brookhaven national laboratory

newsletter

national synchrotron light source

Winter 2006

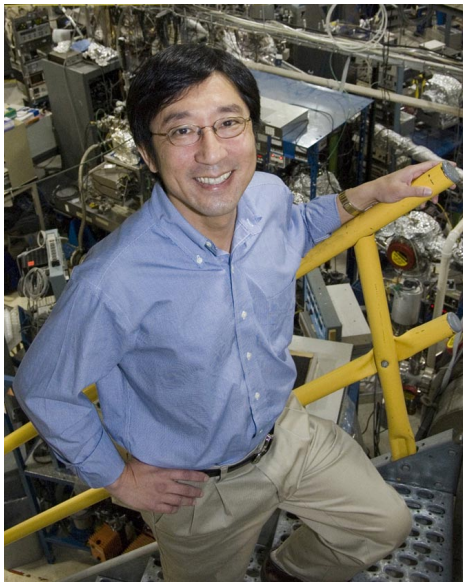
Chi-Chang Kao Named Chair of the National Synchrotron Light Source

Kendra Snyder, NSLS Science Writer

Chi-Chang Kao, a physicist and leader in synchrotron light research, has been named Chair of the National Synchrotron Light Source (NSLS) Department, effective October 1, 2006. Kao had served as interim NSLS Chair since mid-January, after Steve Dierker stepped down to lead the development of the National Synchrotron Light Source II (NSLS-II), a proposed scientific user facility that would produce x-rays more than 10,000 times brighter than the current NSLS.

One of the world's most widely used and productive scientific facilities, the NSLS has 175 employees and a user community of about 2,200 researchers a year from more than 400 universities, laboratories, and companies. Commissioned in 1982, the NSLS has yielded advances in such diverse fields as biology, physics, chemistry, geophysics, medicine, and environmental and materials science. Its annual budget is about $40 million.

"Chi-Chang is an internationally recognized scientist with a remarkable talent for bringing people together and growing scientific programs," said Dierker, who is the current Associate Laboratory Director for Light Sources. "I can think of no better choice than Chi-Chang to lead the NSLS forward."



Chi-Chang Kao

As Interim Chair during the past nine months, Kao produced a five-year plan for the future development of the NSLS. With input from the user community, NSLS staff, and Brookhaven researchers, the plan identifies a number of exciting scientific opportunities, improvements needed for better accelerator operation, and upgrades for beamlines, detectors, and infrastructure. As the new NSLS Chair, Kao wants to ensure that these initiatives are implemented.

"The next five years will be a very important time for the NSLS, because if NSLS-II gets approval, we will transition into the new light source at the end of that period," Kao said. "We have developed a very aggressive strategic plan that will help keep scientific productivity up and also grow new scientific communities at the NSLS. In particular, we want to grow in a way that will allow us to smoothly transition the user scientific program to the NSLS-II."

Additionally, Kao wants to encourage closer interaction between the NSLS, Brookhaven's research departments, industry, and universities, as well as emphasize research related to nanoscience and energy. "There are many ways that synchrotron research can make sig-

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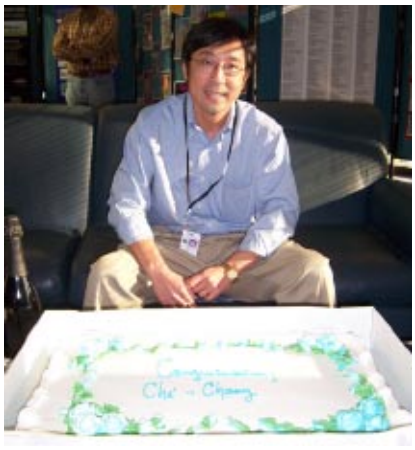
nificant contributions to solve the energy problems the world is facing today," Kao said. "Using light, we can study and make advances in the fields of catalysis, energy storage, fuel cells, and solar energy."

Kao earned a B.S. degree in chemical engineering in 1980 from National Taiwan University and a Ph.D in chemical engineering from Cornell University in 1988. Shortly after, he joined BNL as a postdoctoral research assistant at the NSLS. His research focuses on the development of new experimental techniques using synchrotron radiation, and their applications to condensed matter physics and materials sciences.



Chi-Chang Kao at the celebration recognizing his appointment as NSLS Chair.

He received tenure as a Brookhaven physicist in 1997 and served as the NSLS high-energy program coordinator from 1998 to 2001. He was promoted to senior physicist in 2001 and was named NSLS Deputy Chairman in 2005. Kao is also the Associate Chairman for User Science and an adjunct professor in the Department of Physics and Astronomy at Stony Brook University. He is a member of the American Physical Society and the American Association for the Advancement of Science.

CHAIRMAN'S INTRODUCTION

Chairman's Introduction

Chi-Chang Kao, NSLS Chairman

It is an honor and privilege to serve as the Chair of the NSLS. The NSLS is a very special place with a long and exemplary tradition of innovation in accelerator concepts and technology, as well as in the development of experimental techniques and applications of synchrotron radiation. Moreover, over the last quarter century, the NSLS has been one of the most widely used and productive scientific facilities in the world, and is often used as the standard to measure other synchrotron facilities worldwide.

These accomplishments are clearly a tribute to the large, diverse, and loyal NSLS user community and the dedicated and talented staff at the NSLS. Together, we have created a unique research environment that is intellectually exciting, conducive to the generation of new ideas and collaborations, and has the flexibility to get things done in a timely and cost-effective way. Most importantly, we also have had fun, made friends, and share many fond memories.

It is against these very high standards that we should measure, dedicate, and challenge ourselves in the coming years. During the last nine months, I've talked with many of you during the process of drafting the five-year strategic plan for the NSLS, which includes an aggressive scientific agenda, and a large number of accelerator, beamline, and infrastructure upgrades. Now, I am looking forward to working with all of you to implement this five-year plan to ensure the continued success of the NSLS.

The advent of the NSLS-II project and its success is essential to the future of synchrotron research in the United States. To the current NSLS user community and staff, the unprecedented brightness and flux of the NSLS-II presents a unique scientific opportunity that promises to significantly enhance the existing scientific programs and open completely new directions to lead to major discoveries. However, there are also many challenges ahead of us to ensure a smooth transition from the NSLS to NSLS-II. In the coming months, I will seek your input on both the scientific opportunities offered by the NSLS-II project, and also the transition plan.

