

Accelerator Systems Division Highlights for the Two Weeks Ending August 1, 2003

ASD/LANL: Warm Linac

HIGH-POWER RF (WBS 1.4.1.1)

Accomplishments This Week: (1) LANL shipped one DTL klystron, three CPI SCL klystrons and magnets to ORNL. (2) DTL klystron S/N 8 was installed on the LANL test stand: acceptance tests are underway. E2V sent us a revised schedule for the factory acceptance testing for the remaining three tubes: S/N 7 on Sept 8-12, S/N 11 on Oct 13-17, and S/N 5 on Nov 17-21. (3) CCL klystron S/N 3 was shipped from Thales to LANL on 7/28.

HIGH-VOLTAGE POWER CONDITIONING (WBS 1.4.1.2)

Accomplishments: (1) Software and hardware in the prototype HV converter modulator control rack were upgraded to allow remote operation with the production SCR controller.

Concerns & Actions: We replaced the suspect SCR bridge in the prototype SCR controller with a new SCR bridge from Dynapower and tested it with the production HV CM to low voltage (150 VDC) before an arc occurred in prototype SCR controller bridge. We worked with Dynapower to diagnose the cause of the arc and possible methods to fix the problem.

DRIFT-TUBE LINAC (WBS 1.4.2)

Accomplishments - Tank-4: The problems reported last week with the PMQ and empty drift tube electron beam welding and leaks were sorted out. There will not be a change to the design nor will new end caps need to be made. Production has fully resumed; PMQ magnet loading will commence tomorrow at CMI. End cap welding will begin next week at Hanford. The balance of the tank 4 DT production schedule was reviewed for tasks that could be accelerated. The delivery schedule reported last week is listed with possible schedule improvements. There is not much improvement possible without going to overtime measures. 4A - 9/15/03 new date: no change; 4B - 9/22/03 new date: 9/18/03; 4C - 9/29/03 new date: 9/25/03; 4D - 10/06/03 new date: 10/1/03.

Tank-5: All water channel welds are complete; cavities are rough machined on groups E & F. Group G stress relief is underway.

Tank-6: (1) Water channel welds are complete and stress relief is underway at Bodycote for group 6 H (11 units); 4 (of 11) units of group 6I have had water channel welds completed at Hanford. (2) Waveguide exterior machining is underway at CMI; plating for vacuum ports scheduled for 8/7.

Tank-2: Machining work continues at ESCO and Bodycote. Parts for group J (12 units) were shipped to LANL for diverter to body brazing. Group K parts (12 units) will undergo the diverter to body braze at Bodycote next week. (2) Waveguide exterior machining is underway at CMI; plating for vacuum ports scheduled for 8/7.

Beam Position Monitor Drift Tubes: Internal parts for all units are complete and tested. All the coolant jackets are brazed and are out for machining. Diverters, stems and end caps are ready. Brazing is scheduled for completion 8/20.

EM Dipole Drift Tubes: The last required batch of EMD magnets is due at LANL on Monday, 8/4. Drift tube cavity welding is scheduled to commence at Sciaky on August 4th.

Beam Boxes: Delivery dates are now the following (add a week for delivery date to ORNL): Box 3-4: 9/22, with rough machining underway; Box 4-5 9/22; Box 5-6: 9/22; Box 1-2: 10/17; Box 2-3: 10/17.

Issues and Concerns: As reported last week, we remain concerned about the DTL Tank 2, 4-6 drift tubes delivery schedule. We updated and revising the schedule to optimize and better predict delivery. We are evaluating the likely progress of the EMD and BPM drift tubes and the possibility of halting work on all or some of the dummy drift tubes to gain schedule.

