

## Accelerator Systems Division Highlights for the Week Ending May 25, 2001

### ASD/LBNL: Front End Systems

#### ASD/LANL: Warm Linac

We are tracking the CCL hot model (Fig. 1) progress daily. The stack braze is scheduled for the week of June 4th, pending the ability to clean parts early next week. RF tuning measurements verified that we can accurately measure and predict cell frequency by using a flat plate blank-off procedure, allowing machining estimates to be made right on the machine followed by a single machining operation on the cavity tuning rings. The brazed half-cell "stacking" procedure was exercised a number of times this week in preparation for the initial RF tuning measurements. The segment rotation fixture (Fig. 2) proved to work well and be useful in manipulating the stacked segment during the tuning operation. (WBS 1.1.2.2)



Fig. 1: First stacked assembly of the CCL Hot Model



Fig. 2: CCL segment holding fixture (Fig. 2)

The LANL RF test stand was devoted to JLAB coupler tests all week. Following these tests, the JLAB and LANL personnel will disassemble the equipment and ship it back to JLAB, where JLAB will make improvements. The high-power tests at LANL are scheduled to resume in approximately two months. (WBS 1.4.1.1)

The 140-kV prototype high-voltage converter modulator (HVCM) has been connected to the 402.5-MHz test stand klystron and successfully operated. (WBS 1.4.1.2)

The HVCM final design review was held. The committee, chaired by Ray Fuja, included personnel from ORNL, LANL, and SLAC. In their outbrief, the committee praised the team for a great job and commented that all future accelerators will use the SNS design as their base. While there were no show stoppers, the committee made constructive recommendations for our upcoming work to address unresolved technical issues such as high average power system tests and Q/A of components from industry. (WBS 1.4.1.2)

The DTL tank forgings were received at LANL. Bids were received for the final machining of these pieces, and they are under evaluation. (WBS 1.4.2.2)

A contract was placed for the procurement of the OFE copper for the CCL. (WBS 1.4.4.2)

The prototype CCL magnet was mapped at LANL. The magnet mapper for the SNS CCL & SCL magnets was shipped to ORNL RATS building where further tests will occur. (WBS 1.4.4.3)

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

Fabrication on the Warm Compressor Skids, Cold Compressors, and 4.5K Coldbox continues. The three final oil removal C-D's were received and stored next to the LN2 dewar and He gas tanks.

The Y12 purifier was removed and delivered to JLab for rework. The shipping supports broke in transit; the extent of the damage is unknown.

The first 40 ft section of CHL to Tee Return TL was assembled at ORNL.

The first eight tunnel female bayonet / valve assemblies are complete. The other 120 are in various stages of welding and brazing; they should all be complete by late summer.

The MB single cell cavity has been tested and the HOM performance was as expected.

The MB cavities #2-4 are in final welding. The He vessel is being attached to cavity #1. The calculations are complete for stiffing the MB He vessels and detail test plan is complete.

The crew returned to LANL to continue testing the first pair of fundamental power couplers. The second pair of couplers is expected at JLab next week.

The EP parts bid is being awarded. Work on the specification for the EP cabinet is complete.

The Cavity vendor 2<sup>nd</sup> phase bids were received and are being evaluated.

Cavity ends bids are due 28-May.

The remaining two of three PCR's for R&D to improve the HB performance from 27.5 to 35.0 MV/m in the horizontal cryostat have been submitted and have a drop-dead date of 1-Jul-02 (LI 01-017 & 018)

PCR LI 01-058 for JLab's increased cost of testing the first 5 pair at LANL is in draft form, \$275K (FY99\$); this brings the total work-a-round cost of testing the first 5 pair to about \$600K. Together with the fact that for the most optimistic scenario for the 1MW RF system we will need to test another 10 pair at

LANL, this leads to a totally unacceptable cost. Therefore we are discussing with LANL the concept of composite crews in order to reduce inefficiency and travel costs.

The last remaining major procurement should be released next week. We could productively use an additional \$3M of BA if the first \$1M became available on 1-Jul-01. Preparations for supplemental procurements are proceeding. The first of these supplemental RFP's (CM #14 – Production FPC) will be released next week.

In addition we will have \$8M of phased contracts that can be forward funded.

In the fall of 1999 as part of the MOU discussion, it was agreed that SNS would provide a skidded RF system for the JLab testing of CM's and fundamental power couplers; the original target date was Dec-00 in order to support FPC testing. It is needed in the 2<sup>nd</sup>Q FY02 to test the Prototype CM at full power. If the PCR's are approved now, the best we can do is deliver a standard SNS system after we start full 1 CM per month production. (This is also a 6-month slip in the Milestone #2-30.) This system is a key element not only for conditioning and acceptance testing but also is required to raise the High Beta Gradient from 27.5 to 35.0 MV/m. LANL requires a minimum funding of 20% of LI 01-035 to get started planning, and JLab requires a minimum funding of 25% of LI 00-068 in order to procure long lead items (vacuum circuit breakers, heat exchangers, pumps, pipe, and valves).

