National Synchrotron Light Source II

October 2013 Activity

A view from the northeast shows a crane at work near LOB 2 (at far left), where work proceeds on Satellite Endstation Building 2.

report due date:
November 20, 2013

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OVERALL ASSESSMENT

The National Synchrotron Light Source II Project continued to make excellent technical progress overall. There was, however, a current-period SPI of 0.77 as the result of scheduled procurements into WBS 1.06.04, special process spares, which did not occur as planned. The spares plan was not adequately time-phased to reflect receipt of the remaining spares, which are expected for receipt in mid-FY2014. This large variance masks technical achievement in Accelerator Systems (current-month SPI 2.18) and Experimental Facilities (current-month SPI 0.97). The cumulative SPI for the project is 0.97 and the cumulative CPI is 0.99. The project is 92% complete with 54% of contingency and management reserve for the remaining BAC, including all scope additions. The project has 10 months of schedule float from the early completion date for original project scope and CD4 in June 2015.

Accelerator Systems had excellent schedule performance this month, continuing to recover from previous delays on installation of the storage ring (SR) and integrated testing. The installation of all accelerator systems is about 95% complete. Experimental Facilities made very good progress in October with ongoing utilities installation and the completion of some contracted equipment installations. While there are some minor vendor equipment installation delays, Experimental Facilities continues to hold steady at roughly 2 months with respect to the baseline schedule. Conventional Facilities activities continue with the completion of punchlist items on the NSLS-II buildings, which are anticipated to be complete by the end of December. In October, construction of the Satellite Endstation Building 2 continued, with installation of electrical utilities and pouring of the footings and floor slabs.

A major activity for the project was preparation for the injector commissioning ARR (Accelerator Readiness Review). The Instrument Readiness Review (IRR) pre-start findings were closed and verified by the end of October, and a video teleconference was held on October 29 to prepare for the ARR site visit, which is planned for November 4-7. The initiation of injector commissioning, planned for December 2013, is a significant event for the project as it works to achieve completion.

UPCOMING EVENTS

Accelerator Readiness Review for NSLS-II Booster	Nov 4–7
NEXT ISR Beamline Advisory Team (BAT) meeting for ISR	Nov 8
NEXT Final Design Review (FDR) for the ISS beamline	Nov 14–15
FDR for the HXN beamline SAXS Table	Nov 20
Preliminary Design Review NEXT Phase 2 Lead Hutches	Nov 21
DOE 'Mini-review' of NSLS-II Project	Dec 4
EPICS4 Area Detector meeting	Dec 4–6
FDR for the HXN Endstation Vacuum Enclosure	Dec 5
NEXT Final Design Review	Dec 11–15
PS Science Advisory Committee meeting	Dec 18–19
CSX2 BAT meeting	Jan 2014
SR Instrumentation Readiness Review (IRR)	Jan 6-10
SR Accelerator Readiness Review (ARR)	week ending 2/21/14

ACCELERATOR SYSTEMS

Vacuum. Cell C30 was successfully baked after the installation of scrapers. The C28 DW (damping wiggler) straight was successfully baked after the installation of uncoated DW chambers. The C16 straight had the Day-1 chamber installed and was re-baked successfully. The drift chambers and tapers for C24 were installed and leak checked, ready for installation of the 7-cell warm cavity. Two DW chambers were NEG coated at the vendor site and are ready for shipment to BNL. Ceramic chambers no. 3 and 4 for the kickers were coated and are ready to be shipped. All compressed air lines for the gate valves around the RF straight were completed. Orders for NEXT vacuum components have been placed. All 10 front end (FE) vacuum PLC chassis arrived and were tested successfully. Five of them are already installed in FE racks. Vacuum cables for five components of the project FEs were pulled into place and terminated. More than 50% of the storage ring (SR) RTD sensors are connected and readable through EPICS.

Magnets. All 90 fast correctors are assembled and tested, and 74 of them have been installed in the SR. The remainder will be installed after the straight sections have been installed and baked out.

Front ends. IXS, HXN, CHX, and XPD ray tracings have been submitted for checking. Final drawings and designs were released for safety shutter assemblies, ratchet wall collimators for the CSX and SRX front ends, and fixed masks for the SRX and CSX beamlines. The Front End Task Force final report was updated to include canted front ends.

Modified collimators for all front ends were received from BNL Central Shops, as well as all ratchet wall collimator weldments. The lead bricks for collimator-2 have been received. All FE cables have been pulled and labeled; 90% of terminations are made in the tunnel for vacuum cables. All the absorbers are installed and plumbed. All air circuits and high- and low-flow water circuits are now finished except for the fixed mask to complete the high-flow circuit in 28-ID. There is a bypass water line installed to replace the missing slits at all front ends. Tooling is completed to move the safety shutter stand in order to install the ratchet wall collimators. All water circuits have been flow- and pressure-tested at 150 psi.

Radiation shielding. The mezzanine penetration shields for cells 22 and 24 and the 29ID corner shield are complete. A number of drawings for wall plugs and penetration shields have been received. All plate material for septum shield frame assemblies and the support frame material for the injection straight are on order. Parts for the septum shield frames are being fabricated by BNL Central Shops. Prototypes for the G4 and G6 frames have been manufactured. Installation of the SR G4 shields has started. All 59 ratchet wall collimator penetrations are filled with concrete blocks.

