ISSP Workshops

ISSP Workshop: Triple-Axis Spectrometer

April 27, 2012
T. Masuda and H. Yoshizawa

Since the fiscal year of 2010 the neutron scattering laboratory (NSL) started a new system for Instrument and Research Team (IRT) so that the IRT members can effectively use the machine time and they promote scientific activities in a specific theme. The members have produced excellent results in the fields of strongly correlated electron systems, frustrated system, Fe-based superconductor, f-electron system, etc. Then, on 11th March in 2011, the east Japan earthquake attacked neutron facilities and scientists could not perform neutron experiment in Japan. Instead many Japanese scientists had opportunity to conduct their experiments abroad thanks to the aid from foreign facilities including Oak Ridge National Laboratory (ORNL), Australian Nuclear Science and Technology Organization (ANSTO), Korea Academic Energy Research Institute (KAERI), etc. Many proposals of NSL joint research were transferred to these foreign facilities.

The aims of this workshop are to report the situation of the new IRT system and to present the scientific output obtained in the IRT system and in the transferred proposals. Instrumental scientists of six triple-axis spectrometers reported current situation and management of their spectrometers. Outstanding sciences outcomes including multiferroics, Fe-based superconductivity, f-electron systems, etc., were reported by the IRT members and several frequent users. The new IRT system and scientific topics in condensed matter physics were actively discussed by the professionals of triple-axis spectrometer.

ISSP International Workshop on Coherent Soft X-ray Sciences, and 5th Asian Workshop on Generation and Applications of Coherent XUV and X-ray Radiation (5th AWCXR)

June 27 - 29, 2012
J. Itatani, Y. Kobayashi, and S. Shin

This ISSP workshop was held as a part of the international workshop of the same title. See the section of “International Conferences and Workshops”.

MAterial Simulation in Petaflops era (MASP2012)

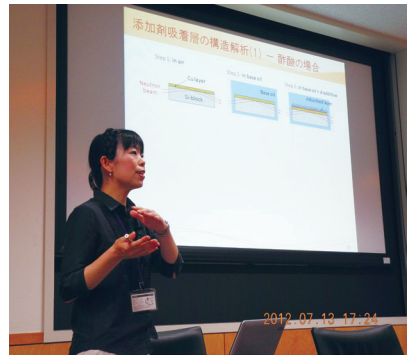
June 25 - July 13, 2012
O. Sugino

This ISSP workshop was held as a part of the international workshop of the same title. See the section of “International Conferences and Workshops”.

ISSP Workshop: Transport and Conversion Processes at Surfaces and Interfaces

July 13 - 14, 2012
J. Yoshinobu

It becomes more and more important to utilize renewable energies efficiently after the 2011 Great East Japan Earthquake. Fundamental and applied studies towards practical use have been accelerated in the field of material science including artificial photosynthesis, water-splitting photocatalysis, thermoelectric conversion device etc. as well as solar cells. These materials and devices are closely related to the disciplines of new material development, optical properties of condensed matter, electronic states of solids, electrochemistry and so on. In particular, surfaces and interfaces between materials in devices play crucial roles, where various energy conversion and transport processes occur including photo excitation, charge separation, charge transport, energy level alignment, and chemical reactions. The processes at surface and/or interfaces could be rate limiting. In addition, energy dissipation (friction) occurs at interfaces. However, researchers in these fields have been working in different academic communities so far. In order to overcome the compartmentalized academic areas, this ISSP workshop was held; we have shared and exchanged our recent knowledge and idea in different fields. We hope that this workshop would activate the collaboration and joint research in the future.



ISSP Workshop: Future Mission of Triple-Axis Spectrometer in Research Reactor and Polarized Neutron Scattering

July 23 - 24, 2012
T. Masuda

Neutron scattering laboratory (NSL) operates triple-axis spectrometers (TAS) installed in research reactor JRR-3 that lead the frontier of neutron science in Japan. Meanwhile J-PARC, in which NSL owns a chopper spectrometer HRC, restarted its operation since December 2011 and now we are in the coexistence era of JRR-3 and J-PARC. In this workshop the future role of the TAS, the flagship of spectrometer in JRR-3, was discussed. As state of arts triple-axis spectrometers, those equipped with multi-detectors that cover wide reciprocal space are of practical use and MACS in NIST and Flatcone in ILL were introduced as successful examples. Meanwhile the important missions for the existing TAS were pointed out; spectrometer for polarized neutron scattering, spectrometer for general purposes from powder diffraction to inelastic neutron scattering on single crystal, and spectrometer for education. Among them polarized inelastic neutron scattering technique is noticed as a potentially powerful one that has not been well developed because of low efficiency of polarizer. Recent progress of polarizer such as supermirror or SEOP can be a breakthrough to realize the efficient inelastic polarized neutron scattering. Relevant research topics in the condensed matter sciences including novel magnetic correlation, precise measurement on spin fluctuations, hybrid mode of magnetic and lattice excitations, and etc. are introduced. Furthermore spin-echo option combined with polarized mode enables very high energy resolution experiment that is useful to the measurement of phonon lifetime, dynamics of Skyrmion lattice, low frequency mode of relaxor, etc. Cryopad option enables three-dimensional polarized neutron analysis and it is used for precise magnetic structure analysis on complex structure. Thus the upgrade of polarization function in TAS is the most important mission. Furthermore, the development of novel types of TAS having multi-detector is also desired. Finally the education for the students in neutron sciences is indispensable to the progress of the field and the TAS, of which the basic is simple, plays important role. Interesting presentations and fruitful discussions were made by 11 speakers and 20 participants.

