付録

表１．硬Ｘ線実験ステーションの性能表

ステーション名	水平取込角 (mrad)	分光器	ミラー	光のエネルギー範囲 (keV)	ビームサイズ（H×V）(mm)	試料位置での光子数 (photons/s)	エネルギー分解能 $(\Delta E/E)\times10^{-4}$	参考文献
BL-1A	0.01	Channel-Cut Si(111) Liquid N_2 Cooling	Bimorph Si Rh-Coated Si Rh-Coated	3.7 ~ 4.5 11.2 ~ 12.9	0.013×0.013	5×10^{10}@11.2 keV	~2	1, 2
BL-3A	1	Flat Double Crystal Si(111)	Bent Cylinder	4 ~ 14	0.7×0.2	6×10^{12}	~5	3, 4
BL-3C	1.75	Double Crystal Si(111)	None	4 ~ 20 or white	20×6 (mono) 0.1×0.1 (white)		~2	
BL-4A	6	Double Crystal Si(111)	KB mirror polycapillary	4 ~ 17	0.005×0.005 0.03×0.03		~2	5, 6
BL-4B2	4.5	Flat Double Crystal Si(111)	Bent Cylinder	6 ~ 20	13×2		~2	7, 8
BL-4C	2	Flat Double Crystal Si(111)	Bent Cylinder	5 ~ 19	0.7×0.5		~5	9, 10
BL-5A	0.125	Double Crystal Si(111) Liquid N_2 Cooling	Bent Plane Si Rh-Coated Bent Cylinder Si Rh-Coated	6.5 ~ 17	0.8×0.2	1.3×10^{11} (0.2×0.2 mm^2)	~2	
BL-6A	2	Bent Crystal Ge(111) (α = 8.0°)	Bent Cylinder ULE	8.3 (fixed)	0.5×0.2	$1.0\times10^{12}/mm^2$ (Slit full-open)	~10	11, 12
BL-6C	2	Flat Double Crystal Si(111)	Bent Cylinder	5 ~ 20 (~25 non- Focus)	0.5×0.3			
BL-7C	4	Double Crystal Si(111) Sagittal Focusing	Double Mirror Fused Quartz Focusing	4 ~ 20 (4 ~ 13)	5×1	$1\times10^{10}/6$ mm^2 (8 keV, 300 mA) (1×10^{11} when focused)	~2	13 - 15
BL-8A	2.22	Flat Double Crystal Si(111)	Bent Cylinder	5 ~ 19	0.82×0.52	3.2×10^{11} (12.4 keV, 400 mA)	~5	16
BL-8B	2.21	Flat Double Crystal Si(111)	Bent Cylinder	5 ~ 19	0.75×0.45	2.2×10^{11} (12.4 keV, 400 mA)	~5	16
BL-9A	3	Double Crystal Si (111)	Collimating and Focusing Bent Conical Mirrors Rh-Coated Double Flat Mirror Ni-Coated	2.1 ~ 15	0.5×0.3	6×10^{11} (7 keV, 450 mA)	2	17, 18
BL-9C	3.5	Double Crystal Si(111)	Bent Cylinder Rh-Coated	4 ~ 23	0.8×0.6	1×10^{11} (8 keV, 450 mA)	~2	
BL-10A	1	Si(111), Si(311) Quartz(100) PG(002) Curved Si(111) (α~ 4°, 8°)	Plane Pt Coated Fused Quartz	5 ~ 25	10×3		10~5	19
BL-10C	2.1	Fix-Exit Double Crystal Si(111)	Bent Cylinder Rh-Coated	6 ~ 14	0.63×0.18	1.5×10^{11} (8 keV)	2	
BL-12C	2	Double Crystal Si(111)	Bent Cylinder Rh-Coated, Double Flat Mirror Ni-Coated	4 ~ 23	0.6×0.6	9×10^{10} (8 keV, 450 mA)	~2	20