RF. The concrete core drilling for the cryogenic penetrations to the tunnel was performed by Howell. The cavity cryoducts are now installed and two have had their interconnects welded. The final vacuum-jacketed line between the manifold box and ambient heater has been delivered and will be installed this week. This will complete the major piping

installation; some small oil recovery tubing is all that is remains to be done. All cold piping is installed and leak tight. The cryo-lines to the RF cavities are being surveyed, after which the vacuum jackets will be welded shut. A successful LESHC review of procedures resulted in a short list of action items. Five existing draft procedures need to be completed, and an additional iitem added as a prestart action. Another action item is to have the control room manned whenever the cold box is cold. We have always assumed this, but had not communicated it formally. This staffing requirement will be taken into account when planning 24/7 coverage in the control room. The contractor Linde has prepared a punchlist of open items. Completing the tasks (mostly leak checks and pump and purge activities) is likely to take about 4 weeks. A walk down of the entire system discovered capped warm return piping that was supposed to run to the cavity locations. The original design did not have valves between warm return lines and the cavities. We have ordered valves and will instruct Linde to install them and cap the pipes after the valves. The entire warm piping system from cavities to compressors will need to be pumped and purged a second time when the cavities arrive. An engineer from Linde was on site to assist in planning the acceptance test procedures and the architecture of the PLC programming of the valve-box/cavity PLC.

Leak checks of the liquid nitrogen system are completed; we are ready for first fill and commissioning. The system is complete and ready for commissioning. The schedule for the superconducting cavity delivery to BNL has slipped by 1.5 months. Final assembly of the cryomodule is being driven by fabrication of the HOM dampers, particularly the brazing cycle of the ferrite/elkonite assemblies. The HOM damper will be installed in the blockhouse for commissioning with the cryogenic system. We will need to have the vent line system installed by that time. The first-cavity string has been assembled (Fig. 1). The cavity vent line piping design has been completed through the tunnel roof. Work continues on the layout for the blockhouse vent line system. This is the last of the major design and fabrication tasks we have.

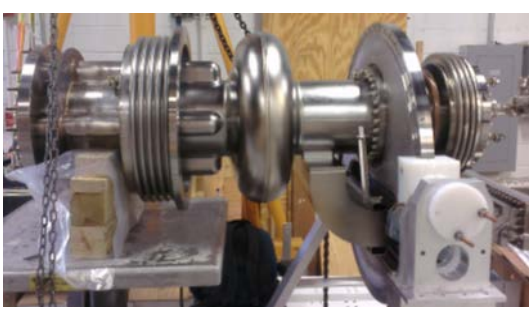


Figure 1. Cavity short-string after successful ultra high vacuum leak check.

The injector 500 MHz Master Oscillator (MO) low-level RF phase compensation controller firmware has been completed and is ready to be rolled out. The injector building MO phase compensation circuit has been running for testing purposes since early October .

The axial coupler for the Landau cavity that was designed to not excite the TE10 mode has been fabricated and installed in the landau cavity by Niowave and should arrive at BNL the second week of November. We will plan the horizontal test of the cavity and seek LESHC approval for the test in the next 2 months. Drawings have been signed off. This was the last item needed for the requisition for offers to be released to industry.

The Petra 7 cell cavity planned for use in the storage ring has been RF conditioned to 2.4 MV (103kW), which is 20% over the 2MV required for SR commissioning. The vacuum is in the 10E-8 range with 103 kW forward power. We plan to install the cavity first week of November.

Insertion Devices. All DW have been received at our Magnetic Measurement laboratory, including all controls racks, cabling, outriggers, air casters, rigging hardware, and safety guards. Also received and in temporary storage at B740 are two crates of spare magnets and tooling. Installation of DW1 and DW2 has been completed at Cell 28 and both control racks are now fully cabled. The fourth unit in the measurement room has been found to have faulty wiring. Some of the correction coils could produce only 30% of field integrals, compared to others.

The problem with coating of the EPU vacuum chamber has been resolved. It is being carried out now by an experienced vendor. Replacement of the IVMMS vacuum motors with atmospheric motors has been completed with implementation of a trajectory compensation scheme. The IVU22 undulator for the SRX device is ready to be shipped. Magnetic measurements have been completed for the canting magnets First Article. Performance looks consistent with the manufacturer's Hall probe data. Rolloff in the integrated dipole at the extreme outer limits of the "good field" region reaches 0.3%. The Production Readiness Review (PRR) has been completed. Shipment of the first completed IVU20 has been rescheduled for the first week of November. The PRR for the IVU22 (ISX), including all subsystems, has been scheduled for Nov. 12 and the PRR report (which includes vacuum systems) is forthcoming. The two dual-channel ion pump controllers from BNL inventory have been received by the Contractor. A sample coated permanent magnet has been received for test and inspection. Permanent magnet data from the supplier Vacuumschmelze (ordered 2 months after PDR authorization by BNL) have been analyzed and approved by BNL. The vendor has received the fabricated structural frame (FDR authorization by BNL given on 3/7/13). The contract for magnet holder component fabrication has been re-bid. This item is on the critical path and delivery dates were unacceptable. Workaround planning is being done, including: fabrication of special tooling to enable flip coil measurements to bypass holder production delays, arrangements for partial deliveries, contract incentive offers, and possible shift work for production. Nevertheless, this slow progress and iterations have added to scheduling delays.

