

Accelerator Systems Division Highlights for the Week Ending September 6, 2002

ASD/LANL: Warm Linac

The fourth E2V (formerly Marconi) 402.5-MHz klystron arrived at LANL today. The Marconi tube is in the test stand and conditioning is underway. (WBS 1.4.1.1)

The first Thales 805-MHz, 550- kW klystron is up to about 560 kW and 62% efficiency. They are currently dealing with a multipactor problem. (WBS 1.4.1.1)

The second CPI 805-MHz, 550-kW tube klystron is in exhaust. (WBS 1.4.1.1)

Another transmitter passed factory tests. Also, two more 402.5-MHz transmitters (s/n 008, 017) were delivered to the RATS facility in Oak Ridge. (WBS 1.4.1.1)

The first shipment of medium-beta section SRF waveguide from Micro Communications was delivered to the RATS facility. (WBS 1.4.1.1)

The high-voltage converter modulator (HVCM) production SCR controller modification and repair work dominated the week. The unit thus far has had the following changes: (1) the snubber assembly (may require further changes); (2) MO varistors changed to 10kJ units (from 100 Joule); (3) gate trigger board (delay relay added for turn-on start-up, to suppress turn-on surge); (4) phase lock loop control bandwidth (reduced to ~1Hz). In addition, spurious trigger problems (surges during operation) continue, probably related to SCR gate driver-to-ground capacitance. This requires further investigation. The SCR closed loop bandwidth needs further adjustment (new control parameter information has been received). Dynapower has been actively involved in these modifications and repairs. They have had engineers on-site up until this week, and have been able to duplicate measurements and observation on an SNS SCR controller at the factory. This will help in further debugging. (WBS 1.4.1.2)

A team from LANL traveled to Dynapower this week to oversee and consult in production HVCM converter modulator assembly. They will work over the weekend and into next week. (WBS 1.4.1.2)

Most of the LLRF team has been at JLab this week. The LLRF system is integrated and driving a small amplifier (1 W) into the cavity in an open loop configuration. This demonstrated that timing pulses were being properly generated and received and the hardware was all talking appropriately to the upstream and downstream components. There were some hitches with the klystron and with the helium system, but those were resolved. The team was able to do high-power RF calibration testing. It went quite smoothly and the system operated in a stable manner, with cavity field up to 17 MV/m. LANL personnel will remain at JLab through next week. We're now setting up to do closed loop 1W testing over the weekend. The actual planned systems tests can begin next week, which would be 4 working days behind the original schedule. The JLab, LANL, ORNL team worked extremely hard and deserve to be complimented and applauded. (WBS 1.4.1.3)

First repairs on the e-beam welds of a leaking DTL drift tube started this week. An unexpected blowout was observed on the drift tube, indicative of contamination within the old weld area. Potential solutions, *e.g.*, a third e-beam weld pass, have been developed and will be qualified. (WBS 1.4.2)

DTL endwalls for Tank 5 were delivered to the RATS facility. (WBS 1.4.2)

ACCEL is making progress with the CCL cavity fabrication. On Module 1, septum brazes for segments 1 and 2 have been performed. On Module 2, segment 1 is brazed. On Module 3, segments 1-4 are ready for final milling. Bridge coupler 1 is done, bridge couplers 2 and 44 bodies are ready, and bridge couplers 4 and 5 are pre-milled. (WBS 1.4.4)

A particle simulation for chopper-timing option 3, where both LEPT and MEPT choppers start at the same time, has been completed. This will add to earlier work (reported) on the beam behavior through the chopper. (WBS 1.4.5) We supported with SNS-ORNL and Russian colleagues in the tuning of DTL-1. Work was done on the cold model at ORNL. (WBS 1.4.5)

Award of the SRF quadrupole power supplies procurement contract is nearly finalized. We announced our intent to award to Alpha Corp. (WBS 1.4.9)

We submitted our Estimate-to-Complete to the SNS-ORNL Project Office. (WBS 1.4.6.1)

ASD/JLAB: Cold Linac

Cavities MB02 and 03 have been mechanically inspected and RF tested at room temperature. They have been degreased and are ready for heat treatment for the removal of hydrogen. Cavity MB01 has received BCP and High Pressure Rinse, it has been mounted on a test stand and HOM couplers have been tuned. It is ready to go into a dewar for the first cryogenic test.

LANL staff and equipment are on site. Installation and checkout of LLRF components and software are complete and initial open-loop tests with one of the cavities in the prototype cryomodule have been going well.

