Brookhaven National Laboratory

SNS

Ring and Transfer Lines Systems

M A R C H

MONTHLY REPORT

01 March – 31 March 2001

Performing Organization:	Brookhaven Science Associates
Location:	Brookhaven National Laboratory Upton, New York 11973-5000
Contract Period:	October 1998 – September 2005

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

I. Senior Team Leader Assessment

1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS

Ring Development – BNL

- A. Fedotov is in Russia for the beam collimation study. This time, in addition to the collimator study, we will also try the effect from the bend crystal to see whether the combined effect is better than one device.

- The Booster has one week beam time for injection and beam loss study during March 26 to 30th. We can also do the measurement on electron production. The result of the study will be reported after data analysis.

- The prototype laser wire scanner has been tested and proved to be successful. Same design will be used to produce one unit for the MEBT for the front end system.

Ring and Transfer Lines – BNL

- Both 27CDM and 12Q45 bids are lower than our original estimate. This represent about 400 K$ of saving from our CEDB input. It mostly due to the dramatic 25% drop of EURO to dollar. We are in the process of lowering some of our estimates for those components with strong European vendors.

- The Vacuum ICD with the control system has been completed and put on the web for partner labs to review. The diagnostic to control ICD will be completed device-by-device in the next few weeks.

- The first article RF Cavity assembly is near completion. The ferrite and copper cooling plate assembly is an improved design from the Booster experience. It will provide uniform cooling with improved reliability due to the simplification of the water loop design.

- The power amplifier assembly is about 50 % complete. The goal is to do the RF high power test in June as a major milestone of the RF system.

- The RFQ package for the medium power supply is near completion. The plan is to let the contract in few months. This will bring the DC power supply design to the 90% completion level.

- Due to the high demand of the injection orbit waveform, the injection orbit kicker may need more power than the original specifications. It this is proven to be true, a sectioned design for the ferrite assembly may have to be adopted. This will increase the kicker cost somewhat.

- The SNS Director, T. Mason, and C. Strawbridge, R. Kustom, and N. Holtkamp visited BNL on March 22. Both Mason and Holtkamp addressed the SNS/BNL staff during an all-hands meeting. A tour of the magnet assembly and measurement facility, the RF lab, the Vacuum lab, and the Diagnostic lab was conducted to witness the progress of SNS construction. The working meeting generated ideas of how to simplify the documentation requirements, how to streamline the PCR approval process, how to reduce EDIA, and how to improve on the communication in the future.

- We are in constant communication with the ASD on how to resolve the early handoff plan. For that purpose, ASD staff will have a meeting with BNL staff on April 10-12 to generate a plan to define role and responsibility of the handoff

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	%
4645.8	4645.8	4594.8	0.00	0.0%	51.0	1.1%

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	%
25412.3	25020.6	24763.7	(391.7)	-1.5%	256.9	1.0%

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

Project Impact: None.

Corrective Action: None

3.2 MILESTONE STATUS

WBS 1.5 has no level 0 milestones. Milestone status is listed below.

Milestones	Level 1	Level 2	Level 3	Level 4	Level 5
Project	1	2	10	13	157
FY01	0	0	0	4	31
Due in Next 30 days	0	0	0	0	2
Total Due at present	0	0	3	11	82
Made	0	0	3	11	76
Missed	0	0	0	1	8
Ahead of Schedule	0	0	0	1	2

3.3 PROJECT CRITICAL PATH ANALYSIS

The critical path for the Ring is the Diagnostic Instrumentation, specifically the BPMs. The next area that is critical within the ring is vacuum chambers and the ring dipole and quad magnet assemblies.

II. Detail R&D Subproject Status

WBS 1.1.3 – Ring System Development

The group worked on the beta beating of the potential working points.

Ring extraction optics were revisited and proposed a new solution for the RTBT height adjustment that was accomplished by rotating the Lambertson magnet by 2.6 degrees.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
4645.8	4645.8	4594.8	0.00	0.0%	51.0	1.1%

Variance Statement: Cum 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

ORNL generated a PCR for the change in the location of the magnet measurements for the HEBT dipole. The PCR also includes the design of a special measurement coil for the HEBT dipole magnet. BNL will provide the design and the coil will be fabricated by ORNL. Work has begun on the design of the coil.

The designs of three types of 21cm quadrupole chambers in the HEBT arc have been modeled and are being detailed. The first standard dipole chamber is completed and being inspected at vendor's facility. The drawings for HEBT extraction dipole chambers are released. A list of vacuum chambers and other vacuum components for HEBT straight sections has been generated.

Integration with the vacuum chamber is continuing.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
2206.3	2212.4	1934.7	6.2	0.3%	277.7	12.6%

Variance Statement: Cum variances are positive whereas BCWP exceeds BCWS and ACWP trails BCWP significantly. WBS 1.5.1.1 and 1.5.1.5 are primary drivers for the variance. Approved PCR RI01016 will adjust variances below thresholds when implemented.

Project Impact: None.

Corrective Action: None.

WBS 1.5.2 – Injection Systems

Detailed design of the revised injection septum magnets and the injection kickers continues. The dump septum magnet drawings still await back correction because the designer is working on checking. The injection foil mechanism drawings and the injection septum magnet drawings have been reviewed and are in the final approval stage. The injection C magnet is back in the checking queue. It has been set at 1GeV.

The checking of long injection kicker drawings is almost completed. A final design review for the design will be held in April. A summary of magnet analysis was written up and posted in the C-AD department server. The power supply currents were updated based on SNS Physics Group beam dynamic requirements and the results from field calculation.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1619.7	1677.5	1845.0	57.8	3.6%	(167.6)	-9.99%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.3 – Magnet Systems

QA testing of the magnet coils continues. The coil test procedures for high potting have been approved.

The core steel for The Allied Engineering (production order for the 1.3 GeV ring dipole magnet cores) has been poured and sent to Metals USA in Canton Ohio where they will be machined to the rough overall dimensions and then heat treated.