Installation. The end date of installation without IDs is currently Jan. 2014 (though the vast majority will be complete by the end of November). See the table and graph on p. 4.

Mechanical utilities. The installation of the DI piping to the cell 24 RF straight is in process (Fig. 2) and will be complete in November. The cooling tower piping reinstallation is in process (2 of 3 bypass valves have been installed). The system

should be ready for testing in late November. The installation of the insulation for the P1 and P4 PCHW heat exchangers is in process. The capillary tubing installation is in process for the flow meters. The P1 aluminum pump skid has been pressure tested, flushed, and is running. The P2 aluminum pump skid pressure testing is complete; P3 testing is due to begin. The building of the P5 aluminum pump skid polishing loop is wrapping up. PCHW has been piped to the damping wiggler (DW) racks. The tie-in of DI water to the cell 28 damping wiggler absorbers is complete, with tie-in to cell 8 starting. The installation of the SR compressed air isolation valves throughout the SR tunnel is complete.

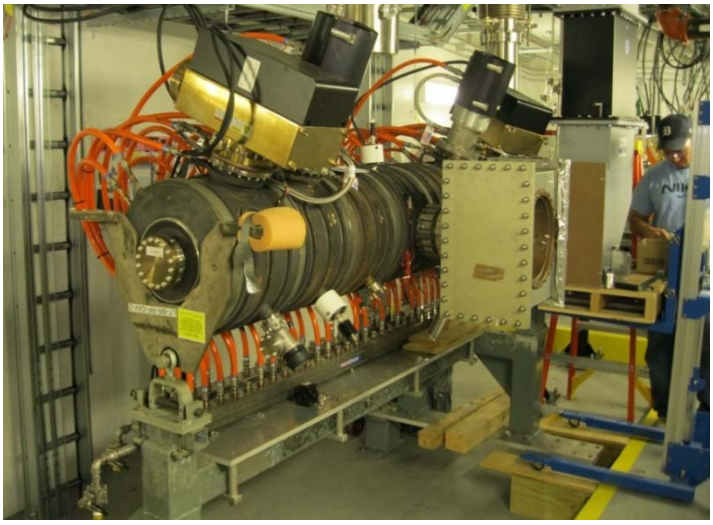


Figure 2. Warm cavity cell 24 RF straight.

Electrical utilities. Installation has been completed for the front end interlock boxes, as well as the cable tray in the cell 24 RF straight. Installation of the cable tray for the IVUs and EPUs will start in early November. The installation of additional battery backup for the cryo interlocks and additional power on the upper mezzanine in the RF building is complete.

Insertion devices. The first two DWs have been transported to cell 28 (Fig. 3); cable pulling to them is in process. The third DW (#5) has been transported to SB-5, where it will be stored before being installed in cell 18 in December. The fourth DW is in the magnetic measurement lab. The last DW and associated racks arrived on Oct. 17. The drilling of the floor of the other two DW straights is complete and scarifying will start.

Figure 3. Cell 28 damping wiggler straight.

Front ends. Cable pulling is underway in cells 8 and 18 (baseline front ends are complete). Compressed air tie-ins in cells 23, 28 and 3 are complete. Survey of stands is in process. Collimators have been received from rework and installed. Absorber installation is in process for all but the XPD. Plumbing work is complete with the components that are available. A safety shutter stand removal test was performed to verify that the cables are long enough for the stand to be removed for installation of the ratchet wall collimator.

Survey. Profiling of the SR magnet/girders continues (25 of 30 are complete). Other survey work included the DW straights, booster final survey, SCRF cavity, RF cryoducts, diagnostic stands, front end stands, SR correctors/ absorbers/ gate valves, and beamline support.

RF. Modifications to the SR tunnel roof through-holes are complete and the cryoduct has been rigged into position on the cell 24 SR mezzanine; connections are in process (Fig. 4, next page). The warm cavity has been installed in the SR tunnel. The LN2 system leak check is complete; the commissioning is on hold due to a required modification to the LN2 tank to allow filling from the truck. The helium system punchlist has been received from the vendor and will take ~2 weeks to complete; commissioning will follow, which will require a new work permit. A walk-through of the RF cleanroom has been scheduled, to receive occupancy permission.

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

NSLS-II Accelerator Installation Progress

	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13
Mechanical Utilities	62%	68%	73%	74%	78%	80%	88%	91%	92%	92%	100%	100%
Electrical Utilities	85%	91%	95%	96%	99%	99%	100%	100%	100%	100%	100%	100%
Magnets	87%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Vacuum	35%	37%	41%	50%	61%	77%	78%	80%	87%	90%	92%	94%
Power Supplies	43%	48%	54%	65%	70%	81%	87%	95%	99%	100%	100%	100%
Instrumentation	53%	58%	63%	66%	74%	80%	83%	85%	89%	95%	96%	96%
Frontends	2%	6%	6%	11%	15%	23%	32%	34%	36%	36%	40%	40%
RF	45%	47%	49%	52%	57%	59%	64%	75%	77%	77%	78%	83%
Inje Straight	0%	0%	0%	0%	0%	0%	1%	4%	27%	35%	47%	62%
LINAC+Booster	92%	95%	96%	97%	97%	99%	100%	100%	100%	100%	100%	100%
Total	**62%**	**67%**	**71%**	**74%**	**78%**	**83%**	**86%**	**89%**	**91%**	**92%**	**94%**	**95%**

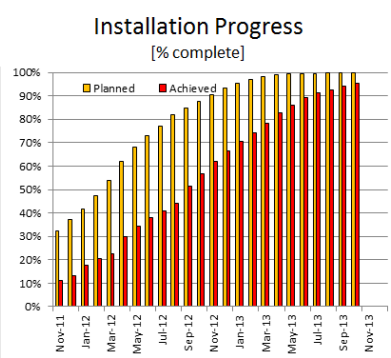


Figure 4. Cryoduct penetration from the SR mezzanine into the SR tunnel.

