

Accelerator Systems Division Highlights Ending July 16, 2004

ASD/LANL: Warm Linac

We finished high power testing all the 5 MW loads we are obligated to test. We will actually test one more than required as we finish the testing of the last 5 MW klystron.

We successfully high power tested a 5 MW circulator and we have a second 5 MW circulator now under test and everything looks good. If something unexpected doesn't surface it will be done tomorrow. This is our last 5 MW circulator to test.

By the end of the week all high power should be completed except for the heat run on the last 5 MW klystron and one last Thales 550 kW klystron. We have about 90 hours to go on the last 5 MW klystron heat run.

The SNS RF group is considering sending us a additional pair of CCL windows to condition and process.

We are developing a plan at Ray Fuja's request to provide some addition on site support during August and September. We don't think their will be any impact to our work package to provide this additional support. This is partially due to the fact that the testing has gone better than expected.

We still have a 3 person team out a SNS supporting installation.

ASD/JLAB: Cold Linac

One cavity is qualified for the H-8 string.

Assembly of the H-7 string has begun. Completion will be delayed by problems with processing Fundamental Power Couplers.

Assembly of the H-6 string is on schedule.

The H-5 cryomodule assembly is complete.

Repair of the H-1 cryomodule is complete. Cooldown is scheduled for early next week and will be followed by the final two weeks of testing.

ASD/BNL: Ring

A shipping container packed with four (4) RTBT WS chambers, bellows assemblies, RF cavity parts and first production PFN (from APS) will be shipped from BNL to ORNL on Tuesday, July 20. Another container – with RF#3 and remaining RTBT WS chambers will be shipped two weeks later.

Half-cell #31 is in final survey. The planned ship date is Tuesday, July 27.

Half-cell #32 is ready for final survey. The planned ship date is Tuesday, August 3.

Deliveries of the injection bump, extraction kicker, and medium range power supplies continue. The schedule for first article testing of the remaining medium range models has been updated by our vendor, IE Power. From the revised test schedule, the 2500A, 50V and the 1300A, 125V are scheduled for August. The 900A, 80V and 900A, 51V are scheduled for September. The 1300A, 95V and 1405A, 390V first article tests are scheduled for October. These last two tests are after BNL power supply support “roll-off” putting the onus on ASD to witness and accept these final units.

Jie Wei gave an oral presentation on SNS at last week's E-PAC conference. In addition, seventeen conference papers/posters were submitted by BNL/SNS staff.

Magnetic measurements on the 36CDR30 rad hard #2 corrector have been completed. Measurements are now finished on both corrector magnets.

High voltage modulators (extraction kicker PFNs) #6 and 7 have been successfully tested by our vendor, APS. The units have been shipped to SNS/OR. Two more units are to be tested in July.

FY04 BA - all new requisitions and change orders are being approved on a case by case basis as FY04 funding permits.

We have been advised by ASD that one of our half-cell assemblies has developed a vacuum leak during testing. BNL's Michael Mapes will travel to Oak Ridge on Monday to oversee an in situ repair of the chamber.

TiN coating: our vacuum team successfully completed the first production coating of a masked extraction kicker magnet. Two doublet chambers (collimator straight section) have also been coated; the spare chamber is next.

From field measurements taken on chicane #1, it is apparent that the magnet coils must be locked into position (z) to minimize multi-pole harmonics. This will be done and the magnet re-measured to confirm results.

Set-up of the first of two dump septum magnets is underway in the mag measure test station.

Rudy Damm will visit BNL next week. He will review project status in general and RTBT / Target design progress in particular.

Work on the injection straight section mock-up has been progressing slowly. Two magnets (chicane #1 and the injection dump septum) are in magnet test station; two chambers are in the Shops for rework; one chamber is with Survey for QA dimensional inspections.

We have been informed by our vendor (Alpha Magnetics) that their steel contractor (Bay Cast) is having difficulty producing some of the steel required for the lower return and pole piece for the extraction Lambertson septum magnet. Jim Rank is working with Alpha and Bay Cast to understand the problem and to come up with an acceptable solution.

