National Synchrotron Light Source II

Project Progress Report

March 2013 Activity

The NSLS-II ring building on a late March evening.

report due date:
April 20, 2013

Steve Dierker
NSLS-II Project Director

Brookhaven National Laboratory
Upton, New York 11973

OVERALL ASSESSMENT

The National Synchrotron Light Source II Project continued to make excellent progress, maintaining cumulative cost and schedule indices of 0.99 and 0.96, respectively. At the end of March, the project was 85% (88%) complete with 49% (61%) of contingency and management reserve for the remaining EAC (BAC).

Conventional construction activities and conventional facilities project staff continue to wind down. In addition to receiving LEED Gold certification and the Diamond Award, the highest category of award by the New York State chapter of the American Council of Engineering Companies as reported in February monthly report, the ring building has received a Grand award, the highest category of award in the National American Council of Engineering Companies 2013 Engineering Excellence Awards competition. In this competition, projects from throughout the world are rated on the basis of many factors including uniqueness and innovative applications, sustainable development considerations, complexity, successful fulfillment of owner's needs, and schedule and budget.

Schedule performance for accelerator systems continued to improve, with a monthly schedule performance index (SPI) of 1.93, +$1.45M, in March. The installation and integrated testing for booster and storage ring are making excellent progress and enhanced radiation shielding is being implemented. Superconducting RF cavity and cryogenic system fabrications are progressing well after various minor issues that caused schedule risks were mitigated. Productions of all types of insertion devices are making good progress.

Experimental facilities continued to maintain its schedule performance in all beamlines, resulted in a monthly SPI of 1.02, +$45K. Excellent progress continued in hutch and utility installation, and fabrication activities of beamline components at various vendor sites. Factory acceptance testing for some components has begun and delivery of the first major optical systems is scheduled.

The project will continue to strive to complete activities to enable initial commissioning of the NSLS-II facility (i.e., accelerator and beamlines together) with beam by June 2014. The critical path of the project now runs through booster Accelerator Readiness Review and DOE approval to start booster commissioning, followed by the commissioning of the booster and storage ring and delivery of the two new insertion devices. The project has 59% (10 months) of schedule contingency for the remaining duration of 17 months before the projected completion date of August 2014.

UPCOMING EVENTS

CSX2 BAT Meeting	Apr 25
Photon Shutter Preliminary Design Review (PDR)	Apr 29
7th International Workshop on Radiation Safety at Synchrotrons	May 8–10
Review of Incorporation of Elliptical Undulators in NSLS-II	May 29–30
Accelerator Systems Advisory Committee Meeting	June 20-21
DOE Review of NSLS-II Project	July 16–18
DOE CD-2 Review of NEXT Beamlines Project	Jul 30–Aug 1

ACCELERATOR SYSTEMS

Injector. The Linac-to-Booster Transfer Line, LtBTL-II, is complete. All components have been installed and tested, and integrated testing is in progress. For the Booster-to-Storage Ring Transfer Line, BtSTL-I, component installation is complete and the system is currently under vacuum. Magnets are still being connected to power supplies. The damaged quadrupole power systems (PS) for the booster were repaired and fully tested early in March. All booster magnets now have radiation shielding, which was the last ongoing activity in the booster tunnel. The booster downstream wall penetration is fully installed and the booster dump lead shielding has been installed. Poly sheets and aluminum skins are ready for installation. The extraction septum forward shield is installed, including the lead and poly. The aluminum skins still need to be installed but will not take much effort to complete. Many of the ~40 dipole shadow shield stands have been installed in the arcs. The stands will be loaded with lead bricks after final survey of the booster. The injection and extraction shield carts have been welded. The BtSTL-I quad and dipole shadow shield stands have been ordered from the vendor. The lead and poly shield assembly designs are being detailed .The BtS-II and SR-IS (storage ring injection straight) support stands are ready for installation**.** The Injector PPS (personal protection system) check-out is complete for Chain A. Chain B still requires some minor programming and will be completed in the early part of April.

Figure 1. Extraction straight and Booster-to-Storage Ring Transfer Line.

The BtSTL safety shutter is fully installed and is being electrically connected to the PPS network. All diagnostic systems for LtBTL and BtSTL-I have been completely tested with the computer programs that control them. Design of the major components for the storage ring kicker magnets has been completed and final manufacturing has begun. Drawings were released for the two major mechanical systems, the magnet core and support system. All purchased parts for the roll mechanism, such as gear boxes, have arrived. The drawings have been sent to BNL Central Shops and fabrication will begin in early April.

Great progress was made with the kicker electronics. All printed circuit boards for the pulser have been completed and a vendor is installing their electronic components. A local

vendor is building the pulser chassis and expects to finish in April. High-voltage power supplies for the kickers arrived. High-voltage diode modules for the pulsers were completed by PPT in Germany and will soon be shipped to BNL. The prototype kicker magnet and pulser were connected. Operating at 10 KV, the pulser made 4.5 KA 5.3 μsec half-sine pulses through the magnet. Specifications called for a minimum amplitude of 4.3 KA. Stability and magnetic field measurements of the prototype system will be completed in April.