Coordination is underway with SNS for the scheduled September 11 delivery of Cold Box Room Vacuum Skid, South Wall Valve Rack, and Vaporizer Valve Rack.

ASD/BNL: Ring

Today is the bid close date for the extraction kicker power supplies. Evaluations will begin on Monday.

Danfysik – 12Q45 production quadrupoles: our weekly teleconference again focused on QA problems related to non-uniform magnetic field and leaky water fittings. BNL, SNS/ASD and Danfysik are working to resolve all issues.

A videoconference with ASD was held to review BNL's funding / spending plans for FY03. Proposed funding profiles for WBS 1.5 and WBS 1.9 are being reviewed.

Continued design work on the collimator top plate to reduce weight and provide an integral fixture for lifting.

Ring RF - the first cavity is apart to coat the beam pipe with titanium nitrate to reduce secondary emission of electrons and e-p instabilities. The tuning power supply is being evaluated for two-quadrant operation.

Magnet assembly and measurement:

- Ring dipole measurements – seven type B magnets have been shimmed, fully measured and matched with seven type A magnets. Additionally, three more type B magnets have been shimmed and are ready for testing.
- 21Q40 – field quality measurement of quad #5 was completed this week. To date, four of these magnets have integral fields within the desired range for Ring grouping.
- 26Q40 – acceptance testing is complete and the magnet has been approved for production. An ECN and drawing revision will be made to reflect the revised pole chamfer.
- 41CDM30 – the 1st article magnet is now being tested.
- Assembly of first half-cell is underway. October shipment to SNS/OR is planned.

Documentation efforts:

- Sign-off approvals on magnet design/parameter sheets.
- Lattice drawing revisions with ASD's Stu Henderson and Jeff Patterson.
- SOW and APPs for FY03.
- ASAC presentations.
- Magnet Production Status spreadsheet.
- Design Manual for the BNL/SNS Ring and Transport System
- Magnet design of the 26S26 high-field sextupoles
- Design of the Injection Chicane Magnet #1
- Designs for the extraction septum and RTBT bend dipole.

Controls

Installation

Installation DB labor force for the week was:

Date	ASD	Target	Sub-total	Absent	Total
8/27/02	74	8	82	3	85
9/05/02	74	7	81	2	83

The timing of HEBT Cavity installation was reviewed in the September 6, 2002 Division Director's Installation Meeting.

- It was decided that all procurements of technical components for the HEBT RF system would continue as planned.
- Installation of the HEBT waveguides will continue as planned. The waveguides are located above beam line components in the HEBT tunnel. This precaution will prevent working above HEBT beam line components after they are installed. LANL will be queried about the plan and delivery for these waveguides
- HEBT cavity installation will proceed as planned subject to delivery from Accel.
- The installation of HEBT RF subsystems components excluding waveguide and will may be deferred until late in the project or after CD-4. It is not necessary to have the HEBT Cavities operational to start up the accelerator.

FY03 Work Package Preparation was also discussed in the September 6, 2002 DD Inst Mtg.

The Ring Installation Schedule is being re sequenced to address budget limits.

IPS PEP dates for Ring Installation will be held.

Electrical power to support Front End System testing was turned on in the Front End Building on 9/03/02.

We have been waiting for the completion of the main utilities for the Front End. To this point a few electrical components were still missing.

Fiber optic lines from the RFQ were run to the Klystron gallery and taken over by the RF group.

We hope to wrap up all CF Front-End interconnecting systems next week.

We have several things on tap for next week. Included are running the rebuncher cavity cables for the RF group, installing different BCM's and related quads, and installing the Front End Diagnostic system.

Looking forward starting in the Klystron Galley to complete Row 5, 6, and 7 by the end of next week. Hope to complete Row 5.

HPRF Xmitter cooling-carts, HV-tanks and Control Racks for DTL3 & DTL4 were prepared and have been shipped for installation in the gallery.

HPRF intra-system high frequency RF Helix cables have been checked on a network analyzer for return loss and delay. All readings show less than 1/1000 returned power from a matched load. Cable lengths have been determined from the delay times measured and recorded.

A vender has been chosen to brush plate copper onto the bare o-ring grooves on the main DTL tank flanges. This work will be done at the RATS facility the week of September 16.

The third DTL tank section (Tank 3-B) is currently being pumped down in preparation for leak testing which will begin tomorrow.

The Stabilizer Shroud "Can" concept has been selected to stabilize and stiffen the DT's for all tanks. LANL will incorporate this mount into their drawing package and will modify and fabricate required components. This concept met all requirements and was the simplest and lowest cost option.



