

APPENDIX

ORGANIZATION

Staff

Director

Katsumi KIMURA Professor

Scientific Staff

Light Source

Goro ISOYAMA Associate Professor

Hiroyuki HAMA Research Associate

Shiro TAKANO Research Associate

Beam Line

Makoto WATANABE Associate Professor

Masao KAMADA Associate Professor

Atsunari HIRAYA Research Associate

Shin-ichiro TANAKA Research Associate

Technical Staff

Kusuo SAKAI Section Chief Engineer

Osamu MATSUDO Unit Chief Engineer

Toshio KINOSHITA Engineer

Masami HASUMOTO Engineer

Jun-ichiro YAMAZAKI Engineer

Eiken NAKAMURA Engineer

Secretary

Yasuno YAMAGUCHI (~ June 1991)

Eiko ADACHI (June 1991 ~)

Guest Scientist

Kazuhiko SEKI Adjunct Associate Professor
from Hiroshima Univ.
(~ March 1991)

Eiji ISHIGURO Adjunct Associate Professor
from Osaka City Univ.
(April 1991 ~)

Koichiro OBA Visiting Research Fellow
from Hamamatsu Photonics
(~ March 1991)

Graduate Student

Sayumi HIROSE (April 1991 ~)

Representative of Beam Lines

BL1A	Makoto	WATANABE	UVSOR
BL2A	Kosuke	SHOBATAKE	Dept. VUV Photoscience
BL2B2	Katsumi	KIMURA	Dept. VUV Photoscience
BL3B	Koichiro	MITSUKE	Dept. VUV Photoscience
BL4A	Shinri	SATO	Dept. VUV Photoscience
BL4B	Kosuke	SHOBATAKE	Dept. VUV Photoscience
BL6B	Kyuya	YAKUSHI	Dept. Molecular Assemblies
BL6A2	Masao	KAMADA	UVSOR
BL8B2	Hiroo	INOKUCHI	IMS
Others	Makoto	WATANABE	UVSOR
	Masao	KAMADA	UVSOR

Steering Committee (April 1990 - March 1992)

Katsumi	KIMURA	IMS Chairman
Jun-ichi	CHIKAWA	Himeji Inst. of Technology
Junji	FUJITA	Nat. Inst. Fusion Science
Masahiro	KOTANI	Gakushuun Univ.
Kaizo	NAKAMURA	Okayama Univ.
Yukinori	SATO	Tohoku Univ.
Tadamasa	SHIDA	Kyoto Univ.
Shigemasa	SUGA	Osaka Univ.
Eiji	ISHIGURO	Osaka City Univ.
Keitaro	YOSHIHARA	IMS
Kyuya	YAKUSHI	IMS
Kosuke	SHOBATAKE	IMS
Norio	MORITA	IMS
Makoto	WATANABE	IMS
Goro	ISOYAMA	IMS
Masao	KAMADA	IMS

JOINT STUDIES (fiscal year 1991)

Special Project	: 3
Cooperative Research	: 27
Use of Facility	:114
Users' Meeting	: 1
Workshop on Beam Dynamics and Free Electron Lasers	: 1
Users' Time	: 40 Weeks

LIST OF PUBLICATIONS

- 1) "Feasibility Study for the Observation of Biological Materials in VUV Wavelength Regions. Using Zone Plates Fabricated by Electron and Ion Beam Lithographies"
Y. Nagai, Y. Nakajima, Y. Watanabe, S. Ogura, K. Uyeda, Y. Shimanuki and H. Kihara
X-Ray Microscopy, Instrumentation and Biological Applications, ed. by P.C. Cheng and G.J. Jan (Springer-Verlag, Berlin, 1987) p. 263.
- 2) "Many Body Effects in Ce 3p XAS and Ce 3p XPS of CeO₂"
A. Bianconi, A. Clozza, T. Murata, T. Matsukawa, T. Miyahara, A. Kotani, S. Nakai and T. Mitsuishi
Physica B **158** (1989) 389.
- 3) "Threshold Energy for Photogeneration of Self-Trapped Excitons in SiO₂"
C. Itoh, K. Tanimura, N. Itoh and M. Itoh
Phys. Rev. B **39** (1989) 11183.
- 4) "Negative-Ion Mass Spectrometric Study of Ion-pair Formation in the Vacuum Ultraviolet. III. SF₆ → F⁻ + SF₅⁺"
K. Mitsuke, S. Suzuki, T. Imamura and I. Koyano
J. Chem. Phys. **93** (1990) 8717.
- 5) "A Simple Cylindrical Retarding Field Energy Analyzer"
Y. Fujii, E. Ishiguro and T. Kitada
Jpn. J. Appl. Phys. **29** (1990) 2176.
- 6) "Electronic Structure of Pc₂Lu and (PcAlF)_n Oriented Thin Films Using Angle Resolved Photoelectron Spectroscopy"
M.R. Fahy, H. Fujimoto, A.J. Dann, H. Hoshi, H. Inokuchi, Y. Maruyama and M.R. Willis
Physica Scripta **41** (1990) 550.