Construction of the ceramic vacuum chambers is ongoing at the manufacturer. Vacuum flanges were welded onto the chambers by a subcontractor. The next step is Ti coating, which is planned for April. The storage ring injection septum is ready for shipment to BNL.

Vacuum. Sections (cells) C10 and C11 were successfully in-situ vacuum conditioned ("baked") in March, bringing the total of conditioned vacuum cells to 18. Twelve straight section chambers were assembled and some are waiting for survey. Three straights were in-situ baked, for a total number of four baked; one straight developed a short during NEG activation and needs to be evaluated. Two of three kicker ceramic chambers delivered to GSI for Ti coating have large leaks at the brazing joints. The septum vacuum chamber was re-cleaned at the vendor's facility and the septum is now ready for shipment. The programmable logic controller (PLC) for the BtSTL-I vacuum system has been tested and is now fully operational. All 30 of the SR vacuum PLCs have been installed. Preliminary testing of their logic using valve simulators has started. The vacuum electrical system for the RF straight was worked on with the RF Group.

Insertion devices. Damping wiggler full production is ongoing while some post-start action items from the production readiness review are being pursued. Final magnetic measurement for the EPU is ongoing at the manufacturer's facility. Procurement of the permanent magnet phasing/canting magnet, which is part of the EPU short straight section, has been initiated. The final design review for the EPU was conducted on March 20. The in-vacuum measurement system (IVMMS) is completed and being readied for shipment; it is expected to arrive at BNL around June 19. Some minor updates of the IVU21 (SRX) have been carried out to enable the use of air-casters for installation. The Utilities group is developing the cooling system schematic and piping system design for this device. The final design of the U20-IVU system has been fixed. The Factory Acceptance Test (FAT) for the first device is expected at the end of May. The final design review (FDR) for the IVU22 (IXS) has been approved except for the control system portion, where some features are being discussed with the vendor. The 3PW was received in March.

Mechanical engineering. The beamline front ends have suffered delays for various reasons previously reported, but significant progress has been made recently. The photon shutter bodies have been brazed, received, and inspected. All mask, photon shutter, and safety shutter Day One top assemblies have been released as revision 1. All photon shutter and safety shutter actuators are assembled and switches are being set. The final ray tracing has been released. A task force on front end safety design has looked into vulnerabilities of the front end safety systems that could result from possible failure of the equipment protection system. This issue will be resolved by minor design changes on lead collimation systems.

Mechanical utilities. Cooling water pump skid systems are nearing completion, with the systems for the first four pentants ready for acceptance testing. For P5, pump skids for Cu and Al water will be ready for acceptance testing by April 15.

Supplemental ring shielding. Designs for the supplemental shielding system for the booster synchrotron and the transport lines in the booster tunnel have been completed and presented to the safety committee for review. The process of releasing assembly drawings and installation travelers is in progress. The support systems for the booster supplemental shield are being fabricated. About half of the assemblies have been completed.

Power supplies. The main dipole PS (power supply) fabrication is complete and in final testing at the manufacturer's facility. A problem with the switch mode control circuit that causes higher ripple voltage on the output of the completed power converter has been solved. A mid-April delivery is planned for the first power supply; the second unit will be delivered by the end of April.

Multipole PS testing has been completed for the PS controllers for P4, and testing for P5 is in progress. All regulators needed for P1 through P3 are available for installation. Testing is in progress for the P4 and P5 devices. All power supply interfaces except those for P5 have passed testing, and work has begun on the P5 devices. The pre-testing for the alignment corrector power amplifier has been completed for P1–P4. The fast corrector power supplies are in the final stage of vendor design. Production low-precision temperature control chassis units have all been delivered and tested. The high-precision temperature controller chassis (used for BPM racks) have been received and tested for all pentants.

RF systems. Tests of the NSLS-II superconducting cavity cryo-module window has been completed by the manufacturer. Efforts are ongoing to get the correct the Cu plating of the stainless steel part of the waveguide input coupler. Cavity fabrication and assembly will be completed by mid-April.

Plans for chemical polishing, high pressure rinse, and bakeout are being refined with the manufacturer. Work on plan B for SR commissioning with RF is in progress. The RF group completed the HOM analysis and investigated the temperature dependence of the mode frequencies of the 7-cell PETRA cavity.

Installation. Installation of most booster technical components was substantially completed, meeting the CD-2 baseline milestone of Feb 2013. However, booster shielding, preparations for the Accelerator Readiness Review (ARR), and remnant issues from the linac incident are affecting the booster commissioning schedule.

Injector complex. Pulling of the BtSTL-I cables is almost complete. Installation of TL power supply rack components is in process, as is pulling of the BtSTL-II cables. Shadow shield stands are being installed. The shielding carts have been test-fitted and will be painted. The booster dump poly sheets are ready to be installed. EPOCH 6 survey work in the linac and

booster is complete. Final alignment of the booster will start in mid-April. The BtSTL-II stands will be installed in the SR tunnel in mid-April.

