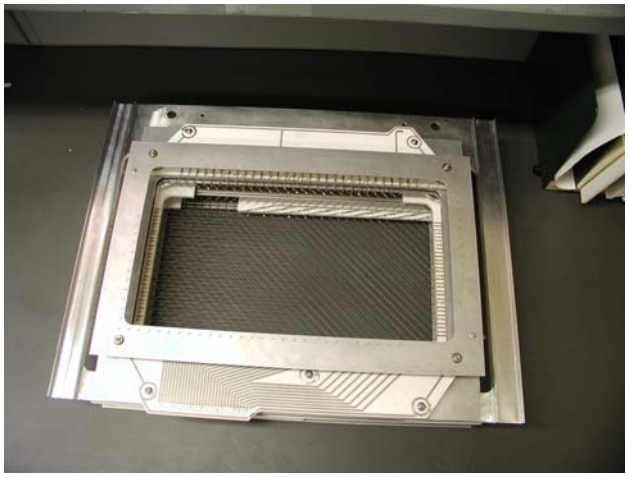
Accelerator Systems Division Highlights Ending July 23, 2004

ASD/LANL: Warm Linac

All technical work has been stopped at LANL pending resolution of performance issues. The item reported this week actually occurred last week but was unreported because of vacation schedules.

HIGH-POWER RF (WBS 1.4.1.1)
All work has been suspended in accordance with Laboratory directives.

DIAGNOSTICS (WBS 1.4.5.2)
All work has been suspended in accordance with Laboratory directives. We completed assembly of the SNS Target Harp last week. We are awaiting confirmation from ORNL on the required cable length before soldering on the signal wires. Otherwise the harp is complete. The parts went together well and the assembly "feels" very solid; no sliding or rattling. See below.



Fully assembled SNS Target Harp

ASD/JLAB: Cold Linac

Assembly of the H-7 string is complete, using an FPC that arced at the end of high power processing, but has since been cleaned up. The string has been evacuated, which revealed a small leak at a HOM probe feedthrough. The leak is being repaired.

Assembly of the H-6 string is on or somewhat ahead of schedule.

ASD/BNL: Ring

FY04 BA - all new requisitions and change orders are being approved on a case-by-case basis as funding permits.

Half-cell #31 is fully assembled. The ship date is Tuesday, July 27.

Half-cell #32 (our last half-cell) is in final survey. The planned ship date is early August.

The first production PFN has been shipped by air ride truck from BNL to SNS/OR. Included with this shipment are:
1. PFN assembly; weight ~1700 lb.
2. Termination resistor disk pack; weight ~210 lb.
3. Five power racks.
4. Trigger module.
5. PFN casters.
6. Miscellaneous parts, including plumbing parts.

7. Two boxes of RF cavity parts.
8. Four RTBT wire scanner vacuum chambers
9. Vacuum bellows assemblies.
ETA at Oak Ridge was 7/21/04.

High voltage modulators (extraction PFN) #8 and 9 are being tested by our vendor, Applied Power Systems. These units will be direct shipped to SNS/OR by August 3rd. Only five more to go!

BNL's vacuum engineer, Michael Mapes, traveled to SNS/OR this week to assist with an in-situ repair of a vacuum leak on the "A4" half-cell chamber. Congratulations to ASD technical staff on the successful repair!

Rudy Damm was at BNL this week to review various Project activities and discuss RTBT/Target design and interface issues.

We have been informed by our vendor (Alpha Magnetics) that their steel contractor (Bay Cast) is having difficulty producing some of the steel required for the lower return and pole piece for the extraction Lambertson septum magnet. Bay Cast is planning a "sample pour" to confirm mechanical integrity (no voids) and final chemistry.

Charlie Pearson sent electronic copies of his RTBT radiation hardened quadrupole/corrector assembly layout to ASD for initial comments. A video conference review is scheduled for 7/26.

Drawings for the IPM internal electrode plates have been checked and will be released for ordering next week.

Field trim blocks have been defined for chicane #1 and the injection dump septum magnets.

Chicane #4: the modified vacuum chamber has been sent back to the Shops for repair (vacuum leak).