Diagnostics & instrumentation. Rework of SR RF BPM receivers is in process (P1 is complete; P2 is being tested; P3 is in re-work).Testing of the scrapers is in process. BPM cable pulling in the injection straight is underway. Cable termination at the loss monitor is in process. Installation of the SiO2 cables for the SR BPM pick-ups will start in mid-November.

Electronics/cable pulling. P5 high-current multipole power supply testing is complete. P1 multipole power supplies are undergoing polarity testing and additional high-current testing. SR-wide power supply testing of both multipoles and dipoles will start in early November. Multipole testing will occur daily from 3 p.m. to 8 p.m., to allow work on the magnet/girders (i.e., survey, diagnostics) in the morning and early afternoon. Installation of the shunt regulators for the fast correctors is in process (pentants 1 and 2 are complete).

EXPERIMENTAL FACILITIES

In October, Experimental Facilities continued to make good progress with installations and Factory Acceptance Testing (FAT) for major beamline optics and components. For example, the IXS KB Mirror System from Toyama Co. was installed, motion tests were completed, and the system and chambers were successfully baked-out in the 10-ID-D hutch. The system is now ready for delivery of the mirrors that will be provided by another supplier. Utility installations continued and are nearly completed for CHX, XPD, CSX, and the HXN hutches on the experiment hall floor. Utility installation work is underway in all sectors and has been carefully scheduled to be certain that the electrical and mechanical utilities are installed before vendors arrive to begin beamline component installations. For XPD, the 19-in. rack enclosures were successfully tested, enabling the start of cable terminations for all the motors and encoders of both branch beamlines. In October, there were also a number of successful FATs. For example, the FAT for the Fast CCD detector for the coherence branch of CSX was held, with delivery expected in November. And, the FAT for the XPD Diffractometer took place at RPI in Bath, UK, and the equipment was determined to be complete and fully compliant. This diffractometer is due to arrive in November.

While most activities in Experimental Facilities are on schedule, there are a few areas with delays. For example, beamline components for SRX and CHX are delayed by approximately 1 month; one of the mirrors for HXN showed defects that were removed and the mirror will be recoated in November; and the vendor fabricating the KB mirrors for SRX had problems with their figuring machines and so these will also be delivered later than planned. However, these delays are not expected to impact the readiness of the beamlines to begin commissioning when the x-ray beam is first available.

CHX. The detectors are critical components for coherent scattering and x-ray photon correlation spectroscopy; the baseline plan of the CHX beamline was finalized with the addition of an Eiger 4M unit for coherent SAXS (small-angle x-ray scattering). A contract for this detector was placed with Dectris Inc., complementing the existing plan/contract for an Eiger 1M. The CHX beamline will thus operate with two detectors, the Eiger 1M of the diffractometer arm for wide-angle scattering applications and the Eiger 4M on the SAXS table. The Eiger instruments are the state of the art of pixelated detector technology, offering the highest frame rates available today (>3 kHz), small pixel size (75 mm), and nearly 100% quantum efficiency. The two detectors will be able to operate simultaneously at the CHX beamline, providing access to structural and dynamical information on an unprecedented range of length scales, from Angstroms to microns.

A preliminary design design review led by Lutz Wiegart was held with GNB Inc. for the SAXS table and was followed by a series of internal meetings where we discussed all the safety aspects and agreed on an engineering solution to ensure a safe operation of this 15 m long “moving table.” The design is now well advanced and the CHX and GNB teams are anticipating an FDR (Final Design Review) in November.

The utilities installation has made tremendous progress and is now basically finalized inside the hutches and proceeds at a high pace on the mezzanine (hutch roofs). All the required cables were pulled at the 11ID-A(FOE) hutch and plans are in

place to complete these installations also in the 11ID-B (end station) hutch during November.

In preparation for the CHX Early Science program, the scientific capabilities of the CHX beamline as well as some interesting recent scientific results were presented by Andrei Fluerasu during an invited seminar at the University of California San Diego. Discussions were held with groups studying the dynamics of materials, leading to several ideas for interesting science projects and possible future proposals for experiments. Also, in preparation for the November deadline for Early Science Proposals, he held several discussions and teleconference meetings with external groups interested in submitting research proposals.

CSX. October saw the successful completion of the FAT for the Fast CCD detector for the coherence branch of CSX, with delivery expected in November. The 19-in. rack enclosures were successfully tested and deemed acceptable for use within the XFD, enabling the start of cable terminations for all the motors and encoders of both branch beamlines. The Controls group has successfully set up all EPICS databases for the vacuum systems for both branch beamlines. Preparations were made for the installation by FMB-Oxford of two additional optical systems, M1A and M3B; delivery is anticipated in November. Integrated testing of all systems still continues.

