

Accelerator Systems Division Highlights for the Week Ending August 9, 2002

ASD/LANL: Warm Linac

We have modified the design of the "Brooklyn Bridge", which will be used to improve the stiffness of the drift tube mount.

All EB weld and braze activities associated with the drift tubes are still on hold. A meeting with the SMEs will take place this Friday.

The support stand for Tank 2 is at Coronado and ready to be painted.

The beam boxes for Tanks 1-3 are expected to be finished by the end of August.

The committee formed to evaluate the drift tube vacuum leaks reported on its findings. The leaks resulted from post weld machining that removed a large portion of the weld. The leaks were not initially detected because they were masked by water present in the cooling channels introduced during welding or hydrostatic testing.

The CCL module support structure is nearing completion at Martinez and Turek in California. An inspection trip will be scheduled for late next week.

CCL Manufacturing continues at ACCEL, they are returning this week from vacation and most of the staff will be back in the office. A partial crew has been continuing work during the shutdown period.

The segment support hardware is nearing completion at a local machine shop

The SCL power supply bids are in review and we plan to award a contract next week.

A first cut at the D-Plate electrical drawings has been made and we plan to deliver preliminary copies to ORNL Friday.

A first cut at the CCL water, vacuum and magnet system block diagrams has been made.

We have performed field measurements on all DTL Tank 3 quadrupoles installed in drift tubes. So far, measurements compare quite well with previous measurements.

We learned that a nagging problem with the Flash memory for the HPM was due to a faulty Altera part design that leads to extreme sensitivity to temperature and voltage fluctuations. Updated parts are expected within 10 days or so.

The new delivery date for LLRF hardware to JLAB for the integrated test with a cryomodule is Aug-23. That is about a week slip from our original schedule. Float in the installation task that followed the delivery allows us to hold steady with the Sep-3 start date for the tests at JLAB.

A description of the performance expectations for the LLRF at JLAB was issued.

Acceptance testing was completed for another transmitter at Titan (402.5 MHz).

We shipped 3 HPRF tested loads and 2 HPRF tested circulators to ORNL.

We baked out a pair of 402.5 MHz windows and put them on the test stand preparing for window testing next week.

SN 4 Marconi tube (402.5 MHz, 2.5 MW) passed full factory acceptance tests.

The last CCL/HEBT window passed factory acceptance tests at Thales and is in transit.

An opening session paper on the HV Converter/Modulator was presented at the

"Joint US-Japan Workshop on Applications of Plasmas and Pulsed Power" in Hawaii.

Installation of a Dynapower production-unit SCR phase controller was started this week for the LANL test stand. This is one of the items needed to enable full average power testing of the converter/modulator.

While the SCR phase controller was being installed, upgrades to the prototype converter/modulator were made to enable it to be ready for full average power testing. Upgrades included new copper IGBT switch plates and a new output filter choke.

Work is progressing on how to tune DTL tank1 to establish the needed field ramp. A draft memo on an axis-symmetric SUPERFISH based model containing the frequency effect of stems, post-couplers, slug-tuners and end-field modifications has been written.

Numerous particle-simulation runs through the MEBT with varied distributions from the RFQ have been completed. Input distributions to the RFQ are generated with various LEBT chopper-voltage settings during the ramp. The distributions have been transported through the MEBT chopper to determine the extent of the residual transported beam.

A draft paper describing the chopper performance has been completed and being finalized for submission to the forthcoming 2002 International Linac Conference.

ASD/JLAB: Cold Linac

ASD/BNL: Ring

Steps have been implemented to better control magnet design parameters and configuration. Included are sign-off sheets under BNL's engineering-change-notice (ECN) for each type of magnet. This week, sign-off sheets were reviewed, approved and are being circulated for individual signatures.

A PCR was submitted to ASD for the medium range power supplies. (Parameters of medium-range power supplies were updated taking into account latest design modification in sextupoles, chicane magnets, and dump magnets. The latest re-grouping reduced the number power supply types from 12 to 8, reducing the needs for spare parts.)

