

National Synchrotron Light Source II

Project Progress Report

September 2011



New perspective from the water tower showing the ring building with Lab-Office Building 2 enclosure work in progress.

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OVERALL ASSESSMENT

The National Synchrotron Light Source II project maintained satisfactory cost and schedule performance, completing 63% of the project by the end of September with over 30% of contingency and management reserve for the remaining Budget At Completion (BAC). The cumulative Schedule Performance Index (SPI) for the overall project is 0.96 and the cumulative Cost Performance Index (CPI) is 1.0.

The project is conducting a project-wide comprehensive Estimate At Completion (EAC) over the next couple of months. This exercise will be based on the current status of the conventional construction, updated magnet production and accelerator installation schedule, up-to-date procurement plans, and more detailed-out installation activities for the six project beamlines. Based on this comprehensive EAC, the cost and schedule contingencies and the projected early completion date for the overall project will be updated.

Construction of the ring building and lab-office buildings (LOBs) remains on schedule. The restoration of the interior courtyard and the foundations for LOB 4 were completed in September. The beneficial occupancy of pentant 3 is planned for early October, at which point more than 65% of the ring building space will be taken over by the project. The contractor is currently projecting that the entire ring building will be turned over to the project by the end of this year.

Although excellent progress continued in most areas as reported below, the monthly SPI in September for the Accelerator Systems was 0.80, largely due to delays in accelerator installation and the production of dipole and transport line magnets. All magnet suppliers except 35 mm dipoles have now ramped up production rates. Progress continued in accelerator installation in pentants 1 and 2, the RF building, the injector building, and the computer room.

The procurements of long-lead-time beamline components for the six Project beamlines are moving ahead at a good pace and the Preliminary Design Review (PDR) for the hutches was held.

The projected early completion date remains at March 2014 and the critical path continues to pass through the 35 mm dipole magnet deliveries, girder assembly and installation, and integrated tests and commissioning of the storage ring. Activities funded by the American Recovery and Reinvestment Act (ARRA) continue on schedule and on budget.

UPCOMING EVENTS

CY 2011

Installation Workshop for Accelerator Systems	Oct 4
Preliminary Design Review (PDR), Liquid Helium System	Oct 4-6
Science Advisory Ctee Beamline Development Proposal Panels:	
Materials Science and Engineering	Nov 17-18
Biological and Medical Sciences	Dec 1
Spectroscopy and Spectromicroscopy	Dec 6
ALD's Conceptual Design Review for NIH BL	Nov 29-30
DOE Review of NSLS-II	Apr 17-19, 2012

ACCELERATOR SYSTEMS

Magnets. Magnet production passed the 50% production complete milestone in September. The production for all but one of the multipole magnets is on track, and a successful production readiness review (PRR) for the 35 mm aperture dipoles took place at the end of September. With only a few action items identified from the PRR, approval for partial production was granted, with full production release expected in early October. The 90 mm aperture dipole production was also fully released in September. The coil production for the Tesla quadrupole suddenly ran into a low yield problem, but a solution was quickly identified. The NSLS-II project team plans to visit Tesla Engineering in early October in order to observe its progress and review the revised delivery schedule. All other production lines are active and producing magnets at the expected rate.

RF. The storage ring RF transmitter was delivered in September, and installation of cable trays, AC power, water utilities, and the transmitter in the RF building is progressing. Fabrication of the booster RF transmitter is also on schedule at the factory. The preliminary design of the cryogenics system was completed on schedule by the supplier; the design review is scheduled for early October. The delivery of niobium for the superconducting cavity production became a problem when overdue delivery from the niobium supplier (different from the cavity manufacturer) eventually arrived in July and the niobium did not meet specifications. This raw material was rejected and new niobium from a different source was ordered by the cavity manufacturer in September. The project team has formulated a backup plan to use an existing cavity for the initial operation, eliminating any potential schedule risks. The project team is also working with the cavity manufacture to minimize any further delays.

Injector. After joint effort by the RF, injector, and controls groups, the linac front-end generated first beam in mid September. The electron gun was operated in the single-bunch mode; the total charge measured met the design specification. Software and hardware implementation of the controls system for the booster is progressing well and production of the injector beam position monitors is in full swing.

Vacuum systems. Installation of ion pump controllers, vacuum gauge controllers, and titanium sublimation pump controllers in pentant 1 was completed and the bake-out for the chambers installed in the magnet-girders is progressing. Awards for the damping wiggler chambers were made.

Insertion devices. Proposals for the 21 mm period in-vacuum undulator (IVU21) were received and evaluated; the request for proposal (RFP) for the IVU20 has been released. A successful PDR for the elliptically polarizing undulator (EPU) was conducted in late September.

Electrical utilities. The delivery of 575 equipment enclosures is now complete and a large amount of shelving and other auxiliary equipment is at hand, ready for installation. Electrical utilities and racks have been installed in pentants 1

and 2, the RF building, and the computer room. For the linac, all power supplies were delivered and cable trays are in place.

