Brookhaven National Laboratory

SNS

Ring and Transfer Lines Systems

F E B R U A R Y

MONTHLY REPORT

01 February – 28 February 2002

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
February 2002
Ring and Transfer Lines Systems

I. Senior Team Leader Assessment

1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS

- Good progress is made in reducing ring dipole field variation. Four magnets have been shimmed to achieve field variation within 0.01%.
- Ring extraction kicker PFN (pulse-forming-network) and prototype magnet have been successfully tested at full voltage (35 kV) and repetition rate (60 Hz).
- AP group identified and investigated the effect of closed orbit offset in extraction kicker.
- J. Wei becomes the Senior Team Leader of the SNS Ring/Transport.

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)

BCWS	BCWP	ACWP	SV	%	CV	%
5060.5	5060.5	56083.3	0.00	0.0%	(22.8)	-0.5%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period CV of -$36.7K (-524.6%) is driven by WBS 1.1.3.2, Injection & Extraction; whereas, actual costs were greater than performed.

Project Impact: None.

Corrective Action: None.

WBS 1.5 Ring and Transfer Lines

BCWS	BCWP	ACWP	SV	%	CV	%
44211.8	44839.7	44326.0	627.9	1.4%	513.7	1.1%

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

Project Impact: None.

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	0	1	3	13	130
FY02	0	0	0	0	28
Due in Next 30 days	0	0	0	0	1
Total Due at present	0	0	3	12	95
Made	0	0	3	11	87
Missed	0	0	0	1	8
Ahead of Schedule	0	0	0	0	0

3.3 PROJECT CRITICAL PATH ANALYSIS

The critical path items for the Ring are the Ring Sextupole magnet, followed by the BCM.

II. Detail R&D Subproject Status

WBS 1.1.3 – Ring System Development

All work covered by R&D funds is essentially complete.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5060.5	5060.5	56083.3	0.00	0.0%	(22.8)	-0.5%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period CV of -$36.7K (-524.6%) is driven by WBS 1.1.3.2, Injection & Extraction; whereas, actual costs were greater than performed.

Project Impact: None.

Corrective Action: None.

III. Detail Line Item Subproject Status

WBS 1.5.1 – HEBT Systems

Phone conferences continued with Tesla during the month on the HEBT dipole magnet. Tesla continues to work on the second magnet. They have not updated their delivery date for this magnet. The vacuum chamber-mounting bracket has been redesigned and ORNL is making the brackets.

Phone conferences continued with Danfysik during the month. Danfysik completed and tested both 12Q45 quadrupole magnet and the 16CD20 corrector magnet. Both magnets were shipped on 2/28/02 and are expected in ORNL by 3/15/02.

Six standard dipole chambers have been received at SNS/ORNL and visually inspected. The first article dipole chamber was fit checked in the magnet at SNS and found acceptable. The three special extraction dipole chambers have arrived at port in the US. The dipole chamber positioning brackets have been redesigned to account for the new lattice positioning system, and forwarded to SNS. The PO for the 12 cm inconel bellows has been awarded to Ameriflex. Expected delivery beings 4-6 weeks.

Ray traces for momentum collimator dipole chamber was revisited due to introduction of new lattice positioning system. Rays for 1.0 GeV at –0.66% appear to scrape the extraction pipe entrance 4 mm and 1.2 cm at the exit flange. Results will be reviewed with AP. The location and window layout for the momentum dump was reviewed.

Drawings for the truncated HEBT line collimators have being prepared, and will undergo internal review. Conceptual drawings of the HEBT momentum dump are still in preparation.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3842.4	3861.9	3743.1	19.6	0.5%	118.8	3.1%

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

Current period schedule variance (SV) $39.5K (32.9%) is driven by BCWP for 16CD20 Corrector delivery, WBS 1.5.1.1.3; whereas cum BCWP is now equal to cum BCWS for 1st delivery activity RI05011347.

Project Impact: None.

Corrective Action: None.

WBS 1.5.2 – Injection Systems

The drawings for the first three injection chicane magnets are being checked. The time step analysis to determine the heating of the carbon/carbon block for stripped electron capture over the injection time period and repetition rate is being done with both ANSYS and ALGOR by two different engineers to compare results.