Tesla Engineering Ltd provided a production schedule for the 21Q40 that meets the requirements of the purchase order and the BNL magnet assembly schedule. The order for the 27CDM30 corrector has been placed with Danfysik. They meet all requirements of the procurement including the delivery schedule. The first cell base was delivered by the BNL Central Shops heat treated (stress relieved) and painted. Unfortunately the vendor used the wrong paint color. It will be repainted to match the SNS color code.

Drawings for the 21CS30 and 21CO30 sextupole and octupole corrector magnets are 95% complete and will be sent for checking and approval next month. A requisition will be prepared for first article magnets of each type.

The modeling in Opera 3D to verify the end fields of the 26Q40 and the 30Q45 quadrupoles was completed and reviewed by the BNL/SNS physics group. The revisions for the 26Q40 were approved and the final drawings are being updated. A requisition is being prepared for a first article 26Q40 magnet. It will be sent out to bid after a project office design review on April 11. Some more analysis is being done on the 30Q45. It will also be reviewed on April 11. When the drawings are complete a requisition will be prepared for procurement of a first article magnet.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3681.8	3663.4	3961.9	(18.4)	-0.5%	(298.5)	-8.1%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.4 – Power Supply Systems

First article boards for the Power Supply Interface/Controller (PSI/PSC) have been built. Prototype testing has allowed us to confirm analog performance in the areas of noise, stability, and linearity. While construction of the first article proceeds, software development continues.

The Final Design Review for the Low Field correctors was held at the vendor's facility on March 29th and 30th. Very detailed discussions on the design were held, and any outstanding issues were resolved. Compatibility with LANL applications was also examined. LANL now intends to order another 58 modules for their needs. With the mineral insulated PCR accepted, BNL is in the process of increasing the order by 22 modules to effect four high current power supplies (120 Amps at 35V). There may be other applications for this versatile power supply in other areas of SNS as well.

First article testing of the Injection Bump Power Supplies is scheduled for June 8-10. An SNS-ORNL engineer will accompany the BNL staff.

The design of the medium power supplies is continuing, with release of an RFP package to vendors by June.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
689.8	563.3	427.6	(126.5)	-18.3%	135.7	24.1%

Variance Statement: Power Supply Systems with cum period SV -$126.5K (-18.3%) and a cum period CV 135.7 (24.1%) are driven by WBS 1.5.4.1 and 1.5.4.2 respectively. Current period CV $41.1K (63.6%) is driven by WBS 1.5.4.2. Approved PCR RIO1016 and RIO1013 will adjust variances below thresholds when implemented.

Project Impact: None.

Corrective Action: None.

WBS 1.5.5 – Ring Vacuum System

The revised halfcell chambers drawings have been checked and released. The dipole chamber vendor has solved the problems in forming the chambers with an acceptable cross section. The first two chambers are being heat treated prior to delivery to BNL. The welding fixture for the

halfcell chambers is being detailed. Half of the Ring all-metal valves have been ordered. The remainder will be purchased in early summer.

The response time of a commercial vacuum gauge controller was measured and found to be 40 msec after a real pressure rise and the other 45 msec for the closure of relay contact. Several gauge vendors have been contacted on the availability of the DeviceNet and/or RS485 communication interface. A vacuum control test bed has been set up with full compliments of vacuum equipment of two regular vacuum sectors.

ICD between vacuum systems and control systems has been finalized. The preliminary specifications for vacuum gauge controllers and ion pump controllers have been prepared and circulated to interested parties in SNS collaboration for review and comments. The specification and statement-of-work for the large sputter ion pumps have been revised with inputs from partner labs.

The vacuum production facilities have been rearranged allowing separate areas for chamber production, chamber coating and vacuum component testing. Development of TiN coating for the extraction kicker ferrite has been conducted with emphasis on effective masking.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1748.3	1690.7	1598.2	(57.7)	-3.3%	92.5	5.5%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.6 – RF System

Assembly of the first rf cavity was completed and it was tested at low power. The measured resonant frequency and R/Q were extremely close to the design values, well within tolerance.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3294.6	3191.3	3204.9	(103.3)	-3.1%	(13.6)	-0.4%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.7 – Ring Diagnostics

1.5.7.1 – BPM

-x-y table adapter plate drawing for 21cm Ring PUE received from shops
-Raw materials for striplines and outer shells of PUEs were received.
-Two pre-production 21cm HEBT PUEs are being assembled in preparation for brazing.
-Machining of outer shells and striplines of two pre-production 12cm HEBT PUEs is in progress.
-Drawings of 30 cm Ring and 36 cm RTBT PUEs were submitted to shops for estimate.
-Given the small incremental cost, the decision was made to add PUEs to all HEBT 12cm quads.
-Inquiries about trim coils for HEBT and RTBT quads revealed that they are already a part of the package for all except 12 cm quads, permitting beam-based alignment in HEBT and RTBT. The possibility of adding trim windings to the 12cm quad package is under investigation.
-Additional Feedthru quote was received, much closer to budgeted cost.

1.5.7.2 – IPM

-A preliminary design for the IPM magnet has been prepared. Because this magnet is a picture frame design, this will necessitate a different transducer head from that in RHIC.
-The electron detector has been bench tested with a new gain and brought to 911B for more tests.
- Modifications to the wire scanner cross were completed to permit installation of an electron detector in RHIC.

1.5.7.3 – BLM

-Participated in video conference to discuss BLM physics and operations issues
-Testing was performed with loss monitor bottles in various configurations to compare polarity-related response.
-Preliminary ICD draft was written and distributed.

1.5.7.4 – BCM

-AFE design schematics have been completed and they have been sent to lay-out.
-Preliminary ICD draft was written and distributed.
-Timing and Gain control design efforts are progressing.
-Preliminary brochure was written and distributed

1.5.7.5 – Tune

-A group member gave a presentation to the BNL SNS Accelerator Physics weekly meeting on various tune measurement possibilities. This was followed by extensive discussion.
-Continued investigation of possibility of detailed probing of tune space with high frequency resonant pickup and high frequency kicker combination.

