

Accelerator Systems Division Highlights for the Week Ending August 30, 2002

ASD/LANL: Warm Linac

Twelve 550 kW circulators passed factory tests. (WBS 1.4.1.1)

One 805 MHz transmitter completed factory tests. (WBS 1.4.1.1)

The schedule for the first Thales 5 MW klystron and 550kW klystron has slipped 2 more weeks, until Sept 30 and Oct. 7. (WBS 1.4.1.1)

Progress was made on the SCR controller. We determined that the start-up surge is due to a capacitive voltage divider from the SCR anode to gate and the gate driver board to ground. The fix was a time delay to isolate board during turn on. System now operates to 100-kV, but is unstable. Dynapower engineer will be returning to help us troubleshoot. (WBS 1.4.1.2)

Considerable progress on the LLRF system was made this week. We demonstrated open and closed loop control of the complete system around a small amplifier with a resistive load. The hardware was shipped to JLAB today. Amy Regan, Kay Kasemir, Mark Crofford, Mark Prokop, and Sung-il Kwon will all be at JLAB next week to integrate the system. (WBS 1.4.1.3)

Good progress on the DTL drift tube fabrication was made. A repair recipe, involving a deep and a cosmetic weld was tested (Fig. 1) and it looks promising. Welds are done without water-cooling. New fixturing was developed and tested. PMQ temperatures are kept low, below 100-deg C. Meanwhile, test at Aster indicated that the strength of the DTL magnets will not change at temperatures up to 225-deg C. (WBS 1.4.2)



Fig. 1: Initial tests on e-beam weld repairs. Since these tests, improved fixturing and heat sinking have made the temperature safety margin greater.

All of the DTL endwalls should ship to ORNL this week, with the exception of the upstream endwall for tank 1. This endwall will ship to LANL where it will be modified due to tuning requirements. This will close out our contract with Major Tool and Machine. (WBS 1.4.2)

Further progress was made on the cold model and Superfish model of DTL Tank 1. The Superfish model now reproduces measurements far better than that achieved earlier. (WBS 1.4.5.3)

Simulations are being pursued for option 3 of chopper-system operation-scheme where both LEBT and MEBT choppers are turned on at the same time. (WBS 1.4.5.3)

ASD/JLAB: Cold Linac

ASD/BNL: Ring

Bill Foyte and Dave Gurd were at BNL this week to review Global Controls and Timing.

Paul Holik and Lee Raines were at BNL to discuss electrical system issues with Jon Sandberg.

Professor Isao Yamane (KEK) was at BNL this week to present a discussion on "Laser Stripping and Proposed POP Experiments".

Bids for the extraction kicker power supplies have been extended to Friday, September 6th, at the request of two potential bidders. To date, we have received a total of four bid proposals that will remain sealed until the bid opening date.

Danfysik – 12Q45 production quadrupoles: our weekly teleconference again focused on QA problems related to uniform magnetic field and leaky (brazed) water fittings. BNL will arrange a conference call with ASD and Danfysik next week.

FY03 funding profiles for WBS 1.5 and WBS 1.9 are being reviewed.

Equipment testing of the injection kicker system continues. A test schedule for magnetic measurements is being developed.

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

Magnet assembly and measurement:

- Ring dipole measurements – five type B magnets have been shimmed, fully measured and matched with five type A magnets. Additionally, four more type B magnets have been shimmed and are ready for testing.
- 21Q40 – field quality measurement of quad #4 was completed this week. Three have integral fields within the desired range while one is outside.
- 26Q40 – magnetic testing with the pole tip chamfer was completed last week; the data have been analyzed and more machining is required.
- 41CDM30 – the 1st article magnet is being set up for survey alignment and acceptance testing. Magnetic testing is scheduled to begin Sept. 4.

Documentation efforts:

- Sign-off approvals on magnet design/parameter sheets.
- Lattice drawing revision.
- SOW, APPs and budget review for FY03.
- ASAC presentations.
- BNL/SNS Design Manual.

Controls

Dave Gurd spent a week visiting the controls team at BNL. The visit included an "earned value" audit for WBS 1.9.5. A strategy was developed with the RF team for assuring that the high power RF control system will be delivered with the standard ControlLogix PLC.

Installation of communications cables in the FE Building continued. Most cables have been pulled. All Ethernet cables have been terminated. Termination of timing system and other remaining cables remains to be done.