The fabrication of the injection septum magnet components still continues. The vacuum chamber still remains to be completed. The other parts have been inspected and sent to the assembly area (building 919B).

The redesign of the dump septum magnet continues. The drawings are ready for checking.

The project office approved the PCR for the spare injection septum magnet and spare coils for the last chicane magnet.

The assembly of the two first article long injection kicker magnets (horizontal and vertical) is nearly complete. Ceramaseal has again revised the delivery date for the ceramic chambers to 3/36/02. The revised short injection kicker design work is complete and awaiting checking.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3191.2	3345.0	3401.2	153.8	4.8%	(56.2)	-1.68%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.3 – Magnet Systems

Sixteen ring dipole magnets (17D120) have been measured so far; many of them twice. At this time we have four good magnets (Integral Transfer Function (ITF) that is $<1 \times 10^{-4}$ from the nominal value). Two magnets that were outside the acceptable ITF value were shimmed. On one the upper pole was shimmed to decrease the gap size and it decreased the ITF difference from -30×10^{-4} value to -3.5×10^{-4}. On another the return legs were shimmed to increase the gap size and it decreased the ITF difference from 13.6×10^{-4} to 2.9×10^{-4}. The shimming did not affect the field quality of the magnets; it is still within specification. Magnets continue to be measured and they will be shimmed in accordance with the experience gained from the first two magnets. In addition, a magnet was measured again after it was split as it would be for vacuum chamber installation. The field changed by $<1.5 \times 10^{-4}$. The survey data and the material data for the dipoles were compiled but there is not direct correlation with the measurement results.

Magnetically measuring the magnet is the only way to determine the ITF and the amount of shimming required to bring the magnets to within .01% of each other.

Phone conferences continued with Tesla during the month on the 21Q40 quadrupole magnet. Fabrication of the next four magnets was completed and the magnets were shipped at the end of the month.

BNL Central Shops completed fabrication of the two measuring coil forms needed for the larger aperture magnets. They are being assembled.

The half-cell-lifting fixture for the ring has been fabricated. It is being prepared for load testing and final weld inspection before painting.

The first production group of seven 27CDM30 correctors is being tested and the first article is being magnet measured. This effort is 90% complete and there are no issues. New England Technicoil is nearly complete with the reworking of the first article 21CS26 sextupole corrector magnet that was returned to them because it was out of tolerance. They expect to ship it back by 3/15/02.

Shipping of first article 26Q40 quadrupole has slipped to March 15, 2002. They have completed the final bits of hardware and are ready to do the final tests before shipment.

Three more phone conferences were held with Budker Institute of Nuclear Physics (BINP). One of them was held with Dr.Yuri Shatunov in attendance at the BNL end. They still have not provided a production schedule. While they dispute the BNL pole tip measuring procedures they mailed us a new pole tip profile piece on February 22. We await its delivery and will review the measurement procedures when that pole is measured. They have reviewed the coil profile drawing – they have no problem with winding the coil in that fashion other than that there will be some corner to corner points at the cross-overs. This is common to both designs. They are having difficulty getting hardware and tools. BNL has agreed to order this for them. So far BNL has generated 5 requisitions for 25 line items that will be delivered to BNL and then air shipped to BINP. BINP is unable to order the epoxy as well and is concerned that they do not understand the instructions from DOW for potting a coil. Because of their concerns; BNL and ORNL will allow them to use the epoxy that they have in stock hoping that it will help insure their success.

The effort to pay SGS Vostok, Ltd. for their inspection and surveillance services that were discussed in last month's report continued. By the end of the month this was completed. This effort is ongoing as they are having difficulty understanding our system of invoice and payment. We also await documentation on the annealing of the steel used for the quadrupoles.

Alpha Magnetics has ordered material for the 41CDM30. Delivery of the first article is scheduled for 5/22/02. The drawings for the 36CDM30 corrector magnet were completed, checked, and approved. The bid package was prepared and sent out for bids. The bids are due back on March 14, 2002.

The detailed design drawings for the 21S26 high field sextupole are in checking. Preliminary design continues on the 26S26 high field sextupole. A design review will be held next month.

The Project Office approved the PCR's for spare magnets.