1.5.7.6a – Carbon Wire Scanner

-MEBT wire scanner engineering drawings have been revised and released to the design room.
-Design efforts on MEBT carbon orifice for "pencil beam" have resumed.
-Additional engineering manpower was added to the wire scanner effort.
-Linear actuator was received from Huntington.

1.5.7.6b – Laser Wire Scanner

-A poster presentation was made to SNS management (Mason/Holtkamp/Strawbridge/ Kustom) during their recent visit to BNL.
-Use of cylindrical lens permits an order of magnitude reduction in laser power, to the range of 25-50mJ. This reduction in power reduces cost of the laser, making the Laser Wire cost-competitive.
-Assembly drawing sent to LBNL. MEBT laser platform profile is being modified to remove a small interference.
-Implementation of Laser Wire in Linac was discussed during weekly diagnostics phone conference. Assembly drawing was forwarded to LANL. They have confirmed a compatible foot print with all wire scanner locations, with possible exception of DTL.
-Laser and optics radiation hardness is under investigation. We have ordered a 50mJ laser to test for radiation hardness.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
2717.8	2622.8	2721.3	(95.1)	-3.5%	(98.5)	-3.8%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.8 – Collimation and Shielding

1.5.8.1 – Ring Collimation

A method of including the effects of the magnetic fields on secondary protons in the estimation of dose to magnets in the collimation straight has been developed. It involves a combination of the COSY-INFINITY code and the MCNPX code. The magnetic fields are determined by the first code, which are then integrated into the input of the second code. Preliminary results indicate that there is a significant difference in the dose due to secondary protons compared to cases without the magnetic field. Drawings of the tube structure (double walled and helium

control valves) have been prepared, and will be combined with the drawing of the RTBT inner collimator structure as a package. This package is currently still in checking.

1.5.8.2 – Moveable Shielding

The prototype moveable shield has been completed and is currently being painted. A safety review of its operation is planned.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
772.1	730.8	800.3	(41.3)	-5.3%	(69.5)	-9.5%

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

Project Impact: None.

Corrective Action: None.

WBS 1.5.9 – Extraction System

The detail fabrication drawings for the prototype extraction kicker have been checked. They are in the final approval cycle. The design of the oil filled version of PFN continues. Parts for a proof of principle prototype are being fabricated. A calculation by W. Meng to estimate heat generation in the extraction kicker ferrite indicates that each kicker module will produce 500 W when they are operated at 60hz. This prompts the need to add a cooling system in the kicker design. Both the ISIS kicker and SNS RF cavity were studied and vacuum group was consulted. A conceptual design is being worked on with Y.Y. Lee. Efforts to finalize the kicker parameters are nearly complete with a satisfactory version that meets the requirements of the beam dynamics group, the power supply group and the available space in lattice.

A design review of the revised layout of the Extraction Region from the Lambertson Septum to the first 21Q40 quadrupole in the extraction transfer line was held and minutes were generated and circulated. This included the 17DS240 Lambertson Magnet, the 22DV50 pitching dipoles and the RTBT 21Q40/27CD30 assembly. Excellent progress was made in this area and only minor modifications are required before the magnets can be released for detailed design. The new layout allows for the correction in beam elevation to the Target Station while minimizing beam loss throughout the region. The region as a whole is well understood and a few suggested performance/cost savings improvements are being investigated.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
640.6	543.3	511.6	(97.3)	-15.2%	31.7	5.8%

Variance Statement: Extraction System with a cum SV of -$97.3K (-15.2%) is driven by WBS 1.5.9.1 Extraction Kicker Power Supply -$91.9K. Extraction Kicker PS is affected by the redesign of PCR RIO1021.

Project Impact: None

Corrective Action: None.

WBS 1.5.10 – RTBT System

Locations of the vacuum components in RTBT have been generated. Design of the vacuum chambers at the Ring extraction section and the beginning of the RTBT line has started.

Drawings for the inner collimator structure for a RTBT collimator are complete and an internal review has taken place. Modifications suggested at the review have been incorporated. The drawings are currently being re-checked. These drawings will be combined with the drawings of the Ring collimator as a package to be bid on by potential manufacturers. This item will be the first collimator to be manufactured

As noted in 1.5.9, a design review was held on the 22DV50 and the magnet is ready for detailed design.

Fixtures for winding the water-cooled radiation resistant bus (for the 35Q80 quadrupoles) are being designed and should be released to the shops next month.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
992.5	1076.4	942.4	83.9	8.5%	134.1	12.5%

Variance Statement: RTBT System has a cum CV of $134.1K (12.5%) and is driven by 1.5.10.5 RTBT Collimator and Shielding whereas BCWP is greater than ACWP. Approved PCR RIO1004 will correct variances below thresholds when implemented.

Project Impact: None.

Corrective Action: None.

WBS 1.5.12 – Technical Support

Machine studies in the AGS Booster were performed. Difficulties with tuning the machine and commissioning the new flag were overcome and some data were acquired. These data need to be analyzed and, depending on the results, more experiments may be performed.

Estimated the losses around the ring, HEBT, RTBT and Linac.

Experimental studies in the AGS Booster for losses.

Measurements of the impedances for different kickers.

Started application development with control group of injection bump magnet current setting, visualization, its interface with EPICS and user.

Updating SNS/BNL naming database and optical database.

Work on commissioning plan for the transfer lines and Ring.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
7044.9	7044.9	6815.0	0.0	0.0%	229.9	3.3%

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

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

(V101) – Eventlink input modules:
This task is complete. 12 modules have been built

V124s – Beam synchronous decoder:
The prototype PCB has been assembled at Brookhaven. Testing is well along and all major functions have been tested and are working. Some minor PCB changes are required, but overall, the module is working. The front panel remains to be fabricated. Refinement to the gate array functionality continues. A second prototype is under construction. Some minor clarifications to the V124s module description has been written in preparation to the software driver work beginning. We do not plan to release this design until after the design review this summer. This task is on schedule.

