

## **Accelerator Systems Division Highlights for the Week Ending May 24, 2002**

### **ASD/LBNL: Front End Systems**

MEBT commissioning continued through the entire week, somewhat hampered by diagnostics software problems. A loose wire connection to the vacuum system PLC resulted in the control system diagnosing an undefined operational state and opening and closing venting valves. The worst was prevented by disconnection electrical power to these valves, but the RFQ suffered from partial venting and had to be re-conditioned. In spite of these problems, we were able to demonstrate Front-End operation at 60 Hz, 6% duty factor with beam.

Towards the end of the week, Sasha Aleksandrov acquired a multitude of emittance measurements, with and without rebunchers.

Rod Keller will be absent from LBNL for the next four weeks; contacts with LBNL should be made in this time with Rick Gough (acting STL), Dick DiGennaro (Program Manager and point-of-contact for FE shipment and installation at the SNS site), and Alex Ratti (Lead Electrical Engineer and point-of-contact for Diagnostics).

### **ASD/LANL: Warm Linac**

LANL shipped the first 402.5-MHz klystron to ORNL on May 24. (WBS 1.4.1.1)

The second 402.5-MHz klystron was installed in the LANL test stand. (WBS 1.4.1.1)

Factory acceptance tests were completed on the second 402.5-MHz transmitter. It is scheduled to ship from Titan (San Diego) to ORNL on May 25. (WBS 1.4.1.1)

Dan Rees was at ORNL this week to discuss high-power RF integration and installation plans. (WBS 1.4.1.1)

LANL and ASD staff were at Dynapower this week. The first production High-Voltage Converter Modulator (HVCM) SCR controller was accepted. All units will be completed by the end of June.

While at Dynapower we also approved Dynapower's manufacturing plan. There will be no further design changes from after May 31, 2002. Any changes required to the design after that point would be retrofitted in the field. Dynapower will develop a design to cast the secondary transformer windings in epoxy. We will provide Dynapower with a final design for the gate driver boards by May 31, 2002. Dynapower will build 6 sets of IGBT board assemblies for the first 4 HVCM units. They will not build the remaining sets until directed by LANL. We agreed to provide Dynapower a decision by July 31, 2002 based on the current plans by the RF group to test the 5-MW klystron in July. Dynapower has ordered most of the parts for the switch assembly boards. We will send key people to Dynapower to support design changes, assembly of the transformer and IGBT boards, as needed. (WBS 1.4.1.2)

The secondary transformer on the prototype HVCM was modified. The number of turns ratio is the same as the production system, and it is more securely fastened using a new design. It is in final stages of assembly and will be installed in the oil tank (along with the higher-performance National Arnold transformer core) beginning of next week. (WBS 1.4.1.2)

Alan Archuleta and Chris Roybal were at ORNL this week. They completed installation of the LANL document server, and coordinated procurement documents transfers and hardware deliveries. (WBS 1.4.6.1)

LANL shipped DTL Tank 3 on May 21. It arrived at ORNL on May 23. (WBS 1.4.2)



Fig. 1: Preparing DTL Tank-3 for Shipment

#### **ASD/JLAB: Cold Linac**

#### **ASD/BNL: Ring**

In preparation for the 5/28/02 design review meeting with IE Power, R. Lambiase, M. Hemmer, D. Raparia and others continued their efforts to review and confirm all operating parameters related to the medium range power supplies.

Status of Ring dipole shimming: magnet #16 has been measured. Unit 17 is in the test stand.

BINP (30Q44): 1<sup>st</sup> article magnet assembly is in progress. No problems were reported during our last teleconference. Expect shipment to BNL by June 1.

Ring RF - testing of the anode PS for the RF system continues. A vendor representative was at BNL this week to help troubleshoot a recent PS failure. The unit has since been repaired and is up and running again.

Alpha Magnetics has been awarded the contract to build the 21S26 ( $q=12$ ) high field sextupole magnets.

