



**Brookhaven National Laboratory**

**SNS**

**Ring and Transfer Lines Systems**

**JANUARY**

**MONTHLY REPORT**

01 January – 31 January 2003

Performing Organization:  
Location:

Brookhaven Science Associates  
Brookhaven National Laboratory  
Upton, New York 11973-5000

Contract Period:

October 1998 – June 2006

Brookhaven National Laboratory  
SNS MONTHLY PROGRESS REPORT  
January 2003  
Ring and Transfer Lines Systems

**I. Senior Team Leader Assessment**

**1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS**

- First-article chromatic sextupole magnet was built by Alpha Magnetics to be shipped to BNL.
- One of the corrector magnets (36CDM30) was magnetically measured and found by BNL to be out of tolerance. It has been returned to the vendor (NETC) for repair/rewind.
- Power supply group is actively assisting our vendor (IE Power) in mitigation of noise and ripple in the first-article medium-range magnet power supply.
- BNL is actively working with our vendor (Stangenes) in a mitigation plan for the out-of-tolerance pole length and width of the ring quadrupole magnet (26Q40).
- Comparing field measurement and computer modeling, one of the injection magnets (chicane #4) is being prepared for a second iteration of pole profile (z bump) to optimize its field quality.
- SNS project directors/division head visited BNL. An all-hands meeting was held.
- Due to pending Project-Change-Request, BNL had to cancel purchase orders made for the spare sextupole magnet and coils while still responsible for the material cost. Originally planned spare injection septum (dump side) magnet was also cancelled.
- All the groups are performing a new round of Estimate-To-Complete. Last ETC was done on December 2001.

**2. ISSUES AND ACTIONS**

- ASAC Recommendations, supported by the recent DOE Review, needs to be authorized, funded and implemented. Awaiting Project direction.

### 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>
5115.0	5115.0	5112.9	0.00	0.0%	2.1	0.0%

**Variance Statement:** Cum variances are within thresholds. No analysis required.  
No current period activity.

**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>
64349.2	65536.2	66617.3	1187.00	1.8%	(1081.1)	-1.6%

**Variance Statement:** Cum variances are within thresholds. No analysis required.  
Current period CV -\$804.9K (-74.2%) is driven by WBS 1.5.1, 1.5.2, & 1.5.3.

**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.

<u>Milestones</u>	<u>Level 1</u>	<u>Level 2</u>	<u>Level 3</u>	<u>Level 4</u>	<u>Level 5</u>
Project	0	1	3	13	126
FY03	0	0	0	0	7
Due in Next 30 days	0	0	0	0	0
Total Due at present	0	0	3	12	111
Made	0	0	3	12	99
Missed	0	0	0	0	12
Ahead of Schedule	0	0	0	0	0

#### 3.3 PROJECT CRITICAL PATH ANALYSIS

The critical path item is Ring Diagnostics. The Ring Diagnostics schedule is presently being reworked.

## 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)

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
5115.0	5115.0	5112.9	0.00	0.0%	2.1	0.0%

**Variance Statement:** Cum variances are within thresholds. No analysis required.  
No current period activity.

**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/RTBT 21Q40 magnets. They are machining parts for the first HEBT/RTBT 21Q40 magnets; they are working on updating their delivery schedule. The stands for the 21Q40 and 27CD30 are being fabricated. BNL is planning on delivery of the first six in March 2003. New England Technicoil has started fabrication of the 27CD30 corrector magnet. There was also a meeting at BNL with four engineers from SNS/ORNL where deliveries of these magnets and others were discussed. Minutes were generated with the details.

The 12cm weld fixture fabrication is complete. Assembly of the fixture is underway. A complete 12 cm chamber production schedule has been generated to meet ORNL installation schedule. Pipe sections for the 12cm quadrupole chambers have been machined and cleaned. The 21cm quadrupole chambers are being packaged for shipment to ORNL. The design of Linac dump line vacuum is complete. The Q33 and Q34 chambers before the ring injection septum have been modified to accommodate the separate magnet stands. The design of the momentum dump vacuum continues. Quotes for base and head castings for 12 cm drift pipe supports have been received.