In addition to the plan in the PCR's (SNS 5MW system), a more aggressive and more costly plan is being developed. It uses a LANSCE Klystron and "White Horse" transmitter. The tube socket is compatible with the LANSCE klystron. For the modulator two options are being explored the ANL "CWDD" (which is missing some long lead items) and an SNS unit "Reece's Pieces" (which is not compatible with the Feb-02 goal).

A second-generation installation of a set of three SNS 550 kW klystrons is also being considered. This would accelerate by ~21 months the first system test of the LLRF (1-Jul-02 vs. 1-Apr-04).

The immediate approval of these PCR's or alternates is required to get people started working on this. The work-a-round costs continue to increase by one FPC pair every 2.5 weeks.

The CHL BOD has slipped 8 months; it is now after the last of the refrigeration equipment has been delivered. The installation, commissioning, and burn in schedule has been compressed by 4 months to recover half of this slip, but the sub-system acceptance test deadlines and most of the warranties will have expired. The A&E has supplied an RFE date 6 weeks before BOD, which matches the delivery date of the 4.5 K Coldbox. Discussions are continuing.

## **ASD/BNL: Ring**

Developed an ANSYS model for the 12cm HEBT BPM for structural analysis and finished the structural analysis of the 26cm HEBT BPM.

A videoconference was held to discuss BLM and interface issues between the BLM and the Machine Protect System.

The MEFT wire scanner fork has been completed and the vendor has shipped the BNC flanges to BNL.

BNL/SNS staff are working to establish a remote receiving capability in the RATS Building at SNS/OR for all BNL equipment deliveries.

Tom Nehring returned from California where he attended the Title II review of the Ring Systems Conventional Construction.

Negotiations are underway between J. Cleaves and P.K. Feng to shift scope of cable tray design / responsibility from BNL to ASD's Paul Holik.

The RTBT Collimator design package was released for vendor quotations. Bids are due back in two weeks.

The 26Q40 quadrupole design package was released for last and final vendor bids. Results are due back by June 1.



Final Machining of 1<sup>st</sup> Dipole Core at Allied Engineering



Ring Dipole Vacuum Chamber - QA using Laser Tracker

## Controls:

Efforts continued to enable Sverdrup, Tullahoma, to begin software development for Conventional Facilities (and ultimately target) controls. Ernest Williams and John Munro went to Sverdrup, Tullahoma Thursday to lay the groundwork for shipping the computers and monitors for the Conventional Facilities control system development system. Training will be conducted the week of 25 June 2001. The first training "application" has been set up on the Linux file server: an initial collection of MEDM screens. An example Excel spreadsheet with PLC tag names has been imported into an Access database application developed for use by the SvT Conventional Facilities development team. The next step is to generate a more realistic example for the spreadsheet input, create the EPICS database, and load the database into an IOC application to "close the loop" on the whole process.

Bill DeVan attended Conventional Facilities design reviews for (a) Ring 70% Interim Title II and (b) CHL Title 60% II.

The Cryo Control System Final Design Review, Part 1, Warm Compressor Controls, scheduled for this week, had to be postponed due to an illness. A new date has not been set yet. No impact on the overall schedule is anticipated.

Brian Oerter (BNL) and Ron Nelson (LANL) met at Oak Ridge to hammer out proposed changes to the Timing System Requirements Document. The resulting draft is posted at <http://www.sns.gov/projectinfo/ics/192/1922/1922.html>. After a review period, a PCR will be issued to obtain project approval for the changes. (This PCR is already entered as "draft" in the SNS PCR system).

A recommended cable numbering scheme and cabling Design Criteria were generated and sent to the labs for comment.

A Statement of Work for a rack fabrication task order contract was generated and sent to procurement for comment.

PLC-5 ladder logic and EPICS database/screens are now ready to test RFQ vacuum hardware.

The Interface Control Document for the power supply controls was updated.

ORNL and BNL are working closely to install and test Epics on the Linux server at BNL. The goal is to move software from the Sun to Linux.

Test software and demo hardware for a Wavetek function generator was received. This function generator is being evaluated for use in injection power supply controls.

## ASD/ORNL: Integration

### Accelerator Physics

A set of requirements for the SRF warm section design were prepared and distributed.

Analysis on effect of the transverse kicks from the SRF cavities on off axis beam was performed. For up to 2 mm cavity offsets, maximum beam deviations are on the order of 1 -2 mm, without correction. The analysis is continuing with focus on including the quad displacements and steering correctors.

The application programming group performed studies on the use of the channel access synchronized get utility to perform real time data gathering (using signals generated on an IOC) with reliable time correlation. This method works well for only 2 process variables, updated at 10 Hz, on IOCs that are not heavily utilized.

## Operations

### Ion Source Group

Thermal Spray Technology HVOF-sprayed the first copper-antenna with an Al<sub>2</sub>O<sub>3</sub> coat. Unfortunately, five minutes after the coating was completed, a part of the coat peeled off. We expect that to be caused by the copper-antenna contraction exceeding the contraction of the Al<sub>2</sub>O<sub>3</sub> coat during cool-down. Most likely this can be avoided if the temperature is maintained during spraying, for example through internal water-cooling of the antenna. A Deublin tandem fluid dual passage union has been acquired and delivered to Thermal Spray Technology to allow water-cooling of the rotating antenna when being HVOF-sprayed. When successfully coated, the antennas will be tested in Berkeley to verify a substantially prolonged lifetime.

