



Brookhaven National Laboratory

SNS

Ring and Transfer Lines Systems

JULY

MONTHLY REPORT

01 July – 31 July 2001

Performing Organization: Brookhaven Science Associates
Location: Brookhaven National Laboratory
Upton, New York 11973-5000

Contract Period: October 1998 – June 2006

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

I. Senior Team Leader Assessment

1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS

Ring Development – BNL

- No R&D Work Planned.

Ring and Transfer Lines – BNL

- The bid package for ring quadrupoles, 30Q44 and 30Q58, has been completed and RFQ was sent to qualified vendors, including several recommended by the project office. The bids are due back for evaluation early in August.
- The first HEBT 6 meter-long dipole vacuum chamber has been measured and tested at BNL. It meets all design requirements and is being shipped to ORNL for future installation.
- The order of vacuum ion pumps has been placed, expecting first article delivery in early August for evaluation. The total cost is lower than the estimate.
- 10 of the ring dipole magnets have been assembled and shipped to BNL. Flip coil measurement indicated good field quality. The long coil measurement will start in August.
- The collimator bids are back, indicating higher than estimate cost due to design changes recommended by the project office to adopt double wall inconel for reliability and maintainability concerns.
- All BPM mechanical parts have been contracted to BNL shop for manufacturing. BNL shop also produced the RHIC BPMs with good results.
- BNL diagnostic group participated in an ASD videoconference to evaluate the possibility of adopting Laser Wire Scanner in the cold linac, instead of the carbon wire system. This is for its nondestructive nature for better reliability.

- BNL survey group participated in a weeklong training session at ORNL for the proper use of the Laser Tracker system. This will guarantee project-wide practices and quality of data for installation.
- A prototype extraction kicker has been assembled for the impedance measurement. The first result showed lower impedance than past measurement. This result will be presented in the ASAC review for advice.
- The Accelerator Physics group has performed extensive study on the beam loss model as function of working points and tune shifts of the SNS ring. The results showed that, a good working point exist with beam loss better than the design requirements.
- The RFQ of the medium power supply was sent to industrial vendors for bid. The total cost is about 3.0 M\$ which will be phased for payment in both FY 2001 and FY 2002.
- All level III managers are working on the Estimate to Complete for submission to the Project Office in mid August. We are also working on the year-end estimate of the spending of FY 2001 fund. The data showed that BNL can commit 100% of BA allocated to BNL for FY 2001 with several millions phased procurements to be paid in FY 2002.

2. ISSUES AND ACTIONS

- The prototype digitizer card for the Beam Current Monitor system to be provided by LANL has been delayed. If not corrected, this will jeopardize the completion milestone for the BCM system.
- The personnel for the ring control group have been short of 3 FTEs for many months. The new staff has to be identified as soon as possible to recover the delay.

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	%
4957.2	4957.2	5029.6	0.00	0.0%	(72.4)	-1.5%

Variance Statement: Cum variances are within thresholds. No analysis required. Current period CV of \$93/4K (124.1%) is driven by a \$72K credit to 1.1.3.4 Beam Scrapping and lowered ACWP to -\$18.1K.

Project Impact: None.

Corrective Action: None.

WBS 1.5 Ring and Transfer Lines

BCWS	BCWP	ACWP	SV	%	CV	%
33489.7	30379.5	31961.7	(3110.1)	-9.3%	(1582.2)	-5.2%

Variance Statement: Cum 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	1	2	8	13	161
FY01	0	0	0	4	24
Due in Next 30 days	0	0	0	0	2
Total Due at present	0	0	3	11	89
Made	0	0	3	11	82
Missed	0	0	0	1	7
Ahead of Schedule	0	0	0	1	0

3.3 PROJECT CRITICAL PATH ANALYSIS

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

II. Detail R&D Subproject Status

WBS 1.1.3 – Ring System Development

Jie and Deepak attained Snowmass summer study and gave three talks. The following papers were submitted;

- Technical note 095 “The Collimation System of the Ring to Target Beam Transfer (RTBT) Line.” And no-cost PCR submitted.
- Technical note 097 “The Collimation System of the High Energy Beam Transfer (HEBT) Line.

Kicker measurements:

- Improvements of the set-up for the measurement.
- Comparison on the coupling impedance of the RHIC dump kicker with and w/o feed through.
- Measurement on a TiN coated ceramic pipe.
- Preliminary results from an analytical model for the SNS kicker.
- Preliminary measurement of the transverse coupling impedance for the full-size prototype of the SNS Extraction Kicker.

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

BCWS	BCWP	ACWP	SV	%	CV	%
4957.2	4957.2	5029.6	0.00	0.0%	(72.4)	-1.5%

Variance Statement: Cum variances are within thresholds. No analysis required. Current period CV of \$93.4K (124.1%) is driven by a \$72K credit to 1.1.3.4 Beam Scrapping and lowered ACWP to -\$18.1K.

