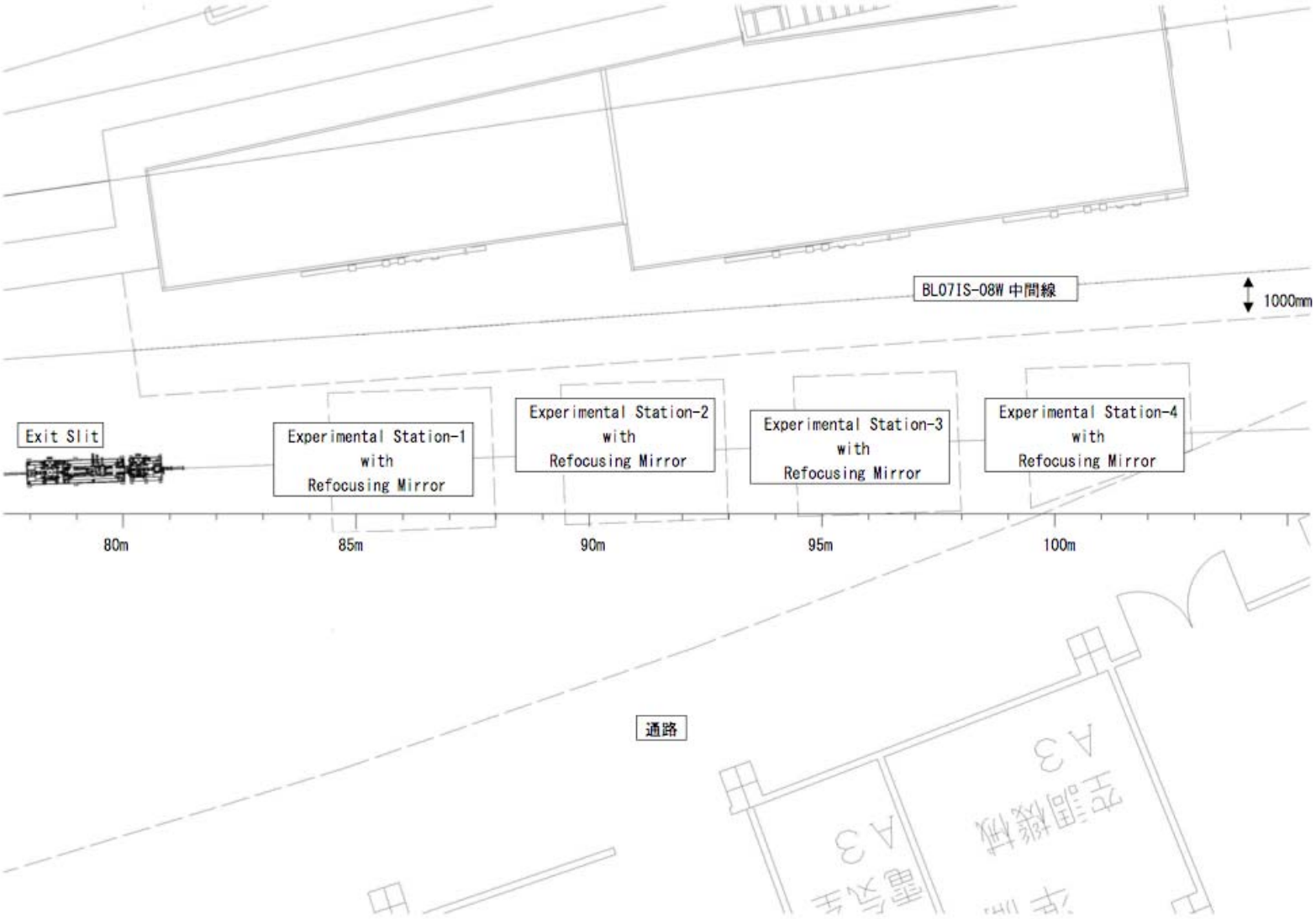


図 4 BL07IS 実験ステーション配置図(案)

Characteristics of the beamline at the SPring-8

○ **Soft X-ray ndulator**

- type： polarization controlled soft X-ray undulator
- fundamental： 250 eV - 2 keV
- brillliance： 10^{19} photons/sec/mm^2/mrad^2 <
- polarization： hor.-, ver.-, circular-, various polarization

○**Beamline and monochromator**

- optics：pre-mirror sys., monochtomator, post-f.-mirror sys.
- energy range： 250eV - 2keV
- resolution： E/ΔE > 10,000
- beam size：< 10□mx10□m 以下

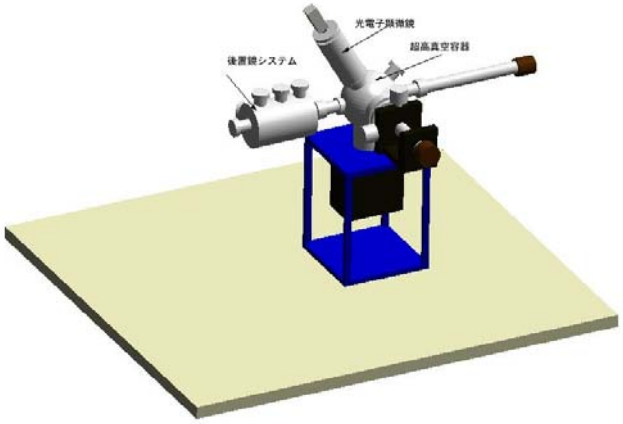
○**Experimental apparatuses**

With coopreration with nation-wide user community

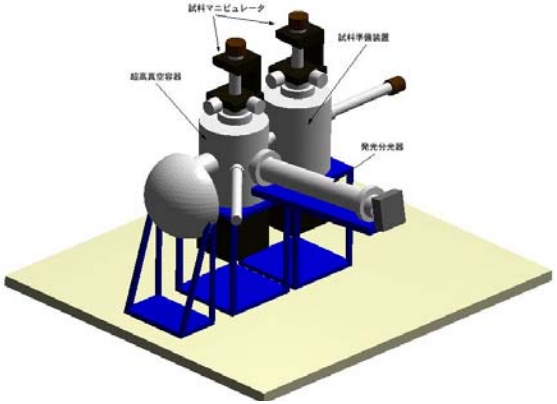
- nono-beam 3D analyses of electronic states --- Dr. Kumigashira *et al.*
- soft X-ray emission spectroscopy ---------- Dr. Haraga *et al.*
- time-resolved experiments (PES, SXE, PEEM etc.) Dr. Matsuda *et al.*
- photoelectron microscopy ---------- Dr. Okuda *et al.*
- soft X-ray imaging ---------- Dr. Ono *et al.*

Experimental apparatuses for high brilliance soft X-ray

Photoelectron microscopy experiments

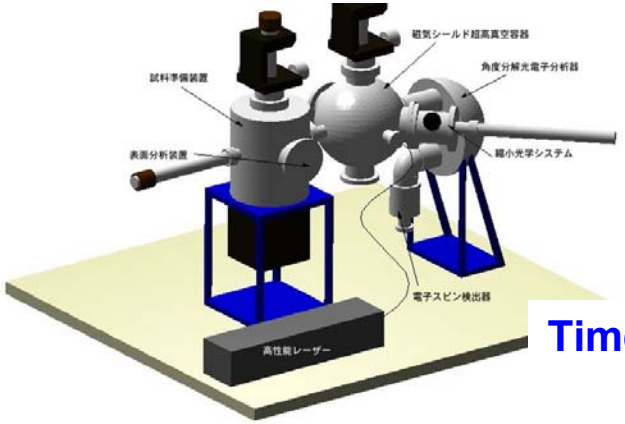


Soft-ray emission experiments

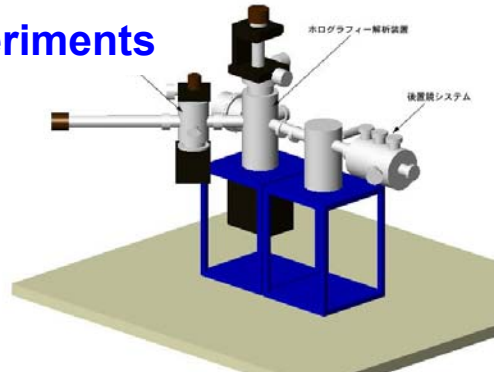


Photoelectron microscopy experiments

Nano-beam photoemission experiments



High-resolution monochromator



QuickTimeý Ç²
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Time-resolved photoemission experiments

