Brookhaven National Laboratory

SNS

Ring and Transfer Lines Systems

A UG U S T

MONTHLY REPORT

01 August– 31 August 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
August 2002
Ring and Transfer Lines Systems

I. Senior Team Leader Assessment

1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS

- The 2002 Linear Accelerator conference was held in Korea this month. The BNL/SNS team including an invited talk on laser-profile-monitor beam diagnostic presented several papers.

- The beam-coupling impedance of the RF cavities was successfully reduced. Introducing resistive glow bar between the capacitors damped major transverse modes.

- Efforts were made to further develop the Unified Accelerator Libraries (UAL) software package. Newly implemented functions include beam halo collimation and scraping, and tune diagnostics.

- Significant efforts were made on the measurement of ring dipole and quadrupole magnet fields. Field variations in quadrupoles (21Q) were closely monitored to determine whether shimming is necessary. Based on multipole measurements (26Q, 30Q), the quadrupole pole shapes were re-iterated to achieve a field quality around 10^-4 level. Time response of the quadrupole fields was also measured to determine operational condition for beam-based alignments.

- At ORNL, HEBT quadrupoles (12Q) made by Danfysik were found with problems of excessive field variation and brazing leak. Coil clamps were found to be magnetic. Three-way discussions (BNL/ORNL/Danfysik) were underway.

- Profs. Yamane and Suzuki from KEK visited us to collaborate on potential experiments of laser stripping of H- beam using the AGS linac. Such scheme, if made successful, can profoundly remove intensity limitation imposed by conventional stripping foils (heating and radio-activation).

- Prof. R. Talman is spending 6 months on sabbatical with us. His main devotion during this period is on documentation and user's manual development of the UAL software package.

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	%
5107.6	5107.6	5112.9	0.00	0.0%	(5.3)	-0.1%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5 Ring and Transfer Lines

BCWS	BCWP	ACWP	SV	%	CV	%
56737.1	57148.5	55999.6	411.44	0.7%	1149.0	2.0%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period variance is driven by WBS 1.5.3, 1.5.6, and 1.5.7.

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	127
FY02	0	0	0	0	17
Due in Next 30 days	0	0	0	0	3
Total Due at present	0	0	3	12	107
Made	0	0	3	12	94
Missed	0	0	0	0	13
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	%
5107.6	5107.6	5112.9	0.00	0.0%	(5.3)	-0.1%

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

Phone conferences continued with Tesla during the month on the HEBT dipole magnet. They have started work on the final two magnets. Tesla provided a preliminary schedule for production of the HEBT/RTBT 21Q40 magnets. First delivery will not be until January 2003. Phone conferences continued with Danfysik during the month. ORNL found that the integral field of the magnet is being excessively affected by the stainless steel used for the coil clamps. Also the clamps were welded by Danfysik which increased the permeability of the clamps. ORNL is heat treating the clamps to reduce the permeability. ORNL has also found more water leaks in the brazed joints of the quadrupoles. A solution to both of these problems is being negotiated with Danfysik.

Detail drawings of 12cm drift pipes have been checked and released. The 12cm quadrupole chamber welding fixture is being designed. Assembly and welding of the 21cm quadrupole chambers have been started. Revisions to some of the drift pipe drawings will be required to accommodate a 25 cm increase in the instrumentation length requirement and for the day-one spare pipes for RF cavities. A conceptual design has been established for welding 12 cm quadrupole chambers and the detail design has been started.

Drawings of the HEBT momentum dump are complete, and are being reviewed. Revised ways of allowing for vacuum chamber settling and interfering with the outer shield are being investigated.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5100.6	5396.2	4476.9	295.56	5.8%	919.3	17.0%

Variance Statement: Cum CV of $919.3K (17%) is material driven by 1.5.1.1.1 HEBT 8D533 Magnet, whereas 6 of 9 magnets were received (580K). ACWP is understated and will be debited in subsequent current periods.

Current period CV is driven by 8D533 Magnet deliveries and 1.5.1.3 labor whereas labor BCWP is greater than ACWP.

Project Impact: None.

Corrective Action: None.

WBS 1.5.2 – Injection Systems

New England Technicoil has begun work on the #2 and #3 chicane magnets and the dump septum magnet. BNL technical representatives will visit them next month. New England Technicoil also repaired the #4 magnet and is shipping it back to BNL.

The long injection kicker magnet full power testing is underway. One small water leak in the bus bar was fixed by reflaring the fitting (not a braze joint leak). The measured inductance and resistance of the magnet are very close to the 148 mH and .003 Ohm calculated value. The magnet has been powered and pulsed up to 1000 amp and 60 Hz rate. At 60 Hz repetition rate, the coil vibrates. An accelerator was moved around the coil and the displacement of the coil vibration is in the range of +/- .5mm. A finite element model is also being built to calculate its mode shape and harmonic stress to verify that it is not an issue. Magnetic measurements will not commence until the first ceramic chamber has been coated.

Ceramaseal has updated their quotes for the long and short kicker chambers. They have added some exceptions to reduce some tolerances. We are reviewing the changes to verify that they will fit our magnet. This is the second phase option from the original PO.