COUPLED CAVITY LINAC (WBS 1.4.4)

Accomplishments: (1) Tuning activities continued this week at ACCEL. Modifications on the tuning end wall tuning bar were required to tune the end cells of the bridge coupler coupling cavity cells. Also development of an exact systematic process for groups of cavities was the main area of effort during the week. Processes were developed for defining the vacuum loading frequency offsets and some problems were encountered with the end blank-off flanges not having repeatable electrical contact with the segment flanges; this gave varying frequency results. After the source of the contact problem was identified the process was proceeding much more smoothly. (2) ESCO has completed the first beam tube welded assembly, a simple straight tube unit for intersegment #5 (Fig 1). We expect delivery on Monday and the remaining units for module 1 by mid-August. (3) Manufacturing of the

module support stands has been completed and LANL staff will be on site at General Tool next week for acceptance inspection.

Concerns & Actions: The rate of progress in tuning CCL module 1 at ACCEL is too slow. LANL and ORNL are working with ACCEL on an alternate schedule that will involve completion of tuning of module 1 at ORNL in order to provide ACCEL staff adequate oversight in finalizing procedures.



Fig. 1: First intersegment beam tube for CCL Module-1.

ASD/JLAB: Cold Linac

ASD/BNL: Ring

ASD's Tom Shea was at Brookhaven this week to meet with our Diagnostics Team. The group's focus was on End Game plans, spare parts, DTL commissioning, and SCL installation needs.

Dan Weiss sent a delivery status report on the HEBT vacuum drift pipes to Mike Hechler.

BNL/SNS staff began work sheets and procurement plans for FY04. A cost and schedule performance review (video) is scheduled for 8/7/03

Vendor progress:

- Tesla remains on track to ship eight (8) 21Q40s to SNS/OR on August 8, 2003.
- NETC - shipped the last four 36CDM30 to BNL this week; they shipped four (4) 27CDM30 to SNS/OR this week; they plan to ship Chicane #3 to BNL next week.
- Alpha Magnetics – two more 21S26 were shipped to BNL this week; two 41CDM30 magnets have been repaired and will be returned to BNL on 8/11; production of the 26S26 is going well with production magnets expected in September.
- We are working with SDMS (our collimator vendor) to come up with cost cutting options for the Ring primary collimator. Results so far are good!
- SDMS plans to ship RTBT collimator #1 to SNS/OR on 8/14/03, by boat.

Power supplies for the IPM magnets are being considered for inclusion with the order for the Ring's medium range power supplies.

Testing of the Ring's third RF cavity is underway at BNL.

Design room efforts continue on the HEBT quad, dipole and collimator installation/assembly drawings in support of ASD's installation efforts.

A specification has been written for the Outer Shield Assembly for the Ring #2 & 3 collimators. An RFQ will be issued by early August.

Mag measure continues on 26Q40, 30Q44, 30Q58 and 21S26.

Work continues to update and expand the magnet parameter spread sheets to include measured resistance, power requirements, PS matching, heat loads and water flow.

Magnet connections, based on required polarities and magnet orientation, are being generated.

Preparations are being made at BNL to ship two (2) base plates to SNS/OR for the HEBT collimators. The plates are scheduled to ship on 8/4.



Controls

Considerable progress was made with the installation of communications subsystems this week. All CCL communications cables have been pulled and termination is in progress. The ICS network block diagrams have been updated and will be distributed next week. The test timing link signal distribution has been implemented to the RF test stand. (Software development is still in progress for the test timing master, so the test timing system still isn't ready yet). A test network switch was set up for the magnet test stand. This is in preparation for magnet ramp testing planned to happen in a few weeks.

Forty-six inputs have been connected to the Machine Protection System and have gone through "vertical" testing. The Beam Loss Monitors and several other devices that are not required for the D-Plate are not included. The D-Plate quadrupole and the differential beam monitor will be installed and tested on Monday. Test screens for most devices are complete and tested. Final signal inputs from Vacuum and RCCS are expected Monday in time for final

integration testing scheduled for next Tuesday. Only the current monitor for the D-Plate quadrupole might not be ready for these tests.

A problem that had resulted in the “freezing” of the new LLRF screens was understood and fixed. Testing of the emittance measurement system was successfully completed.