- 7) "Spectroscopic and Photoelectron-Spectroscopic Studies on Condensed Matters by Using Extreme Ultraviolet Radiation from Synchrotron"
M. Kamada
Proc. 2nd Int. Symp. on Advance Nuclear Energy Research, 1990, p. 575.
- 8) "Vacuum UV Microscope with Free-Standing Zone Plates at UVSOR"
H. Kihara, Y. Shimanuki, K. Kawasaki, N. Watanabe, M. Taniguchi,
H. Tsuruta, Y. Nagai, Y. Watanabe and S. Ogura
X-Ray Microscopy in Biology and Medicine, ed. by K. Shinohara et. al.
(Japan Sci. Soc. Press, Tokyo, 1990) p. 143.
- 9) "Direct Absorption Spectra of S₂ and S₃ States of Benzene Clusters"
A. Hiraya and K. Shobatake
Chem. Phys. Lett. **178** (1991) 543.
- 10) "Photoemission Study of an Al-Cu-Fe Icosahedral Phase"
M. Mori, S. Matsuo, T. Ishimasa, T. Matsuura, K. Kamiya, H. Inokuchi
and T. Matsukawa
J. Phys. : Condens. Matter **3** (1991) 767.
- 11) "Photoionization Processes in Nonpolar Media : Density Effect"
K. Nakagawa
Radiat. Phys. Chem. **37** (1991) 643.
- 12) "Relaxed Configuration of Self-Trapped Excitons in Na_{1-x}K_xI and K_{1-x}Rb_xI
Mixed Crystals"
M. Itoh, S. Hashimoto and N. Ohno
J. Lumin. **48 & 49** (1991) 121.
- 13) "Luminescence from Surface CN⁻ Centers Created Photochemically on Alkali
Halide Crystals"
H. Nakagawa, A. Fukumoto, A. Ohnishi, K. Fukui, H. Matsumoto,
M. Fujita, T. Miyanaaga and M. Watanabe
J. Lumin. **48 & 49** (1991) 811.

- 14) "Surface Core Exciton in LiCl Studied by Photoelectron Spectroscopy"
K. Ichikawa, O. Aita, M. Kamada and K. Tsutsumi
Phys. Rev. B **43** (1991) 5063.
- 15) "Three Types of Emission Bands from Hetero-Nuclear Relaxed Excitons in NaBr:I, KBr:I and RbBr:I"
K. Kan'no, K. Tanaka, H. Kosaka and Y. Nakai
J. Lumin. **48 & 49** (1991) 147.
- 16) "Luminescence Associated with Self-Trapped Excitons in LiBr"
K. Fujiwara, S. Nagata, H. Nishimura, M. Nakayama, T. Komatsu and S. Hashimoto
J. Lumin. **48 & 49** (1991) 107.
- 17) "Dissociative Single, Double, and Triple Photoionization of Silicon Tetrafluoride in the Valence Shell and Silicon 2p Regions ($h\nu = 33-133$ eV)"
T. Imamura, C.E. Brion, I. Koyano, T. Ibuki and T. Masuoka
J. Chem. Phys. **94** (1991) 4936.
- 18) "K-Absorption Spectrum of Solid Neon"
A. Hiraya, K. Fukui, P. Tseng, T. Murata and M. Watanabe
J. Phys. Soc. Jpn. **60** (1991) 1824.
- 19) "Dissociative Single, Double, and Triple Photoionization of OCS in the Region $h\nu = 20 - 100$ eV Studied by Mass Spectrometry and the Photoion-Photoion Coincidence Method"
T. Masuoka and I. Koyano
J. Chem. Phys. **95** (1991) 909.
- 20) "On the Common Feature of the Optical Reflectivity in Rare-Earth Monopnictides Due to 5d Electron Screening"
Y.S. Kwon, M. Takeshige, O. Nakamura, T. Suzuki and T. Kasuya
Physica B **171** (1991) 316.

