JULY 1998 NSLS NEWSLETTER

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Opportunities for In-Vacuum Undulators at the NSLS

J.B. Hastings

NSLS

The Green-Chasman lattice, which is the basis for both NSLS storage rings, was conceived with insertion devices in mind. Long, field-free straight sections were provided in the design. The electron optics were chosen so that these sections had zero dispersion and the effects of new magnetic structures placed in these regions would have minimal effect on the emittance of the electron beam. This design concept has been followed by all high-brightness rings which were built subsequent to the NSLS.

The X-Ray Ring straight sections also have a very small vertical β function, in addition to the zero dispersion. This was done to optimize the brightness of wiggler sources. There is a further benefit however. The β function determines the beam size and divergence at a particular point in the storage ring lattice. The size is proportional to $\sqrt{\beta}$ and the divergence is proportional to $1/\sqrt{\beta}$. Thus the electron beam is very small at the center of the X-Ray Ring straight sections. In the initial development of the insertion device program, no specific advantage was taken of this feature. Of the eight straight sections in the X-Ray Ring lattice, five are readily available for magnetic insertion devices and the remaining three are dedicated to radio-frequency drive cavities (2) and injection (1).

Historically the NSLS has been active in R&D for state-of-the-art electron beams, photon beams and x-ray optics. One of the available straight sections has therefore been dedicated to insertion device R&D. Over the past five to seven years a program aimed at exploiting the very small vertical β function in the straight sections has yielded first a prototype small gap undulator (PSGU)[1] and then an in-vacuum undulator (IVUN)[1]. The basic idea for these devices is to make the magnet gap small so one can make the magnet period small as well, producing hard x-rays from a medium energy electron storage ring like the NSLS X-Ray Ring, without compromising performance. The relationship between magnet period and the on-axis photon wavelength of the undulator fundamental is given below:

(1)

$$\frac{\lambda_u}{}$$

$$\lambda = 2\gamma^2 (1+K^2/2)$$

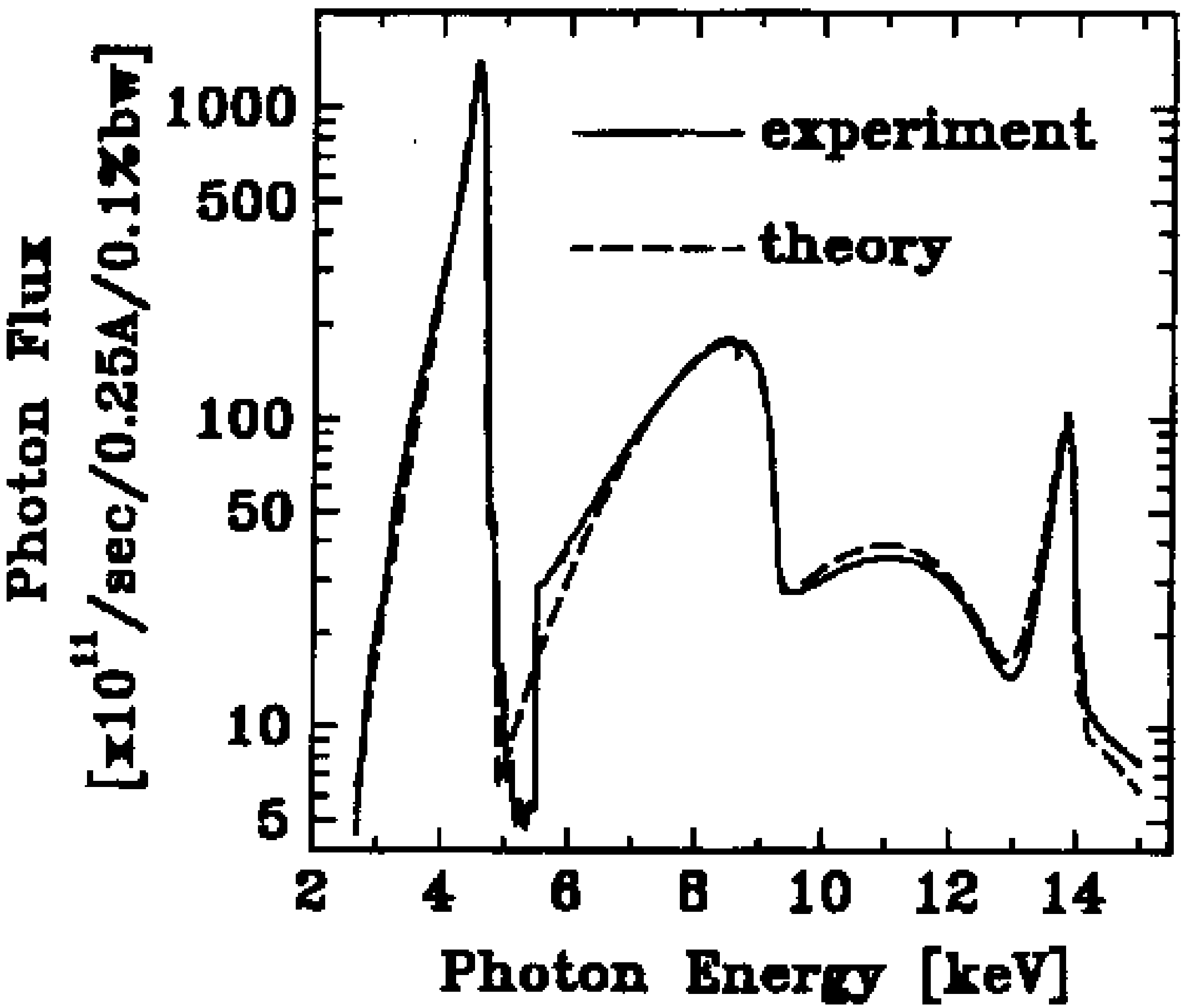
where λ is the photon wavelength, λ_u is the magnet wavelength (period), γ is the electron beam energy in units of the electron rest energy, and K is the magnetic strength parameter, which for the devices considered here is of order 1. Thus, with the NSLS X-Ray Ring electron beam energy of 2.5 GeV and a magnetic period of 1 cm, a photon wavelength of 3.1 Å (4.0 keV) is produced.

The PSGU study provided independent control of the magnet and vacuum chamber gaps, with the magnet located outside the vacuum envelope of the storage ring. This permitted independent evaluation of the effect of a small vacuum gap and small magnet gap on the stored electron beam. The conclusion of these studies was that small gaps can be achieved with minimal effect on storage ring performance. Furthermore, magnetic structures with periods less than 2 cm can be built to high tolerances and the photon beams they yield are quantitatively in agreement with calculation.

These results encouraged us to pursue a collaboration to build an in-vacuum undulator that would yield first harmonic radiation well into the x-ray region of the spectrum. The SPring-8 team in Harima, Japan are amongst the world leaders in insertion devices and as partners in the IVUN collaboration they constructed the magnetic arrays for the IVUN project. The 11 mm period yields a fundamental energy of nearly 4.6 keV. As with the PSGU, the project demonstrated that undulator radiation, now from an in-vacuum device and at x-ray energies, can be produced at NSLS. The impact of this program of insertion device research at NSLS is significant. Because of the very short periods, the overall length of the entire IVUN assembly is under a meter. This opens up the possibility of placing these devices between the X-Ray Ring RF cavities which produces two additional locations for insertion device sources.

The IVUN sources attain a brightness similar to the existing hybrid wigglers in X21 and X25. They radiate significantly lower total power than the wigglers but produce higher power densities. They provide undulator rather than wiggler spectra, as can be seen in **Figure 1**. Because of the small gaps and small periods there is not much tunability in these devices and they will have to be purpose-built for a specific scientific program. The original IVUN parameters were chosen for inelastic x-ray scattering, similar to the scientific program on X21. This put the fundamental at 4.6 keV and the third harmonic at 13.8 keV.

