

Accelerator Systems Division Highlights Ending August 13, 2004

ASD/LANL: Warm Linac

DTL

- Water system fine tuning is still continuing. Ph sensors, resistivity sensors, and oxygen monitors are being fixed and calibrated.
- DTL4 RCCS has to be flushed again this week and several of the flow meters cleaned. Hopefully this will take care of any further meter problems.
- Installation of diagnostics back into the DTL beam boxes is ongoing this week and will be completed on Monday.
- Construction of the beam stop components is still underway.

CCL

- An alignment check of all 48 CCL magnets was completed this week. The positional accuracies of all magnets were sufficient for commissioning.
- Magnet polarity checks of all 48 CCL magnets were completed this week. Polarities were correct.
- Cooling system hose connections for CCL-4 have been installed and the loop filled and leak tested. Controls testing will begin next week.

LANL

- As predicted, LANL ran out of BA last Friday in both WBS 1.4 and 1.9 (including sufficient funds to cover outstanding commitments and late charges), so all SNS work has been stopped by our Financial Division

Cold Linac

JLAB

- All cavities for the H-8 string have been qualified and all auxiliary parts are available. String assembly will begin next week.
- Two cavities have been qualified for the H-9 string.
- Assembly of the H-6 and H-7 cryomodules continues

ASD/ORNL

Review for cooling down cryomodule MB03 held on Wednesday August 11. Recommendations from the committee have been implemented
Preparations for cooldown of the transfer lines are in the final stages. Initiation of cooldown is expected late Friday or early Saturday.

ASD/BNL:HEBT, Ring, RTBT

Controls

- The Controls Group supported preparations for cooldown of the transfer line and cryomodule #3. Checkout of cryo control systems was completed. Checkout of cryomodule #3 vacuum system was completed. Tuner motor controls were checked out. The Linac Tunnel ODH system was certified.
- The Controls Group also continued preparations for FE/DTL/CCL commissioning. PPS reconfiguration and testing continued. Informal integrated system testing of CCL power supply controls was completed. The testing then had to be halted while polarity measurements were made. Formal power supply testing will start next Monday. CCL4 vacuum and RCCS system testing will take place early next week.
- Software activities included the following:
 - Provided EPICS support for the LINAC ODH including archiving support.
 - Provided archiving support for the Cryo Module cooldown.
 - Started work on a new feature for the archiver that would allow us to look at more than one sub-archive without building a full index. (The planned approach will be slower on retrieval but is much easier to set up).
- Examined a number LLRF control problems. We are finding that some of the SCL LLRF IOCs (2 LLRF systems per crate) get in a state where they automatically reboot because of a "kernel work queue panic". Usually this means a board generates interrupts and the CPU can't clear them. In some cases we found faulty FCM and HPM boards (though unclear why they went braindead). In one case, only one out of 6 HPM boards worked. In another instance the problem not understood at all (e.g. where we see reboot ~once a day without reason). These problems didn't show up in the RF test cave. One theory is that the electrical noise is responsible. Significant noise was observed on the RF drive cable (from LLRF to transmitter). Having that level of noise in the VXI crates would cause problems.
- Interactions between BNL and ORNL RF personnel have resulted in a desire to move "slow" LLRF feedback algorithms out of the DSP and into the IOC. In a proof of principal this week, the adaptive feedback loop was demonstrated using an EPICS state machine running on the IOC and issuing the resulting control parameters to the DSP.
- In a separate LLRF development, EPICS support for the programmable DAC and ADC modules developed at BNL has been implemented and tested.

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 SCL-ME7 TRCC cart continued.
- Installation of the SCL QMCS header continued.
- Installation of water lines to SCL Cryomodule #3 couplers was started.
- Modification to the CHL compressor piping was completed.
- Installation of the HEBT Service Building PS cooling lines was started.
- Water maintenance activities performed this week included cleaning of Linac water system flow meters.

Ring Systems

- The HEBT 21Q40 magnet assy #15 was assembled.
- The RING “D” arc vacuum leak testing continued.
- The installation of diagnostic cables into the HEBT tunnel continued.

Accelerator Physics

- Group members are continuing to analyze data accumulated in the DTL1-3 commissioning run. A study of MEBT input twiss parameters has been completed. The data for this study included MEBT beam profiles measured as functions of all MEBT quad settings. The results show good agreement between measured and model-predicted beam profiles over a wide range of quadrupole settings. The MEBT input twiss parameters in the vertical plane show a clear disagreement with the design RFQ output twiss parameters.
- A study of wire scanner profile data in the DTL was reported by S. Cousineau. This study attempts to quantify the halo as functions of tuning parameters. The measurements show convincingly halo growth vs. MEBT quadrupole mismatch.
- The Faculty and Student Team from Tennessee State University reported on their Singular Value Decomposition analysis of MEBT/DTL beam position data. They have analyzed sets of data that include 1000 beam pulses with 10 BPMs recorded. A few large singular values appear in the transverse planes, indicating sine-like and cosine-like coherent betatron modes. The analysis also includes the phase data which doesn't reveal a single large mode. Analysis of data to obtain BPM resolutions continues.
- AP group members continue to prepare for DTL/CCL beam commissioning. The Beam Commissioning Plan is being prepared, as is the fault-study plan and applications programming for CCL setpoint determination.