Installation crews progressed well with the third and fourth magnet-girders in the accelerator tunnel, and racks and cables are now being installed in pentant 2. The installation of power supply equipment, vacuum controls system, and programmable logic controllers for safety systems has begun in pentant 1. The accelerator installation crews also have begun working in the injector building. Cable trays and de-ionized (DI) water piping have been installed, and equipment enclosures have been placed and connected to utilities.

The monthly SPI for the Accelerator Systems in September was 0.80, largely due to the installation activities in the storage ring being behind schedule, and to delays in the production of dipole magnets and transport line magnets. A dedicated installation workshop for the Accelerator Systems is scheduled to be held in early October to review the current status and update the installation plan and schedule based on latest magnet production schedules and experience gained from the initial infrastructure and magnet-girder installation activities. This workshop will be one of the main inputs in formulating the comprehensive Estimate At Completion (EAC) for the Accelerator Systems.

EXPERIMENTAL FACILITIES

Experimental Facilities work concentrated on various procurement packages for the long-lead-time beamline optical components. The preliminary design review meeting was held at BNL for the lead and steel hutch contractor.

IXS. The specification document for the KB Mirror System is ready for final review and good progress was made on the specification document for the first optical enclosure package.

A formal agreement has been signed between DESY/PETRA III and NSLS-II to enable collaboration between the two facilities on high-resolution crystal optics R&D. The 1 meV prototype test endstation has been commissioned and the system will be shipped to PETRA III in early October. The 4B crystal monochromator mechanism has also been completed and a set of 4B crystals has been procured, ready for testing together with the mechanism in the coming beamtime at PETRA III. Another set of 4B crystals is being fabricated in-house by the crystal fabrication group.

The IXS Beamline Advisory Team (BAT) held its sixth meeting in September to discuss the choice of high resolution optics for the baseline scope in light of the recent test results obtained on the CDW optics. Design of the spectrometer and the sample environments for initial experiments were also discussed at the meeting.

CHX. The RFP for the optics package was released in early September and several suppliers have indicated interest in submitting proposals. In response to requests, the deadline for proposals was extended from Oct 17 to Nov 21.

The procurement of a first (small format – 512x512 pixels) XPCS detector was started with a request for information (RFI) being released in late September. The Specifications and Statement of Work (SOW) for the multi-circle diffractometer were completed and the evaluation criteria were also finalized. A new capillary holder and beamstop holder were designed and built for an experiment that will take place at ESRF.

CSX. The SOWs and specs are being finalized for each of the mechanical components, and the tender for the gratings is expected to be ready for release soon. The procurements of toroidal mirrors, monochromators, and the M3A mirror are soon to follow. Investigations are underway to improve the coating for the optics.

HXN. The proposals for the optics package were received and are being reviewed; the selection process is expected to be completed in early November. A contract for a set of advanced piezo stages and controllers for manipulating MLL optics was awarded and delivery of components is expected in three to four months. A major breakthrough was accomplished in the MLL optics, which can now be mechanically polished to below 10 microns. Measurements with x-ray beam will be taken on the newly sectioned optics in the last week of October at the Advanced Photon Source.

XPD. The RFP for Double Laue Monochromator, released in July, is expected to receive five proposals in October. The RFPs for the remaining beamline components are being prepared for release in mid October.

SRX. All RFPs for optics packages were completed and released in September. Tests for precision positioning using the Delta Tau controller showed that the interaction of a coarse stage, a fine stage, and an interferometer enables very precise positioning. Discussions with several potential suppliers are under way in order to identify the optimal stages.

Optical metrology. The final design review of the gantry for the Nano Radian Surface Profiler was held successfully and the delivery of the profiler is expected to be on schedule at the end of January 2012.

Optics fabrication. 4-bounce crystal optics fabrication for the IXS group's planned experiments at PETRA-III was completed, with metrology results indicating that the crystals are all of high quality.

CONVENTIONAL FACILITIES

Construction of conventional facilities continued to make excellent progress during September. Site restoration by the ring building contractor is transforming the "jobsite" look of the facility to that of one nearing completion (Fig. 1). The ring building and LOB construction contracts continue ahead of schedule. Major accomplishments for September include completion of interior courtyard site restoration, completion of foundations for LOB 4, and the start of foundations for LOB 5.



Figure 1. Courtyard restoration is complete near the tunnel and service bldg. 4.

The ring building contractor continues work toward phased turnover of the ring building for beneficial occupancy. The cooling tower building and pentant 3 are expected to be turned over in early October. Pentant 4 is slated for turnover in November and pentant 5 in December, more than two months earlier than scheduled. With turnover of the cooling tower building, the cooling water systems that are needed to support equipment installation in the injection, RF, and storage ring buildings will undergo pre-operational checks and be made ready to support installation and the start-up of accelerator systems. This and turnover of pentant 3 in early October will bring more than 65% of the ring building space under beneficial occupancy and available for Accelerator Systems installation activities (Fig. 2). Punchlist work in the occupied areas continues to be steadily completed and is being coordinated under a work permit system.



Figure 2. Service bldg. 3 mechanical room is nearly ready for turnover.