The closing day for the injection kicker ferrite bid is 8/31. The newly delivered 5 short magnet coils have passed hydraulic and electrical test. They have been moved to warehouse building 918.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
4319.6	4974.0	4367.1	654.41	15.2%	606.8	12.2%

Variance Statement: Cum SV of $654.4K (15.2%) & CV of $606.8K (12.2%) are material driven by 1.5.2.1 Pulsed Magnet Ferrite, Blocks, whereas first delivery and final delivery BCWP have been taken in advance of BCWS and ACWP promoting a positive cum SV and CV. ACWP and BCWS are understated and will be accounted for in subsequent current periods.

Current period variances are also driven by the same activities.

Project Impact: None.

Corrective Action: None.

WBS 1.5.3 – Magnet Systems

The SNS magnet parameter sheets for each magnet type have been distributed for review and approval separately by the cognizant physicists, engineers, and managers and tied to the magnets drawings. Any change to magnet design or parameters will require an ECN and an update to the

sheet. The overall spreadsheet will be maintained and updated as a reference but the individual sheets will be the accurate reference for information.

At this time there are 23 17D120 ring dipole magnets (ITF that is $<1 \times 10^{-4}$ from the nominal value) that have been fully shimmed and magnetically measured. Another 4 magnets have been initially measured and shimmed. Fourteen of the 32 magnets have been defined as matched pairs and the dipole for the first half cell has been welded to the strong back.

17 21Q40's are now at BNL and have passed inspection. Tesla is preparing another batch of six for shipping. The last seven magnets for phase I will be assembled and shipped in November. Production measurements of the five 21Q40 have been completed. Four magnets have integral fields that are close enough for them to be matched in the same power supply string.

Wiring of the measuring coil for the 26Q and 30Q quadrupoles and related magnets was started this month. It is about 40% complete.

The pole tip modification of the 26Q40 magnet was completed and the magnet was reassembled. Magnetic measurements of the first 26Q40 with modified pole and chamfer have been completed. The revised chamfer was approved and an ECN for the change will be issued.

Measurement and analysis of the first 30Q58 were completed. The results indicated that the pole profile needs to be modified to achieve the required field quality. Several modifications are currently under study.

The damaged 27CDM30 was returned to Danfysik for repair. The other magnets have been acceptance tested.

The Alpha Magnetics 41CDM30 1st article has been acceptance tested and set-up in the magnet measurement facility. Magnetic measurement is underway.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
10523.3	10566.3	10597.7	43.01	0.4%	(31.4)	-0.3%

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

Current period SV -$297K (-57.7%) is material driven by WBS 1.5.3.2 Low Field Magnets, whereas BCWS shows the planned material delivery for which BCWP was taken in a prior current period, thus communicating a negative SV. Current period CV -$87.7K (-40.2%) is material driven by 1.5.3.1, High Field Magnets; whereas ACWP reflects material expensed for material received (BCWP taken) in a prior period.

Project Impact: None.

Corrective Action: None.

WBS 1.5.4 – Power Supply Systems

A design review was held at the vendor's facility (Danfysik) for the RF Tuning power supply. The first unit should be delivered by January '03.

During that same visit, the low field correctors were also examined. There were still some areas that needed addressing. Based on production estimates, 20 low field correctors per week will be shipped starting October. The first ten units will be shipped to BNL, which will be followed by 136 modules shipped in the LANL configurations. After that, the production BNL configured units will follow.

The bid closing date for the extraction kicker was extended to September 6 at the request of two of the bidders. There will be no further extensions.

Testing is being performed at BNL on the injection kicker to measure its performance with the actual magnet load. This includes determining it's tracking ability.

Testing of the first medium range power supply, 5040 Amps at 18 Volts is scheduled for mid-October '02.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
950.7	942.7	1064.3	(7.95)	-0.8%	(121.6)	-12.9%

Variance Statement: Cum CV of -$121.6K (-12.9%) is driven by WBS 1.5.4.1 & 1.5.4.2; BCWP for material, is understated and will be adjusted in subsequent current periods.

Project Impact: None.

Corrective Action: None.

WBS 1.5.5 – Ring Vacuum System

A short custom elbow has been designed to allow the installation of ion pumps at arc 26cm (type D) halfcell chambers without modifying the sextupole buss work. Preliminary layout of the extraction straight section vacuum chambers has begun. The 1st production RF cavity pipes were successfully coated with TiN. Leak checking and vacuum degassing of the remaining three sets of RF cavity pipes continue.

Based on the SEY measurements of our coating coupons by colleagues in CERN, the ring chambers will be coated at pressure of 5 mTorr instead of 1.5 mTorr. The film produced at higher pressure has higher roughness and higher outgassing but lower SEY. The ring arc pressure profiles were re-calculated based on the higher outgassing rate. More coating coupons

were sent to CERN and KEK for more SEY measurements. The outgassing and SEY results were discussed in AP meetings. Potential solenoids at injection and collimation straight sections were proposed to reduce the electron activity. The status of ring vacuum systems was reported during project office visit.