HXN. The HXN diffraction detector station contract ($90k value) was awarded. The Preliminary Design Review (PDR) for the x-ray microscope vacuum enclosure was held, with substantial details in the design. Xiaojing Huang joined the HXN team as a beamline scientist. The braids for cooling the second monochromator crystals were fabricated. The two HXN beamline mirrors, HCM and HFM, reached vacuum level of 8×10^{-10} and 2×10^{-9} mBar, without bake-out.

IXS. The IXS focus session of the NSLS-II Early Experiments Workshop was successfully held on October 1, where potential high-impact first experiments for the beamline were discussed. The workshop had 12 invited speakers and 43 registered participants, and was followed by a half-day BAT meeting.

The IXS KB Mirror System from Toyama Co. was installed and motion tests were completed on October 18 (Fig. 5). The chamber bake-out then followed and was completed by the end of October.

Figure 5. IXS KB Mirror System in the 10ID-D hutch, wrapped for bakeout.

The ultimate pressure reached 5×10^{-10} Torr. The system is now ready for the installation of mirrors and benders. The FAT for the mirrors and benders was held Oct. 8–10 at the WinlightX site. The bender mechanism was tested with the VFM installed, and motor configurations were verified (Fig. 6). Both the HFM and VFM mirrors and the benders are due to be delivered to BNL in November for the onsite metrology acceptance test, followed by installation into the mirror chamber.

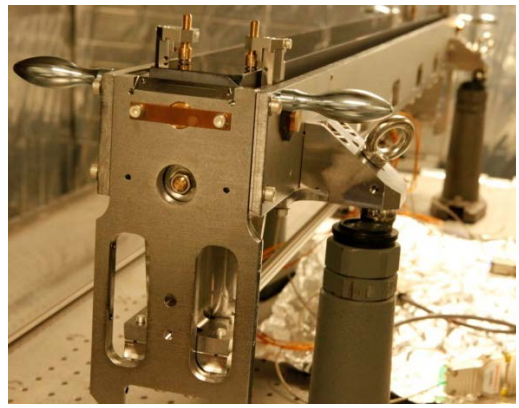


Figure 6. The VFM mirror and the bender for the IXS KB Mirror System at WinlightX.

SRX. The SRX team continued to stay in close contact with the vendors Bruker-ASC, manufacturer of the SRX Optical Package, and WinlightX, manufacturers of the SRX KB Mirror System. Bruker worked on finishing the manufacture of all parts accepted in September, to get them ready for shipment. They continued to work on the double-crystal monochromator; a factory acceptance test is scheduled for December. WinlightX has made progress in mitigating the delays encountered in the deliveries of the necessary invar parts. The factory acceptance test is scheduled for December. The SRX team continues to closely monitor the advancements in the work of both vendors.

Figure 7. Hutch 5-ID-B houses the secondary source aperture of the SRX beamline and a photon shutter. Due to a change in the design of the photon shutter, the roof of the hutch had to be elevated. The distance between the top of the open doors and the rim of the roof marks the height change.

XPD. Over the span of three days, FMB-Oxford (FMB-O) installed components into the optics hutch of the XPD First Optical Enclosure. Photon shutter installation was completed Oct. 17 and vibration-tested on Oct. 18. Everything is readied for phase 3 installation in November, which includes the

Bremsstrahlung Collimator 2 (BRC2) and a diagnostic module (beam position monitor and white beam screen). Preparations started for baking out the components in the distinct vacuum sections. The fourth attempt by FMB-O at brazing the Fixed Aperture Mask (FMK) failed to yield leak-tight cooling circuits. A design change of the FMK has been proposed by FMB-O and approved by BSA. The FMK and BRC1 need to be aligned to one another and vacuum tested at the FMB-O factory. The current plan is for FMB-O to ship the assembly out with the monochromator by the end of November and to install the FMK-BRC1 at the same time as the monochromator in January. A support is already in place in the A hutch.

For the Laue-Laue monochromator, all parts have been received at FMB-O and equipment (Figs 8, 9) is being readied for the FAT scheduled for Nov. 5–8. We expect the monochromator will be sea-freighted in a container with its cryocooler and other equipment destined for NSLS-II at the end of November. Installation is currently scheduled for the second week in January 2014.

Figure 8. FMB-O monochromator granite support with components being assembled at the factory. The visible green blocks are wedge translations between the base and the top granite section. These are manually adjustable to give fine alignment in height, roll, and pitch. On the top of the upper granite section, the longitudinal motorized axis is visible: it positions the 2nd crystal between 370 mm and 950 mm from the 1st crystal. The right-hand side of the photo shows the diagnostic unit which consists of a shielded camera mounted at a fixed distance from a 45° mirror (a fused silicon prism with an aluminum coating) to view the x-ray beam (direct beam or beam reflected off crystal 1 *or* crystal 2) hitting the scintillator (100 μm-thick cadmium tungstate). It is possible to use this diagnostic unit at all energies/angles.

The FAT for the XPD Diffractometer took place at RPI on Oct. 15–18 in Bath, UK with representation from BNL, and further tests were carried out Oct. 21–22. The results were discussed in a teleconference Oct. 28: the equipment (Fig. 10) is complete and fully compliant. The consignment is due to dock in New York on Nov. 20; customs clearance and delivery will take another 3 to 5 days. The installation date is set for Dec. 2–11; travel and site access arrangements for two RPI engineers carrying out this action are complete.