This is an important and exciting period of time in the history of the NSLS. I'm confident that by working together, we will be able to overcome the challenges and take full advantage of the opportunities ahead of us. The future of the NSLS is going to be brighter than ever.

Finally, whether you're a visiting scientist, a staff member, or a member of the BNL community, I'm always open to your thoughts and suggestions. You can reach me at (631) 344-4494, kao@bnl.gov, or just stop by my office.

New NSLS-II Website Launched

Check out the latest news about the NSLS-II on the project's new website. Visitors can find information about everything from machine specifications to employment opportunities. The site is constantly being updated with new information, so visit it frequently at *http://www.bnl.gov/nsls2/*.

Latest rendering of the NSLS-II

One User's Perspective

Chris Jacobsen, Users' Executive Committee Chair
Stony Brook University

Things continue to look bright at Brookhaven!

It is with delight that we recognize the appointment of Chi-Chang Kao as Chair of the NSLS with the word "Interim" removed from his title. Under his leadership, the NSLS has a strategic plan for the ongoing development of the facility through its lifetime. The NSLS-II project, led by Steve Dierker (who is also the Associate Lab Director for Light Sources at BNL), is in the final stages of completing a conceptual design report on this future centerpiece for synchrotron radiation studies at Brookhaven. Many aspects of the conceptual design were described at our August 17 Town Meeting; you can see a video archive of Steve's presentation at *http://www.bnl.gov/nsls2/video.asp*, and you can view the PowerPoint slides at *http://www.bnl.gov/nsls2/docs/Dierker_Town_Mtg_8-17-06.ppt*. Between these two developments, we have a foundation for the future of synchrotron radiation research at Brookhaven. In the coming year we are likely to see a call appear for people to form beamline development teams and beamline access teams for NSLS-II, so it is not too soon to think of how existing NSLS users want to bridge their research to NSLS-II and how new users want to join in.

With the background of these essential developments, one matter of urgency for the moment is cybersecurity. We all recognize the need to keep sensitive personal data, and mission-critical systems, secure against intrusions. However, there are built-in conflicts in how people view cybersecurity. To a user, the ideal NSLS system is one they can access from anywhere at any time with minimal hassle, so that they can grab the data from their most recent visit, analyze it, and work interactively with NSLS "locals" to discuss its meaning. To someone charged with the responsibility of guaranteeing cybersecurity, the best computer system is one with no network connection at all and no access. Sometimes there can be a comedy of errors in communication between the two interests, such as when information on access modes for those outside the Lab is posted on internal servers; this can lead to a Catch-22 situation where you need to have a secure connection to on-site configured before you can read information on how to set up a secure connection to on-site… Be assured that both the NSLS staff and the Users' Executive Committee are there in the discussion to try and find solutions that provide both security and access.

As of this writing, we are a month into the new fiscal year but with no federal R&D budget, and since congressional elections have recently occurred, all bets are off as to when a budget will be finalized and what will be in it. However, there appears to be broad, bipartisan support for the American Competitiveness Initiative (ACI); we hope that you as users will continue to express your feelings on this initiative to your elected representatives regarding the ACI! If you have any questions for the UEC, please feel free to contact me at Chris.Jacobsen@stonybrook.edu.

UEC members and SpIG representatives: (Standing from left): Chi-Chang Kao (BNL-NSLS), Dean Connor, Jr. (BNL-NSLS), Jiuhau Chen (Stony Brook U.), Mahbub Khandaker (TJLab), Jiufeng Tu (City College of NY), Jeff Keister (SFA, Inc.), Paul Evans (Univ. Wisconsin-Madison), Paul Northrup (BNL-Env. Sci.), Jeff Gillow (BNL-Env. Sci.), Michael Dudley (Stony Brook Univ.), Cecilia Sanchez-Hanke (BNL-NSLS), Kathy Nasta (BNL-NSLS), and Lisa Miller (BNL-NSLS). (Sitting from left): John Sutherland (BNL-Biology), Chris Jacobsen (Stony Brook University), Joe Dvorak (Montana State U.), Howard Robinson (BNL-Biology), Chris Cahill (George Washington Univ.), and Dan Fischer (NIST). Missing from photo: Peter Stephens (Stony Brook Univ.), Steve Almo (AECOM), Alexei Soares (BNL-Envi. Sci.), and Simon Bare (UOP LLC).

Measuring Synthesis Intermediates for Better Materials

Kendra Snyder, NSLS Science Writer

Involved in about 90 percent of all chemical processes and the creation of about 60 percent of the chemical products available on the market, catalysis is vital to American industries. Catalysis, the acceleration of a chemical reaction by means of a separate substance (the catalyst), benefits fields such as chemistry, petroleum production, environmental protection, pharmaceuticals, bioengineering, and the development of fuel cells. New information about catalysis can lead to better and more efficient materials and processes such as oil refining and reducing harmful emissions in motor vehicles. But while catalysis might sound like it's all about the end product, Brookhaven National Laboratory and University of Connecticut researchers are focused on what happens in between.