A PCR was submitted to ASD related to procurement options for the high field (ring dipole) power supply. Parameter Risk Based Plan for Ring Magnets – a Progress Status Schedule of individual magnets has been prepared for submittal to ASD.

Project Director's Review – a videoconference was held on August 6 to review salient issues and progress during the last five months.

An internal review of the collimation system was conducted to review crane limits, component weights, and lifting methods.

An Engineering Seminar on the SNS (Ring) Low Level RF System was presented to BNL/SNS staff by RF engineer, Kevin Smith.

27CDM30 (28) – Danfysik's production is complete. With the exception of one magnet that was returned for shipping repair, all magnets are now at BNL.

Danfysik reported that seven more 12Q45 quad assemblies were shipped to SNS/OR last Friday (August 9th). Thus, their production run is ~ 50% complete with 16 more units remaining to be shipped.

41CDM30 (9) – 1st article arrived at BNL from Alpha Magnetics; inspections are underway.

30Q58 (BINP) – this first article magnetic has been tested and accepted for the RTBT line. Minor changes in the pole tip contour will be required for the ring magnets. Budker will be given the go ahead for production with understanding that minor contour changes (~20 mils) will be required.

26Q40 – the pole tip chamfer is being machined. We plan to reassemble the magnet next week to complete testing.

27CD30 – bids have been opened. Technical and cost evaluations are IP.

New England Techni Coil reported that chicane #4 (24D64) has been repaired and should arrive at BNL by Sept. 1.

Magnetic Measurements – Dipoles: we have completed full measurement on three "type B" magnets. A fourth magnet was also measured with 20 mil shims, but needs more shimming. In addition, we have initial measurements on three additional magnets; these have been shimmed and are waiting to be measured.

Magnetic Measurements - 21Q40: quadrupole #3 was disassembled and reassembled. Measurements after reassembly showed no significant change in harmonics.

A purchase order was written for the half-cell pedestal jacks.

Testing of the first article injection kicker PS is underway. All low level testing is complete.

The extraction kicker PFN has been tested to 40kV at 60 Hz for a period of ~ 65 hours. Our next test point is at 45kV.

Writing of a design manual for the SNS - WBS 1.5 - Ring and Transport System has started.

Controls

Timing system progress for this week includes:

- "Rev B" of the VME utility board interface software (driver and device support) was completed. Testing is now awaiting arrival of two test boards, expected on Monday, August 12.
- SNS Timing system databases and EDM screens converted to the new timing gate naming standard.
- Timing Master directory converted to new ADE format.
- Application directory, databases, EDM screens, and support software created for JLab RF test stand.

Installation of ICS communications cables continued in the Front End Building. The layout of the Front End Temporary Control Room began to take shape as the modular walls were installed and consoles put in place.

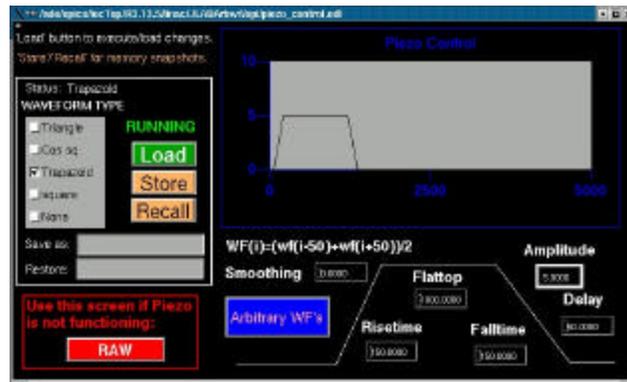
RF controls activities at LANL included the following:

- For the HPRF transmitter, adapted EPICS software to conform to transmitter PLC software version 'E'. This version is used on LANL transmitters and will be used on the ORNL warm linac transmitters.
- Development of SC tuning controls continued. Two OMS stepper motor controller boards were operated in one crate as planned for the ORNL setup. Also continued development of the stepper motor controls for the JLab test stand.
- LLRF interface developments included adding waveform support to FRCM software. Another IOC was added to the LANL LLRF test lab.

