

Accelerator Systems Division Highlights for the Week Ending October 4, 2002

ASD/LANL: Warm Linac

The first CPI 550 kW klystron passed the 36-hour heat run. In the course of the heat run, we also passed a 550 kW water load through its' high power tests. (WBS 1.4.1.1)

We started a 96-hour heat run of the fourth Marconi 402.5 MHz klystron (WBS 1.4.1.1)

The second-to-last normal-conducting HPRF transmitter is in test. Titan plans to ship the final two to ORNL RATS on Oct. 12. (WBS 1.4.1.1)

Items at LANL prepared for shipment to the ORNL RATS include: 1- 402.5 MHz Klystron; 1- 402.5 MHz Klystron Socket; 1- 402.5 MHz Circulator; 1- 805 MHz 550 KW Klystron. Estimated date of arrival is Oct. 10 or 11. (WBS 1.4.1.1)

Two CCL HPRF transmitters, SRF linac loads, and twelve SRF linac circulators were delivered to the ORNL RATS. (WBS 1.4.1.1)

Bill Reass was at Dynapower all week. He initially went to witness the preliminary acceptance test of the first production high-voltage converter modulator unit (Fig. 1). Instead, he spent the week expediting and assisting with the final assembly. The test is now scheduled for next week. (WBS 1.4.1.2)

The prototype HVCM ran well all week for the klystron heat runs. We still are awaiting a load that will allow us to run at full power (the Thales 5 MW klystron). (WBS 1.4.1.2)

The following HVCM items were delivered to the ORNL RATS: two tanks; two cabinets; one fan assembly; probes; mounting brackets; and cables. (WBS 1.4.1.2)

Hamid Shoaee has been named the new LANL LLRF Controls Work Package Manager, assuming responsibility for our scope of work, budget, and schedule through the successful demonstration of pre-production systems. Hamid will provide overall technical and project direction to the LLRF team. (WBS 1.4.1.3)

The LANL LLRF team began a systematic evaluation of the status of every piece of the project. A preliminary review revealed functional areas still needing testing and unresolved problems. (WBS 1.4.1.3)

In collaboration with ORNL and LBNL, we started the LLRF replan effort which consists of tightening physics requirements, prioritizing functionality commensurate with machine commissioning and operation, and improving configuration management. This week, we focused on the commissioning schedule and engineering development. There is a draft of how to "synchronize" engineering platforms and tools between the two labs. ORNL and LBNL LLRF staff will be at LANL Oct 9-11 for extensive management and engineering discussions. We should have a clearer path ahead following that visit. (WBS 1.4.1.3)

We received the first draft of the LLRF requirements document from ORNL and submitted our comments. (WBS 1.4.1.3)

We started drafting a LLRF schedule and a project plan to use as a basis of discussion with LBNL and ORNL next week. (WBS 1.4.1.3)

Drift tube repairs are progressing with re-welds of the body/sleeve joints. The units being welded are the non-damaged magnet units and empty drift tubes (37 units total available for welding). Status is summarized in Table I. Of the 37 total available units for processing, 25 have been sent to the welder and the remaining units are either waiting bakeout (9) or need to be restored to this level of completion as they were used as samples (3) to provide weld qualification data for process qualification. The EMD drift tubes are still in the final fabrication stage. (WBS 1.4.2)

| DT TYPE | Repair Completed | Welded with Surface Problems | Not Processed | In Fabrication | Totals |
|--------------------|------------------|------------------------------|---------------|----------------|--------|
| PMQ-(39 Total) | | | | | |
| Damaged Magnet | 0 | 0 | 18 | | 18 |
| Non Damaged Magnet | 7 | 8 | 5 | | 21 |
| Empty (16 Total) | 7 | | 9 | | 16 |
| EMD (4 Total) | | | | 4 | 4 |
| | | | | Total | 59 |

Table I: Status of drift tube repair

Several completed drift tubes have had the magnet re-measured after the repair process was completed. All four of the tested units show no change in the magnetic field due to the repair process. Based on this data, we are continuing to process the remaining units as quickly as possible at ISYS. A proposed repair sequence has been developed for the damaged magnet units and test welds of the stages required will be prepared next week for evaluation and decision. Photographs of two of the welded drift tubes are shown below (1-22, 1-25). The 1-25 unit shows a typical surface finish of a completed repair. The 1-22 unit is an example of the category "Welded with surface problems". We have observed that some of the drift tubes exhibit a "spattering" tendency that can be clearly observed. The cause of this is under investigation. A surface contaminant is suspected but so far has not been removed with a standard acetone scrub using a nylon pad. (WBS 1.4.2)



Fig. 1: SNS converter modulator production at Dynapower ca. 9/23/02.