ステーション名	水平取込角 (mrad)	分光器	ミラー	光のエネルギー範囲 (keV)	ビームサイズ（H×V）(mm)	試料位置での光子数 (photons/s)	エネルギー分解能 (ΔE/E)×10⁻⁴	参考文献
BL-14A	1.28 (Vertical)	Double Crystal Si (111) Si (311) Si (553)	Bent Cylinder Rh-Coated Fused Quartz	5.1 ~ 19.1 9.9 ~ 35.6 22.7 ~ 84.5	2×1 at focus 5×38		2	21
BL-14B	2.2 (Vertical)	Flat Double Crystal Si(111)	None	10 ~ 57	5×14		2	22
BL-14C	1.96 (Vertical)	Double Crystal Si(111), Si(220)	None	5 ~ 100 or white	6×70		2	23, 24
BL-15A1	0.2	Double Crystal Si(111) Liquid N_2 Cooling	Horizontal: Bent Plane Si Bimorph Silica Rh-Coated Vertical: Bent Plane Si Rh-Coated Double Flat Si Ni-Coated	2.1 ~ 15	0.02×0.02	3.5×10^{11} (7.5 keV, 450 mA)	~2	25
BL-15A2	0.2	Double Crystal Si(111) Liquid N_2 Cooling	Horizontal: Bent Plane Si Bimorph Silica Rh-Coated Vertical: Bent Plane Si Rh-Coated Double Flat Si Ni-Coated	2.1 ~ 15	0.6×0.04	3.5×10^{11} (7.5 keV, 450 mA)	~2	25, 26
BL-17A	0.1 ~ 0.2	Double Crystal Si(111) Liquid N_2 Cooling	Horizontal: Bent Plane Si Rh-Coated Bimorph Silica Rh-Coated Vertical: Bent Plane Si Rh-Coated Bimorph Silica Rh-Coated	6 ~ 13	0.08×0.016	3.1×10^{11} (12.4 keV, 450 mA, 0.04×0.016 mm^2)	~2	27 - 29
BL-18B [India, DST]	2	Double Crystal Si(111)	Plane and Bent Cylinder	6 ~ 20			~2	
BL-18C	1	Double Crystal Si(111)	Cylinder Fused Quartz Pt-Coated	6 ~ 25	0.07×0.04		~2	
BL-20B	2	Double Crystal Si(111)	None	5 ~ 25 or white	26×5	1×10^{11} (12 keV, 450 mA)	~2	
BL-27B	4	Double Crystal Si(111)	None	4 ~ 20	100×6		~2	30
AR-NE1A	0.28	Micro-Channel Double Crystal Si(111), High- Resolution Channel Cut Si(4,2,2)&(12,2,2)	Bent Plane W/C Multilayer Coated Si	6 ~ 50	0.8×0.2	8×10^{11} (0.2×0.2mm^2)	~2	
AR-NE3A	H:0.2 V:0.1	Double Crystal Si(111) Liquid N_2 Cooling	Pre-Mirror Bent Flat Si Rh-Coated Post-Mirror Bent Cylinder Fused Quartz Rh-Coated	6.5 ~ 17	0.8×0.2	8×10^{11} (0.2×0.2 mm^2)	~2	31, 32

India DST:　インド政府科学技術省（Department of Science & Technology）

ステーション名	水平取込角 (mrad)	分光器	ミラー	光のエネルギー範囲 (keV)	ビームサイズ（H×V）(mm)	試料位置での光子数 (photons/s)	エネルギー分解能 $(\Delta E/E)\times10^{-4}$	参考文献
AR-NE5C	3	Double Crystal Si(111)	None	30 ~ 100 or white	60×5		5	33
AR-NE7A	4	Double Crystal Si(111)		25 ~ 50 or white	80×3		5	
AR-NW2A	H:1.0 V:0.2	Double Crystal Si(111) Liquid N_2 Cooling	Bent Cylinder Si Rh-Coated Bent Flat Si Rh-Coated	5 ~ 25	0.6×0.2 ~10×0.06	6×10^{12} (12 keV, 60 mA)	~2	34 - 36
AR-NW10A	1.2	Si(311)	Bent Cylinder Pt-Coated, Double Flat Mirror Rh-Coated	8 ~ 42	2.2×0.5	1×10^{10} (22 keV, 60 mA)	~1	37
AR-NW12A	H:0.3 V:0.1	Double Crystal Si(111) Liquid N_2 Cooling	Pre-Mirror Bent Flat Si Rh-Coated Post-Mirror Bent Cylinder Si Rh-Coated	6.5 ~ 17	1.3×0.3	2×10^{11} (0.2×0.2 mm^2)	~2	38 - 40
AR-NW14A	H:0.3 V:0.1	Double Crystal Si(111) Liquid N_2 Cooling	Bent Cylinder Rh-Coated Bent Flat Rh-Coated	4.9 ~ 25	0.45×0.25	1×10^{12}	~2	41