Initial testing of FE controls was conducted. Communications networks, controllers, vacuum gages, and vacuum valves were checked out and found to be mostly OK.

A quote from DCS for 12 more communications cabinets was reviewed, several problems (on both sides) were resolved, and the contract was awarded. DCS is already building RCCS racks for the CCL section. One hold-up is we are waiting on power panels to be delivered.

The Functional System Design document for the cooling tower was issued.

The contract for the fabrication of the CHL Main 4.5 K Cold Box integrated control system PLC rack was awarded to DCS. This cabinet will house the PLC and interface hardware needed for monitoring and control of the turbines.

The EPICS database for the 4.5 K cold box was generated and loaded into the IOC. The PLC programming was completed for the first of the 5 turbines. The proper display of several of the signals from the PLC and silicon diode modules was verified. Testing of the EPICS screens and PLC logic for the 4.5 K cold box turbine simulator was started. This simulator will be used to verify that the PLC control logic properly optimizes operation of the turbines and protects the turbines from operating outside their design conditions. Once proper operation of the logic for the first turbine is verified, logic for the other 4 turbines will be generated.

Cryogenic control system personnel prepared view graphs and participated in the dry run of the Central Helium Liquefier commissioning review.

The contract for the procurement of the helium liquid level meters was awarded to American Magnetics. A model 135-2K meter connects to the helium liquid level probe in each of the 23 cryomodules.

The contract for the procurement of the CHL Mezzanine Integrated Control System racks was awarded to APW. These racks will house the CHL ICS Gas Management, 4.5 K Cold Box, and 2.1 K Cold Box IOCs and the Utility System PLC. They will be located just outside the control room in the CHL building.

Installation

Installation DB labor force for the week was:

Date	8/27/02
ASD	74
Target	8
Sub-total	82
Absent	3
Total	85

Testing of Front End Building power systems needed to support Front End System check out will begin on 9/03/02

CCL #1 wave-guide installation continued in the Klystron Building. Modification of the design is required due to the configuration of delivered wave-guide components.

The Division Director's Weekly Installation Meeting addressed:

- Efficient Management of Installation Labor
- Future requests for long-term changes in ASD craft labor assignments and priorities will be resolved in the Division Director's Weekly Installation Meeting. Group Leaders affected will be asked to attend these deliberations.
- Maintaining the ASD Installation Technical Base Line

An update to the ASD Installation Documentation Plan is being initiated.

ASD Groups will be required to review their documentation and identify items not yet generated. Documentation completion dates will be determined that allow adequate time for installation planning.

Installation of RF Bldg. continues, including placement of equipment racks and start of plumbing to technical equipment. Developed proposal for alternative plan to receive HVCM at ORNL earlier than late September / early October date projected by Dynapower.

We have continued with the Front End cleanup and checking of electrical wiring and components. There are still a few more a.c. pulls to make all of the racks and outlets ready for inspection by the Electrical Safety Committee.

Controls has now operated all of the ion gauges and all of the valves on the LEBT/RFQ/MEBT from laptop based EPICS screens. They have also checked many of the fiber optic loops to see that the proper devices are connected.

Front-End chillers and water systems are awaiting pressure tests and flushing and then will be hosed in to their respective systems.

Rack Row 4 in Klystron gallery has been installed. All Front End Building ac wiring to technical components is complete. Electrical safety checkouts will begin next week.

Accelerator Physics

J. Holmes has been running the parallel ORBIT code with 3D space charge on the ORNL EAGLE supercomputer, and on the AP cluster with 16 processors. He has reproduced and confirmed many of the earlier 3D results obtained by A. Fedotov regarding transverse impedance. Work continues to evaluate longitudinal stability with 3D space charge, and transverse feedback performance with 3D space charge.

V. Danilov spent the week at BNL discussing laser-stripping ideas and possible experimental tests with I. Yamane and the BNL group.

The application-programming group has been working on a Trace-3D Channel Access client, a new optimization framework within XAL for orbit correction and general optimization problems, evaluation of plotting packages, and global database editing.

Operations Group

Working on the hiring process for new Chief Accelerator Operators and Operations Coordinator.

On schedule with Training Courses for Operator Certification and Subject Matter lecture in the Operations Training Program.

Underway with Review and Sign Off process for Operations Procedures Manual for ARR.

Finalizing review documentation for the ARR. This includes Safety Committee Charter and minutes.

