



Brookhaven National Laboratory

SNS

Ring and Transfer Lines Systems

NOVEMBER

MONTHLY REPORT

01 November – 30 November 2001

Performing Organization:	Brookhaven Science Associates
Location:	Brookhaven National Laboratory Upton, New York 11973-5000
Contract Period:	October 1998 – June 2006

Brookhaven National Laboratory
SNS MONTHLY PROGRESS REPORT
November 2001
Ring and Transfer Lines Systems

I. Senior Team Leader Assessment

1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS

- The first article HEBT dipole magnet has been shipped to ORNL for acceptance test.
- All mechanical dimensions are within the specification and tolerances. The field measurement indicates 1.5 thousandth of quadrupole components resulting from the change of steel used to save cost. The gradient can be easily compensated by the quadrupole in the beam line.
- The contract for the medium field power supply has been awarded. The capacity has been upgraded to 1.3 GeV due to the saving in the final bid.
- A design review has been conducted for the chromaticity sextupole design. After integration of the recommendations from the project office, BNL will generate final drawings and cost estimate for industrial bidding.
- The SNS, LBNL, LANL, and BNL have final agreement on the delivery of the wire scanner and Beam Current Monitor to LBNL for testing of the RFQ and MEBT performance.
- BNL participated in the semi-annual DOE review at ORNL on November 7-9. The committee was satisfied with the performance and progress of BNL and recommend completion of handoff plan and specifications of spares.
- ORNL and BNL met at BNL to finalize the handoff plan. Role and Responsibility and acceptance criteria has been reviewed by cognizant experts and approved by the STL. Discussion for post-handoff activities have been continuing.
- BNL submitted the work plan for FY2002 with proper WBS descriptors and manpower estimate included. At the end of FY2002, BNL will have completed about 65% of the baseline assignments.

2. ISSUES AND ACTIONS

- None.

3. COST AND SCHEDULE STATUS

3.1 VARIANCE ANALYSIS AND PROJECT COST PERFORMANCE REPORTS

WBS 1.1.3 R&D

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>	<u>%</u>
5115.4	5115.4	5038.7	0	0	76.7	1.5

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

WBS 1.5 Ring and Transfer Lines

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>	<u>%</u>
43396	40079	39429	(3316)	(7.6)	650.3	1.6

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: No impact to BAC.

Corrective Action: None

3.2 MILESTONE STATUS

WBS 1.5 and 1.1.3 have no level 0 milestones. Milestone status is listed below.

Milestones	Level 1	Level 2	Level 3	Level 4	Level 5
Project	1	2	8	13	159
FY02	0	0	0	0	15
Due in Next 30 days	0	0	0	0	1
Total Due at present	0	0	3	12	91
Made	0	0	3	11	83
Missed	0	0	0	1	8
Ahead of Schedule	0	0	0	0	0

3.3 PROJECT CRITICAL PATH ANALYSIS

The critical path for the Ring is the Diagnostic Instrumentation, specifically the BPM and IPM systems. The next area that is critical within the ring is the high field magnets, specifically the chromaticity sextupoles and the 30Q44/Q58 magnets.

II. Detail R&D Subproject Status

WBS 1.1.3 – Ring System Development

All work covered by R&D funds is essentially complete except for some material commitments.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
<u>5115.4</u>	5115.4	5038.7	0.00	0.0%	76.7
<u>%</u>					1.5%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

III. Detail Line Item Subproject Status

WBS 1.5.1 – HEBT Systems

Magnets:

Phone conferences continued with Tesla during the month on the HEBT dipole magnet. The HEBT dipole 1st article was received at ORNL and acceptance tested. There were some minor discrepancies that were discussed with Tesla during the phone conference and will be corrected in the production magnets. ORNL is field-testing the magnet. Tesla will be given the go ahead for production when the field-testing is completed. For now they are winding coils.

The HEBT dipole stands have been fabricated, assembled, and wrapped for shipment. They will be sent next week.