Figure 1: The measured and calculated spectrum from the IVUN in the X13 straight section. The magnet period is 1.1 cm and the gap is 0.331 cm. The calculation was done with the URGENT code (R.P. Walker, B. Diviacco, Rev. Sci. Instrum., ***63(1)****, 392, (1992)).*



The question that this new possible insertion device poses is "what science programs can best take advantage of this new insertion device source?". To answer this, a task force was formed by M. Hart, NSLS Department Chair and charged with identifying viable scientific programs that could seek outside funding to construct IVUN beamlines. The membership of the task force was composed of NSLS staff, J. B. Hastings, C.-C. Kao and P. Stefan as well as S. Burley (Rockefeller University), G.S. Cargill (Lehigh University), M. Chance (Albert Einstein College of Medicine), S. Dierker (University of Michigan), W. Hendrickson (Columbia University), K. Evans-Luderodt (Lucent Technologies) and H.-K. Mao (Carnegie Geophysical Institution).

The task force concentrated on experimental programs that are presently being pursued on new insertion devices worldwide. For example, x-ray photon correlation spectroscopy, which takes advantage of the large coherent flux from undulator sources, was considered. However, this program was not considered as the highest priority because, although as an

NSLS source the IVUN is amongst the brightest in the hard x-ray spectral region, it is still down by several orders of magnitude compared to third-generation machines. In the area of high pressure diamond cell research as well, the need for high energy photons (>20 KeV in general) also puts an IVUN source at a distinct disadvantage.

The general area of protein crystallography, however, is ideal for the IVUN source. The gain in flux-on-sample is significant when compared to NSLS bending magnet sources, in particular for small crystals and/or very large unit cells. When the X-Ray Ring running energy is finally settled between 2.5 and 2.8 GeV, an IVUN source can be designed to work effectively for Multi-wavelength Anomalous Dispersion (MAD) studies as well, concentrating for example on the Se K edge.

The unique electron beam optics that makes the IVUN possible in the first place, namely an extremely small vertical β function, also makes the IVUN ideal as a source for micro-diffraction. The vertical full-width-at-half maximum of the source is approximately 16 microns. Simple x-ray optics have the potential of delivering high intensity x-ray beams with sub-micron dimensions. This is an exciting possibility for materials characterization in many areas of current interest.

The list of potential scientific programs investigated by the task force is by no means exhaustive. Its findings, which are described in BNL Informal Report #65581, provide two clear scientific disciplines that would benefit significantly from an IVUN source. The community at large is encouraged to consider these new sources as well and to contact the NSLS Chair with other scientific programs for his consideration.

References:

(1) P.M. Stefan, S. Krinsky, G. Rakowsky, L. Solomon and D. Lynch, "Small Gap Undulator Research at NSLS: Concepts and Results", BNL-65092 (Nucl. Instr. Meth., in press).

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Introduction by the Chairman

Michael Hart

Last month, on the 8-9 June 1998, the BSA Science & Technology Steering Committee (STSC) met for the first time. This key committee provides scientific advice and guidance to the BSA (Brookhaven Science Associates) Board and to the BNL Director and to the two Deputy Directors. The Committee oversees the self-assessment of science and technology programs and provides quality assurance. As such it commissions independent visiting committees, peer reviews, and ad-hoc study panels, in cooperation with the S&T Deputy Director. In addition, the STSC also is responsible for the final review of tenure cases and makes tenure recommendations to the Board. Clearly this is a very important committee for the NSLS staff and users since it will be responsible for commissioning reviews of the nature and quality of our programs.

The committee serves at the pleasure of BSA and consists of two members of each Board Institution (16 members) and with up to four additional members proposed by the BNL Director to assure broad and diverse programmatic representation. For your information, I list below the first 16 nominated members. Let us welcome them to our community and look forward to productive interactions in the future.

BSA Science and Technology Steering Committee

Dr. Thomas Dunning, ***Pacific Northwest National Laboratory***

Dr. Vincent McGinniss, ***Battelle Memorial Institute***

Professor Alfred Mueller, ***Columbia University***

Professor Richard Osgood, ***Columbia University***

Professor Paul Houston, *Cornell University*

Professor John Silcox, *Cornell University*

Professor Robert Jaffe, *Massachusetts Institute of Technology*

Professor David Litster, *Massachusetts Institute of Technology*

Professor Thomas Shenk, *Princeton University*

Professor John Huth, *Harvard University*

Professor Frans Spaepen, *Harvard University*

Professor Stewart Smith, *Princeton University*

Professor James Glimm, *SUNY at Stony Brook*

Professor Janos Kirz, *SUNY at Stony Brook*

Professor Charles Baltay, *Yale University*

Professor Don Engelman, *Yale University*

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Power Outage '97: The Latest Update and Future Impact on NSLS Users

***D. Danseglio* (BNL Plant Engineering)**

***R. Heese* (NSLS Head of Operations)**

***J. Keane* (NSLS Electrical Systems Manager)**

On Sunday morning November 23, 1997, two days prior to the winter 1997 shutdown, 480 Volt feeder cables failed in the underground electrical ductbank that connects power from two substations in the middle of the NSLS courtyard to equipment inside the building. A committee was formed to investigate the causes of the electrical failure. The Electric Feeder Failure Report has now been completed and provides the basis for answering the following questions:

What happened?

The main 480 Volt feeders from sub-stations 1 and 2 connect to a pull box located in the middle of the X-Ray Ring via a 5X3 matrix underground ductbank. Each duct can house as many as three 500 kcmil cables. The cables going to MER2 (mechanical equipment room) from substation 3 shorted together causing fault currents to flow. Since the appropriate breaker failed to open an explosion occurred which damaged the entire duct bank surrounding feeders. As a result, the breaker going to the RF penthouse from substation 2 tripped.

Testing showed that the maximum load on the cables was only 50% of their rating. Furthermore, there was no evidence of a faulty load in MER2 after the repair had been completed. The cables which shorted, however, showed evidence of corrosion and had microcracks in the cable jacket. These only appeared in the region of the fault, some 12 feet from the pull box. The rest of the cable in the underground ductbank to the substation showed no evidence of prior damage. There is no doubt that degraded insulation caused the fault current from substation 1, but the cause of the damage is still unclear. Since the point of failure was close to a caustic drain, corrosive material could have entered the duct bank through a cracked PVC pipe and accelerated the degradation of the cable insulation. Observation of cracks and the presence of sand in the PVC duct piping in areas away from the explosion indicate that the ductbank installation was not up to today's standards - it was not structurally supported by concrete. Though the scenario described above is very likely, no conclusive evidence was found to support this conclusion.

How was the problem fixed?

There was no damage to any equipment other than the wiring itself. Because of the extensive damage, it was considered necessary to replace and reroute all of the wiring in the cable tray over the building roof. This also required that a new junction box be installed. This permanent repair was completed December 15. Because of a tremendous effort by BNL Plant Engineering electricians, engineers, and contractors, the job was completed before the end of the winter 1997 shutdown.

What will happen next?

(1) A detailed preventive maintenance program for NSLS and the entire BNL site will be implemented on all 13.8kV/480V substations, associated breakers, switches, and transformers in compliance with industry standards. The need for such a maintenance program is probably the single most important lesson learned.

(2) All substation 480V breakers in the NSLS will be certified or rebuilt.

(3) A testing program will be devised to determine the integrity of the insulation on the remaining underground ductbank cables.

(4) A breaker/fuse coordination study of the NSLS 13.8kV-480V substations will be done.

How will all this affect the NSLS users?

The majority of the work required will be done during the winter 1998 shutdown and will require power interruptions. It is hoped that this can be done over the course of a week. Other work scheduled for that shutdown period will have to be coordinated to avoid an unduly long shutdown. During the remaining maintenance days this year, there may be power interruptions required to install power cable monitors. Users will be informed prior to and during periods of power outages.