V123S – Beam synchronous encoder:
Assembly of additional prototype V123s modules is underway.

The parts list for the RTDL encoder, V106, referenced BNL part numbers. This month the parts list was updated to reference manufacturers part numbers and the parts list was sent out to a distributor to get a quote on kitting the parts. The quote is due this Friday. Once the quote is in, we will have a better idea of the delivery schedule for the components.

Using RHIC spares, we are setting up an RTDL system at BNL in building 817 for software development.

Eventlink Fanouts-

I have not had a chance to initiate orders for the beam sync fanouts, however, if necessary we can use RHIC spares for now, and replace them if the production schedule is inconsistent with SNS needs.

Event Timing System:

The V123s – (SNS beam synchronous encoder prototype module) register functions have been tested under VxWorks. Its EPICS driver is under development and it will be tested against V124s – (SNS event decoder prototype module) in April. EPICS drivers for both modules will be released in May.

V123s – SNS beam synchronous encoder prototype module

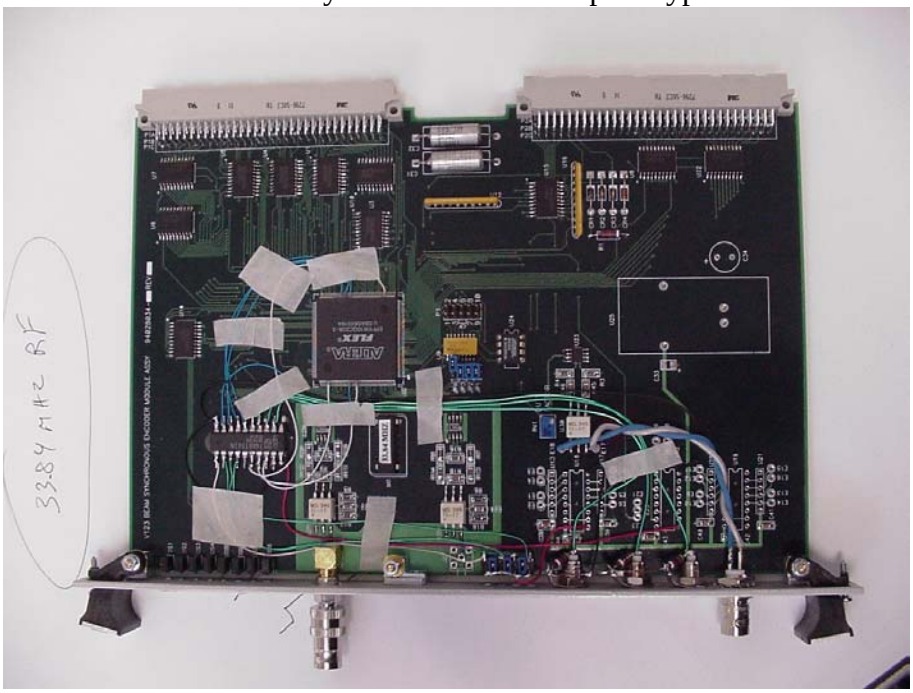
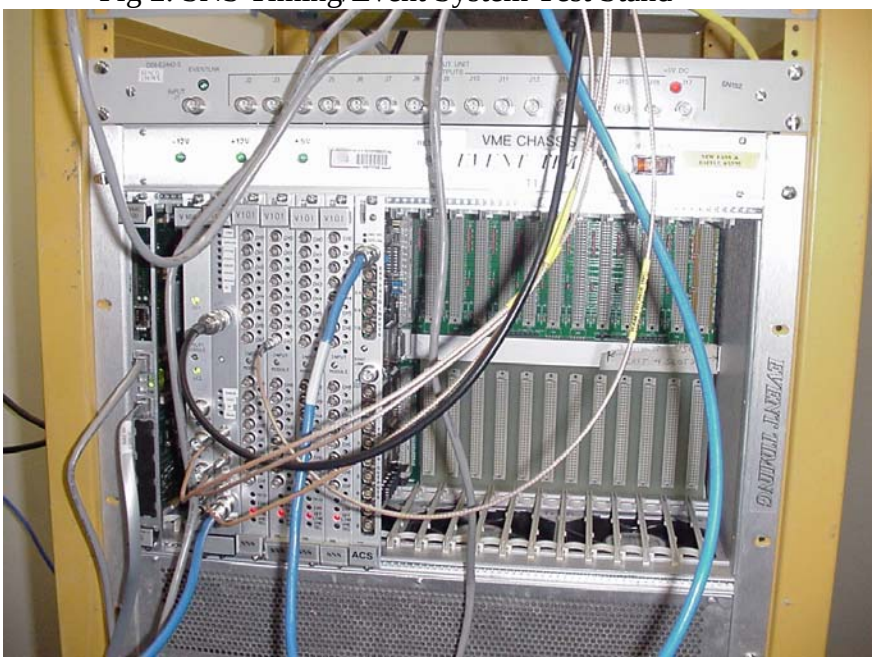


Fig 2. SNS Timing/Event System Test Stand



WBS 1.9.5.1 – Ring Controls Integration

BNL is working with ORNL to the setup of the ADE and new server at ORNL. Ernest Williams plans to come to BNL in April to assist us in making the development environment at BNL the same as ORNL. In addition he will help in the transition from the Sun environment to Linux and the installation of new software such as EDM.

BNL plans to order an extra server on the cluster that will be used for Linux software testing. This is a very low cost approach, is extendable and requires very little resources, (disk space, backup services etc.) because it boot straps on the present cluster work.

WBS 1.9.5.2 – Power Supplies

PSI/PSC:

We are in the process of writing the Epics drivers and checking out the hardware. We have done some stability testing on the DAC and ADC, and some accuracy testing of the DAC. The attached graphs below show the test results. The drift with time and temperature is low and the DAC accuracy is very good. The ADC accuracy is yet to be measured. We installed a GPIB interface to a multimeter and provided labview interface so we could accurately measure input and output voltages for testing the hardware.