Mike Blaskiewicz was a co-speaker at a C-AD Accelerator Physics Seminar earlier this week. He gave a report on the "ECLLOUD 2002 Workshop".

In a cost savings move, a contract for the Ring half-cell jack stand pedestals will be exercised by ASD through a local fabrication shop. Assemblies will be direct shipped from the vendor to the SNS site. Funds will be transferred from BNL via a PCR.

Joe Tuozzolo and George Mahler held a videoconference with Cutler and Murdoch on various Ring and HEBT magnet issues (i.e. water fittings; magnet survey holes; HEBT dipoles – measurements and shipping damage; the jack stand contract, etc.).

#### **Diagnostics Group:**

- Continuing efforts to get and utilize beam-time for testing the Luminescence Monitor and the 200 MeV Laser. Another access into the Laser cave was scheduled for this week.
- Working on tech-notes and preparations for the upcoming design reviews.
- Reviewing cost/manufacturing options for an improved BLM detector design.
- Work plans are underway to refurbish the MEBT wire scanners.

At the request of K. Rust, the SNS/EE Group is making plans to measure in-rush current on the Danfysik low field power supplies.

A contract has been approved within BNL for Tesla to begin the phase II manufacturing plan for (32) 21Q40 quadrupoles, including bases and spare coils.

Danfysik reported that they plan to ship the first six production 12Q45/16CD20 magnet assemblies to SNS/OR on June 14.

## **Controls**

We are in the thick of testing the fiber optic converter boards used to transmit/receive the various timing and MPS links. Status as of this week is as follows:

- SMRX (Single mode Receiver): 50 boards tested, ECL outputs only (TTL outputs tested separately). All 50 boards tested OK
- MMTX (Multi mode Transmitter boards): 30 boards tested, ECL inputs only. 2 boards failed.
- SMTX (Single mode transmitters): 10 boards to be tested.

FE Network, timing, and MPS cable installation documentation was signed off and submitted to the DCC. Service request orders (SROs) will be handed over to the ASD Installation Group after the documentation is copied early next week.

Larry Doolittle and Carl Lionberger got the feedback control loop with the FE LLRF processors driving tuning motors in the MEBT cavities working.

A FE remote I/O cable in vacuum PLC system was repaired. The cable fault contributed to a vacuum incident, which occurred Monday and has been receiving considerable discussion at the global controls level. The vacuum system has been stable since.

Replaced several FE Group3 fiber connectors. These connectors were found to produce loop errors detectable from the diagnostic displays if left at certain angles in their sockets (these connectors can be rotated as freely as the fiber itself will allow). After replacement, the apparent temperature sensitivity of the Group3 equipment we've seen in recent weeks is either gone or much improved. It was even possible in some cases to predict from the displays which fiber segment would be at fault.

Started running the FE channel archiver on frog.lbl.gov rather than spoke.lbl.gov. This causes it to connect through the channel access gateway rather than directly to the IOCs -- part of a program to reduce load on IOCs. Particularly ioc2 (cooling and klystron control) seemed vulnerable -- more of a buffer allocation problem than actually exceeding CPU bandwidth or memory.

There were many FE emittance runs this week. Noted occasional hangs of the digitizer card for which the only cure found is to reboot the IOC. Probably could be fixed with driver modification but will take considerable elapsed time to implement because of the low failure rate (~1/day), assuming it can be duplicated at all in a development environment.

FE Ground problem fixed and chopper thermocouples installed.

FE Alarm handler covers entire front end now, but wide usage will probably have to wait for implementation at ORNL.

## **Installation**

### **Accelerator Physics**

Trajectory correction application written by Tom Pelaia was tested in real-time with real MEBT data. The application was able to correct the MEBT trajectory after a corrector was intentionally mis-tuned.

The group is preparing for the EPAC conference by writing papers and assembling posters. Galambos, Holmes, Danilov, Cousineau, Doleans and Henderson will be attending.

Sasha Aleksandrov was at LBNL this week for MEBT commissioning.