Ernest Williams and Herb Strong traveled to JLAB to start setting up controls for the JLAB RF test stand. Support from JLab was excellent. Some tasks completed include:

- Rack-mounted equipment was installed (e.g. VME/VXI crates, computers, PLCs, timing system fanouts, etc.).
- JLAB Computer/Network Support installed a network switch and provided access through the firewall for remote access to EPICS process variables.
- JLAB Software Engineering provided user accounts and served as a point of contact for technical and administrative needs.

- Heater Control implementation was started. EDM screens were verified to work. EPICS process variables were read from the Test Cave.
- Arbitrary Function Generator (AFG) implementation was started. (This function generator will be used for Piezo control). EDM screens were verified to work. The AFG was externally triggered at 60 Hz. The EPICS "Arb" function generator was actually connected to the Piezo Controller yesterday and gave good results. There are still some issues that need to be worked out.



Arbitrary Waveform display in use at JLAB.

- Installed Channel Access PV Gateway.
- Started initial EPICS user training of local JLAB software team.

RF test-stand-related activities in the next couple of weeks will include:

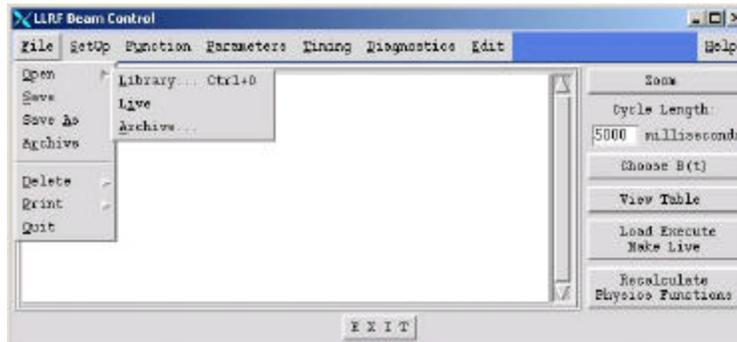
- Continuing the integration effort
- Timing system installation and set-up
- LLRF system installation and set-up



Control System Racks at JLAB

The first release of an application to aid commissioning of the ring LLRF is complete. The application maintains a library of phase and voltage waveforms, based on turn #, and timeline events. The waveforms can be interactively edited as piecewise linear functions, or take advantage of quadratic interpolation. The phase and voltage waveforms

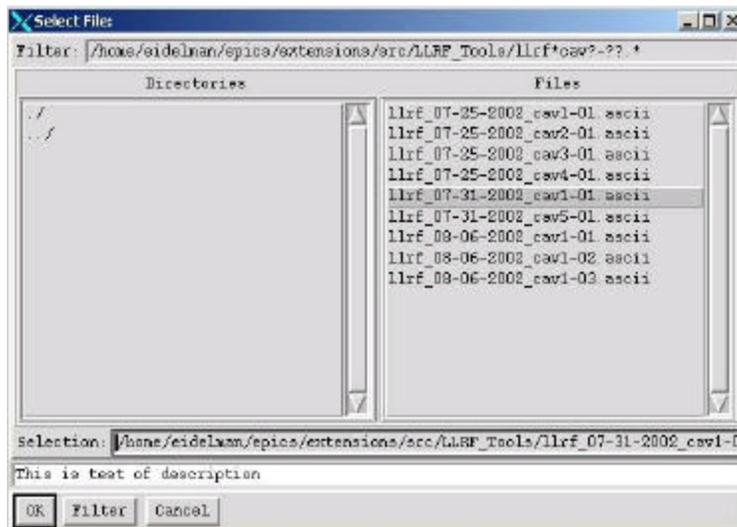
are converted to the I,Q form used by the LLRF DSP. These values are currently stored in table in disk files, but eventually will be directly loaded into the DSP memory via EPICS.