Danfysik is holding to the delivery date for the quadrupole magnet and the 16CD20 corrector to January. They are preparing to machine the first pole tip profile for the 12Q45. The steel for the 16CD20 is being machined.

WBS 1.5.1.3 HEBT Vacuum System

Most 12cm magnet chamber drawings are waiting to be checked. Most 12cm drift chambers have been laid out on the lattice. The 21cm pump tees from vendor have been inspected for roundness tolerance and found to be marginal especially for use with the foil stripper. The final design review of the HEBT and Ring Injection vacuum systems was conducted through videoconference with two ASD staff participating at BNL.

WBS 1.5.1.5 HEBT Collimation

Integration of the absorber, scraper, and adjacent quadrupoles are continuing.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>	
<u>4664.0</u>	4130.0	3415.3	(534.0)	-11.4%	714.8	17.3%

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.2 – Injection Systems

A Technical Review of SNS Ring HEBT and Injection Vacuum Systems was held on November 15, 2001. This included review of the injection septum magnets, the injection straight section vacuum chambers, and the injection kicker ceramic chamber. The review was successful with no major changes. In response to a request made during the review, a second thermal analysis on the ceramic chamber heating due to eddy current was carried out with a non-uniform heat distribution in the inside coating. The results indicate that the ceramic chamber is acceptable for this heating.

The injection foil mechanism is being assembled; it is 80% complete. It awaits the delivery of the rotary feedthroughs. The base support plate was designed and sent to the shops for fabrication.

The fabrication of the injection septum magnet continues – delivery of the parts is scheduled for the end of January. The redesign of the dump septum magnet has begun. Design of the injection chicane magnets continues. The bids for the last chicane magnet were received and the low bid was within 1% of the ETC estimate. The order was placed with New England Technicoil.

The fabrication of the first article long injection kicker components is nearly 95% complete. Parts for the second magnet will be received in January. About ½ of the ferrite has been received from Ceramic Magnetics. Everson Electric is holding to their delivery schedule for the first article coils in December.

The short injection kicker design work continues. The increase to 2" thickness of ferrite in the back leg together with the 12-turn coil of 1470 amp has been approved and is being incorporated.

Many of the parts for the long injection kicker first article have been fabricated and moved to the assembly area.

Variance Analysis (Cumulative to date) (\$K)

BCWS	BCWP	ACWP	SV	%	CV
<u>2919.8</u>	2496.1	2798.5	(423.8)	-14.5%	(302.5) -12.12%

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.3 – Magnet Systems

The second and third ring dipoles (17D120) were measured during November. For several reasons, the measurement rate per day was much lower than the rate planned for standard production measurements. Time was spent making additional measurements to check the operation of the measuring system, especially the reproducibility of the horizontal position of the coil. Time was spent repairing the power supply, which has been more reliable since the repair. Measurements were at times delayed due to lack of staff. Staffing will improve in early December. With data from several magnets in hand, the measurement plan was altered to reduce measurement time without reducing the number of measurements. For example, the wait time between the end of a ramp and the start of a measurement was reduced. The measurement rate in December is expected to be much higher than that in November.

Phone conferences continued with Tesla during the month on the 21Q40 quadrupole magnet. The first magnet was shipped and it was received by BNL at the end of last month. Acceptance testing is underway and some minor discrepancies were found, documented, and discussed with Tesla. Mechanical and magnetic measurements of the first article 21Q40 were performed. The mechanical measurements indicated a deviation from the design print in certain areas. The deviation was confirmed by magnetic measurements. While it is within specification the sextupole component of this magnet is higher than the prototype magnet. This is in line with the measured error. Tesla is making up new alignment fixtures and will use it on the next four production magnets that are scheduled for completion in January. If those magnets are significantly better, the first magnet will be used for the HEBT or RTBT line. The first magnet was also split and then reassembled and measured. There was no difference in the measurements to $<1 \times 10^{-5}$. The first article quadrupole support frame was received with a minor discrepancy.