Drawings of the HEBT momentum dump are being reviewed. Fabrication of the HEBT collimators is continuing. Outer shield arrangements have also been designed, and the drawings are complete. A pedestal to which the support jacks, and the lateral movement jacks will be attached has been designed and the drawings are complete.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
5857.0	7319.0	6079.5	1461.98	25.0%	1239.5	16.9%

**Variance Statement:** Cum SV \$1461.98K (25%) & CV \$1239.5K (16.9%) are material driven by 1.5.1.1 HEBT 8D533, 16CD20 & 12Q45 Magnets, whereas most magnets were received ahead of schedule. Also ACWP is understated and does not reflect final payment to magnet suppliers. After final payment ACWP will be accrued in a subsequent current period and a material change to the CV will be reported. BCWS and current SV will be redressed and adjusted during the ETC. Current period CV -\$521.9K (-1148.1%) is driven by WBS 1.5.1.1 HEBT Magnets whereas an accounting accrual was recorded subsequent to BCWP.

**Project Impact:** None.

**Corrective Action:** None.

### **WBS 1.5.2 – Injection Systems**

Magnetic and full power tests on the first article injection kicker magnets continued without incident. A stationary magnetic measurement coil with dipole windings was mounted inside the magnets to measure the performance of the injection kicker system (power supply and magnets). The driving voltage, magnet current, and voltage from the pickup windings for three different waveforms were recorded. Measurements were made with no beam tube and with the coated ceramic beam tube in place. It was confirmed that the fall-time of the magnetic field met specifications [exact number from YY] and that the ceramic beam tube did not affect performance. These results were reported at the January 28 AP Videoconference.

Ceramic Magnetic Inc. has delivered all long kicker ferrites and the first batch of short kicker ferrites. The last batch of short kicker ferrites will be delivered on 2/14/03. According to Ceramaseal, the delivery date for the long kicker ceramic chambers is on 3/25/03 for two chambers, and on 5/11/03 for other three. Most of the machined parts are finished from Central shop. The two strong backs will be finished soon. Beam components group is inspecting and cataloging parts - preparing to start the assembly work.

Long coil magnetic measurements of the chicane outfitted with an initial set of iron “z-bumps” have been completed. The results indicate that the required field uniformity has not been achieved. Therefore, a second iteration of the “z-bump” design is underway.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
4915.7	5373.8	5494.2	458.15	9.3%	(120.4)	-2.2%

**Variance Statement:** Cum variances are within thresholds. No analysis required. Current period CV -\$198.1K (-522.3%) is driven by 1.5.2.1 Pulsed Magnets whereas an accounting accrual for material was not offset by current period BCWP. BCWP will be adjusted in a subsequent current period. Current period CV is also driven by 1.5.2.3, DC Magnets, whereas an accounting accrual for material was recorded against previously reported BCWP.

**Project Impact:** None.

**Corrective Action:** None.

### **WBS 1.5.3 – Magnet Systems**

The second half-cell is being assembled in the 902 to assembly area. It awaits installation of the dipole interconnect bus work which is being fabricated. It will be shipped in February. Preparation and assembly on the third and fourth half-cells has started. The fitting repairs on the 17D120 quadrupoles have been completed.

The last batch of 21Q40 magnets was received at BNL and they are being acceptance tested. They still had the old stainless steel braze material so the fittings on those magnets will have to

be removed and replaced. With these six a total of nine quadrupoles remain that need to be repaired. Production measurements of the 21Q40 have resumed. Nine magnets were measured during the month so that a total of 18 out of 29 have been characterized.

Stangenes Inc. sent the inspection reports of the machining tolerances of the core pieces. Half of the pieces are out of tolerance on the overall length. Stangenes is willing to re-machine as necessary to match the pieces to the drawing tolerances.

The BINP held only two phone conferences during the month. They did receive most of the hardware parts that were purchased by BNL except the klixons that were missing from the box. They will supply Russian klixons. They are still scheduling shipment of 3 – 30Q58's and 2 – 30Q44's from their facility in March via ground transport. They don't know the best route or time for shipment.

At this time eighteen 27CDM30's have been measured and accepted. The measurement effort for these magnets has been stopped to allow for measurement of the 21Q40's.