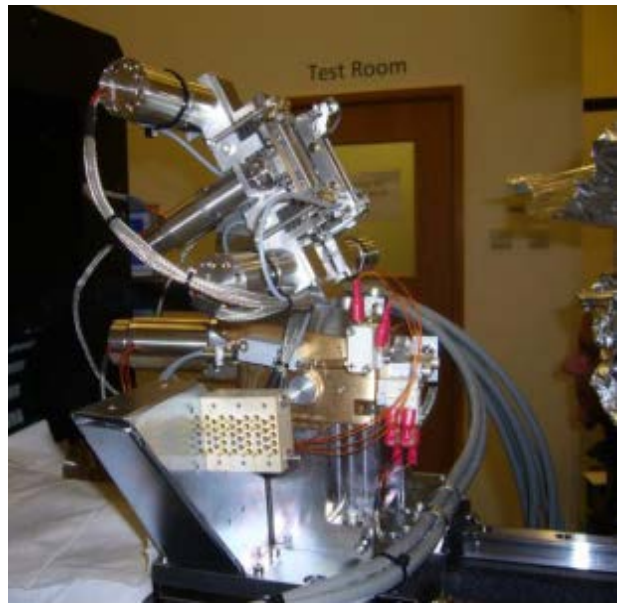


Figure 9. Crystal 2 stack with motorized pitch and roll and manual yaw adjustments. The design of the crystal cage and bender are essentially the same as for crystal 1. There are no silver foils and the crystal design is different, as there is no cooling. A different solution has been implemented to constrain crystal 2 on axis during operation.

The XPD X-ray Photon Counting Pixel Area Detector ("C10") is being upgraded with built-in depolarization capability (a new EMCO component for high voltage supply and a new controller board). System integration of the board started on Oct. 18. System assembly, final testing, and shipment are underway. Final shipment is expected in early November.

Mechanical utilities for the lead/steel enclosures 28-ID are complete; the supply of chilled water to the racks is in process. Electrical utilities have been installed and inspected.

Figure 10. View of the diffractometer at the RPI factory in Bath during the FAT, showing 2 80kg masses at the 12 o'clock position to simulate the detectors on both circles at the maximum load, the counter-weights at the 6 o'clock position, and the heavy duty table facing the diffractometer.

The Request for Quotation for the Multi-Analyzer Crystal X-ray Detector was posted on FedBizOps on Oct. 7. Proposals from the suppliers are due on Nov. 1. The FDR for the XPD robotic sample manipulator took place on Oct. 30 onsite and did not reveal any showstoppers (Fig. 11). The Stäubli TX90 robot was ordered on Oct. 21 (delivery to Square One is expected on Dec. 15). Manufacture of the X-ray Flat Panel Detector is completed. The XPD Vertical Focusing Mirror has been completed at Winlight-X.

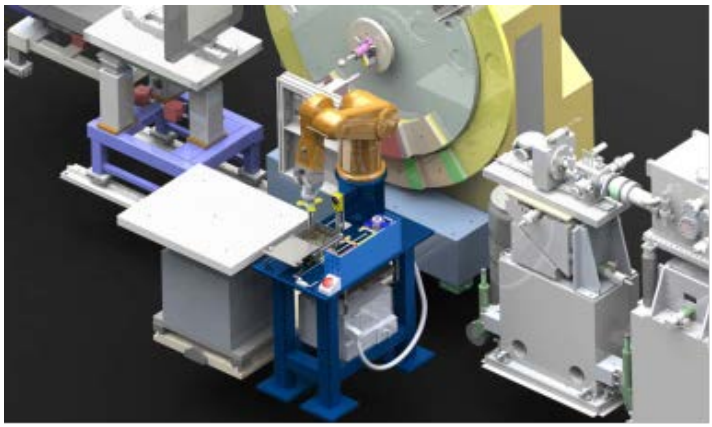


Figure 11. 3D model of the XPD end station C with the robot in place, per the final design review.

NEWLY HIRED

George Dacos – Mechanical Engineer – ASD
Linda Verbeeck – Administrative Svcs. Asst., PSD

COST/SCHEDULE BASELINE STATUS

October's current period schedule variance (SV) for the overall project was (-$2.6M) with an associated schedule performance index (SPI) of 0.77, due primarily to Special Process Spares planned in October but not realized. The spares plan was not adequately time-phased to reflect receipt of the remaining spares, planned for mid-FY2014.

The current-month cost performance index (CPI) for the NSLS-II project in October was 1.49, +$2.8M, red status, due to positive cost performance/efficiencies in some areas and timing of accruals in other areas. The cumulative SV is $25.9M with an SPI of 0.97. The cumulative cost variance (CV) is (-$8.7M), for a cumulative CPI of 0.99.

For Accelerator Systems, WBS 1.3, there is a positive October SV of +$1.3M with an SPI of 2.18, primarily due to continued positive schedule performance in almost all Accelerator Systems areas. The cumulative SV continues to improve at (-$12.2M) and an SPI of 0.96. The Accelerator Systems CV for the month is $1,062K with a CPI of 1.75, red status. The cumulative CV is (-$13.4M) with a CPI of 0.95, green status.