Project Impact: None.

Corrective Action: None.

III. Detail Line Item Subproject Status

WBS 1.5.1 – HEBT Systems

Work is underway for updating the materials cost and manpower effort required to complete the BNL contribution to the SNS project. A preliminary descriptor defining BNL responsibility and handoff is being generated.

Phone conferences continued with Tesla during the month. They have not potted the coils yet because of an error in their potting fixture design. They are rebuilding the potting fixture. Tesla has started to machine the core steel. They will be on vacation the end of July and part of August.

Danfysik was on vacation for most of July. They have not provided a price for the trim coils yet. They are in the process of ordering steel and copper for the 12Q45 and 16CD20.

The 1st dipole chamber has passed the vacuum and dimensional inspection, and is being shipped to RATS. All the arc 21cm Inconel bellows were received and tested. The 8" EVAC flange assemblies for arc quadrupole chambers were received. Preliminary quotes on 8" pump tees were received from vendor and are being evaluated. Design work continues on the 12 cm vacuum system, with details generated around the collimators that were allocated with 2.75m space. Orders for 8" and 4.5" beam pipes were placed.

Integration of the absorber with the vacuum chamber is continuing.

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

BCWS	BCWP	ACWP	SV	%	CV	%
3160.0	2880.3	2409.6	(279.7)	-8.9%	470.7	16.3%

Variance Statement: Cum CV \$470.7K (16.3%) is driven by 1.5.1.1 HEBT Magnets and Support; whereas procurement progress of 1.5.1.1.2 12Q45 Magnet and 1.5.1.1.3, 16CD20 Corrector Vendor Fab was acknowledged. Current period SV -\$165.3K (-49%) is driven by 1.5.1.3.1 HEBT Beam Pipe Fabrication; and current period CV \$91.1K (53%) driven by performance taken for 1.5.1.1.2 HEBT Magnet Quad.

Project Impact: None.

Corrective Action: None.

WBS 1.5.2 – Injection Systems

Work is underway for updating the materials cost and manpower effort required to complete the BNL contribution to the SNS project. A preliminary descriptor defining BNL responsibility and handoff is being generated.

The injection foil mechanism fabrication is continues. Injection septum magnet drawings were sent out for fabrication cost estimate.

The fabrication of the first article long injection kicker has been approved. Two first article magnets will be assembled and tested: a long horizontal and a long vertical. The contract for the injection kicker magnet coils has been awarded to Everson Electric Co. The first article Ceramic Tubes with end cuffs are out to bids (correction to last month's report which had them ordered). The ferrite for the 1st article magnets is on order.

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

BCWS	BCWP	ACWP	SV	%	CV	%
2107.1	1949.5	2263.2	(157.6)	-7.5%	(313.8)	-16.09%

Variance Statement: Cum CV of -\$313.8K (-16.1%) is driven by WBS 1.5.2.2 Injection Kicker PS whereas actual costs were greater than planned due to the redesign of the PS (programmable). Current period SV of \$260.5K (92.9%) is driven by 1.5.2.1, 20DP64/22DP21 Magnets Procure. Current period CV -\$82.4K (-412.4%) is driven by 1.5.2.2 Injection Kicker PS CV -\$26.5K, 1.5.2.3 DC Magnets CV -\$23K and 1.5.2.5 Stripped Foil CV -24.9K.

Project Impact: None.

Corrective Action: None.

WBS 1.5.3 – Magnet Systems

Work is underway for updating the materials cost and manpower effort required to complete the BNL contribution to the SNS project. A preliminary descriptor defining BNL responsibility and handoff is being generated.

The cores for the ring dipole magnets continue to arrive from Allied Engineering. 18 have been received and inspected. Coils have been installed in 10 of the cores and this assembly work continues. Measurement of the first 1.3 GeV dipole with the Allied steel is underway. Allied Engineering is ready to ship the first of the end pole tip shaping plates.

Phone conferences continued with Tesla during the month though there is a break while they were on vacation. Tesla shipped a slice of the pole tip to BNL for inspection. The discontinuities are due to a gap in the Tesla machining program and will be corrected. Overall the schedule continues to slip on there end with the first magnet scheduled for shipping now by the end of September. Dr. Beggs has been contacted about accelerating the production schedule.

Phone conferences were held with Danfysik though there was a break due to their July vacation. The first magnet has been wound and is being potted. They plan to ship it before August 8.

The contract for the 21CS30 and 21CO30 sextupole and octopole corrector magnets was awarded to New England Technicoil. They were visited at the end of the month. They have an excellent facility and a thorough understanding of the task and the schedule. The steel and the wire for the magnets is on order.

The contract for the first article 26Q40 magnet was award to Stangenes. Stangenes and their machine shop subcontractor will be visited in August.

The bid package for the 30Q44/30Q56 was sent out to vendors around the world. A design review for the 41CD30 was held in July. There were some design changes. The final drawings should be ready for checking by the end of August. The 3D magnetic analysis of the 21S26 and 26S26 high field sextupole has been completed.