Stabilizer Shroud "Can" Concept

Accelerator Physics

Five group members are preparing presentations for the ASAC conference.

The ORBIT Feedback module has been parallelized. Simulations of a ring wideband feedback system with the full 3D space charge are underway to determine the required gain of the system.

In fulfillment of an ASAC recommendation, evaluation of previous uses of fast feedback continues. So far, SLC, LANSCE, FNAL, BNL, CERN and ISIS have been contacted. None of the pulsed proton facilities make use of "fast software feedback" for control of the beam. FNAL uses "fast feedback" for RF control.

S. Cousineau has submitted a paper (with coauthors in the group and BNL) presenting calculations toward understanding beam dynamics and limitations in the LANL PSR.

L. Kravchuk is working out a procedure for DTL Tank #1 field tuning and stabilization.

Operations Group

For Operations, the focus this week is preparing for the Accelerator Readiness Review, which begins next week and will last for about six weeks. The ARR committee will consist of the previous members of the Accelerator Safety Review Committee (that reviewed the Safety Assessment Document) and will be supplemented by an additional accelerator physicist and QA person.

The Committee intends to visit SNS on the week of October 14th (this has changed - I had announced it would be the previous week).

We have been writing, editing and sending out for review the documents of the Operations Procedures Manual (OPM). The SNS OPM can be found at <http://www-internal.sns.gov/SNS-OPM>.

Ion Source Group

All group members continue to participate in the operator training.

Paul Gibson and Robert Morton continue to participate in the installation of the front end.

Syd Murray and John Munro prepared the hot spare stand for ion extraction. Five Minutes before the planned ion extraction, the QEI pulse generator failed during the last plasma test. The pulse generator was immediately returned to QEI and is expected to be back within a week. This delay forced us to re-evaluate our plans: we will now install the LEBT and test the ion extraction with an operational LEBT.

Mechanical Group

Completed DTL tank test flanges.

80% of concept on the primary laser wire optics box and support frame completed.

Testing chamber for RF signal completed and tested by Craig Deibele.

Magnet Systems

We have measured DTL Quads 1-20.

We continue work on 12Q45 measurements and leak problems.

Vacuum Systems

RF Group

Electrical Systems Group

Survey and Alignment Group

Cryogenics Group

The CHL piping contract for the trench and south wall piping was issued to King mechanical, they will start work as soon as the compressors are placed on the pads. The compressors are being moved starting today and we expect completion within a week.

Rao Ganni of Jefferson lab visited Proquip to discuss the contentious slippage of the cold box shipping date. He met with management and developed a list of items to complete and an agreed detailed schedule. Proquip will go to a 7-day workweek to complete the tasks. Assuming they find no internal or major external leaks the cold box new shipping date is 10/7/02.

The preliminary commissioning review for the CHL was held on 9/5/02.

Leak checking of the 2.5" welded clamshells of the upstream supply modules in the tunnel continues. Measurements have been taken for the 3.5" clamshells and delivered to the machine shop for production.

Supply modules HB14/HB15 and HB16/HB17 are 90% completed and final leak check should be next week.

Return module HB7/HB8 is 90% completed and should be completed next week.

Return module MB7/MB8 is completed and ready for shipping to the tunnel.

Beam Diagnostics

BNL SNS Beam Diagnostics Progress Report:

General: At the request of ORNL Project Office, cognizant engineers for all systems prepared detailed breakdowns of anticipated FY03 purchases.

1.5.7.1 BPM: Discussions of BPM sum/difference mode impedance match continue. TDT measurements are in progress. PCI interface card design effort continues. Business is very good for the AFE vendor (Bergoz). The resulting delays in delivery affect the BNL AFE as well as the Linac. Delivery for the prototype Ring AFE is now estimated to be in March. As a result, prototype effort will in resuming in-house. The baseband AFE is in layout.

1.5.7.2 IPM: Burle Electro Optics makes a 15cm diameter round microchannel plate that will allow a single MCP design for the IPM. This greatly simplifies the IPM design. Cost implications of electromagnets are being evaluated. An experimental plan for the development of the luminescence profile monitor is being defined. At the moment the baseline intent is to provide only the vacuum chamber (space has been reserved in the Ring for the conflat cross). Further development effort is driven (as well as manned and funded) by the RHIC application, with the SNS benefiting from the spin-off.