On the 21S26, Alpha is nearing completion and will ship in February (actual 2/4/03). Alpha is working on a schedule for delivery of the 26S26 – they have ordered both the copper and the steel.

The 36CDM30 corrector magnet was magnetically measured and found to be out of tolerance. It was shipped back to NETC for repair and rewind.

Alpha Magnetics has started production on the 41CDM30. They expect to deliver the first units in early March.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
11514.3	11322.0	12123.7	(192.32)	-1.7%	(801.7)	-7.1%

**Variance Statement:** Cum variances are within thresholds. No analysis required. Current period CV -\$145.4K (-127.8%) is driven by WBS 1.5.3.1 High Field Magnets whereas an accounting accrual for direct & trade labor, small & special purchases exceeded BCWP by \$150.8K.

**Project Impact:** None.

**Corrective Action:** None.

#### **WBS 1.5.4 – Power Supply Systems**

- First Article testing of the RF Tuning PS was performed at the vendor's facility (Danfysik). The unit performed well. This unit was shipped to BNL. The production run of three additional units should be shipped by May.

- A design review of the Extraction Kicker was held at the vendor's facility (Applied Power Systems). There is about a two month slip in schedule, but the production is otherwise going very well.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
1261.8	1088.1	1332.1	(173.69)	-13.8%	(244.0)	-22.4%

**Variance Statement:** Cum SV of -\$173.69K (-13.8%) & CV -\$244K (-22.4%) are driven by High Power and Main Ring Power Supplies. whereas BCWP is understated for material and will be adjusted in a subsequent current period. Current period SV 88.3K (729.54%) is driven by WBS 1.5.4.1 Ring Dipole PS whereas BCWP was recorded ahead of schedule. BCWS will be reported in a subsequent current period.

**Project Impact:** None.

**Corrective Action:** None.

**WBS 1.5.5 – Ring Vacuum System**

Five type-D halfcell chambers have been assembled and leak checked, therefore completing the assembly of all the arc halfcell chambers. The design of the welding fixture for the 30cm doublet chambers is complete and the drawings were sent to the Shop for fabrication. The chamber components for the injection and rf straight section doublet chambers have been leak checked. The rf section doublet chamber design is being modified to provide more space for diagnostics. Testing of various types of seals with 14” openings has been conducted with mixed results. Further testing will be coordinated with ORNL together with the design of remote clamps.

Two type-C halfcell chambers have been coated with TiN. The last (#4) RF cavity pipe assembly has also been coated with TiN. All type B chambers have been assembled and delivered to building 905 for half-cell assembly. The second coating stand is being modified for the coating of the injection kicker ceramic chambers with Cu and TiN.

The orders for all the turbopump station isolation valves and all-metal right-angle valves have been placed. Vacuum instrument adaptor flanges have also been purchased. The vacuum instrument block diagram, the rack layout, the PLC I/O assignment and the cable run list are being generated for Project Office. An internal meeting was held to discuss various vacuum controls and interface issues. The HEBT Vacuum EPICS screen design and the PLC ladder programs were revised to include the updated vacuum device list and the interface to MPS. Communication via ControlNet is under test. Several team members have attended and presented the status of ring vacuum control on vacuum control video conference.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
5361.3	5354.7	5608.1	(6.58)	-0.1%	(253.4)	-4.7%

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

**Project Impact:** None.

**Corrective Action:** None.

### **WBS 1.5.6 – RF System**

- Ring LLRF work has focused on preparation for the cavity IQ loop test. The prototype A/D daughter card is undergoing testing. The A/D FPGA firmware is being debugged. The DSP IQ loop code continues to evolve using the A/D daughter card data to test it. A rudimentary EPICS interface to the DSPs has been established.
- For high level RF, assembly work on PA's, cavities and cap banks continues. Tests of the second PA are in progress. Tuning PS tested at Danfysik and first unit due to BNL in February. Work on the wall current monitor was started.
- Accelerator physics work on the e-p instability continued. A simulation code which models nonlinear space charge and instabilities is finished and has been run several times. Several more runs will be needed to test the analytic theory.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
7821.4	7638.2	7949.3	(183.25)	-2.3%	(311.2)	-4.1%

**Variance Statement:** Cum variances are within thresholds. No analysis required. Current period SV \$81.6K (57.5%) is material driven by 1.5.6.2 RF Beam Control System, whereas BCWP was recorded against material originally scheduled in a prior current period.