Design of the fixtures that will hold the remaining ring magnets in the magnetic measurement facility continued. BNL Central Shops continued work on the two measuring coil forms needed for the larger aperture magnets.

Detailed design of the $\frac{1}{2}$ cell assembly continues. Right and left hand details of the quadrupoles are being designed. The dipole magnet water-cooled bus that runs along the $\frac{1}{2}$ cells in the arcs is being designed. The brackets have been ordered and 1st article bus will be ordered next month. The $\frac{1}{2}$ cell-lifting fixture for the ring was designed, analyzed, approved by safety, and is in the shops for cost estimate.

Danfysik has started production of the 27CDM30. They have fabricated molds for potting the coils, machined the steel, and wound the first coils. Completion of the first production lot is still scheduled for January.

The first article 21CS30 and 21CO30 sextupole and octopole corrector magnets have been received and acceptance testing is underway. They will be magnetically measured when the 21Q40 testing is completed.

The 26Q40 quadrupole steel is being machined and the coils are being wound. A vendor visit is scheduled in December with ORNL participation. Delivery of first article 26Q40 quadrupole is still scheduled for December 31, 2001. They are on schedule at this time.

Budker Institute of Nuclear Physics has started work on the 30Q44/30Q56 1st article magnet. They have asked many questions and suggested many changes. In response to their request a more detailed drawing of the pole tip profile was provided. They have not provided a detailed schedule yet – this is the first deliverable required by the purchase order.

The drawings for the 41CDM30 were checked and approved during the final design review. The bid package is being prepared.

The detailed design of the 21S26 high field sextupole continues. A videoconference design review was held with ORNL personnel. There were no major problems and design is proceeding. The design of the 36CDM30 corrector continues.

The effort to define geometric relationship of high field dipole bending magnets to beam trajectory continues in consultation with BNL Accelerator Physics. The goal is to have a sketch for each bending magnet that relates the beam trajectory sagitta with the mechanical pole tip centerline and core fiducial points. The first release of lattice global coordinate system point map is dependent on these definitions. This is required also for the practical requirement to put together a Ring girder assembly at 902 in the near future. W. Meng has done a magnetic field analysis on the dipole to determine the magnetic length along beam trajectory.

Work continues on the listing of the magnet device names and updating the spreadsheet LATTICE_MAGNETS_PARAMETERS_List.xls. The spreadsheet that provides data on each magnet will be updated LATTICE_MAGNETS_PARAMETERS_Expanded.xls spreadsheet or dumped into a database with the help of Bob Lambiase and Tom Nepsee.

An effort to establish naming conventions for magnet fiducials that will allow unique names when consolidated with other magnets into a local coordinate system for assembly on a girder is underway. Related effort is to get complete lattice fiducial names required for IDEALS computation.

An effort is underway to establish first version of Alignment Database on ORNL server (OTODEV).

Variance Analysis (Cumulative to date) (\$K)

BCWS	BCWP	ACWP	SV	%	CV
6169.8	6090.9	7612.0	(78.9)	-1.3%	(1521.2)
<u> </u>					
%					

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.4 – Power Supply Systems

Medium Range Supplies: The contract for the Medium Range Power Supplies was awarded to IE Power. The next milestone for this equipment will be the design reviews, which will be held in January or February. We now also have a plan for spares for these units, which will be either be whole units or selected components, based on the quantity of units used on the project.

Injection Kicker First Article: The control circuitry was changed, and this resulted in a large improvement in performance, but this was not enough to give the required performance at low current. Another circuit is going to be added to bring us into compliance. This will require up to four months to implement, but will give us the performance we need. With everything as we need it, we can proceed with purchasing the additional seven units (plus a spare unit or parts) that are required for the project.

Main Dipole Power Supply: The RFP for this unit will go out in January. It is different from other RFPs in that there will be vendor involvement in installation and commissioning. Close coordination between SNS/ORNL and BNL will ensure that this plan is implemented as it should.