Storage ring. Pulling of timing fibers throughout the SR is complete. Installation of the front end and straight section cable tray is complete. The survey team is currently working in P1 on the front ends, injector survey/EPOCH 6, vacuum straights, and the profiling test. The SR tunnel PPS interlock gates have been moved further downstream so they are not in the middle of the IDs. Front end stands have been installed in cells 3, 5, 11, 23, and 28. Floor preparation at the other front end locations is in process. Shielding installation at the SR ratchet wall DIW piping penetrations is in process (50% complete). The pulling of the special diagnostic cables will start in early April.

In P1, installation of the aluminum DIW system drops and functional testing of the associated pump skid will start in early April. Final alignment of magnet girders ("profiling") by the survey team is in process (60% complete). Each cell is taking about 1 week. In P2, installation of cable tray in the SLM diagnostic hutch is complete. The magnet DIW connections need to be reworked and retested in April, once the low-current power supply testing is complete. In P3, functional testing of the SB-3 pump skid is complete. Hand-off of the P3 PCHW is complete; valves to the racks will be opened on April 1. Installation of the DIW drops in P3 is almost complete, with pressure testing to start on April 1. Final checks of the PPS cabling are in process. The installation of BPM receivers and the BPM timing in P3 is complete. Chamber installation for the vacuum straight section is in process. The grounding of the girders is complete.

In P4, power supply installation is in process and will be completed in early May. Bellows installation is complete; bakeout is ongoing. The vacuum straight installation is in process. Installation of the BPM electronics in P4 will start in early April. The installation of the P4 DIW drop stands has begun. PPS cable termination is complete; wiring to the panels is in progress. In P5, pulling of PPS cables is complete. Pulling of multipole magnet cables is in process and should finish in mid-April. Bellows installation is underway.

In the RF buildings, installation of the cryogenic plant has begun. AC cable pulling in the compressor building is complete. The cryo phase separator and stand have been rigged and secured to the RF mezzanine (Fig. 2). The manifold box (Fig. 3) will be rigged there during the week of April 1. The installation of the LN2 piping along the SR mezzanine will also start that week. The cold box fixture has been assembled. Core drilling through the fire wall from the RF mezzanine to the SR mezzanine for the cryo piping is complete. In addition, the HVAC duct on the RF mezzanine was installed in late March. The plumbing installation work in the compressor building is complete. Permits are in place and workers have been trained, allowing pipe welding to begin from the tank farm to the compressor building, where a welding area has been set up.

Figure 2. Cryo phase separator.

Figure 3. Cryo manifold box.

All storage ring girders are installed and water manifolds with plastic restrictor lines are pressure- and flow-tested. All braided feed lines are installed. Fast corrector mounting components are assembled and waiting for coils.

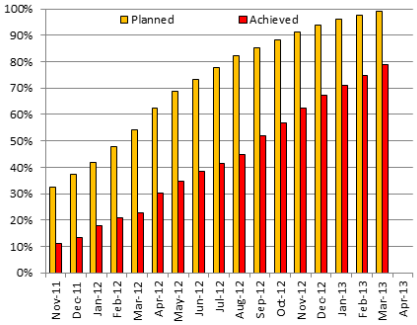
Integrated testing. Low-power testing (100W) in the booster continues, to enable work on the cavity tuner ramp blanking circuit. The Controls group has placed a workstation near the RF racks to facilitate use of the EPICS interface. Low-current testing of the LtBTL magnet power supplies is in process.

Injection and extraction kicker testing is ongoing. Booster PPS interlock chain B check-out is ongoing. Low-level testing of the booster RF cavity is ongoing. Extended integrated testing of booster components and systems will start in early April. All multipole girders in P1–P4 have been hydrostatically tested,; leaks have been repaired and retested. P2 low-current testing of the power supplies is in process. Pre-testing of the magnet power supplies is in process in P3. Pressure testing of multipole girders is complete in P4.

Table 1. NSLS-II Accelerator installation progress at the end of March 2013.

Achieved

	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13
Mechanical Utilities	38%	38%	38%	39%	60%	61%	62%	68%	73%	74%	78%
Electrical Utilities	61%	65%	69%	72%	75%	80%	85%	91%	95%	96%	99%
Magnets	50%	62%	65%	68%	73%	78%	87%	93%	99%	100%	100%
Vacuum	10%	13%	14%	15%	21%	30%	38%	39%	44%	53%	65%
Power Supplies	15%	18%	22%	27%	30%	36%	43%	48%	54%	65%	70%
Instrumentation	27%	31%	38%	36%	37%	46%	53%	58%	63%	66%	74%
Frontends	0%	0%	0%	0%	0%	1%	2%	6%	6%	11%	15%
RF	27%	32%	33%	35%	38%	40%	45%	47%	49%	52%	57%
Inje Straight	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
LINAC+Booster	27%	33%	42%	55%	74%	82%	92%	95%	96%	97%	97%
Total	**35%**	**38%**	**41%**	**45%**	**52%**	**57%**	**63%**	**67%**	**71%**	**75%**	**79%**



EXPERIMENTAL FACILITIES

Experimental facility progress continued in March with manufacturing of beamline components at vendor locations proceeding on or close to the planned schedules. Factory acceptance testing for some components has begun, and delivery of the first major optical systems is scheduled. The XPD double Laue monochromator was tested at the Diamond Light Source. The results demonstrate how the monochromator design will perform under the extreme thermal environment expected for the damping wiggler source. Small improvements to the thermal contact geometry are likely to further improve the monochromator performance once installed at the NSLS-II. Hutches are making good progress, with 15 hutches erected and all panels for the remaining hutches delivered to the NSLS-II site. Acceptance testing is proceeding: 23-ID-A is accepted and six other hutches have been released for acceptance testing by the hutch vendor. Some remediation work has been identified and is underway. The hutch vendor has increased the installation effort and has initiated a 6-day work week, working 10 hours per day. This added effort has improved the hutch assembly performance. Delays in accelerator installations and hutch delivery schedule require revision to the utility installation schedule. This revised planning has been initiated.