Bob Lambiase is working with ASD on need to replace surface mount resistors on the power supply interface modules (PSI) supplied to us by Apogee Labs. A modified unit will be used for acceptance testing at IE Power next month.

Controls

This week was spent supporting the RF processing of DTL Tanks 4-6, and preparing for the planned processing of the CCL next week. By Friday the CCL 2 RCCS water system and Vacuum system had been signed off for RF processing. On CCL3, the functional check out (complete vertical testing of the RCCS and Vacuum systems) was completed this week. The official sign off for CCL3 will be completed next week. A test plan for the SCL vacuum system was also prepared and signed in preparation for the planned August operation of cryomodule MB3.

Progress was made on preparing the CCL magnet power supply IOCs for integration testing. Utility modules were installed and connected. The Beckhoff BK9000 bus controller Ethernet modules were configured for CCL2 and CCL4. The module for CCL3 has a bad dip switch. A replacement module will be ordered.

Machine Protection System (MPS) hardware was installed in the DTL RCCS and HPRF IOCs.

All of the Low-Level RF (LLRF) systems for the RFQ and DTL tanks 1 to 6 were replaced with the standard Field Control Modules (FCM) and the supporting IOC software installed and tested. The same FCMs were already in the CCL LLRF systems. The first six SCL LLRF IOCs have also been set up. In principle those were simple copies, but it took about 1 day/system to get all the connections & jumpers right.

The two BLM IOCs needed for the CCL run have been shipped from BNL to ORNL, and have now been installed and debugged and are now running. The CCL IOCs are using the faster MVME 5100 processor, fast enough to handle data at the full 60 Hz rate. BNL and ORNL continue to collaborate on installing and commissioning these systems. Ongoing efforts include integrating network, event-link and MPS interfaces, and supporting Labview-based testing of the MPS "comparator modules" developed by the BNL beam diagnostics group. A report characterizing the CPU loading of the BLM IOCs under a variety of circumstances was released. This report confirms 60Hz operation of the BLM software.

The control strategy for triggering the HPRF and LLRF systems in the accelerator has changed. Several variable events have been replaced by seven fixed position and fixed rep rate events that any RF system can use. This facilitates testing, conditioning, and protection of systems during operation. The timing master is providing events for both systems temporarily while the timing databases for the linac RF systems are being changed.

Several RF and magnet power supply PPS bypasses have been installed this week in support of the current RF processing activities and to meet goals for the August 23 ARR. Documentation and as built drawings for the upcoming PPS phase 1.2 are being completed, while field work required for PPS phase 1.2 is ongoing.

Pre-integration testing was conducted this week on the LINAC ODH system. The PLC program is installed and operational; the oxygen sensors are up and reading normally (they have not been calibrated); the blue beacons and warning speakers are functional, however replacement beacons are being ordered due to reliability issues; the ODH system control of the EVS dampers is functional, but the ODH control of the LINAC EVS fans is not yet working. Formal integration testing will start next week. The anticipated operational date is August 6.

The IOCs for Medium Beta cryomodules 5 – 9 and the HEBT service rack were successfully booted; the HEBT IOC and PLC are communicating with an initial version of the data base and the HEBT IOC is scanning the silicon diode and LVDT input modules. All of these are prerequisites for the upcoming cooldown of MB3 and the transfer line. EPICS updates to version 3.14.6 continued where still needed. All IOC screens were updated to include the EPICS version number and VxStats time. New IOCs were added to the status screens and updated screens were committed to CVS. RF Summary PVs were made available. They are on the RF overview screen, and can be added to the highest level overview being prepared by Operations.

Controls were represented at a design review at the supplier's location (Columbia SC) for the Collimator Cooling Water System skids. A few errors were found and with the vendor's help many improvements were made. The Foils and Scraper system block diagram was updated to reflect junction box and cabling improvements recommended by BNL and convert to "official" device names.

