

Accelerator Systems Division Highlights Ending October 29, 2004

ASD/JLAB: Cold Linac

The first cavity is qualified for the H-12 string.

The H-10 string is leak-tight.

Assembly of the H-8 cryomodule was completed.

ASD/BNL: Ring

At the request of ASD's Julius Fazekas and Joe Error, the Laser Tracker survey equipment that is on loan at BNL is being packaged for return to Oak Ridge. (Apparently, an equipment malfunction at ORNL made this request necessary.) The SNS/OR owned Laser Tracker is used here at BNL for individual magnet assemblies, magnet measurements, injection mock-up assembly and alignment of diagnostics. Reverting to alternative methods, such as optical or ManCAT, will require some lead time for changeover. The current tracker configuration includes a BNL computer that was installed to replace the second failed Leica computer. Loan transfer paperwork for the BNL computer is being handled by BNL's Frank Karl.

Extraction Lambertson Septum Magnet - report from Alpha Magnetics:

- The vacuum chamber will be returned from plating within a week and the last flange will then be welded on.
- The bottom return plate and pole are being set-up for finish machining. They are the last two magnet core parts to be machined.
- The first coil has been wound and is ready for the epoxy mold. The potting mold is almost finished; we should be potting the first coil next week.
- The second coil is being wound now.
- Current estimate for trial assembly/fit of core and coil is mid November.

Chopped beam: Craig Dawson distributed screen shots of chopped beam during testing at ORNL this week using base-band electronics. Craig reported that the results have been very good and have been posted on the E-log by Mike Plumb (see attached).

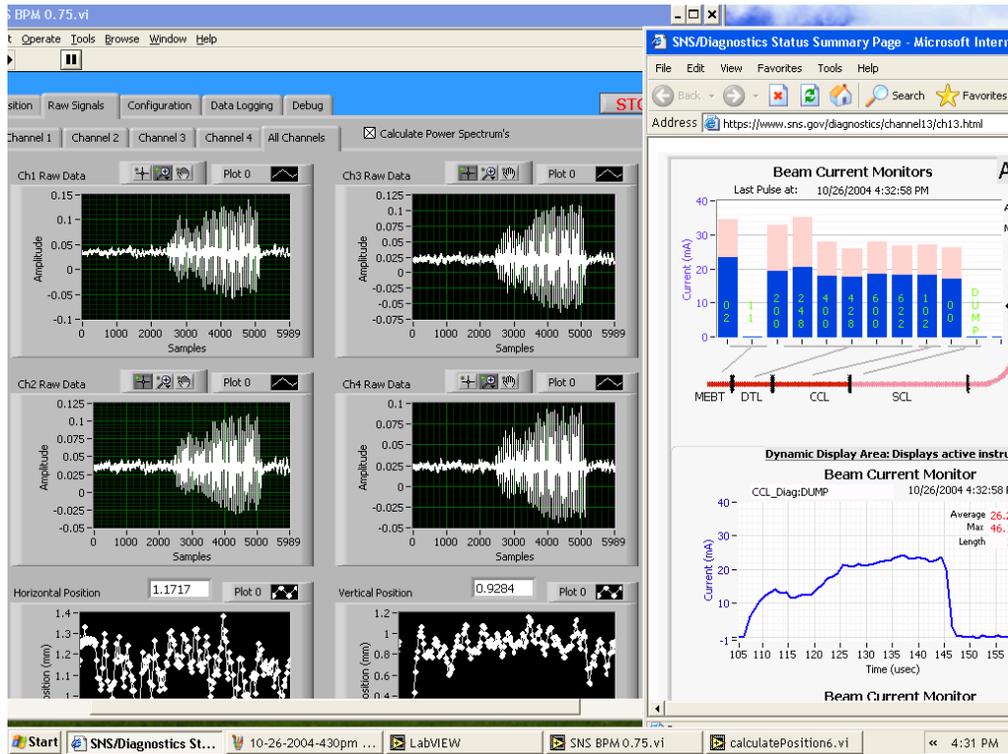
A producibility/cost savings review was conducted on the permanent outer shielding for the primary collimator. Minor design changes will be incorporated before the design package is released for vendor quotations.

Bench testing commenced on the HEBT foil drive mechanisms. In addition to numerous mechanical cycles, each assembly is being checked for vacuum leaks, serial ID, travelers, etc. In parallel, techs had a chance to power the thick stripping foil drive assembly, which has been cycled ~40 times. Work is underway on the assembly of two (2) nineteen inch electronic racks.

Base blocks have been rigged into place to support the 36Q85 magnets during magnetic measurements by Peter Wanderer. Water hoses have been fitted on the first magnet and hydro test is complete; mag is now ready for delivery to test station in building 902. The other three quads will follow closely behind.

Transitions, flanges and adaptors have been welded onto the two IPM chambers. The chambers are being cleaned prior to coating.

The next shipping container is being packed for delivery to SNS/OR. Included will be RF equipment, vacuum components and the #2 long injection kicker magnet.