**Project Impact:** None.

**Corrective Action:** None.

### **WBS 1.5.7 – Ring Diagnostics**

Preparations are underway for a visit by the ORNL Diagnostics team the week of February 24th, the ASAC Review the week of March 10th, and the upcoming design review the week of March 24th. ETC and Schedule work continues.

Delivered 12 more 12cm BPMs to the vacuum group (running total for 12cm BPMs is 21), sent out 10 units of 30cm BPMs to the brazing shop, continued assembling other BPMs to be ready

for copper brazing, continued machining parts for the additional 6 units of 30cm BPMs in the shop. A stuffed baseband BPM AFE/digitizer board was received and is in testing, interfaced to a LANL PCI card. Work continues on the RF portion of the BPM electronics. Implementing TDR calibration scheme to complement beam-based alignment/calibration, daughter card for baseband board is in preparation. Revisiting the log amp design. Additional LANL-design PCI interface cards needed for this system are in fab. A rackmount PC for the BPM system was located and ordered after an extensive search, and has been received.

Design work continues on the IPM detectors. The inclusion of the electron calibration source in the SNS IPM will require switching of high voltages used to generate the electron sweep field. An electrical engineer has started to work on this design.

Preparations for DTL commissioning continue. We need an MPS board from ORNL to test our interface to MPS. So far it has not been possible to get one. The 8 channel AFE board is being stuffed. The controls interface document has been written with instructions on how to communicate via digital I/O to the 8 channel AFE. Construction of AFE test stand continues. The final PCB design specs for the 32 channel MPS interface VME module are being refined. Expect delivery of the 10 LND Incorporated BLM ion chamber detectors next week. This delivery has been repeatedly delayed and is moving close to the critical path for DTL. Working with Elma on cost estimates for delivering assembled AFE chassis based upon our design specs. AFE power supplies have been received.

Testing of DTL BCM electronics continues. Additional boards were sent out for stuffing. LANL version of the PCI card is in fab. DAC boards received for DTL calibrators. Working on conceptual design to meet the request for differential current measurements. Integrated BCM card in layout. A meeting with Controls resolved questions about implementation of the timing decoder. Need a V124S module from ORNL for system development work. Detail drawings of HEBT pickups are in progress. Received ceramic gaps for HEBT BCMs from Ceramaseal. Performed stress analysis on the vacuum chamber during bake-out. Result shows stress in Kovar slightly below yield with 200 C bake-out temperature.

Detailed design of tune kickers continues. Implementation of both coherent and incoherent tune measurement systems in modified BPM modules is proceeding. Vendor contact continues in preparation for the pulser purchase.

Awarded a contract to Key Vacuum Product to fabricate the HEBT wire scanner beam boxes. Expect to receive the parts by mid March. Exploring the possibility of adding scrapers to the Ring wire scanners for Beam-in-Gap and Halo measurements.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
7602.9	7267.6	7323.4	(335.30)	-4.4%	(55.7)	-0.8%

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

Current period CV -\$43.9K (-31.2%) is material driven by WBS 1.5.7.1, Beam Position Monitor, whereas an accounting accrual for material exceeded BCWP. BCWP is understated and will be adjusted in a subsequent current period.

**Project Impact:** None.

**Corrective Action:** None.

**WBS 1.5.8 – Collimation and Shielding**

- Work is continuing on the scrapers for the ring. The ring secondary and tertiary absorber drawings have been completed, with the exception of the flanges. Finally, the vacuum chambers before and after the primary collimator are being integrated with the collimator.
- Drawings of the modified shield are complete. A review with Project Office staff was carried out, and the drawings are now in checking.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
1888.6	1783.5	1773.6	(105.1)	-5.6%	9.9	0.6%

**Variance Statement:** Cum variances are within thresholds. No analysis required. Current period SV \$91K (361.6%) is material driven by WBS 1.5.8.1 Ring Collimator and Shielding whereas BCWP was recorded against material originally scheduled in a prior current period.