Thanks are given to the members of the committee, namely chairman Dennis Danseglio (BNL Plant Engineering), Richard Heese (NSLS), Terry Monahan (BNL Safety & Environmental Protection Division), William Softye (BNL Plant Engineering), and John Keane (NSLS). In addition the help of R. Lofaro's DAT (Dept. of Advanced Technology) group in testing of the failed cables is greatly appreciated. Guidance from

Nick Gmur (NSLS - ES&H Coordinator) provided support for the committee as well. The success of the interdepartmental efforts in recovering from this event teaches us what can be achieved when a spirit of cooperation and teamwork exists.

A plaque of appreciation to commemorate the outstanding efforts of the Plant Engineering (PE) Division and National Synchrotron Light Source (NSLS) Department Cable Replacement Team was given on behalf of the NSLS Users by the Users' Executive Committee Chair to representatives of the 70-person team.

(back, from left) John Parise (UEC Chair), Bill Softye (General Supervisor for PE's electrical Shop) and Joe Sheehan (NSLS Electrical Engineer).

(front, from left) John Keane (NSLS), Dennis Danseglio (PE Electrical Engineer) and Jerry Magee (PE Electrical Supervisor).

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A Users' Perspective

John B. Parise

SUNY Stony Brook

UEC Chair

As of this week I take up the reins from Joel Brock as UEC Chair and the newly elected UEC members become part of the committee. This year's User meeting was amongst our most successful thanks to the phenomenal efforts of the User Administration Office and the program committee. All the workshops were well attended and the number of people attending the User meeting on Tuesday was also up. I offer my personal congratulations to everyone involved in the 1998 meeting and particularly to my program committee, Linda Feierabend, John Hill, Elaine DiMasi, Harald Ade, Nancye Wright, and Eva Rothman.

A special thanks also to Joel Brock for steering the UEC through "interesting times". Joel's *User's Perspectives* in Newsletters over the past year make for absorbing reading. They trace a tumultuous time in the history of BNL and the NSLS. If they were bundled into a movie script, it would doubtless be rejected as too bizarre by all but the most Shadowy of individuals. They also trace what can be accomplished by the NSLS Administration and the Users working together. The March *Perspective* is a hopeful one and ends with a "call to arms" which reminds users of their unique position and responsibility for maintaining the excellence of the NSLS. I would like to pick up on both points here.

Some of big questions have been resolved and the hope is for a positive atmosphere for science over the next year. The appointment of Brookhaven Science Associates (BSA) as the BNL contractor has dispelled a major uncertainty and we are now in a "feeling out" period. Some of this feeling out occurred at the user meeting. BSA's published vision includes "Maintenance of the NSLS as a state-of-the-art user facility". This will encourage the NSLS user community since it is the excellence of this synchrotron source and its staff that continues to attract amongst the nation's most innovative science to the BNL. The uniqueness of BNL's scientific culture derives from the large number of "outsiders" who are attracted to the Laboratory's national user facilities. The NSLS is the "jewel in the BNL crown" and many of us treat it as an extension to our home laboratories. This trend will doubtless accelerate as more biological scientists integrate synchrotron radiation into their research programs. Many of these new users are consumers and both they and the administration need to discuss needs in an atmosphere of collaboration. The UEC can provide a forum for users' interests and a coherent voice to express these interests to the NSLS and BNL administrations, and the outside world.

Another hopeful sign was recognition of the NSLS record of productivity, user support and innovation lauded in "The Birgeneau report". The case made to this blue ribbon DOE panel by some of its users was compelling and well managed by the NSLS Chair, Michael Hart. It is important however, for all sides, to realize what a fragile resource the NSLS is, how integral it is to the BNL mission and how attacks on the BNL can negatively impact the ability of the NSLS to deliver.

I believe the users have available to them a team of dedicated individuals in the NSLS administration and staff. That dedication is on display during the shutdown in December 1997. The repair to the NSLS was so well managed that most users did not know there had been a major power failure until the individuals most responsible for the repair were acknowledged at the User Meeting. Individuals and groups do sterling work and deliver a service to users which allows us to concentrate on our science. As users we are grateful for this service and we are prepared to back any initiative that furthers the interests of users.

We should also be prepared to protest vigorously those initiatives which are *not* in the best interests of users. The source of the injury to the user program could be from the NSLS and/or BNL management or, more commonly of late, from external sources. There are poorly informed interests, both local and national, who would prefer that BNL not exist. These interests are well funded and dedicated. They are keen to have their message heard and are willing to sacrifice time and effort to get that message across. This contrasts sharply with the attitude of some users who have difficulty finding time to help a facility which DIRECTLY impacts their ability to do science! Believe it or not "I contribute by doing good science and publishing articles acknowledging the Light Source" really is not good enough. You know - it never really was. The individuals with whom I am involved on the UEC and with whom I enjoyed doing science over the past couple of decades share several qualities distinguishing them from the herd who simply do "good science": they care deeply about the community which has given them the opportunity for exposure and success, and they actually enjoy making a difference to the facility and the community which is the NSLS. Reporting our science, submitting research nuggets, generally highlighting the best of the NSLS science, involvement in the UEC, town meetings, responding positively to letter campaigns, membership in SPecial Interest Groups (SPIGs).......... These "non-research" activities are often regarded as distractions. In the present climate none can be ignored.

So I appeal to all users: if the NSLS is important to you, decide to make a difference. The time you invest in writing a letter to help dispel misconceptions, which if left unchallenged can dramatically and negatively impact our ability to do cutting-edge science, often has a disproportionate impact. Stumping for increases in science funding, writing letters in defense of your interests is the minimum that can be done. To aid in this effort the UEC has instituted a home page on the World Wide Web:

http://www.buoy.com/~nsls_uec/

where users will find resources which will allow them to effectively communicate their legitimate interests. This page will keep the membership informed about issues which most affect them and will be used as a resource for news and advice without violation of the lobbying rules. Remember, there are people out there who feel strongly about BNL, to its detriment. Self-interest alone dictates that each of us needs to be more aware and responsive.

For the cognoscenti whose research programs depend heavily on the NSLS, the day-to-day operations of the facility, the impact of sustained attacks on the BNL, changes in the Laboratory contractor, the Birgeneau report all weigh heavily. There are many "occasional" users however who depend on the services provided by the NSLS to get into the facility, get their data and get out. These are a new generation of users for National facilities in general. These are project-oriented researchers funded by specific agencies and do not have the time commitment traditionally associated with the operations of a national facility. These people depend heavily on infrastructure - they depend on a generation's worth of sources, physics, and beamline optics development- and they have little appreciation for the depth of resource behind and what is required in development to support their experiments. In the next year we will engage more of these researchers.

The research enterprise is a competitive one. Users believe their association with the NSLS provides them with the sort of satisfaction and competitive edge to fulfill their research goals. The attainment of those goals, however, depends on having the infrastructure maintained. That requires involvement and making your wishes heard. The UEC provides an independent voice and looks out for the users' interests but we depend on the memberships involvement and enthusiasm. When you receive a solicitation, to contribute a research report or write a letter of support, please consider your use of the NSLS; consider how much you receive from this facility, and from its community of developers and users. Perhaps this will justify taking some of your valuable time to help out.

Please send comments to me at John.Parise@sunysb.edu

Users' Executive Committee

Chair: John Parise (SUNY @ Stony Brook)

Vice-Chair: Barbara Illman (USDA/FS Forest Products Laboratory University of Wisconsin)

Past Chair: Joel Brock (Cornell University)

Paul Stevens (Exxon Research & Engineering Co.)

Carol Hirschmugl* (University of Wisconsin)

Lisa Kelly* (U. of Maryland Baltimore County)

John Hill* (Brookhaven National Lab-Physics Dept)

*New members, elected 5/19/98

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BLOSA Training Goal - 100% Compliance!