Variance Analysis (Cumulative to date) (\$K)

BCWS	BCWP	ACWP	SV	%	CV	
%						
2143.6	1057.5	826.7	(1,086.1)	-50.7%	230.8	21.8%

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.5 – Ring Vacuum System

Two more type A halfcell (HC) chambers have been welded and leak checked. Pump down and outgassing measurements of the HC chamber have begun before and after insitu bake. The design of the injection straight doublet chambers has been completed.

The 1st HC chamber is being coated with TiN. Development of Ti coating for injection ceramic chamber has resumed with uniform coating using four longitudinal grounding wires. The results were presented at HEBT & Injection vacuum review.

Two first article ion pump controllers (IPC) were received and passed initial inspection and evaluation. A third controller has been shipped from the vendor to replace one with bad HV readback. The IPC specification, SOW and RFQ documentations are in the project IMAN system. The TMP specification, SOW and system schematic have been finalized. The TMP RFQ

was forwarded to Procurement for release. The RFQ for the gauges and gauge controllers was released to potential vendors. Work has been started on HEBT vacuum control rack layout. A paper on SNS vacuum I&C systems was presented at ICALEPCS.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
<u>3198.1</u>	2988.8	2916.8	(209.3)	-6.5%	72.1
<u>%</u>					2.4%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.6 – RF System

For low level RF, the problem of through put and delay in the system are under detailed study. Specifications of available DSPs are being used to find suitable candidates. For high level RF, the first article cavity has been tested to 11 kV/gap. This was done both for h=1 and h=2. Preparations for testing dynamic tuning are underway. Accelerator physics: Studies of the electron-proton instability continued.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
<u>5230.0</u>	4986.1	4317.4	(244.0)	-4.7%	668.7
<u>%</u>					13.4%

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.7 – Ring Diagnostics

Two more 21cm Ring BPMs were received from the brazing vendor. The braze work is beautiful, and concerns about the vendors’ geographic move are now relieved. BPM PUE striplines are undergoing modification to allow movement during the 400C firing/cleaning. Two HEBT 21cm PUEs were delivered to the Vacuum Group. Firing tools for these PUEs have been

fabricated. Assembly tools for 26, 30 and 36cm BPMs are being designed. Ring analog front end electronics design continues.

Fabrication of a phosphor screen IPM prototype is moving ahead, with the hope to have it installed in RHIC before the end of run in late January.

Work continues on the interface of the BLM with the MPS is underway, as does work on a faster ion chamber design. Investigated the phenomenon of measuring picoamperes of direct current from an ion chamber in a 1 Rad Cs-137 source field with no high voltage applied. A paper describing this investigation is in progress. A conclusion drawn is that this does not represent a problem for the present system design, and previous calculations are valid.

DC restoration has been added to the droop compensation software. A parts package for a second BCM board has been prepared and stuffing will begin shortly, both to have a board available after the first board is shipped and to provide a fallback if dual channel acquisition continues to be problematic in the PCI interface.

All parts for all 6 MEBT carbon wire scanners and their cabling are in house, and assembly is underway.

The 200MeV laser wire is ready for beam. Switching from the low current (~100 microamp) polarized source to the conventional source seems to involve significant downtime for the RHIC polarized proton program. We are exploring ways to work around this. The 50mJ laser for the radiation resistance test is installed at the AGS BLIP facility and is accumulating dose. Parts for the MEBT laser wire were received from the shops, and assembly has begun.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
<u>5056.7</u>	4637.5	4373.8	(419.2)	-8.3%	263.7
<u>%</u>					5.7%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.8 – Collimation and Shielding

The final scraper drawings are in checking. Following this step the first unit will be manufactured.

