

Accelerator Systems Division Highlights Ending June 18, 2004

ASD/LANL: Warm Linac

HIGH-POWER RF (WBS 1.4.1.1)

- We finished testing a 550-kW Thales klystron for shipment to ORNL next week. Another 550-kW klystron is being installed in the test stand.
- We finished testing a pair of CCL windows (for CCL-3) for shipment to ORNL next week. There is a slight RF leak on one of the windows. The leak was less than 0.4 mw/cm² on contact and down around 0.1 mw/cm² at 1 inch, where the probe is accurate (1 mw/cm² is the safety standard). We were concerned that this might be an indicator of poor RF contact but saw no indications of arcing at full peak and average power. The windows for CCL-4 are being prepared for installation on the test stand.
- We have a truck leaving next Tuesday for ORNL containing a 5-MW klystron that has not been site tested, two 550-kW Thales klystrons that were site tested, and a pair of CCL windows that were site tested and conditioned.
- We continued to provide installation and commissioning support at ORNL.

DIAGNOSTICS (WBS 1.4.5.2)

- Macro-metallics' delivery of the RTBT ceramic harp cards has been delayed because of problems with their trace application process. They believe they have worked through the issues and have now successfully applied traces to most of the cards.
- We have completed work on the RTBT harp high-voltage planes. We now have eight complete HV planes, enough for one harp assembly and one spare.

ASD/JLAB: Cold Linac

Testing of the H-1 cryomodule continues.

H-4 cryomodule assembly will be complete early next week.

Assembly of the H-5 cryomodule is progressing well. The inner magnetic shield is in place and we're getting ready to install the cold mass into the thermal shield/space frame assembly.

Assembly of the H-6 string is on schedule.

ASD/BNL: Ring

BNL's AP Group continued their modeling work of beam trajectories to optimize magnet / vacuum chamber placement of the injection dump septum magnet.

Engineers provided ASD with our planned work schedule for the RTBT radiation hardened quadrupoles and correctors.

The Vacuum Group started TiN coating of the RF upstream straight section, including the Diagnostic's BCM chamber, bellows and tubes. As of this week, eight diagnostic components (one BCM chamber and seven adaptors/bellows adaptors) have been coated.

The Vacuum and Diagnostics Groups are working together to make plans to vacuum fire, leak check, seal and ship the available RTBT diagnostic vacuum chambers to SNS.

Extraction kickers: a special masking is being used during TiN coating to provide electrical isolation between the high voltage conductor and the grounded eddy current strips. Coating of the 1st production unit is underway.

Two engineers traveled to Detroit, MI to conduct a pre-award inspection of Pioneer Steel Corporation, the low bidder for RTBT 17D244 magnet core. Upon their return, BNL's Dept. of Contracts was authorized to proceed with a contract for this work.

Half-cell #30 is assembled and will be shipped to SNS/OR tomorrow.

Work continues on half cells #31 and 32.

RF #2 arrived at Oak Ridge last week. Next shipment (~2 weeks) will include a long injection kicker magnet assembly. The shipment after that will include RF #3.

String Assembly of the Injection Straight Section line at BNL: two vacuum chambers are being modified to provide necessary assembly clearance. An intermediate adjusting plate for chicane #4 (inadvertently missed on the order list) had to be special ordered.

Magnetic Measurements: work is underway at two test stations; one for the 36CDR30 and one for Chicane #1.

Controls

The Group said good-bye this week to Carl Lionberger, who returns to Berkeley. His contributions to the start-up of the Front End Control System and Low-Level RF systems, along with many others, were much appreciated. Carl will be sorely missed.

The first "wave" of controls group members packed this week for their move to the CLO, where they will report to work next Monday.

Don Dohan visited this week to further the database collaboration with APS. A preliminary set of goals and a schema was agreed, and follow-up tasks agreed and assigned. An early benefit of this collaboration for SNS should be an automatically populated set of relational database tables that will describe the configuration of control system components. This should prove invaluable for maintenance, and was never in our plans.