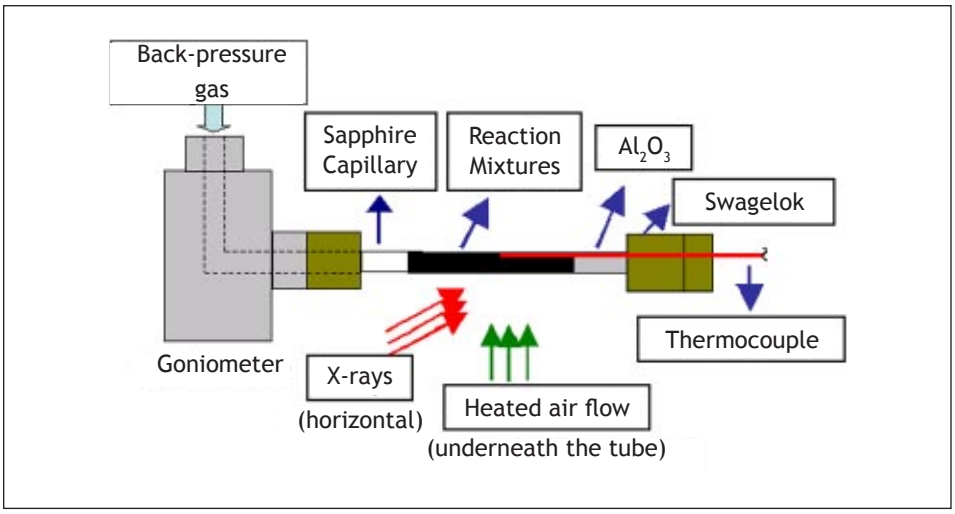


Figure 1. *Schematic diagram of the tube reactor.*

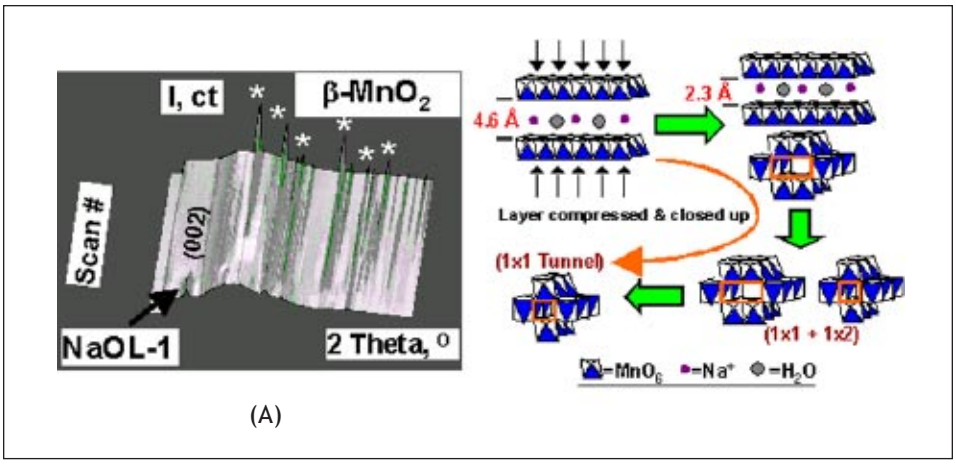


Figure 2. *A) In-Situ synchrotron XRD patterns for synthesis of a β-MnO_2 (1×1 tunnel structure) by hydrothermal treatment of a layered structure manganese oxide with 1 M HNO_3. The system was heated from 25 to 180 ˚C at 6.2 ˚C /min, and held at 180 ˚C. XRD patterns were collected continuously with 5 min/pattern. B) Schematic to show transformation from layered structures to the final 1×1 tunnel structure.*

The properties and activity of materials can vary significantly with different synthesis methods or at different conditions, such as temperature and time. Using x-rays at beamline X7B of the National Synchrotron Light Source, BNL and UConn researchers measured the changes catalyst materials go through during synthesis, showing that kinetic and mechanistic information about certain materials could allow for better synthesis control. "By understanding the intermediate, we can define the conditions whereby you get the product you want," said BNL chemist Jon Hanson, part of the group that performed the research.

The traditional way of making these observations is done outside of the reaction environment, termed ex-situ. During this method, target materials are separated from the reaction systems after different reaction times and then washed and dried before structural analysis. However, this process can alter materials from their original state in the reaction systems.

"You're probably going to change the material when you measure it," Hanson said. "You can't observe the characteristics under processed conditions."

Thanks to high-flux x-rays, scientists can avoid that alteration with a method called in-situ synchrotron x-ray diffraction. This process provides a real-time look at the phase transformations involved in the synthesis or catalysis without removing them from the reaction environment. At the NSLS, Hanson together with Xiong-Fei Shen from Steven Suib's research group at the University of Connecticut used this mode to study structural changes during the synthesis of manganese oxide octahedral molecular sieves, a group of materials that have uses ranging from catalysts to gas sensors.

To find out details about manganese oxide synthesis, a different type of in-situ

procedure was used. The majority of in-situ studies use the targeted material in a solid or gel form. BNL and UConn researchers, however, used hydrothermal synthesis, in which the material is in a heterogeneous liquid-solid form. Researchers heated a slurry of dried birnessite, a layered-structure manganese oxide, with HNO_3 solution. They then "watched" the effects of different temperatures on the mixture through x-ray diffraction and determined the conditions needed to obtain different structures of the compound. For example, after heating the mixture for 15 minutes at 180 degrees Celsius, a 1 x 2 tunnel structure of manganese oxide starts to form. Similar observations were performed with KOMS2, for which scientists determined the conditions needed to produce desired surface areas. Knowing basic characteristics, such as structure and surface area, as materials are synthesized can provide better control or "tuning" to get the catalytic properties scientists and industries want, Hanson said.

The results of their work are published in the April 12, 2006 edition of the *Journal of the American Chemical Society*. Other scientists involved in this research include Yun-Shuang Ding, and Mark Aindow (University of Connecticut). Funding was provided by the Office of Basic Energy Sciences within the U.S. Department of Energy's Office of Science.

USER ADMINISTRATION UPDATE

News from the User Administration Office

Kathleen Nasta, NSLS User Administrator

Here are some of the things that have been happening since the summertime:

The End-of-Run survey form has been revised and is now available on the web at: *https://pass.nsls.bnl.gov/end_of_run/*. Changes were made to limit the number of questions and simplify the information gathered so that users can complete the survey more quickly. Further changes are planned to allow access for beamline staff, through the PASS system, to view the responses to the survey directly and as often as they wish. It is anticipated that this will ensure more timely feedback and/or resolution for problems identified. The survey will remain anonymous, unless a user wishes to provide an e-mail address for an individual follow-up response.

The Research Support Building will house the new "Guests, Users, and Visitors (GUV) Center" where the check-in process can be completed. Other services will also be located in this building, such as the housing and (permanent) badging offices. At press time, it is anticipated that the GUV Center will be operational between January and February 2007. The expected hours of operation will be 7 a.m. to 7 p.m. Monday through Friday, with some coverage during later evening and weekend hours. NSLS Users will be able to complete all the physical check-in tasks that would normally be done at NSLS User Administration at the GUV Center. The User Administration office will still be available for all other needs and requirements. A formal announcement will be made with further details when the opening date is confirmed.