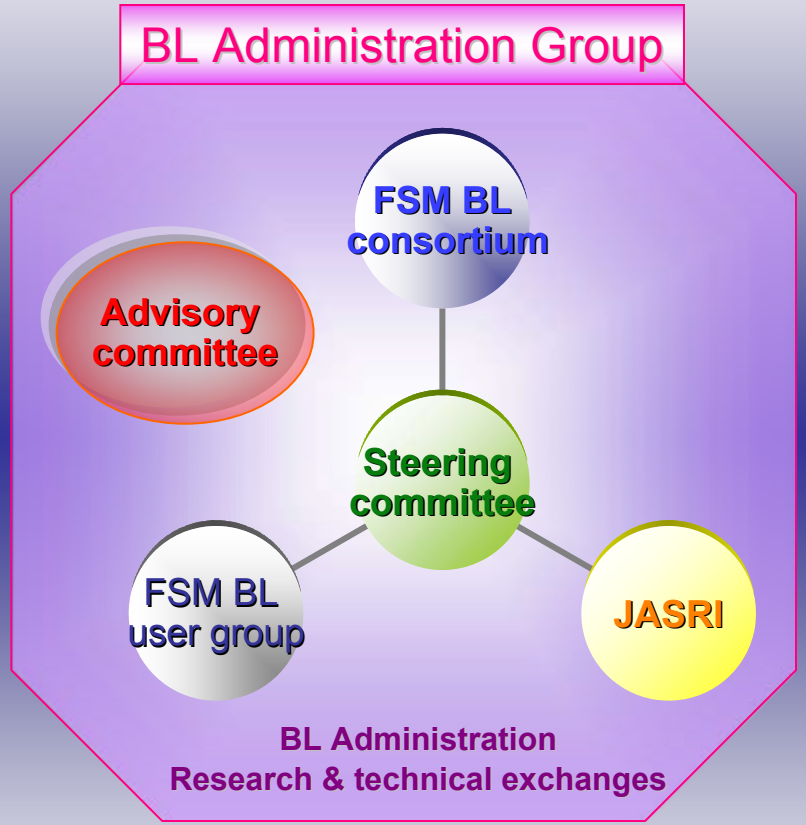
Frontier Soft Matter Beamline (FSM BL)

The mission of the FSM BL is to clarify nano-to-meso scale structure-property relationships of polymers and soft matter in the bulk and thin-film states from industrial and academic points of views for development of the next-generation materials on the basis of nano- and micro-technologies.

In order to construct an undulator BL as a modern and powerful analytical tool for polymers and soft matter, the industry-academic joint consortium (FSM BL consortium) was organized by 17 corporate groups consisting of companies and academic researchers each in February, 2008.

Construction of the FSM BL will be started in spring, 2008. This contract BL will be opened for the consortium users around winter, 2009 after commissioning. The academic members will lead the consortium to new polymer and soft-matter science utilizing synchrotron radiation.

Frontier Soft Matter Beamline (FSM BL) Consortium



[Notes]

Advisory committee :

(1) Advice from a wide point of view

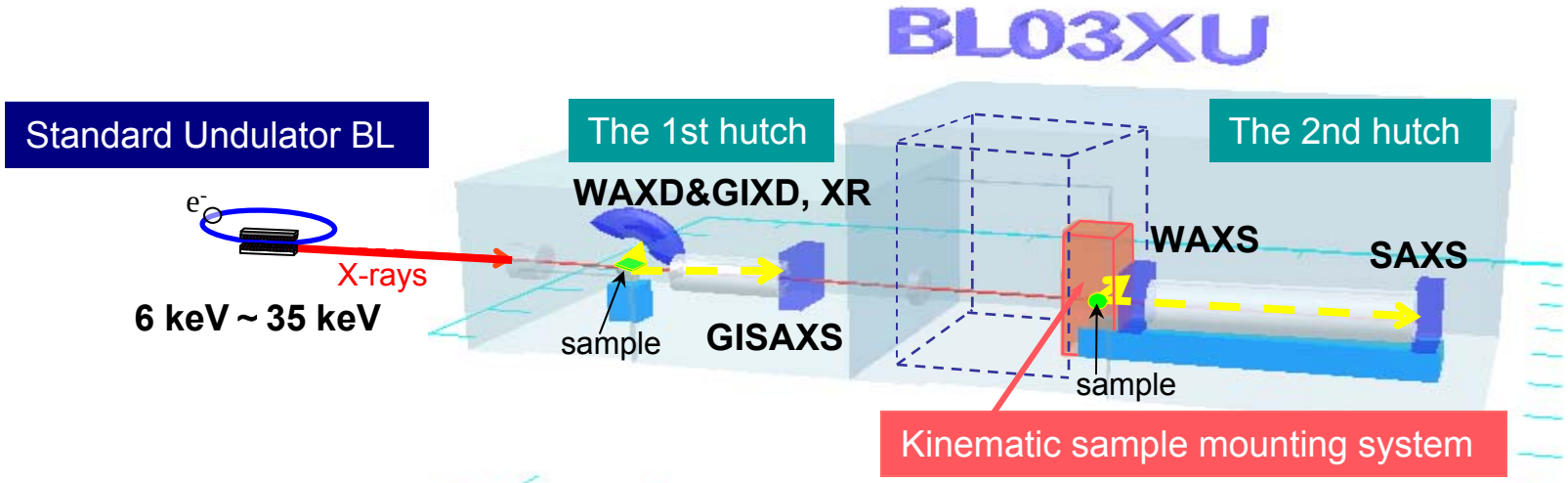
(2) Proposal on strategic utilization of FSM BL from industrial and academic points of views

FSM BL user group :

(1) Research & technical exchanges among corporate groups

(2) Planning regulary-scheduled workshops

Features of Frontier Soft Matter BL



[the 1 st hutch, thin-film structure science]

- **The BL is equipped with the systems of time-resolved GIXD and GISAXS measurements for thin films of polymers and soft matter.**

[the 2 nd hutch, dynamic nano・meso-structure science]

- **The SAXS resolution is max. 0.7 μm (1.0 μm).**
- **The BL is equipped with the systems of time-resolved WAXS/SAXS measurements and microbeam WAXS and SAXS measurements for the bulk samples of polymers and soft matter.**
- **A space of 3 m (*l*) x 3 m (*w*) x 4 m (*h*) is reserved as sample one for large and industrial processing or casting machines.**
- **A kinematic sample mounting system is designed to exchange samples in a quick and easy way in the BL.**

Expected Outputs in FSM BL

- Clarification of dynamic structure-property relationships of polymers and soft matter under various external conditions to control their material properties
  - ← Time-resolved simultaneous measurements of small-angle and wide-angle X-ray scattering (SAXS/WAXS), X-ray photon correlation spectroscopy
- Clarification of the hierarchical structure of polymeric materials in thin films (in the surface & interface regions) and in the super small size (in the very narrow region)
  - ← GISAXS/GIWAXS measurements and microbeam SAXS/WAXS measurements
- Visualization of the electron density distribution of polymer crystals
  - ← Fine structure analysis for crystalline polymer materials
- Clarification of deformation mechanism of molded and cast products at the nano- and meso-scales
  - ← Simultaneous measurements of X-ray scattering with the other physical properties
- Successful trace of structural and physical changes of polymeric materials during industrial processing and molding treatments
  - ← Application of SR to industrial development and invention

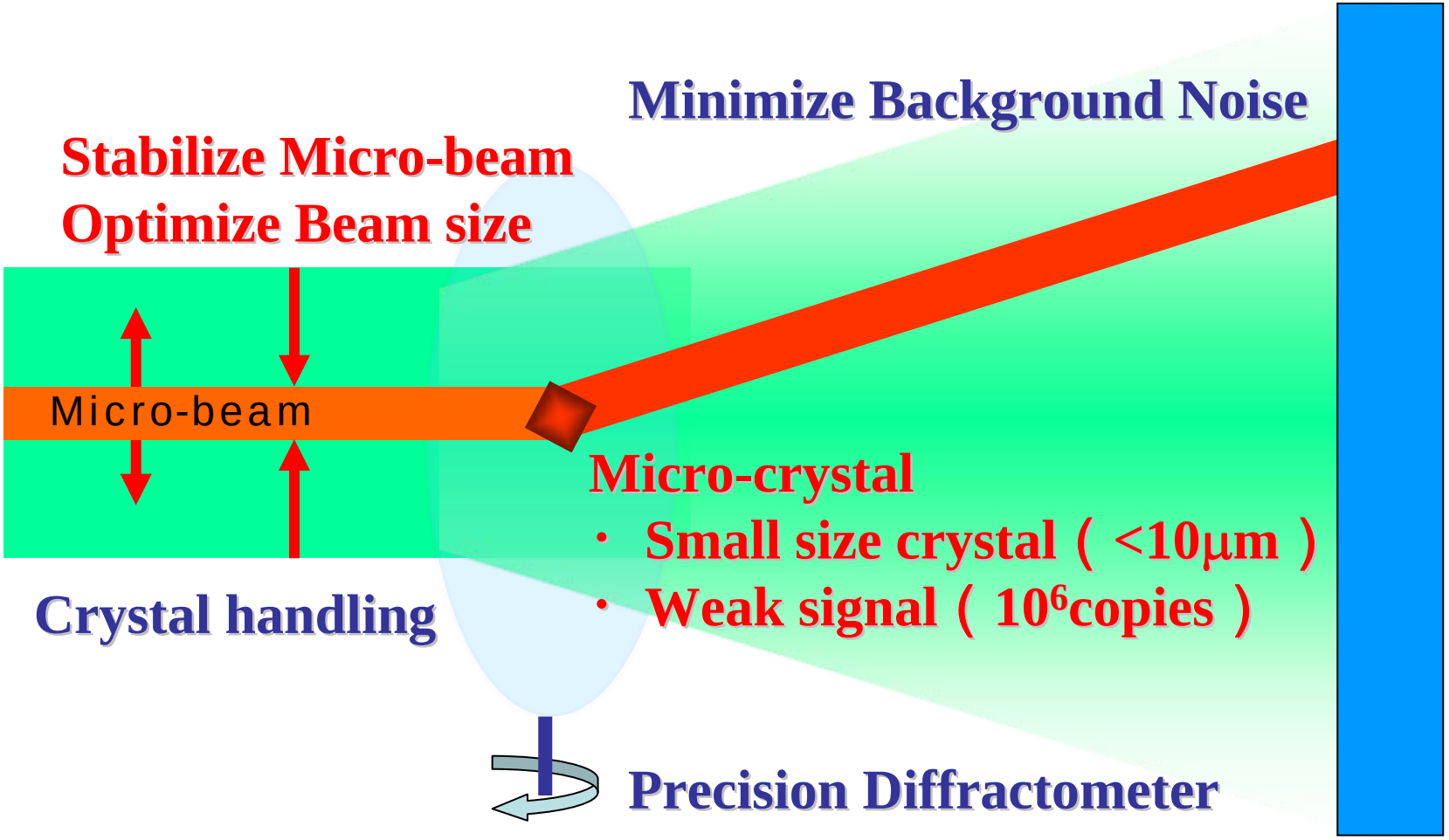
Target Protein project;

