Accelerator Systems Division Highlights Ending **August 20, 2004**

ASD/LANL: Warm Linac

DTL
CCL
LANL

Cold Linac

JLAB

ASD/ORNL

ASD/BNL:HEBT, Ring, RTBT
BNL activities for the week ending August 20, 2004:

- Staff here at BNL recently celebrated another SNS milestone. After more than two years of hard work, some of the BNL/SNS Project Team gathered in the magnet assembly area to celebrate the completion of the last (# 32) half-cell before it was shipped to Oak Ridge. See accompanying photograph.

- Performance testing of PFN supplies continues at Applied Power Systems (APS). Testing of unit #10 is underway this week; testing of unit #11 is scheduled for next week. APS plans to ship four units (#8 – 11) the week of September 1st. We expect the remaining three to be tested before October 1st.

- BNL engineers are working to understand why one of the PFN oil pumps (being tested at BNL) developed a leak around the shaft seal. The vendor has been contacted; issues related to priming and back pressure are being explored. Pumps at APS continue to work fine in their test station.

- A test set-up is underway to measure overall impedance of one complete extraction magnet assembly (coated, in vacuum chamber) with PFN. Our aim is to have system measurements in time for ASAC.

- Extraction Lambertson Septum: our vendor, Alpha Magnetics, reported that all the yoke steel is in process with the exception of the last two parts recently acquired from Gary Steel; these last two pieces are being heat treated and will be shipped to Allied Engineering (sub) for machining immediately afterwards. The ELS vacuum chamber materials (less the E-vac flanges) are also at Alpha. Joe Tuozzolo will visit Alpha Magnetics and Allied Engineering next week to observe production status and progress.

- A shipping container was delivered to SNS/OR with RF #3 system including cavity, PS, PA, spare parts, etc. Also included were a wall current monitor, wire scanner hardware, and an assortment of coated and uncoated bellows assemblies.

- The first of two motor control racks are being wired and made ready for system testing with VME Controls. These control racks are for the stepper motors used on the HEBT and Ring foil drives. Signal redundancy (one for MPS input) will be provided via rack mounted relays instead of dual output position limit switches. All parties at BNL and OR appear to be in agreement with the relay solution.

Controls

Installation

Water Systems

- Installation of the DI piping to the second set of SCL-ME6 klystrons continued.
- Installation of the DI piping to the first half of SCL-ME7 continued.
- Installation of the DI piping to the SCL-ME3 HVCM was completed.
- Installation of the SCL QMCS header continued.
- Installation of water lines to SCL Cryomodule #3 couplers was completed.
- Checkout of the Linac RCCS for the ARR was documented..
- Installation of the HEBT Service Building PS cooling lines continued.
- Water maintenance activities this week included water sampling of the Front End Test Stand for De-Ox effect and change out of DI pump oil.

Ring Systems

- The HEBT 21Q40 magnet assy #15 was assembled and is queued for survey.
- The HEBT 21Q40 magnet assy #17 was assembled and is queued for survey.
- The RING “D” arc sections and Half-Cell D6 were individually vacuum leak tested.
- The RING RF Cavity #3 and related power system elements were received.
- The RING RF straight section Wall Current Monitor diagnostic was received.
- Miscellaneous RING bellows assemblies were received.
- The installation of diagnostic cables into the HEBT tunnel continued.

Accelerator Physics

Operations

- Continue with preparation for the DTL 3-6 and CCL 1-3 ARR
    - Held ARR Video Conference on August 19
    - Closing out Post Start Action Items
    - Writing and approving Operations Procedures

- Completed and executed the PPS 1.2 Test and certification Procedure

- Preparing the DTL-CCL Equipment

- Assisting with procedures, certification and monitoring of the SHL Transfer Line cooldown

- Ran RF Coupler processing

Ion Source

- We have measured emittances with the modified Allison scanner and the data are currently being analyzed.

- The ion source and LEBT on the Frontend have been checked out in preparation for ARR.

- All ion source group members have been certified as electrical workers.

Survey and Alignment

- **MAGNET MEASUREMENT**

  All work performed in the Magnet Measurement area this week had to do with the 21Q40 and 8Q35 magnets. First, two 21Q40's were set optically so the Magnet Measurement group could begin their magnet mapping process. Second, one 21Q40 was fiducialized with the Laser Tracker. Third, a 21Q40 set up stand was positioned and leveled. Fourth, three 8Q35's (warm section quadrapole magnets) were fiducialized with the Laser Tracker and were entered to our master data base. Finally, the combination 21Q40 quadrapole/27CD30 corrector magnet assemblies are beginning to be aligned in the magnet measurement area. Upon completion of this alignment, the assembly will be transported to and installed between the HEBT dipoles and positioned to their proper lattice locations.

- **DTL/CCL**
  The beam stop, which will be positioned at the end of CCL4, was fiducialized with respect to the new mounting plate. Tentative alignment of the beam stop into its final position will begin Tuesday the 24th. All paper work requiring the signature of S&A, except for the sign off of the beam stop, has been completed and distributed to the proper personnel.