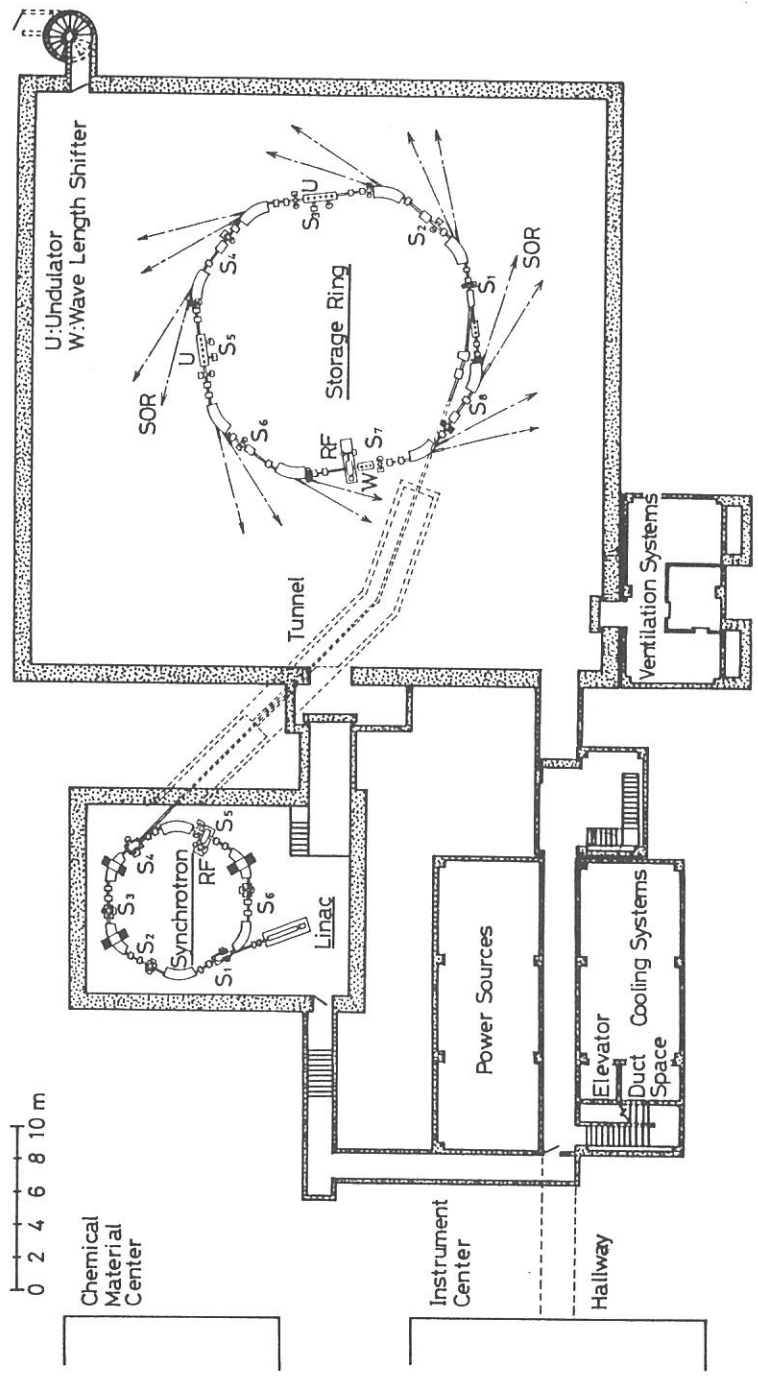
- 21) "Dissociative Single and Double Photoionization of CH₃F in the Region 20 - 110 eV Studied by Mass Spectrometry and the Photoion-Photoion Coincidence Method"
T. Masuoka and I. Koyano
J. Chem. Phys. **95** (1991) 1619.
- 22) "Fine Structures of Cd²⁺ 4d Core Excitons in CdCl₂-CdBr₂ Mixed Crystals and CdI₂ Crystal"
M. Fujita, H. Nakagawa, N. Kitagata, H. Matsumoto, T. Miyanaga,
K. Fukui and M. Watanabe
J. Phys. Soc. Jpn. **60** (1991) 1792.
- 23) "Direct Absorption Spectra of Jet-Cooled Benzene in 130-260 nm"
A. Hiraya and K. Shobatake
J. Chem Phys. **94** (1991) 7700.
- 24) "Performance of the Charge-Coupled Device for Direct X-Ray Detection in the Energy Range of 1-9 keV at the Synchrotron Radiation Facility"
H. Tsunemi, S. Kawai and K. Hayashida
Jpn. J. Appl. Phys. **30** (1991) 1299.
- 25) "Negative-Ion Mass Spectrometric Study of Ion-Pair Formation in the Vacuum Ultraviolet. IV. CH₄ → H⁻ + CH₃⁺ and CD₄ → D⁻ + CD₃⁺"
K. Mitsuke, S. Suzuki, T. Imamura and I. Koyano
J. Chem. Phys. **94** (1991) 6003.
- 26) "Negative-Ion Mass Spectrometric Study of Ion-Pair Formation in the Vacuum Ultraviolet. V. CF₄ → F⁻ + CF₃⁺"
K. Mitsuke, S. Suzuki, T. Imamura and I. Koyano
J. Chem. Phys. **95** (1991) 2398.
- 27) "Far-Infrared Optical Constants of Liquid Acetonitrile at 238 to 343 K as Measured with a Synchrotron Radiation Source"
T. Ohba and S. Ikawa
Mol. Phys. **73** (1991) 985.