Production delivery of TMP Carts is underway. Work on HEBT PLC I/O assignment and ladder logic code continues with effort focusing on interfacing to SCL and dump lines. Work on the HEBT PLC ladder logic continues. Both RSView debugging panel and EPICS applications are functional.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
4842.0	4797.6	4751.3	(44.46)	-0.9%	46.3	1.0%

Variance Statement: Cum Variances are within thresholds. No analysis required.
Current period SV -$140.5K (-40.5%) is material driven by 1.5.5.3 Ring Electropneumatic Gate Valve whereas BCWS shows the planned material delivery for which BCWP was taken in a prior current period, thus communicating a negative SV in the current period.

Project Impact: None.

Corrective Action: None.

WBS 1.5.6 – RF System

- Benchmarking of BNL and LBL electron cloud was successfully completed. For identical physical models the outputs agrees within 20%. Estimates of conditioning rates for the SNS vacuum chamber were made. For full RF voltage, and sufficient linac intensity to create marginally stable beams, the vacuum chamber secondary yield should drop below 2 in about 1 day. The electron cloud instability should not be a problem for 2 MW operations.
- Prototype IQ modulator to begin testing
- Investigating DSP IO throughput capabilities
- Successfully tested prototype VME carrier card
- Controls low level interface development continues
- Completed first pass of RF GUI application
- A/D daughter card development continues

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5957.1	6393.5	6521.8	436.41	7.3%	(128.3)	-2.0%

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

Current period SV -$128.4K (-67.4%) & CV -$192.6K (-309.9%) are material driven by WBS 1.5.6.1 High Level RF; whereas BCWP for the RF Power Amplifier is understated and will be adjusted in next current period. The understated current period BCWP contributes to the negative SV & CV.

Project Impact: None.

Corrective Action: None.

WBS 1.5.7 – Ring Diagnostics

We completed and distributed the informal BNL internal report on the Diagnostics Design Review,and await the committee report. Work is progressing on the Design Manual update, rack power requirements, and cabling. Group members devoted considerable effort to preparing manpower and budget estimates for the Project Office.

Continued discussions with AP about matrix methods of beam-based BPM offset determination, with an eye to removing the need for the relays and power supplies. Richard Talman reported on a possible implementation, which will be documented in an AP note. Work continues on BPM and BCM PCI interface. Business is very good for the BPM AFE vendor (Bergoz). The resulting delays in delivery affect the BNL Ring and RTBT AFEs, as well as the LANL Linac. Delivery for the prototype Ring AFE is now estimated to be in March. Prototype AFE effort in resuming in-house. The baseband AFE is in layout. Bergoz remains involved in an advisory capacity. Preparing thirteen 21cm HEBT BPMs for brazing.

Accelerator Physics discussions of IPM magnet design have led to the conclusion that the IPM magnets should be electromagnets. An AP note is in progress. Budget includes only permanent magnets. Cost implications are being evaluated. Burle Electro Optics makes a 15cm diameter round microchannel plate that will allow a single MCP design for the IPM. This greatly simplifies the IPM design, eliminating the need for dual staggered MCPs and the resulting need for precious space along the beam line.

An experimental plan for the development of the luminescence profile monitor is being defined. At the moment the baseline intent is to provide only the vacuum chamber. Space has been reserved in the Ring for the conflat cross. Further development effort is driven (as well as manned and funded) by the RHIC application, with the SNS benefiting from the spin-off.

Working on the detailed circuit design of the BLM digital interface to the SNS controls system. This includes a remote and local polling scheme to monitor the status of all the jumpers on the AFE. The circuit components for this interface will reside partially on a separate logic module (installed in AFE chassis), and partially on each AFE module. Prototyping the analog comparator circuit for the MPS threshold input. Vendor fabrication and evaluation of the improved BLM ion chamber prototypes continues. Cost remains a major consideration. Calculations and considerations of various X-ray shielding material parameters were conducted. We have resolved more details for the study of X-rays on ion chamber detectors at JLAB, and are investigating X-ray source parameters and study time at JLAB.

BCM DAQ for MEBT is on schedule to be delivered to ORNL in mid-September. An agreement was reached with BNL Controls for installation and support of IOC core in the BCM nodes. Four AFE boards were stuffed, and testing of the MEBT board is in progress. A running average algorithm was prepared to get better DC offset and transformer time constant estimates. Calibrator development continues. Completed the copper housing and the machining of the beam pipes and end caps of the prototype HEBT BCM. Welding the ceramic break to the copper housing of the prototype HEBT unit.

Refurbished MEBT carbon wire scanners are on schedule to be delivered to ORNL in mid-September. Received six upgraded (replaced defective bellows, installed brakes and double ended motors for encoders) feedthru/actuators from Huntington. A new carbon wire attachment method was developed. Carbon wires were installed on all six forks. An electrical connector was developed to permit separating the fork from the rest of the actuator, simplifying carbon wire replacement. Started integrating the forks to the actuators, and assembling connectors.