- **RTBT**

S&A's monthly leveling monitoring campaign of the RTBT occurred this week. Final results indicate another 0.240 inches of subsidence at the lowest point. This brings the total subsidence at the lowest point to 6.80 inches below designed elevation.

- **TARGET**
  Once core vessel inserts are installed into the core vessel, a survey of their reference mirrors must be performed. With the respect to the number of core vessel inserts that have been installed, five inserts were surveyed this week with a remainder of two inserts still requiring surveying. A request by Target was made to measure the distance from the floor V-rail and the target cart liner ceiling at several locations.

- **MISCELLANEOUS**
  Approximately ten chipmunk locations were staked out (above ground) around the Ring and Linac Dump. A continuation of the Linac elevation re-observation campaign is progressing. With the cooling down of the transfer lines located in the SCL area Thursday and Friday, which resulted in a no access condition in the Linac, S&A relocated to the region between start of the HEBT and the Linac Dump to continue elevation re-observations for those two days. As usual, meetings were attended.

Mechanical Group

Magnets

- We have now measured a total of seven SRF 8Q35's. Four of these are matched within 0.1%.
- Two Warm Section assemblies are done.
- We have completed measurements on four-27CD30's for HEBT and five-21Q40's.
- Two 21Q40/27CD30/vacuum assemblies are under way.

Electrical Systems

Power Supplies:

- All warm Linac magnet power supplies are operational and ready for beam tests.
- SCL magnet power supplies have been installed through Modulator SCL ME4 (Cryo-module HB3.

Electrical Installation:

- Cryo-module cabling and terminations complete through MB-5.
- Modulator area SCL ME2 complete.
- Modulator area SCL ME3 racks and ac complete - in process of pulling cabling to tunnel.
- Modulator area SCL ME4 - tray and most racks installed; ac cabling ongoing.
- Modulator area SCL ME5 - tray installation in progress; first rack row installed.

Modulators

- SCL-ME3 installation continued, and should now be ready for testing next week.
- The SCL-ME4 modulator tank was placed in the gallery in preparation for installation.
- The new, lower resistance snubber was installed in the RFTF modulator, and testing continues.
- A HVCM safety review was given this week, and suggestions were made to improve system safety.

- Prototyping of a new SCR gate driver design was initiated.

HPRF

- Work continues on CCL4 RF Station. AC power is now available. A few cable terminations and water system checks (an unusually low flow condition was discovered) remain before starting the formal transmitter check-out procedure.

- SCL MB4c waveguide showed no power to cavity. After rechecking cables, directional couplers and instrumentation, concluded that the circulator must have been mislabeled. The circulator is 440 lbs and hangs 15 feet up with water and electrical connections. After removing, flipping and reinstalling the circulator, tests showed the expected power balance in all waveguide legs. Changed the arrow decal on the circulator.

- High power certification tests were run on SCL ME1 RF systems in preparation for applying rf to cryomodule MB3. Test results satisfactory.

- Lead shielding and output waveguide sections were installed on the MB5 Thales klystrons. This keeps the pipefitters on schedule.

- MEBT amplifiers have been re-connected to the cavities after modification and tests. The solid state amplifiers have been slightly modified for additional stability and all amplifiers have been tuned and tested to over 15 kW including spare.

- RFTF: Cryo-coupler testing continues. Bakeout of next coupler pair completed 4/19 and rf processing began 4/20.

- Set up RFQ through SCL ME2 RF Stations for PPS certification. Tests are underway.

LLRF

- Installation: LLRF racks are installed and loaded up to SCL rack row 16, which serves the first six stations of ME-4. This brings the number of installed Field Control and High Power Protection modules to 53. Here is a summary of the SCL installation: ME-1 installation is complete; testing and checkout is in progress. ME-2 installation is essentially complete. ME-3 installation is in progress; Heliax cable terminations will begin next week. ME-4 awaits cable pulls. MB3 cryomodule tunnel Heliax terminations are complete; MB4 terminations are in progress and will be finished next week. Marek Szajbler of LBL assisted with installation work over the last two weeks. He will spend another two weeks with us beginning Aug. 30.

- Development: Hengjie Ma discovered and eliminated (via FPGA code change) a noise source on the Field Control Module. This was essentially a “hanging chad” problem in that clock signals were routed to a diagnostic connector on the motherboard for testing purposes, and were not subsequently disconnected. Mark Crofford has been investigating spurious HPM faults in the SCL with assistance from Kay Kasemir.

- Ring RF: The following items were received from BNL on Aug. 18: 3rd RF cavity and power amplifier, two bias supplies, three QEI driver amplifiers, one wall current monitor, two screen power supplies, and assorted spare parts. We have agreed, with concurrence from ORNL/ASD and BNL management, to defer the LLRF complete milestone until Dec. 31, 2004. This means the 4th Ring RF system will remain at BNL beyond Oct. 1 to support training and ongoing LLRF development. Chip Piller will be working with Kevin Smith next week at BNL. Tom Hardek, who will assume responsibility for the Ring HPRF systems, will report to work at ORNL on Aug. 23. A videoconference with ORNL and BNL was held on Aug. 17. The primary purpose was to

involve SNS controls and physics personnel to clarify outstanding technical and operational issues for the Ring LLRF system.

Cryo-Group

Beam Diagnostics