- 28) "Present Status of the UVSOR Light Source"
G. Isoyama
Nucl. Instr. & Meth. in Physics Research **A308** (1991) 31.
- 29) "Carbon K-Shell X-Ray Absorption Near-Edge Structure of Solid Co₆₀"
H. Shinohara, H. Sato, Y. Saito, K. Tohji and Y. Udagawa
Jpn. J. Appl. Phys. **30** (1991) L848.
- 30) "Carbon K-Edge X-Ray Absorption Near-Edge Structures of Solid C₇₀"
H. Shinohara, H. Sato, Y. Saito, K. Tohji, I. Matsuoka and Y. Udagawa
Chem. Phys. Lett. **183** (1991) 145.
- 31) "Anisotropic Angular Distribution of Fragment Ions in Dissociative Double Photoionization of OCS"
T. Masuoka, I. Koyano and N. Saito
Phys. Rev. A **44** (1991) 4309.
- 32) "Dissociative Photoionization of Al₂(CH₃)₆ and Al₂(CH₃)₃Cl₃ in the Range 40-100 eV"
S. Nagaoka, I. Koyano, T. Imamura and T. Masuoka
Appl. Organomet. Chem. **5** (1991) 269.
- 33) "Angle-Resolved Photoemission and Inverse Photoemission Studies of Bi₂Sr₂Ca_{1-x}Y_xCu₂O₈ (x=0, 0.4, 0.6)"
T. Takahashi, T. Watanabe, T. Kusunoki and H. Katayama-Yoshida
J. Phys. Chem. Solids **52** (1991) 1427.
- 34) "Self-Trapped Exciton Luminescence in Dilated NaI Crystals - Relaxation Process of Excitons in Alkali Halides -"
M. Itoh, S. Hashimoto and N. Ohno
J. Phys. Soc. Jpn. **60** (1991) 4357.
- 35) "Photon-Stimulated Desorption of Excited-State Alkali Atoms from Alkali Halides Irradiated with Undulator Radiation"
S. Hirose and M. Kamada
J. Phys. Soc. Jpn. **60** (1991) 4374.