In response to a request from the ARR committee, a proximity card reader was installed to activate the PPS entry door to the controlled area enclosing DTL1 and DTL3 to limit personnel access to those who have been trained and authorized. This system will recognize proximity cards (the same ones that we now use for the Front End roto-gate) that have been entered into the proximity card reader system. Only those proximity cards will open the PPS door. Personnel will be authorized to enter after receiving appropriate training.

The PPS interface on the third HV modulator (ME-3) has been rewired to meet PPS requirements. A PPS bypass was installed to allow operation of the device into a resistive load or beam stick. All of the phase 1 PPS remote I/O PLC racks in the Klystron gallery have been powered and ControlNet communication between the control room and remote racks has been established. Cabling work for the Beam Shutdown Stations in the LINAC tunnel has begun.

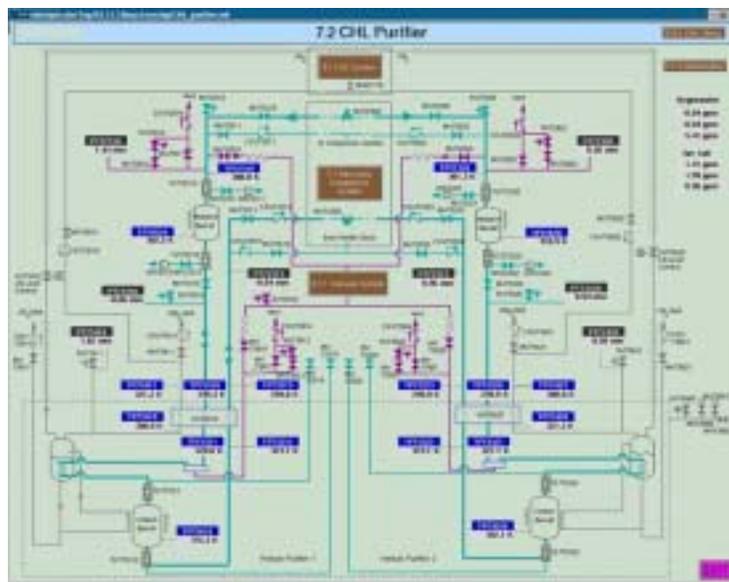
A major overhaul of the Ring Vacuum and SCL Vacuum FSDs was completed this week, and the SCL Vacuum system block diagram was improved in preparation for a series of meetings planned for next week. The warm vacuum document was also rewritten at LANL this week.

At LANL, all tuner racks have been tested and will be shipped next week. One will be kept for further test.

Tom Shea from ORNL Diagnostic group visited BNL this week. Controls used this opportunity to demonstrate the Labview-based BLM AFE test and calibration stand, and to demonstrate the controls software interfacing with the first article BLM AFE crate (soon to be shipped to ORNL).

In preparation for implementation of the CHL ODH system, a demonstration program was created and reviewed for the CHL PLC/ PanelView. The operational program is 95% complete. A 90% review was conducted on the CHL control room rack drawings. Calculations have been made to determine the normal and alarm state current requirements. Drawings are scheduled to be complete by mid August. Quotes have been obtained for the control room rack parts not already on hand. A draft calibration procedure has been created for the analog I/O modules. The Software Safety Requirements Specification (SSRS) has been revised based on the draft Safety Requirements Specification for the ODH system

Wiring of the Central Helium Liquefier building purifier system to the ICS PLC was completed and checkout of the control system was started. Temperatures and pressures for the purifier system are now displayed in the CHL Control Room. Calibration of the sensors and actuators will start next week. The control room display is shown below.



Installation

Craft Snapshot 7/23/03

ASD craft workers	70.0
Foremen, ES&H, etc	12.0
Less WBS 1.9 etc	7.0
Less absent	5.0
TOTAL	70.0

The 2K Cold Box was received and installed in the CHL. It is one of the most important technical component installations in the entire SNS construction project.

In preparation for installation, HVCM SCL_ME01 is being checked out in the EE area of the Klystron Hall.

The second and third HVCMs for the SCL were checked out at Dynapower this week.

Two Ring collimators will be received next week. One will arrive on Tuesday and the other on Thursday.

The second Medium Beta cryomodule will be received next Thursday.