Micro beam Beamline for Protein crystallography - BL32XU -

Masaki Yamamoto
RIKEN SPring-8 Center

Micro-beam optimized for Micro-crystal

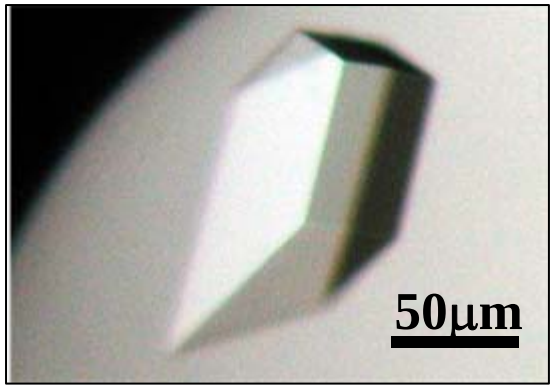
- Maximize Signal/Noise ratio
- Development Micro-crystal handling technique

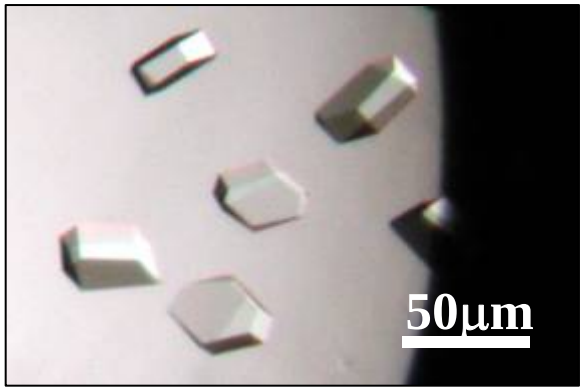


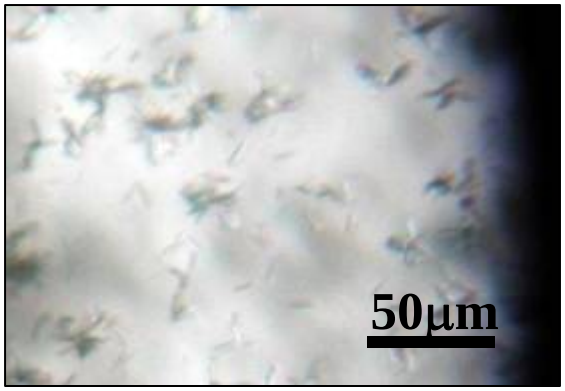
Micro-beam optimized for Micro-crystal

Target Protein Project

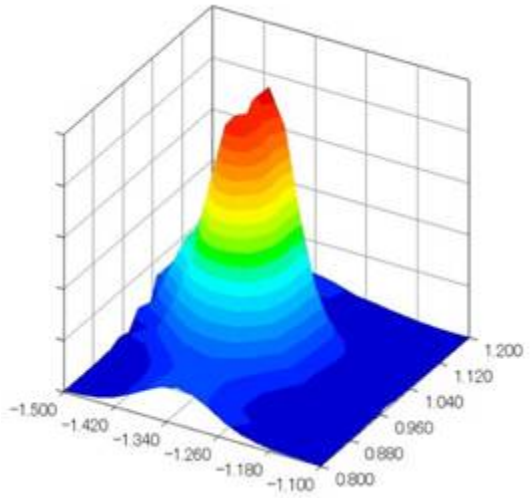
Standard	Current Limit	Micro-crystal
>50μm	20~30μm	<10μm







Next Target



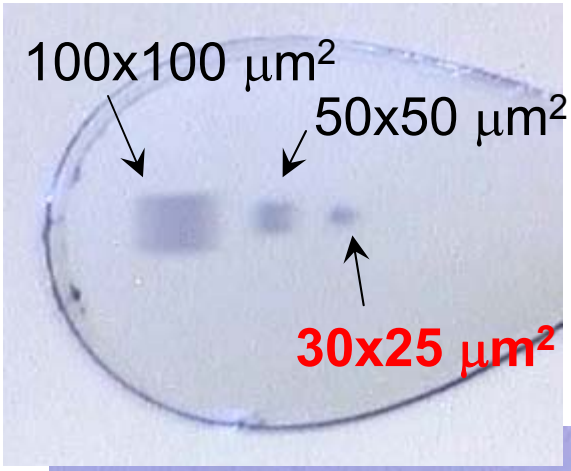
Beam profile of SPring-8 BL41XU

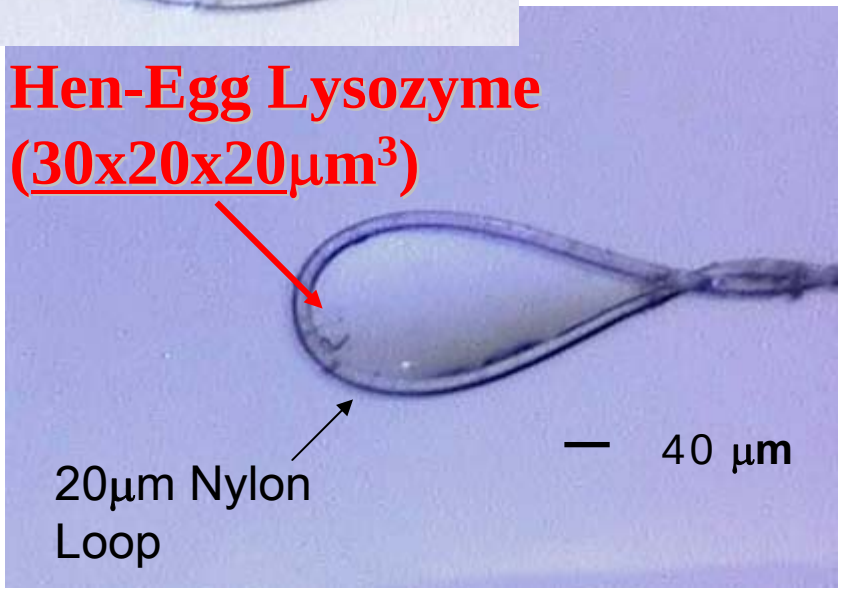
Micro-beam optimized for Micro-crystal

	Now	Target	
• Beam Size	100×100	1×1	μm^2
• Flux density	10^{13}-10^{14}	10^{16}	Photons/Sec./mm^2