Work in pentants 4 and 5 continues to proceed ahead of schedule. Interior painting of pentant 4 is complete, and mechanical and electrical work in service building 4 is nearing completion. Pentant 5 will be the last major work area for the ring building contractor, so demobilization of some of the subcontractors will be taking place in the next month or two as their work in pentant 5 is completed and punchlist work is closed out.

Substantial progress was made on site restoration during September. Final paving of all roads and parking lots is nearly completed. Distribution of topsoil, final grading, and seeding is complete in the interior courtyard except for some touch-up

work. Finish grading and seeding of the exterior areas are now well underway and should be completed by the end of October. Some areas along the exterior of the ring building will be left for completion by the LOB contractor due to ongoing construction of the LOBs. These areas will be completed by the autumn of 2012, due to the added scope of LOBs 4 and 5.

LOB construction continues to make excellent progress. LOB 1 mechanical and electrical work, roof installation, and building enclosure are underway. Partition wall installation and roofing of LOBs 2 and 3 are in progress (Fig. 3).



Figure 3. LOB 3 partition walls in open plan office area.

LOB 4 foundations have been completed and steel erection is scheduled for mid-October (Fig. 4); foundation work for LOB 5 is now underway. The coordination of work between the ring contractor, LOB contractor, and ongoing accelerator installation continues to progress well with minimal interference or disruption.



Figure 4. Steel being staged for erection at LOB 4.

RECENTLY HIRED

Christopher Amundsen – Mechanical Engineer – ASD
 Stephen Antonelli – Mech. Engineer – Beamline Eng., Photon Division
 Mark Breitfeller – Mechanical Engineer – ASD
 Joseph Dadhal – Student Assistant – Elec. Engineering, ASD
 William Licciardi – Mech. Tech. – Insertion Devices, ASD
 Jüri Tagger – Controls Engineer – Controls, ASD
 John VanHouten – Computer Support Technician, Business Division
 Paul Zschack – Deputy Division Director, Photon Division

COST/SCHEDULE BASELINE STATUS

The cumulative Cost Performance Index (CPI) for the overall project is 1.0 and the cumulative Schedule Performance Index (SPI) remains at 0.96, both well within the acceptable range. The project is 63% complete, with 28% of contingency and management reserve remaining, based on EAC work remaining.

The project current-period SPI of 0.83 is due to Conventional Facilities (0.86 SPI) and Accelerator Systems (0.80) in September. The Conventional Construction schedule variance (SV) for the current month results from completion of mechanical work in August that was scheduled for September; this will self-correct next month. Accelerator Systems' monthly SPI of 0.80 is based on delays in storage ring installation activities and production numbers for dipole and transport line magnets.

Experimental Facilities continues to perform close to plan on a cumulative basis for both cost and schedule.

The critical path for the project has not changed since last month; the systems on the critical path include 35 mm dipole magnet deliveries; pentant 5 girder assembly, installation, survey, and alignment; subsystem test diagnostics; EPU installation; integrated tests; and commissioning of the storage ring. The projected early completion date for the project remains at March 2014. There are 15 months of float between the project early completion milestone and CD-4, with approximately 33% schedule contingency.

PROCUREMENT ACTIVITIES

Four significant solicitations (>\$100K, estimated) were released to industry through FedBizOps in September. Awards under this group of solicitations will be made in October and are estimated at greater than \$1M. An RFP for the CHX Beamline Optical Components Package was posted on FedBizOps on September 2. Awards for the Damping Wiggler Vacuum Chambers (\$790K) and the SR Injection Pulsed Magnet System – Septum System (\$336.6K) were made in September.

ENVIRONMENT, SAFETY, AND HEALTH

The beneficial occupancy readiness evaluations (BOREs) continued on schedule. BOREs have been completed for pentants 1, 2, and 3; the RF, compressor, and injection buildings; and the cooling tower. Occupancy of pentant 3 and the cooling tower is pending finalization of pre-start items and should be complete by 10/20/11, enabling occupancy.

Significant efficiencies have been gained from experience with the BORE process: with the recent evaluations there have been fewer pre-start items and less time from the BORE inspection to approved changes leading to occupancy.

The Booster Safety Assessment Document and Accelerator Safety Envelope have been developed and will go through an internal PSD review in October. This development process is approximately one month ahead of schedule and is attributed to lessons learned during linac documentation development.

The Accelerator Readiness Review (ARR) committee has been selected and all committee members are now engaged. An initial meeting of the committee took place at the Accelerator Safety Workshop during the week of Sept. 19. The intent of the meeting was to update the committee on the progress of the injection facility, injector hardware, and the necessary documentation being developed. Several groups continue to work on documentation necessary for a successful commissioning ARR, including operational procedures, emergency procedures, and training and qualifications criteria; these tasks are on schedule to be completed in late October. The linac ARR is now scheduled for mid January 2012.

On September 22, a painter working in the ring building was injured while moving a box containing the cover for an electrical cabinet. Although he was wearing appropriate personal protective equipment, when the box slipped out of his hands and landed on the instep of his foot, it unfortunately caused a fracture and subsequent lost time.



Figure 5. The new sign is above the main door of the ring building, and the "loop" paving is in place.