The RHIC/AGS users have been part of a pilot program through the transportation office, loosely known as the "after-hours transportation program." The program allows users to borrow a car for later afternoon through early morning hours from the transportation office if a car is available toward the end of the workday. Users who are interested can call extension 2714 or stop by the transportation office in Building 179B. It is recommended to do so by 1 p.m. of the day the car is needed so that availability can be verified and the car is filled with gasoline. The car can be picked up later in the day, after the user shows a valid identification and driver's license. The car may be used on-site only and may be used to transport additional users in need of a ride. The service is free to users and to the NSLS, but it expected that the car be treated gently and responsibly. Availability is on a first-come, first-served basis.

I would be interested in your feedback if you decide to use this service. Please contact us at *nslsuser@bnl.gov* or 631-344-8737.

SAVE THE DATE

Joint NSLS/CFN Users' Meeting
May 21-23, 2007

For meeting information, see:
http://www.nsls.bnl.gov/users/meeting

X9 to X3 Beamline Relocation Complete

Steve Hulbert, BNL-NSLS

Beamlines X3A and X3B are operating without restrictions after being transferred from X9 in just four and a half months. The relocation of the two beamlines was completed in advance of original estimates, with deconstruction of X9A and X9B beginning in early May and the first commissioning beams running in late August and early September.

The Case Center for Synchrotron Biosciences, which utilized the former X9 beamlines, moved to X3 to make room for a new undulator-based beamline at X9. The X9 straight section is currently the last one available in the x-ray ring. It will be used for a small-angle x-ray scattering Facility Beamline with BNL's Center for Functional Nanomaterials as a Contributing User. The new X9 beamline is expected to be operational in 2008, with commissioning completed during the first cycle of the year and full operations starting in May or June.

Beamline X3 before

Beamline X3 after

Although performed quickly, the relocation from X9 to X3 wasn't an easy process. First, the X16C beamline was renovated to accept the experimental program that was operating at beamline X3B1. Next, the former X3 beamlines and experimental equipment were completely removed from the X3 floor space. Then, planning, surveying, and engineering and design for the relocation of the two X9 bending magnet beamlines to counterpart locations at X3 were undertaken and the necessary reviews were completed. The X9A hutch was modified and re-built in its new location at X3A, a new hutch for X3B was constructed, and associated utilities and interlocks were installed. The beam pipes for both beamlines, which penetrate the shield wall and connect them with the front end, were moved from X9 to X3, and the shield wall and neighboring lead shields were rebuilt accordingly. All experimental equipment and controls for these beamlines also were moved to their new locations at X3.

All of the equipment was in place at X3 by August, with the first commissioning beams running shortly after. Re-commissioning was completed around the end of the 2006 fiscal year, and both beamlines are now operating without restrictions. In addition to hosting Participating Research Team (PRT) experiments, X3B started taking General Users in October. X3A is serving PRT users experiments, and will take General Users starting in November 2006.

This remarkably quick transition couldn't have been completed successfully without the assistance of numerous NSLS technicians, designers, engineers, and scientists and the staff members at Case Western Reserve University, especially those present on site.

Weekly NSLS Activities

Wednesdays

Joint VUV and X-Ray Users' Meeting
11:30 a.m., Seminar Room

Coffee and Cookies for Users and Staff
3:30 p.m., NSLS Lobby

Thursdays

Student/Postdoc Pizza Get-Together
Every other Thursday, 1:00 p.m,
Either Conf. Rm. A or Conf. Rm. C

Fridays

Friday Lunch Seminars
12:00 to 1:00 p.m., Seminar Room

For more information about the following activities, visit: *http://www.nsls.bnl.gov/newsroom/events/weekly_meetings.asp*

Short Course: XAFS Studies of Nanocatalysis and Chemical Transformations

Anatoly Frenkel, Yeshiva University

The short course in x-ray absorption fine-structure (XAFS) analysis, emphasizing problem-solving methods in typical catalysis applications, was offered on October 19-21 at the NSLS. It continued the annual NSLS tradition of gathering a group of scientists, active in the field, who share their expertise with those interested in learning about the possible use of XAFS in their research as well as with those who are relatively advanced. The latest two courses were organized and co-sponsored by the U.S. Department of Energy's Synchrotron Catalysis Consortium (SCC) and the NSLS. The theme of the latest course was tailored to users of the SCC who have recently collected data in systems of relevance for catalysis applications: nanoparticles- mono- and bimetallic (including core-shell), supported on different surfaces, studied ex situ or in situ. The latter included real-time reactions studied at the SCC facilities by XAFS.

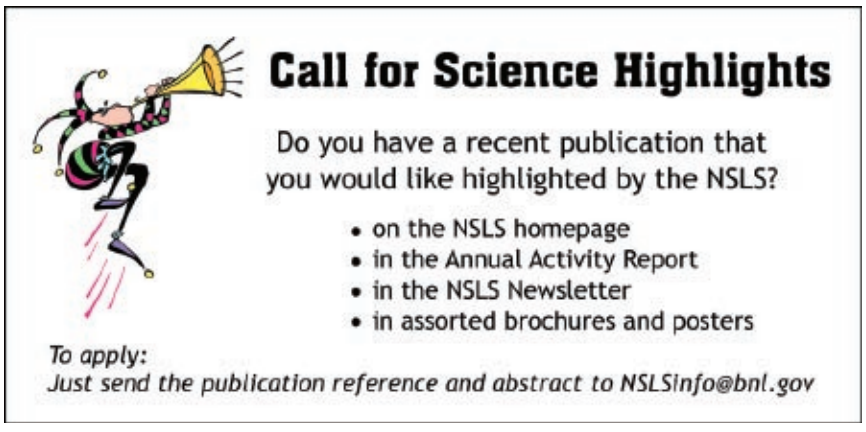
The course was organized by Anatoly Frenkel (Yeshiva University), Syed Khalid (NSLS), and Faisal Alamgir (NIST). The format of the course consisted of lectures in the morning and data analysis sessions in the afternoon. Most lectures were designed as tutorials on different aspects of XAFS analysis, such as the "Theory of XANES" and "Theory of EXAFS" (Josh Kas, University of Washington), advanced data analysis methods (Principal Component Analysis, by Stephen Wasserman, SGX Pharmaceuticals), and the basics of EXAFS data processing and fitting (Scott Calvin, Sarah Lawrence College). In addition, lecture topics included the "Concepts of advanced EXAFS data modeling" (Anatoly Frenkel), "In situ XAFS studies of fuel cell catalysts" (Carlo Segre, IIT), "XAFS studies of battery materials" (Faisal Alamgir), and "New opportunities with Quick XAFS at the NSLS" (Syed Khalid).