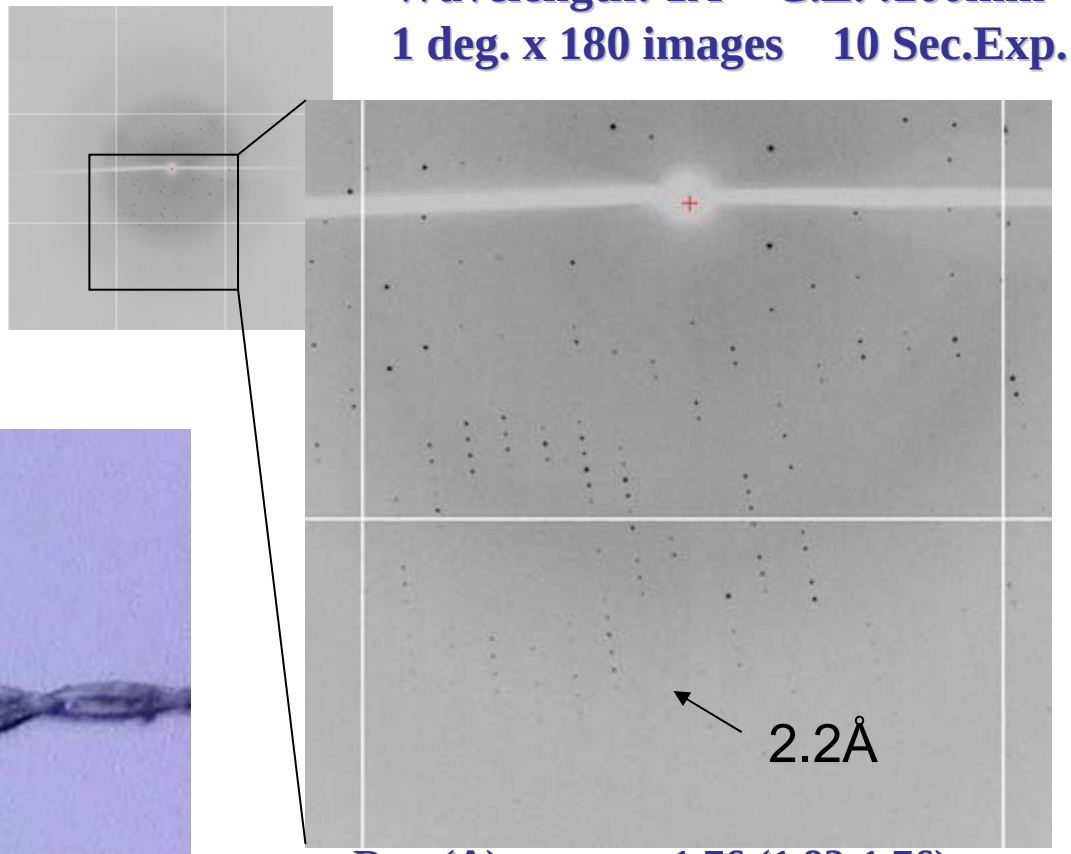
Current Limit of Micro Crystal Size

Undulator beam (30x25 μm²) @ SPring-8 BL41XU





Wavelength: 1A C.L. :200mm
1 deg. x 180 images 10 Sec.Exp.

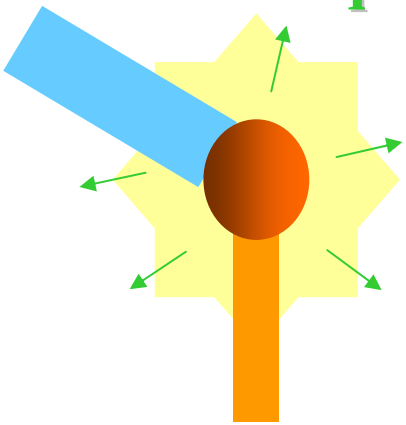


Res. (A)	1.76 (1.82-1.76)
No. of Ref.	12,140
R_{merge}(%)	8.0 (30.3)
I/σ(I)	38.0 (5.2)

Micro-beam Beamline for Difficult Crystal

Non-uniform Crystal

Eliminate low quality part

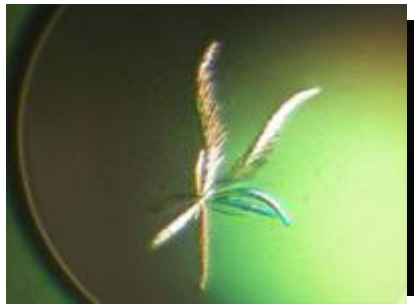


On-line Laser cutter

On-line feedback at BL

Micro probe select High-quality Part

Scan by Micro probe



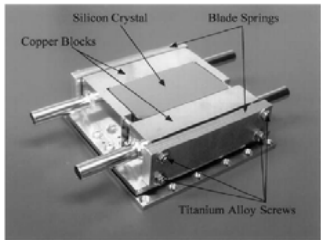
Cluster Crystal

R&D for Micro-beam Optics

Development of Stable micro-focusing Optics

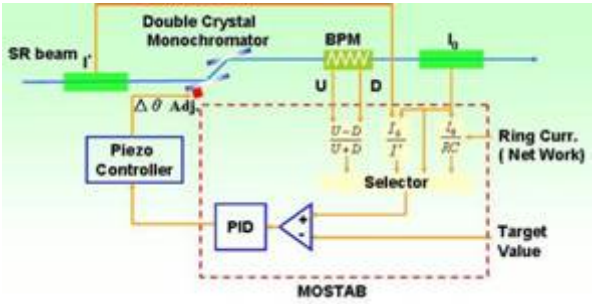
High-precision Monochromator

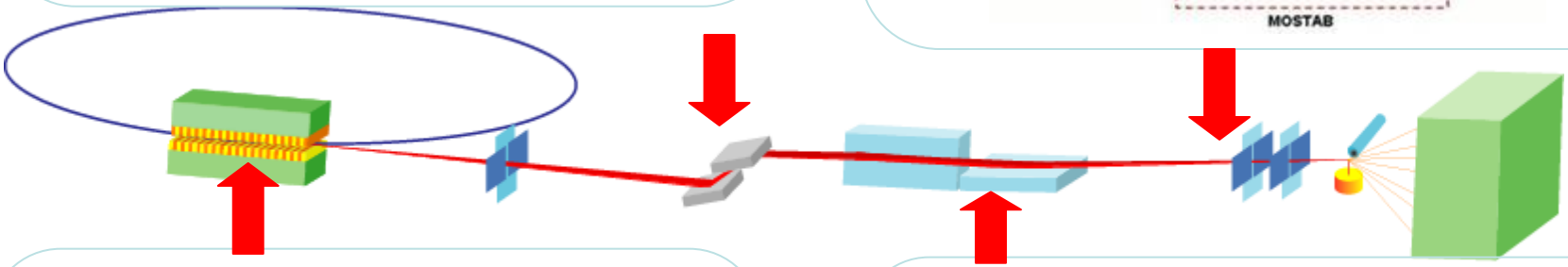
- Liq-N2 Crystal Cooler
- High-precision & Stability



Beamline Feedback System

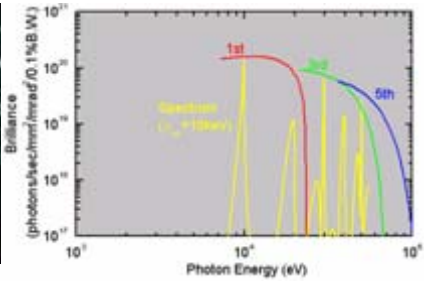
- Beam monitor & Feedback system





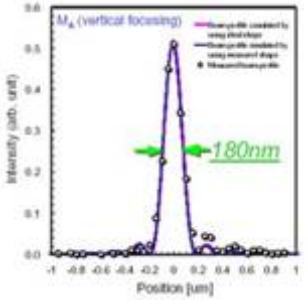
High Brilliance Light Source

- In-Vacuum Undulator



Micro-beam Optics

- EEM-Mirror for Micro Focusing



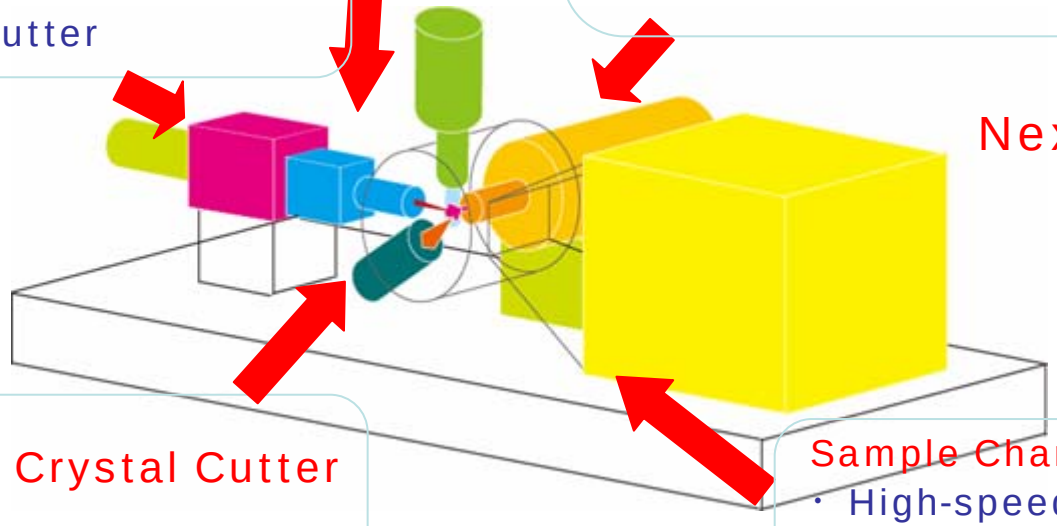
R&D for Micro Crystal Diffractometer

Low-Noise & High-Precise Diffractometer

Precise Crystal Centering
- Select the beam position
- Reduce Radiation Damage with trans.

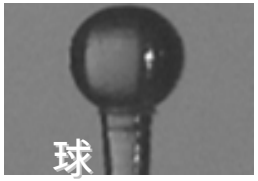
Low-Noise & High-Precise Diffractometer
- High-precision Goniostat for Micro Crystal
- He Chamber for Low Background Noise
- He Crystal Cooler

Micro-Beam Control Optics
- Clean Beam Collimator System
- High-speed Shutter

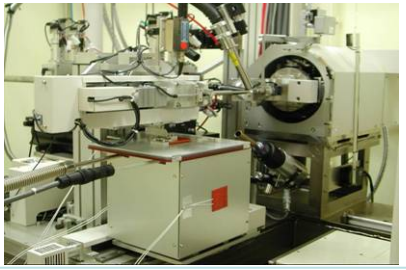


Next Generation Detector
➡ ?