REFERENCES

[1] Liebschner *et al*. Acta Cryst. D **72**, 728 (2016).
[2] M. Hiraki, N Matsugaki, Y. Yamada and T. Senda. AIP Conf. Proc. **1741**, 030029 (2016).
[3] Photon Factory Activity Report 2006, #**24**, A 64 (2008).
[4] Photon Factory Activity Report 2006, #**24**, A 104 (2008).
[5] A. Iida, X-Ray Spectrom. **26**, 359 (1997).
[6] A. Iida, X-Ray Spectrom. **40**, 376 (2011).
[7] Powder Diffraction User Group, KEK Report 94-11 (1995).
[8] H. Toraya, H. Hibino, and K. Ohsumi, J. Synchrotron Rad. **3**, 75 (1996).
[9] H. Iwasaki *et al.*, Rev. Sci. Instrum. **60**, 2406 (1989).
[10] Photon Factory Activity Report 1995 #**13**, E-1 (1996).
[11] N. Shimizu *et al.*, J. Phys.: Conf. Ser. **425**, 202008 (2013).
[12] H. Takagi *et al.*, AIP Conf. Proc. **1741**, 030018 (2016).
[13] M. Nomura and A.Koyama, KEK Internal, 93-1 (1993).
[14] M. Nomura *et al.*, KEK Report, 91-1 (1991).
[15] M. Nomura and A. Koyama, in "X-ray Absorption Fine Structure", ed. by S. S. Hasnain, Ellis Horwood, Chichester, **667** (1991).
[16] A. Nakao *et al.*, AIP Conf. Proc. **1234**, 367 (2010).
[17] M. Nomura and A. Koyama, J. Synchrotron Rad. **6**, 182 (1999).
[18] M. Nomura and A. Koyama, Nucl. Instrum. Meth. A **467-468**, 733 (2001).
[19] S. Sasaki, Rev. Sci. Instrum. **60**, 2417 (1989).
[20] M. Nomura and A. Koyama, KEK Report, 95-15 (1996).
[21] Y. Satow and Y. Iitaka, Rev. Sci. Instrum. **60**, 2390 (1989).
[22] M. Ando *et al.*, Nucl. Instrum. Meth. A**246**, 144 (1986).
[23] Photon Factory Activity Report 1999, #**17**, A 92 (2000).
[24] Photon Factory Activity Report 1999, #**17**, A 103 (2000).
[25] N. Igarashi *et al.*, J. Phys.: Conf. Ser. **425**, 072016 (2013).
[26] H. Takagi *et al.*, Appl. Phys. **120**, 142119 (2016).
[27] N. Igarashi *et al.*, AIP Conf. Proc. **879**, 812 (2007).
[28] N. Igarashi *et al.*, J. Synchrotron Rad. **15**, 292 (2008).
[29] Y. Yamada *et al.*, J. Synchrotron Rad. **20**, 938 (2013).
[30] H. Konishi *et al.*, Nucl. Instrum. Meth. A **372**, 322 (1996).
[31] Y. Yamada *et al.*, AIP Conf. Proc. **1234**, 415 (2010).
[32] M. Hiraki *et al.*, AIP Conf. Proc. **1234**, 673 (2010).
[33] T. Kikegawa *et al.*, Rev. Sci. Instrum. **66**, 1335 (1995).
[34] T. Mori *et al.*, AIP Conf. Proc. **705**, 255 (2004).
[35] H. Kawata *et al.*, AIP Conf. Proc. **705**, 663 (2004).
[36] Y. Inada *et al.*, AIP Conf. Proc. **879**, 1230 (2007).
[37] M. Nomura *et al.*, AIP Conf. Proc. **882**, 896 (2007).
[38] L. M. G. Chavas *et al.*, J. Synchrotron Rad. **19**, 450 (2012).
[39] L. M. G. Chavas *et al.*, J. Phys.: Conf. Ser. **425**, 012008 (2013).
[40] L. M. G. Chavas *et al.*, J. Synchrotron Rad. **20**, 838 (2013).
[41] S. Nozawa *et al.*, J. Synchrotron Rad. **14**, 313 (2007).