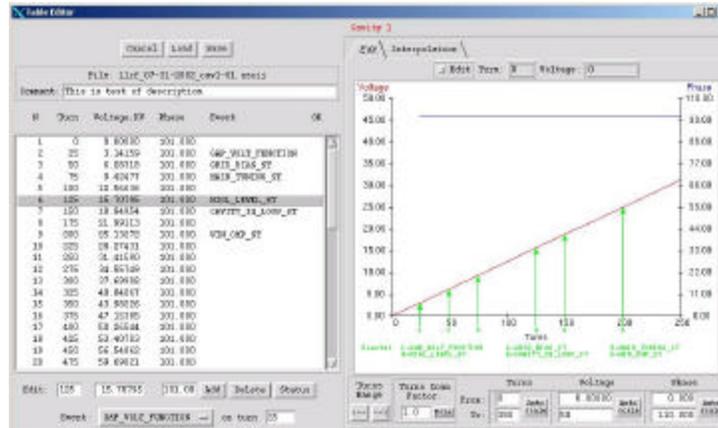
Main window showing “open/library” function.



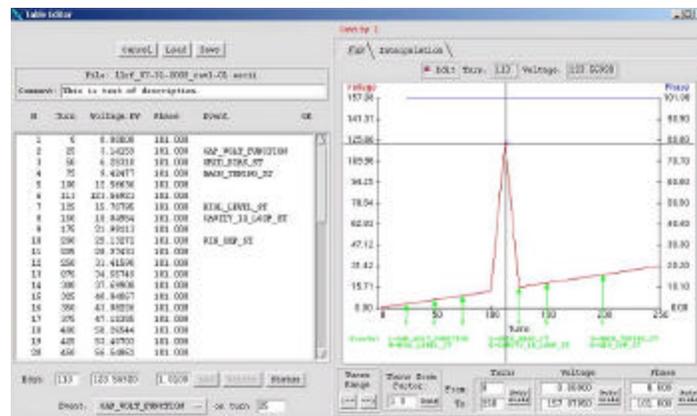
Select function for one of the 4 ring cavities.



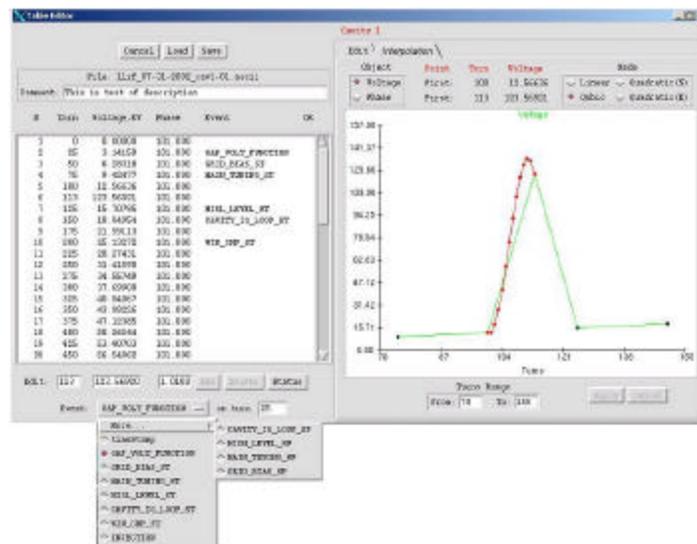
Select a file from the library of saved waveforms. Each file contains a brief user description that is displayed before the file is opened.



Waveforms are shown in tabular and graphical form, and can be edited in either mode. Event markers are overlaid on the graphical waveform.



Individual points can be added graphically.



Quadratic interpolation can be applied between selected points.