On-line Laser Crystal Cutter



Sample Changer SPACE
- High-speed Crystal Screening

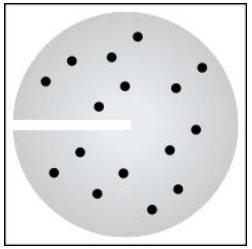


Development of Real-time Monitoring System

High-throughput Data collection system under Radiation Damage

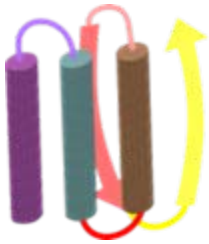
Before Data Collection

Estimation of Radiation Damage



Screening

+



Molecular information

=

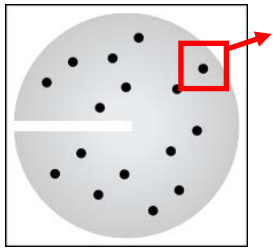
Optimize Experimental Condition

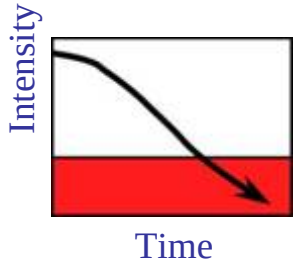
Feedback

BSS

Data Collection

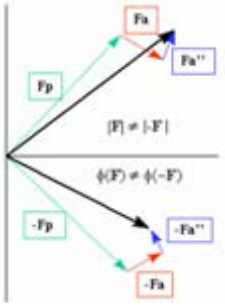
Real-time Monitoring the Signal





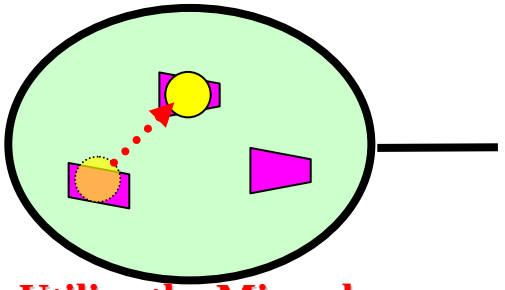
Feedback

Estimation of Anomalous Signal



Calculate the minimum exposure time

Automatic Sample Change



Utilize the Micro-beam

Target Protein Research project

R&D Proposal from SPring-8

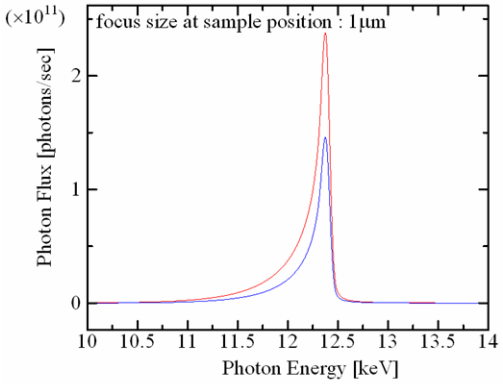
Micro focus beamline

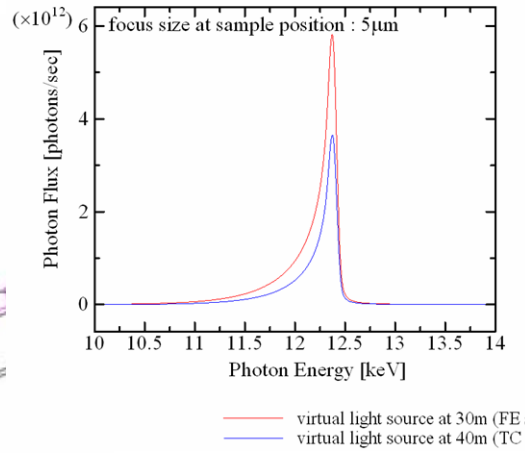
- Target beam size : < 5 μm
- Flux density : > 10^{16}photons/mm^2/sec.

New BL construction

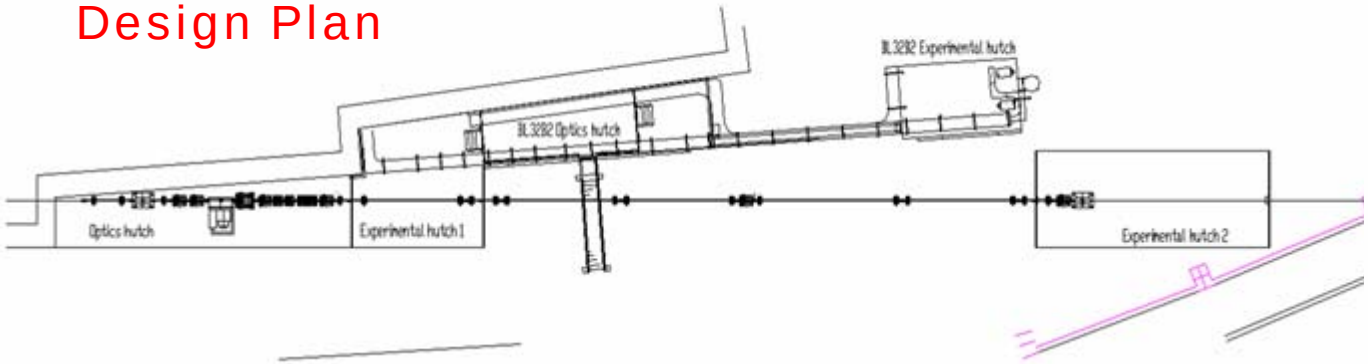
(BL32XU / Medium length Beamline)