**Project Impact:** None.

**Corrective Action:** None.

**WBS 1.5.9 – Extraction System**

The checking of the down stream end kicker assembly continues. To optimize the aperture and the size of flanges used in the beam pipe to septum, the bellow in the exit end may have to be modified with an off center flange. The upstream end kicker assembly detailed fabrication drawings are moving along and will be finished soon. A PFN design review was held at APS, the contractor for fabricating PFN, to go through all drawings and make sure they understand what they are required to build. The review went smoothly, APS and their subcontractors are confident they can build the 14 PFNs. No major questions about the drawings. Some of their suggestions will be implemented in a ECN. A new drawing list will be issued to APS for fabrication.

Dies have been manufactured for forming of the conductor used on the circular-arc shaped coils of the Extraction Lambertson Septum and Extraction Dump “dog-leg” dipoles. Upon receipt of

the first run of conductor in early February, bend radius tests will insure tolerable keystoneing and ovalization. CFX blank flanges, chains, seals for use downstream on the Lambertson magnet chamber are on order. Testing of an optimized seal design for the large (15.5" OD) upstream QD flanges that connect the extraction drift pipe to the Lambertson and to the bellows after the Kickers is being performed.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
1885.2	2026.5	2152.3	141.30	7.5%	(125.8)	-6.2%

**Variance Statement:** Cum variances are within thresholds. No analysis required. Current period SV -\$33.6K (-66.2%) is labor driven by WBS 1.5.9.1 Extraction Pulsed Dipole Magnets, 1.5.9.3 Lambertson Septum Magnets, whereas BCWP is understated and will be adjusted in a subsequent current period. Current period CV \$42.3K (246.7%) is driven by an accounting adjustment reversing a special procurement charge to 1.5.9.2, Extraction Kicker PS; whereas the -\$73K reversal reduced the current period actuals to yield -\$25.1K.

**Project Impact:** None

**Corrective Action:** None.

**WBS 1.5.10 – RTBT System**

Castings required for RTBT vacuum pipe supports are on order. The orders for various bellows assemblies, custom vacuum fittings and flanges have been placed. Testing of an optimized seal design for the large (15.5" OD) upstream quick disconnect flanges of Lambertson chamber is being performed.

The 36Q85 cores from Ranor have been unpacked and set up for dimensional inspection. After completing the set-up of the winding fixture and brake assembly we started winding first of 16 36Q85 coils. The conductor and winding is progressing well so the process for completing the MI conductor order is underway. There was a meeting with the engineers from SNS/ORNL.

The as built drawings for the RTBT collimator are complete. The drawings for the remaining RTBT collimator have been completed.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
3286.1	3407.9	3927.3	121.78	3.7%	(519.4)	-15.2%

**Variance Statement:** Cum schedule variance (CV) of -\$519.4K (-15.2%) is material driven by 1.5.10.5 Collimator & Shielding; whereas BCWP is understated and will be adjusted in a subsequent current period. Current period SV- \$24.9K (-39.6%) is labor driven by 1.5.10.1

RTBT Magnets and Support whereas BCWP is understated and will be adjusted in a subsequent current period.

**Project Impact:** None.

**Corrective Action:** None.

### **WBS 1.5.12 – Technical Support**

- Aperture radius for the ring collimator #2 & #3 was decided, and it will be 66.00 mm.
- Released the UAL 1.7 version. This version is associated with the User Guide aiming to provide comprehensive view of the UAL modularized simulation environment. The release includes Jie Wei’s TIBETAN module, the first module that has been developed from scratch following the new UAL framework. TIBETAN is a longitudinal phase space tracking code.
- Ported the UAL software to Linux Red Hat 8.0.
- Injection kicker was measured and it meets the spec.
- 21Q40: sorting for the 1<sup>st</sup> string of 8 was completed.
- ETC effort was begun, and preliminary estimates have been received. Project Support is reviewing the inputs and working with the group leaders to scrub the estimates.
- Study on nonlinear resonance correction is continuing.
- Extensive changes to the Controls and Diagnostics schedule were made, and continue. In response to ORNL requests, constraints are being reviewed and removed provided they don’t allow the BNL baseline to shift.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
12954.1	12954.1	12853.1	0.00	0.0%	101.0	0.8%

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

**Project Impact:** None.

**Corrective Action:** None.

### **WBS 1.9.5.1 -Ring Controls Integration**

Residual effects from last month's LINUX server disk failure continued to hamper development efforts into the first couple weeks of this month until all issues were resolved.