A group member presented an invited talk on the laser wire at the Linac 2002 Conference in Korea. We have outlined a proposal for testing a laser welder and electron detector for Laser Profile Monitor in the BNL Linac. Commercial laser welders can deliver 1ms pulses of average power 5kW over optical fibers of at least 100m (possibly 200m) lengths. Units can be bought with multiple switched fiber optics. Unitek Miyachi has a demonstration laser welder they will make available to us for profile measurement tests. The intent is to purchase the items which will be installed in a radiation area (fiber and final optics), and use the demo welder to demonstrate profile measurement. We received the envelope dimensions of the SCL beam box , and are making preparations for installation in the BNL HEBT line.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
6747.1	6227.8	6473.1	(519.37)	-7.7%	(245.3)	-3.9%

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

Current period SV -$732.1K (-81.8%) & CV -$41.5K (-25.5%) are material driven by WBS 1.5.7.1 BPM deliveries; whereas BCWS shows the planned material delivery for which BCWP was taken in a prior current period communicating a negative SV in the current period.

Additionally, 1.5.7.4 Beam Current Monitor BCWP material is understated by $75K and will be adjusted in the next current period.

Project Impact: None.

Corrective Action: None.

WBS 1.5.8 – Collimation and Shielding

Work is continuing on the first scraper for the Ring. The ring secondary and tertiary absorber drawings are being reviewed. 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)

BCWS	BCWP	ACWP	SV	%	CV	%
1753.5	1567.9	1587.1	(185.6)	-10.6%	(19.2)	-1.2%

Variance Statement: Cum schedule variance (SV) of -$185.6K (-10.6%) is material driven by 1.5.8.1 Ring Collimator 1st delivery; whereas planned delivery is in March ’03 thus correcting the SV.

Current period variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

WBS 1.5.9 – Extraction System

The full power test of the low mu ferrite extraction kicker is finally complete. There is no indication of heat in the ferrite. The kicker will be built with the ferrite originally specified. Detailed design of the extraction kicker is moving along. The down stream assembly is almost finished. A final layout with bellow dimensions was given to vacuum group for beam pipe and adaptor design.

The preliminary design of the extraction lambertson magnet has been completed and approved. Detailed design will begin next month. A final design review for the extraction region and magnets will be held in October.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1623.5	1527.8	1604.0	(95.76)	-5.9%	(76.2)	-5.0%

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

Project Impact: None

Corrective Action: None.

WBS 1.5.10 – RTBT System

The order for the 27CD30 corrector dipole magnet that is used in both the RTBT and in the HEBT line has been placed with New England Technicoil. They will be visited next month. Raynor has received material for the large aperture radiation resistant quadrupoles and has started machining the cores.

Detailing of RTBT magnet vacuum chambers and drift spaces pipes continues.

The first unit has been shipped to ORNL. Methods of reducing the lifting requirements for the crane are being investigated. These include modifying the top plate of the inner shield box.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
2963.7	2798.9	2814.1	(164.81)	-5.6%	(15.2)	-0.5%

Variance Statement: Cum variances are within thresholds. No analysis required.
Current period CV $38.7K (47.7%) is labor driven by WBS 1.5.10.1 RTBT Magnet & Support whereas ACWP was less than performed.

Project Impact: None.

Corrective Action: None.

WBS 1.5.12 – Technical Support

- Work continues on FY03 work packages, SOW and schedules.
- RF cavity coupling measurements with dumped impedance were finished.
- Estimate of solenoid winding in collimator section to reduce the electron cloud effect was finished.

- Estimate for beam scrubbing to reduce e-p effect were carried out.
- Base on measurement new impedance budget was finished.
- Integrated the PAC::Beam and ACCSIM module with the UAL framework.
- Added the API documentation of the UAL framework, ZLIB, and PAC::Beam modules: http://www.ual.bnl.gov/ref/v1/doc/doxygen/html/namespaces.html
- Work on UAL User manual continues.
- Studies continue for envelope instability and parametric resonances continued.
- Study of excitation of resonances with fringe field was continued.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
11955.2	11955.2	11741.4	0.00	0.0%	213.9	1.8%

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 remaining 49 production boards have been delivered and are undergoing incoming inspection and test.

V123s
The engineer associated with this task has left Brookhaven. A new engineer will be assigned in the near future.

The production version of this module will clean up the rework present on the six prototypes plus add three more i/o signals one each for a second $T_{cycle\ start}$ and T_{ext} plus a signal indication when the RF input signal is not present. Prepulse will be removed.

Eventlink fanout
A production contract of 80 pieces has been awarded. Deliver is scheduled for mid September

V206
The first article of a production run of 16 modules was received and approved. The remaining 15 production boards are scheduled the week of September 9th.

Eventlink Monitor
This task has been delayed until FY03. An order of 3 built assemblies and seven blank PCB will be initiated.