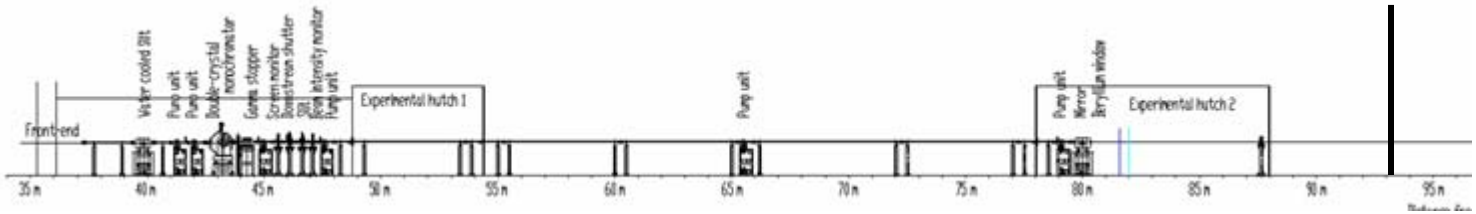
Calculated Flux

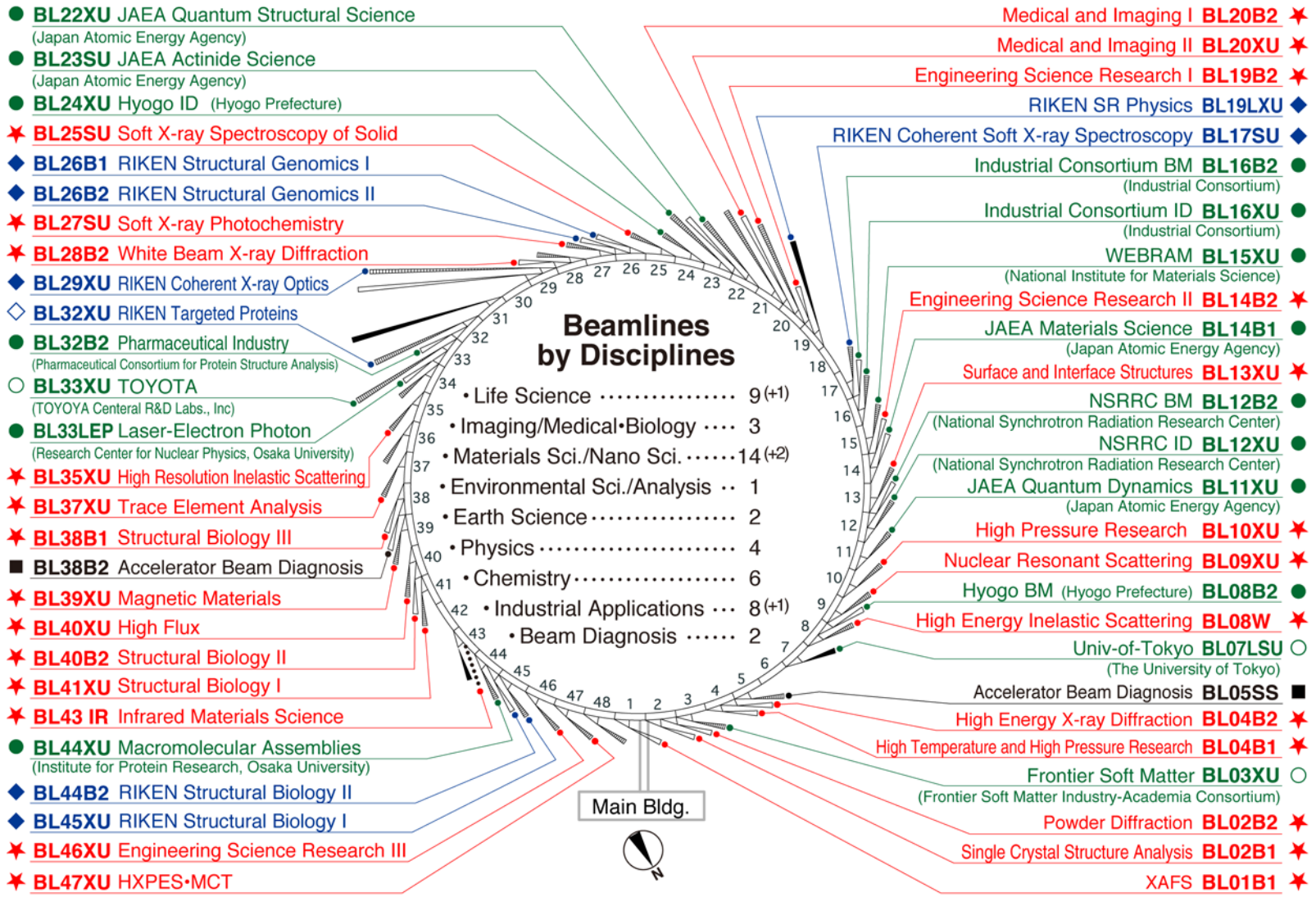




Design Plan





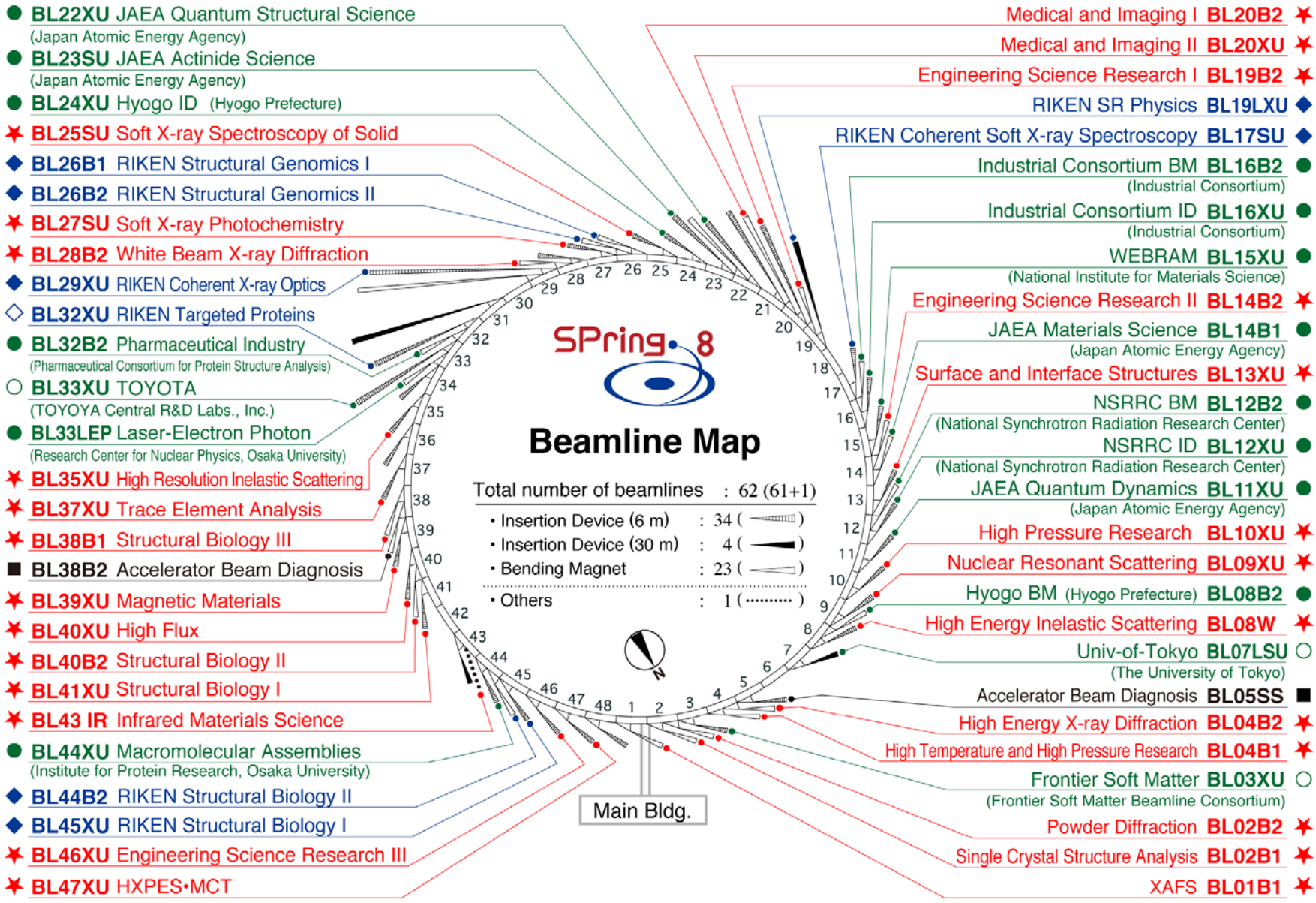


STATUS	BEAMLINES				TOTAL
	Public BL	Contract BL	RIKEN BL	Beam Diag.	
Operational	26	14	7	2	49
Under Const.	0	3	1	0	4
TOTAL	26	17	8	2	53

Total Number of Beamlines : 62 (61+1)

- Insertion Device (6 m) : 34
- Insertion Device (30 m) : 4
- Bending Magnet : 23
- Others : 1

★ : Public Beamlines
● : Contract Beamlines
◆ : RIKEN Beamlines
■ : Accelerator Beam Diagnostic Lines
☆ ○ ◇ □ : Planned or Under Construction