CHX. The procurement of an ultra-fast pixelated x-ray detector for coherent scattering and x-ray photon correlation spectroscopy advanced and is now complete with a contract awarded to Dectris, Inc. The XPCS pixelated detector will be one of the most important instruments at the beamline. The CHX team also went through a safety review and took beneficial occupancy of one of the laboratories in LOB 3. Eventually this will be a wet lab used by external users and in-house researchers, but for the remaining time of the project it will be used as an assembly lab for the CHX beamline.

Other important procurements, such as the Transfocator, SAXS table, and the list of additions to the Optics package, have been finalized and approved by the internal teams and are now close to an official RFP.

CSX. The differential pump delivered by Gamma Vacuum was tested and verified to deliver two orders of magnitude of differential vacuum. Design of the Toroidal mirror package, the most complicated for the CSX polarization control branch, is advancing. The vendor is making final touches and running simulations to check the component's performance. Delivery and installation of the monochromator package will occur in September of this year. Reports from the vendors of the gratings and mirrors indicate that beamline optics work is currently on schedule. Final vacuum design for CSX is nearly complete; some vacuum components are being purchased.

HXN. Both hutches (3-ID-A and 3-ID-B) are complete and handed over to NSLS-II by GPS, Inc. The installation of all utilities is about 95% complete. All parts of the phase 1 component package have been manufactured, assembled, and scheduled for factory acceptance testing in early April, 2013. The HXN group's work on developing new phase-contrast imaging techniques using multilayer Laue lenses (MLLs) and its application for investigating solid oxide fuel cells (SOFCs) were published in *Scientific Reports* (Fig. 4).

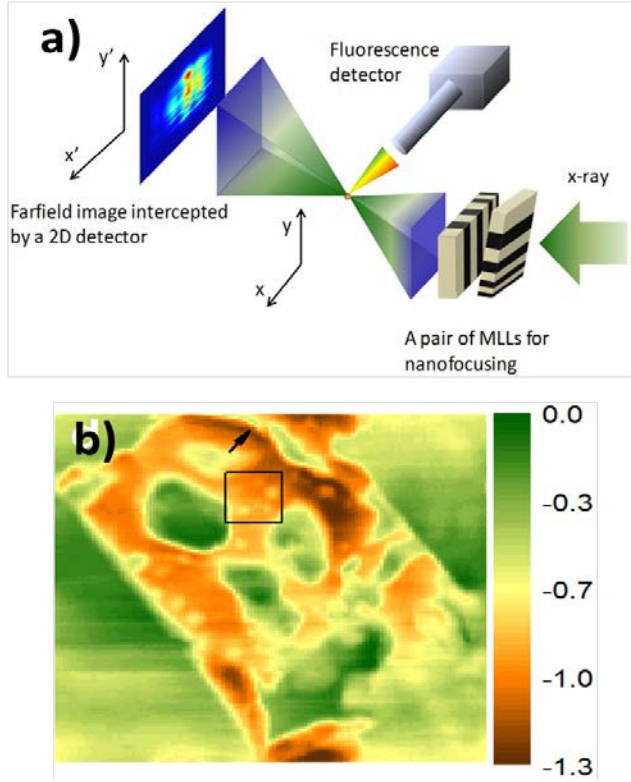


Figure 4. A new imaging technique using multilayer Laue lenses (MLLs) was developed a) and used for quantifying the nanostructure of solid oxide fuel cell samples b). The results were published in *Scientific Reports* (Yan et al., Sci. Reports 3, 1307 (2013)).

The nanopositioning R&D work on performance characterization of a prototype MLL microscope is featured on the cover of another publication (Fig. 5).

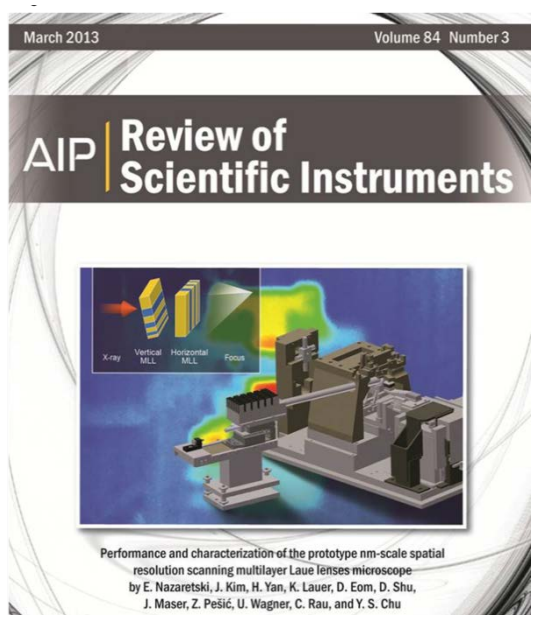


Figure 5. R&D work developing a prototype MLL microscope is featured on the cover of *Review of Scientific Instruments* (Nazaretski et al., Rev. Sci. Instrum, 84 033701 (2013)).

