

Joint Studies Programs

As one of the important functions of an inter-university research institute, IMS facilitates joint studies programs for which funds are available to cover the costs of research expenses as well as the travel and accommodation expenses of individuals. Proposals from domestic scientists are reviewed and selected by an interuniversity committee.

(1) Special Projects

A. Development of Polarized Quantum Beam Sources and their Applications to Molecular Science

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By using particle accelerator technologies, polarized quantum beams of various kinds can be produced. At the UVSOR facility, circular polarized coherent synchrotron radiation ranging from visible to deep UV can be produced by using resonator free electron laser.¹⁾ We have demonstrated that such polarized radiation is a powerful tool for molecular science.^{2,3)} In this joint study program, we are going to develop techniques to produce polarized quantum beams of various kinds and explore their applications.

It was successfully demonstrated at UVSOR to produce circular VUV light beam by using a technique called Coherent Harmonic Generation (CHG).⁴⁾ Towards higher intensity, a new undulator system called optical klystron was developed and installed in the ring (Figure 1). Its basic performance has been confirmed by observing the spontaneous synchrotron radiation spectra. A first CHG experiment will be done in autumn, 2012.

It was also successfully demonstrated at UVSOR to produce a polarized gamma-ray source by using a technique called Laser Compton Scattering (LCS). Laser photons are injected to the electron beam and are scattered off, and they are converted to gamma-rays via inverse Compton scattering process.⁵⁾ The polarity of the gamma-rays can be changed by changing that of the laser photons. The possible applications are now being explored.

In Nagoya University, a polarized electron source has been developed based on an electron gun technology using GaAs

photocathode. The spin polarization higher than 90% has been demonstrated.⁶⁾ In collaboration with Nagoya University, a spin polarized electron source is now under commissioning at UVSOR. The first experiment on bio-molecular science will be carried out in autumn 2012. The application in the field of inverse photoelectron spectroscopy is now under preparation.



Figure 1. Variable Polarization Optical Klystron at UVSOR-III.

References

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- 2) J. Takahashi, H. Shinojima, M. Seyama, Y. Ueno, T. Kaneko, K. Kobayashi, H. Mita, M. Adachi, M. Hosaka and M. Katoh, *Int. J. Mol. Sci.* **10**, 3044–3064 (2009).
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- 4) M. Labat, M. Hosaka, M. Shimada, M. Katoh and M. E. Couprie, *Phys. Rev. Lett.* **101**, 164803 (2008).
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PROGRAMS

(2) Research Symposia

(From Oct. 2011 to Sep. 2012)

Dates	Theme	Chair
Nov. 1–2, 2011	Molecular Science for Supra-Functional Molecular Systems by Using Experimental and Theoretical Methods	SEKIYA, Hiroshi FURUTANI, Yuji
Mar. 13, 2012	Symposium for Young Inorganic Chemists Aiming at the Innovation	MIZUTA, Tsutomu MASAOKA, Shigeyuki
Mar. 15–16, 2012	Symposium on Integral Researches toward the Next Generation of Molecular Science	MATSUMOTO, Yoshiteru FURUTANI, Yuji
Jun. 1–2, 2012	Recent Development of Experimental and Theoretical Methodology on Liquids and Soft Matters: Basic Properties and Applications to Novel Devices	NISHIYAMA, Katsura OKUMURA, Hisashi
Jul. 30–31, 2012	New Avenue for Investigating Molecular Structure via Laser Spectroscopy and Magnetic Measurements	BABA, Masaaki OHSHIMA, Yasuhiro
Jun. 16–17, 2012	Preparatory Meeting for the 52 nd Molecular Science Summer School & the 1 st Symposium for Young Molecular Scientists	YAMAZAKI, Kaoru FURUTANI, Yuji

(3) Numbers of Joint Studies Programs

Categories	Oct. 2011–Mar. 2012	Apr. 2012–Sep. 2012	Total
Special Projects	0	1	1
Research Symposia	3	2	5
Research Symposia for Young Researchers	0	1	1
Cooperative Research	55	51	106
Use of Facility	Instrument Center	51	92
	Equipment Development Center	7	14
Use of UVSOR Facility	78	56	134
Use of Facility Program of the Computer Center			179*

* from April 2011 to March 2012