For Experimental Facilities, WBS 1.4, schedule performance in October was negative with a current-period SV of (-$70K), an SPI of 0.97, green status. The cumulative SV is (-$6.7M), an SPI of 0.90, green status. The current-period CV is positive at +$699K with a CPI of 1.40, red status.

For Conventional Facilities, WBS 1.5, schedule performance for October is positive with an SV of +$15K. The cumulative SV is (-$422K) with an SPI of 1.00, green status. The current period CV is +$417K. The cumulative CV is (-$928K) with a CPI of 1.00, green status.

Pre-Ops, WBS 1.6, is showing a negative current-period SV of (-$3,883K), SPI of 0.39, red status, due to the planning for special process spares and a positive current-period CV of +$677K (CPI 1.37). Cumulative SV continues to be negative at (-$6.6M), SPI 0.83, with a positive CV of +$7.8M (CPI 1.33). The positive CV is due to continued underruns in Pre-Ops Project Management.

The project was approximately 92% complete as of October 31 with approximately 54% remaining contingency/MR on BAC work remaining. The project EAC is currently reported at $900,744K, against a PMB/UB (Baseline) of $872,696K. This EAC of $900,744K is a growth of about $400K from the EAC reported in September 2013. The contingency/MR based on the EAC is approximately 39% of the EAC work remaining. Percent complete based on EAC work remaining is approximately 89%.

The critical path was updated in October and now runs through Injector ARR, Booster Commissioning; SR Shielding; Safety Assessment Document/Accelerator Safety Envelope (SAD/ASE) activities for SR Commissioning; IRR/ARR preparation activities for SR Commissioning; SR Commissioning; Insertion Device Installation; Integrated Test and SR Cavity Installation; and Project Closeout activities. There are 10 months of float between the project's August 2014 early completion of original scope (Sept 2014 for all new scope additions) and CD-4.

ENVIRONMENT, SAFETY, AND HEALTH

Significant progress was made in October towards initiation of an Accelerator Readiness Review (ARR) to begin commissioning the booster. The two Unreviewed Safety Issues (USIs) identified during commissioning readiness activities were resolved and approved by the Brookhaven Site Office (BHSO). The first issue, discovered during implementation of the Instrument Readiness Plan, concerned the depth of the soil berm over the linac and booster. Surveys of the berm showed places where the soil depth was less than the designed level (max. deviation: 1.2 feet). A USI was prepared, presented to and approved by the Laboratory ESH Committee (LESHC), and approved by BHSO. The second USI was noticed during the Instrument Readiness Review (IRR) and concerned the PPS interlock of the B2 bending magnet in the booster-to-storage-ring transport line. As described in the Safety Assessment Document (SAD), the magnet was to be included in the PPS protection system logic and be physically locked out. At the time of the IRR, the PPS interlock was not yet installed and would not be installed prior to booster commissioning. A

USI evaluation and resolution were prepared, submitted to the LESHC, and approved by BHSO.

Much of October was spent addressing the 49 prestart action items identified during the IRR and ensuring that sufficient evidence was provided to support closing the actions. All prestart actions and approximately half of the post-start actions were closed by October 23 in anticipation of the ARR. At the end of October, 21 post-start actions remained open, most of which will be closed by the end of November.

Significant attention was directed toward planning for the ARR scheduled for early November. A conference call held on October 25 provided introductory information to the ARR team and a website was populated with many documents needed for the ARR, including the Authorization Basis documents for the linac and booster, associated USIs and SAD Addenda, the linac Corrective Action Plan (CAP) with documented evidence of action closure, procedures, etc. Actions identified in the CAP are essentially complete, with approval still required for a few documents and approval of the Conduct of Operations Matrix by the BNL Conduct of Operations Board (COB) and DOE. The BNL COB extensively reviewed the PS Conduct of Operations Matrix and implemented several iterations of changes. The Con-Ops Matrix has been released to BHSO for review and approval.