The last 402.5MHz klystron for the DTL was received.

Work on High Beta Wave Guide has progressed to the ninth run/subsystem.

Work is progressing on the water piping for the first system to support the twelve klystrons in the SCL_ME01 system. Some interferences and access problems around the wave guides are being experienced.

In the Main Ring tray installation is being completed. Cabling in the Main Ring begins next week.

Installation of HEBT vacuum components will begin next week.

Six crates of vacuum chambers were received from BNL.

Accelerator Physics

Operations Group

Operations is running day shifts to assist with:

- Working with Controls on the PPS Prox Card Access Control system
- Installation and testing of the D-Plate
- Preparing for running the Front End next week
- RF Reprocessing of DTL 1 and 3 and Running the RFTF for HVCM Burn-In

Interviewed Chief Operator candidate.

Scheduling meeting to discuss what we are doing from now to the ARR following the Division Meeting in 3104.

ARR

- Test Plans must be completely signed off by August 4
- List of Reviews is required from Group Leaders
- Dry Runs, Tuesday Aug 5
 - Put in Safety Issues, solutions etc.
- Test Plans are to be submitted to Mario

Ion Source Group

Ion source testing with high duty cycle continues on the hot spare stand.

The rewiring for the 2 MHz RF interlock has been completed. It is waiting for configuration control inspection and verification by PPS and our own testing.

The ion source and LEBT were temporarily removed to allow for an optical survey of the RFQ entrance and exit aperture. During the removal marks were found on the electron target attached to the extractor. The marks indicate that the electrons locally melted a small part of the copper target.

We have generated a JHA for entries in to the Big Blue Box to perform minor tasks that are routine, repetitive, and integral to the use of the ion source and LEBT for production. The JHA explains the potential dangers and the gives the proper procedure to assure the safety of the person performing the task. In addition, it also discusses what kind of tasks can be performed without LOTO, but in full compliance with OSHA. The plan calls for retraining the operators and for posting the JHA on all access doors of then Big Blue Box to significantly enhance the safety of our operation.

Survey and Alignment

FE, DT_1, D_Plate Alignment Verification

We are in the process of verifying the alignment of the three components mentioned above. This on-going exercise started Thursday with optical measurements of the RFQ. Work will continue today and throughout the weekend measuring components with the laser tracker.

A four man crew from the S & A has been working night shifts measuring our network monuments for the purpose of updating and strengthening our Global Survey Network.

Engineers of S & A have prepared the necessary coordinate data for the layout of ring half cell bolt hole locations. Collimator data is also being prepared to facilitate HEBT Collimator bolt hole layout.

S & A engineers and technicians verified the location of the Target outer support cylinder.

Mechanical Group

This week we completed the changeover from facility chilled water to DI water on the MEBT quadrupoles. This will eliminate the sweating and water quality problems we have been experiencing.

The D-plate has been put in position downstream of DTL-1 and aligned. Integrated system testing is in progress and will be completed next week.

Preparations are underway in the FE building for DTL-2 tank assembly. The support stand is being anchored to the floor and the tank segments will be moved from RATS to the FE building next week.

Several options for the DTL tank installation sequence and commissioning strategies are being considered in an attempt to minimize the impact of drift tube delivery delays. Schedules are being developed to help determine how other component deliveries might need to be changed. Our preliminary assessment indicates that assembling and installing DTL-2 next (not DTL-4 as is in the current plan) has some advantages, including earlier commissioning of DTL-2 and -3.

Water Systems Installation

- Solenoids & Check Valves were added to ME-3 SCR Cabinet, and RFTF SCR Cabinet.
- CCL-4 Feed Piping to RCCS has been completed.
- CCL-4 Piping from RCCS to Tunnel is on going.
- SCL-ME1 Piping from facility to TRCC Carts is complete.
- SCL-ME1 Piping from TRCC Carts to Equipment is progressing.
- Deionized water system was put into operation in the Klystron magnet test and power supply areas.
- The conversion of FES MEBT chilled water supply to deionized was completed.
- Design and layouts of water systems in the RING continues.