WBS 1.9.5.1 -Ring Controls Integration

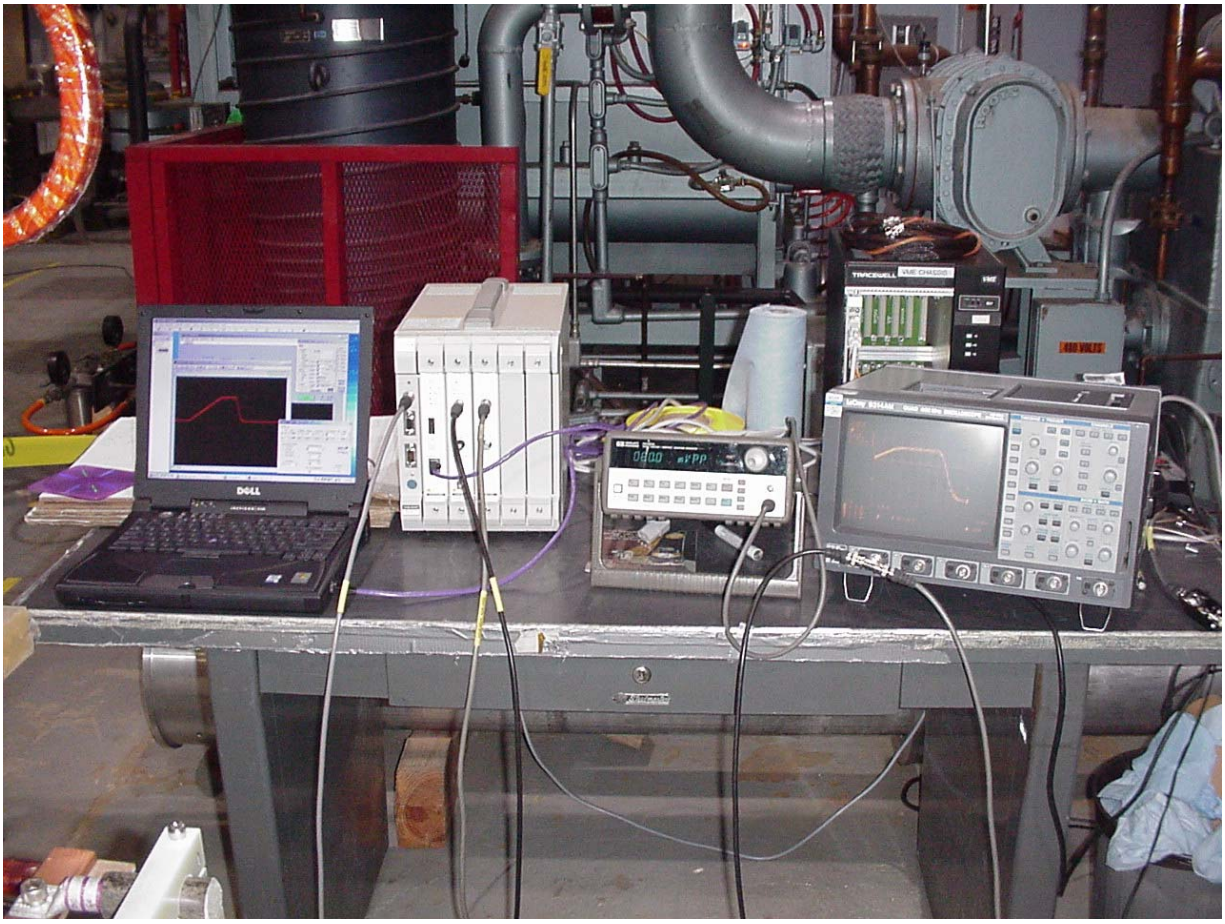
The central timing system is now being used to generate power supply (PSC) read and write strobes at 60Hz via V124 trigger modules. Previously, such strobes were generated via local function generators.

The locations of all the controls IOCs in the HEBT, Ring, and RTBT service buildings have been identified and reported to ORNL. All MPS, timing, and ethernet connections have been identified, including ethernet connections to waveform generators for injection kicker power supplies and oscilloscopes for extraction magnet current readbacks. A preliminary plan for building the controls racks at ORNL has been established, but a written plan needs to be drafted.

WBS 1.9.5.2 - Power Supply Controls

The PSC application was modified to adhere to accepted device and signal naming conventions.

The Yokogawa function generator is being used to test the first article injection kicker power supply and magnet at BNL's magnet test facility. Representative waveforms have been created using BNL software, and the waveform readback capability of the Yokogawa is now being used. From left to right, this picture shows a laptop running Yokogawa software, displaying the current in the kicker magnet, the Yokogawa unit itself, including a function generator module and a digitizer module, a 60 Hz function generator to trigger the Yokogawa, and a 'scope to verify the Yokogawa readback.