John Cleaves and Dave Gurd from the ORNL controls group traveled to BNL to discuss two main topics.

The first topic was the BNL component of the controls ETC. These discussions made clear a shortfall in controls staff at BNL, partially due to a new hire who could not resolve necessary visa issues. This staff shortfall will have to be rectified by increasing staff or transferring scope.

The second topic was plans for installation and test of BNL supplied controls hardware and software by ORNL staff. Preliminary agreements were reached on the form and content of installation documentation, and level of effort estimates.

### **WBS 1.9.5.2 - Power Supply Controls**

Some defects were discovered in both PSC and PSI units. In each case, the result of the defect is the possibility of compromised measurements of power supply outputs. The PSC and PSI units can be used to control power supplies even with the defects (and are being used at the AGS Booster). Nevertheless, the vendor (Apogee Labs) has been contacted about these newly discovered defects, and there is every hope that they can be easily remedied.

The PSC defect results in incorrect data recorded in memory under certain rare PSI communication failure modes. The incorrect data masks the communications fault, but contains incorrect values, resulting in single-sample "glitches" in measurement waveforms.

Inadequate insulating washers cause the PSI defect. The result is improper grounding in several PSI units. This improper grounding allows ground loops, which can interfere with measurements of power supply outputs. A more suitable washer has been identified.

Fully configured ring PS IOCs have been tested for memory use and CPU loading. Under normal circumstances memory and CPU usage is less than the suggested 50% threshold limit. The PS application supports a diagnostic mode to analyze selected PS output measurements at a higher sampling rate, and to perform this diagnostic at rates up to the 60Hz rep. rate of SNS. CPU loading tests show that the IOC cannot provide this diagnostic for all PS channels at 60Hz. All channels can be supported at 2 Hz, or 2 channels can be supported at 60Hz. A full report on these tests is being written.

### **WBS 1.9.5.3 – Diagnostics**

ICS recommended using a revised "low power" version of their digitizer for new designs. Two units were ordered and tested, and found to be functional equivalents of previous version. More detailed tests to verify linearity and accuracy are planned for next month.

Two mechanisms were developed for improving the throughput to BCM data acquisition and processing. Both mechanisms exploit parallelism by processing previously acquired data during data acquisition. Previously data acquisition and data processing were performed serially, limiting throughput. These techniques will be benchmarked next month.

**WBS 1.9.5.4 - Vacuum**

The HEBT EDM screens, EPICS database, and PLC program have undergone minor revisions due to refined requirements. Ring PLC program is under development. The ControlNet-based interface between the Ring and HEBT PLCs has been set up and is undergoing test.

**WBS 1.9.5.5 - Applications Software**

Yury Eidelman traveled to ORNL to demonstrate the EPICS alarm handler configuration application he developed. Presentations were made to the controls and operations staff. The application was installed on the ORNL servers, and was used successfully during the last days of MEBT commissioning.

**WBS 1.9.5.6 – RF**

An IOC has been set up in the RF lab to support RF development and tests. This IOC software connects the previously developed LLRF waveform application with the IOC, allows downloading of DSP software through the IOC to the LLRF DSPs, and provides EPICS support for waveform readbacks of calculated DSP values for display on EDM screens. This software uses a simple polling technique for the communication protocol. Future efforts will more tightly couple the IOC and the DSP by using interrupts to signal appropriate times for data transfer.

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

<b>BCWS</b>	<b>BCWP</b>	<b>ACWP</b>	<b>SV</b>	<b>%</b>	<b>CV</b>	<b>%</b>
5042.2	4579.8	4592.3	(462.46)	-9.2%	(12.5)	-0.3%

**Variance Statement:** Cum variances are within thresholds. No analysis required. Current period SV of -\$151.4K (-63.9%) is driven by 1.9.5.3 Diagnostics, (SV -\$90.9K); whereas Diagnostic & Collimator Controls material is delayed. Delivery will be recorded in a subsequent current period.