The tests are done using the serial interface port to the PSC. This port can be used to do power supply testing if in a location where there is no Epics support.

Ethernet Digitizer & Function Generator:

We have been contacted by KEK and they indicated that by contract they are no able to provide us with the source code for the Yokogawa instruments we anticipated using for the injection power supplies. BNL and KEK will both try to contact the factory to see if some arrangement can be made so we can obtain the source. If unsuccessful we will work with the power supply group to choose alternate instrumentation. This is not expected to be a problem except we will likely have to give up on the Ethernet interface.

Software Development:

The EPICS driver is under development and approximately 50 percent complete. There are some hardware issues but it is expected the impact on the software will be small so software development is proceeding. EPICS driver development extensively tests the VME interface.

WBS 1.9.5.3 – Diagnostics

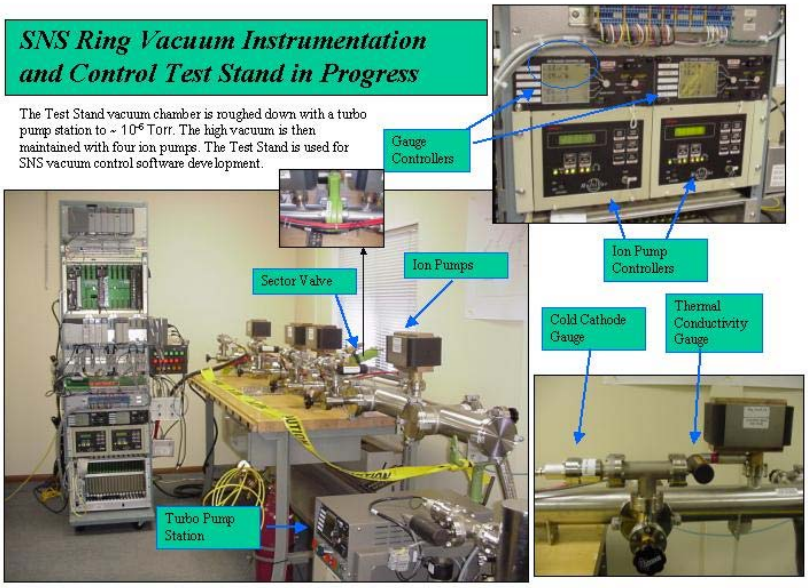
There was a meeting this month with the diagnostics group to define the requirements for the ICD. After the meeting it was agreed that the ICD for the BCM would proceed and act as a prototype.

We are providing assistance to the diagnostics group in the setup of development PC's and software. We setup a system for the wire scanner, which includes the PC, NT, Labview, motor controller hardware and software. It is now ready for diagnostic development.

WBS 1.9.5.4 – Vacuum

Some work is continuing on the Vacuum control system. Serious work will wait until the controller interfaces have been defined and some test controllers have been purchased. We continue to improve on the Vacuum lab.

Fig 6. SNS Ring Vacuum Test Stand in Progress



WBS 1.9.5.5 – Application Software

SNS Ring Application Toolkit.

N. Malitsky gave a talk on "SNS Ring Application Software Development" for ORNL SNS scientists.

BNL worked with the ORNL Database team on the Optics Database schema. During this visit we achieved agreement on tables for describing sequences of accelerator devices. A small proof-of-principle experiment was planned and will be implemented at ORNL and BNL over the next few weeks

The Java-based Python was installed and tested.(Jython: http://www.jython.org). Jython is freely available for both commercial and non-commercial use and is distributed with source code. Jython is complementary Java and is especially suited for the following tasks: embedded scripting and rapid application development. Java programmers can add the Jython libraries to their system to allow end users to write "middle-of-the-night" scripts.

SNS Ring Simulation Environment.

BNL: worked with the ORNL Accelerator Physics team studying effects of impedance and collective instabilities on the SNS Ring performance. During the visit a plan was defined to integrate relevant algorithms in the UAL environment.

UAL 1.0 Envirionment:
The tune diagnostics package has been implemented in the UAL 1.0 environment. The package aims to facilitate the selection of the SNS Ring working point

MatLab and EPICS Interface Evaluation – SNS Injection Orbit Bump Optimization**.**
A demo program has been setup to evaluate the capability of EPICS tools integrating with a commercial tool as an alternative method for SNS control application, such as SNS Injection Orbit Bump Optimization.

Fig 3. Using EPICS and Matlab tools for SNS Injection Orbit Bump Optimization Problem