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

BCWS	BCWP	ACWP	SV	%	CV	%
4920.0	4380.1	6102.1	(539.9)	-11.0%	(1722.0)	-39.3%

Variance Statement: Magnet System has a cum SV of -\$539.9K (-11%) and is driven by 1.5.3.1 High Field Magnets, 30Q44/Q58 Magnet Assy & Test and 1.5.3.2 Low Field Magnets, 41CD30 Corrector Procurement, whereas BCWS is greater than BCWP, Magnet Systems has a cum CV of -\$1,722K (-39.35) and is driven by 1.5.3.1 High Field Magnets whereas ACWP for purchased material is greater than BCWS. FY01 BCWS does not reflect FY00 authorized material purchases received and paid for in FY01. Current period SV -\$196.6K (-43%) & CV -\$532.2K (-203.9%) is driven by 1.5.3.1 High Field Magnet 30Q44/Q58 Assy & Test of 1st Article and 1.5.3.2 Low field Magnets, 27CDM30 & 41CD30 Correctors procurement and current period CV of -\$532.2K (203.9%) and is driven by 1.5.3.1 High Field Magnets special procurement.

Project Impact: None.

Corrective Action: None.

WBS 1.5.4 – Power Supply Systems

The medium range power supply RFP has been released to vendors. It has a bid closing date at the end of August. The award process will begin with the evaluation of technical proposals on September 5. The order should be placed in September.

The vendor has written a test procedure for acceptance of the first article low field correctors. This is being evaluated by BNL, and the final version will be in place for acceptance testing at the factory in October.

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

BCWS	BCWP	ACWP	SV	%	CV	%
1319.3	944.6	533.0	(374.7)	-28.4%	411.6	43.6%

Variance Statement: Power Supply Systems with cum period SV -\$374.7K (-28.4%) and a cum period CV \$411.6K (43.6%) are driven by WBS 1.5.4.1 Ring Quadrupole PS Procure and 1.5.4.2 Ring Low Field PS, respectively. Current period SV -\$101.9K (-70.4%) is driven by 1.5.4.1 Quadrupole PS & 1.5.4.2 Low Field PS whereas vendor procure under performed. Current period CV \$20K (46.6%) is driven by 1.5.4.2 Low Field PS Type A whereas BCWP was acknowledged before ACWP,

Project Impact: None.

Corrective Action: None.

WBS 1.5.5 – Ring Vacuum System

The magnet measurement group has tested the dipole and quadrupole chambers for their effect on magnetic field. The welding fixture for halfcell chambers is completed and is being painted. Machining of mounting brackets continues. The 2nd dipole chamber is ready to be shipped by vendor. All the arc inconel bellows were received and are being sample leak checked. The 1st article pump screens were test-fitted into the pump tees.

The ion pump order was officially placed at the beginning of the month and the vendor has shipped the 1st articles. The pumping speed measurement dome has been assembled for 1st article testing. Order for five additional all metal gate valves was placed. The draft specification and SOW for turbomolecular pump cart are being revised with comments from internal review and three potential vendors. The specification and SOW for ion pump controller were finalized incorporating inputs from partner labs and from vendors. The RFQ for ion pump controller was generated and submitted for approval. Additional data on gauge response time were received from two more vendors and are being evaluated. Concerns on vacuum systems without UPS were raised with project office.

Discussions were held with AP group on the coating parameters for both injection and extraction kickers. TiN and Ti coatings of 6 µm and 15µm, respectively, were deposited on sample ceramic chambers and provided to AP group for impedance measurements. The resistivity of the coatings was measured with 4-probe meter and found to be higher than the book values. Sample ferrites were also coated with thin TiN and measured for its resistivity.

The vacuum team leader visited project office to work out the detail of hand off agreement and used it in Estimate-To-Complete. Large effort was dedicated to ETC.

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>
2115.9	1899.0	2359.3	(216.9)	-10.3%	(460.3)	-24.2%

Variance Statement: Vacuum Systems has a cum SV of -\$216.9K (-10.3%) and CV of -\$460.3K (-24.2%) are driven by 1.5.5.1 Evac CFX Flange, Straight Quad Chamber and Arc half Cell Chamber. The cum CV reflects a \$277K current period material charge in WBS 1.5.5.1, Vacuum Chambers and \$76K material charge in 1.5.5.2 Gate Valves, whereas BCWP will be adjusted in the next period. Current period SV -\$63.9K (-48.3%) and CV -\$412K (-603%) are impacted by the same issues and WBS activities as the cum variances.

Project Impact: None.

Corrective Action: None.

WBS 1.5.6 – RF System

Worked on the estimate to completion. Made a first version block diagram of the low level RF system.