Considerable effort was expended this week to understand a problem that was preventing the successful booting of a number of IOCs. In consultation with the vendor of the VxWorks operating system, it was discovered that necessary procedures had not been followed to make sure the VxWorks image used to "flash" the Read-Only-Memory (ROM) was built from the same source files used to create the VxWorks image file that is loaded into memory at boot time. A procedural change will be required in how IOCs are set up. These changes are currently under test for the CCL2, CCL3, and CCL4 power supply control IOCs.

Installation

Craft Snapshot 7/6/04

ASD productive craft workers	63.0
Foremen (Pd by 15% OH)	5.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	71.0
Less WBS 1.9, 1.2 etc	6.0
Less absent	7.0
TOTAL PD BY ASD/ORNL DB WPs	50.0

Accelerator Physics

Five AP group members attended the EPAC conference. Jeff Holmes presented an invited talk on collective effects in high-intensity rings.

The applications programming group is preparing applications for the upcoming DTL/CCL commissioning run. High on the list are the phase and amplitude scanning application for obtaining DTL and CCL RF setpoints. Input data for the CCL delta-T procedure are being prepared from the online model. Software for the emittance and Twiss measurement based on multiple wire scanner data is being readied. The beamline information in the database is undergoing a quality control check. An "audible enunciator" is being written for help in the control room on diagnosing alarms.

A paper by Cousineau et al on "PSR microbunching" was accepted for publication in Phys. Rev. STAB.

Iterations with BINP continue on laser-stripping injection experiment hardware design.

The Interface Control Document for the Ring and Target Systems has been updated and a draft has been circulated for comments. The old version only discusses the target interface, and most of the revisions are to include the beam dumps.

The locations of the last four quadrupole magnets (Q27 - Q30) in the RTBT have been finalized, following a check of the beam optics using Transport. The Q27 and Q28 magnets have been moved apart enough to insert a vacuum flange between them, and Q29 and Q30 have also been moved apart for the same reason. At the same time, the Q29/30 doublet has been moved upstream, closer to the Q27/28 doublet, to increase the sensitivity of the harp.

Operations

ASD Operations focused on RF processing of DTL Tanks 4, 5 and 6. Problems developed with the circulator on DTL 5, halting progress on 5 and 6. We attempted to bring on DTLs 1, 2 and 3 for reprocessing but DTL ME-1 failed halting progress on DTL 1 and 2. The CCL2 cavity was ready by the end of the week for RF processing but CCL ME-1 was not ready for turnover by PM Friday. The limits reached for DTL 4, 5 and 6 are as follows: The repetition rate was 10 Hz.

DTL#4 -- 1.98 MW -- Forward -- 66.6 kW -- Reflected -- 700 uSec -- Pls Width
 DTL#5 -- .94 MW -- Forward -- 15.8 kW -- Reflected -- 150 uSec -- Pls Width
 DTL#6 -- 1.13 MW -- Forward -- 26.9 kW -- Reflected -- 300 uSec -- Pls Width

Ion Source Group

On Tuesday, July 13, we terminated a 12 day, 24 hour run because the source delivered less than 20 mA, after starting out with over 30 mA. As in several of the previous runs, the antenna was found to be in good condition, although covered with a thin resistive coating measuring many kohms along the 2.5 windings. A reconditioned ion source was installed, and a new run is in progress.

Revised emergency shutdown procedures have been posted around the hot spare stand. The revision includes a scaled drawing indicating the location of all emergency shutdown stations and circuit breakers.

Survey and Alignment

We have completed the laying out of the 276 bolt for magnet stand assemblies. This enables the installation groups to start drilling and setting the stands at their discretion.

Our monthly monitoring of the RTBT indicated continual settlement.