Drawings of the modified shield are being prepared.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
<u>1219.1</u>	1101.2	1229.6	(117.8)	-9.7%	(128.3)
<u>%</u>					-11.7%

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.9 – Extraction System

Full power testing in vacuum chamber of the extraction kicker prototype continued. The prototype kicker was successfully tested with full power. During the test the kicker has shown no sign of any heat generation in the ferrite. The thermocouple reading, vacuum quality, and wave form of the pulse shape all pointed to a result of no significant heating in the ferrites. This test was run many different ways to make sure there was no error in this result. This is great news since it greatly simplifies the kicker design (no internal water cooling).

The PFN Assembly work is moving along. Small modifications and some electric components are still needed to complete the assembly.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
<u>1266.3</u>	1208.8	1066.6	(57.5)	-4.5%	142.3
<u>%</u>					11.8%

Variance Statement: Cum and current period variances do not affect Budget at Completion (BAC)

Project Impact: None

Corrective Action: None.

WBS 1.5.10 – RTBT System

Magnets:

3D computer field analysis is being done on the 36Q85 magnet to determine the best design of the radiation resistant coils was completed. A designer has been assigned and layout and design has begun of the magnet core. A PCR is also being generated for using radiation resistant mineral insulated coil material. The manufacturer has provided a sample of the material.

WBS 1.5.10.3 RTBT Vacuum System

Analyses were performed to validate the proposal of using a thick window to defocus the beam. Further iterations are in progress to find the optimum, which satisfies all the concerns. Detail layout of RTBT vacuum system is still on hold waiting for available designer.

WBS 1.5.10.5 RTBT Collimation

The manufacture process for the first article is on schedule. A visit by a BNL engineer was undertaken to ensure that the construction of the first collimator tube is satisfactory. A video-conference was held with SNS staff to discuss the collimator cooling system, and the location of the heat exchangers.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>
1975.4	1885.2	1698.7	(90.3)	-4.6%	186.5
<u>%</u>					9.9%

Variance Statement: Cum variances are within thresholds. No analysis required.
 Current period variances do not affect Budget at Completion (BAC)

Project Impact: None.

Corrective Action: None.

WBS 1.5.12 – Technical Support

The group mainly worked in the following: Group Participated in the chromaticity sextupoles final design review. Reviewed the measurement analysis for first dipole production magnet. Establish magnet polarity conventions for the SNS ring. Constructed of the SNS ring "holy" lattice. Finalized with the survey group the positioning of the SNS main dipole. Set-up of the longitudinal coupling impedance Measurements for the full-size prototype of the SNS Extraction kicker in the vessel. Studied the ceramic coating for the SNS injection kicker. Calculated the heating for the kicker ferrite bricks. Simulation -optimization for the minimum beam halo on the primary scraper continued. Study continued on space charge limit in the presence of imperfection resonates. Revised the linac dump optics for optimizing the beam size on the linac dump window to avoided excessive heating.

Variance Analysis (Cumulative to date) (\$K)

<u>BCWS</u>	<u>BCWP</u>	<u>ACWP</u>	<u>SV</u>	<u>%</u>	<u>CV</u>	
<u>%</u>						
9486.3	9475.6	9173.1	(10.8)	-0.1%	302.5	3.2%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

WBS 1.9.1 – R&D

WBS 1.9.2.2 – Global Timing

V124s

Three bids have been received. The low bidder is a local company that is new to the department. We will perform a QA visit early in December. The initial request is for construction of ten pre production modules.

One V124s has been sent to LBL for field evaluation.

V123s

No activity.

Eventlink Monitor

No Activity. A RHIC eventlink monitor has been modified for SNS eventlink monitor testing. The preliminary testing look good, but more in-depth tests will be required.

A True Time GPS receiver, network timeserver option and IRIG B VME module have been ordered for evaluation. Delivery is expected in December.

We are continuing to support the SNS effort to have the RHIC timing system distribution components built. This month we evaluated the 1300 nm OCP laser transmitter in a BNL circuit board for compatibility and performance, including signal rise time, optical power output, and jitter.