Work continues on the BNL/SNS magnet parameter list to include the latest design and physics information. All four levels of magnet development (designer, engineer, magnetic field analysis, and physics parameters) are being reviewed and compared for correct information. The designers and engineers have reviewed and updated the list. The physics group is reviewing it. The lattice drawing is still being worked on. The design room is providing plan views of components that can be incorporated into a second sheet of the lattice drawing. All of the errors in the lattice coordinates have been reviewed and corrected by ORNL. The final ring lattice positions will depend on which magnet ITF is chosen as the standard. This is imminent.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
8472.2	8222.9	8395.7	(249.3)	-2.9%	(172.8)	-2.1%

Variance Statement: Cum variances are within thresholds. No analysis required.

Current period schedule variance (SV) -$164.8K (-44.6%) is driven by 21Q40 Magnet production dlvy Phase 1, WBS 1.5.3.1; whereas no performance was taken against $117.5K of BCWS; and 21CS/CO26 Correctors production dlvy, WBS 1.5.3.2 whereas no performance was taken against $67.6K of BCWS. Current period cost variance (CV) -$145.7K (-71.1%) is driven by the material cost ($118K) of Low Field Magnets, WBS 1.5.3.2; whereas actual costs have been expensed against material received.

Project Impact: None.

Corrective Action: None.

WBS 1.5.4 – Power Supply Systems

A design review of the first six models of the medium range power supplies was held at the vendor's facility Feb 12-13. Details of the design were reviewed, issues resolved, and initial documentation received.

During the same visit as the medium range supplies, the regeneration circuit of the injection bump power supplies was demonstrated, using the final capacitor bank. This worked very well.

First article testing of the low field correctors was held at the vendor's facility Feb 27 - Mar 1. The unit was not fully complete, and there were technical issues to resolve. These were resolved, and two units are going to be shipped to BNL early April for our detailed testing and analysis. We'll use a maximum of one week for this, and based on the results, we can have the vendor start on full production.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
865.8	867.6	863.3	1.7	0.2%	4.3	0.5%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.5 – Ring Vacuum System

All the dipole chambers were received from vendor SDMS. They have been inspected and leak-checked. To this date, nine type-A halfcell (HC) chambers and eight type-B HC chambers have been welded and leak checked. Pump down and outgassing measurements of the HC chamber continue. The design of the RF straight section doublet chambers continues with shorter doublet chambers to provide more space for diagnostics. The interface between extraction kicker chambers and doublet chamber was reviewed.

The 1st article gauge controller set has passed all acceptance tests including analog and set point response time, and RS-485 communication. The production lot order was released to vendor. One gauge controller set was shipped to turbopump (TMP) vendor for integration into the 1st article TMP cart. The TMP cart vendor was visited to review requirements and schedule. Input and output modules and wiring components for the HEBT prototype PLC were ordered. A HEBT stick figure was generated. The Ring vacuum and control ICD was finalized, signed off and released.

Outgassing tests revealed a higher than expected outgassing rate for the TiN coated HC chambers. HC chambers were subsequently coated or re-coated at lower pressure. Both color of the coating (relative to density) and measured outgassing rates improved. Coupons from these runs will be analyzed with AES and SEM, compared with previous ones.

The pump port RF screens were successfully re-coated with TiN after ultrasonic cleaning and vacuum bake. Two copper coating tests for injection kicker chambers were carried out on glass tubes using a screen as an anode trap. Adhesion was fairly good, but the coating thickness was not uniform and the resistivity was higher than expected.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3345.8	3480.0	3382.8	134.2	4.0%	97.2	2.8%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.6 – RF System

- Trip to LANL to study linac low level rf.

- Continued design work on the wall current monitor.
- Began investigating control interface issues between DSP and IOC.

- For high level RF, tests of dynamic tuning continued.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
4848.5	5555.3	5038.6	706.8	14.6%	516.7	9.3%

Variance Statement: Cum schedule variance (SV) of $706.8K (14.6%) is driven by 1.5.6.1 High level RF Systems. A PCR is being processed to adjust material deliveries and correctly amend the SV & CV. Current period SV of -$109.7K (-66.6%) is driven by 1.5.6.2 Low Level RF Systems and CV of -$130.3K (-237.3%) is driven by 1.5.6.1 High Level RF Systems. A PCR is being processed to adjust material deliveries and correctly amend the cum variances.