International Workshop on 3D Atomic Imaging at Nano-Scale Active Sites in Materials

August 6 - 8, 2012

K. Hayashi, H. Daimon, K. Gohara, T. Takahashi, J. Yoshinobu, Y. Sasaki, K. Ohoyama, and T. Matsushita

This ISSP workshop was held as a part of the international workshop of the same title. See the section of “International Conferences and Workshops”.

Frontier of Searching for Strongly Correlated Materials

October 22, 2012

Z. Hiroi, H. Kageyama, M. Nohara, and Y. Ueda

The workshop focused on the recent progress in searching for new compounds in the field of the strongly correlated electron systems. Approximately 60 people including 14 invited speakers got together and intensively discussed various classes of materials such as superconductors, frustrated compounds, and heavy fermion compounds. The workshop gave a good opportunity for attendees to understand the present status and to imagine the future prospect of materials research. Moreover, it was helpful in building a community for solid state chemists and physicists.

Workshop on the Occasion of the Establishment of Laser and Synchrotron Research Center "Frontier of Laser and Synchrotron Joint Research"

November 29 - 30, 2012

T. Suemoto

Laser spectroscopy and synchrotron radiation (SOR) spectroscopy have made a considerable progress for decades as two independent fields. Recently, these two advanced light sources become to have a large overlap in the wavelength domain from terahertz to soft-X-ray. This workshop aimed at promoting collaboration between these two fields and we invited speakers from both laser and synchrotron communities under common concepts on physics and methodology. On the occasion of the establishment (Oct. 2012) of LASOR (Laser and Synchrotron Research Center) at Institute for Solid State Physics, we organized this workshop.

The sessions included are:

(1) General introduction of the recent activity of LASOR:
Laser sources based on high harmonic generation. High performance undulator at SPring-8.

(2) Time-resolved inner shell spectroscopy:
Chemistry of adsorbed molecules and catalysts. Operand-spectroscopy. Time-resolved inner-shell spectroscopy.

(3) High resolution photoemission spectroscopy (PES):
Application of high resolution PES to new materials including strongly correlated systems, topological insulators etc.

(4) Time-resolved photoemission spectroscopy:
Dynamics of photoinduced phase transitions, excited carriers in semiconductors, etc. Comparison of laser and SOR.

On average, 80 participants were present in every session, and we shared common science irrespective of the light source hardware. We believe that this workshop promote growth of a merged community of materials photon scientists.

Recent Developments in Computational Condensed Matter Physics

January 10 - 11, 2013

O. Sugino, N. Kawashima, H. Noguchi, S. Todo, H. Watanabe, S. Kasamatsu, Y. Noguchi, and H. Shiba

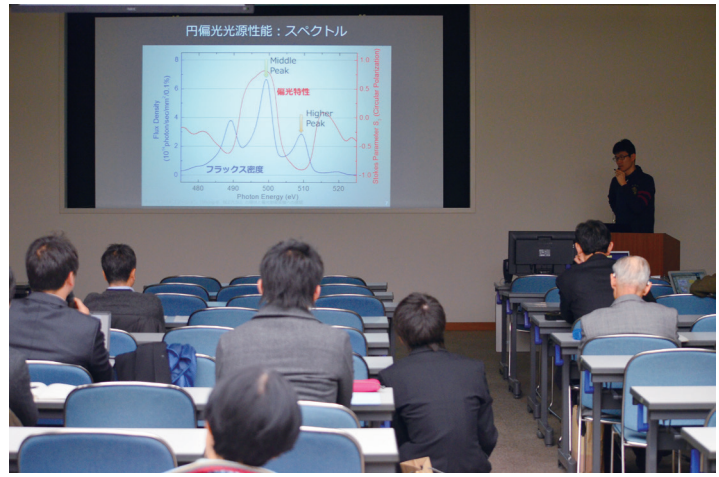
This workshop was held cosponsored by ISSP, CCMS (center of computational material science) of ISSP, and centers of the MEXT project "Research for Advanced Strategic Materials". The ISSP supercomputing environment is facing sea change by the vast computer resources provided by K-computers (and possibly the exaflops computers of the next decade) and by the responsibility to take part in strategic material design. The ISSP supercomputer itself is going to be reinforced by the system C (Fujitsu FX10) in the coming new fiscal year and will be replaced to novel systems in 2015. In this circumstance, the annual ISSP supercomputer user workshop was enlarged this year to call for attendance of general computational materials scientists. The workshop started by the plenary talk by Prof. Matsuoka, a developer of Tsubame supercomputer, where the role of Graphics Processing Unit (GPU) played in the next generation supercomputers was discussed; Prof. Yoshimoto, on behalf of a committee of the HPCI consortium, discussed possible hardware and software requirements in the exaflops computers. In addition to the fifteen oral presentations given by the heavy users of ISSP supercomputers, four presentations were given on the future strategic research on advanced electronic materials, magnets, catalysts/batteries, and structural materials.