William Thomlinson

Associate Chairman for Environment, Safety, and Health (ESH)

In 1993 the NSLS embarked on an ambitious program to provide Beam Line Operations and Safety Awareness — BLOSA. The intent was to supplement the training given in the User Administration Office with awareness of specific safety issues in the local environment where a user would be working. This awareness program was to be distinct from any training given which teaches the operation of the experimental hardware. Since it was meant to be given by the Beamline Training Coordinator or designee, it gave the users a chance to meet and discuss any concerns with the staff. Such a program was new to the NSLS environment, but has since become recognized as one of the key features of our user safety program. It fits in very well with all of the upgraded and new ESH programs at BNL designed to continue to improve our already outstanding safety program.

The program got off to a rocky start because it was begun well after most beamlines had been operating for a long time. The culture was not established in which the beamline personnel would meet every user at the start of an experiment. The level of compliance, as shown by comparing the number of users registered to work at a given beamline with the total of BLOSA trained users, has improved over the years through the efforts of the beamline personnel and the NSLS staff. However, a recent review of the program shows that it is still languishing at a 0 to 50 % compliance level - even though users who are trained and beamline personnel who do actually train users agree that it is valuable to them.

Therefore, the NSLS has set a goal of achieving 100% compliance by the end of the calendar year 1998. We recognize that it will take a lot of effort on the part of the NSLS ESH, User Administration and Operations staff to meet the goal. Equally sharing the effort, however, will be the beamline spokespersons, local contacts and training coordinators. "Business as usual" will not continue with regard to this program. As I am writing this message, necessarily well in advance of its publication, the details of how we will bring about the required upgrade are unclear. The goal is to have the program defined and the changes underway by July 1998.

> *"The NSLS has set a goal of achieving 100% compliance by the end of the calendar year 1998... "Business as usual" will not continue with regard to this program... if no BLOSA trained user is present at a beamline, then the beamline will not be enabled."*

No matter how the details work out, it is clear that several key components will be required to be changed or implemented. The NSLS user database, which already includes the BLOSA training information, will be used to identify any user (PRT, General User, or Staff) who will be coming to work on a beamline and who is BLOSA trained (and therefore those who are not trained, as well). The information has to be made available to the people who need to see it (the beamline training coordinator, the operations staff, the users) and in the format most useful to them. Since the Safety Approval Form lists all experimenters who will be at the NSLS to work, it will be used to flag those individuals who will need BLOSA training. Beamlines will be notified that some users coming to work will the training upon arrival.

When placing the Safety Approval Form (SAF) at a beamline, the Operations Coordinator will verify that at least some of the users present have valid training and therefore the beamline can be enabled. At the same time, the OpCo will direct the research team to the beamline specific BLOSA forms and require that the untrained individuals receive training immediately and properly file the forms for collection by the NSLS. The primary responsibility for the training will remain with the Beamline Training Coordinator. However, if that person is not available, previously trained users may do the training for their colleagues. We recognize that such a system may not be as good as if the beamline personnel were training, but in reality we know that such a system is already being done in practice (I have done it myself). It works and is valuable. The NSLS will then have the responsibility of properly collecting the forms and keeping the database up-to-date.

Overall compliance of a beamline with the BLOSA program will remain the responsibility of the beamline staff. The NSLS, once we are convinced that we are doing our part, will begin to strictly enforce the BLOSA training requirements at the beamlines.

Everyone should understand that if no BLOSA trained user is present at a beamline, then the beamline will not be enabled. We can do no less than require 100 % compliance.

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X-Ray Ring Status

Roger Klaffky

X-Ray Ring Manager

During the recent Spring 1998 shutdown, a new all-copper cavity was installed replacing the existing RF2 cavity. This system is unique, having two 125 kW amplifiers driving a hybrid combiner capable of supplying in excess of 160 kW to the cavity and beam. The original cavity and drive loop limited this power to 100 kW. A new all-copper drive loop with improved cooling and a refined window design was also installed and tested to 150 kW continuous input power. Running at 150 kW will supply another 60 kW to the beam and allow the system to run more reliably at 350 mA with three transmitters if one system trips. The cavity has also run to 65 kW, and when in operation will increase the total voltage gradient to the beam, improving reliability when operating at 2.8 GeV. The new cavity has improved cooling and superior internal surfaces which will result in better vacuum after conditioning. The higher order mode damping exceeds that of the previous cavity.

A small water leak in the horizontal radiation shield downstream of the X17 Wiggler was detected during the Winter shutdown. The leak was dealt with at the time by pulling a vacuum on the water passages in the shield. Unfortunately, this solution prevented the wiggler from operating until the shield could be replaced. In the months between then and the recent shutdown, a new and improved radiation shield was designed and fabricated. In addition, the new wiggler for X17, which is currently scheduled to be installed in the upcoming Winter shutdown, necessitated changes to the X17 straight section beam tube on the downstream side to accommodate the longer wiggler. These changes were incorporated into a new beam tube section and were installed along with the new radiation shield. The new straight section beam tube, which incorporates two radiation shields to protect welded joints and uncooled regions of the beam tube, was successfully installed during the recent shutdown. The tasks involved in this effort included splitting three quadrupole magnets, shielding rework around the X17 chamber, and extensive surveying. The shielding rework includes the incorporation of two panel fans to circulate air around the beam tubes to prevent the effects of ozone corrosion which had been noted on the exterior surfaces of the removed chamber and radiation shield. The new straight section has a small spool piece which will be removed when the new wiggler is installed. The existing wiggler will remain in service until the new wiggler is installed during the December 1998 shutdown.

The new X17 wiggler has been received from Oxford Industries, Ltd., and is currently on site at the Building 902 magnet test facility. This wiggler has eleven full poles and two half poles to allow for three operating modes:

(1) a full wiggler mode - all full poles at 3.0 tesla field, end (half) poles at 1.5 tesla;

(2) a partial wiggler mode - five central poles at 4.7 tesla, two end (half) poles at 2.35 tesla (same as existing wiggler);

(3) a wave shifter mode - one central pole at 5.5 tesla, two end (half) poles at 2.75 tesla.

The wiggler has already been through extensive performance testing at Oxford's facilities where all design fields have been achieved. The magnet quench protection circuitry has also been successfully demonstrated as an integral part of Oxford's performance tests. Additional tests at Building 902 will be made to optimize the magnets current ramping rates for all modes, establish appropriate NSLS monitoring and control interfaces, and integrate the cryogenic supply and exhaust system. The new wiggler has been designed for minimum cryogenic losses. This has been achieved by incorporating liquid N_2 and He exhaust gas cooled thermal shields as well as vacuum thermal shielding. The wiggler package includes a stand-alone liquid He supply system that eliminates the inefficient and marginally reliable liquid He closed loop refrigeration system used on the present wiggler with a dedicated open loop system. The new wiggler and cryogenics system will be installed during the next winter shutdown in December of this year and will be operational immediately following the shutdown.

The beryllium window replacement program, which was begun in the Winter 1996 shutdown, has been completed during this shutdown. During this time, the upstream-most beryllium windows in beamlines X10B, X11A and X22C were replaced, bringing the total number of beamlines upgraded to 38. Consequently, all NSLS X-ray beamlines are now compatible with ring operation up to and including 438 mAmps at 2.584 GeV or 300 mAmps at 2.8 GeV. The final requirement for high current operation is that a simulation and testing be completed to confirm a lifetime projection for the 10 degree crotch assembly. Funds have been allocated to purchase the required equipment for this test.

There were a number of interlock tasks completed during the Spring 1998 shutdown. The X14A beamline security system was converted from a Phase I system to a Phase II modular system and a Phase II system was installed on the new X14B beamline. Fast valve electronics were installed for the X10, X13, X14, X15, X16, and X23 front ends. To render these systems operational, their logic systems must be modified (so the X-Ray Ring will dump if they trip) or molybdenum fast valve blades must be installed. The installation of cables for the Critical Device Overtemperature System (CDOS) took place bringing this system closer to completion. X-ray Ring tunnel emergency stops were inspected and rewired where needed.