Attended IBB Meetings with Craft Labor representatives at ORNL pertaining to ASD Operations staffing.

Collecting documentation needed for the ARR.

NEXTEL Cell phone tower bids came back totally unacceptable, began the process of competitive bidding for cell phone communications system. We are acquiring FRS walkie-talkie radios for an on-site test and examining the cost of industrial quality multi channel walkie-talkies.

Worked on the Management Information Systems CMMS and the Document Control issues.

Ion Source Group

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

Syd Murray and John Munro continue to prepare the hot spare stand for ion extraction.

Discussions have concluded that a fast HV-disconnect switch should be a part of the front end.

Twenty-one edited manuscripts have been submitted to the American Institute of Physics for publishing under the title "Production and Neutralization of Negative Ions and Beams" in their Conference Proceeding Series. Rod Keller, Robert Welton, and Martin Stockli are first authors on three manuscripts, contributing a total of 54 pages, or 29% of the entire proceedings.

Stockli et al's 25-page manuscript on "Accurate Estimation of RMS Emittance from Single Current Amplifier Data" was posted as SNS Tech note #80. It describes the detailed analysis that estimates the rms-emittance of one vertical LBNL-LEBT distribution at 0.19 ± 0.006 , meeting the SNS requirements. In addition, the paper demonstrates that only SCUBEE_x, the newly invented self-consistent, unbiased, elliptical exclusion analysis, can extract reliable rms-emittance estimates from LBNL ion source emittance distributions.

Mechanical Group

Design Shop

Magnet Systems

Vacuum Systems

RF Group

For installation next items being worked on include:

- Water connections to Klystron, circulator, load, for RFQ, the rest to follow. Both DI and Glycol.
- AC power to transmitters and the HVCM. Looks like Mid September for the transmitters and October 1st for the HVCM.
- Final warm linac transmitter shipped from Titan soon, Titan to start on cold linac transmitters.
- Modifications to transmitter racks almost complete, work being done in Rats.
- Modifications to water carts continuing in Rats.
- All modifications to transmitters and klystron cooling metering carts will be finished next week.
- New plan for arrival of HVCM proposed, investigating feasibility.

Electrical Systems Group

The electrical safety committee presented the electrical safety checkout procedure in their meeting this week.

The SCL quad power supply bids have been reviewed and recommendations sent to LANL.

The first delivery of corrector power supplies has been delayed to 10/15/02 from 9/15/02. The schedule calls for 20 power supplies to be delivered per week starting on this date.

Survey and Alignment Group

Cryogenics Group

Beam Diagnostics

BNL SNS Beam Diagnostics Progress Report:

1.5.7.1 BPM: PCI card efforts continue. We are in the process of evaluating using BNL vs. Bergoz as the designer/supplier of the BPM AFE electronics. Potential schedule impacts due to Bergoz's workload motivate us to do this ourselves. A schematic of a proposed prototype AFE is in preparation at BNL to facilitate testing at an earlier date than would be available from Bergoz. Rack and cabling requirements are being addressed. Preparing (13) 21cm

HEBT BPMs for brazing.

1.5.7.2 IPM: A decision has been made to use an electromagnet instead of a permanent magnet for the IPM.

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. We expect to receive another prototype BLM detector from one of the vendors within a week (this one designed to reduce cost). Another vendor has submitted data on a prototype chamber that they are developing. Initial data taken with the chamber filled with propane looked reasonable. Soon tests will be done with nitrogen and argon. We hope to receive this unit at BNL to test it on our ATE stand. Calculations and considerations of various X-ray shielding material parameters were conducted. We have resolved more details for the study of X-rays on ion chamber detectors at JLAB. We are also investigating X-ray source parameters and study time at JLAB

1.5.7.4 BCM: Additional parts have been ordered to permit stuffing the new circuit board, which is underway. Software upgrade efforts are underway. A request has been made for the software that was developed at ORNL for the "shared memory" to permit testing with our BCM software. Working on ceramic break to the SS pipes.

1.5.7.5 Tune: Work continues on the further development of the prototype for the SNS tune meter.

1.5.7.6a Carbon Wire Scanner: Per Huntington, the six feedthroughs for the MEBT WS are presently on their way to BNL. We expect to receive the RF spring next week. Fabrication of copper sleeves for the new wire attachment is complete. The connectors, that disconnect the fork from the wires, are being assembled. Modification of the extension rods and the spool pieces is complete.