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>
4024.1	3583.6	3601.5	(440.6)	-10.9%	(17.9)	-0.5%

Variance Statement: RF System with a cum SV of -\$440.6K (-10.9%) is driven by 1.5.6.1.2 RF High Voltage PS Procurement. RF Power Supplies are behind schedule due to late prototype delivery.

Project Impact: None.

Corrective Action: Prototype testing will be completed and production unit deliveries will follow.

WBS 1.5.7 – Ring Diagnostics

Cost-to-complete estimates are in progress for all diagnostics systems.

The four (two 12cm and two 21cm) first article HEFT pre-production BPM PUEs were received from the braze house. Final assembly was completed, and the PUEs have passed leak checking. A traveler has been developed for the pre-production BPMs. The BNL central shops exercised their option to fabricate the production PUEs. Drawings and work packages for all SNS PUEs have been released to the shops.

Unexpected ringing has been observed in RHIC IPMs at high beam currents. Efforts to understand and remedy this are in progress.

Breadboards of the BLM front-end amplifiers have been completed and tested, and drawings have been submitted to CAD for layout of printed circuit boards for this prototype design. Four additional BLMs were installed in RHIC near the RF cavities to explore X-ray sensitivity. Testing of the BCM analog front-end electronics continues, using a breakout board to allow access to the digital interface of the AFE without a working digital PCI board. Noise measurements were made, and circuit board modifications are in progress.

The MEBT wire scanner beam box was received from LANL. Vibration, repeatability, and accuracy testing of the first article MEBT scanner is underway. Group members made presentations on wire scanner requirements, wire heating, and front-end electronics at a LANL-based video conference PDR.

Shop drawings are complete for the MEBT Laser Wire, all mechanical parts are in-house, the optics have been ordered, and some EPICS application software is under development. A group member attended a one week laser seminar at MIT. Preparations are underway for installation of a Laser Wire at 200MeV in the Linac-to-AGS transfer line. The installation will include a current monitor, two BPMs, and a carbon wire, as well as an existing upstream harp. New optics have been worked out to give a long narrow line focus parallel to the ion beam. This will lower power density at the beam stop, as well as increasing ionization efficiency and improving resolution. Group members participated in a video conference to explore the feasibility of making the Laser Wire the baseline profile monitor in the superconducting Linac.

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

BCWS	BCWP	ACWP	SV	%	CV	%
4170.6	3372.1	3600.3	(798.5)	-19.1%	(228.1)	-6.8%

Variance Statement: Ring System Diagnostic Instrumentation has a cum SV of -\$798.5 (-19.1%) and is driven by 1.5.7.6 Wire Scanner, SV -441.9K; 1.5.7.5.1 BPM, SV -\$143.4K and 1.5.7.5 Ring Tune Monitor, SV -\$109.2K. Current period CV \$167.3K (52.3%) is driven by 1.5.7.1 Beam Position Monitor whereas BCWP for Detail Design was acknowledged.

Project Impact: None.

Corrective Action: None.

WBS 1.5.8 – Collimation and Shielding

WBS 1.5.8.1 – Ring Collimation

Work is progressing on the design of the scraper module.

WBS 1.5.8.2 – Moveable Shielding

Modifications to the shield suggested by the safety committee in the prototype shield are still progressing.

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

BCWS	BCWP	ACWP	SV	%	CV	%
988.0	938.8	1062.9	(49.2)	-5.0%	(124.1)	-13.2%

Variance Statement: Collimation and Shielding has a cum CV of -\$124.3K (-13.2%) and is driven by 1.5.8.2 Moveable Shielding CV of -\$104.3K. Current period SV \$49K (90.9%) is driven by Ring Collimator and Shielding Fab Prototype; and CV \$50.6K (-49.1%) is driven by 1.5.8.1 Ring Collimator and Shielding.

Project Impact: None.

Corrective Action: None.

WBS 1.5.9 – Extraction System

Work is underway for updating the materials cost and manpower effort required to complete the BNL contribution to the SNS project. A preliminary descriptor defining BNL responsibility and handoff is being generated.

The assembly of the prototype extraction kicker is under way. The magnet will be assembled in stages so impedance measurements can be made with various configurations of the ferrite, bus bar, and figure eight shorting assembly. A reference beam pipe and mounting flange was fabricated for the impedance measurements also.

Effort continues on revising the layout of the extraction region and the RTBT line to take into account the roll of the lambertson magnet. A redesign that eliminates a need for the vertical dipole correction from a dipole corrector magnet is underway.

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

BCWS	BCWP	ACWP	SV	%	CV	%
911.1	667.5	728.6	(243.6)	-26.7%	(61.1)	-9.2%

Variance Statement: Extraction System with a cum SV of -\$243.6K (-26.7%) is driven by WBS 1.5.9.2.2 Charging Power Supply Procure. Current period SV -\$37.7K (-52.7%) is driven by 1.5.9.2.2; Charging Power Supply.

Project Impact: None

Corrective Action: None.