A number of electrical power distribution tasks were also completed during the recent shutdown. A power panel (SP8) inside the ring was moved to a more accessible location. When the last panel is moved during the upcoming Winter shutdown, all power panels inside the ring will have been relocated. Emergency power was hooked up to X-ray, UV and Booster micros, to back up the existing UPS systems, and to the Biology Cold Rooms.

The deionizer pumps for the NSLS machine water systems were moved to a more accessible location. New hosing and proteus units were installed on different water cooled X-ray Ring components, as a part of the maintenance program.

Commissioning of the X-Ray Ring went smoothly. The new RF system parameters were adjusted to restore routine injection to 350 mA. The X17 Active Interlock system was re-certified for the new X17 chamber PUEs downstream of the wiggler. The chamber conditioned rapidly with the wiggler at 4.7 Tesla.

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FOCUS ON . . . . .

NSLS Budget/Administration Group

Frank Terrano

Assistant to the Chairman - Administration

Have you ever thought about who is handling the "Business" of the Light Source? Who are the people behind the scenes that maintain the administrative systems, watch the money, process all the contracts and purchases, run the stockroom, interface with the support divisions of BNL and to a large degree, ensure the smooth day to day administrative operation of the facility? We are talking about the Budget/Administration Group.

Headed by Jim Desmond (Deputy Department Administrator), the group consists of Kenneth Koebel, Susan White-DePace, Mildred Laster and Armand Di Filippo, assisted by Lewis Jackson and Collos Lamb who run the stockroom and Donna Buckley who provides secretarial support. These are the people who make it work.

Back row, from left: Kenneth Koebel, Jim Desmond, Armand DiFilippo, Donna Buckley, and Lewis Jackson. Clockwise from bottom: Mildred Laster, Collos Lamb, Tom Reisig (recently retired), and Susan White-DePace.

"Just what is Budgeting?", you might ask. Well let's say the Department of Energy (DOE) decides to support your research, and sends you $100,000. How much of that $100,000 do you actually have, to spend? That depends. If you want to hire someone, you will have about $46,950 available to put toward that person's salary. If you are going to use it for materials and travel, you will get to spend about $69,550, unless the components you are ordering are over $25,000. Then you actually get to spend $84,600. If however you are going to purchase a piece of capital equipment you will be able to spend $91,900 of that $100,000 funding. Then again, if you are occupying an office, there will be an additional space charge deducted from your budget. Now, if some of the money is to come in next year, it's a whole different ball game, since overheads and burdens applied against your funding tend to change from one year to the next. Also, funding coming from agencies other than DOE will in many cases be subject to different overhead costs. Clearly, budgeting is a process of careful planning, knowing the rules and how to best optimize your spending.

There are many facets to the budgeting process, which is the largest part of the group's function. The Department's annual budget is approximately $31 million, which comes in several "colors" of money. Each color, or type of funding is for a specific purpose and comes with its own set of rules. Every dollar spent is reviewed for compliance to the rules of funding, budget coverage, proper spending authorization and for adherence to allowable costs as defined under the Brookhaven Science Associates' contract with the DOE.

The largest segment of funding at the NSLS is the Operating budget, which covers the expenses of running the facility. These include salaries for scientific, professional and support personnel, electric power for the machines and buildings, travel, materials, maintenance, support services and a host of incidental expenses including various overheads and space costs. Other allocations of the Operating budget cover our investment in the future, supporting NSLS Research and Development and infrastructure maintenance, as well as Safety and Environmental Protection efforts. There are over one hundred operating accounts set up which allocate the budgets to the various components of the organization. These budgets must be set up at the beginning of each fiscal year on October 1st and then monitored for spending throughout the year. The spending can not exceed the budget, but by the end of the fiscal year virtually all of the money must be spent. The dynamics of the operating budget can be extreme and require a high degree of maintenance. There are continuous personnel changes affecting the salary base, power rates constantly change, machine running schedules have a significant affect on the two million dollar annual power bill, unplanned equipment and machine repair costs, and overhead adjustments are just some of the variables. This process requires an accurate reporting system so that the individuals responsible for each account know just where they stand at any time during the year. The Budget group maintains this system, and distributes monthly hard copy budget reports to all appropriate personnel. The system also provides daily inquiry capabilities.

Other major types of budgets handled by the group include Accelerator Reactor Additions and Modifications (ARAM), which are small to medium sized projects set up for machine improvements, and Capital Fabrication, for the acquisition or fabrication of equipment. Along with ARAM and Capital, other miscellaneous types of funding such as Laboratory Directed Research and Development (LDRD), Special Process Spares (SPS), Cooperative Research and Development Agreements (CRADA), Advanced Research Projects Agency (ARPA) and Work for Others (WFO) go into the makeup of some seventy additional accounts at the Light Source. All are monitored and reported on in the same way as the operating accounts.

Each year, starting in early January, the annual budget submission process begins. This is an exceptionally busy time for the budget group when the funding requests for the next two years are put together for submission to the DOE. The process generally takes about two months to complete and addresses literally every aspect of change projected in the budgets. Factors such as escalation rates, revised staffing levels, machine running time, spares requirements, special projects, machine upgrades, equipment needs, overhead adjustments, space usage, and countless other considerations must all be incorporated into the projections. This process pretty much consumes the second quarter of the fiscal year.

When the dust settles from budget submission, the focus changes to setting up the remainder of the ARAM and Capital projects, since there is now only about seven months left in the fiscal year. The money must be "obligated", that is spent or committed to a contract by the end of the fiscal year. This process involves interfacing with the cognizant scientists and engineers who will be involved in each project to establish the budget requirements, schedule and person power needed for completion. With this information the "Data Sheets" are set up and submitted through the BNL review and approval process which concludes with final approval from the local DOE and Budget offices. At this point the accounts are opened and the projects may proceed.

In the final quarter of the fiscal year the emphasis is on bringing the budgets to a close. The focus is on where the money is really being spent, and not spent. Plans change during the year, priorities are shifted, unanticipated costs must be covered. The budgets are realigned for the final time. Completed projects must be "closed out" and transferred to fixed assets. Preparation for the final close out of the fiscal year on September 30, takes place. At the same time the first real indications of the funding levels for the new fiscal year start to arrive, and the process of setting up the new budgets to be ready for October is underway. Hence the new budget cycle begins.

The NSLS stockroom is maintained by this group as well. An inventory level of approximately $115,000 consisting of electrical and electronic components, valves, flanges, gasses, batteries, film, office supplies and other miscellaneous items is made available to NSLS staff and users on a 24-hour-a-day basis. The stockroom system, developed and maintained by the Administrative group, allows individuals to do their own shopping, using hand held bar code readers, and charges their accounts automatically at the end of each month. Approximately $250,000 of inventory is drawn from the stockroom annually. The NSLS Stockroom Committee, comprised of NSLS staff and users, reviews stock request forms to determine what items and quantities will be stocked. User input is welcomed. Inventory not on hand in the NSLS stockroom may be ordered through the system from BNL's centralized warehouse to be delivered by the next business day. The stockroom also acts as the main receiving and shipping area for all deliveries coming in and out of the facility.

Property management is something that is taken seriously by the DOE, and at the NSLS. With some 2,500 items in our equipment inventory valued at $27,000,000 it requires a good tracking system and a good deal of attention. A physical inventory of every piece must be taken every two years and the results reported to the DOE. The added complication of an equivalent amount of equipment belonging to users, interspersed with our own throughout the experimental floor, does not make the job easier. With the use of bar coding however, combined with a digital image and description of every piece in our inventory, and to whom it is assigned, the task is well in hand.