WBS 1.9.5.3 – Diagnostics

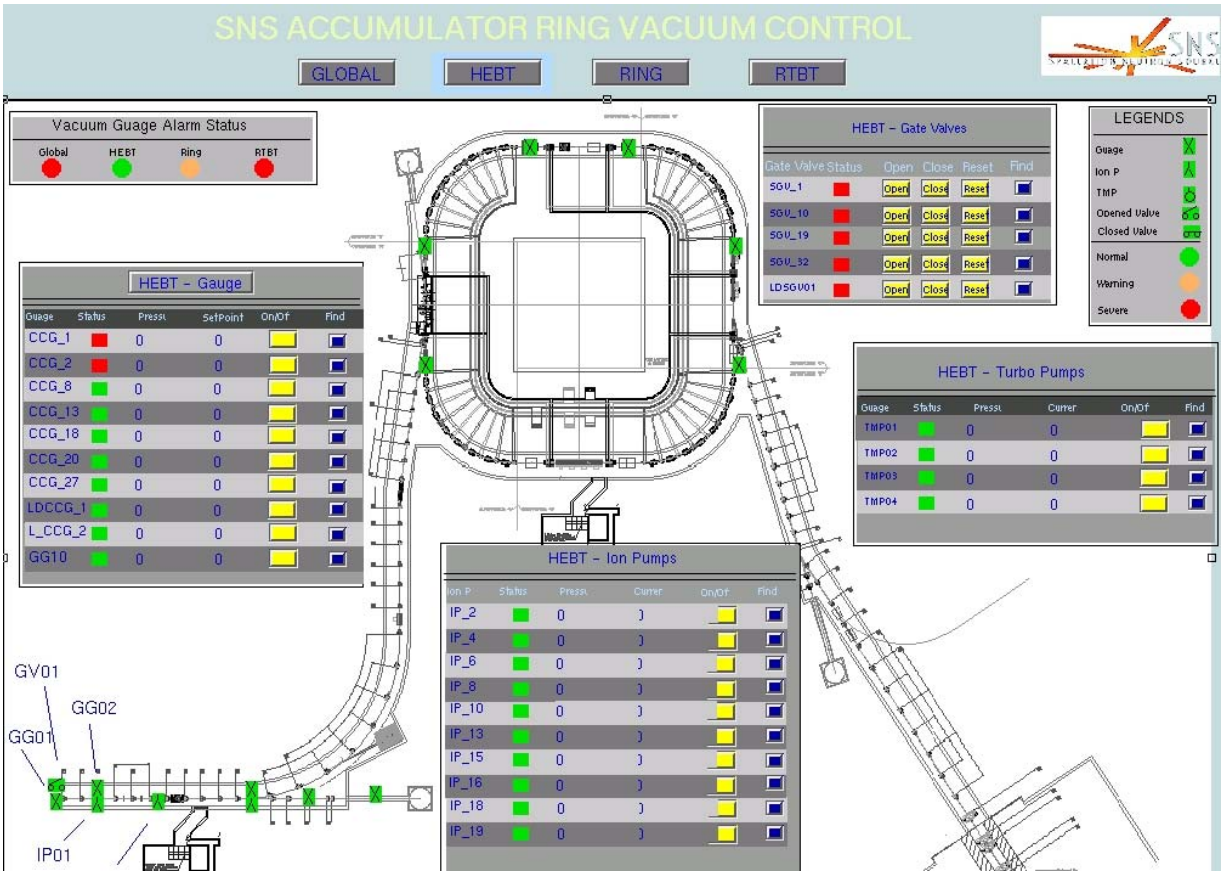
A study of ADC thermal drift concludes that temperature compensation is unnecessary. No further analysis of BLM ADCs is planned. A meeting later this week is expected to result in selections of ADCs and all other VMEbus modules needed for the BLM system, so that work can begin on the IOC application.

Analysis of ADCs for the IPM system has begun. Three ADCs are under analysis, the Struck SIS3301, the Hytec VTR2536 (used in the RHIC IPM system), and the ICS 145-8A. The report of the analysis of the SIS3301 is now available on the BNL SNS web site.

Effort continues to support the diagnostic group in updating the BCM software, and to support IOC core on the NAD, rather than the Portable Channel Access previously used.