Fig. 2: Drift Tube 1-25, after weld repair (left) and Drift Tube 1-22, with surface spattering (right).

We prepared a revised schedule for the DTL repairs and delivery and shared it with ORNL. (WBS 1.4.1.3)

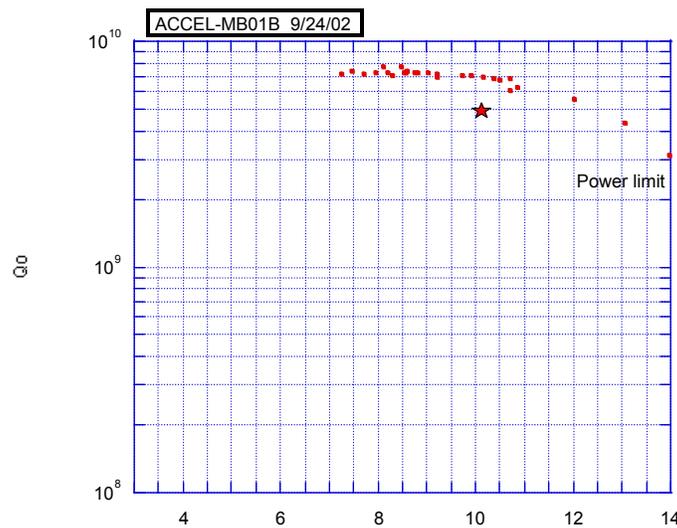
The ETC PCR (LI 02 040) and the September BCWS Replan PCR (LI 02 041) have been approved and will be implemented in the September baseline. (WBS 1.4.6.1)

Subrata Nath has returned to LANSCE Division after a three-year assignment to SNS. We are grateful to Subrata for his contributions to SNS linac requirements and design, beam dynamics simulation and analysis, and engineering specifications and integration. We wish him well in his new assignments for LANSCE. (WBS 1.4.6.1)

ASD/JLAB: Cold Linac

Vendor leak checking of the 4.5 K cold box is complete. Shipment is authorized for October 7, with arrival at SNS anticipated on October 11.

Cavity MB001 was reprocessed and retested. An additional 60μ was removed for this test, and although Q_0 was somewhat low, it met specification at the design gradient.



ASD/BNL: Ring

Participated in the ASAC Review at Oak Ridge, TN. Six talks were presented for the Ring and Transport Systems. Speakers included J. Wei (Overview), A. Jain (Mag Measure), K. Smith (RF), H. Hseuh (Vacuum), A. Fedotov (Ring Effects) and M. Blaskiewicz (Electron Cloud Effects). BNL's efforts and achievements were recognized and praised by the committee. There were no outstanding issues.

The ASAC committee endorsed our proposal to implement electron-cloud mitigation measures in key areas, including solenoids for the collimation region, clearing electrodes for the injection region, and video monitoring system on the stripped-electron collectors.

We have completed FY 2002 with an excellent financial performance. The Budget Authorization (BA) for BNL's SNS effort is \$26M for FY 2003, a reduction of about \$2M in support of project office's BA needs for FY03. Certain procurements were deferred from FY03 to FY04, still in time to support the commissioning of the Ring/Transport.

We returned a total of \$1.1M to the SNS project, based on the estimated reduction in the SNS Ring/Transport system baseline cost considering the reduced overhead rates on large-amount procurements.

A procedure to prevent copper-to-stainless-steel brazing leak, which occurred among 3 out of 6 vendors on SNS Ring/Transport magnets, was successfully tested by the vendors.

Danfysik brazing samples have been received, inspected and approved. They have been given approval to resume brazing of ss fittings to copper coils. In our weekly teleconference, Danfysik also reported that two magnets were observed to be damaged upon arrival at their loading dock. These units are being returned to them for inspection/repairs.

21Q40 Quads: Tesla reported that the six remaining (Phase I) quad cores have been machined. They are awaiting BNL approval of their ss/cu brazing samples before completing the coils. Bill Birkholz will travel to Tesla on October 28 to review existing technical issues and readiness for Ph II production.

PFN vendor bids are being evaluated. The number of bids under consideration has been reduced from six to two. Both proposals look good and prices are near engineering estimates.

In support of the Front End commissioning, C-AD is preparing six "chip-monk" radiation monitors to be shipped to ORNL before end of October 2002 (one now and five more before 10/28/02).

Five upgraded wire scanner actuators were shipped to SNS/OR.

An updated Magnet Progress Schedule was sent to ASD.