Some Personnel Protection System activities for the week:

- The specification for the procurement of the production Chipmunk type radiation detectors has been issued for procurement. This procurement is valued at \$210,000 and concludes the major 1.9.9.1 procurements for FY02. Programming for phase 0 PLCs A, B, and C at 95% complete
- PPS "Safety System Requirement Specification" is now 95% complete
- Phase 1 PLC racks design/build by Sverdrup continuing toward 60% completion.

A preliminary copy of the cryomodule marshalling panel fabrication drawing was sent to DCS for review and comment.

Installation

RFE of the RF Building was taken on Monday 8/05/02. Installation of RF Technical Components was started - SCR, Transmitter and two Titan Cooling Carts.

The Klystron Hall was prepared for the LANL RF "Lead" Visit starting 8/12/02. If the RF Front End RF termination and check out proceeds quickly with LANL, they may assist in the RF Building.

Parking at the West Gate is a major problem for ASD personnel. When ASD technical staff arrives the 66 spaces are filled by bargaining unit personnel arriving earlier. This situation is made more difficult with subcontractor personnel parking in the area planned for personnel supporting Technical Components Installation. Dick Davis and Bill Tomb to help resolve this issue.

[A Front End Safety Briefing will be conducted in the RATS Building at 8:30 AM Tuesday 8/13/02. This training is mandatory for personnel who work in the FES/FEB area.](#)

Installation of two (2) telephones in the tunnel has been expedited as a safety issue. Installation is being requested for next week.

The Cryo group will set the supply tee in the tunnel on Monday 8/12/02.

Delivery of the D - Plate Assembly is now planned for 10/15/02. A documentation package associated with that equipment is expected on Monday 8/12/02.

A meeting will be held between the Electrical Safety Committed and CF Electrical on Tuesday 8/13/02 at 2:00 PM. This meeting will review the FEB electrical system status, testing, documentation and documentation is preparation for turn over. This meeting will determine the date that power for technical components can be turned on in the FEB.

The second issue of the 30 Day Look Ahead Schedule was presented at the Installation Meeting on Friday 8/9/02.

The PPS Rack installation noted last week has been re sequenced to 9/3/02.

BPM and BCM for the FES is now planned for 9/1 - 15/02 vs 8/23/02.

FES Utility Connections are a critical activity this week. That work was scheduled to occur during the period 8/09/02 and 8/22/02.

Waveguide installation was begun in the tunnel.

At the Division Director's Installation Meeting at 1:00 PM on Friday 8/9/02 Procurement presented plans for creating a web based system on their home page which will provide actual contract delivery dates to ASD from Partner Labs purchase orders. Procurement will travel to the Partner Labs during the week of 8/19/02 to coordinate the start up of this system. This system will be a major asset to ASD Installation Planning. Efforts must be made to integrate delivery point information and partner lab subsystem assembly operation schedules with this new tool.

Accelerator Physics

AP group members are preparing ten papers for presentation at the LINAC Conference in Korea.

Ten AP group members have begun "Operator Training" in preparation for front-end commissioning in November.

S. Danilov has completed a module for the ORBIT beam dynamics code, which simulates a feedback system in the ring.

Database tables and global coordinates are being prepared for the linac, transport lines and ring. The database tables in preparation include all beamline devices and power supplies. The global coordinate update includes a number of small changes to the layout, which have occurred in the last year.

The AP group is working with the Mechanical Engineering group to specify and design a beam-limiting aperture and a pair of horizontal scrapers to be placed in the front-end.

Operations Group

DOE signed off the SNS Commissioning Program Plan

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

Continued development of the Operations Training Program

Began Sign Off process for ASD Operations Procedures Manual for ARR

Worked on Radiation Shielding issues in Front End Building

Worked on Chipmunk Procurement and placement

Continued work with XFD Target Systems on Accelerator Seismic survivability

Worked on the Management Information Systems CMMS

Met with CF on Cell Phone Repeaters for the Tunnels, Power Monitoring System, the PA system for the accelerator and the Prox Card Reader access system.