Work on SCL vacuum control systems continued. Procedures for testing and calibrating the "Analog Vacuum Interface Cards" (AVICs) (one of seven module types in the JLAB Control Chassis) were finalized, based on initial procedures supplied by JLAB. Testing and calibration of AVIC modules was started. An external "AND" gate module assembly (required for the LLRF vacuum interlocks) was wired up for the first rack. Development of Control Chassis test procedures is also in progress. IOC Software will be tested next week when John Dalesio visits.

Certification of the phase 1.1 PPS is 75% complete. The EPICS screens that support Phase 1.1 are also complete. The last remaining section of the procedure is to energize all PPS controlled equipment and demonstrate an actual shutdown from the PPS. Plans are to complete this last test some time within the next two weeks. This PPS will secure the entire Linac and control the Front End equipment, DTL RF equipment, CCL RF equipment, SCL-ME1, and SCL2 RF. It is possible that CCL-4 RF equipment may not be ready for certification. Five chipmunks have also been installed and certified for phase 1.1 PPS.

When a reboot message is entered using the IOC Operating Status button on the IOC status page, this information is now entered automatically in the controls e-log.

Two members of the ORNL RF group, spent several days at BNL reviewing the ring RF system. As part of this review, the BNL controls group demonstrated the LLRF EPICS software and LLRF waveform editing GUI, the dedicated timing master system, and the HPRF controls (using the ControlLogix PLC as a bridge to the PLC-5).

A video conference was held with ORNL to discuss FY04 budget and schedule for control-funded diagnostic development (Network Attached Devices). There was agreement that additional funding is needed in FY04 to support NAD developments.

The Controls web page has been updated to include software modules for the current EPICS version. Some magnet control screens have been captured as a basis for discussion of how this data can be summarized and included in the new operator-designed overview screens.

Installation

Craft Snapshot 6/15/04

ASD productive craft workers	57.0
Foremen (Pd by 15% OH)	6.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	66.0
Less WBS 1.9, 1.2 etc	6.0
Less absent	10.0
TOTAL PD BY ASD/ORNL DB WPs	41.0

Accelerator Physics

Ring Online Model infrastructure has been completed by C. Allen at LANL. The aps programming team is starting to use and test the ring online model. A virtual accelerator for the ring has been assembled to allow realistic testing of ring applications using the same PVs as in the real machine.

The following are new XAL applications in progress:

- i) Emittance and Twiss measurement from an array of wire scanner profiles,
- ii) Optics matching in the HEBT and
- iii) Slit/harp emittance analysis in preparation for the MEBT inline emittance device.

J. Galambos has been incorporating the phase-slip into the online model description of the linac dynamics. Results mentioned in previous weeks for the DTL show good agreement with earlier studies. Work is focusing now on the CCL in order to prepare input data tables for the CCL delta-T procedure.

AP group members are preparing papers and posters for the upcoming EPAC conference

Operations**Ion Source Group**

Our deionized cooling water loop on the hot spare stand has been equipped with a 1 micron filter that follows the 50 micron filter. Reports indicate that a 1 micron filters eliminate the problems we are experiencing with the dissolved copper oxide.

Since Monday we are testing source # 2 that consistently yields an average pulse current of 30 mA for the 1.23 ms long beam pulses. Despite running with 55 kW RF we experience only a few trips during the 24/7 operation.

Survey and Alignment**Mechanical Group**

The waveguides have been trial fit to DTLs 4-6 so that they will connect properly when we are ready for them.

All water systems have been worked on including the addition and calibration of a few sensors and fixing some minor leaks. There are a few items pending but much progress was made.

EMD drift tube magnet testing was completed last week and all went well.

Nearly all wiring connections are complete with the exception of a few on DTL4. These will be resolved next week.

Vacuum systems made substantial progress and put everything in a position to begin check-out next week.

CCL Installation

- CCL-2 RF windows were installed and leak checked. Both had 10^{-7} level leaks and problems with the seals are suspected. Options to improve the performance of the current seals are being pursued. Other seal types are also being considered.
- CCL-3 vacuum and cooling system electrical terminations were completed.
- CCL-3 inter-segments were installed and are ready for alignment.
- CCL-4 cooling manifolds were installed

Ring Systems Installation

- The RING Half-Cell #29 (Unit A6) was installed.
- The RING Straight Section Collimators #2 & 3 were installed.
- The RING RF Unit #2 was received.
- The RING RF Units #1 & 2 supports were installed
- Termination of magnet cables to the HEBT tunnel magnets continued.