An analysis of the thermal load on the antenna operating in a plasma discharge has been started. The results show that under normal conditions the average thermal load should cause only moderate temperature gradients in the insulating coat that surrounds the antenna.

### **RF Group**

White, Rust, Anderson, Ball, Fuja, and Kevin Norris attended the final design review for the LANL HVPC at LANL on the 24th. Design to specification packages will go out for bid June 1st and design to print package will go out for bid the end of June. 1st production units of the Substation/transformer, SCR controller and equipment control rack should be delivered to LANL Dec. 01 the rest coming one a month. The 1<sup>st</sup> converter/modulator for big Klystrons arrive at LANL April 02 the rest start coming in July 02 then one a month. This is to give LANL time to integrate and test all systems as a whole. The 1st converter modulator for the SC linac arrives at LANL June 03 then one a month. Total systems to be provided is 17. The review was excellent and LANL did a tremendous job thus far on the HVCM prototype and on presentations at the review.

### **Cryo Transfer Line Group**

We interviewed an excellent candidate for our transferline engineering position.

We shipped the 80K purifier from Y-12 to Jefferson lab. Some damage ensued during the transportation and Jefferson is now surveying the damage.

We continue to develop return transferline.

We have ordered the materials to build up the tooling for the Cryomodule bayonet cans and the "T" section.

All the necessary parts are in house to seal the helium gas storage tanks at the site. Mandatory sight specific safety training is scheduled for Tuesday.

### **Mechanical Group**

#### **Installation and RATS Building**

Mock-ups are continuing. The tray and cooling water piping have been installed in the ring. Some cable has been received and will soon be installed. DTL tank #3 structure and stand is complete. Waveguide (plywood) is +mocked-up from the structure to the entrance of the chase. Tray has arrived and will be installed soon. Should receive drawings for the DTL header and distribution piping from LANL sometime next week for the mock-up.

The craft Electricians are working on the mock-ups and power distribution to the magnet measurement and power supply areas. Our Pipe Fitter is working the manifold piping for the DI water.

The barcode system software has been loaded on Don Smith's computer and will be demonstrated today.

Friday's installation meeting was with the Surveyors. They will work on man loading and task durations for Phil Kraushaar to input into the installation schedule.

The Front End Installation Team has been identified. Mike Hechler (FE Team Leader) has identified and prioritized issues to be resolved by team members prior to our scheduled videoconference on 6/15/01.

Site orientation training has been scheduled in RATS on Tuesday, 5/29/01. We will have workers working on the CHL helium storage tanks next week and have been informed by Jacobs (CM) that anyone working or directing work on site must go through this orientation to do so.

### **Magnet Measurement Group**

The CCL Magnet measuring system arrived, intact, along with the CCL Quad prototype. When water and power are installed we will re-measure and fiducialize the prototype. We visited the rebar supplier and took various samples from their cutoff waste for checking. Measurements of these samples are underway. The supplier agreed to provide samples from rebar destined for the SRF section of the beam tunnel. When these arrive, we will check field levels.

### **Power Supply Group**

This week Paul Holik attended an SNS/Knight Jacobs conventional construction design review meeting in San Francisco. The issue of ring construction with the tech alcoves deleted was addressed.

Roy Cutler attended the NuMI (Neutrinos using the Main Injector) DOE Project Review to review the technical component progress.

Ken Rust attended the SNS/LANL design review of the Linac Modulators in Los Alamos

### **Survey and Alignment Group**

The S & A Group has completed compilation drawings for review. These drawings have been assembled primarily as a confidence check regarding the position of the ASD Lattice relative to the site buildings, and clearances to building walls. Since these drawings represent the most current information available, we encourage others to view them for their own purposes.

The Comparex.dwg drawings displays the latest generation of the AE Site drawing (May 01) overlaid for comparison with the (March 01) version of the same drawing. This compilation, entitled Comparex.dwg has been color coded for clarity. The May 01 version has been designated red while the March 01 version is blue. The latest changes can easily be identified. This drawing can be viewed on the SNSNTA Users directory under Error\Comparex.dwg.

AEP0002\_JE\_May\_23\_01\_FE\_Meters.dwg (ASD Global Coordinate System)  
AEP0002\_JE\_May\_23\_01\_FE\_Feet.dwg (Site Surveyors/CF Coordinate System)

This drawing is a compilation of the latest information available and includes 143 ASD Lattice Positions, the May 01 AE drawings and the latest iteration of the Front End. Again, we encourage others to view this drawing as it relates to their own areas.

Updated tunnel floor monument layout to new AE drawing and produced a mock layout in the RATS Bldg.

Met with the Argonne Instrument Group to discuss alignment issues regarding instrument components.

Continued field procedure plans for the construction of the network observations. Continued development of survey software.

### **Beam Diagnostics Group**