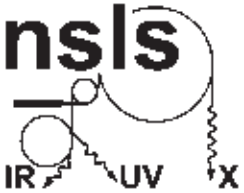
Partcipants in the XAFS Studies of Nanocatalysis and Chemical Transformations course

There were 26 registered participants from academia, industry, and national laboratories, as well as about 10 graduate students from Stony Brook University and Yeshiva University who audited the course. The lecturers were also the data analysis session instructors. During the data analysis session, participants were trained in using the XAFS analysis packages IFEFFIT (authors: M. Newville and B. Ravel), FEFF8 (authors: J. Rehr, et al) and PCA software (author: S. Wasserman).

Most of the course participants brought their own data they recently collected at the NSLS or other synchrotrons. The analysis sessions were organized by matching instructors to the problems. Instructors rotated between sessions, thus sharing their expertise with more than one group of participants. For example, all groups benefited from Steve Wasserman's tutorials on the use of his Principal Component Analysis program and Josh Kas' tutorials of modeling in-situ XANES data in nanoparticles with FEFF8. Scott Calvin, Faisal Alamgir, and Carlo Segre advised all those interested in adaptation of IFEFFIT programs to advanced modeling methods. Anatoly Frenkel helped those studying monometallic and bimetallic, including core/shell, nanoparticles.

All course members thoroughly enjoyed friendly and professional logistical support by the NSLS Users Administration Office: Gretchen Cisco, Liz Flynn, Kathy Nasta, and Mercy Baez.





X-Ray Ring Long-Range Schedule

January 2007

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February 2007

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March 2007

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VUV-IR Ring Long-Range Schedule

January 2007

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February 2007

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April 2007

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1 0000 Ops.	**2** 0000 Ops.	**3** 0000 Studies	**4** 0000 Studies	**5** 0000 Ops.	**6** 0000 Ops.	**7** 0000 Ops.
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22 0000 Ops.	**23** 0000 Ops. 1800 Timing	**24** 0000 Ops.	**25** 0000 Ops.	**26** 0000 Ops.	**27** 0000 Ops. 1800 Studies	**28** 0000 Ops.
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NSLS Accelerator Complex Update

Erik Johnson, Associate Chair for Operations and Engineering

To support the NSLS user community, we target 95% reliability on scheduled operations. In fiscal year 2006, which just ended, we exceeded the goal on the VUV-IR ring (97%) and fell just short on x-ray (94.3%). This year, as in years past, a relatively small number of faults over 4 hours in duration account for much of the downtime. In the case of the x-ray ring, 15 of 232 downtime faults four hours and over are responsible for 50% of the total downtime. For VUV-IR, only eight such faults account for 80% of the total downtime.

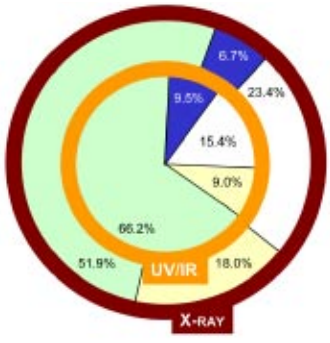
Although fault analysis can be illuminating in exposing system weaknesses, it is actually a fairly blunt tool for assuring highly reliable operations. Fault analysis only illustrates what went wrong, usually in a brash failure mode. To routinely achieve 90%+ reliability in systems as complex as the NSLS, clearly a lot is "going right." The NSLS community owes much of its success through the years to the "System Stewards" who develop, maintain, and monitor their equipment, and to the accelerator and engineering staff, who continually seek to improve the performance and reliability of the facility as a whole.

As part of this drive for excellence, the system stewards were charged during this past year with preparing for a Machine Operations Reliability Evaluation (MORE). This external panel review was chaired by Bob Hettel of SSRL in early October. Their charge was to examine our assessment of the reliability risks and risk mitigation plans, as well as evaluating other aspects of ensuring optimal performance of the machines including the staffing to support robust operations. The process of gathering the information to prepare for the review really illustrated the depth of knowledge and expertise within the staff. While any individual may not have detailed knowledge of every machine component, the review clearly demonstrated that we have very knowledgeable ***people*** to support NSLS operations and a system that usually has ample, available information. The MORE review panel recognized the contributions of our people in the success of NSLS operations, and commended the staff *for its skill, resourcefulness and dedication* in the closeout presentation. We are looking forward to the panel's full report; the insights of our peers at other facilities will be invaluable in helping us assure continued robust NSLS operations in the future.

In the near term, the winter shutdown schedule is now set and is paced by work for the new X9, an undulator-based beamline to support the research programs of the Center for Functional Nanomaterials. With the new RF cavities already installed and the Case Western Reserve University program successfully moved from its former home at X9 to X3, the focus is now on the buildup for the new X9 beamline, which will ultimately include a new insertion device, front end, and dipole vacuum chamber in addition to the beamline and end station. In the winter shutdown, the main activity will be the replacement of the phase I storage ring dipole vacuum chamber with a phase II chamber designed to support an insertion device source. Other routine maintenance activities are scheduled for both rings, with return to operations scheduled for January 10 on VUV-IR and two days of beam observation for x-ray starting on January 18.

> "Knowledge is of two kinds: we know a subject ourselves, or we know where we can find information upon it."
>
> *- Samuel Johnson*

Finally, thanks again to all who provided input for the winter 2007 schedule. The schedule sequence was phased to accommodate solid operations for the RapiData 2007 course. This adjustment resulted in some "extra" operation days in January on x-ray, but otherwise the schedule adheres to the standard four-week scheduling cycle. If there are any special scheduling considerations for the summer 2007 cycle please let me know before March 2007.



User Metrics	UV/IR	X-ray
Reliability[1]	97.0%	94.3%
Availability[2]	110.9%	106.6%

Activity/Hours	UV/IR	X-ray
Operations	5796.5	4544.8
Unscheduled Operations	828.8	589.0
Maintenance	1348.0	2045.8
Other	786.7	1580.4

Other Activities	UV/IR	X-ray
Studies	1.1%	4.3%
Com/Con	2.5%	5.7%
Holiday	2.2%	2.2%
Injection	1.1%	2.1%
Unscheduled Downtime	2.1%	3.2%
Interlock	0.0%	0.6%

YTD 8760 Hrs 100 Hrs= 1.1%

[1]Operations during scheduled time
[2]Operations compared to total scheduled time

Graphical summary of the operations activities for both machines for fiscal year 2006.