IXS. The contract award for the HRM vacuum chambers was placed on March 22 with a delivery date of July 26, 2013. Procurement and fabrication of the remaining components for the HRM are in progress. The installation and integration of the HRM will be carried out by the IXS team once the chambers are delivered and will take place over the summer. The mechanical parts of the IXS Strip detector have been fully assembled and its vacuum tested (Fig. 6). The sensor elements have been fabricated and tested. Full assembly of the detector, including wire bonding of the sensor element, is planned for April. Testing with x-ray will be carried out as soon as the full assembly is completed.

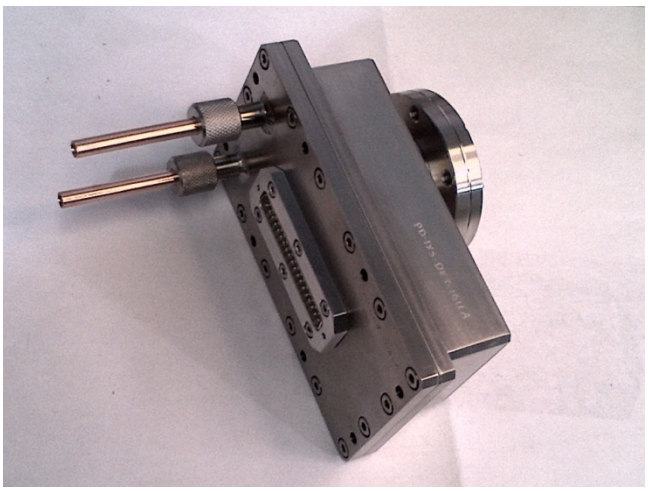


Figure 6. The IXS Strip detector housing and internal cooling mechanism as completed and assembled.

SRX. The SRX team continued to monitor very closely the progress vendors made in fabricating the components with both big optical packages, the Beamline Optics and the KB Mirror System. A major activity continues to be the work on the design of sample environment and sample stages in context with the right positioning of the interferometer control of stage movement and the right placement of the fluorescence detectors. Figure 7 shows the most recent design of the sample stages with the rotary stage for tomography in place and the visible light microscope on top to continuously monitor the sample during the measurements with x-rays.

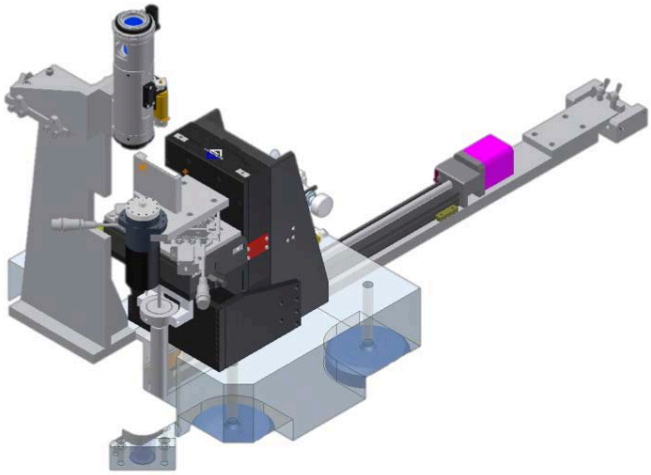


Figure 7: Sample stage design for collecting fluorescence tomographic data.

XPD. Work orders for the XPD Beamline Components are going forward. Work on several water-cooled sub-components and brazing of vacuum parts is underway. An Engineering Change Notice (ECN) was released on March 28 that defines configuration changes to the Bremsstrahlung Collimator 2, White Beam Screen 1, and additions to the End Optical Bench. These items may not be fully available at the Factory Acceptance Tests scheduled for the beginning of June, but this ECN should not impact the overall schedule of the beamline components. Figs. 8 through 10 show work in progress on the filter unit.

Figure 8. White Beam filter Assembly Vessel: All the Silicon Carbide (SiC) filters are mounted in a single vessel on 5 pneumatically driven axes. Provision is made on the vessel for the mounting of cameras. On the side of the vessel are 5 viewports and camera mounts, centered on each filter.

Figure 9. Pneumatic actuators for the SiC filters

Figure 10. SiC filter cooling loops: cooling is achieved by clamping a filter between two cooled copper blocks.

Manufacture of the Laue-Laue monochromator (DLM) Part 1 is complete. This comprises crystal 1, crystal support and bending mechanism, all motions and sensors, vacuum vessel, and cryogenic system (Figs. 11 and 12, p. 7). The FAT for Part 1 took place 2/26–3/7/13. It was then installed at beamline I12 at Diamond Light Source (DLS), where comprehensive measurements were carried out to verify its performance. The XPD team tested several in-beam configurations and examined the mechanical, thermal, and optical performance of the DLM crystal 1 using the I12 wiggler white beam. The DLM had been identified as a high-risk component; operating Part 1 in an x-ray beam at an early stage of the construction project was an element of the risk mitigation strategy. This experiment is a major achievement and milestone.