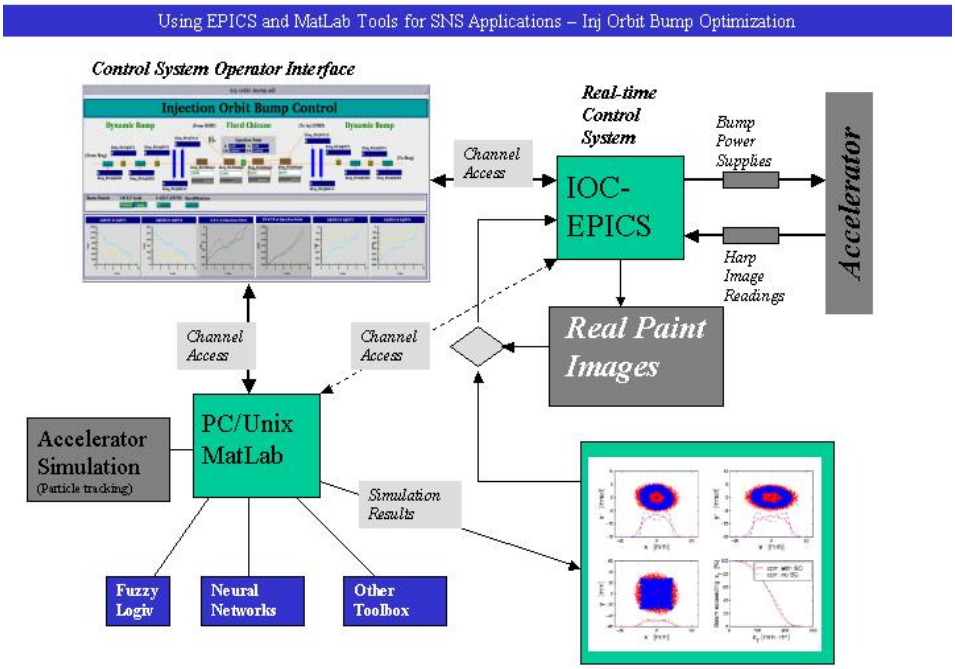
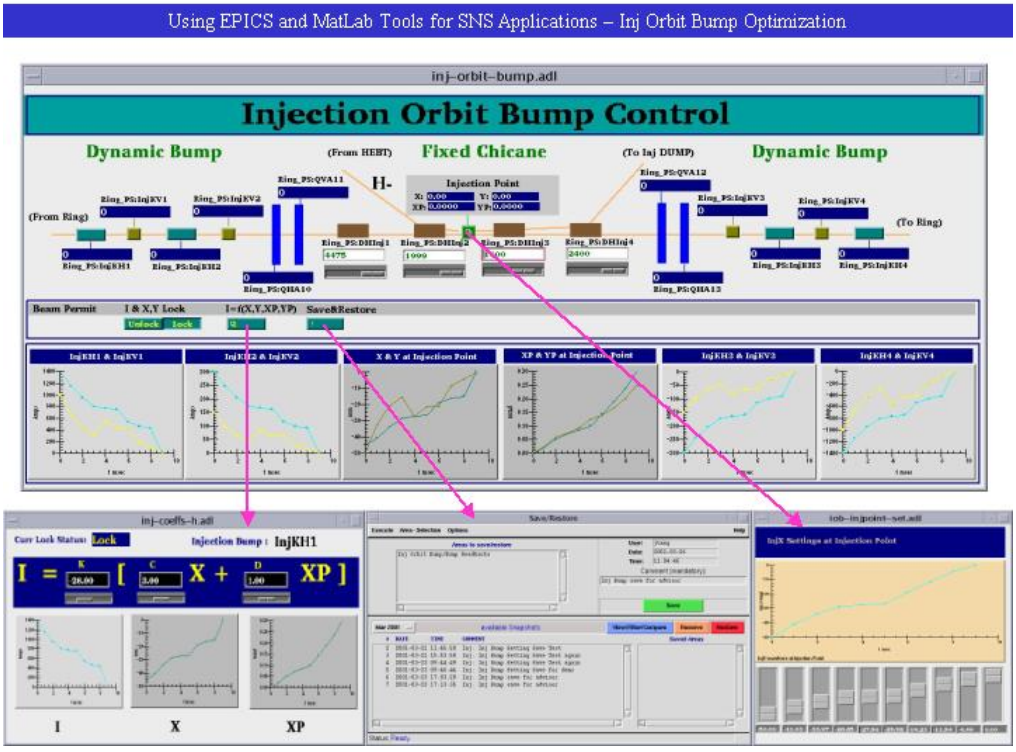


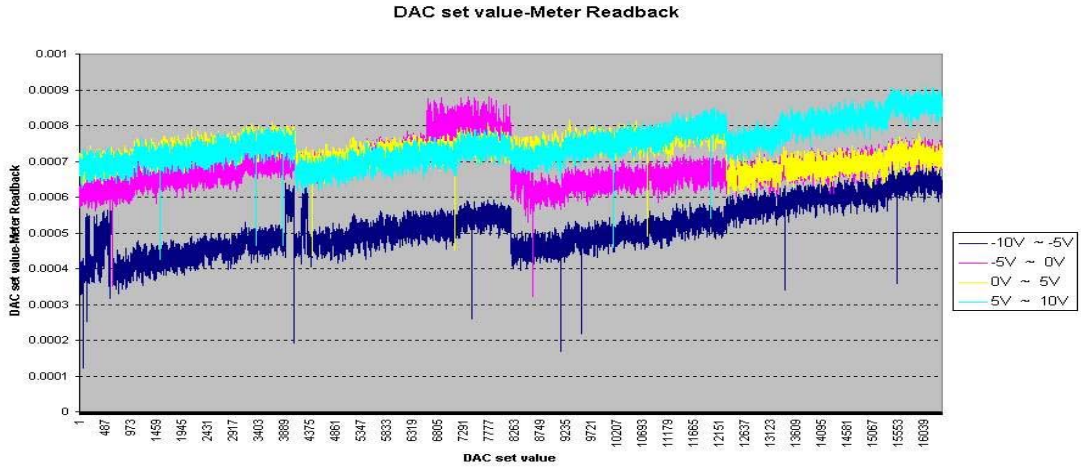
Fig 4. Using Existing EPICS Display Manager Tool for GUI