Water Systems Installation

- Installation of the piping to the CCL4 klystron RF equipment continued.
- Installation of the cooling manifold on CCL4 module continued
- Installation of the piping to the RF equipment on SCL-ME5 and SCL-ME6 continued.
- Modifications to the RFTF cooling system were completed

Magnet Task

This week we installed intersegments in CCL Module 3. Now, we have 12 more CCL intersegments left to do. We are mapping magnets for those intersegments.

We also continued work on the SRF 8Q35's associated with repeatability issues.

Also, work still continues on the 21Q measurement coil assembly and alignment.

Electrical Group

DTL 4, 5 and 6 corrector power supplies have all been commissioned with the DTL magnets. All DTL magnet power supply tasks are now complete.

The Ring Main Dipole Magnet Power Supply rectifier and control assembly has been delivered. All components of the Ring Main Dipole Supply have been delivered.

One additional Ring Injection Power Supplies has been delivered, bringing the total of these delivered to 4 (of 9, including spare)

Two 700 A, 25 V Ring Medium Magnet Power Supplies have been delivered, bringing the total of the medium magnet power supply deliveries to 37 (of 77, including spares).

HPRF

We now have 6-thales 550 KW tubes positioned in the ME-5 section of the gallery. Pipefitters will start connections next week.

Tested CCL-4 circulator, load and waveguide components being installed. Pipefitters will start connections next week.

CCL-3 klystron operated at 15 HZ, with full HV pulse and 4.1.MW of RF for 0.5 ms. Going to 30 HZ caused HVCM to fail twice. Goal is to run at 30 HZ with 1.0 ms RF and 4 MW, hope to achieve goal today.

SCL-ME-2, 12 pack being verified for operation as soon as network is available.

LLRF

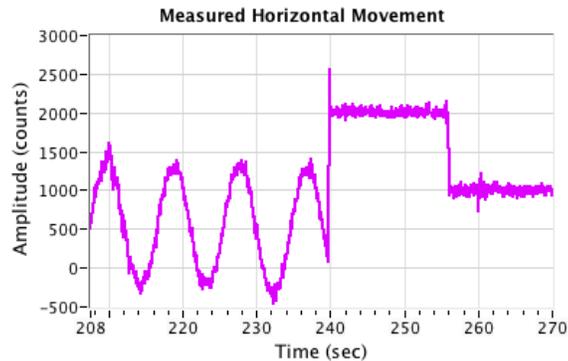
Cryo-Group

Beam Diagnostics

BPM: John Power was here from LANL to help ready the BPM electronics for CCL commissioning. We received estimates for construction of the reference fanouts and have begun ordering components. All design documents required to review the Ring BPM electronics have been received from BNL.

BLM: Next week's video conference will be dedicated to loss monitor discussions.

Laser: The active beam stabilization algorithm was improved. This uses a QUAD detector, Piezo actuators and a PID loop implemented in a gate array programmed with LabVIEW FPGA. The software was upgraded to version 7.1. The plot below shows measured laser position vs. time. Simulated beam drift was produced by steering an upstream mirror with sinusoidal time dependence. The latter part of the plot shows stabilized beam at two different setpoints.



Laser position vs. time. Feedback turned on at about 240 seconds to counter the sinusoidal motion applied upstream.

Data Management: Updated versions of Altiris and SQL Server were deployed. Two servers were added to the accelerator network to complement the servers already in use on the test network. A system to track the acceptance, installation and integration of each device is nearing readiness. This will be used to report progress against the new baseline in the ASD subproject schedule.

Timing: The first cost-reduced PCI timing cards have been sent to fabrication and should be received next week. Software development for this system continues in parallel.

Misc: A cost/schedule video conference was held with BNL. EPAC talks and papers are in preparation. With cable tray now available in CCL3, cable terminations have been restarted. The start date for a contract technician has been set for this coming Tuesday. Interviews for electronics engineering candidates are being arranged. The final interview for the Controls digital engineering position was completed. A meeting was held to review input for the Diagnostics estimate-to-complete. This input will now be entered into P3 and MPM to form the new baseline. This will be ready by July 1.