Project Impact: None.

Corrective Action: None.

WBS 1.5.7 – Ring Diagnostics

Group members made contributions to various ASAC presentations. Technician offices and labs are moving, considerable effort is being devoted to packing and unpacking.

The running total of BPM PUEs delivered to the Vacuum group is 2 for HEBT and 20 for the Ring. Shop work continues on 12cm, 26cm, 30cm, and 36cm PUEs. Finished machining of assembly fixturing for the 26cm, 30cm, and 36cm BPMs. Looking into using a Bergoz AFE for Ring BPM electronics.

Investigation of alternative designs for the Ring transverse profile monitor continues. Concern is electron background. The two possibilities under investigation both rely on optical detection, the first with a fluorescent screen in vacuum to convert electrons to photons and the second looking directly at the excitation of Nitrogen molecules in the vacuum. A test of the fluorescent screen optical IPM has been prepared for installation in the HEBT line of the BNL Linac next to the

Laser profile monitor test. The possibility of installing a luminescence monitor in the AGS is also under investigation.

Design drawings of the next generation BLM prototype were completed (uses a 12KV feedthru, which arced at 3.3Kv from the conductor to the welding lip). Redesigned the prototype BLM with a thicker Macor spacer to increase the leakage path to ground. This prototype was fabricated, assembled, and tested purged of Argon and refilled with Nitrogen in a 1 Rad/hr field. Flat response was obtained at 3KV, but sensitivity was reduced as expected due to Nitrogen's reduced pair production capability. Test chamber was mounted along side a standard RHIC unit for comparative measurements. When the C-AD facility recovers from maintenance, we intend to look closely at the beam loss generated signals. BLM front end electronics circuit board design was completed and sent offsite for fabrication. Software efforts have started for an ATE fixture. Controls continues to test a 24 bit ADC.

The second generation BCM AFE board artwork is under review. The MEBT BCM Electronics was shipped last week. A rough calibrator for checkout purposes was added to the BCM system at Tom Shea's request. An EDM or MEDM interface is under development. The current output DAC evaluation board has been powered up and is being tested for possible use as a calibrator. • Initial tests of the DAC2902 indicate it works as advertised. It has a very fast rise-time (near 1ns), and can deliver 20ma. A scaled current (5ma) has been used to simulate a 50 ma beam pulse. We have been investigating various termination schemes to achieve a 50 Ohm termination for the calibration winding, while introducing no errors in the current pulse to the winding. Preparing for Final Design Review at LANL in March.

Tune footprint measurement details were refined. UAL script has been prepared for modelling beam transfer function measurement. Communicating with vendors regarding cost and availability of suitable amplifiers. We continue to investigate details of tune spread measurements using the Quadrupole Moment Monitor. Material was prepared for the ASAC review.

The MEBT laser wire platform was assembled and shipped to LBNL. It appears to fit properly. The control/power supply was returned to Big Sky for repair, then forwarded on to Berkeley. The motion control software was bench tested and appeared to operate correctly. ASAC laser wire presentation was completed. Informal request for transfer of the BIG laser from LANL to BNL was submitted. Further data taking at 200MeV at the AGS Linac awaits the arrival of that laser.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
4855.2	4818.4	5151.1	(36.8)	-0.8	(332.7)	-6.9%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period CV of -$95.9K (-76.9%) is driven by $60K material costs for WBS 1.5.7.1, Ring Beam Position Monitor Sys.

Project Impact: None.

Corrective Action: None.

WBS 1.5.8 – Collimation and Shielding

The final scraper drawings are complete. A work order for the BNL shop was submitted

Drawings of the modified shield are complete. This work is being suspended until the HEBT collimator designs are complete.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1338.3	1344.1	1330.4	5.7	0.4%	13.6	1.0%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.9 – Extraction System

The PFN and the prototype kicker magnet are being tested at 35kV @ 60 Hz. There is still no indication of heating of the ferrite. A design review was held of the kicker area layout. Both kicker modules were moved closer to the 30Q44/58 doublet assembly. The goal is to keep the operating voltage at or below 35 kV for long-term reliability. BNL/SNS physics is looking at various positions, apertures, lengths, and ring working points that satisfy all of the requirements. Final detailed design is on hold until this is defined.