Ion Source Group

John Munro won the click-clack game. Friday afternoon he succeeded to get through the hot spare equipment protection system ladder logic program to exercise all the rungs. He can simulate in the ladder logic by flipping bits what an operator using the EPICS control screen will do. The relays for turning on the various power and voltage supplies to the ion source all click and clack and the status lights on the blue box corners go on. This shows the wiring to the Flex I/O modules to be finally correct.

Sonali Shukla showed her poster at the SNS and ORNL poster session reporting on the great job she did for us this summer. She left on Thursday to continue her studies at UT.

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

Martin Stockli lectured on the ion source /LEBT as a part of the operator training program. All participants successfully passed by correctly answering at least 8 of the 10 questions. The presentation is available on Pueblo U:\Stockli\presentations\Ion-BBQ.ppt

Mechanical Group

This week we have focused on getting the Front-End ac wiring, water, and air connections underway. The temporary control room was brought in and assembled including the workstations. FER01B was installed in the Blue Box. Tubes were installed in the rebuncher power supplies FER20-25. We have been vacuum checking and pumping on individual cryo pumps on the RFQ to get them ready for operation. Diagnostics has teamed up with RF to fix their cables to the BCM's and BPM's. The Ion Source Group brought out and installed an ion source in the LEBT chamber to allow water connections and electrical leads to be routed.

Design modifications to the two drift tube mount concepts that were selected last week (the collet and the bridge designs) are in progress. Hardware will be available next week and testing will be done as soon as the hardware is available.

Several special tools have been designed and fabricated to smooth and polish sealing surfaces on the copper plated tanks. Initial testing indicates that these tools polish surfaces faster and more uniformly than if it is done by hand. These tools are now being used on DTL tanks 1 and 3.

The Drift Tube Fabrication Recovery Group reported their preliminary finding to ADS during a conference call on Friday, Aug. 9. The group found that the primary cause of drift tube leaks was porosity in the EB welds that was exposed after much of the weld material was machined away. Rewelding of this porous joint appears to be a feasible fix but the technique must be developed. LANL is developing a detail plan for repairing the drift tubes and will begin discussions with ASD next week.

Magnet Systems

We have tested all DTL Tank 3 Drift Tube Quads. HEBT Dipole #6 is on the measurement stand being tested. HEBT 12Q45 SN004 is on the measurement stand. It has a water leak on a fitting that is on a jumper that connects two coils. We are repairing the leak. Buss #8 has been completed and work started on Buss #9, the last one.

Vacuum Systems

Leak testing of DTL-3 DT's continued with twenty-six DT's having now been tested, including seven of which that have been retested. No leaking DT were identified this week including three suspect units that were retested. A further potentially suspect unit was identified and will be retested next week. The test tank to allow testing of the larger DT has been commissioned and is now being used for testing of the DT's.

The curved test plate to allow the leak testing of individual ports on the DTL tank was received. End covers to allow the testing of each DTL tank section are being fabricated.

SNS QA has completed inspection of all the O-ring seal grooves of DTL-3. A preliminary review of the measurements has been made which would indicate that generally the O-ring grooves are deeper and narrower than recommended by O-ring manufacturers. This has resulted in an evaluation of O-ring squeeze and fill volume being undertaken to assess potential sealing problems. It has also been determined from manufacturing inspection reports that the O-ring groove dimensions were generally in tolerance following machining, and it is suspected that changes in dimensions are due to plating.

Accelerator equipment received this week included 2 turbo pump carts and 8 RGA's for the DTL.