A draft version of the Work Smart Standard document for the FE, DTL and CCL is being circulated for comments. A proposal has been made up for an X-ray measurement program on DTL tank 3. These measurements will be made during and after conditioning of this tank in November 2002.

### **Operations Group**

Reviewed the Report: Necessary And Sufficient Process Work Smart Standards For ES&H - the SNS Front End and Warm Linac.

Help in preparation of Electronic Logbook demonstration.

Finished general PPS Sweep and Access Procedures, and detailed procedure for DTL 3 Enclosure Sweep.

Began defining requirements for the Operator Interface to EPICS Control Screens.

Continued defining requirements of an improved Document Management System.

Continued helping others to get started using the Equipment Tracking System and Bar-Coding of equipment.

Continued writing the Operators Training Manual.

### **Ion Source Group**

#### **RF Group**

#### **Mechanical Group**

#### **Magnet Task**

HEBT Dipole's #2 and #3 have had their gaps measured by Joe Error's group. Both are within specification. Dipole #3 was put back in the shipping crate (field measurements are complete) and dipole #2 was placed on the measurement stand. This magnet had suffered some slight shipping damage in that the coils were shifted about an inch in the Z direction. We have re-positioned the coil and are setting up for field measurements. Joe Error's group also fiducialized the 12Q45. Three buss bar assemblies are complete and work is started on #4.

#### **Vacuum Task**

Conducted initial review of potential design changes to the ion source/ LEBT interface valve to overcome shortcomings identified during the 24/7 test at LBNL and commence planning of the test set-up which will be used for cycle testing of the modified valve.

DTL vacuum racks 1 and 2 were moved to the vacuum area in preparation for equipment installation and wiring.

Accelerator equipment received this week included six Varian connectors for the DTL/ CCL installation.

Assembly of the vacuum system controls test stand continued in conjunction with the Controls Group.

Assembly of the vacuum gauge test stand commenced.

Leak testing in support of buss bars fabrication by the Magnet Group continued.

Multi-gas calibrated leaks for RGA calibration were defined and ordered.

### **Cryogenics Group**

Transfer Lines: Supply modules MB11/HB1 And HB2/HB3 are complete and ready for transportation to the tunnel. Return module MB3/MB4 is 60% completed. The tooling is being set for the second return module assembly line. Preparations are being made to move the "T" sections and 6 supply modules into the tunnel on 6/3/02 providing the tunnel RFE is met.

The 6 helium warm compressors and 2 Kinney vacuum pumps were moved to the RF pad of the CHL site this week. They will be stored there temporarily while the building steel is constructed around them, after which they will be mounted on their operating pads in the CHL.

The final weld was made on the outer jacket of the extraction dump flight tube. It is ready for shipping to the site.

We continue to interview for the open technical positions of the JLAB Cryomodule work.

### **Electrical Systems Group**

A fruitful meeting with LANL brought clarification of installation issues regarding DTL.

Majority of cabling has been ordered; about 40% is in house. HV coax cable for ion pumps and beam loss monitors were combined into one specification for the entire machine. This HV coax will be made to SNS specification to meet UL 1581 listing as well radiation hardness (250Mrad). HV cabling for RGA has been ordered and special HV cable harnesses will be built to meet RGA manufacturer requirements.

Ring system DC cabling for 1.3GeV operation has been rechecked for ring power supply order evaluation.

### **Survey and Alignment Group**

Phase II of our global survey network measuring campaign has now been completed. At this time, we have succeeded in re-measuring the entire global network including the damaged monuments. Further, via three penetration points this coordinate information has been transferred into the FE/Linac Building where this data is used in conjunction with previously measured data from approximately 300 monuments inside the building. The results are a precision survey network that is already being utilized for the layout and positioning of numerous items.

As a result of backfill re-compression however, we are currently monitoring elevation changes presently affecting the linac floor and our network. Specific information on this topic is available upon request.

I am pleased to report that we have received alignment information from Berkeley for the FE. That information has been translated and adjusted into the SNS Global Coordinate System and we are ready to support installation.

### **Beam Diagnostics**