1.5.7.3 BLM: Work continues on the design of the electronics digital I/O. Prototype circuit evaluation and testing for interface with the MPS continues. Layout of the analog front-end chassis continues, a focus on backplane and input/output configurations. Received preliminary quote from one of the detector vendors, awaiting a breakdown to be sure all aspects are covered. Received prototype from same vendor of a chamber similar to the RHIC design, except in has an aluminum chamber. This tested well. Next, a prototype with the SNS BLM dimensions will be built and tested. Another vendor has built a prototype and filled with nitrogen. We should receive this chamber soon; we will then fill with argon and test with our facility.

1.5.7.4 BCM: All parts have now been given to instrumentation for board stuffing. Software issues are being addressed. All of the display items have been completed. A running average algorithm is being prepared to get better DC offset and transformer time constant estimates. EPICS requirements and calibrator software are next on the agenda. The calibrator hardware design is being addressed. We are trying to see what can be built quickly for the MEBT and how to handle communications with the final version. Completed the copper housing and the machining of the beam pipes and end caps of the prototype HEBT BCM. Welding the ceramic break to the copper housing of the prototype HEBT unit.

1.5.7.6a Carbon Wire Scanner: Received six upgraded (replaced defective bellows, installed brakes and double ended motors for encoders) feedthru/actuators from Huntington. Modifying extension rod to eliminate the interference that occurred during assembly of the connector and the RF spring (to disconnect the fork from the wires). Completed installation of carbon wires on all fork assemblies. Started integrating the fork to the actuator, and assembling connectors. Expect to ship all assemblies in the coming week.

1.5.7.6b Laser Wire Scanner: Unitek Miyachi has a demonstration laser welder they will make available to us for profile measurement tests. The intent is to purchase the items that will be installed in a radiation area (fiber and final optics), and use the demo welder to demonstrate profile measurement.

LANL SNS Beam Diagnostics Progress Report:

BPM pickups: The SMA DTL vacuum feedthroughs, which were sent to Meggitt for welding into the inserts, are expected back on 6/Sep. We received 11 ea. CCL BPM pickups, thus completing the CCL BPM procurement. Mapping and testing is now in progress. We received the prototype SCL BPM, which will be mapped and tested soon. The one remaining 4-inch BPM for the D-plate was delivered to Continental in Albuquerque for feedthrough welding.

BPM electronics: Testing continues on the new PCI motherboard. A new 3.3-V clock multiplier chip is needed to complete fabrication and testing. The 4 each digital front end (DFE) daughter cards arrived, and one is now 90% stuffed. Testing will commence soon. Design modifications continue on the analog front end (AFE) at Bergoz.

WS actuators: Work continues at Huntington on the wire scanner actuators. We are working closely with them to expedite the order.

WS electronics: All signal processor PC boards have been modified for dual polarity, with the exception of the unit at ORNL. Testing will be complete soon. A linear driver and peripheral equipment have been ordered for testing the

linear driver concept.

CM: Work continues to completely pot the DTL transformers, which presently exhibit excessive outgassing.

D-plate: Fabrication continues at several machine shops. The beam boxes arrived this week. The steering magnet winding is now in progress at LANSCE-2. The beam stop delivery has been delayed another two weeks. The new delivery date is 18/Sep.

Misc: Work continues on the estimate to complete for Linac diagnostics.

ORNL SNS Beam Diagnostics Progress Report:

Dave Purcell started looking into the video imaging diagnostics for the Laser-wire system. We intend to use his system at our RATS' laser room. We hope to have our Laser Room operational by September-20-2002. Paul Holik is helping us with the power needs and Jim Schubert with the necessary water-cooling. SCL Laser-wire development is coming along very well. We would like to thank the Mechanical Engineering group for their support. They are working on the new optics box that simplifies the alignment. The choice of laser and optics is clear but we are doing envelope calculations to make the table of specifications complete. Saeed gave a status report to the Accelerator Physics group. The Laser-wire ASAC presentation will be discussed on 9/12 at 1:00 PM ET via video with our SLAC, LANL and BNL collaborators. Wim is working on the new-shared memory interface template with LabView. He is also continuing tests on the EPICS/LabView. Wim is helping Warren on the tolerance issues of the Laser-wire system.

Craig is working on the electron pickup. He did some stretch wire measurements and is prototyping different apertures to the electron collector. Craig is also spending 50% of his time on DTL tuning. The group worked on their PADS. Saeed presented a diagnostic lecture to the operation's training class.

Lumagraphics has completed component placement of the embedded timing circuit. We have reviewed this and final routing is now in progress.

A work package was prepared for the diagnostics support to be provided by controls. We are now preparing the work package containing all FY03 activities of the ORNL diagnostics group.