Vacuum group continues with TiN coating of diagnostic equipment (bellows, adaptors, etc.) for the RF straight section.

Controls

Installation

Craft Snapshot 7/20/04

ASD productive craft workers	**64.0**
Foremen (Pd by 15% OH)	5.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	72.0
Less WBS 1.9, 1.2 etc	**11.0**
Less absent	**0.0**
TOTAL PD BY ASD/ORNL DB WPs	**53.0**

Accelerator Physics

Operations

Operations is running nights and weekends when possible. Staffing the Control Room during the day shift.

RF Processing

Processing DTL-4, 5, 6 and CCL 1, 2 Reprocessing DTL 1, 2, 3. In KW:
DTL 1- 522
DTL 2- 1321
DTL 3- 2014
DTL 4- 1856
DTL 5- 600
DTL 6- 650

CCL 1- 650
CCL 2 -210
CCL 3- Begin Friday Night

PPS Systems

Two incidents of people pushing the Emergency button on the HEBT Gate door and bypassing controlled access. Both were around 08:00. This is a clear, deliberate violation of access procedure.

Scheduling for the SCL

Maintaining the Detailed schedule
Developing a high level schedule for CHL Turn-on, Transfer line cool-down and SCL RF processing including reviews, ODH installation /certification etc.

Preparing for the ARR

Video Conference presentations on Thursday August 19
On site visit and report writing Tuesday-Thursday August 24-26 with a close out
On Thursday from 11:00-12:00
Must present information on Cryo Hazard and Safety for the DTL-CCL enclosure

Working on the DataStream implementation, CF is now ahead of ASD. We need to work to rectify this situation

Working with Controls and CF on issues related to control and monitoring of CF equipment and SNS utility use from the Control Room.

Ion Source

Doug Moehs from FNAL visited to test the SNS ion source as a possible solution for their proposed new injector. Triggered by the SNS timing system, an external pulse generator provided pulses to generate up to 3.2 ms long beam pulses at 5 Hz. The 80 kW RF amplifier did not allow us to operate with the desired 10 Hz due to an equipment safety interlock that could be easily modified. The desired 10 mA were achieved by reducing the RF to very low levels. The lower plasma density appeared to change the meniscus in such a way that the beam in lens 1 was rather small, rending lens 1 ineffective. Accordingly the beam was large in lens 2 likely to cause the observed aberration. We also took measurements at 55 kV to counteract this problem. Measuring the emittance we discovered inverted signals of less than 1% of the maximum beam passing through the entrance slit. The inverted signals appear in the range of 40 to 80 mrad away from the beam core. This questions the validity of the emittance measurements and we have initiated modifications that should eliminate the problem.

In the early wee hours of Friday, a solenoid of a HV safety relay inside the ion source hot spare stand over heated and caused a spark or vice versa. In any case the relay failure triggered the fail safe interlock system that automatically shut down the RF and the HV supplies, and the Hydrogen gas. Alerted by the spark and by the smell, the chief operator on duty notified the ion source staff. As a redundant measure the ion source staff instructed the CO to press the emergency shutdown button and to switch off all circuit breakers following the posted emergency shutdown procedure. The relay was replaced and operation resumed around Friday noon.

Survey and Alignment

In the CCL, we have completed alignment of seven of twelve quad magnets for CCL3 and CCL4. Possibly we will complete them all today,

Our HEBT re-alignment campaign is progressing well. We have completed HEBT Dipole Alignment through DH18 and the majority of the flange mapping throughout that area.

Survey & Alignment is again in the process of updating our drawing and data base. Our FE data now includes ideal coordinates for the newly installed and aligned D_Box.

We are also reviewing a new list of 1056 linac and ring coordinates for diagnostic equipment. With respect to the linac tunnel, there appears to be a significant disconnect between the physic's data base and the actual placement of equipment. As a result, a request has been made by the Diagnostics group for us to map the "asbuilt" location for these coordinates.

We have optically set two 21Q40 magnets to enable Magnet Measurement to perform the actual mapping.

We have also fiducialized two additional 8Q35s.