Operations

- Continue with preparation for the DTL 3-6 and CCL 1-3 ARR
 - Closing out Post Start Action Items
 - Writing and approving Operations Procedures
- Completed and executed the ODH Test and certification Procedure
- Writing the PPS 1.2 Test and Certification Procedure
- Preparing the DTL-CCL Equipment
- Assisting with procedures and certification for the SHL Transfer Line cooldown
- Staffing the control room for RF Coupler processing and CHL Cooldown
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Ion Source

Ion source #2 that started 14 days ago with about 30 mA, maintained its output without additional cesiations until Tuesday when it was vented. It was purged with nitrogen to continue its operation after completing modifications in the diagnostics chamber.

The LEBT end electrode on the ion source hot spare stand has been modified to properly reflect the RFQ entrance aperture of 0.295". At the same time we replaced the current transformer with a compact, off-the-shelf model. The new installation features an insulated aperture to suppress back streaming electrons.

The slit width of the horizontal moving Allison scanner has been found to be 0.01", yielding a 2 mrad resolution, and therefore was left unchanged. Both scanners have been equipped with new deflector plates to eliminate the inverted polarity signals found between 30 and 80 mrad from the peak signal.

Survey and Alignment

Mechanical Group

Magnet Task

Electrical Systems

Power Supplies:

- All warm linac magnet power supplies have been integrated with their magnets and have been checked out. Warm Linac Magnet polarity tests have been completed.
- Ken Rust, Bob Lambaise and Jon Sandberg (both of BNL) visited IE Power for first article acceptance tests for the 2500 A and 1300 A ring medium power supplies. The 1300 A power supply passed its acceptance test, but there were some issues with the 2500 A supply. It is expected that these issues will be resolved next week and we will be able to accept the 2500 A supply upon receipt of data reflecting these corrections from IE Power.

HVCMs

- DTL-ME1 and -ME2 underwent their annual maintenance this week. SCL-ME1 was repaired to continue support of RF testing efforts.
- SCL-ME2 was repaired and retested to determine optimum start pulse configuration for maintaining flux symmetry. SCL-ME3 modulator tank was installed in place after completion of tank components' checkout.
- The snubber for the RFTF modulator is being rebuilt with non-inductive snubber resistors. The pulser for next generation ion source development was shipped to LBNL this week

HPRF

ORNL HIGH-POWER RF (WBS 1.4.1.1)

- RFQ – CCL3 RF Stations: Ready for Operation
- CCL4: Repaired water leak on klystron body circuit. Cable terminations continue.
- SCL: MB ME1 RF system integration tests with Timing, EPICS, and LLRF successful.
- Studying cause of false trips on LLRF cavity forward channel at high RF power.
- Found one bad waveguide directional coupler. RF leakage survey OK.
- Coupler transitions and waveguide shorts mounted on MB3 cryo-module in preparation for cool-down.

- RFTF: Cryo-coupler testing continues.

LLRF

Cryo-Group

Beam Diagnostics

BPM:

All MEBT/DTL/CCL BPMs have now have updated software and we have completed informal integration testing of all BPM devices. BPM507 is the only exception due to its KVM switch being powered down. Due to the work stoppage at LANL, John Power had to cancel his trip to ORNL and could not provide assistance. We have recovered from this by deferring work on lower priority systems. The calibration coefficients are being checked and entered.

BCM:

BCM have all been calibrated and are ready for formal system tests.

D-Box:

D-box effort has been limited by higher priority work. New systems should still be ready shortly after the ARR.

Wire Scanners:

All CCL wire-scanners had to be pulled out due to one or two broken wires. The puzzling thing is the carbon fibers were broken in two or three pieces. Since none of these actuators were run after the wires tested OK, we don't have an explanation for this level of damage.

Faraday Cups:

Bill modified two Faraday Cup flanges and reassembled them to avoid interference of the BCM wires and the FC. Randy has been helping him and has leak-checked the unit for Tank 3.

BLM:

Ion chambers and Neutron detectors are essentially ready for beam. MPS integration will proceed with the Controls group.

BSM:

All BSMs are installed in the tunnel and system integration is progressing. One BSM was misaligned by the Lexan magnet cover. We will work with Electrical Systems to remedy this.

Timing:

The timing system PCI cards and software are now complete for the upcoming run. This system has been integrated with EDM screens and tested with diagnostic devices. Remaining work includes deployment of the final TTL fanouts. 2 prototype timing fan-outs have been put together by Jim Diamond and Syd.