Nanoscience Safety

Andrew Ackerman, NSLS Safety Officer

Nanoscience safety requirements at the NSLS are tightening in an effort to ensure that there are no harmful health effects from the study and handling of nanomaterials.

The properties of nanoscale materials are known to differ from those observed for the same materials in bulk or even microscale configuration, and those differences result in uncertainty about the potential health effects and environmental concerns these materials could present.

Studies are showing that nanoscale particulates can pass through intact skin, are more likely to reach the air exchange portion of the lungs when inhaled, and can migrate in the body through compartments, along nerve pathways, and through epithelial barriers. The acute and chronic effects of exposure are not yet defined and, until researchers are able to develop a technical basis for exposure standards and for assessment of the risks presented, nanomaterial work conducted at Brookhaven National Laboratory (BNL) must include conservative controls.

The U.S. Department of Energy (DOE) and BNL policy is to use these materials with care and to minimize personnel exposures and environmental releases. Environmental, Safety and Health (ESH) staff working at each of the five DOE nanocenters has developed a set of nanoscience safe work practices that is posted on the BNL Standards Based Management System (SBMS) website: *https://sbms.bnl.gov/sbmsearch/subjarea/105/3836d011.pdf*. Everyone working with these materials is expected to know and meet the requirements outlined in that document.

The work practices apply to all nanomaterial handling, but focus on control of 'free' nano-particulate work as that presents greater risk of exposure or release. Included are requirements for working in hoods, encapsulating samples, scrubbing gasses that flow over particulates, labeling, transport packaging, and waste handling. Please help us keep these experiments safe by reading the document referenced above, reporting your nanoscience work on Safety Approval Forms, and working to comply with the new rules while preparing samples and collecting the data we want at the beamlines.

The NSLS Newsletter is printed on paper containing at least 25 percent recycled materials, with 10 percent post-consumer waste.

1,000 Injury-Free Days... and Counting

Kendra Snyder, NSLS Science Writer

NSLS users and staff have now worked more than 1,000 days without a lost-time injury. This significant safety milestone was reached on Monday, August 14, 2006 as the tally in the NSLS lobby jumped into the quadruple digits. The number means that almost three years have passed without a person working at the NSLS losing work time or incurring restricted duties as the result of an injury or exposure on the job.

The milestone is a major accomplishment for the NSLS, considering the complicated work environment and the hundreds of people working within the building 24 hours a day, said Bob Casey, the NSLS Associate Chair for Environment, Safety, Health, and Quality. "This success is the result of many people taking care to plan their work and making sure that hazards are identified and controlled," Casey said. "A safe work environment is good for each of us personally, and it is good for the NSLS. I tip my hat to everyone for their efforts to keep our workplace safe."

The NSLS Remembers Former Users, Staff

Kendra Snyder, NSLS Science Writer

David Murray Zehner

David Murray Zehner, who helped develop NSLS beamline U12B, died on Monday, June 19, 2006. He was 62.

Zehner was a research scientist for more than 30 years in the Solid State and Condensed Matter Physics Divisions at Oak Ridge National Laboratory, where he served as group leader and section head for many years. Zehner focused most of his research on elemental and alloy metal surfaces.

David Murray Zehner

In the late 70s and early 80s, Zehner worked on experiments in the Physics Department and at the Cornell High Energy Synchrotron Source (CHESS) focused on the structure and phase behavior of gold surfaces. The studies were later transferred to NSLS beamline X22C, where platinum and iridium surfaces were added to the research. Zehner also conducted research at beamline X20.

"David was brutally honest and he liked to do things right," said Doon Gibbs, BNL's Associate Laboratory Director for Basic Energy Sciences. "He was very precise about the little details, from doing the experiment to writing the papers. But he also was a lot of fun and cared a lot about what people thought and how they were doing."

Zehner helped develop beamline U12B in the early 80s as a collaboration between Oak Ridge and the University of Pennsylvania. Beamline U12B researchers used electron scattering to determine and understand the structure and chemistry of surfaces.

Julian David Baumert

Julian David Baumert, a Brookhaven physicist working on the cutting edge of research on liquid surfaces and thin organic films, died of melanoma on June 24, 2006. He was 31. Baumert was a relatively new research associate in the Soft Matter and X-ray groups in the Condensed Matter Physics and Materials Science Department at BNL.

A native of Molfsee, Germany, Baumert was educated at the Institute of Experimental and Applied Physics (IEAP) at the University of Kiel and the Institute Laue-Langevin (ILL) in Grenoble, France. He came to BNL in July 2004 and conducted his research at NSLS beamline X22, where he was part of a team of scientists learning to make smaller and more powerful molecular-scale circuit components.

Julian David Baumert

"He had such great promise to be an extremely successful scientist," said Ben Ocko, who hired Baumert into his research group. "He was easy-going and friendly, and exhibited a high level of creativity, great skills as an experimentalist and the ability to explain complex phenomena in simple and elegant terms."

After an operation last summer to battle skin cancer, Baumert continued his scientific research including travel to the Advanced Photon Source last December to investigate how "surface freezing" modifies the capillary wave spectrum at the surface of long-chain alkane molecules.

Elizabeth A. Hicks

Elizabeth "Liz" A. Hicks, a Brookhaven systems analyst for more than 14 years, died on Wednesday, July 12, 2006. She was 41.

Hicks received a B.S. in computer science from Stony Brook University, joined BNL in May 1990 as a Database Administrator at the NSLS, and later became an applications engineer. She maintained and developed numerous employee databases, assisted the NSLS User Administration Office, helped develop the NSLS stockroom database, and provided general support for sections throughout the department.

Hicks battled multiple illnesses during her time at Brookhaven, but she didn't let that affect her spirits. Described as daring, humorous, and without a "mean bone in her body," Hicks left the Lab on long-term disability in July 2004.

"She was always cheerful and smiling," said colleague Wendy Morrin. "She had so much against her health-wise, but she never let it show. She was just a truly beautiful person."