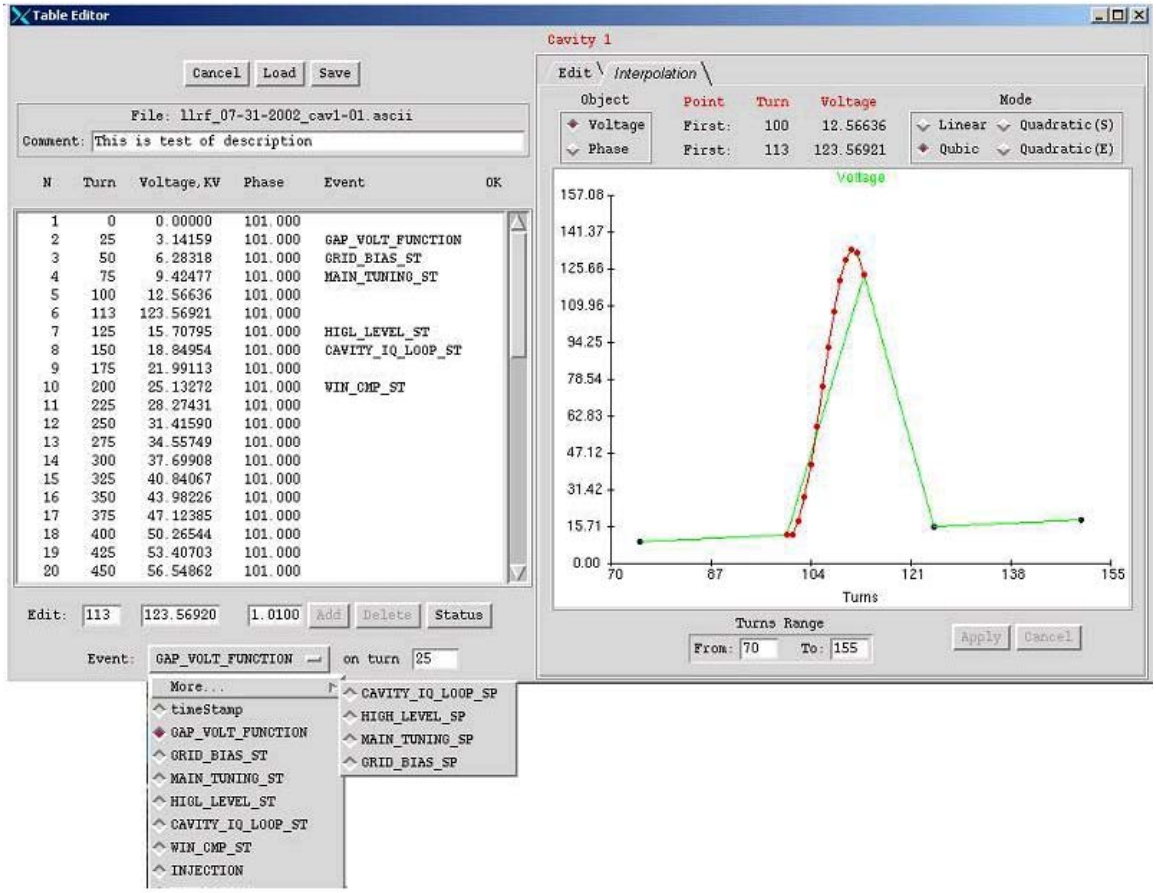
WBS 1.9.5.4 - Vacuum

The HEBT PLC program is largely complete. Preliminary IOC applications and 4 separate control screens have been developed based on the IOC application.



WBS 1.9.5.5 - Application Software

The first version of the LLRF beam control application is complete and has been released for use by the RF group in upcoming tests. User documentation and online help are being developed.



UAL work continues with the integration of the PAC::Beam and ACCSIM module with the UAL framework, and the addition of the API documentation of the UAL framework, ZLIB, and PAC::Beam modules: http://www.ual.bnl.gov/ref/v1/doc/doxygen/html/namespaces.html

WBS 1.9.5.6 – RF

Work continues to port the Bittware DSP "Host Interface Library" to the MVME2100 processor board, and to provide EPICS device support for the HIL.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3906.6	3999.3	4057.5	92.70	2.4%	(58.2)	-1.5%

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

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)

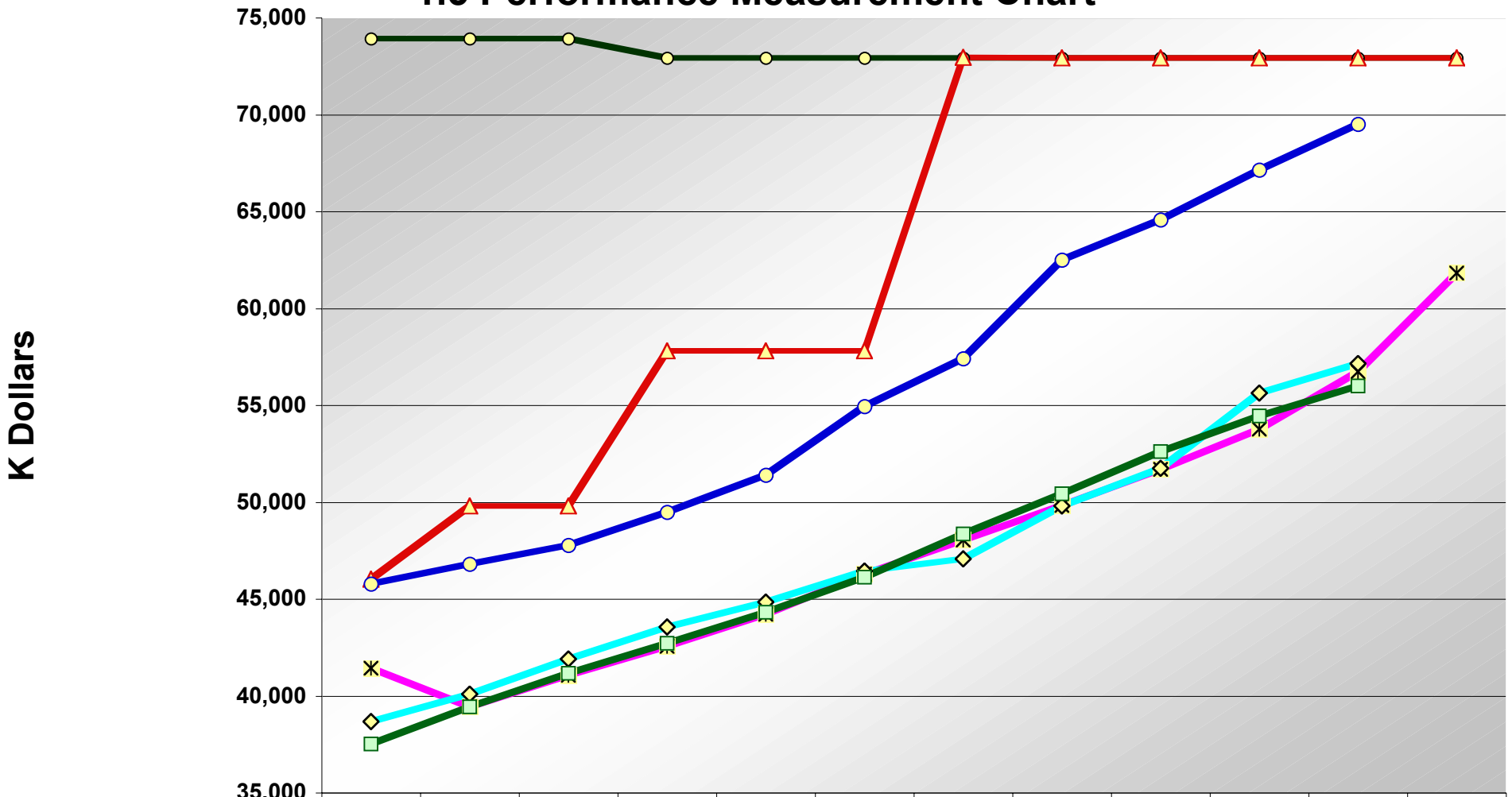
PROJECT TITLE: SPALLATION NEUTRON SOURCE	**REPORTING PERIOD:** 1-Aug-02 thru 31-Aug-02	**PROJECT NUMBER:** 99-E-334
		START DATE: October 1998
PARTICIPANT NAME AND ADDRESS: Brookhaven National Laboratory Brookhaven, NY	**BCWS PLAN DATE:** October 1999	**COMPLETION DATE:** November 2006