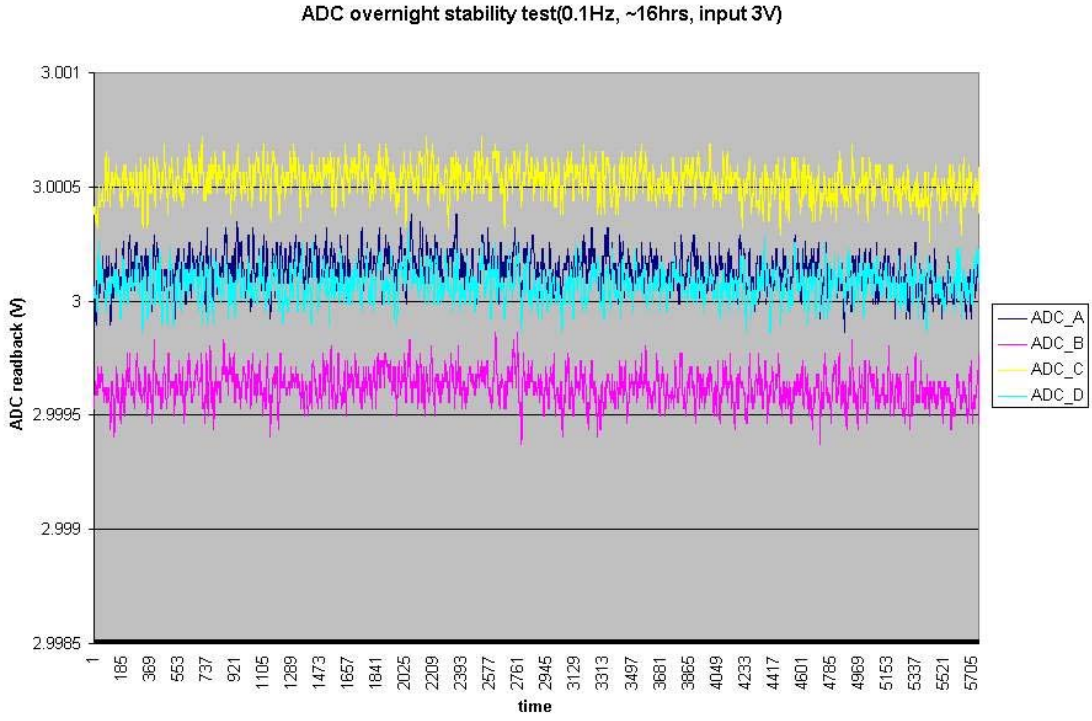


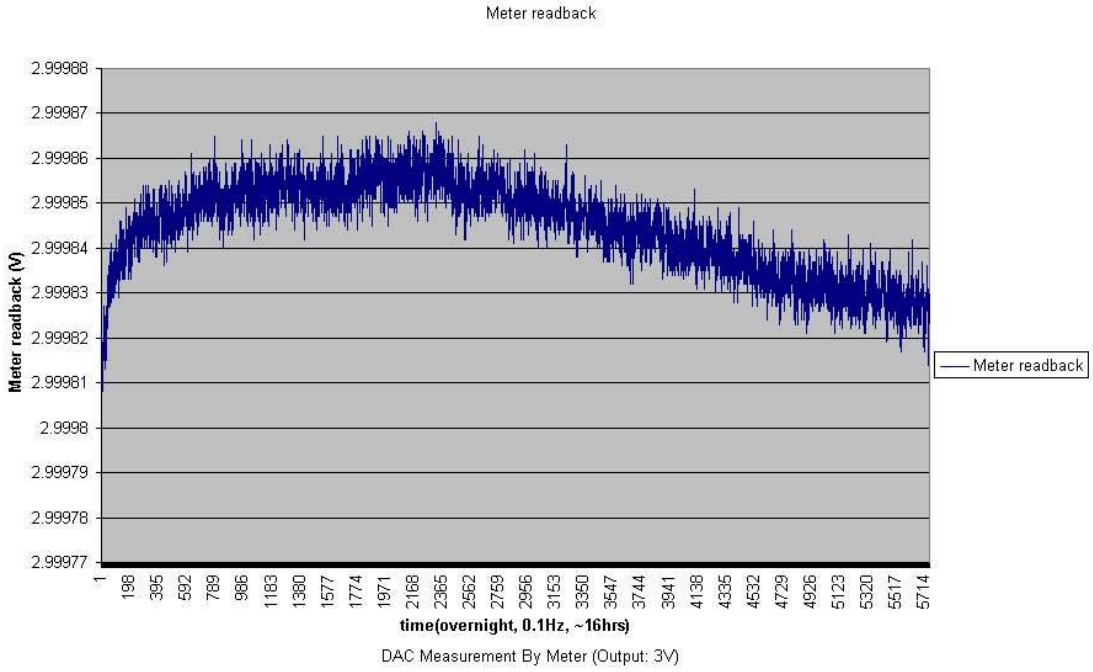
WBS 1.9.5.6 – RF

There was no work done on the RF system. We expect to get an ICD for the Low Level RF in May.