Figure 11. View of XPD vacuum vessel in hutch 2 of beamline I12 at Diamond Light Source. A 300l/s ion pump ensures pressures below 5x10-7 mbar are reached. The vessel is separately supported from the internal optics via a set of large diameter legs that bolt onto a jack table supported by the facility floor.

The vacuum vessel for the XPD Vertical Focusing Mirror was shipped to the contractor. The FAT is scheduled for the end of April and scheduled date of delivery is May 30.

The FEA for the XFD Diffractometer is complete and will be reviewed by the project. Adjustments to the granite elements are complete and drawings have been released for purchasing. The design of the sample table is 80% complete and design changes to the 3-Axis Spindle Assembly are 95% complete. The linear bearings have been ordered. The manufacturing process of the Spindle Housing casting is on schedule and should be complete by the end of April. The FDR is scheduled at BNL on April 9; the October delivery is unchanged.

The Data Acquisition (DAQ) board for the XPD X-ray Photon Counting Pixel Area Detector is built and programmed. Software development is on hold pending the hiring of a new engineer. Assembly of the chips is in progress.

Lead/steel enclosures 28-ID A, B, and C are progressing well. Enclosure 28-ID-C is released. 28-ID-A and B have been successfully surveyed.

The solicitation for the Multi-Analyzer Crystal X-ray Detector was posted on March 18; responses are due April 22. The SOW and Specs for the robotic sample manipulator are finalized and being routed for approval. The RFQ for the X-ray Flat Panel Detector was released.

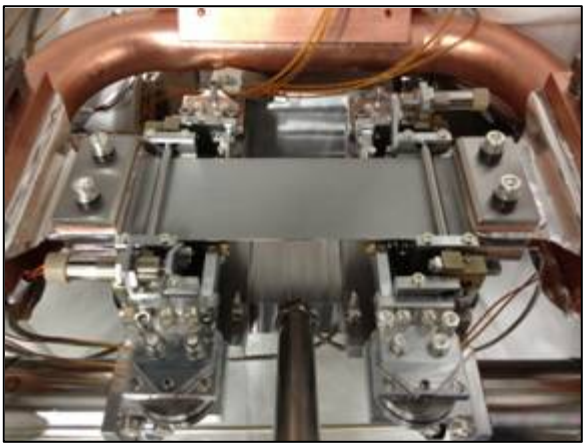


Figure 12. The XPD crystal and the cryo-lines. The proposed cooling solution will employ an isolated liquid nitrogen circuit which is only loosely coupled to the crystal via annealed silver foils. The bender consists of a pair of upper rollers whose positions determine the sagittal bend and a pair of lower rollers whose distance can be varied to control the anticlastic (meridional) bend.

CONVENTIONAL FACILITIES

Conventional construction continued its excellent progress through March. All base scope construction is substantially complete. LOBs 3, 4, and 5 are now occupied. LOB 1 is ready for occupancy with move-in planned for later this year. The HXN end station building adjacent to LOB 3 is completed and beamline installation activity is now underway.

The procurement package for the construction of a second satellite building as an investment for the future beamline has been released and a pre-bid meeting with potential bidders was held. Proposals are due on April 9 and the plan for the construction management of this additional scope has been formulated and is in place.

Some minor change order and punchlist work continues, so there is still a contractor presence on the site. However, both the ring building and LOB contractors have demobilized most of their field teams. The daily contractor workforce will continue to diminish over the next few months as punchlist and warranty work is completed. Remaining work includes final dress-up of site grading and landscaping in localized areas, painting and carpentry punchlist work, and final adjustments of controls as part of commissioning.

Following completion of all physical work at the site, final demobilization and contract closeout will commence. It is anticipated that both the ring building and LOB contractors' site presence will end by June 2013, although they will continue to be available for any warranty work. The Facilities Division staffing level is also being reduced in accordance with the ramp-down plan. However, the core of the Facilities Division team remains to oversee the closeout of contractor activities.

NEWLY HIRED

Marve Bobis-De Long – Administrative Services Assistant – Training
April Spencer – Administrative Services Assistant – Training
Amy Xia – Radiation Safety Physicist – ES&H
Weihe Xu – Postdoctoral Research Associate – Photon Division

ENVIRONMENT, SAFETY, AND HEALTH

Work continues to address the actions identified in the corrective action plan (CAP) associated with the beam mis-steering event that occurred at the linac on May 29, 2012. Staff are being recruited from other BNL organizations and through contracts to augment existing PS Staff to ensure timely completion of these actions. Commissioning activities will not resume until all necessary corrective actions have been satisfactorily implemented and a successful Accelerator Readiness Review is conducted.