With respect to the floor design height, the actual height of the RTBT floor at the target interface is as follows:

May 30, 2003-----	-2.409 inches
July 10, 2003-----	-2.476
August 08, 2003-----	-2.489
Sept 11, 2003-----	-2.540
October 09, 2003----->	-3.280
Nov 07, 2003-----	-3.858
Dec 03, 2003-----	-4.754
Jan 09, 2004-----	-4.958
Feb 16, 2004-----	-5.074
March 16, 2004-----	-5.103
April 12, 2004-----	-5.177
May 05, 2004-----	-6.074
June 15, 2004-----	-6.284
July 09, 2004-----	-6.569

Please see web note #121 for detailed update on RTBT Settlement

The URL for this document is <http://it.sns.ornl.gov/asd/public/html/sns0121/sns0121.html>

The realignment of the HEBT is underway. To date we have completed the straight section (linac line) including all dump magnets. Furthermore, as of today, we have completed about half of the HEBT Dipoles. We are also verifying the position of the dipole vacuum chambers. It is probable that we will have to return to this area to reposition dipole vacuum chambers once the data is analyzed.

We are still plagued by floor settlement. From the completion of our network measuring campaign (Early June), measurements recorded while settling HEBT components already indicates settlement of 100 – 250 microns depending on the area.

This week we received additional half cell fiducialization data from BNL. As of today we have data for 30 dipoles and all quarter cells. As a result we have generated the necessary ideal data for the actual setting of these components in the near future as we work our way around from the HEBT.

We characterized the features on the D_Box. As a result of measurements, the D_Box was sent out for further machining so that it could be set to its proper elevation with respect to beam. S & A also performed motion tests on the HARP actuator.

One additional 21Q40, one reference magnet and one 8Q35 magnet have been fiducialized in magnet measurement this week.

S & A located, in the HEBT, the positions of the hangers for the Diagnostic's Group laser line which runs from the beginning of the HEBT to just short of the LINAC beam dump penetration. This will allow the Installation Group to install the hangers and laser pipe, where upon completion, we will align the laser pipe.

S&A is currently arranging the as-built chopper cavity (located in the Target monolith) measurements into a usable and understandable format for the beam line engineers and scientists. These measurements will provide a guide for the instrument engineers and scientists when designing components for their respective beam lines.

We attended two separate meetings with the Instrument Group. The first meeting was to discuss our needs for the clean room where core vessel and shutter inserts (which require guides) are to be assembled and aligned. This clean room will be located in the Target Building, to be determined at a later date. The second meeting was to discuss verification of anchor bolt placements located in the poured in place shielding for instrument beam line three.

Mechanical Group

After the final water system details were finished all of the DTL systems performed well for the initial conditioning attempts of tanks 4, 5, and 6. DTL 3 was also conditioned. DTLs 3 and 4 reached 2.1 MW at 1 ms, and DTLs 5 and 6 reached 1.1 MW at 150ms all at 10 Hz.

CCL-1 RF window seals were replaced.

CCL-2 is ready for conditioning which may begin this weekend.

CCL-3 magnet power supply testing is complete.

CCL-4 tuning is complete.

Magnet Task

The attachment is a picture of a Permanent Magnet Dipole mounted on our SRF 8Q35 measurement stand. This magnet was acquired (free) from Fermi Lab and will be used as a reference for the measurement system. We have worked out problems with field clamp spacing and assembly/re-assembly of these 8Q35's and have now started production measurements of SRF 8Q35's.

We have completed measurements of all 50 CCL Quadrupoles. Eight CCL module 4 intersegments are ready for installation into the CCL module 4 next week.

We have also assisted in installation of the BSM's into CCL module 1 intersegments 9 & 11.

The 21Q40 system is back on line and we have mapped three 21Q's with a spread of 0.16% which is consistent with measurements.



Electrical Group

Completed installation and check out of CCL3 power supplies integrated with the CCL3 magnets.

Received Extraction Kicker Power Supplies 5 and 6 (of 14).

LINAC AC KL-SS3 feeders preparation and terminations is in progress for next week tie-ins (will require KL-SS3 outage).

HEBT/RING work on VAC cabling and beam line instrumentation cabling in good progress.

HPRF

MEBT Amplifiers: One spare amplifier has been tested to 18kW.

DTL RF: Internal water leak discovered on DTL5 Circulator. Replacement is in progress.