BL22XU JAEA Quantum Structural Science
(Japan Atomic Energy Agency)
BL23SU JAEA Actinide Science
(Japan Atomic Energy Agency)
BL24XU Hyogo ID (Hyogo Prefecture)
BL25SU Soft X-ray Spectroscopy of Solid
BL26B1 RIKEN Structural Genomics I
BL26B2 RIKEN Structural Genomics II
BL27SU Soft X-ray Photochemistry
BL28B2 White Beam X-ray Diffraction
BL29XU RIKEN Coherent X-ray Optics
BL32XU RIKEN Targeted Proteins
BL32B2 Pharmaceutical Industry
(Pharmaceutical Consortium for Protein Structure Analysis)
BL33XU TOYOTA
(TOYOYA Central R&D Labs., Inc.)
BL33LEP Laser-Electron Photon
(Research Center for Nuclear Physics, Osaka University)
BL35XU High Resolution Inelastic Scattering
BL37XU Trace Element Analysis
BL38B1 Structural Biology III
BL38B2 Accelerator Beam Diagnosis
BL39XU Magnetic Materials
BL40XU High Flux
BL40B2 Structural Biology II
BL41XU Structural Biology I
BL43 IR Infrared Materials Science
BL44XU Macromolecular Assemblies
(Institute for Protein Research, Osaka University)
BL44B2 RIKEN Structural Biology II
BL45XU RIKEN Structural Biology I
BL46XU Engineering Science Research III
BL47XU HXPES•MCT
SPring-8
Beamline Map
Total number of beamlines : 62 (61+1)
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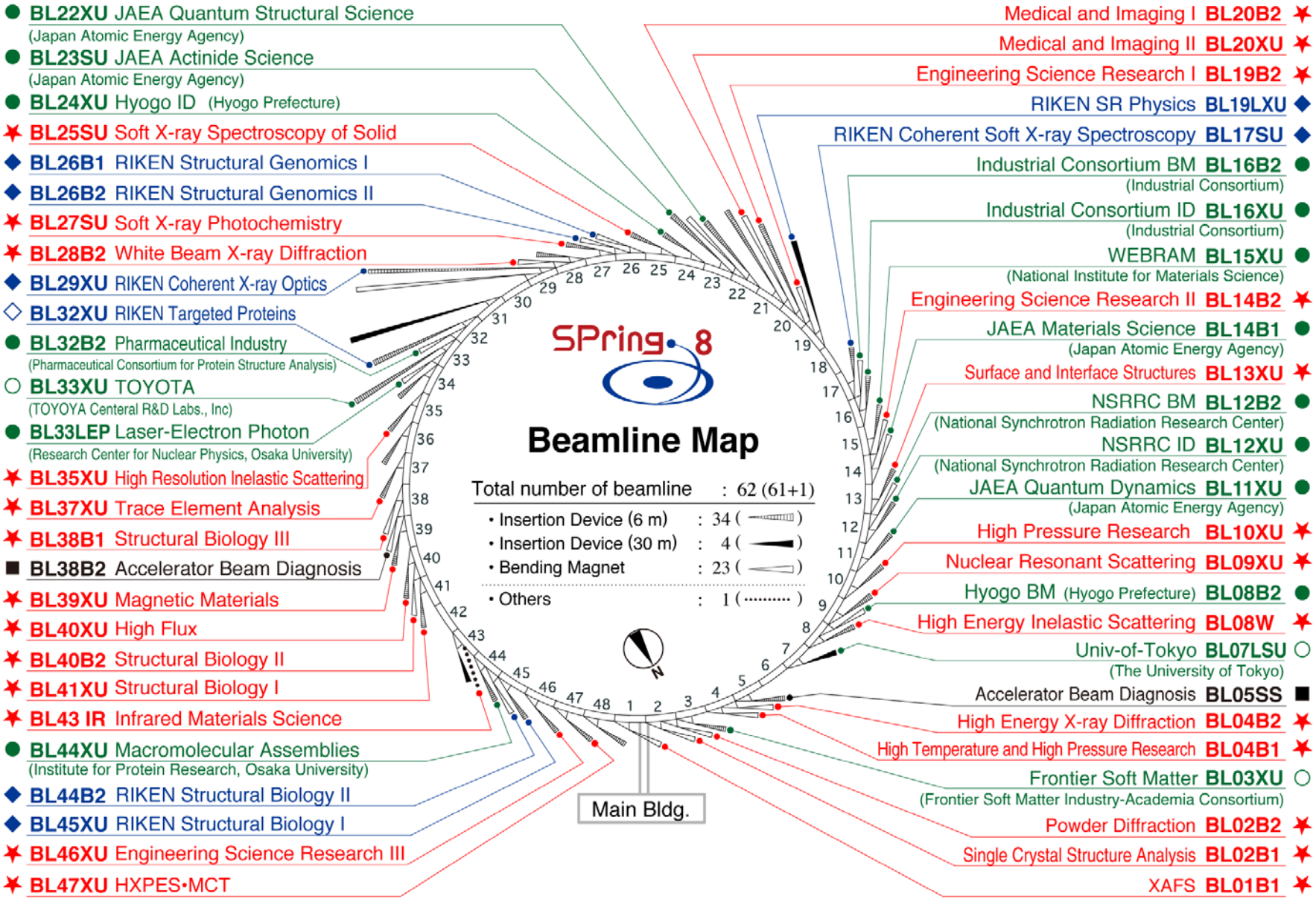
N
Main Bldg.
Medical and Imaging I BL20B2
Medical and Imaging II BL20XU
Engineering Science Research I BL19B2
RIKEN SR Physics BL19LXU
RIKEN Coherent Soft X-ray Spectroscopy BL17SU
Industrial Consortium BM BL16B2
(Industrial Consortium)
Industrial Consortium ID BL16XU
(Industrial Consortium)
WEBRAM BL15XU
(National Institute for Materials Science)
Engineering Science Research II BL14B2
JAEA Materials Science BL14B1
(Japan Atomic Energy Agency)
Surface and Interface Structures BL13XU
NSRRC BM BL12B2
(National Synchrotron Radiation Research Center)
NSRRC ID BL12XU
(National Synchrotron Radiation Research Center)
JAEA Quantum Dynamics BL11XU
(Japan Atomic Energy Agency)
High Pressure Research BL10XU
Nuclear Resonant Scattering BL09XU
Hyogo BM (Hyogo Prefecture) BL08B2
High Energy Inelastic Scattering BL08W
Univ-of-Tokyo BL07LSU
(The University of Tokyo)
Accelerator Beam Diagnosis BL05SS
High Energy X-ray Diffraction BL04B2
High Temperature and High Pressure Research BL04B1
Frontier Soft Matter BL03XU
(Frontier Soft Matter Beamline Consortium)
Powder Diffraction BL02B2
Single Crystal Structure Analysis BL02B1
XAFS BL01B1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(Institute for Protein Research, Osaka University)
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BL46XU Engineering Science Research III
BL47XU HXPES•MCT
SPring-8
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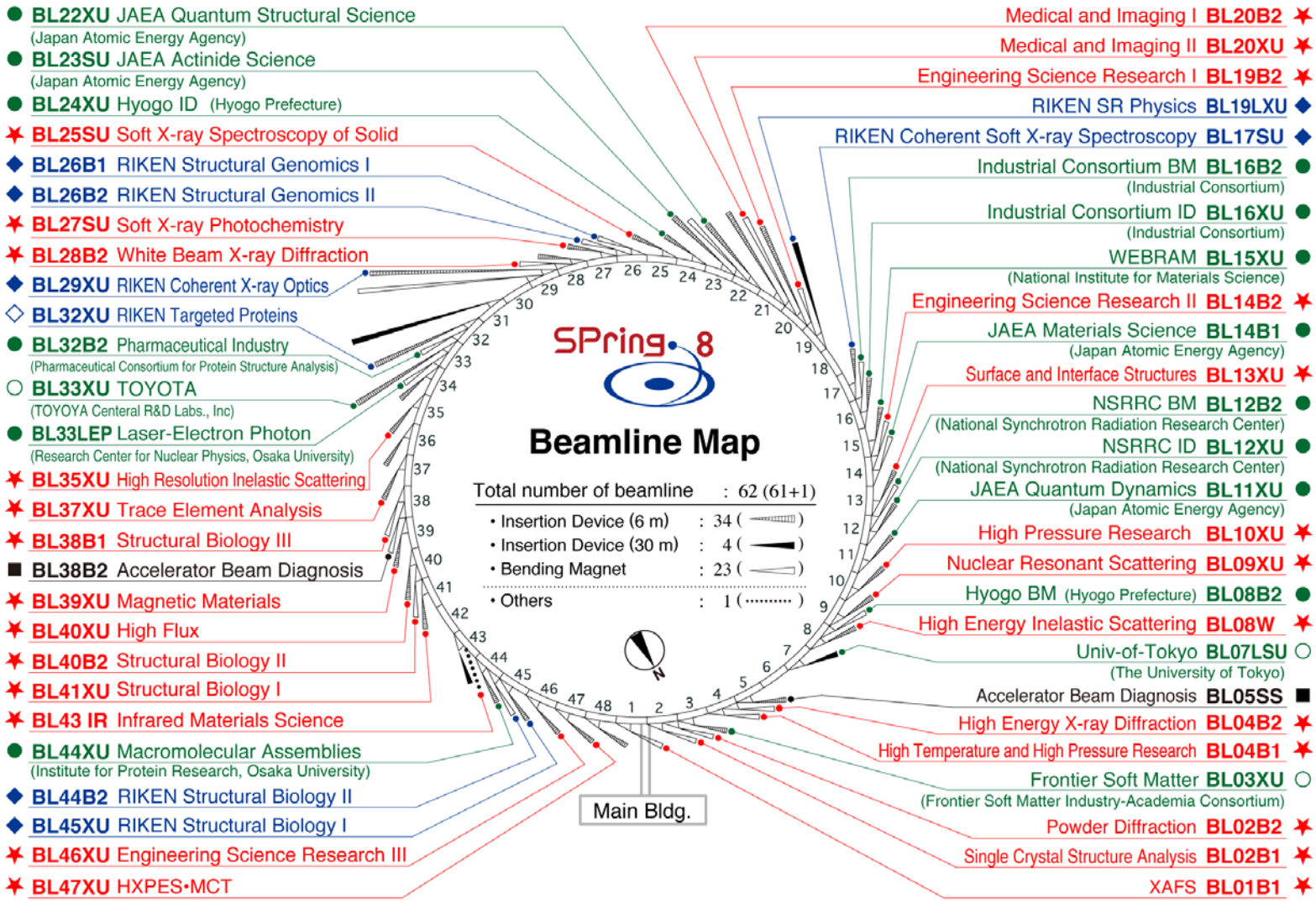
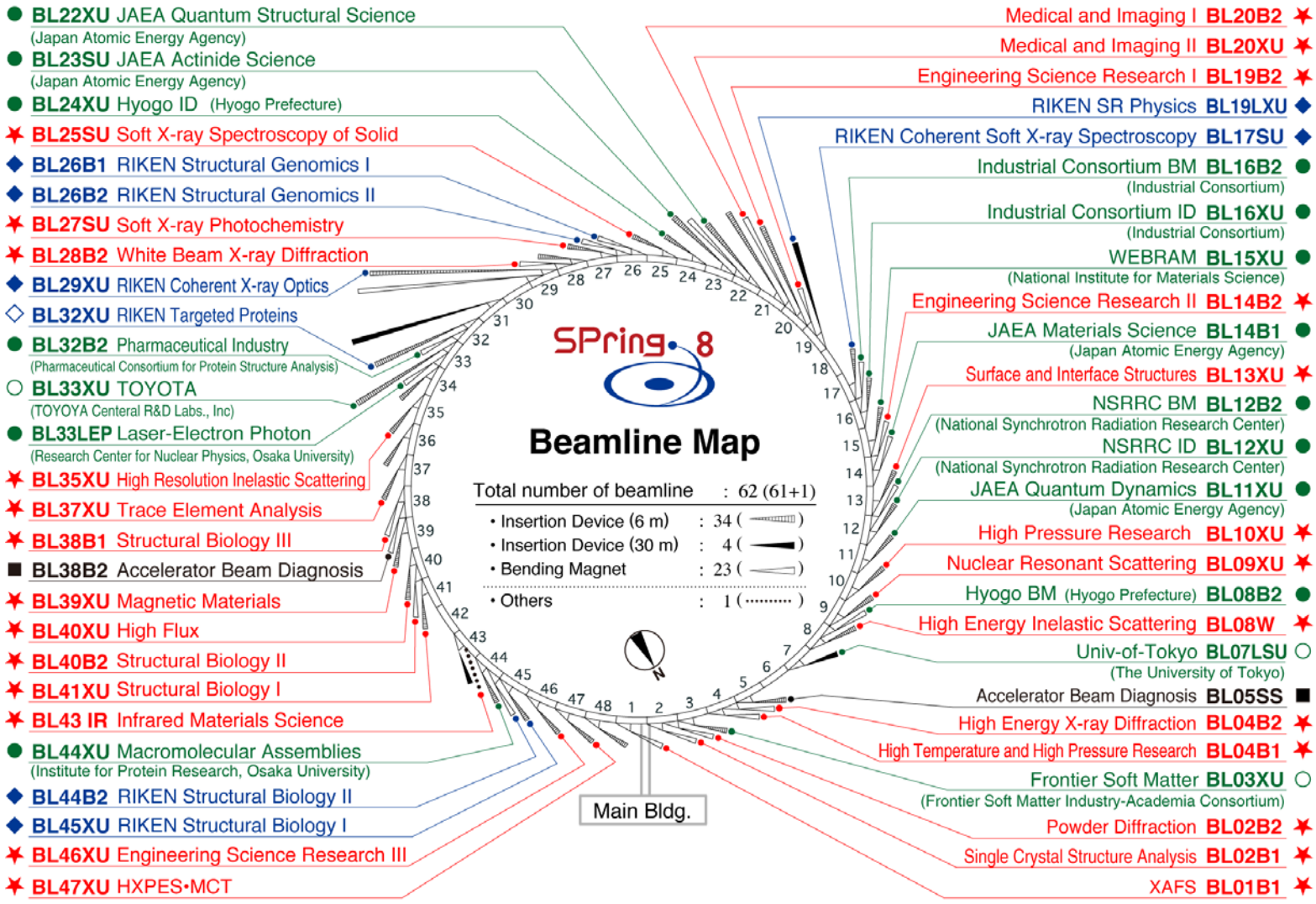
Medical and Imaging II BL20XU
Engineering Science Research I BL19B2
RIKEN SR Physics BL19LXU
RIKEN Coherent Soft X-ray Spectroscopy BL17SU
Industrial Consortium BM BL16B2
(Industrial Consortium)
Industrial Consortium ID BL16XU
(Industrial Consortium)
WEBRAM BL15XU
(National Institute for Materials Science)
Engineering Science Research II BL14B2
JAEA Materials Science BL14B1
(Japan Atomic Energy Agency)
Surface and Interface Structures BL13XU
NSRRC BM BL12B2
(National Synchrotron Radiation Research Center)
NSRRC ID BL12XU
(National Synchrotron Radiation Research Center)
JAEA Quantum Dynamics BL11XU
(Japan Atomic Energy Agency)
High Pressure Research BL10XU
Nuclear Resonant Scattering BL09XU
Hyogo BM (Hyogo Prefecture) BL08B2
High Energy Inelastic Scattering BL08W
Univ-of-Tokyo BL07LSU
(The University of Tokyo)
Accelerator Beam Diagnosis BL05SS
High Energy X-ray Diffraction BL04B2
High Temperature and High Pressure Research BL04B1
Frontier Soft Matter BL03XU
(Frontier Soft Matter Industry-Academia Consortium)
Powder Diffraction BL02B2
Single Crystal Structure Analysis BL02B1
XAFS BL01B1