A prototype eventlink master and RTDL master remains set up in the SNS controls lab for driver development.

WBS 1.9.2.2 –Timing Software

Event Timing System:

The driver software for the Event Timing Beam Trigger module (V124s) is being developed. A paper on SNS timing software development was written for the ICALEPCS conference.

WBS 1.9.5.1 -Ring Controls Integration

The SNS Web server was updated to include photos of controls group hardware under development.

WBS 1.9.5.2 - Power Supply Controls

PSI:

Verification of the PSI is completed and this month BNL plans to ship some units to ORNL. It was decided that the PSI initialization code should be changed to explicitly require that the on/off command bits be set to off and the set point value we set to zero when the unit is powered on. This requires a change in the FPGA code. Before shipping the FPGA code in each unit will be updated to reflect the latest version of the code.

PSC:

We continue to extensively test the PSC/PSI combination. We found a bug in the PSC logic that only occurs in software-triggered modes and a second problem that only occurs in burst mode under some conditions. We are working with the manufacturer to find and fix the problems. The errors noted occur at very low rates under heavy load. We now have test procedures that allow us to automatically detect the errors. When operating in the normal SNS mode, using hardware triggers, we have been able to run 10^9 messages without an error.

Power Supply Application:

IOC configuration information for all SNS HEBT, Ring and RTBT power supplies has been compiled and integrated with an existing power supply database currently maintained by Bob Lambiase.

IOC Equipment Cabinet Power Estimates have been completed and have been entered into the power supply database.

A new instance of the application, containing additional operator screen controls for diagnostic purposes, has been built from the power supply database, and is being used for PSC and PSI testing.

A paper on the SNS PSC/PSI power supply controller was presented at ICALEPCS.

WBS 1.9.5.3 – Diagnostics

A system was put in place to test the 16-bit VMIC ADC board for the BLM system. A 24 bit ADC board is on order but has not arrived yet. High precision voltage source and meter have been acquired for the testing.

Laser Wire:

The testing of the Laser Wire software started. Motor failures caused the tests to be suspended. Testing will resume when the hardware is available.

WBS 1.9.5.4 - Vacuum

A paper on the Vacuum controls system was written and presented at the ICALEPCS conference.

Work was started on setting up the Ring Vacuum ICS rack. A standard SNS rack is being used in the configuration

WBS 1.9.5.5 - Application Software

Submitted the ICALEPCS paper “A prototype of the UAL 2.0 application toolkit” to the ICALEPCS conference.