CCL RF: CCL3 calibration completed.

SCL RF: SCL5 second pair of tanks (5 tubes) prepared and populated in the gallery.

RFTF: Cryo-couplers tested to 650kW into load; will ship to JLAB.

LLRF

Operations: DTL4-6 were signed off and turned over to Operations on Friday, July 9. CCL2 was checked out on Friday, July 16, and is ready for RF conditioning. CCL3-4 will be checked out and signed off early the week of July 19. The group is supporting RF conditioning in preparation for the upcoming beam commissioning run.

Installation: Field Control Modules (3rd generation LLRF hardware) have been installed in RFQ, DTL1-6, CCL1-4, and SCL1-12. The total number of installed FCMs to date is 23 (out of 98 for the entire linac). Installation activities are focused on SCL ME-1 and ME-2.

Procurements: The FCM procurement is nearly complete, with only a few daughterboards remaining to be delivered. The AFE procurement is approximately 65% complete; final delivery is expected by the end of July.

Reference System: The reference system is operational and ready to support the upcoming beam commissioning run. Completion of the temperature and air regulation systems is in progress, but is slow due to craft availability.

Cryo-Group

The CHL 4.5 K coldbox run was concluded on Wednesday, two days ahead of schedule. The run was very smooth. The plant started up and was producing liquid helium in about eight hours. A number of tests were run by Linde/JLab/our personnel, and they indicate that while things have improved and the plant has more than ample capacity for 32 cryomodules, the problem with higher than specified nitrogen consumption is still present. This may be due to the coldbox turbines or the heat exchanger (or a combination). Linde has agreed to replace the turbines with new ones (or new components), and these should be ready no later than September. The turbines can be changed out individually, while the coldbox is operating, so this will not interfere with the upcoming schedule of cooling down the transfer lines in August, testing cryomodules at 4.5 K, and commissioning the 2K coldbox. Once the turbines have been changed, additional tests can determine what fraction of the problem is attributable to the heat exchanger.

Two styles of replacement feedthroughs for the 2 K coldbox are being fabricated by Deutch for Air Liquide. They will be tested this week. An alternative style developed internally has passed testing, and delivery of the first batch of ten is scheduled for next week.

Beam Diagnostics

BPM: The DTL RF Reference distribution chassis has been built by the RF group's technicians Jeff Ball, Dale Heidenreich, and Mark Cardinal under the leadership of Craig Deibele. This team has also done high quality work installing RF cables for us in the BPM equipment racks and their support at this critical time is gratefully acknowledged. Due to the LANL stand-down, John Power will not be traveling to ORNL. This will impact the integration of the BPM system.

BLM: All BLMs in the DTL have been connected and the electronics and software to support this area have been installed. Work on the BLM test station continues, although motion control for the emittance scanner has recently taken precedence. Damage to some of the high voltage connectors appears to cause excessive leakage. They are being replaced and the installation and test procedure for the rest of the BLMs is being modified to address this. Next week's video conference will be dedicated to loss monitor discussions.

BCM: The additional electronics chassis required for the next run have been assembled and installed. They are now being configured.

Faraday Cups: The fix for the leaking actuator has been qualified by the vacuum team. They will be assembled and readied for installation at the rate of 2 per week. There are 6 total required for the upcoming run.

BSM: The first two BSMs are now installed in the CCL.

Timing: The cost-reduced PCI timing cards has been demonstrated with the minimum functionality required for the upcoming run. Production boards have been ordered and should arrive next week. The initial driver has been written. A test system utilizing commercial hardware has been developed to simulate the event link master. Various error conditions can be simulated to assure proper response from the timing clients. This platform will be further developed to include RTDL simulation.

D-box: After a slight modification, the D-box can now be mounted with an alignment of a few mils. The first of the new actuators has been tested and dramatically exceeds all requirements for position resolution and accuracy. Two more D-box actuators were assembled and wired. The emittance harps have been wired.

Misc: A meeting was held to review the Diagnostics estimate-to-complete and planned staffing.