SPring-8
Beamline Map
Total number of beamline : 62 (61+1)
• Insertion Device (6 m) : 34
• Insertion Device (30 m) : 4
• Bending Magnet : 23
• Others : 1
N
Main Bldg.
BL22XU JAEA Quantum Structural Science (Japan Atomic Energy Agency)
BL23SU JAEA Actinide Science (Japan Atomic Energy Agency)
BL24XU Hyogo ID (Hyogo Prefecture)
BL25SU Soft X-ray Spectroscopy of Solid
BL26B1 RIKEN Structural Genomics I
BL26B2 RIKEN Structural Genomics II
BL27SU Soft X-ray Photochemistry
BL28B2 White Beam X-ray Diffraction
BL29XU RIKEN Coherent X-ray Optics
BL32XU RIKEN Targeted Proteins
BL32B2 Pharmaceutical Industry (Pharmaceutical Consortium for Protein Structure Analysis)
BL33XU TOYOTA (TOYOYA Centeral R&D Labs., Inc)
BL33LEP Laser-Electron Photon (Research Center for Nuclear Physics, Osaka University)
BL35XU High Resolution Inelastic Scattering
BL37XU Trace Element Analysis
BL38B1 Structural Biology III
BL38B2 Accelerator Beam Diagnosis
BL39XU Magnetic Materials
BL40XU High Flux
BL40B2 Structural Biology II
BL41XU Structural Biology I
BL43 IR Infrared Materials Science
BL44XU Macromolecular Assemblies (Institute for Protein Research, Osaka University)
BL44B2 RIKEN Structural Biology II
BL45XU RIKEN Structural Biology I
BL46XU Engineering Science Research III
BL47XU HXPES•MCT
Medical and Imaging I BL20B2
Medical and Imaging II BL20XU
Engineering Science Research I BL19B2
RIKEN SR Physics BL19LXU
RIKEN Coherent Soft X-ray Spectroscopy BL17SU
Industrial Consortium BM BL16B2 (Industrial Consortium)
Industrial Consortium ID BL16XU (Industrial Consortium)
WEBRAM BL15XU (National Institute for Materials Science)
Engineering Science Research II BL14B2
JAEA Materials Science BL14B1 (Japan Atomic Energy Agency)
Surface and Interface Structures BL13XU
NSRRC BM BL12B2 (National Synchrotron Radiation Research Center)
NSRRC ID BL12XU (National Synchrotron Radiation Research Center)
JAEA Quantum Dynamics BL11XU (Japan Atomic Energy Agency)
High Pressure Research BL10XU
Nuclear Resonant Scattering BL09XU
Hyogo BM (Hyogo Prefecture) BL08B2
High Energy Inelastic Scattering BL08W
Univ-of-Tokyo BL07LSU (The University of Tokyo)
Accelerator Beam Diagnosis BL05SS
High Energy X-ray Diffraction BL04B2
High Temperature and High Pressure Research BL04B1
Frontier Soft Matter BL03XU (Frontier Soft Matter Industry-Academia Consortium)
Powder Diffraction BL02B2
Single Crystal Structure Analysis BL02B1
XAFS BL01B1
BL: Beamline
B1, B2: Bending Magnets
XU: X-ray Undulator
SU: Soft X-ray Undulator
W: Wiggler
IR: Infrared Radiation
LEP: Laser-Electron Photon
LXU: Long-length X-ray Undulator
LSU: Long-length Soft X-ray Undulator
SS: Straight Section
WEBRAM: Wide Energy Range Beamline for Research in Advanced Materials
NSRRC: National Synchrotron Radiation Research Center, Taiwan
★ : Public Beamlines
● : Contract Beamlines
◆ : RIKEN Beamlines
■ : Accelerator beam diagnostic lines
☆ ○ ◇ □ : Planned or Under Construction



Status	Beamlines				Total
	Public Beamlines	Contract Beamlines	RIKEN Beamlines	Accelerator Beam Diagnostic Lines	
Operational	26	14	7	2	49
Planned or Under Construction	0	3	1	0	4
Total	26	17	8	2	53

★ : Public Beamlines
● : Contract Beamlines
◆ : RIKEN Beamlines
■ : Accelerator beam diagnostic lines
☆ ○ ◇ □ : Planned or Under Construction

Installation Procedure for Contraction Beamline in SPring-8

Letter of Intent※

↓

Contract Beamline Installation Plan※

↓

Contract Beamline Agreement

(Contract beamline installation period is 10 years from the date of approval of the application for commencement of installation)

Completion of Installation/Start of Operation

↓

Interim Review※ (at the halfway point of the installation period)

(Based on the review results, JASRI recommends either of the following)

↓ ↘

Continuation・ Improvement

(Continuation requires the approval of "Improvement Plan.") ※

Removal

(Submission of "Removal Completion Report" is required)

↓

One Year before the Expiration of Installation Period

(Based on the agreement, the proposer is required to request extension of the installation period, renewal of the agreement, or removal of the beamline.)

↓

Post-Implementation Review※

(After the termination of contract beamline agreement)

↙ ↓ ↘

Extension

(Extended up to 5 years, once approved.)※
At the expiration of the extended period, post-implementation reviews are conducted

Renewal

(The contract period can be extended for another 10 years) ※

Removal

(Submission of "Removal Completion Report" is required)

※JASRI approves based on the review results of the Contract Beamline Review Committee