Liz Hicks with sons Christopher and Adam

Jean Jakoncic Wins Esteemed Student Lecturer Award

Kendra Snyder, NSLS Science Writer

National Synchrotron Light Source student researcher Jean Jakoncic won the prestigious Margaret C. Etter Student Lecturer Award for researching the use of high-energy x-rays to prevent crystal damage in diffraction studies.

He received the award at the American Crystallographic Association national meeting, held in Honolulu, Hawaii, on July 22-27. The Etter award, given out once a year, recognizes achievement and future potential for scientists at an early stage in their careers.

Jean Jakoncic

Jakoncic, a graduate student from Joseph Fourier University working toward his Ph.D. in structural biology, came to the NSLS four years ago. Conducting research under the supervision of NSLS Physicist, Vivian Stojanoff, at NSLS beamline X6A in addition to X17B1 and the European Synchrotron Radiation Facility beamline ID15B, Jakoncic helped to show that high-energy x-rays could be an option for the structural determination of radiation-sensitive proteins. He also worked with NSLS scientist Zhong Zhong and ESRF scientists Marco Di Michiel and Veijo Honkimaki.

"Traditionally, people use medium- and low-energy x-rays for diffraction studies of protein samples," Jakoncic said. "At these energies, there is a significant amount of energy deposited in the crystal and substantially there is radiation damage. We propose to use higher energies, where the energy deposition is about 10 to 15 times less."

Brookhaven Lab Wins R&D 100 Award for X-ray Focusing Device

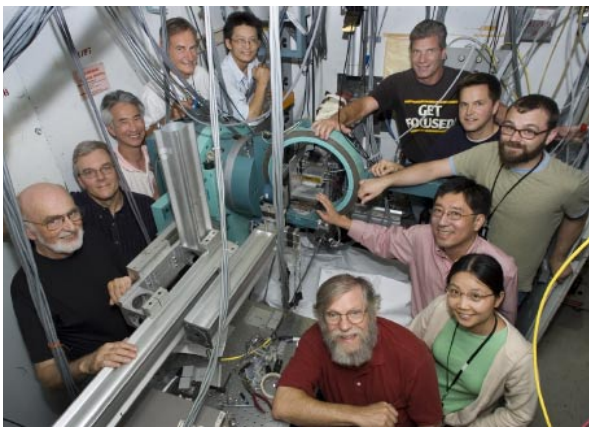
Kendra Snyder, NSLS Science Writer

Brookhaven National Laboratory won a 2006 R&D 100 award for developing the first device able to focus a large spread of high-energy x-rays. The device, called a Sagittal Focusing Laue Monochromator, could be used in about 100 beamline facilities around the world to conduct scientific research in physics, biology, nanotechnology, and numerous other fields.

R&D 100 Awards are given annually by R&D Magazine to the top 100 technological achievements of the year. The awards were presented in Chicago on October 19.

NSLS physicist Zhong Zhong led the development of the focusing device with help from BNL scientists Chi-Chang Kao, Peter Siddons, Hui Zhong, Jonathan Hanson, Steven Hulbert, Dean Connor and Christopher Parham; BNL technicians Anthony Lenhard, Shu Cheung, and Richard Greene; and former BNL scientist Jerome Hastings, who is now working at the Stanford Linear Accelerator Center.

As x-rays are produced at light sources, they spread out, or diverge. X-rays produced by a beamline with a 5 milliradian divergence, for example, will spread to 5 millimeters (mm) by the time they are 1 meter away from their source, and to 50 mm when 10 meters away. This is a problem for light source scientists, who want the highest possible x-ray flux on a small spot.



On the left, from front to back: Jonathan Hanson, Steven Hulbert, Shu Cheung, Anthony Lenhard, and Zhong Zhong. On the right, from front to back: Peter Siddons, Hui Zhong, Chi-Chang Kao, Dean Connor, Christopher Parham, and Richard Greene. Not pictured: Jerome Hastings.

Previous focusing technologies relied on mirror-like surface reflections, but this required large surfaces and caused technical difficulties in error control and limitations on the energy of the x-rays that could be focused. The device developed by Zhong's team, however, doesn't rely on a crystal surface to reflect the beam. Instead, it sends the x-rays directly through a set of silicon Laue crystals. The result is a 1,000-fold increase in beam intensity, as well as high-energy resolution, reduced costs and ease of operation. It is the first device that can focus a large divergence of high-energy x-rays, handling a beamline with a divergence as great as 20 milliradian.

NSLS Summer Sunday Draws 650 Visitors to Facility

Kendra Snyder, NSLS Science Writer

Using gumdrops and toothpicks to illustrate molecular crystals and Marshmallow Peeps to demonstrate the power of a vacuum, about 650 community members had a sweet time at the NSLS Summer Sunday on July 30, 2006.

For eight consecutive Sundays each summer, the BNL Summer Sunday program invites the public to see the popular Whiz-Bang Science Show and showcases a different BNL facility every week.

A steady stream of visitors filled the NSLS lobby

Visitors who came to the event began their tours in Berkner Hall, where Marc Allaire, Lisa Miller, Steve Hulbert, Tony Lanzirotti, and Andrew Ackerman explained the concept of a light source and gave more detailed information about the facility and its research goals. Before boarding a bus for the quick drive to the NSLS, visitors learned more about nanoscience research at a display set up by the Center for Functional Nanomaterials, and roamed among several other hands-on exhibits.

Once at the NSLS, visitors crowded the lobby, seminar room, and front patio, where 14 hands-on displays were set up to demonstrate how the light source works and teach visitors about the science performed there. Learning about science topics ranging from light diffraction to liquid nitrogen, the NSLS guests floated from display to display.

At the "Crystals: Unlocking the Secrets of Life" display, many kids, and some adults, assembled "crystals" from toothpicks and gumdrops. Another popular display was "Sounds of Silence," where guests watched how a vacuum pump caused a balloon to expand and the sound of a ringing bell to considerably fade. Display volunteers also exposed Marshmallow Peeps to the vacuum, which expanded the Peeps when turned on and shriveled them down to a smaller size when turned off. Visitors then performed a science experiment of their own by popping the de-puffed Peeps in their mouths. Their findings: The vacuum didn't make the candies any less tasty.