The group also acts as liaison with BNL's Division of Contracts and Procurements, in the area of Contract administration. They coordinate the set up of all NSLS contracts, review progress against milestones and deliverables, implement change orders, resolve disputes and authorize payments. Additionally, there are approximately 1,000 Purchase Orders and 300 Intra-Laboratory Requests (ILR's) for BNL services, which they process annually through the

NSLS systems.

Along with their major responsibilities, the Budget/Administration Group covers numerous other tasks such as systems development, ad hoc reporting, responding to audits and reviews, managing telephones, rate development, budget assistance to individuals, building keys, etc.... If something new comes up in the line of business, they will probably be the ones to cover it!

The NSLS User Administration Office maintains this document. *DISCLAIMERS* : Revised Date : July 24, 1998

July 1998 Newsletter, National Synchrotron Light Source

Facility Improvements, 1998

Mike Kelly

NSLS Building Manager

Building 725 Lighting:

The NSLS will be upgrading the lighting system on the experimental floor by replacing the overhead lamps. We are currently experimenting with different wattage metal halide bulbs. This type of lamp was chosen over the present high pressure sodium (HPS) lamp because the spectral output is closer to natural light.

The testing of the new lights has been on going at U8, U5, and X20. We have tried three different wattage bulbs, depending on the distance to the floor. The process has been slow because each lamp must be wired with a matching ballast. Most industrial lamps are powered by 220 vac. Our lamps are powered by 480 vac which requires a special order to the company that produces them.

As the lamps are installed over the X-Ray Ring floor, they will be positioned to better illuminate the open areas. The original lighting was installed long before the hutches were built, and in many cases hutches were built directly under them. This problem doesn't occur on the VUV Ring floor since the lamps are high above the overhead cranes.

The HPS lamps that illuminate the cubicles, room 1-100 through room 1-109, will be replaced with standard fluorescent tubes.

Space Available:

The NSLS trailer park has three office trailers that are available for occupancy. The trailer sizes are 400 square feet, 720 square feet, and 720 square feet.

There are also four offices available in Building 510E, third floor of physics. Please contact the NSLS Space Committee for details (Frank Terrano, NSLS Administration, x3963 or terrano@bnl.gov).

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The Cryo X-ray Microscope at Beamline X1A

Chris Jacobsen

Department of Physics & Astronomy, SUNY Stony Brook

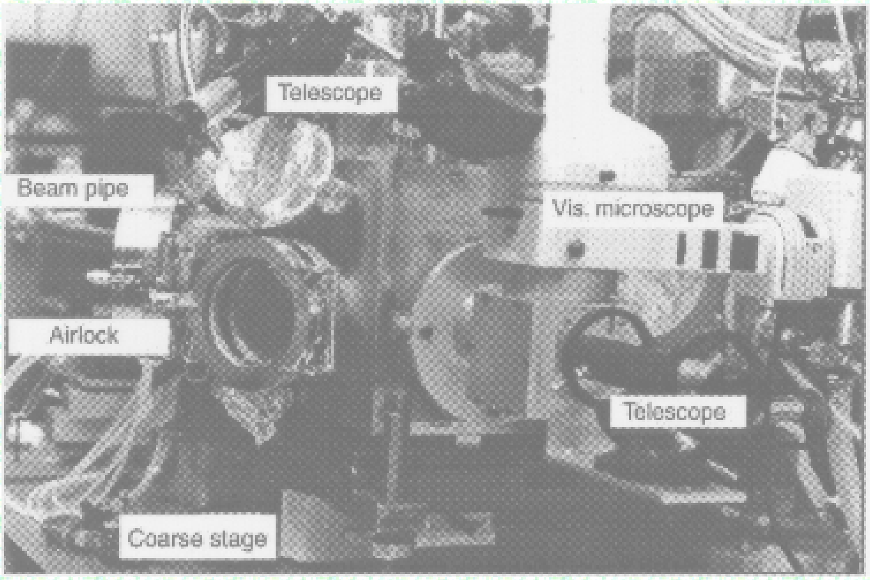
Soft x-rays are well suited for studying hydrated organic specimens: they offer high contrast, good penetration in micrometer-thick water layers, and the potential for high resolution imaging due to small wavelength. The lack of plural scattering using low-energy x-rays makes quantitative image analysis relatively straightforward, and the chemical binding of major constituents can be studied using x-ray absorption near-edge spectroscopy (XANES). At X1A, these advantages are put to use for studies in biology, polymer science, colloid chemistry, environmental science, and geochemistry.

A major challenge to studying biological specimens has always been the fact that small structures must be exposed to a large number of ionizing photons, leading to significant problems with radiation damage. The radiation dose in a typical image is about 10^6 Gray or 10^8 rad, which is far beyond the 10^0—10^3 Gray tolerated by living specimens. The limitations of radiation damage have been mitigated in past studies in several ways. Scanning microscopes, where the 5-15% efficient focusing optic (a Fresnel zone plate) is located *before* the specimen rather than *after* as in a conventional microscope, minimize losses in signal relative to specimen exposure and therefore minimize radiation dose. Chemical fixatives (such as glutaraldehyde) offer varying degrees of protection depending on the sample, but often at a cost of causing significant morphological and chemical changes to the specimen. Dried specimens can often be studied with ease (since most damage in hydrated specimens is caused by radiolysis of water), but one must then recognize that the specimen has often been significantly altered by dehydration.

To overcome these limitations, we have developed a scanning transmission x-ray microscope which makes it possible to image specimens temperatures around 110 K. Design of the system began in earnest in 1994, and was led by Jörg Maser (now at the APS) with Steve Wang, Angelika Osanna, Janos Kirz, and myself from Stony Brook. Important contributions have also been made by Steven Spector (Luecnt Technologies) and Jan Warnking (Stony Brook). More recently, Barry Winn and Matthias Weigel (Stony Brook) have joined as key participants. The microscope uses zone plate optics developed in collaboration with Don Tennant at Lucent Technologies /Bell Labs. At present, 72 nm Rayleigh resolution optics are used in our early operation of the cryo microscope, though the microscope has successfully worked with 55 nm optics and zone plates with a theoretical resolution as small as 22 nm have been fabricated. After a development period where it had only occasional beam access at the outboard branch of the X1A beamline, this microscope is now semi-permanently installed at the inboard branch of X1A and has significant beam access.

It is by now well known in the electron microscopy community that one can rapidly cool thin (e.g., 10 µm or less) specimens by rapid plunging in liquid propane or ethane so as to produce amorphous ice, and that such specimens can tolerate radiation doses up to about 10^8 Gray. Samples in amorphous ice are free of "Swiss cheese" artifacts caused by ice crystal formation, and comparisons between x-ray scattering data from wet versus frozen hydrated frog myofibrils have shown excellent fidelity of high resolution structures. It is also known in the protein crystallography community that crystals at liquid nitrogen temperature are much more resistant to radiation damage. When a hydrated sample is held at liquid nitrogen temperature, radiolytical products such as OH^- are unable to diffuse in the ice matrix. In fact, in experiments at X1A and also with the Universität Göttingen cryo x-ray microscope at BESSY, x-ray doses of up to 10^{10} Gray have been shown to produce little or no radiation damage to frozen hydrated specimens. The increased dose tolerance may be due to a lower dose rate and to relatively less energy deposition in ice.

For cryo x-ray microscopy, we are able to grow cells in culture on thin films on electron microscope grids, and plunge-freeze the cells directly from the living state in culture medium. They are then loaded onto the cryo holder (which is a modified version of those used in electron microscopes) and loaded through an airlock into the microscope (**Figure 1**). One can then take large-field images to find a desired specimen location, and begin high resolution imaging within minutes.