Development for Polarization-Control Experiments at SPring-8BL07LSU: Present and Future

February 15, 2013

S. Shin, I. Matsuda, Y. Harada, and F. Komori

In the high-brilliance soft X-ray beamline BL07LSU of SPring-8, new proposals for long-term beam-time were approved and the beam-time started last year using three regular end-stations, which were made by the construction teams. The experiments of the short-time proposals have progressed smoothly as well. In parallel, the development for polarization-controlled experiments has been continued. This workshop was held to review the achievements of the proposals submitted this year in this beamline and to discuss the prospects of the polarization-controlled experiments. The number of the participants was over 60. After the summary of the beamline and achievements, the present status of the development for polarized light from the undulator was first reported. Then, the plan of the further developments for the polarization control using new phase-shifters and the application to the experimental studies of material science were proposed and discussed. In the latter half, fruitful and interesting experimental results at the regular end-stations and at the free port were presented. The beamline has been successfully constructed, and is now used for various studies on solid-state physics and materials science related to electronic devises, batteries and catalyses.



Valence Fluctuations and Quantum Criticality in the Strongly Correlated Electron Systems

February 25, 2013

S. Nakatsuji, M. Takigawa, and Y. H. Matsuda

Quantum critical phenomena in the strongly correlated electron systems have attracted attention for the emergence of the exotic quantum phases such as anomalous metallic phase and anisotropic superconductivity. In this context, the heavy fermion systems have been well-studied since the high-purity single crystal samples are available and the ground state is tunable by magnetic field and pressure in the clean limit. As a result, anisotropic superconductivities and non-Fermi liquid behaviors have been found in various heavy fermion systems near the antiferromagnetic quantum critical point. These studies have been performed in the Kondo lattice systems where the valence of the rare-earth ions has the integer value. In contrast, in the valence fluctuating systems with a moderately high Kondo temperature, no instability of magnetism have been found because of strong screening effect. In recent years, however, the valence fluctuating systems have been found to show physical properties indicating localization of 4*f* electrons, quantum critical phenomena and the superconductivities. In addition, the experimental results based on the recent developments of microscopic/macroscopic methods imply that these anomalous behaviors are strongly related to the valence fluctuations. Therefore, it was quite timely to organize this workshop to discuss the interesting developments and the future directions.

In spite of a short announcement, a relatively large number of on/off-campus researchers reaching 38 attended this workshop. As the first speaker, Prof. Kazumasa Miyake from Osaka University gave a introductory lecture about the theory of the quantum critical valence fluctuations. Next, based on the results obtained by the various experimental methods, several talks were made to discuss the quantum critical phenomena due to the valence fluctuations in β-$YbAlB_4$. Distinct quantum critical behaviors were discussed, which were found under magnetic fields and pressure in the electric/thermal transport properties as well as the thermal bulk properties. It was pointed out that these quantum critical behaviors are clearly different from the typical non-Fermi liquid behaviors observed in the vicinity of the antiferromagnetic quantum critical point. The results of the microscopic measurements including Mossbauer spectroscopy and nuclear magnetic resonance were also reported in detail. Prof. Hisao Kobayashi from University of Hyogo reported slow valence fluctuations estimated from the latest results of the Yb Mossbauer spectroscopy obtained by using Synchrotron Radiation. Prof. Yasuhiro Matsuda at ISSP talked about the recent developments of the valence control by magnetic field. His talk provided an active discussion about the relation between the valence crossover and quantum critical phenomena. The time-resolved photoemission spectroscopy was also introduced as a new tool to measure dynamics of valence fluctuations. Finally, Prof. Hisatomo Harima from Kobe University introduced a new viewpoint to understand anomalous properties and superconductivities in the zigzag lattice. Through this workshop, the future direction was addressed to shed further light on this new quantum criticality.