All BOREs (Beneficial Occupancy Readiness Evaluations) for the NSLS-II facility have been completed. The BORE process ensures that all life safety and code compliance requirements are in place prior to staff occupying the LOBs. Work to close out the remaining post-occupancy items from the ring building continues and is nearly complete. Operational Readiness Evaluations (OREs) were conducted for the first three of ten laboratories in LOB 3, and pre-start findings have been completed. These labs are being used for beamline component assembly and component testing. The ORE process, similar to the BORE, ensures that all life safety, code compliance, and work planning/controls are in place prior to commencing with laboratory work. Conventional construction activity is nearly complete; work continues to address punchlist work. Painting of the roof deck in P1 is ongoing to correct a paint delamination issue. The repainting job is approximately 60% complete and is expected to be done by the end of June. Coordination efforts between the contractors and ongoing accelerator and beamline installation/testing work in the area have been good. The contractor is working with technical staff to expand the work areas to accelerate completion of the work early.

Increased emphasis is being given to safety as the contractor demobilizes. Historically, this phase of a construction project results in increased injuries and claims. Enhanced communications and job planning continue to be practiced in order to minimize this risk.

COST/SCHEDULE BASELINE STATUS

The current-period schedule variance (SV) for the overall project is +$1.06M with an associated schedule performance index (SPI) of 1.16. This indicates strong schedule performance for the month due to positive activity in most areas of the project, including Accelerator Systems, +$1.45M, and Experimental Facilities, +$45K. The cumulative SV for the project has green status with a SPI of 0.96 (-$31.9M).

The current-month cost performance index (CPI) for the NSLS-II project is 0.67 (-$3.8M). The cumulative cost variance (CV) for the project is green at 0.99 (-$9.2M).

The Experimental Facilities cumulative SPI, 0.88 (-$5.7M), has continued to improve from previous months due to better monthly schedule performance by all beamlines contributing to an overall positive monothly SV of +$45K and SPI of 1.02.

The Conventional Facilities schedule performance for March is slightly negative with a SPI of 0.82 (-$80K), red status. The cumulative Conventional Construction SPI has green status at 1.0 (-$860K).

Accelerator Systems (WBS 1.3) had positive schedule performance in March of +$1.45M and a SPI of 1.92, due to continued positive schedule performance in many areas. The cumulative Accelerator Systems schedule performance continued to improve, with a SPI of 0.92 (-$20.8M), resulting in green status.

Accelerator Pre-Ops (WBS 1.6.2), Integrated Test, is again behind schedule in the current month. There is a negative schedule variance (-$361K) contributing to a continued negative cumulative schedule performance for all of Pre-ops WBS 1.6: (-$4.5M), SPI 0.77, red status. This schedule variance is due to delays in installation, which have in turn delayed integrated testing planned in WBS 1.6.2.

The Project was approximately 87% complete as of March 31 with approximately 61% remaining contingency/MR on BAC work remaining.

At the end of March there was approximately $65.5M remaining of Contingency and MR on the Project, based on the PCRs processed and approved through March 15. (Remaining MR is $3,391K.)

The Project EAC is $874,327K and MR/Contingency is approximately 49% of EAC work remaining. Project percent complete based on EAC work remaining is 85%.

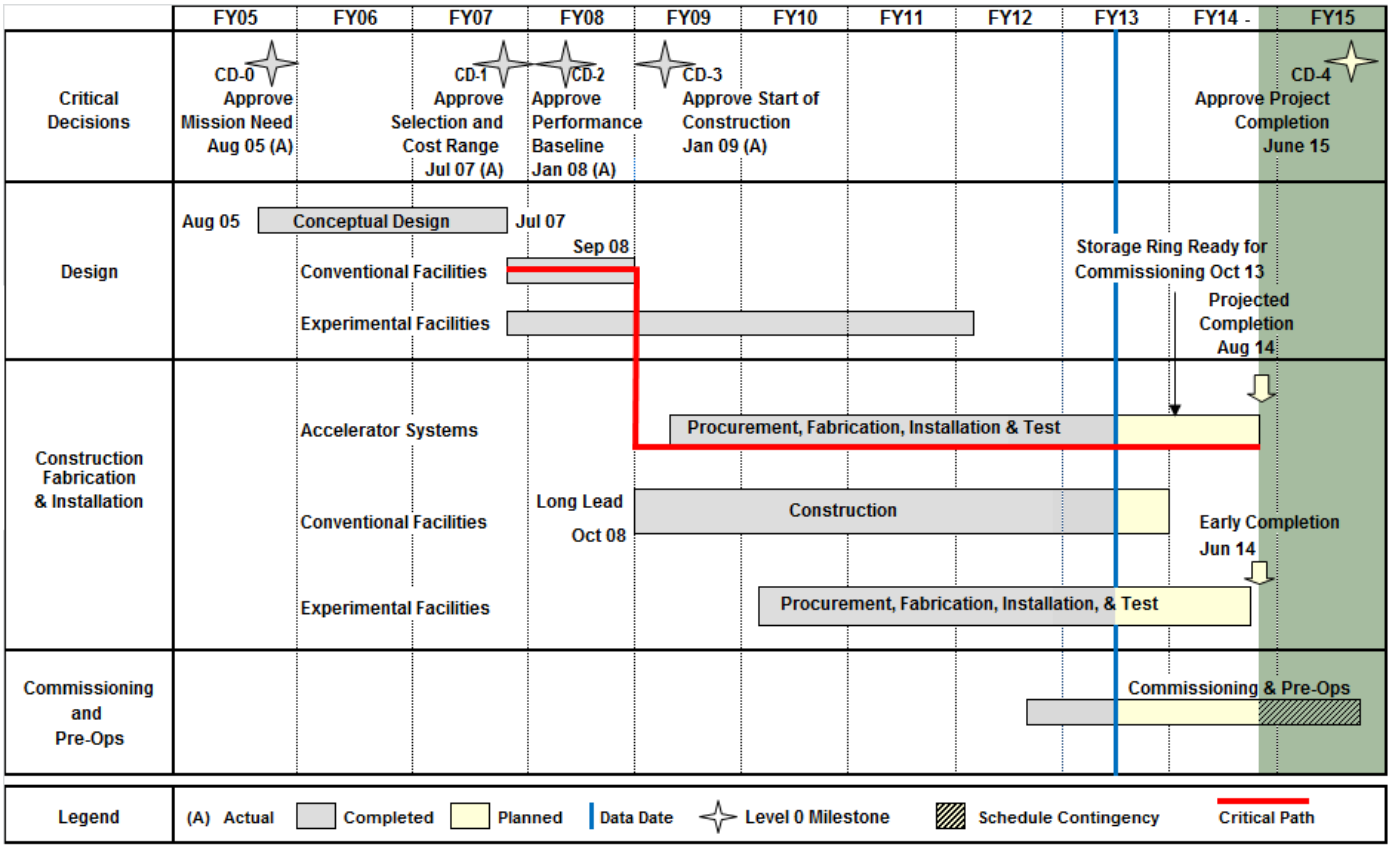
The critical path remains the same as last month with the early completion of the project at August 2014, due to the Insertion Device scope additions delivery schedule. There are now 10 months of float between the Project's early completion milestone and CD-4, with approximately 37% schedule contingency.