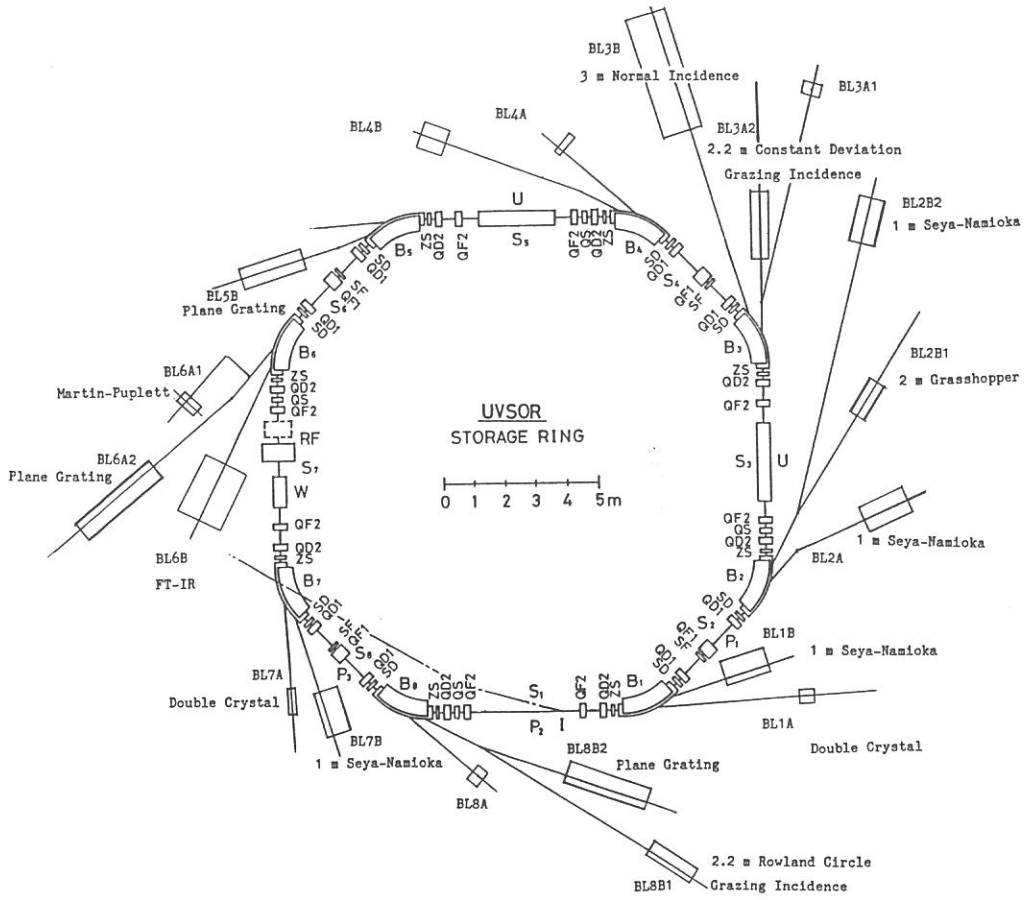
- 36) "Polarized Reflection Spectra of Orthorhombic PbCl₂ and PbBr₂"
M. Fujita, H. Nakagawa, K. Fukui, H. Matsumoto, T. Miyanaga and
M. Watanabe
J. Phys. Soc. Jpn. **60** (1991) 4393.
- 37) "Ge and Ge-L X-Ray Absorption Spectra in Some Semiconductors"
S. Naoe, K. Fukui, T. Matsukawa and T. Murata
Proc. of the 6th Int. Conf. on Xray Absorption Fine Structure, York 1990,
ed. by S. Hasnain (EllisHorwood, 1991) p. 337.
- 38) "Structural Imperfections in Silicon Dioxide Films Identified with Vacuum
Ultraviolet Optical Absorption Measurements"
K. Awazu, H. Kawazoe, Y. Saito, K. Watanabe and T. Ando
Appl. Phys. Lett. **59** (1991) 528.
- 39) "Characterization of Silica Glasses Sintered under Cl₂ Ambients"
K. Awazu, H. Kawazoe, K. Muta, T. Ibuki, K. Tabayashi and
K. Shobatake
J. Appl. Phys. **69** (1991) 1849.
- 40) "Simultaneous Generation of the 7.6-eV Optical Absorption Band and F₂ Molecule
in Fluorine Doped Silica Glass under Annealing"
K. Awazu, H. Kawazoe and K. Muta
J. Appl. Phys. **69** (1991) 4183.
- 41) "Optical Properties of Oxygen-Deficient Centers in Silica Glasses Fabricated in H₂
or Vacuum Ambient"
K. Awazu, H. Kawazoe and K. Muta
J. Appl. Phys. **70** (1991) 69.
- 42) "Effects of Oxidation Conditions on the Formation of Paramagnetic Centers at and
near the Si/SiO₂ Interface"
K. Awazu, H. Kawazoe, T. Ando and K. Watanabe
J. Appl. Phys. **70** (1991) 2979.