表 2. 真空紫外・軟 X 線実験ステーションの性能表

ステーション名	スリットサイズ H × V (mrad) または アンジュレータの パラメータ	分光器	溝密度 (/mm)	光のエネルギー範囲 (eV)	ビームサイズ H×V (mm)	エネルギー分解能 (E/ΔE) 光子数（photons/s）	参考文献
BL-2A ID02-1: Planer Undulator ID02-2: Variable Polarized Undulator	ID02-1: K_{max} = 2.3, λ_u = 6 cm ID02-2: K_{max} = 4.93, λ_u = 16 cm	Variable-Included-Angle Varied-Line-Spacing Plane Grating	400 600 1000	30 ~ 2000	~0.5 × 0.1	2000 ~ 20000 10^{13} ~ 10^{11}	1
BL-2B ID02-1: Planer Undulator ID02-2: Variable Polarized Undulator	ID02-1: K_{max} = 2.3, λ_u = 6 cm ID02-2: K_{max} = 4.93, λ_u = 16 cm	Variable-Included-Angle Varied-Line-Spacing Plane Grating Double Crystal InSb(111), Ge(111), Si(111)	400 600 1000	30 ~ 4000	~0.5 × 0.1	2000 ~ 20000 10^{13} ~ 10^{11}	1
BL-3B	10×2	Grazing Incidence R = 24 m α+β = 165° 1800	200 600	10 ~ 280	< 2ϕ	200 ~ 3000 10^{12} ~ 10^{9}	2, 3
BL-7A [RCS]	6×1	Varied-Line-Spacing Plane Grating	150 300 650	50 ~ 1300	2.5×0.5	1000 ~ 9000 10^{12} ~ 10^{9}	4
BL-11A	5×1	Varied-Included-Angle Varied-Line-Spacing Plane Grating	600 1200	70 ~ 1900	2×1	500 ~ 5000 10^{12} ~ 10^{9}	
BL-11B	4×0.6	Double Crystal InSb (111), Si (111)		1724 ~ 5000	5×2	2000 10^{10}	5-7
BL-11D	4×2	Grazing Incidence Varied Deviation-Angle On-Blaze Mount R_1 = 52.5 m R_3 = 22.5 m	2400	60 ~ 245 200 ~ 900	1×0.1	2000 10^{11}	8, 9
BL-13A/B Variable Polarized Undulator	K_{max} = 5.28 (Horizontal Linear Polarization) K_{max} = 3.65 (Vertical Linear Polarization) λ_u = 7.6 cm	Variable-Included-Angle Varied-Line-Spacing Plane Grating	300 1000	50 ~ 330 100 ~ 2000	~0.22×0.05	4000 ~ 12000 10^{13} ~ 10^{9}	10-12
BL-16A ID16-1 & ID16-2: Variable Polarized Undulator	K_{max} = 2.37 (Circular Polarization) K_{max} = 3.12 (Horizontal Linear Polarization) K_{max} = 1.98 (Vertical Linear Polarization) K_{max} = 1.73 (45-deg Linear Polarization) λ_u = 5.6 cm	Variable-Included-Angle Varied-Line-Spacing Plane Grating	100, 250, 500, 1000	250 ~ 1500	~0.2 × 0.1	4000 ~ 8000 10^{12} ~ 10^{11}	13, 14
BL-19B Revolver Undulator	K = 0.5 ~ 1.25 λu = 5 cm	Varied-Line-Space Plane Grating	800 2400	200 ~ 1200	1×0.5	4000~8000 10^{12} ~10^{11}	15-17
BL-20A	28 × 5	3 m Normal Incidence	1200 2400	5 ~ 40	2×1	300~30000 10^{12} ~10^{8}	18