The Ceramic Magnetics delivery date for the low mu ferrite is still 4-5-02

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1241.0	1229.5	1222.6	(11.5)	-0.9%	6.9	0.6%

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

Project Impact: None

Corrective Action: None.

WBS 1.5.10 – RTBT System

The detailed drawings for the 36Q80 magnet core were completed, checked, and approved. The RFQ for their fabrication has been sent out for bid. Design work continues on the coil design and the coil winding fixtures. C. Pearson traveled to ORNL for an interface meeting with conventional facilities and the target group for installation of these magnets. Open issues from the meeting include: relocation of the final harp to a position immediately downstream of the last quadrupole, the tight work space or lack of space above quadrupole area in the target building, the design of the remotely removable vacuum clamps and the beam chambers (an ORNL responsibility at this time), interface to the final beam chamber before the window, and the beam line shielding between and before the quadrupoles. ORNL is investigating a Russian Laboratory that may be able to provide the final four radiation resistant magnets directly to ORNL without the need for BNL participation. Assembly of the tooling for the 36CD30 winding of a sample coil is underway.

Design work is underway on the 27CD30 corrector dipole magnet that is used in both the RTBT and in the HEBT line with the 21Q40 quadrupoles.

An internal review of the RTBT vacuum layout was conducted. Updates to details of RTBT vacuum chambers and drift space spools continue.

The manufacture process for the first article is on schedule. The final drawings of the inner collimator box are complete, and are undergoing internal review. The final drawings of the second RTBT collimator are also complete.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
2159.8	2063.5	1895.9	(96.4)	-4.5%	167.6	8.1%

Variance Statement: Cum variances are within thresholds. No analysis required.

Current period SV -$105.5K (-51.1%) is driven by WBS 1.5.10.2 RTBT Low Power PS 1st delivery; whereas no current period performance was achieved against BCWS.

Project Impact: None.

Corrective Action: None.

WBS 1.5.12 – Technical Support

- Presented a talk on “Impedance Measurements and Kickers Optimization” to the February 2002 ASAC Review in Oak Ridge.

- Calculation of the dimensions of the beam pipe aperture of the secondary and tertiary ring collimators.

- Study of the transverse coupling impedance of the displaced beam in the extraction kickers.

- Group members give 6 talks to ASAC review (M. Blaskiewicz, D. Davino, A. Fedotov, Y.Y. Lee, N. Tsoupas and J. Wei)

- Ring Web Page for lattice is published on web (<http://www.sns.bnl.gov/AP_group/>http://www.sns.bnl.gov/AP_group/)

- The beam pipe aperture of the secondary and tertiary ring collimators were finalized. Analysis of PSR space-charge experiments (with ORNL/SNS group) is being performed. Study of the transverse coupling impedance of the displaced beam in the extraction kickers was completed.

- Benchmarking between 2D and 3D to prepare for beam instabilities studies using 3D space charge package underway.

- Location for e-detectors, IPM's and WS and tune measurements in the ring were reviewed with Diagnostic groups BNL/ORNL.

- Reviewed beam pipe aperture of the RF section for beam loss.

- Extractions kicker locations were revised to reduce the required voltage below 35 kV.

- Linac dump optics was reviewed.

- Studies of the electron-proton instability continued.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
10050.9	10050.9	9900.5	0.0	0.0%	150.3	1.5%

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

The pre-production run of 10 V124s modules have been inspected and tested and eight have been sent to ORNL. Two remain at BNL. Heather is actively looking into "bugs" reported by ORNL of the V124s operation. Some, but not all have been duplicated in the lab. Updated gate array files will be sent to ORNL for validation testing.

V123s
No activity.

Eventlink Monitor
No Activity.

A True Time GPS receiver with the network time server option and IRIG B VME module has been set up in the SNS controls lab for software development.

The prints for the SNS 16 channel eventlink fanout have been marked up and have been submitted to drafting.

Prototype eventlink and RTDL master systems remain set up in the SNS controls lab for system testing.