- 43) "Anisotropy in the Electronic Structure of Polysilanes Investigated by Synchrotron-Radiation Spectroscopy"
 H. Tachibana, Y. Kawabata, S. Koshihara, T. Arima, Y. Moritomo and
 Y. Tokura
 Phys. Rev. B **44** (1991) 5487.
- 44) "UPS of New Type Polyacetylene"
 K. Kamiya, H. Inokuchi, M. Oku, S. Hasegawa, C. Tanaka, J. Tanaka and
 K. Seki
 Synth. Met. **41-43** (1991) 155.
- 45) "High-Tc Superconductor Studied with Synchrotron Radiation"
 T. Takahashi
 Nucl. Instr. & Methods in Phys. Reserach A303 (1991) 515.
- 46) "Photoemission Study of Bi System High T_C Superconductor"
 T. Takahashi and T. Kusunoki
 J. Advanced Science **3** (1991) 91.
- 47) "Photoemission Study of C₆₀ and its Alkali-Metal Compounds"
 T. Takahashi, T. Morikawa, S. Sato, H. Katayama-Yoshida, A. Yuyama,
 K. Seki, H. Fujimoto, S. Hino, S. Hasegawa, K. Kamiya, H. Inokuchi,
 K. Kikuchi, S. Suzuki, K. Ikemoto and Y. Achiba
 Physica C **185-189** (1991) 417.
- 48) "Angle-Resolved Photoemission Study of Bi₂Sr₂Ca_{1-x}Y_xCu₂O₈ (x=0.0, 0.2, 0.4,
 0.6) Single Crystals"
 T. Kusunoki, T. Takahashi, S. Sato, H. Katayama-Yoshida, K. Kamiya
 and H. Inokuchi
 Physica C **185-189** (1991) 1045.
- 49) "Local Structures of Metals Dispersed on Coal. 3. Na K-Edge XANES Studies on
 the Structure of Sodium Gasification Catalyst"
 H. Yamashita, S. Yoshida and A. Tomita
 Ind. Eng. Chem. Res. **30** (1991) 1651.

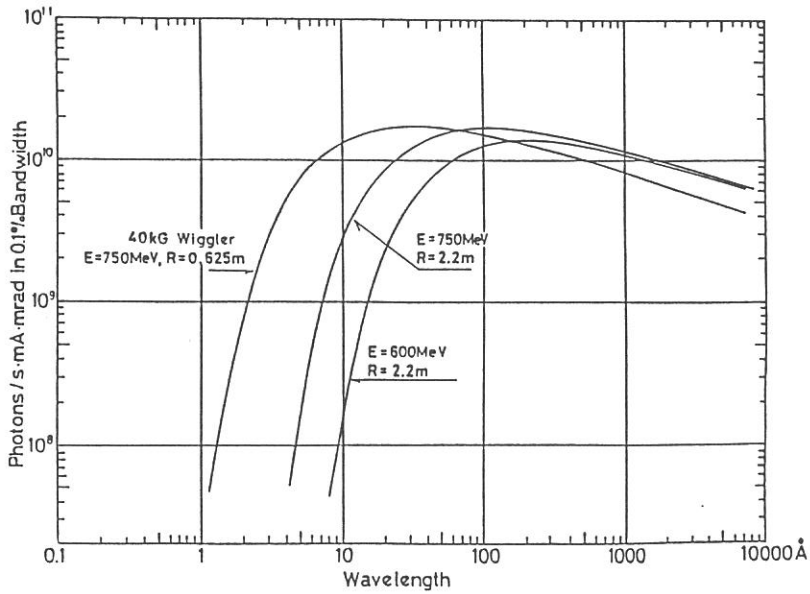
- 50) "Focusing Efficiency and Resolution of a Nickel Phase Zone Plate for Soft X-Rays"
H. Fujisaki, N. Nakagiri, H. Kihara, N. Watanabe and M. Taniguchi
Jpn. J. Appl. Phys. **30** (1991) 2943.
- 51) "Absorption and Fluorescence Studies of Molecules and Clusters"
K. Shobatake, A. Hiraya, K. Tabayashi and T. Ibuki
Vacuum Ultraviolet Photoionization and Photoemission of Molecules and Clusters, ed. by C.Y. Ng (World Scientific Publishing, Singapore, 1991) p. 503.
- 52) "Measurements of Far-Infrared Optical Constants of Liquids with a Synchrotron Radiation Source"
Y. Fujita, T. Ohba and S. Ikawa
Can. J. Chem. **69** (1991) 1745.