WBS 1.5.10 – RTBT System

Work is underway for updating the materials cost and manpower effort required to complete the BNL contribution to the SNS project. A preliminary descriptor defining BNL responsibility and handoff is being generated.

Fabrication of the fixtures for winding the solid radiation resistant bus (for the 41CD30 correctors) continues. H. Ludwig is modified a study he did for the cables that feed the 36Q80 to provide a dose estimate at the magnet coils. The ETC for the RTBT will use a 30Q58 quadrupole in place of the first 36Q80 quadrupole at the end of the line.

The beam window analysis and design for the Linac and Extraction Dumps continued. There is some concern over the placement of the water cooling lines for the window and the responsibility for run instrumentation cable back from the target face

The general RTBT vacuum layout is being revised following the relocation of collimators and beam diagnostic components. The numbers of chambers, pipes, flanges, bellows and pumps were also generated. Detail of dump window design was generated with the addition of water-cooling lines.

Final negotiations for the construction of a first article collimator with the apparent lowest bidder are in progress. Two BNL-SNS staff members carried out a pre-award visit to the vendor. The preliminary interactions with the vendor were positive, and an award should be made shortly.

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

BCWS	BCWP	ACWP	SV	%	CV	%
1464.2	1458.3	1108.3	(5.9)	-0.4%	350.0	24.0%

Variance Statement: RTBT System has a cum CV of \$350K (24%) and is driven by 1.5.10.5 RTBT Collimator & Shielding whereas labor is under performing the plan. Current period SV of \$32.2K (-27%) is driven by 1.5.10.1 RTBT 36Q85 Magnet Design & CV of \$36.6K (41.9%) is driven by 1.5.10.1 RTBT Magnet & Support whereas labor is under performing and 1.5.10.3 RTBT Vacuum Systems Collimator & Shielding whereas material is also under performing the plan.

Project Impact: None.

Corrective Action: None.

WBS 1.5.12 – Technical Support

- Space Charge Study:

Group studying several important issues related to space-charge limit in a Ring:

- 1) Coherent resonance condition.
- 2) Collective beam response to a resonance.
- 3) Difference between systematic and imperfection resonance response.
- 4) Envelope instability.

- Code Developments:

- Automatic calculation of the distribution of beam losses around the ring from; UAL tracking
- Introduce the correction package and BPM in MAD Lattice
- Paper on magnet fringe accepted for publication in PRE.

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

BCWS	BCWP	ACWP	SV	%	CV	%
8293.8	8293.8	8192.1	0.0	0.0%	101.7	1.2%

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

Project Impact: None.

Corrective Action: None.

WBS 1.9.1 – R&D

WBS 1.9.2.2 – Global Timing

The Timing System final design review was held on July 31st at LANL.

Jitter measurements were made this month in preparation for the final design review. Jitter was measured at ± 1.25 ns at the end of 2.2 km of single mode fiber. This is one fourth of the allowable ± 5 ns for the timing system.

The rest of the month was spent preparing for the design review.

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

WBS 1.9.2.2 –Timing Software

Event Timing System:

VxWorks drivers for the SNS timing system VME board testing was completed (<http://www.sns.bnl.gov>)

We are continuing work on the Event Timing system drivers and demonstration software. We are waiting for the Event Link timing board. The timing board is needed to do a system test and verify proper operation of all the hardware and software.

RTDL System:

Software necessary to use the RTDL system was made available to the partner labs. The RTDL receiver is the Utility module. The software is designed to allow simple commands to be sent so that the Utility module, beam permit module and hardware being built for diagnostics can be tested at the other labs.

SNSEvents.adl (edited)

SNS Event Code Configuration

Event Name	Trigger	Channel	Enable	Intrpt	Event Code	Event Name	Trigger	Channel	Enable	Intrpt	Event Code
Cycle start-60Hz	Trigger		On	On		Beam inject	Trigger		On	On	
Cycle start-120Hz	Trigger		On	On		Finish inject	Trigger		On	On	
MPS inhibit	Trigger		On	On		Extract	Trigger		On	On	
MPS fault	Trigger		On	On		Snapshot	Trigger		On	On	
SRC/DTL off	Trigger		On	On		1 Hz event	Trigger		On	On	
SRC 10 usec	Trigger		On	On		10 Hz event	Trigger		On	On	
SRC 50 usec	Trigger		On	On		RTDL Transmit	Trigger		On	On	
SRC 100 usec	Trigger		On	On		RTDL Valid	Trigger		On	On	
SRC 1 msec	Trigger		On	On		Transient Recorder Save Data	Trigger		On	On	
DTL 10 usec	Trigger		On	On		System 1	Trigger		On	On	
DTL 50 usec	Trigger		On	On		System 2	Trigger		On	On	
DTL 100 usec	Trigger		On	On		System 3	Trigger		On	On	
DTL 1 msec	Trigger		On	On		System 4	Trigger		On	On	
LDHP 10 usec	Trigger		On	On		System 5	Trigger		On	On	
LDHP 50 usec	Trigger		On	On		System 6	Trigger		On	On	
LDHP 100 usec	Trigger		On	On		System 7	Trigger		On	On	
LDHP 7.5 kW	Trigger		On	On		System 8	Trigger		On	On	
IDHP 10 usec	Trigger		On	On		System 9	Trigger		On	On	
IDHP 50 usec	Trigger		On	On							
IDHP 100 usec	Trigger		On	On							
IDHP 7.5 kW	Trigger		On	On							
IDHP 200 kW	Trigger		On	On							
Ring 10 usec	Trigger		On	On							
Ring 50 usec	Trigger		On	On							
Ring 100 usec	Trigger		On	On							
Ring 7.5 kW	Trigger		On	On							
EDHP 10 usec	Trigger		On	On							
EDHP 50 usec	Trigger		On	On							
EDHP 100 usec	Trigger		On	On							
EDHP 7.5 kW	Trigger		On	On							
TCT 10 usec	Trigger		On	On							
TCT 50 usec	Trigger		On	On							
TCT 100 usec	Trigger		On	On							
TCT 7.5 kW	Trigger		On	On							
TCT 200 kW	Trigger		On	On							
TCT 2 MW	Trigger		On	On							