WBS 1.9.2.2 –Timing Software

Event Timing System:
The Event Timing system slave boards and utility boards are expected to be delivered next month. When these arrive the timing system IOC software can be completed.

WBS 1.9.5.1 -Ring Controls Integration

Temperature monitoring devices were ordered. We are looking for units that can be used to monitor temperature for Collimators, Beam Dumps and laboratory test.

We are acquiring space for a diagnostic and RF lab in building 830. Timing cables are being run between labs so we will be ready to test the timing and power supply systems when timing boards become available next month.

Two people went to Linux training at ORNL.

Three people from BNL anticipated in a design review of controls hardware and software modules at LANL.

WBS 1.9.5.2 - Power Supply Controls

At the time of the software design review last month there was a one-day training course of EDM at BNL. Since then the goal has been to convert the power supply applications from MEDM to EDM and to install the software on CVS at ORNL. The most recent version of the application has now been loaded in the CVS repository at ORNL.

The method developed to automate the building of top-level MEDM screens from a database has been applied to the building of EDM screens. The conclusion is that we can build EDM screens the same way we build MEDM screens.

Two EDM issues were reported to John Sinclair, the primary developer for EDM. He advises that he has recently addressed the first issue, controlling button visibility from process variables. On the second issue, X-Y plotting, he recommends that we submit our requirements to him for evaluation that will be done soon.

A website for power supply application software has been created. It currently contains a copy of the Interface Control Document, and a copy of the IOC record descriptions mentioned below. Other documents will be added as they become available.
IOC record descriptions have been placed in a database. This will be grouped with other application configuration information when a master configuration database in constructed. A report has been created to generate user documentation from the record database. A copy of the report has been placed on the documentation website.

IOC boot warning messages resulting from incompatible default record field values in the CapFast symbol definitions have been eliminated. The problem was fixed by updating our set of CapFast symbol definitions for the record types we are using. Symbol definitions for other records were not updated because it would take considerable extra time to do this. A set of record definitions supplied by LANL was tested but they were lacking at least one record symbol that we are using. More work is needed to resolve the issue.

Demonstrated that Labview could communicate with power supply IOCs, collect data and display a fourier transform to show source of noise. Good results require the new version of Epics which allows reading long arrays.

PSC:

We continue with long term reliability testing of the PSC/PSI hardware and power supply prototype IOC software. We have not seen any errors. We noted that the PSI when given a recalibrate command will take 15 seconds to reset. We have asked the manufacturer if that time could be reduced. He has agreed to look into it and will notify us when a change to the FPGA code is available. We will hold up shipping additional PSI units to ORNL until we get the change but the existing modules are satisfactory and available if needed.

WBS 1.9.5.3 – Diagnostics

BLM:

A final report on the test results for the VME 24-bit and 16-bit VME boards was completed. The report was sent to the diagnostic group. The diagnostics group is building some hardware to simulate real signals. It is expected to be ready next month and then BLM testing can continue.

BCM:

Work was done to analyze the ADC and digital boards to be used in the BCM. The digital board is a PCI format board. The ADC is a daughter board on the digital board. Since both boards are prototype boards, the result is just a preliminary report. The tests will be repeated with the first article or production boards are available. Two types of testing were done. The first is a measurement of the time to perform the algorithms needed to read and process data from the board. The second was to measure the accuracy, noise and drift on the ADC board. From the first test areas where improvement can be made were identified. The second test identified some sources of board noise.

WBS 1.9.5.4 - Vacuum

The hardware and software needed to communicate with serial interfaced vacuum devices is being researched.

WBS 1.9.5.5 - Application Software

The sns cluster has been used for the 2.5 D space charge simulation. Recently, the UAL/ORBIT module has been upgraded to deal with 3D space charge issues. The 3D space charge studies require one or two weeks of the CPU time on our local BNL/SNS cluster. To resolve this problem, the UAL software has been installed on the central BNL cluster containing 40 dual nodes. Both clusters are not available and AP expects to use both clusters.
The UAL simulation environment has been used in many RHIC applications. The RHIC team has added several useful extensions. To facilitate the future UAL development and documentation, both versions are being merged together.