RF Group

The past couple of weeks saw the RF group preparing to move more transmitter and HVCM equipment on site and the installation team preparing the RFQ, DTL 1 & 2 area for Transmitter cable installation and termination. Additional cable tray was added to minimize cable runs and tray rated equipment interconnecting cable is being pulled. Two klystron water-metering skirts remain to be final positioned, they are on site. Come MONDAY all cable should have been pulled and equipment positioned. LANL HPRF people arrive Monday morning and

afternoon, 4 in all and are scheduled to leave on Friday. They are to LEAD the cable terminating effort and will be assisted by our people. The plan is to completely wire 3 transmitter, RFQ, DTL 1 & 2 and if time permits start wiring the RF shop. We will complete the wiring of the RFQ, DTL1 & 2 transmitters next week.

Rack Row 3 HVCM Equipment Control Rack (ECR) in the Klystron Gallery was installed this week. Installation of the SCR Control Head units in the first 3 ECRs was completed and wired this week (requiring some modifications to the vendor documentation). Installation of Rectifier Transformers for the CCL and RF Building converter/modulators continued this week. Dedicated RF cable tray, which incorporates a solid bottom to minimize EMI and RFI, was installed in the RFQ / DTL1 / DTL2 section. Equipment for 402.5 and 805 MHz high power testing was installed in the CHL/RF Building this week (see attached photograph). Detailed waveguide layout, modification of RF electrical panel schedules, and the grounding scheme were ongoing for the CHL/RF Building this week.



Champion visited LANL on 7/31 - 8/01 and met with Mike Lynch and the LLRF development team to assess the status of the LLRF control system. I filed a trip report with ASD management on 8/06.

The weekly videoconference on the September test of the LLRF control system at JLab was held on Wednesday, 8/07, with participants from ASD, LANL and JLab. We continue to work toward a start date of 9/03, which allows for 3 weeks of testing prior to the ASAC review.

The capacitor bank in the RF Test Stand at JLab will be upgraded from 8 to 12 microfarads to reduce the voltage sag during the 1.3 ms pulse. This upgrade should begin next week. We agreed to retest the operation of the crowbar system after completing the upgrade. We will ship the spark gap and trigger unit to JLab on 8/12 to support this test.

Electrical Systems Group

Hardware for intra rack electrical distribution has been installed in row 1&2

Rack row 3 has been completed

Additional cable trays for RF group have been added and completed for RFQ, DTL1&2.

Paul Holik visited LANL 7/31 - 8/1/02 to discuss Systems Integration Plans and wiring for the D-Plate Diagnostic package.

Tom Owens and Eddie Tapp visited BNL 7/30 - 8/1/-02 to witness operation of the ring RF amplifier first article acceptance test.

The Electrical Systems Group reviewed the bids for the SCL quadrupole power supplies and sent our recommendations to LANL.

The Electrical Systems Group reviewed the ring dipole power supply and ring medium power supply procurements and made recommendations on spares and testing options.

The Electrical Systems group met with Conventional Facilities engineers to discuss the cost of recent facility change orders.

Cable trays and ac and technical wiring were installed in preparation for the LANL installation team for the RF transmitters in the klystron gallery.

Additional stripping foils were sent to BNL for testing. These foils were grown using a microwave source rather than hot filament and should have higher purity.

Survey and Alignment Group

Cryogenics Group

The manufacturer of the cold box (PROQUIP) has informed us that shipment of the cold box will be some time in the middle of September. This is another 2-week slip to the schedule. Final setting of the compressors is still help up pending installation of the exhaust fan ductwork.

The installation of the warm gas piping is continuing and we have completed the installation of the warm gas headers at the "T" section of the tunnel. (Photo). WE anticipate the setting of the supply "T" section of the transfer line on Monday.

Assembly of 2 more supply modules, S-HB10/HB11 and S-HB14/HB15 is completed and ready for installation. Assembly of return module R-HB5/HB4 is completed and module R-MB6/MB7 will be completed on Tuesday 8/13/02.

The 5th technician for the Cryomodule assembly at Jlab has been hired and will report to work at Oak Ridge on September 16, 2002.