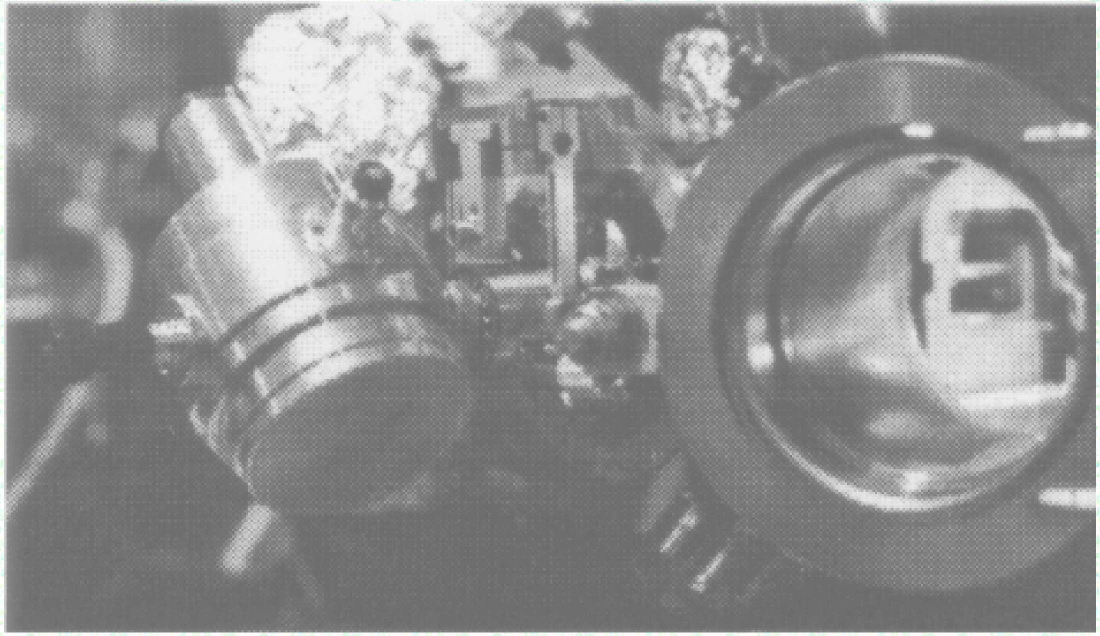


Figure 1: The cryo microscope at X1A.

An overall view of the microscope is shown at left, and a closeup of the specimen holder at 60° tilt is shown above.

Using cryo-stabilized samples, we are able to carry out investigations of biological specimens which make use of the full range of techniques which have been pioneered at X1A on more robust samples. By rotating a cell through the microscope's depth of focus, we are able to obtain a series of projections for tomographic reconstruction (**Figure 2**) and thereby sort out the complexity of overlapping information in unsectioned biological specimens. This allows us to study much thicker specimens than the ~500 nm thickness limit of electron microscopy and at a higher 3D image resolution than optical microscopy. Furthermore, we are able to image all structures present in a cell rather than only those which can be fluorescently labeled for confocal and through-focus optical microscopy.

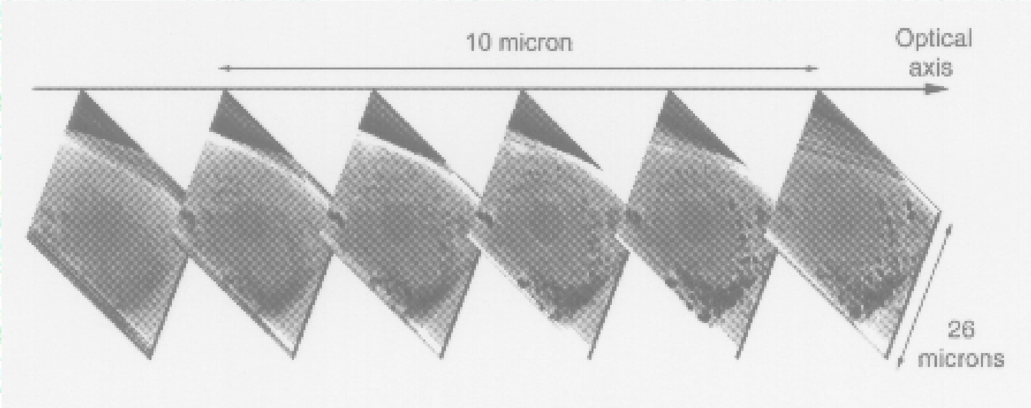


Figure 2: "Slices" from a tomographic reconstruction of a tilt series of images of a 3T3 fibroblast viewed in the frozen hydrated state.

(Steve Wang,

PhD dissertation,

Stony Brook, 1998.)

Scanning x-ray microscopes are well matched to high resolution monochromators, allowing for spectro-microscopy using XANES resonances. Biological applications of this capability have included the mapping of protein and DNA in dehydrated sperm to help understand how proteins pack chromatin in sperm, and the mapping of calcium and collagen in bone, tendon, and cartilage. With cryo, we are now beginning to apply these techniques on frozen hydrated specimens, and to extend them to the nitrogen and oxygen edges since our specimen is now in vacuum rather than in air.

The capabilities of x-ray microscopes for studying micrometer-thick specimens at high resolution and with spectroscopic sensitivity provide information not easily obtainable by other means. Early operation of the cryo scanning transmission x-ray microscope at X1A has shown that these capabilities can now be fully implemented on sensitive, hydrated biological specimens. Studies using cryo tomography and spectroscopy are currently underway. n

Acknowledgements:

We gratefully acknowledge the support of the Office of Biological and Environmental Research, U.S. Department of Energy, for support under contract DE-FG02-89ER60858, and the National Science Foundation for support under grants DBI-9605045 and ECS-9510499.

References:

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July 1998 Newsletter, National Synchrotron Light Source

VUV Ring Status

Stephen L Kramer

X-Ray Ring Manager

The turn on of the VUV Ring after the winter 1997-1998 shutdown has been difficult. The vacuum recovery has been slow as a result of opening the U5 undulator vacuum chamber to air, when the ion pumps on that chamber had to be removed for the installation of the radiation shield wall in that region. The need to pull the pumps wasn't foreseen and therefore time for a bakeout and conditioning wasn't planned. In order to increase the rate of desorption of the accumulated gas, two extra fills per night were added. Then during the March maintenance a vacuum feedthru on a distributed ion pump in sector one opened up, venting the half the ring almost to atmospheric pressure. This required significant downtime for a bakeout of sector 1 and 4 of the ring. The recovery from this vacuum leak resulted in a 15% loss of scheduled operations for March. However, a reduction in the number of study hours used, resulted in an actual loss of operating time of only 6.7% for the month. Despite continuing the two extra injections per day and several attempts to look for and repair leaks in the ring vacuum chamber, the lifetime continues to be low by about 30% from the record level set in November 1997. As a result of these vacuum difficulties, an improvement plan is being developed to address the issues of diagnostics, pumping speed and reliability of vacuum components on the ring, with a goal of improving recovery from vacuum accidents and possibly also the base vacuum pressure of the ring during normal operations.

Despite the vacuum difficulties, the U10 IR beamline was commissioned and is now able to open during normal operations. After the rest of the beamline is operational, a major increase in the infrared resources of the VUV Ring will become a reality. Since several experiments on the infrared beamlines will want shorter bunch lengths for timing experiments, studies have begun on a new VUV Ring lattice for short bunch length operation, the Short Bunch Lattice or SBL. The SBL will give a reduction in the zero current bunch length of the electron bunches in the ring by more than a factor of two, while increasing the horizontal emittance by 60% over the normal achromatic lattice. The increase in horizontal emittance will increase the lifetime over the normal lattice operations. Studies with the SBL have actually shown an increase in the lifetime over the normal lattice without the bunch lengthening RF cavity turned on. This results from the higher horizontal emittance and similar bunch lengthening with increasing current as compared to the normal lattice. The plan will be to use the bunch lengthening RF system to counter the bunch lengthening at increased current, but this will require some studies before this becomes operational. Despite maintaining the same horizontal and vertical tunes, the Global Orbit Feedback System doesn't work properly with the SBL. A new response matrix for the Global Orbit Feedback System is needed in order to achieve the orbit stability of the normal lattice in the SBL, and this will take some effort to address.