WBS 1.9.5.1 -Ring Controls Integration

The installation of the Epics software on a Linux computer is being tested.

A Linux version CapFast was received, and an account has been created for it on one of the Linux cluster nodes. Installation and testing will be completed next month. We are working closely with E. Williams at ORNL to make sure the system is compatible with the ORNL installation.

WBS 1.9.5.2 - Power Supply Controls

PSI:

First article boards were delivered and are being tested. There are no known problems but testing is continuing.

PSC:

We found two problems with the PSC when using the board with remote triggers. These have been reported to the manufacturer. The manufacturer plans to come to BNL next month to fix outstanding issues. The problems appear to be related to the logic in the FPGA code so they can be fixed without any board changes and are not expected to affect delivery. Some of the issues are caused by definitions of functionality under unusual conditions. We believe most of the issues have been resolved but long term testing a PSC with multiple PSIs is needed to insure reliability. We expect delivery of a few PSI boards next month and this will allow us to do extensive testing.

Ethernet Digitizer & Function Generator:

We received a loan of an Ethernet digitizer and function generator from Yokogawa this month. We also received a copy of the source code and permission to use it. Unfortunately it is written in Japanese so we may need a translator to convert the comments to English. We have software that lets us program the function generator and digitizer from a PC. With this we are able to test the hardware. We find that the output of the digitizer has more noise than expected. This will be looked at next month with the appropriate engineers to make sure it is suitable for the applications. Next month we expect to test the digitizer.

Power Supply Testing at the Factory

The control software based on LabView for the WAVETEK function generator was finished and it was used in Canada for Power Supply test.

Power Supply testing at the factory with the PSC and PSI went very well. The engineers were able to identify and correct some wiring problems.

Power Supply Application:

Initial integration of PSC device support code with the IOC application database has been completed. A new mbbiDirect record was added to the database to receive the extended status readback, which went from sixteen to thirty-two bits. Support for mbbiDirect records was added to the device support code, and new device driver functions were created to read the status bits

from PSC memory. Minor revisions were made to the device support and driver code to correct inconsistencies.

A test setup was constructed for end-to-end functional testing of the combined hardware and software. The setup consists of an IOC with a PSC connected to a PSI connected to a Power Supply Simulator. A function generator was used to feed a waveform into the analog readback channels to test the waveform readback and plotting functions.

All of the device support functions have been tested. The major functions supporting power supply command, setpoint, status readback and analog readback have been verified using the test setup described above. Most of the functions supporting PSC control and status reporting have been verified. Some minor inconsistencies have been noted, and will be addressed as design issues.

MEDM screens were revised to conform to the updated database and device support.

A method was implemented to generate the top-level MEDM screen file using template + substitutions files. This simplifies the task of creating new screens for different sets of power supplies.

WBS 1.9.5.3 – Diagnostics

We did not complete the ICD for the collimators as expected.

The ICD for the BCM was completed and distributed for comments. We had a meeting with LANL people on the hardware/software that will be used for the BCM.

Work is continuing on the ICD for the BLM. Next month the ICD should be completed and a VME ADC board selected and testing started.

WBS 1.9.5.4 - Vacuum

We started to acquire the cost to complete data for the Vacuum system.

We need a definition of the control hardware to be used in the Vacuum system before we can proceed with the software. The selection and purchase of hardware is not expected to be ready before the end of the year.

WBS 1.9.5.5 - Application Software

The latest version of UAL 1.0 Environment including the C++ and Perl classes dealing with the transverse impedance kick, and examples of their using were installed onto SNS/BNL Linux cluster for all users.