RING Systems Installation

- Installation of the HEBT Dipole magnets on the realigned stands was completed.
- Installation of the 12Q45 magnets continued, 90% of the magnets are installed.
- Installation of available 12Q45 magnet chambers continues.
- Cable pulling in the HEBT continues.
- Cable tray installation in the RING continues.
- Cable tray installation in the RING Service Building continues.

Magnet Task

This week we are working on DTL EMD's, 12Q45 chambers, and 21Q/27CD measurement bench.

Electrical Group

HPRF

HPRF: Re-calibrated the klystron power output for DTL3 to compensate for measurement error caused by using the Solid State Amplifier front panel test points during previous calibrations. Changed the calibration procedure to eliminate the use of the SSA front test panel and the requirement to measure the SSA voltage output directly.

Trial aligned the first three SC klystrons/transmitter tank. Found a more extensive adjustment of the waveguide will be required than estimated. We are implementing a new procedure.

The ground plane has been laid for the first SCL ME system. Only connections to equipment remain to be completed.

Prep work began for installing the DTL4 klystron next week

LLRF

New Hardware Development

The Rev B Field Control Module (FCM) production package was turned over to the vendor this week for fabrication of five sets of hardware. This includes the VXI carrier board, the Digital Front End (DFE), and the RF Output (RFO). Delivery is planned for mid-August.

The Rev A DFE was designed such that it received a 40 MHz clock from the RFO and would internally generate an 80 MHz clock for producing the data stream to the RFO. The setup and hold requirements between these two signals has been difficult to control, and there have been problems where not all FCs behaved in the same way when using the same "bit" file (the FPGA code that is downloaded at boot time). We discovered a simple modification that eliminates the frequency doubling within the FPGA; we are now routing the 80 MHz ADC clock from the RFO to a clock input on the FPGA. This is essentially the same configuration as used successfully on the 2nd generation control chassis. This modification was included in Rev B of the FCM. This modification has provided for more reliable FCM operation: we now have two FCMs running at ORNL; one FCM was delivered to LBNL today; and two FCMs reside at LANL.

We plan to do more testing of the FCM at the SNS site as soon as possible. We'll begin with the RFQ with beam, and will then proceed to either DTL1 or 3 as schedule permits. We are working hard to implement a new version of the history buffers which eliminates the familiar data decimation and provides for real averaging and the "look and feel" of a digital scope. The history buffers must be completed prior to the next test with the RFQ so that we can observe full 1 ms pulses.

High Power-Protect Module (HPM)

The ORNL team is undertaking a small production run of Rev D HPMs with a local vendor in advance of completion of the Rev F HPMs at LANL (prototypes presently under test). This will get us through the short term goal of completing the DTL installation and will give us experience with this local vendor, who will likely be on the bid list for production of ~100 systems later this year.

Operations

The LLRF control EPICS screens at the site were prone to lockup for unknown reasons. This has been repaired (so far) by moving the underlying code from the LLRF VXI IOCs to a separate server that is running the next revision of EPICS (R3.14.1)

MEBT Rebunchers

A new connector adapter was designed and procured to replace the ribbon-cable version in the 1st generation control chassis. This has been installed on the spare chassis, which is in the lab for test and repair. This new adapter should provide for more reliable operation of the chassis and will be fitted to the four installed chassis after successful lab testing.

Cryo Systems Group

CHL: The 2.1K cold box was shipped from JLAB and installed Pictures are attached.
 The first stage warm compressor couplings are installed and aligned.
 We have cooled down the 20,000 Gal liquid nitrogen dewar in anticipation of a bulk delivery.
 The charcoal beds of the purifier are on dry nitrogen purge.
 The "A" mole sieve bed on the purifier has been evacuated and back filled with dry nitrogen.
 The "B" mole sieve bed is being heated and is on dry nitrogen purge.

Tunnel: The contractor has completed the installation of the warm gas piping and we are now installing the Helium purge lines using orbital welding.

RATS: We continue to build sub assemblies for the helium "U" tubes.



Beam Diagnostics