In our endeavors to produce the best data possible, we conducted a one day experiment with our optical bar code levels. The experiment between the five lighting systems for the bar-code level rods revealed that the new lighting systems tested do not work as well as the systems we already use. In fact, the two methods that position the light source at the base of the rod produce results which are both imprecise and biased. The bias may be due to the presence of 'microshadows' produced by slightly raised paint stripes on the face of the invar scale.

S&A is continuing to arranging the as-built chopper cavity (located in the Target monolith) measurements into a usable and understandable format for the beam line engineers and scientists. These measurements will provide a guide for the instrument engineers and scientists when designing components for their respective beam lines.

Engineer from S & A attended a core vessel insert pre-installation meeting hosted by Caddell-Blaine. Representatives from both Target and Instrument Groups also attended this meeting. An overview of each group's responsibilities were outlined in the meeting. Survey and Alignment will verify the relative position of the core vessel inserts once they have been installed. Core vessel installation will begin Monday, July 26th.

Our upcoming priorities are as follows:

Complete all FE/DTL/CCL activities that require our services. These include

- Align five CCL magnets that have not been made available to us as of today. They include the three CCL1/BSM magnets, and two magnets on CCL4.
- D-Box Final Mapping. A request has been made by the Diagnostics Group form one final mapping of the newly installed D-Box.
- Map BLMs & ND's.

Support Target/Instrument related activities

Continue HEBT Re-alignment

Elevation run through entire Linac. Our current floor elevation data for most of the Linac is from February 2004. This information will be needed for the upcoming SCL alignment scheduled in August.

SCL alignment

CCL Magnet Verification?? Not an easy job (Two 12 hour days required to complete this task utilizing four engineers/technicians)

Mechanical Group

The RFQ on the Front End System was readied and has begun to be conditioned by the operations staff.

DTLs 1 through 4 have reached their conditioning goals of full power at 1 ms and 10 Hz.

While there were a few delays in processing DTLs 5 and 6 they have resumed conditioning and this will continue through the weekend.

We continue to refine the RCCS water skids and tank connections to remove any signs of leaks and to make them more user friendly. This is turning out to be an ongoing process but one that will benefit us greatly in the future.

CCL-3 is ready for conditioning which may begin this weekend.

Ten of eleven CCL-4 magnets have been installed. Power supply testing is planned for next week
.
The final piping configuration of the magnet cooling system has been installed and is operational.

Ring Systems Installation

- The vacuum leak in the RING arc Half-Cell #A4 was successfully repaired and leak tested. The A arc will be reassembled next week and pumped down.
- A shipment of 4 RTBT beamline diagnostic wire scanner chambers was received.
- Installation of the laser-stripping system in the HEBT was started.
- Installation of vacuum and diagnostic cables into the HEBT tunnel continued.
- The RTBT to Target interface section of the tunnel was painted by the AE/CM.
- The final backfill was placed over the RTBT tunnel.

Water Systems Installation

- Installation of the piping to the CCL4 klystron RF equipment was completed, leak tested, and turned over to the RF group.
- Installation of the SCL QMCS header piping continued.
- Installation of the piping to the RF equipment on 2nd half of SCL-ME5 continued.
- Installation of the piping to the RF equipment on 2nd half of SCL-ME6 continued.
- The jumper line between the QMCS manifold and the CCL4 magnet manifold has been completed and the system is operational.

Magnet Task

We have all but one CCL intersegment installed that being #47. This one is assembled but will have to have its beam tube straightened. This will happen next week and then we will install it into the CCL.

We have two SRF 8Q35's mapped and ready for assembly into the first warm section raft.

Four 21Q40's have been mapped. The spread among the four is 0.16% with three falling within 0.1%. These measurements are now consistent with measurements of 21Q40's at BNL.

Electrical Group

We have repaired the problems with DTL modulator ME-1 and CCL modulator ME-2. These modulators, along with DTL modulators ME-2 and 3 and CCL modulators ME-1 and 3 have been turned over to operations in support of cavity commissioning.