Ground plan of the basement of the UVSOR Facility



The UVSOR storage ring and the beam lines.



Intensity distribution of the UVSOR radiation.

Table 1. Main Parameters of the UVSOR Accelerator ComplexLinac

Energy	E = 15 MeV
Frequency	$f_{RF} = 2.856$ GHz

Synchrotron

Energy	E = 600 MeV
Beam Current	I = 32 mA
Circumference	C = 26.6 m
Superperiodicity	$N_{\text{superperiodicity}} = 6$
Bending Radius	$\rho = 1.8$ m
Harmonic Number	h = 8
RF Frequency	$f_{RF} = 90.115$ MHz
Repetition Rate	$f_{\text{rep}} = 2.6$ Hz

Storage Ring

Energy	E=750 MeV
Critical Energy of SR	$\epsilon_c = 425$ eV
Beam Current (Nominal)	
Multi-Bunch	I = 200 mA
Single-Bunch	I = 50 mA
Beam Lifetime	$\tau = 200$ min. at I=200 mA
Circumference	C = 53.2 m
Superperiodicity	$N_{\text{superperiodicity}} = 4$
Bending Radius	$\rho = 2.2$ m
Betatron Wave numbers	
Horizontal	$Q_x = 3.19$
Vertical	$Q_y = 2.22$
Momentum Compaction Factor	$\alpha = 0.032$
RF Frequency	$f_{RF} = 90.115$ MHz
RF Voltage	$V_{RF} = 50$ kV
Natural Emittance	
Horizontal	$\epsilon_x = 1.15 \times 10^{-7}$ π m rad
Vertical ^{a)}	$\epsilon_y = 1.15 \times 10^{-8}$ p m rad
Beam Sizes	
Horizontal	$\sigma_x = 0.39$ mm
Vertical ^{a)}	$\sigma_y = 0.27$ mm
Bunch Length	$\sigma_l = 170$ psec

a) 10 % coupling is assumed.

Table 2. Beam Lines at UVSOR

Beam Line	Monochromator/ Spectrometer	Wavelength Region	Acceptance Angle (mrad)		Experiment
			Horiz.	Vert.	
BL1A	Double Crystal	15 - 8 A	4	1	Solid
BL1B	1m Seya-Namioka	6500 - 300 A	60	6	Gas & Solid
BL2A	1 m Seya-Namioka	4000 - 300 A	40	6	Gas
BL2B1	2 m Grasshopper	600 - 15 A	10	1.7	Gas & Solid
BL2B2	1 m Seya-Namioka	2000 - 300 A	20	6	Gas
BL3A1	None (Filter, Mirror)		(U) 0.3	0.3	Gas & Solid
BL3A2	2.2m Constant Deviation Grazing Incidence	1000 - 100 A	(U) 10	4	Gas & Solid
BL3B	3 m Normal Incidence	4000 - 300 A	20	6	Gas
BL4A	None		6	6	Irradiation
BL4B	None		8.3	6	Irradiation
BL5B	Plane Grating	2000 - 20 A	10	2.2	Calibration [#]
BL6A1	Martin-Pupplet	5 mm - 50 μ m	80	60	Solid
BL6A2	Plane Grating	6500 - 80 A	10	6	Solid
BL6B	FT-IR	200 - 1.7 μ m	70	25	Solid
BL7A	Double Crystal	15 - 8 A 15 - 2 A	2 (W) 1	0.3 0.15	Solid Solid
BL7B	1 m Seya-Namioka	6500 - 300 A	40	8	Gas & Solid
BL8A	None (Filter)		25	8	Irradiation/ User's Instr.
BL8B1	2.2 m Rowland Circle Grazing Incidence	440 - 20 A	10	2	Gas & Solid
BL8B2	Plane Grating	6500 - 80 A	10	6	Solid

National Institute for Fusion Science

U: with an undulator, W: with a wiggler

LOCATION

Ultraviolet Synchrotron Orbital Radiation (UVSOR) Facility, Institute for Molecular Science (IMS) is located at Okazaki. Okazaki (population 300,000) is 260 km southwest of Tokyo, and can be reached by train in about 3 hours from Tokyo via New Tokaido Line (Shinkansen) and Meitetsu Line.



Address

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