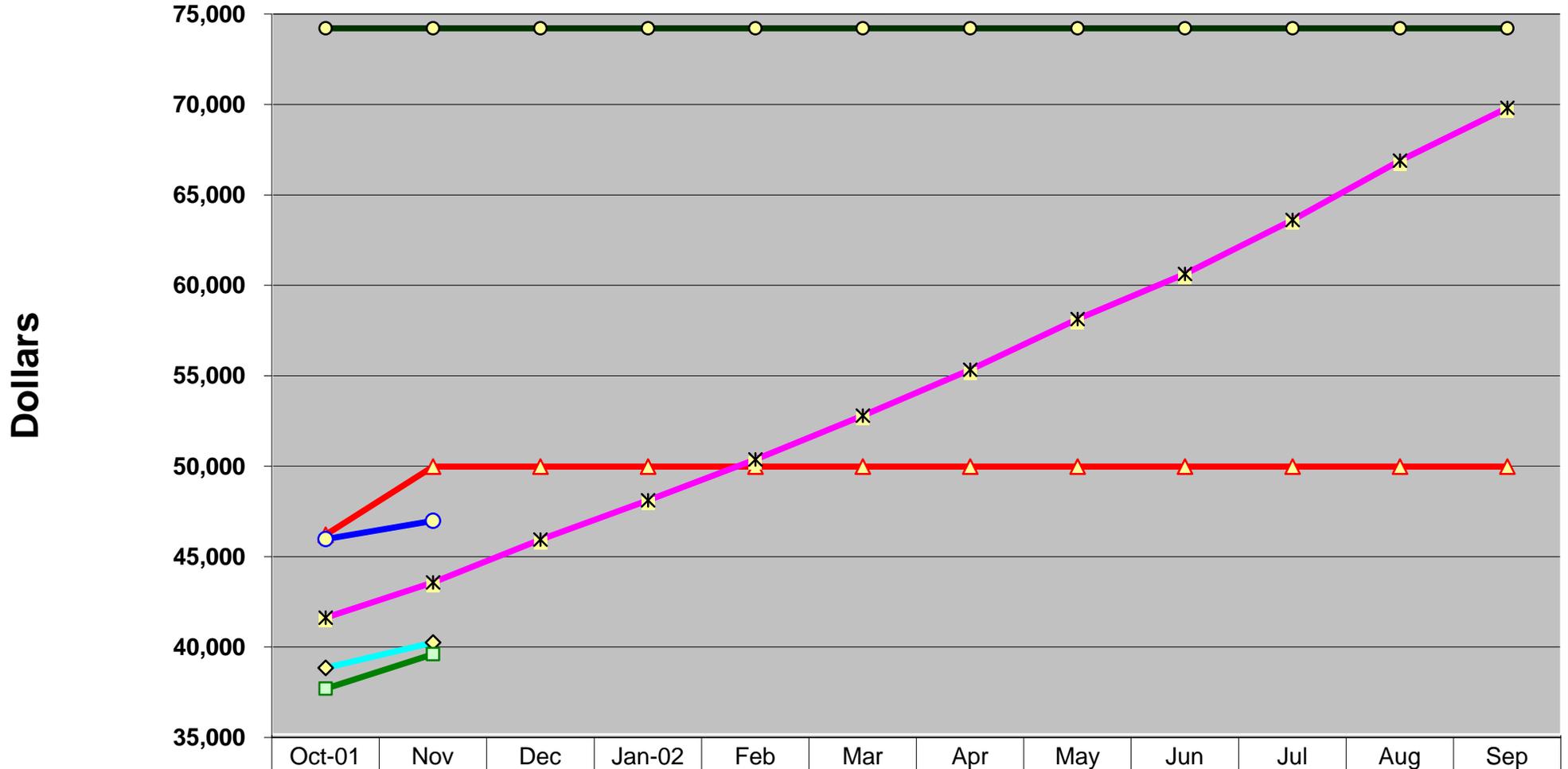
Implemented the Open JMS-based demo on the sun1.sns.bnl.gov computer. The demo is considered an integral part of the Orbit Difference Display development and connected together Java Channel Access and Ptolemy II Plot allowing external users to access the EPICS run-time data through a firewall. This work has been done together with the ITD specialists providing the port proxies for the BNL/SNS server.

WBS 1.9.5.6 – RF

There were meetings with the RF group to setup schedules for software and hardware development. The present schedule is for the preliminary ICDs for both the LLRF and HLRF to be ready in January. The software for the HLRF will not be required before the middle of 03. It is anticipated that LLRF hardware will start to become available in March. At that time driver software development will start.

IV. Earned Value Reports and Charts

1.5 Performance Measurement Chart



	Oct-01	Nov	Dec	Jan-02	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Cum Planned BA	74,034	74,034	74,034	74,034	74,034	74,034	74,034	74,034	74,034	74,034	74,034	74,034
Cum Authorized BA	46,034	49,806	49,806	49,806	49,806	49,806	49,806	49,806	49,806	49,806	49,806	49,806
Cum Actual BA	45,796	46,801										
Cum BCWS	41,443	43,396	45,769	47,940	50,186	52,611	55,155	57,963	60,453	63,433	66,719	69,634
Cum BCWP	38,670	40,079										
Cum ACWP	37,521	39,429										