WBS 1.9.5.6 – RF

A version of the HLRF and LLRF ICD have been written and is being edited. The RF group will buy a PMC format DSP board for evaluation. We are investigating the software needed to communicate with the PCM board and working with the RF group to come up with the design of a system that meets the RF requirements. Since the MPS is a PMC format, the software to communicate between the CPU and PMC board should be available.

IV. Earned Value Reports and Charts

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

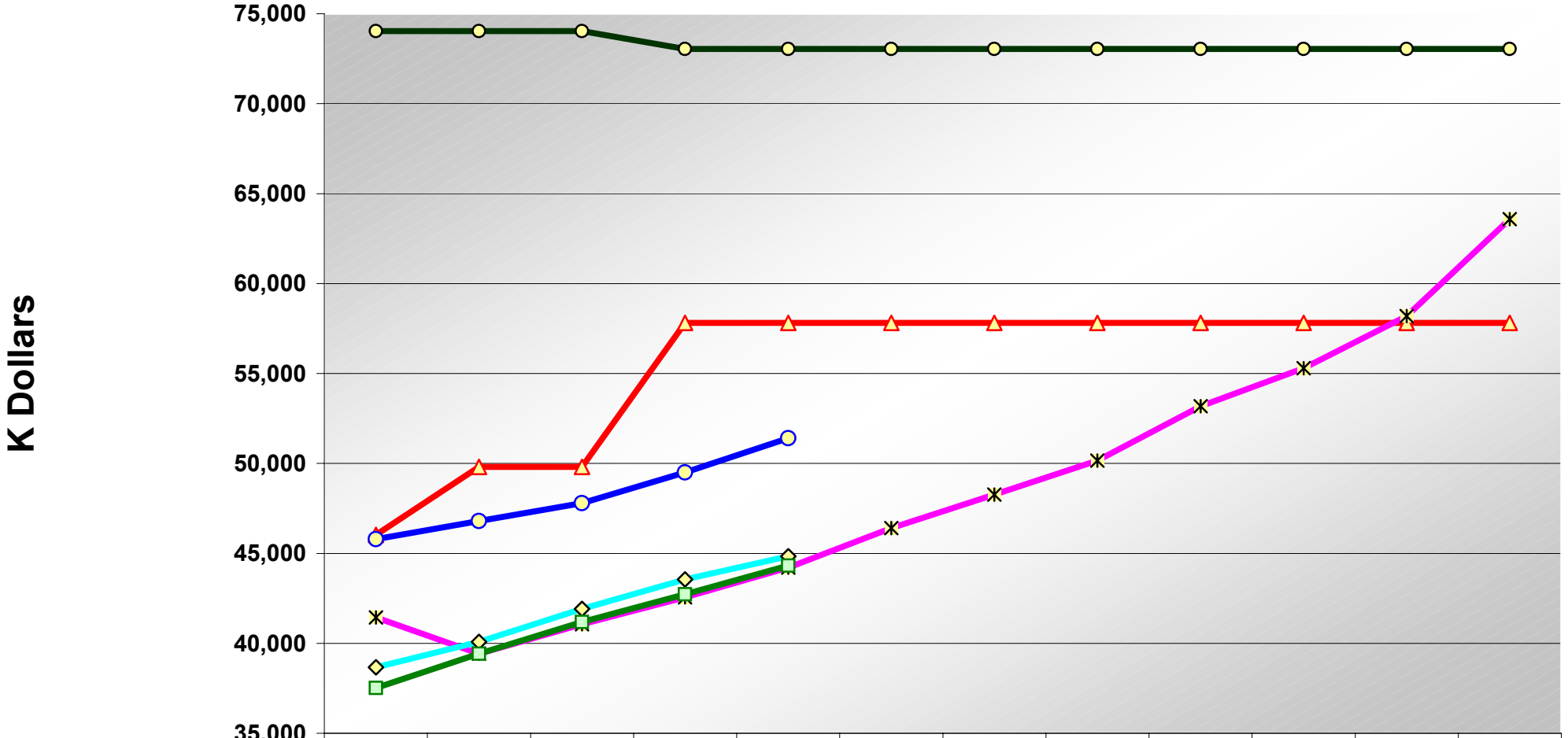
PROJECT TITLE: SPALLATION NEUTRON SOURCE	**REPORTING PERIOD:** 1-Feb-02 thru 28-Feb-02	**PROJECT NUMBER:** 99-E-334
		START DATE: October 1998
PARTICIPANT NAME AND ADDRESS: Brookhaven National Laboratory, Brookhaven, NY	**BCWS PLAN DATE:** October 1999	**COMPLETION DATE:** November 2006