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	8.1	8.1	0.00	0.0	8.1	5,107.6	5,107.6	5,112.9	0.0	(5.3)	5,115	5,115	0.0
1.5 Ring & Transfer Line System	2,958.6	1,529.0	1,546.2	(1,429.6)	(17.2)	56,737.1	57,148.5	55,999.6	411.4	1,149.0	113,241	113,241	0.0
1.5.1 HEBT (High Energy Beam Transport) Systems	187.6	189.5	89.9	1.9	99.5	5,100.6	5,396.2	4,476.9	295.6	919.3	10,081	10,081	0.0
1.5.2 Injection Systems	287.4	173.6	124.4	(113.8)	49.2	4,319.6	4,974.0	4,367.1	654.4	606.8	9,218	9,218	0.0
1.5.3 Magnet Systems	515.1	218.08	305.8	(297.0)	(87.7)	10,523.3	10,566.3	10,597.7	43.0	(31.4)	17,002	17,002	0.0
1.5.4 Power Supply System	14.6	10.3	21.9	(4.3)	(11.6)	950.7	942.7	1,064.3	(8.0)	(121.6)	3,524	3,524	0.0
1.5.5 Vacuum System	347.2	206.6	161.3	(140.5)	45.3	4,842.0	4,797.6	4,751.3	(44.5)	46.3	9,732	9,732	0.0
1.5.6 RF System	190.5	62.1	254.7	(128.4)	(192.6)	5,957.1	6,393.5	6,521.8	436.4	(128.3)	12,128	12,128	0.0
1.5.7 Ring Systems Diagnostic Instrumentation	894.7	162.6	204.2	(732.1)	(41.5)	6,747.1	6,227.8	6,473.1	(519.4)	(245.3)	14,365	14,365	0.0
1.5.8 Collimation and Shielding	40.6	44.5	42.7	3.9	1.8	1,753.5	1,567.9	1,587.1	(185.6)	(19.2)	3,418	3,418	0.0
1.5.9 Extraction System	69.3	53.0	52.5	(16.3)	0.5	1,623.5	1,527.8	1,604.0	(95.8)	(76.2)	6,144	6,144	0.0
1.5.10 RTBT (Ring to Target Beam Transport) System	84.3	81.3	42.5	(3.1)	38.7	2,963.7	2,798.9	2,814.1	(164.8)	(15.2)	7,342	7,342	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	327.3	327.3	246.3	0.0	81.0	11,955.2	11,955.2	11,741.4	0.0	213.9	20,287	20,287	0.0
WBS SUBTOTAL	2,966.7	1,537.1	1,546.2	(1,429.6)	(9.1)	61,844.7	62,256.2	61,112.5	411.4	1,143.6	118,356		
UNDISTRIBUTED BUDGET													
SUBTOTAL	2,966.7		1,546.2			61,844.7		61,112.5			118,356		
MANAGEMENT RESERVE													
TOTAL	2,966.7		1,546.2			61,844.7		61,112.5			118,356		

RECONCILIATION TO CONTRACT BUDGET BASE

DOLLARS EXPRESSED IN: THOUSANDS	SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR: Jie Wei	DATE: September 18, 2002

1.5 Performance Measurement Chart



	Oct-01	Nov	Dec	Jan-02	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Cum Planned BA	73,931	73,931	73,931	72,931	72,931	72,931	72,931	72,931	72,931	72,931	72,931	72,931
Cum Authorized BA	46,034	49,806	49,806	57,806	57,806	57,806	72,947	72,931	72,931	72,931	72,931	72,931
Cum Actual BA	45,796	46,801	47,788	49,500	51,402	54,943	57,427	62,496	64,584	67,150	69,522	
Cum BCWS	41,443	39,429	41,061	42,563	44,212	46,288	48,045	49,821	51,685	53,778	56,737	61,824
Cum BCWP	38,670	40,079	41,914	43,553	44,840	46,433	47,079	49,797	51,737	55,620	57,149	
Cum ACWP	37,521	39,429	41,181	42,722	44,326	46,140	48,353	50,439	52,599	54,453	56,000	

Months