Months

**U.S. DEPARTMENT OF ENERGY
COST PERFORMANCE REPORT - WORK BREAKDOWN STRUCTURE (FORMAT 1)**

PROJECT TITLE: SPALLATION NEUTRON SOURCE	REPORTING PERIOD: 1-Nov-01 thru 30-Nov-01	PROJECT NUMBER: 99-E-334
PARTICIPANT NAME AND ADDRESS: Brookhaven National Laboratory Brookhaven, NY	BCWS PLAN DATE: October 1999	START DATE: October 1998
		COMPLETION DATE: November 2006

WORK BREAKDOWN STRUCTURE	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	Budgeted Cost		Actual Cost of Work Performed	Variance		Budgeted Cost		Actual Cost of Work Performed	Variance		Budgeted	Revised Estimate	Variance
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
1.1.3 Rings System Development	0.0	0.0	0.5	0.0	(0.5)	5,115.415	5,115.415	5,038.7	0.0	76.7	5,115		
1.5 Ring & Transfer Line System	1,952.8	1,409.5	1,908.6	(543.3)	(499.1)	43,396.091	40,079.442	39,429.1	(3,316.6)	650.3	123,312		
1.5.1 HEBT (High Energy Beam Transport) Systems	427.1	245.1	293.9	(181.9)	(48.7)	4,664.010	4,130.044	3,415.3	(534.0)	714.8	10,639		
1.5.2 Injection Systems	33.2	7.4	86.7	(25.8)	(79.3)	2,919.814	2,496.058	2,798.5	(423.8)	(302.5)	9,233		
1.5.3 Magnet Systems	140.9	64.07	426.1	(76.8)	(362.0)	6,169.776	6,090.862	7,612.0	(78.9)	(1,521.2)	16,357		
1.5.4 Power Supply System	97.5	36.4	40.8	(61.1)	(4.4)	2,143.558	1,057.501	826.7	(1,086.1)	230.8	5,779		
1.5.5 Vacuum System	254.5	227.5	125.1	(27.1)	102.3	3,198.148	2,988.826	2,916.8	(209.3)	72.1	11,404		
1.5.6 RF System	274.6	193.9	167.0	(80.7)	27.0	5,230.047	4,986.056	4,317.4	(244.0)	668.7	13,049		
1.5.7 Ring Systems Diagnostic Instrumentation	169.4	114.0	177.3	(55.4)	(63.3)	5,056.696	4,637.451	4,373.8	(419.2)	263.7	16,102		
1.5.8 Collimation and Shielding	53.3	0.0	73.0	(53.3)	(73.0)	1,219.059	1,101.228	1,229.6	(117.8)	(128.3)	2,740		
1.5.9 Extraction System	100.1	159.7	81.9	59.5	77.7	1,266.284	1,208.821	1,066.6	(57.5)	142.3	5,965		
1.5.10 RTBT (Ring to Target Beam Transport) System	131.8	83.3	163.0	(48.5)	(79.7)	1,975.429	1,885.154	1,698.7	(90.3)	186.5	8,099		
1.5.11 Cable	21.9	10.0	0.0	(11.9)	10.0	66.941	21.886	0.7	(45.1)	21.1	2,817		
1.5.12 Technical Support	248.5	268.2	273.8	19.7	(5.6)	9,486.329	9,475.555	9,173.1	(10.8)	302.5	21,127		
WBS SUBTOTAL	1,952.8	1,409.5	1,909.1	(543.3)	(499.6)	48,511.5	45,194.9	44,467.8	(3,316.6)	727.0	128,428		
UNDISTRIBUTED BUDGET													
SUBTOTAL	1,952.8		1,909.1			48,511.5		44,467.8			128,428		
MANAGEMENT RESERVE													
TOTAL	1,952.8		1,909.1			48,511.5		44,467.8			128,428		

RECONCILIATION TO CONTRACT BUDGET BASE

DOLLARS EXPRESSED IN: THOUSANDS	SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR: Bill Weng	DATE: December 19, 2001
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