1.5.7.6b Laser Wire Scanner: In preparation for testing in 200MeV line; we received the envelope dimensions of the SCL beam box, and are studying the feasibility of the SCL beam box with the setup in the BNL HEBT line.

LANL SNS Beam Diagnostics Progress Report:

BPM pickups: DTL BPMs -- 2 are ready for installation into drift tubes, 3 are in ABQ ready for us to test, 1 has a bad feed-through, 4 are in fabrication. Two SMA feed-throughs failed during welding. These were sent back to the manufacturer (Meggitt), who offered to weld the rest of our remaining 13 ea. Feed-throughs to their mating inserts, free of charge. CCL BPMs -- the prototype has been successfully tested; the remainder is expected in the next few days. SCL BPM -- the prototype is expected soon.

BPM electronics: Testing continues on the new PCI motherboard. All tests to date have been successful. The next step is to test the board with a digital front end (DFE) daughter card. The new DFE cards were received 29/Aug. we've built a low phase noise signal generator to test and debug phase measurement with the BPM electronics. Analog front end (AFE) modifications continue at Bergoz.

WS actuators: Huntington has announced yet another delay in the delivery of two prototype actuators. The new date is in three weeks.

Ws electronics: Two PC boards have been modified for the dual polarity bias and testing is now in progress. Updated software has been loaded on all four of the PCs we have here at LANL.

CM: The modified DTL transformers do not meet vacuum specifications, and retrofits will be necessary. Work is in progress to plug the vacuum leaks with epoxy.

ED/FC: The actuator assembly drawings are in checking. Good progress has been made on the prototype electronics. We now have a test bed PC set up with almost all the necessary hardware. We've designed a PC card for the HV bias supply, and it is now ready for procurement.

D-plate: Fabrication continues on the mechanical systems. We're experiencing delays in the deliveries of many components, especially the stepper motor actuators from Huntington, and this is affecting the delivery date of the D-

plate to ORNL.

ORNL SNS Beam Diagnostics Progress Report:

We continue having our weekly Laser design group meeting with local experts on Tuesday mornings at RATS. We are converging on our optical beam box design. Meanwhile, the Laser-wire vacuum box design is complete and is being sent to manufacture two prototypes. One will be sent to BNL for the 200 MeV tests. The electron collector is also being manufactured. The goal is to send the agreed system to BNL by the beginning of the October. We also had a videoconference with SLAC on their Laser-wire recommendations and ORNL-SNS approaches.

Dave Purcell and Saeed are looking into the D-plate wiring and rack assignments. Dave is making modifications to the rack spaces to accommodate the BSM. BSM integration is solely the responsibility of the ORNL diagnostic team and will not affect the LANL contribution. There will be another D-plate meeting on September-9-2002 to continue discussions on D-plate installation, commissioning and integration. We share the same concerns as LANL team has expressed above. ORNL diagnostic group is working very closely with LANL to optimize the integration and testing of the D-plate. Stay tuned.

The ORNL diagnostic and controls group have begun the scheduling and share the responsibility of the installation of the D-plate emittance systems. Saeed is considering all aspects based on the table of requirements. Requests regarding the emittance device should go directly to Saeed. Delphy is in charge of the D-plate and front-end emittance measurement software. Ernest is the expert on the low level EPICS drivers for the emittance devices.

Dave Purcell is putting together a CCD camera for Laser-wire test activities. Wim is improving all DAC and analysis activities (Wire-Scanner, Laser-wire and so on).

Warren is working on the laser-wire beam box design with the mechanical engineering group. He also wrote a preliminary report on analysis of mirror vibration. Sasha's jitter calculations will relax the tight vibration analysis we were following in our design considerations so far. Craig is working on filter design for the Laser-wire and he tested his electron feed-through. The results matched his calculations.

Based on the successful tests of EPICS IOC core on Win32, we have decided to migrate to this platform. Currently, the MEBT systems run the ActiveX version of Portable Channel Access. Due to the tight schedule, we may keep this original architecture for MEBT commissioning at ORNL. The goal is to have all systems migrated by the start of DTL commissioning in early 2002.

Layout of the embedded timing circuit should be completed this week. This will require a visit to the layout house in Atlanta to review the analog portion. Even with the delay of a week or two, we still expect working hardware this month.