RCS: 東京大学大学院理学系研究科附属スペクトル化学研究センター（Research Center for Spectrochemistry）

ステーション名	スリットサイズ H × V (mrad) または アンジュレータの パラメータ	分光器	溝密度 (/mm)	光のエネルギー 範囲 (eV)	ビームサイズ H×V (mm)	エネルギー分解能 (E/ΔE) 光子数（photons/s）	参考文献
BL-27A	5 × 0.5	Double Crystal InSb (111)		1800~ 4000		2000	19
BL-28A/B Variable Polarized Undulator	K_{max} = 4.93 (Horizontal Linear Polarization) K_{max} = 4.93 (Vertical Linear Polarization) λ_u = 16.0 cm	Variable-Included-Angle Varied-Line-Spacing Plane Grating	400	30 ~ 300	0.15×0.05	30000 10^{12}	1

REFERENCES

[1] K. Amemiya and T. Ohta, J. Synchrotron Rad. **11**, 171 (2004).
[2] A. Yagishita *et al*., Nucl. Instrum. Meth. A **306**, 578 (1991).
[3] S. Masui *et al*., Rev. Sci. Instrum. **63**, 1330 (1992).
[4] K. Amemiya *et al*., J. Elec. Spectrosc. Relat. Phenom. **124**, 151 (2002).
[5] T. Ohta *et al*., Nucl. Instrum. Meth. A **246**, 373 (1986).
[6] M. Funabashi *et al*., Rev. Sci. Instrum. **60**, 1983 (1989).
[7] T. Iwazumi *et al*., Rev. Sci. Instrum. **66**, 1691 (1995).
[8] Photon Factory Activity Report 1997 #**15**, A 101 (1998).
[9] T. Hatano and S. Aihara, J. Phys.: Conf. Ser. **425**, 152018 (2013).
[10] K. Mase *et al*., AIP Conf. Proc. **1234**, 709 (2010).
[11] A. Toyoshima *et al*., J. Vac. Soc. Jpn. **54**, 580 (2011).
[12] A. Toyoshima *et al*., J. Phys.: Conf. Ser. **425**, 152019 (2013).
[13] K. Amemiya *et al*., AIP Conf. Proc. **1234**, 295 (2010).
[14] K. Amemiya *et al*., J. Phys.: Conf. Ser. **425**, 152015 (2013).
[15] S. Suzuki *et al*., Activity Report of SRL-ISSP 60, (1989).
[16] A. Kakizaki *et al*., Rev. Sci. Instrum. **60**, 1893 (1989).
[17] A. Kakizaki *et al*., Rev. Sci. Instrum. **63**, 367 (1992).
[18] K. Ito *et al*., Rev. Sci. Instrum. **66**, 2119 (1995).
[19] H. Konishi *et al*., Nucl. Instrum. Meth. A**372**, 322 (1996).

表 3. 低速陽電子実験ステーションの性能表

ステーション名	ビームエネルギー	パルス幅	繰り返し周波数	ビーム強度	参考文献
SPF-A3	100 eV - 35 keV	1.2 μs	≤ 50 Hz	5×10^7 e^+/s (before brightness enhancement)	1, 2, 3
SPF-A4	50 eV - 1 keV	1.2 μs (long-pulse mode), 200 μs - 20 ms (pulse-stretching mode, ≤ 5.2 keV)	≤ 50 Hz	5×10^7 e^+/s (before brightness enhancement)	
SPF-B1	100 eV - 35 keV	1-10 ns	≤ 50 Hz	5×10^6 e^+/s	4, 5
SPF-B2	100 eV - 35 keV	1-10 ns	≤ 50 Hz	5×10^6 e^+/s	6, 7

REFERENCES

[1] K. Wada, *et al*., Eur. Phys. J. D **66**, 37 (2012).
[2] K. Wada, *et al*., J. Phys.: Conf. Ser. **443**, 012082 (2013).
[3] M. Maekawa, *et al*., Eur. Phys. J. D **68**,165 (2014).
[4] K. Michishio, *et al*., Appl. Phys. Lett. **100**, 254102 (2012).
[5] K. Michishio, *et al*., Nucl. Instrum. Methods **785**, 5 (2015).
[6] H. Terabe, *et al*., J. Phys.: Conf. Ser. **443**, 012075 (2013).
[7] S. Iida, *et al*., J. Phys.: Condens. Matter **28**, 475002 (2016).