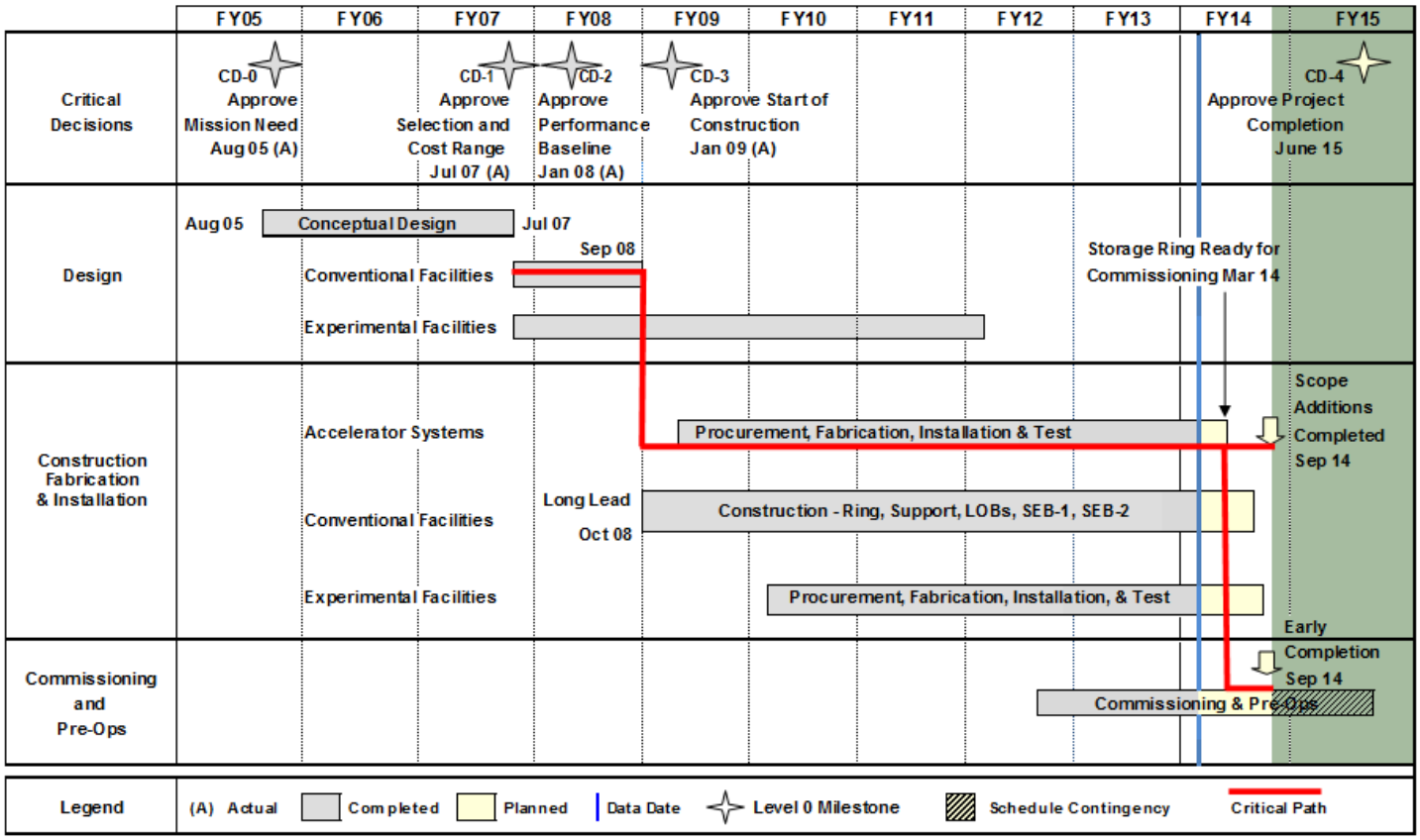
Safety performance continues to be excellent, with no first aid, reportable, or day-away injury cases reported.

ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
ACWP	Actual Cost of Work Performed
ARR	Accelerator Readiness Review
ARRA	American Recovery and Reinvestment Act
ASE	Accelerator Safety Envelope
BAC	Budget At Completion
BHSO	Brookhaven Site Office
BNL	Brookhaven National Laboratory
BORE	Beneficial Occupancy Readiness Evaluation
BPM	Beam Position Monitor
BST	Booster to Storage Ring Transport Line
CAP	Corrective Action Plan
CD4	Critical Decision 4 (a Project ‘Go-No go’ point)
CHX	Coherent Hard X-ray beamline
COB	Conduct of Operations Board
CPI	Cost Performance Index
CSX	Coherent Soft X-ray beamline
CV	Cost Variance
DC	Direct Current
DI	Deionized (water)
DOE	Department of Energy
EAC	Estimate at Completion
ESH	Environment, Safety and Health
EVMS	Earned Value Management System
FAT	Factory Acceptance Test
FDR	Final Design Review
FOE	First Optics Enclosure
HVAC	Heating, Ventilation and Air Conditioning
HXN	Hard X-ray Nanoprobe beamline
ID	Insertion Device
IPT	Integrated Project Team
IRR	Instrument Readiness Review
ISR	In-Situ Resonant X-ray Studies beamline
IXS	Inelastic X-ray Scattering beamline
LESHC	Laboratory ESH Committee
LOB	Lab–Office Building
LtB TL	Linac to Booster Transfer Line
MO	Master Oscillator
NEXT	NSLS-II Experimental Tools (beamlines)
ODH	Oxygen Deprivation Hazard
OPC	Other Project Costs
ORE	Occupancy Readiness Evaluation
P1, P2	Pentant 1, Pentant 2, etc.
PCHW	Process Chilled Water
PCR	Project Change Request
PDR	Preliminary Design Review
PLC	Programmable Logic Controller
PPS	Personnel Protection System
PS	Photon Sciences Directorate
RTD	Resistance Temperature Detector
SAD	Safety Assessment Document
SAXS	Small-Angle X-ray Scattering
SPI	Schedule Performance Index
SR	Storage Ring
SRX	Submicron Resolution X-ray Spectroscopy
SV	Schedule Variance
TCR	Technical Change Request
USI	Unreviewed Safety Issue
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



Funding Profile

Funding Type	NSLS-II Funding Profile ($M)											
	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
R&D			3.0	20.0	10.0	2.0	0.8					35.8
OPC	1.0	4.8	19.0									24.8
PED			3.0	29.7	27.3							60.0
Construction					216.0	139.0	151.3	151.4	47.2	26.3		731.2
Pre-Ops							0.7	7.7	24.4	27.4		60.2
Total NSLS-II Project	1.0	4.8	25.0	49.7	253.3	141.0	152.8	159.1	71.6	53.7		912.0

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 Bldg. 745, Brookhaven National Laboratory, Upton NY 119873.