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				
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost	Budgeted	Revised Estimate	Variance
1.1.3 Rings System Development	7.0	7.0	43.7	0.0	(36.7)	5,060.5	5,060.5	5,083.3	0.0	(22.8)	5,115	5,101	13.9
1.5 Ring & Transfer Line System	1,648.6	1,286.8	1,604.2	(361.8)	(317.4)	44,211.8	44,839.7	44,326.0	627.9	513.7	113,037	112,400	636.9
1.5.1 HEBT (High Energy Beam Transport) Systems	119.9	159.4	135.1	39.5	24.3	3,842.4	3,861.9	3,743.1	19.6	118.8	10,174	10,015	159.5
1.5.2 Injection Systems	135.9	116.0	124.6	(19.9)	(8.5)	3,191.2	3,345.0	3,401.2	153.8	(56.2)	8,994	9,204	-210.0
1.5.3 Magnet Systems	369.7	204.84	350.6	(164.8)	(145.7)	8,472.2	8,222.9	8,395.7	(249.3)	(172.8)	16,712	16,554	157.9
1.5.4 Power Supply System	12.6	14.2	10.6	1.6	3.6	865.8	867.6	863.3	1.7	4.3	3,434	3,431	2.5
1.5.5 Vacuum System	138.2	150.5	162.8	12.4	(12.3)	3,345.8	3,480.0	3,382.8	134.2	97.2	9,759	9,796	-37.0
1.5.6 RF System	164.6	54.9	185.2	(109.7)	(130.3)	4,848.5	5,555.3	5,038.6	706.8	516.7	12,132	12,279	-147.7
1.5.7 Ring Systems Diagnostic Instrumentation	127.6	124.7	220.7	(2.9)	(95.9)	4,855.2	4,818.4	5,151.1	(36.8)	(332.7)	14,410	14,496	-86.3
1.5.8 Collimation and Shielding	35.0	38.2	33.7	3.1	4.5	1,338.3	1,344.1	1,330.4	5.7	13.6	3,429	3,421	7.9
1.5.9 Extraction System	56.2	40.5	51.9	(15.6)	(11.3)	1,241.0	1,229.5	1,222.6	(11.5)	6.9	6,169	6,151	18.4
1.5.10 RTBT (Ring to Target Beam Transport) System	206.3	100.8	83.5	(105.5)	17.3	2,159.8	2,063.5	1,895.9	(96.4)	167.6	7,487	6,866	621.5
1.5.11 Cable	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.7	0.7	0.0
1.5.12 Technical Support	282.7	282.7	245.7	0.0	36.9	10,050.9	10,050.9	9,900.5	0.0	150.3	20,337	20,186	150.3
WBS SUBTOTAL	1,655.6	1,293.8	1,647.9	(361.8)	(354.1)	49,272.2	49,900.1	49,409.3	627.9	490.9	118,152		
UNDISTRIBUTED BUDGET													
SUBTOTAL	1,655.6		1,647.9			49,272.2		49,409.3			118,152		
MANAGEMENT RESERVE													
TOTAL	1,655.6		1,647.9			49,272.2		49,409.3			118,152		

RECONCILIATION TO CONTRACT BUDGET BASE

DOLLARS EXPRESSED IN:	SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR:	DATE:
THOUSANDS	Bill Weng	March 19, 2002

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	73,034	73,034	73,034	73,034	73,034	73,034	73,034	73,034	73,034
Cum Authorized BA	46,034	49,806	49,806	57,806	57,806	57,806	57,806	57,806	57,806	57,806	57,806	57,806
Cum Actual BA	45,796	46,801	47,788	49,500	51,402							
Cum BCWS	41,443	39,429	41,061	42,563	44,212	46,405	48,270	50,152	53,181	55,296	58,191	63,575
Cum BCWP	38,670	40,079	41,914	43,553	44,840							
Cum ACWP	37,521	39,429	41,181	42,722	44,326							

Months