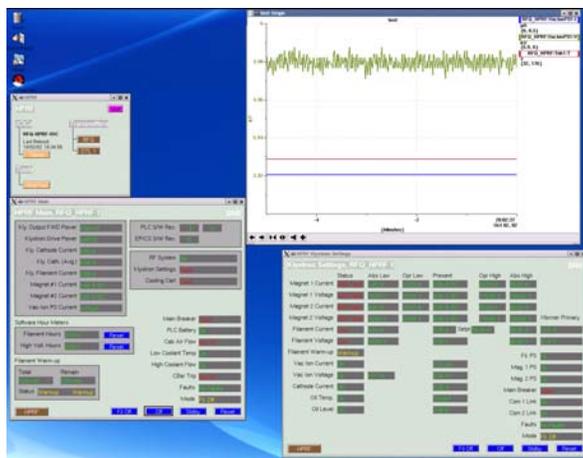
Controls

The controls team participated in both the ASAC and the LLRF Reviews last week, and hosted a Timing System Software Workshop this week.

The controls team participated in tests of the front end vacuum and power supply systems, running equipment from the Front End Control Room.

John Munro was included in the "Significant Event Award" that was given for operation of the Hot Spare Ion Source Test Stand in the RATS Building. John played an important role in seeing that the test stand operated under EPICS in as prototypical a way as possible. Congratulations to John and to the whole Front End team.

Colleagues from LANL gave training on the EPICS interface to the high power RF systems, and at the site exercised for the first time the DTL HPRF IOC and PLC. The screen shot below is taken at the site.



Operator Training was given on both the Timing System and Conventional Facility Controls, and training on operation of the Front End vacuum system was given to the vacuum group.

An inspection of the racks for the ICS Central Helium Liquefier Control Room Racks was made at the DCS facility. As usual, it was found that DCS did an outstanding job on the fabrication and assembly of the equipment. They will be delivered to the SNS Construction Site next week and placed in the CHL building control room.



Integrated Control System - Central Helium Liquefier Control Room Racks

Five Conventional Facilities Controls Racks (including two racks for the CHL Building) and a console PC were delivered this week.

Considerable progress has been made at BNL on the ordering, production, delivery and testing of SNS Timing System modules. The first production V124S trigger modules have arrived at BNL. Eight have been sent to ORNL and two have been installed in SNS IOCs at BNL. The first SNS event link fanout module has arrived and been accepted. The full complement of 80 units can now be ordered. The first run of V206 RTDL input modules has also arrived. Modules are being installed and tested in RHIC before being shipped to ORNL. V294 and V128 fanout modules are ready to be ordered. In addition, ten utility boards (RTDL receivers) were received from Los Alamos.

Personal Protection System (PPS) EPICS screens, databases, source codes, and Ether IP database definition files have been saved in the SNS CVS repository. Wiring has been pulled and terminated from the PPS Operator Control rack to the Chipmunk interface panel and Chipmunks

The EPICS Channel Archiver was used to archive Front End vacuum and water-cooling data. (See screen shot below.)

We diagnosed several water problems and have an untested solution for house chilled water pressure issues.

The MEBT raft can be put under vacuum via EPICS and its own pumps.

The RF group has been successfully testing some of the LLRF controls for the MEBT rebunchers.

Accelerator Physics

In response to the Low-level RF Review recommendations, the AP group is revisiting the phase and amplitude requirements for linac RF. D. Jeon is considering 0.5%/0.5 degree and 1%/1 degree for calculation of energy and phase jitter at the end of the linac and after the corrector cavity. J. Holmes is considering ring momentum painting with varying energy jitter.

Work is beginning with the Mechanical Group to specify and design a current limiting aperture to be installed in the front-end antichopper box. This aperture would allow low-current low-emittance commissioning of the linac.

Operations Group

Prepared for the ARR to be held the week of October 14

Conducted Operations Training Sessions
Prepared Operations Procedures for the SNS OPM

Participated in the design studies of the RTBT Shielding

Participated in the design studies of the HEBT Door Shielding

Worked with XFD on Accelerator shutdown in a Seismic event

Participated in the Controls System Timing Review

Participated in LLRF Post review discussions and planning

Ion Source Group

The hot spare stand has been conditioned to produce slightly more than 10 mA of beam at 65 kV without the addition of Cesium. This was accomplished with about 50 kW of RF power generating 660-A peak-to-peak antenna current with a rather low gas flow. When the schedule permits, we will install two more turbo pumps to allow for higher source pressures, which should significantly increase the ion beam output. In addition LBNL experience has shown that the addition of Cesium increases the ion beam by a factor of 3.

All of the ion source group members continue to participate in the operator training.