Beam Diagnostics

BNL SNS Beam Diagnostics Progress Report:

General: Design review meeting notes have been compiled and consolidated. A Diagnostics BNL web site is under construction. The 1998 version of the ring Design Manual is under revision.

1.5.7.1 BPM: Discussions of BPM impedance matching with Craig Deibele are underway, and Craig is visiting BNL next week. Modal impedances have been derived for the BPM pick-ups in preparation for Craig's visit. A spec for the base-band BPM electronics is underway.

1.5.7.2 IPM: Nothing to report

1.5.7.3 BLM: Work continues with the detector vendors to acquire information regarding manufacturing and purchasing. We are writing a plan to test detectors in an X-Ray field to study shielding techniques. JLAB has been approached for these tests.

We have received several Keithley components for the detector and electronics ATE. These have been checked functionally and interfaced with Labview.

1.5.7.4 BCM: Testing of the second artwork circuit board rev uncovered one minor artwork error (schematic error). This is to an unused connector pin that is readily repaired. Initial testing of the analog circuits show improved noise performance in all areas of the board. The 10MHz and 40MHz "punch thru" from the PCI board was no longer observed on this rev. The wideband buffered output appears "clean" for both channels, as does the output signal buffer. Detailed documented measurements will follow. Most of the functions of the gain control circuitry have been checked. Digital data has been transferred to the PC and processed. As per suggestions of the design review

committee, the BCM Calibrator design is under review to include special features to assure safe operating conditions for the transformers during calibrator failures.

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: Parts have been designed and fabricated to try out a new wire attachment method. The Huntington feed through is being upgraded (adding encoders, brakes and replacing bellows). Parts have been ordered to get ready for WS reassembly. ORNL has been contacted to obtain a beam box for the WS assembly work.

1.5.7.6b Laser Wire Scanner: Nothing to report

LANL SNS Beam Diagnostics Progress Report:

Mike Plum is on vacation. ORNL and LANL had a videoconference on the D-plate progress. Interface among groups were discussed. Mike Plum sent one SCL BPM prototype and a current transformer to Saeed for testing.

ORNL SNS Beam Diagnostics Progress Report:

Dave Purcell is testing NADs manufactured by different vendors. He also is in the process of automating the Cable Verification Test (CVT) based on TDR-Labview. All data will be stored in the Oracle Database. Meanwhile, Craig with the support of RF technicians has fixed/modified the MEBT diagnostic cable terminations (Type-N connectors). After the fixes, all MEBT BPMs and BCM cables are certified to be good now.

We are in the process of setting up a laser room at the RATS. Safety interlock and the door warning lights are ordered. We have transferred the MEBT laser wire to our lab to investigate the reproducibility of the actuators. The SCL laser system design is coming along very well. We expect to have the laser vacuum beam-box design and the first optics box design completed this coming week.

David Rodgers from LBNL is collaborating with Carl Lionberger from controls and Saeed to provide achievable data from LBNL neutron detectors. He has offered to make his system EPICS compatible. We are grateful to Rod Keller to setup this collaboration. ORNL-ASD management has approved the diagnostic group's request to have INR manufacture the neutron detectors. A visiting scientist from INR (Sasha Zhukov) will be giving an ASD seminar on his neutron production calculations of D-plate and the SHIELD code on Aug-13-2002.

Phone conferences were held to clarify packaging of the embedded timing module. For LANL diagnostics, it was determined that a short, half-height PCI card with coax connectors for the trigger signals will be produced. For BNL's use, an internal connector will be added. Signaling on this connector will be compatible with National Instruments' triggering bus (RTSI). Packaging for the CardBus version has been selected and includes a 68-pin I/O connector. Signaling on this connector has been designed to allow the use of off-the-shelf cables and breakout modules. An internal design review was held with the participation of controls group staff. Craig Swanson will attend to a few minor action items and hopes to have the first card in house by early September.