Power Supply Test Results







IV. Earned Value Reports and Charts

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

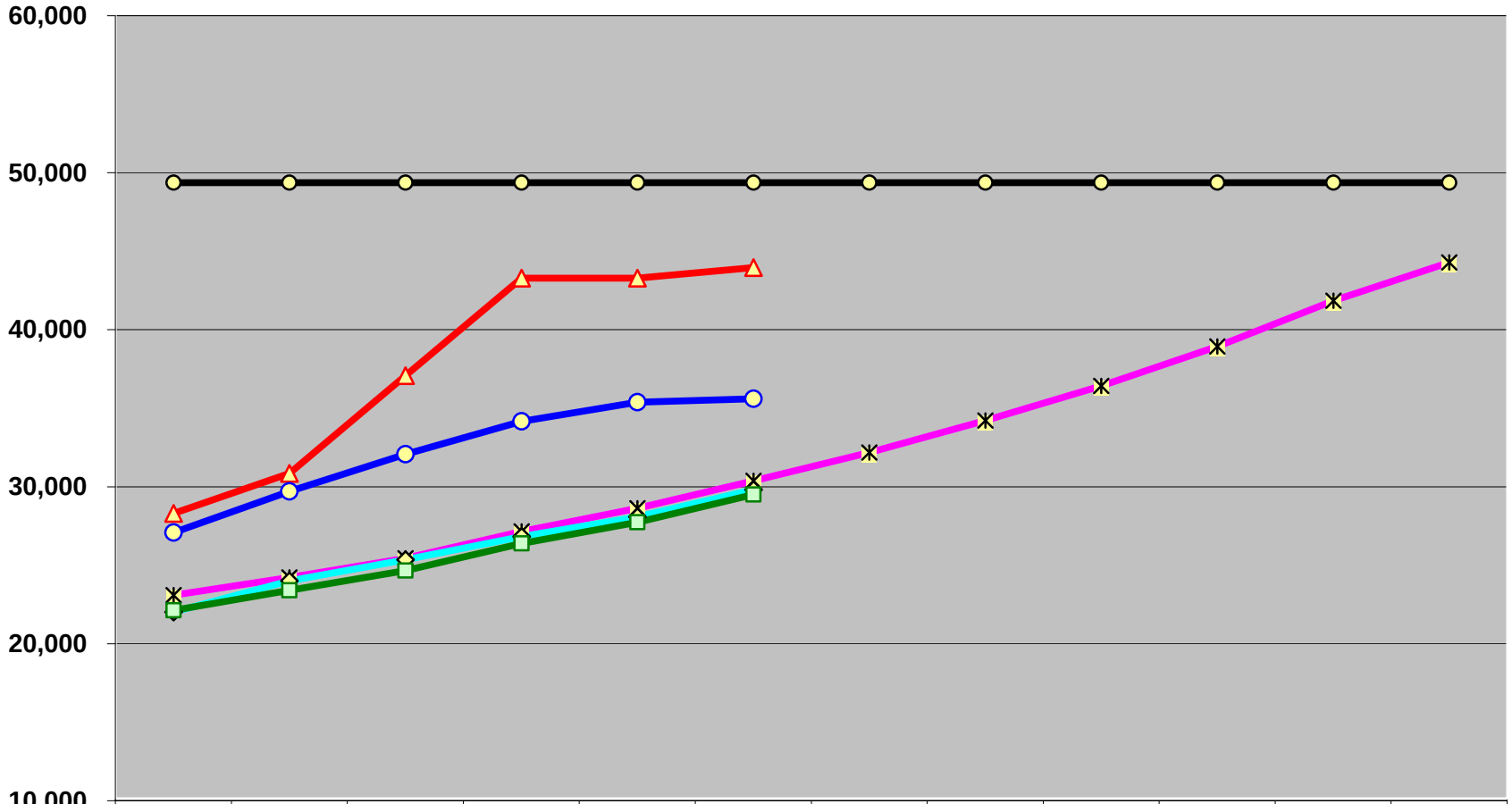
PROJECT TITLE: SPALLATION NEUTRON SOURCE	**REPORTING PERIOD:** 1-Mar-01 thru 31-Mar-01	**PROJECT NUMBER:** 99-E-334
		START DATE: October 1998
PARTICIPANT NAME AND ADDRESS: Brookhaven National Laboratory, Brookhaven, NY	**BCWS PLAN DATE:** October 1999	**COMPLETION DATE:** November 2006

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	81.2	81.2	191.5	0.0	(110.4)	4,645.8	4,646	4,594.8	0.0	51.0	5,111		
1.5	Ring & Transfer Line System	1,497.0	1,643.9	1,583.9	147.0	60.1	25,412.3	25,021	24,763.7	(391.7)	256.9	121,344		
1.5.1	HEBT (High Energy Beam Transport) Systems	84.0	171.9	75.8	87.9	96.0	2,206.3	2,212	1,934.7	6.2	277.7	10,716		
1.5.2	Injection Systems	1.1	111.6	75.7	110.5	36.0	1,619.7	1,677	1,845.0	57.8	(167.6)	9,066		
1.5.3	Magnet Systems	262.3	327.90	329.3	65.6	(1.4)	3,681.8	3,663	3,961.9	(18.4)	(298.5)	16,165		
1.5.4	Power Supply System	86.2	64.6	23.5	(21.5)	41.1	689.8	563	427.6	(126.5)	135.7	5,328		
1.5.5	Vacuum System	68.4	81.7	77.5	13.3	4.2	1,748.3	1,691	1,598.2	(57.7)	92.5	11,339		
1.5.6	RF System	169.8	148.0	426.2	(21.8)	(278.2)	3,294.6	3,191	3,204.9	(103.3)	(13.6)	13,159		
1.5.7	Ring Systems Diagnostic Instrumentation	269.4	302.6	154.0	33.3	148.6	2,717.8	2,623	2,721.3	(95.1)	(98.5)	16,271		
1.5.8	Collimation and Shielding	55.4	18.3	35.9	(37.1)	(17.6)	772.1	731	800.3	(41.3)	(69.5)	2,779		
1.5.9	Extraction System	93.9	27.5	46.9	(66.3)	(19.4)	640.6	543	511.6	(97.3)	31.7	5,092		
1.5.10	RTBT (Ring to Target Beam Transport) System	80.1	63.4	35.6	(16.8)	27.8	992.5	1,076	942.4	83.9	134.1	8,301		
1.5.11	Cable	0.0	0.0	0.0	0.0	0.0	3.8	4	0.7	0.0	3.0	2,674		
1.5.12	Technical Support	326.4	326.4	303.4	0.0	23.0	7,044.9	7,045	6,815.0	0.0	229.9	20,454		
WBS SUBTOTAL		1,578.1	1,725.1	1,775.4	147.0	(50.3)	30,058.1	29,666.4	29,358.6	(391.7)	307.8	126,454		
UNDISTRIBUTED BUDGET														
SUBTOTAL		1,578.1		1,775.4			30,058.1		29,358.6			126,454		
MANAGEMENT RESERVE														
TOTAL		1,578.1		1,775.4			30,058.1		29,358.6			126,454		

RECONCILIATION TO CONTRACT BUDGET BASE

DOLLARS EXPRESSED IN: THOUSANDS	SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR: Bill Weng	DATE: April 26, 2001

1.5 & 1.1.3 Performance Measurement Chart



	Oct-00	Nov	Dec	Jan-01	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Cum Planned BA	49,225	49,225	49,225	49,225	49,225	49,225	49,225	49,225	49,225	49,225	49,225	49,225
Cum Authorized BA	28,155	30,710	36,924	43,138	43,138	43,813						
Cum Actual BA	26,928	29,553	31,930	34,012	35,242	35,448						
Cum BCWS	22,943	24,067	25,297	27,013.5	28,480	30,234	32,041	34,075	36,278	38,790	41,692	44,135
Cum BCWP	21,864	23,850	25,201	26,688	27,938	29,666						
Cum ACWP	21,979	23,263	24,516	26,238	27,582	29,359						

Months