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

A plan has been generated to demonstrate ion beam production capability with the FE ion source before 10-28-02.

DTI has completed the removal and required rewiring of the fast switch of the 65 kV supply. It proceeds to a thorough checkout before shipping the supply scheduled for October 11, 2002.

Mechanical Group

Magnet Systems

Vacuum Systems

RF Group

Electrical Systems Group

Last three DC bus assemblies were installed in the ring duct bank.

Klystron building rack row six has been installed.

Walk through for BOD of FE and 225MeV has been done with CF.

Walk through of the HV switchgear readiness for modulator operation has been done.

Survey and Alignment Group

Cryogenics Group

The spool pieces fabricated by the compressor vendor (PHPK) have been assembled and installed onto the compressors. Fabrication measurements can now be made by King mechanical to begin fabrication of the warm gas piping. Dan Hatfield and Don Richied visited King mechanical where they saw piping and support brackets being manufactured for the compressor piping. (Photos) The cold box vendor (PROQUIP) has received authorization to ship the box on 10/7/02 and it should arrive at SNS late on 10/10/02 or early on 10/11/02.

The vacuum jacket for the west end Supply transfer line is under vacuum. The east supply transfer line that is installed in the tunnel has been aligned; the inner pipe is welded and awaiting installation of the final piece due to be received on 10/7/02.

The last supply transfer line (HB18/HB19) is complete and ready for shipment on 10/7/02. WE are shipping it with return module MB9/MB10 that is also completed and ready for shipping. Work on the west supply end box is 50% completed and work on return module HB2/HB3 is 60% completed.

The remaining 3 technical staff have arrived and are assigned to cryomodule assembly tasks. A 1-day clean room class was held and attended by all the technical staff. The prototype cryomodule is being prepared for a road trip, starting today, to test its sensitivity to transportation induced stresses.

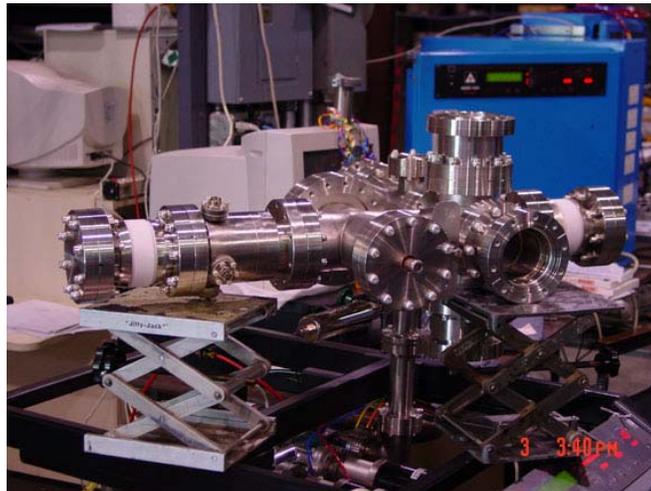




Beam Diagnostics

ORNL Beam Diagnostics Progress report:

SCL laser profile monitor design is progressing well. The first prototype vacuum beam box is ready. The picture below shows all components including electron collector, SCL-BPM and ceramic breaks required for the differential current measurements being tested to $10e-10$. The vacuum beam box is transferred to RATS for evaluations.



The prototype dipole magnets for laser profile monitor are also complete. We need minor modifications to the leads to avoid interference with the vacuum beam box. Ted Hunter's group is measuring and evaluating the prototype magnets.

Warren Grice and Jim Pogge are preparing the RATS laser room for laser diagnostic development. The ME group has completed the conceptual design of the mirror box for the HEBT ceiling. The ORNL laser group is working on the laser-wire studies and prioritizing the FY03 work.

Dave Purcell has developed an automated TDR capture to the database LabView software. We will use his software for the MEBT cable bar coding and connectivity to the Oracle database. Ernest from Controls has provided us the necessary NAD IP's for the up coming visit of the diagnostic engineers from the partner labs.

Dave is also working with BNL on redundant assignment of the BLM's at different section of the SNS site.

Wim is mentoring the new engineer to develop NAD specifications. He also put together a new Laser wire DAQ that can handle more than 200 1K-point acquisitions per second.

We received and inspected the MEBT carbon wire scanner actuators. Paul Gibson's group will install the WS's on the MEBT. Wim sent out his LabView template for feedback.