The results of the radiation shield wall improvements are still being evaluated, since the levels have always been low and the large statistical uncertainty of the data makes comparison difficult for short time samples. However, the TLD radiation monitors show significant reductions of factors of 3 to 6 on the experimental floor and factors of 3 to 10 for the second floor offices. A major portion of this gain came from detailed measurements and changes of the injection timing and injection energy of the beam from the booster. These improvements increased the injection efficiency of the beam from the booster into the VUV Ring, reducing the beam lost during injection, a major factor in the radiation dose from the VUV Ring. The injection rate into the VUV Ring have similarly increased and injection times of one minute or less are now quite common.

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CALL FOR EXPERIMENTAL SUMMARIES (ABSTRACTS)

FOR THE 1998 NSLS ACTIVITY REPORT

http://www.nsls.bnl.gov --> Science --> ESS

E-Mail and Disk Submissions Accepted Until September 25, 1998:

Anyone who decides not to use the ESS (Electronic Submission System) this year, for whatever reason, can still submit a via E-mail or on disk (WordPerfect, Mac or PC Word file, or ASCII text). The catch is that your submission must be post-marked no later than September 25, 1998. We would like to accommodate those who prefer submitting without the ESS, but because it introduces extra processing on our end and an extra round of editing on your side, we must limit the submissions to this time period.

ESS Submissions Between September 8 and October 30:

* NEW submissions accepted until 5 pm Friday October 16.

* EDITS to existing submissions allowed until 5 pm Friday October 30.

Detailed information and instructions can be found on the Web on the ESS pages (http://www.nsls.bnl.gov, "Science --> Experimental Summary Submission"). Note that many people are going to submit at the last minute and the system will be extremely busy and slow near the deadlines. There is not much we can do to change this system limitation - please save yourself anxiety and try to submit earlier!

After October 30, 1998:

We must enforce this strict deadline in order to produce the Activity Report according to schedule and in time for the Users' Meeting. October 30 is a hard deadline. Although the system will remain open, any submissions entered after October 30 will be automatically rolled over into the 1999 Activity Report. The November Newsletter will have information about when the abstracts will be available for viewing on the Web.

CALL FOR PUBLICATION REFERENCES for the period September 30, 1997 through December 31, 1998

Our publication references are an important element in how funding agencies judge the productivity of the NSLS. All NSLS users are obligated to send the NSLS a complete publication reference for any paper based in whole or in part on research done at the NSLS. Each beamline PRT submits a list of their own

papers as part of their Annual Beamline Progress Report, but the NSLS must also collect references by General Users and other collaborators in order to present the complete picture of the work being done here.

Please take a few moments to e-mail or fax us your publication references. If you are not sure whether you had already sent us your list, send it in anyway - we always check on this end to avoid double-listings. Send your references to Nancye Wright at wright1@bnl.gov or FAX 516-344-7206.

DO YOUR PART TO SUPPORT THE NSLS!

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July 1998 Newsletter, National Synchrotron Light Source

PROPRIETARY RESEARCH AT THE NSLS

You can perform research at the NSLS while retaining all intellectual property rights instead of publishing your results in open literature. Proprietary beam time can be requested through the General User Program or through a beamline Participating Research Team.

There are basically three requirements:

1) Your institution must sign a Proprietary Users' Agreement with Brookhaven Science Associates, operator of Brookhaven national Laboratory. Many institutions have already signed - check your institution's status with the User Administration Office. The Agreement covers all users from that institution, for an indefinite period of time.

2) Submit a Proprietary Research Proposal for each experiment or program. It must include a brief non-proprietary description of your work.

3) Pay for the beam time you used - if you do not pay for the beam time you do not own the data and potential patent/marketing rights. Beam time usage is reported after-the-fact.

The current rate is $669/8-hour shift, with an 8-hour shift being the smallest chargeable unit.

If you would like more detailed information about performing proprietary research

at the NSLS, please contact the User Administration Office or visit our web site at

http://www.nsls.bnl.gov/Proposal/Propriet/propriet.htm

MAIL-IN EXAFS SERVICE (proprietary or non-proprietary) is also available

http://www.nsls.bnl.gov/BeamRD/services/exafs.HTM

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CALL FOR GENERAL USER PROPOSALS

Deadline for proposals and requests for beam time on the NSLS X-Ray and VUV Rings is

Wednesday, September 30, 1998 for scheduling Jan. - April 1999

Prior to Submitting a Proposal

You must contact the beamline personnel responsible for the beamline(s) selected in order to verify technical feasibility on the beamline(s) and discuss any special arrangements for equipment. Your chance of getting beam time is improved by being able to use more than one beamline.

Preparing Your Proposal

The same form is used for both new proposals and beam time requests against existing proposals. Follow the instructions on the information sheet and complete and submit all the required sections. Type or print all information legibly. MAIL OR FAX **ONE COPY** of the proposal form and any attachments to the NSLS User Administration Office. Only **one copy** is required - *do not mail a hard copy if you have already faxed one to us.*

Proposal Deadline

The complete proposal package must be received by the User Administration Office on or before 5:00 pm Eastern Time Wednesday, September 30 in order to be considered for the Jan.-April cycle. The fax machine is always extremely busy on the deadline date; please do not rely on faxing the proposal successfully on September 30. We encourage submitting new proposals by mail or fax prior to the deadline. Beam time requests for active proposals will be accepted after the deadline, but will be allocated beam time only after requests received on time have been allocated. Late requests are not eligible for a rating upgrade if beam time could not be allocated to them.

Each proposal will receive a prompt preliminary review to verify that it is complete and legible. If there is a problem with the proposal, you will be contacted immediately. Submitting your proposal well in advance of the deadline date assures that the User Administration Office has time to reach you and that you will have enough time to correct any deficiencies.

Additional Information and Forms

Blank proposal forms and instructions, a guide to the NSLS beamlines, and more information about the General User Program are available on the World Wide Web at **www.nsls.bnl.gov**, or by contacting E. Pinkston or L. Rogers in the NSLS User Administration Office. Office hours are Monday through Friday, 8:00 am to 5:00 pm Eastern Time. Contact information is on the back page of this Newsletter.

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SAFETY APPROVAL FORMS . . .

- Are now valid for one (1) year from date of approval.
- Must be submitted at least 1 week before the expected start date for your experiment.

SPECIAL INSTRUCTIONS

FOR GENERAL USERS:

If you are submitting a NEW proposal, do NOT submit a SAF - wait until you receive notification that you have been allocated beam time. Your allocation letter will contain a reminder for you to submit your Safety Approval Form before your experiment starts.

If you are submitting a BEAM TIME REQUEST against an exisitng proposal, you may already have a valid Safety Approval Form in place. Remember, they are valid for a year. If your previous form has expired or this proposal has not yet received any beamtime, then you will have to submit a Safety Approval Form before you experiment starts.

If you need to find out about your SAF's status, contact:

Andrew Ackerman, 516-344-5431, ackerman@bnl.gov

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NEW PROPOSAL FORMS

for General Users and for Proprietary Research as of April 1998

The new General User proposal form is only two pages long. The older versions of the form are no longer being accepted. Please be sure to get the new version in Word or PDF format from the web at http://www.nsls.bnl.gov/Proposal/wordfiles.html or contact the User Administration Office and request a Fax.

Proprietary research forms have also been updated; if you had an active Proprietary Proposal during the past year then you will receive a letter in August with new forms enclosed.

See Safety Approval Form instructions.

Important Upcoming Dates

Sept. 8 - Oct. 30	NSLS Activity Report 1998 Abstract Submissions
Sept. 17, 1998	NSLS Town Meeting
Sept. 18, 1998	UEC Meeting
Sept. 18, 1998	Deadline for submissions, November Newsletter
Sept. 30, 1998	Deadline for General User Proposals (Jan.-April `99)

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