At "See the Light," visitors could observe actual synchrotron light, guided to the lobby from the experimental floor by a fiber-optic. And by using a Skee Ball-type backboard and rubber bouncy balls, the "Electron Catapult" display showed visitors how different amounts of energy are required to propel an electron from an atom's "ground state" level to higher levels.

Visitors gather around the outdoor displays

Standing at the lobby and second-floor viewing windows overlooking the experimental floor were staff members Steve Bennett, John Dabrowski, Susila Ramamoorthy, Gary Weiner, and Ray Raynis. The volunteers pointed out various components of the light source to visitors, using large neon numbers as reference points.

The excitement also carried over to the outside, where every half hour visitors gathered around the building's front windows or on the patio to watch a water rocket launch by Matt Engel, John Kuczewski, and Steve Ehrlich.

Upon entering the building, each guest received a quiz with questions that could be answered by visiting each display. Every finished quiz was handed in and redeemed for an NSLS orange frisbee. In addition, one person was selected raffle-style every half hour by the enthusiastic MC Gerry Van Derlaske to receive one of two prizes – a BNL T-shirt or a tour of the experimental floor. This is the first year that floor tours were offered during the event, and visitors were excited to see the actual piping, foil and wires of the NSLS up close.

The rest of the more than 40 NSLS volunteers that made the event possible included: Kimone Antoine, Al Borrelli, Jonathan Cheung, Mary Anne Corwin, Angelo Dragone, Steve Giordano, Sarah Heins, Madeline Hughes, Steve Hulbert, Syed Khalid, Steve Kramer, Ariane Kretlow, Tony Kuczewski, Brian Kushner, Andreana Leskovjan, Sean McCorkle, Corinne Messana, Eileen Morello, Payman Mortazavi, Shirin Mortazavi, Kathy Nasta, Kumi Pandya, Meghan Ruppel, Cecilia Sanchez Hanke, Lenny Santangelo, Yusuf Siddiqui, Randy Smith, Kendra Snyder, Marie Van Buren, Adele Wang, Matt Worth, Nancye Wright, and numerous NSLS family members.

NSLS, NSLS-II Employees Celebrate at 2006 Picnic and Service Awards

Kendra Snyder, NSLS Science Writer

Pushed back a week because of rain, the 2006 Light Source Directorate Picnic took place on September 21. For the first time, the annual end-of-year celebration was held for both NSLS and NSLS-II employees, hosted by NSLS Chair Chi-Chang Kao and Steve Dierker, Associate Laboratory Director for Light Sources. Kao presented a cake to celebrate 1,000 injury-free days at the NSLS, which was cut — carefully — by Jim Tarpinian, Assistant Laboratory Director for Environment, Safety, Health and Quality, after he congratulated employees on the significant safety milestone.

NSLS Chair Chi-Chang Kao

Service Awards

Michael Caruso, Richard Freudenberg, Richard Heese and Pooran (Boyzie) Singh were honored for 25 years of service at Brookhaven Lab, and 20-year awards went to Scott Buda, Shuchen Kate Feng, and Michael Fulkerson. In the 10-year category were G. Lawrence Carr, Elaine DiMasi, Joan Marshall, Cheo Teng, and John Vaughn III. And although it isn't an officially recognized BNL milestone, John Dabrowski was acknowledged for an impressive 45 years of service at the Lab.

ALD for Light Sources Steve Dierker

Spotlight Awards

The Spotlight Awards go to NSLS staff members who have shown exceptional dedication to their jobs during the year. This year's winners were:

Walter DeBoer: The vendor contracted to build the X25 undulator could not deliver the completed device on schedule, so the burden of completing and testing the device fell onto the NSLS technical staff. DeBoer took on a great amount of that responsibility, traveling twice to Lansing, NY, to assemble, bake, and vacuum-test the undulator.

David Harder: Because the delivery of the X25 undulator was delayed, less than two weeks were left to spend on magnetic measurement and shimming. Harder, whose careful examination of the Hall probe scanning system enabled a precise characterization of the undulator's magnetic field, worked overtime on the project to compensate for lost time.

Mike Lehecka: Lehecka, who runs the pulsed wire bench for the NSLS magnetic measurement laboratory, is an expert in setting up pulsed wire measurement systems, which vendors don't have the capability to do. Without his effort, the X25 undulator magnetic measurement and shimming couldn't have been finished in such a short amount of time.

Ed Losee: In the effort to produce superconducting undulators for the NSLS and NSLS-II, Losee undertook the responsibility for prototype undulator magnet fabrication and assembly. The NSLS can now produce and test superconducting magnets and other complex components in-house with Losee's assistance and skills.

Philip Marino and Tom McDonald: Marino and McDonald upgraded the NSLS beamline safety checklists, which were old, difficult to use, and didn't have a system in place to assure periodic review and update. The NSLS relies on this system for radiological safety.

Paul Montanez: Montanez served as an engineer, supervisor and coordinator during the relocation of beamlines X9A and X9B to X3. The originally proposed spring shutdown schedule was cut in half because Montanez figured out ways to do more preparation and minimize work.

NSLS and NSLS-II employees enjoy the food at the annual barbeque.

Charlie Nielson and Wayne Rambo: The NSLS Controls and Diagnostics groups were tasked with integrating the X25 MGU control system into the NSLS Controls System. Rambo and Nielson both put in overtime hours and extraordinary effort to accomplish the system pre-testing, installation, and commissioning within a tight schedule.

Mihai Radulescu: The bellows on the VUV-IR injection shutter failed during operations in July 2006. This would have resulted in major downtime if Radulescu hadn't developed a method for removing the actuator while leaving the shutter block in place.

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Call for NSLS General User Proposals

For Beam Time in Cycle	Deadline
May - August 2007	Wednesday, January 31, 2007

General User Proposal and Beam Time Request instructions can be found at:
http://www.nsls.bnl.gov/users/usersguide/bt-gu.asp
Proprietary Research instructions can be found at:
http://www.nsls.bnl.gov/users/usersguide/bt-proprietary.asp

Safety Approval Forms

Safety Approval Forms (SAFs) are required for every experiment. Your SAF must be submitted online **at least one week before** your scheduled beam time. To submit, go to:

https://pass.nsls.bnl.gov/

NSLS User Administration Office

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http://www.nsls.bnl.gov/