We have received the first hardware for the embedded timing circuit. Test code has been loaded into the gate array and signals have been traced through the event link and RTDL receivers. Loading of the PCI core has been thwarted by a bug in the Altera tools. The vendor has confirmed the problem with the latest version of the development tools and promises quick resolution. If it is not resolved in one week, we will roll back to the last known working version. Concurrently, Craig Swanson is making good progress with the event link and RTDL decoding and phase lock loop functions. We expect demonstrate all required functions except the bus interface in one week.

Two term employees started last week and a contract engineer started this week. Stacey Newbold (a technician) and Matthew Stedinger (an engineer) will work out of the Diagnostics Support WBS in Controls. Jim Pogge is working on contract in support of laser diagnostics and electronics development for the laser system.

LANL Beam Diagnostics Progress report:

BPM pickups: Fabrication continues on the DTL BPM pickups. Five more SMA feedthroughs, pre-welded to the inserts, have been ordered from Meggit. This should be enough feedthroughs to complete all the DTL BPMs. The CCL pickups were sent back to ISYS to properly size the pins that push the electrodes into place when the feedthroughs are fastened to the body of the BPM. They were originally sized with a gap at the feedthrough vacuum flange, caused by incomplete compression of the copper gasket. They are due back early next week (7/Oct). Fabrication continues on the SCL BPM pickups.

BPM electronics: The jitter in the beam phase measurement has been narrowed down to the clock multiplier chip on the PCI motherboard, and 10 MHz (plus a little 2.5 MHz) noise introduced on the 40 MHz digitization frequency due to the grounding and isolation of this multiplier. The cure will involve a modification to the component layout on the PCI motherboard. Testing continues on the digital front-end board. A missing reset trace was discovered, which will require a revision to the board. Design modifications continue on the analog front end at Bergoz Instrumentation.

WS actuators: We received the two 3-inch and 6-inch actuators from Huntington, and they look great. We are now in the process of wiring them up to prepare to test them. The balance of the actuators needed for DTL-1 and the D-plate are expected to be shipped within the next week. We received the rad hard BNC connectors needed for the wire signals.

WS electronics: We received the Python linear stepper motor driver and the National Instruments interface box. These components will allow us to assemble a prototype system to test the linear driver concept. We are working on the electronics needed to control the brakes on the MEBT wire scanner actuators.

ED/FC: We received the ED/FC head for DTL-1. It looks great. Fabrication continues on the ED/FC head for the D-plate, and on the air actuator assemblies.

D-plate: Fabrication continues at local machine shops, and assembly continues here at LANL. We received the slit heads for the emittance measurement. They look great too. The beam stop should be completed in about a week, and we are preparing for the acceptance tests. The cabling block diagrams are complete and are now in sign-off. A special cable for the camera was sent to ORNL for installation.

Misc: Wynn Christensen, Lisa Day, John Power, and Matt Stettler, will travel to ORNL in mid October to assist with FES diagnostics re-commissioning.

BNL Beam Diagnostics Progress report:

One group member has planned travel to ORNL to support BCM and laser wire systems during MEBT re-commissioning. Two group members have registered for the Diagnostics Workshop at ORNL this month.

1.5.7.1 BPM: Work continues on BPM impedance calculations and measurements.

Updated IFE schematic has been sent to Instrumentation for corrections. Active components have been ordered for the prototype AFE. Passive parts to be compiled after the bill of materials come back from the schematic drawing process.

1.5.7.2 IPM: Estimate is \$120K increase for change from permanent magnets to electromagnets in IPM system. PCR will be written. Assembly of Argonne-style electron detectors for testing in RHIC ring (and comparison with CERN style detectors) continues. Work continues on control system for the gas system of the luminescence profile monitor.

1.5.7.3 BLM: We are working-up a cost estimate of the end cap assembly of the improved ion chamber with the BNL central shop. We have submitted documentation to the electrical design group to begin work on the 8 channels AFE module schematic, as well as the PCB, which resides inside the ion chamber detector. We continue working with two of the potential detector vendors to get a final price quote from LND, Inc., and prototype units from Far West Technologies. Discussions continue on finding the additional rack space needed to implement the hardware required for system redundancy throughout the SNS facility.

1.5.7.4 BCM: A schematic for a MEBT Calibrator has been prepared and components are being gathered. A high current calibrator amplifier design is in preparation. Assembly of prototype BCM detector continues

1.5.7.5: Preparing presentation on incoherent tune measurement for ORNL Diagnostics Workshop.

1.5.7.6a Carbon Wire Scanner: Five upgraded WS actuators have arrived at ORNL. Interface information has been provided to control group. ECN in progress to incorporate latest changes into the documentation.

1.5.7.6b Laser Wire Scanner: Waiting for decision from ORNL to proceed with preparations for testing of laser wire at 750KeV, with purpose of verifying electron detector design.