ACRONYMS

ARR	Accelerator Readiness Review
ARRA	American Recovery and Reinvestment Act
BAC	Budget At Completion
BHSO	Brookhaven Site Office (of DOE)
BORE	Beneficial Occupancy Readiness Evaluation
BSA	Brookhaven Science Associates
BtS	Booster-to-Storage Ring
CAP	Corrective Action Plan
CHX	Coherent Hard X-ray beamline
CPI	Cost Performance Index
CSX	Coherent Soft X-ray beamline
CV	Cost Variance
DAQ	Data Acquisition
DIW	Deionized Water
DLM	Double Laue Monochromator
EAC	Estimate at Completion
ECN	Engineering Change Notice
EPU	Elliptically Polarizing Wiggler (beamline)
EVMS	Earned Value Management System
FAT	Factory Acceptance Test
HRM	High-Res. Monitor; Harmonic Rejection Mirror
HVAC	Heating, Ventilation and Air Conditioning
HXN	Hard X-ray Nanoprobe beamline
ISR	In-Situ Resonant X-ray Studies beamline
IVU	In-Vacuum Undulator
IXS	Inelastic X-ray Scattering beamline
LOB	Lab–Office Building
LtB	Linac-to-Booster
NEXT	NSLS-II Experimental Tools (beamlines)
ODH	Oxygen Deprivation Hazard
ORE	Occupancy Readiness Evaluation
P1, P2…	Pentant 1, Pentant 2, etc.
PCHW	Process Chilled Water
PDR	Preliminary Design Review
PLC	Programmable Logic Controller
PPS	Personnel Protection System
PS	Power Supply
RF	Radio Frequency
RFQ	Request For Quotations
SAXS	Small-Angle X-ray Scattering
SLM	Synchrotron Light Monitor
SOFC	Solid Oxide Fuel Cells
SPI	Schedule Performance Index
SR	Storage Ring
SRX	Submicron Resolution X-ray Spectroscopy
SV	Schedule Variance
TL	Transfer Line
WBS	Work Breakdown Structure
XPD	X-ray Powder Diffraction beamline

The NSLS-II Project is being carried out to design and build a world-class user facility for scientific research using synchrotron radiation. The project scope includes the design, construction, and installation of the accelerator hardware, civil construction, and experimental facilities required to produce a new synchrotron light source. It will be highly optimized to deliver ultra-high brightness and flux and exceptional beam stability. These capabilities will enable the study of material properties and functions down to a spatial resolution of 1 nm, energy resolution of 0.1 meV, and with the ultra-high sensitivity necessary to perform spectroscopy on a single atom.

DOE Project Milestone Schedule



Key Personnel

Title	Name	Email	Phone
Federal Project Director	Frank Crescenzo	crescenzo@bnl.gov	631-344-3433
NSLS-II Project Director	Steve Dierker	dierker@bnl.gov	631-344-4966

The NSLS-II Project Progress Report is prepared monthly for submission to the Department of Energy.

This condensed version is available to the public at the NSLS-II website in PDF format. For questions or comments contact the editor, Kathleen Robinson, at krobinson@bnl.gov,

or via mail at: Room 37, Bldg 830M, Brookhaven National Laboratory, Upton NY 119873.