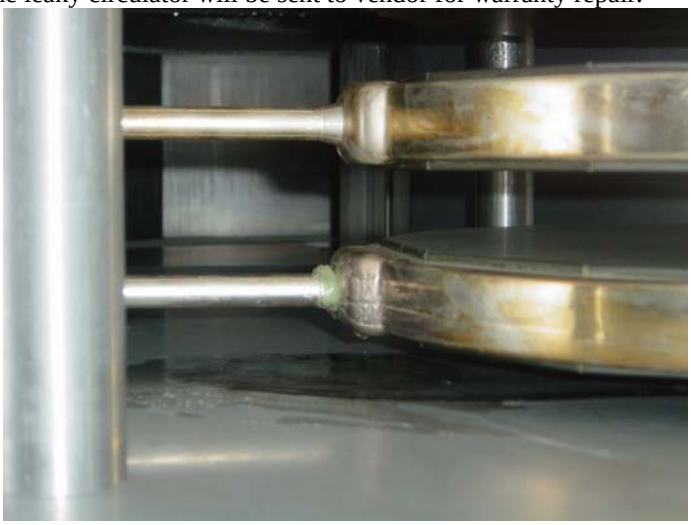
The RFTF modulator was repaired over the weekend with the aid of the Dynapower factory engineer. It is appears that the design of the printed circuit board to send signals to fire the SCRs is not perfect. Some fixes were made specifically for the low power output needed for this testing unit. A new design circuit board for all units may be needed.

Extraction Kicker power supply number 7 (of 15) has arrived from BNL.

All warm linac DB electrician work is complete. Next week, 30 electricians will be working in the SCL area and 10 electricians in the HEBT area in support of upcoming SCL cavity testing and Beam Tests.

HPRF

Excessive reflected power on the DTL5 RF Station was traced to an internal leak in the 2.5 MW circulator. The 2200 lb. circulator was replaced and the TCU control software was optimized. The system was successfully tested up to full power into a waveguide short. The DTL5 RF Station has been turned over to the Operations Group for structure conditioning. The leaky circulator will be sent to vendor for warranty repair.



The CCL3 RF Station was calibrated and turned over to Operations for structure conditioning. Ops now have all NC RF stations through CCL3. Completion of the CCL4 klystron lead shielding remains before the standard check-out procedures can begin.

A ground plane was installed tying the MEBT amplifier units to the building RF ground. Preliminary testing showed four (of six) amplifiers available for operation. One spare is running at half power and will be checked on Monday.

SCL klystron HV tank preparation continues.

LLRF

Operations: We continue to support RF conditioning of RFQ, DTL and CCL in preparation for the upcoming beam commissioning run. All of the necessary LLRF control systems have been signed over to Operations.

Installation: Installation activities are focused on SCL ME-1 and ME-2. Field Control Modules for ME-2 are being prepared in the lab and will be installed next week.

Procurements: We received the final shipment of Analog Front End daughter cards from GMW/Bergoz. A purchase requisition was issued for an additional 20 Digital Front End daughter cards.

Reference System: The reference line pressure system was changed over from a stand-alone pressurization unit to a system that is based on facility air. Thanks to Jim Shubert and Mike Morrow.

Ring RF: We received two boxes of Ring RF Cavity parts from BNL. Chip Piller will spend next week at BNL working with Kevin Smith on the Ring LLRF system.

JLab Test Stand Equipment: We received the remainder of the equipment that had been installed at JLab nearly two years ago to support LLRF testing in the Cryomodule Test Facility. No further tests are planned at JLab.

Cryo-Group

Work continues on items for transfer line cooldown on 8/11. Warm compressor oil modifications are underway, and fabrication of jumpers for the transfer line was started. Air Liquide has been pursuing two separate paths for 2K coldbox feedthroughs. They informed us this week that both styles had failed testing. The SNS-developed style feedthrough, shown below, has passed electrical and temperature tests. The first shipment of these is expected next week.