**Project Impact:** None.

**Corrective Action:** None.

**IV. Earned Value Reports and Charts**

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

<b>PROJECT TITLE:</b> SPALLATION NEUTRON SOURCE			<b>REPORTING PERIOD:</b> 1-Jan-03 thru 31-Jan-03						<b>PROJECT NUMBER:</b> 99-E-334					
<b>PARTICIPANT NAME AND ADDRESS:</b> Brookhaven National Laboratory Brookhaven, NY			<b>BCWS PLAN DATE:</b> October 1999						<b>START DATE:</b> October 1998					
									<b>COMPLETION DATE:</b> 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	0.0	0.0	0.0	5,115.0	5,115.0	5,112.9	0.0	2.1	5,115	5,115	0.0	
1.5 Ring & Transfer Line System	912.0	1,085.4	1,890.3	173.4	(804.9)	64,349.2	65,536.2	66,617.3	1,187.0	(1,081.1)	112,438	112,438	0.0	
1.5.1 HEBT (High Energy Beam Transport) Systems	50.2	45.5	567.4	(4.8)	(521.9)	5,857.0	7,319.0	6,079.5	1,462.0	1,239.5	9,886	9,886	0.0	
1.5.2 Injection Systems	51.1	37.9	236.1	(13.2)	(198.1)	4,915.7	5,373.8	5,494.2	458.2	(120.4)	9,350	9,350	0.0	
1.5.3 Magnet Systems	138.0	113.8	259.2	(24.2)	(145.4)	11,514.3	11,322.0	12,123.7	(192.3)	(801.7)	16,935	16,935	0.0	
1.5.4 Power Supply System	12.1	100.4	99.0	88.3	1.4	1,261.8	1,088.1	1,332.1	(173.7)	(244.0)	3,746	3,746	0.0	
1.5.5 Vacuum System	69.8	72.4	80.1	2.6	(7.7)	5,361.3	5,354.7	5,608.1	(6.6)	(253.4)	9,758	9,758	0.0	
1.5.6 RF System	142.0	223.6	227.1	81.6	(3.5)	7,821.4	7,638.2	7,949.3	(183.2)	(311.2)	12,009	12,009	0.0	
1.5.7 Ring Systems Diagnostic Instrumentation	130.4	140.9	184.8	10.5	(43.9)	7,602.9	7,267.6	7,323.4	(335.3)	(55.7)	13,584	13,584	0.0	
1.5.8 Collimation and Shielding	25.2	116.1	25.0	91.0	91.2	1,888.6	1,783.5	1,773.6	(105.1)	9.9	3,437	3,437	0.0	
1.5.9 Extraction System	50.7	17.1	(25.1)	(33.6)	42.3	1,885.2	2,026.5	2,152.3	141.3	(125.8)	6,165	6,165	0.0	
1.5.10 RTBT (Ring to Target Beam Transport) System	62.9	38.0	34.9	(24.9)	3.1	3,286.1	3,407.9	3,927.3	121.8	(519.4)	7,280	7,280	0.0	
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	179.6	179.6	201.9	0.0	(22.3)	12,954.1	12,954.1	12,853.1	0.0	101.0	20,287	20,287	0.0	
<b>WBS SUBTOTAL</b>	<b>912.0</b>	<b>1,085.4</b>	<b>1,890.3</b>	<b>173.4</b>	<b>(804.9)</b>	<b>69,464.2</b>	<b>70,651.2</b>	<b>71,730.2</b>	<b>1,187.0</b>	<b>(1,079.1)</b>	<b>117,553</b>			
<b>UNDISTRIBUTED BUDGET</b>														
<b>SUBTOTAL</b>	<b>912.0</b>		<b>1,890.3</b>			<b>69,464.2</b>		<b>71,730.2</b>			<b>117,553</b>			
<b>MANAGEMENT RESERVE</b>														
<b>TOTAL</b>	<b>912.0</b>		<b>1,890.3</b>			<b>69,464.2</b>		<b>71,730.2</b>			<b>117,553</b>			
<b>RECONCILIATION TO CONTRACT BUDGET BASE</b>														
<b>DOLLARS EXPRESSED IN:</b>  THOUSANDS			<b>SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR:</b>  Jie Wei						<b>DATE:</b>  February 14, 2003					