The new C++ class BunchDistributor was tested as a base for parallel calculation of the 3D space charge forces. This class distributes particles between different CPUs in the case of parallel calculation according to the known criteria. In the case of the 3D space charge calculation it will be longitudinal position of the particle. The Perl interface to this class was worked out as well.

The new parts of UAL 1.0 Environment were installed onto the ORNL Alpha cluster.

The MPICH environment on the ORNL Alpha cluster was configured. Now all components of this Linux cluster can be used in parallel calculations (8 Work Stations).

A proposal for the Orbit Difference Display application based on the UAL 2.0 Application Toolkit was prepared.

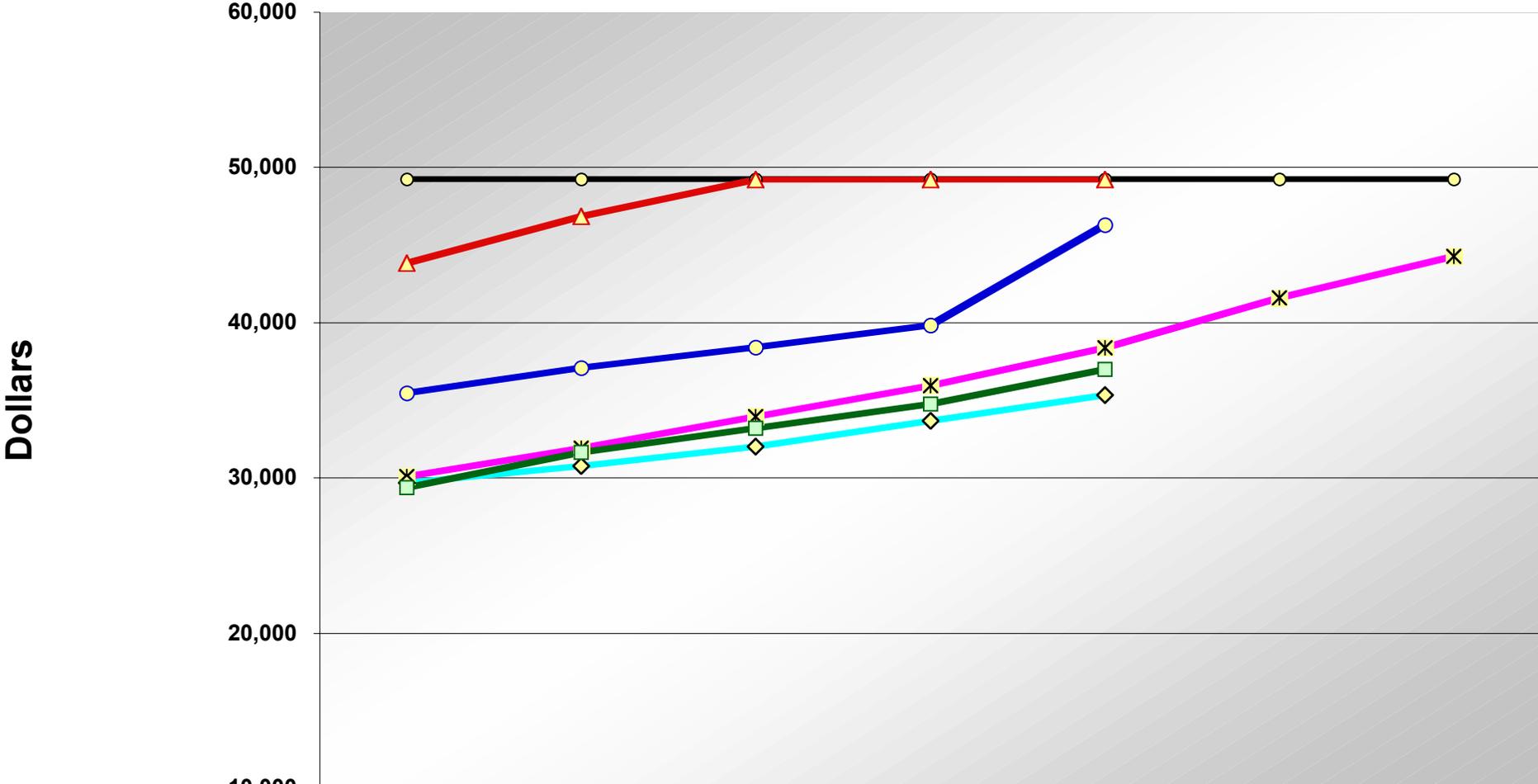
The build2 snapshot of the UAL 2.0 Application Toolkit was implemented. This snapshot includes support of the Standard Machine Format (SMF) attribute sets. In UAL, all attribute sets have the same structure. This uniform organization enables one to use a simple generic interface and facilitates the integration of accelerator containers with general-purpose tools. In addition to the generic interface, each set defines an explicit fast interface to its data. The build2 updated accelerator containers have been successfully tested with the Accelerator Description Exchange Format (ADXF) file containing the SNS MEBT lattice description and element attributes.