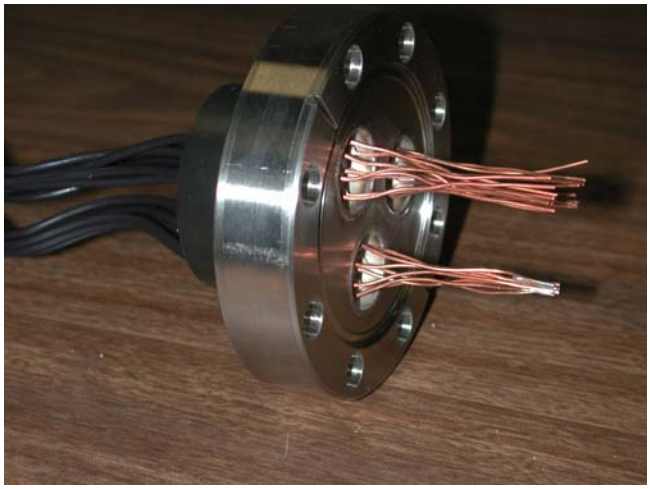


Photo of alternative feedthrough, consisting of three 8-pin connectors

Beam Diagnostics

BPM: The RF distribution chassis required for initial testing are now available. End to end testing will begin next week by sending simulated reference signals through the fiber system and measuring the spectrum at the copper output.

BLM: Installation of BLMs (ion chambers and fast neutron detectors) is nearly complete in DTL and CCL. All required electronics modules have now been received from BNL. Cable installation in SCL continues.

BCM: A draft task list for the complete BCM system has been prepared and circulated for comment. The cost basis and summary of responsibilities has been sent to BNL for comment. We will use this to prepare a PCR that will finalize the BCM production plan.

Wire Scanners: The wire scanners will be evaluated next week to attempt to increase the reliability of the wire holder. If all else fails, a switch to a larger wire is being considered. This would necessitate a change in wire material as we are now using the largest available carbon fiber. Mike Plum is evaluating the expected SEM signal and peak temperature of a 100 micron Tungsten wire.

Faraday Cups: The 6 faraday cups will be repaired and leak checked well in time for installation. Installation will begin when the first modified wire scanners are ready in about one week.

BSM: The third and final BSM is being prepared. Installation in the CCL is planned for this coming Tuesday.

Timing: Production boards are being fabricated after one fix was communicated to the vendor. They are now due early next week. The RTDL gate array code has been loaded and initial testing shows that it is functioning well. Testing and debugging of the additional event link channels continues.

D-box: The emittance amplifier and signal interface chassis have been wired. Actuators for the emittance slits have been installed. The faraday cup/beam stop has been assembled. Rack modifications will begin next week.

Racks: All equipment has been removed from DTL rack row 7 to finalize the installation. The Fiber chassis was moved to the front, power strips were installed and wired into the electrical system, and an imaged PC was installed to support timing.

Misc: Three candidates for the engineering position were interviewed. Our offer was accepted for the technician position with a tentative start date of either August 16th or 23rd. The RSS for the diagnostics group was prepared.

Faraday Cup repair is under way. Bill has disassembled the actuators and three are sent to VTI for modifications.

One channel version of the timing card has been successfully tested. Next, the low level driver and LabVIEW drivers will be written. We expect to have one completed system to go to testing by July-29-2004. --This is on critical path for testing.

D-box is on schedule.

Third BSMs will be installed in the tunnel on Tuesday July-27-04.

DTL, CCL BLMs [software, hardware and the detectors are ready for final testing]. [On track]

All PCs are ready with a exception of the BSM, one Faraday Cup, and CCL Beam Stop.[On track]

The BPM reference line needs to go to testing on Monday July-26th-04. -- Hardware preparation was on critical path. Andy worked on the Rack preparation on Saturday July-24th. [Will be ready by testing time at 2:00 PM on Monday]

Wire scanner repair is on-hold due to LANL stand-down and late travel plans for Steve Armijo. Plan-B is to get help from Randy on overtime. This is on critical path

150 Hours of Klystron Gallery work is needed to get ready for September run. [2 person, two weeks]

MEBT laser transport-line installation will begin on Monday July-26th.

We expect to populate all WS, BPM and BCM PCs with the latest LabVIEW applications by July-30th.