WBS 1.9.5.6 – RF

This month there were several meetings with the RF group to define in detail the controls requirements. This is needed to get data for a valid ETC. The LLRF will be more difficult than expected. Instead of 1 or 2 VME crates, there will be four crates. The RF group will be designing up to 8 VME boards and each will require a new Epics driver. We will need to assign an experienced Epics developer to this project fairly soon.

IV. Earned Value Reports and Charts

1.5 & 1.1.3 Performance Measurement Chart



	Mar	Apr	May	Jun	Jul	Aug	Sep
Cum Planned BA	49,225	49,225	49,225	49,225	49,225	49,225	49,225
Cum Authorized BA	43,813	46,840	49,201	49,201	49,201		
Cum Actual BA	35,448	37,075	38,414	39,832	46,275		
Cum BCWS	30,058	31,894	33,931	35,946	38,373	41,578	44,275
Cum BCWP	29,666	30,764	32,013	33,661	35,337		
Cum ACWP	29,359	31,615	33,196	34,736	36,991		

Months

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

PROJECT TITLE: SPALLATION NEUTRON SOURCE			REPORTING PERIOD: 1-Jul-01 thru 31-Jul-01					PROJECT NUMBER: 99-E-334					
PARTICIPANT NAME AND ADDRESS: Brookhaven National Laboratory Brookhaven, NY			BCWS PLAN DATE: October 1999					START DATE: October 1998					
								COMPLETION DATE: November 2006					
WORK BREAKDOWN STRUCTURE	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	Budgeted Cost		Actual Cost of Work Performed	Variance		Budgeted Cost		Actual Cost of Work Performed	Variance		Budgeted	Revised Estimate	Variance
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
1.1.3 Rings System Development	75.3	75.3	(18.1)	0.0	93.4	4,957.2	4,957.2	5,029.6	0.0	(72.4)	5,115		
1.5 Ring & Transfer Line System	2,424.9	1,598.3	2,273.0	(826.6)	(674.7)	33,489.7	30,379.5	31,961.7	(3,110.1)	(1,582.2)	123,312		
1.5.1 HEBT (High Energy Beam Transport) Systems	337.1	171.8	80.7	(165.3)	91.1	3,160.0	2,880.3	2,409.6	(279.7)	470.7	10,639		
1.5.2 Injection Systems	280.5	20.0	102.3	(260.5)	(82.4)	2,107.1	1,949.5	2,263.2	(157.6)	(313.8)	9,233		
1.5.3 Magnet Systems	457.6	261.02	793.2	(196.6)	(532.2)	4,920.0	4,380.1	6,102.1	(539.9)	(1,722.0)	16,357		
1.5.4 Power Supply System	144.8	42.9	22.9	(101.9)	20.0	1,319.3	944.6	533.0	(374.7)	411.6	5,779		
1.5.5 Vacuum System	132.2	68.3	480.4	(63.9)	(412.1)	2,115.9	1,899.0	2,359.3	(216.9)	(460.3)	11,404		
1.5.6 RF System	239.5	182.1	137.3	(57.4)	44.8	4,024.1	3,583.6	3,601.5	(440.6)	(17.9)	13,049		
1.5.7 Ring Systems Diagnostic Instrumentation	277.4	320.1	152.7	42.7	167.3	4,170.6	3,372.1	3,600.3	(798.5)	(228.1)	16,102		
1.5.8 Collimation and Shielding	53.9	102.9	153.5	49.0	(50.6)	988.0	938.8	1,062.9	(49.2)	(124.1)	2,740		
1.5.9 Extraction System	71.7	33.9	48.6	(37.7)	(14.7)	911.1	667.5	728.6	(243.6)	(61.1)	5,965		
1.5.10 RTBT (Ring to Target Beam Transport) System	119.6	87.3	50.8	(32.2)	36.6	1,464.2	1,458.3	1,108.3	(5.9)	350.0	8,099		
1.5.11 Cable	3.1	0.3	0.0	(2.8)	0.3	15.5	11.9	0.8	(3.6)	11.2	2,817		
1.5.12 Technical Support	307.7	307.7	250.5	0.0	57.1	8,293.8	8,293.8	8,192.1	0.0	101.7	21,127		
WBS SUBTOTAL	2,500.3	1,673.7	2,254.9	(826.6)	(581.2)	38,446.9	35,336.7	36,991.3	(3,110.1)	(1,654.6)	128,428		
UNDISTRIBUTED BUDGET													
SUBTOTAL	2,500.3		2,254.9			38,446.9		36,991.3			128,428		
MANAGEMENT RESERVE													
TOTAL	2,500.3		2,254.9			38,446.9		36,991.3			128,428		
RECONCILIATION TO CONTRACT BUDGET BASE													
DOLLARS EXPRESSED IN: THOUSANDS			SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR: Bill Weng							DATE: August 27, 2001			