Controls

Installation

Craft Snapshot 10/19/04

ASD productive craft workers	60.0
Foremen (Pd by 15% OH)	5.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	68.0
Less WBS 1.9, 1.2 etc	5.0
Less absent	2.0
TOTAL PD BY ASD/ORNL DB WPs	53.0

Accelerator Physics

Commissioning of the warm linac was completed this week. After the implementation of adaptive feedforward in the low-level RF control system, phase and amplitude stability in the presence of beam surpassed design requirements. This enabled more refined RF setpoints to be obtained at peak currents of 35 mA. The setpoints were retuned using BPM phase scans and the Delta-T technique in the CCL. A large quantity of beam data was accumulated and is now being analyzed. The most critical relates to the transverse dynamics in the linac, understanding the matching at MEBT/DTL and DTL/CCL interfaces and the growth of emittance and halo. After a 1-2 week shutdown, the linac will be operated again for an operability run, with occasional beam measurements being performed

We generated the global coordinates for the steering magnets in the RTBT beam line. Previously we only had coordinates for the quadrupole magnets. Next up is the global coordinates for the HEBT steering magnets.

Model calculations of beam loss in the ring and RTBT for the case of on-axis injection show just 0.06% beam loss, to be compared to the nominal beam loss of about 0.10%. On-axis injection is a mode that should be automatically protected against. Our primary signal to prevent this mode will be the loss monitor system. Although the beam loss in most parts of the ring will be small, as shown by these model calculations, in the vicinity of the stripper foil the signal will be substantially larger due to the greater number of foil hits (up to 20 times larger).

Tests of the prototype baseband BPM system for the ring using chopped beam during the present DTL-CCL commissioning period showed a good signal from the circuit, with about 0.5 mm resolution (on a CCL BPM) with no obvious contamination from the 402.5 MHz background.

Operations

A summary of Tanks 4-6 and CCL Modules 1-3 is as follows:

After a number of initial problems, we have accomplished most of the goals in the Beam Commissioning Plan. We have commissioned the accelerator structures, finding the correct cavity amplitude, phase, steering and focusing settings. We have also commissioned additional diagnostic equipment including the Bunch Shape Monitors and the MEBT Emittance Measurement system.

We have made significant progress in the development and deployment of Accelerator Physics Application codes for dynamic beam measurement and setpoint determination. This includes the Delta T measurement system and the On-Line Beam Model. We are developing these and other tools necessary to rapidly commission the SCL with its 81 individual cavities.

We commissioned and are operating with the new Low Level RF Field Control Modules, which are a significant improvement over the previous generation of LLRF control. We are currently implementing the adaptive feed-forward feature of this module which will allow for operation with 38mA of peak current.

We have begun the process of automating the turn on and ramp up of the High Power RF systems which will be critical when we have 81 SCL klystrons in addition to the 11 warm linac klystrons.

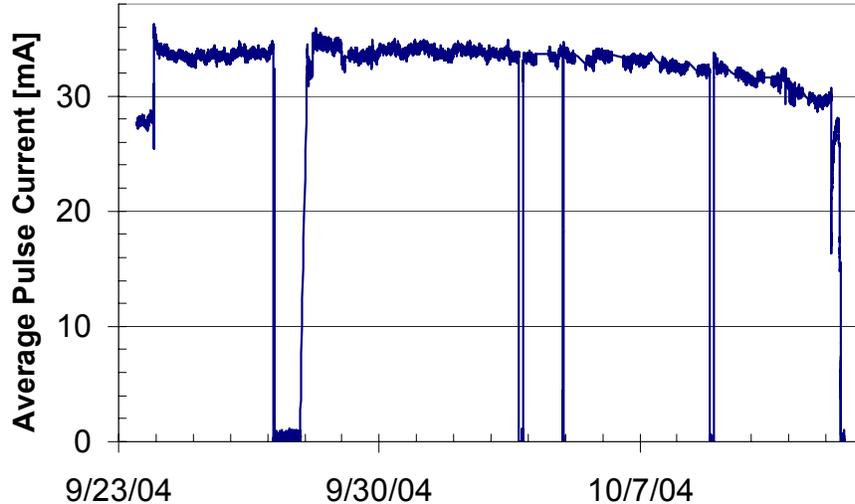
When difficulties were encountered we applied temporary fixes, found a technical workaround or applied permanent fixes.

We plan to operate beyond the end of the physics beam commissioning period

Ion Source

Together with diagnostics we took another snapshot of the source RF noise problem. The 13.56 MHz remains of little concern because its noise level is 100 times smaller than the highest 2 MHz noise level found on BCM248. The 2MHz noise level on BCM200 dropped by a factor of 5. The 2 MHz noise on BCM02 increased 1000 fold but is still 50 smaller than BCM248. This may be induced by a beam modulation because previous measurements were taken without beam. The question that keeps arising is why is BCM02 showing so little noise despite being the closest to the source? The complete table is posted in the e-log.

Our last run has been analyzed based on 22,941 archived beam current measurements. Of the over 19 days only 27 hours were lost due to only 4 trips. The output current exceeded 30 mA for 16.3 days.



Survey and Alignment

Mechanical

Water Systems Installation

- Installation of the DI piping to SCL-ME7 continued.
- The installation of the DTL and CCL DI auto-fill tie-in continued this week.
- The HEFT SB power supply cooling system checkout was started.
- Installation continued on the RING SB power supply cooling system upgrade
- Installation started on the HEFT tunnel magnet cooling system.

Ring Systems Installation

- The final alignment of the HEFT arc Dipole magnet chambers and 21Q40 magnets continues.
- The HEFT magnet stands for 12Q45 units #31, 32, 33 and 34 were grouted.
- The RING Primary Collimator Mounting Plate was painted and installed.
- A vacuum leak was found on a bellows flange joint on RING Injection Kicker Magnet and its repair is in process.
- The installation of the magnet cables on arc C was started.
- The RTBT magnet stands for 21Q40 units #11, 12, 13 were grouted

Magnet Task

This week we have moved to the CLO and re-established measurement of the 8Q35's. We checked the system by mapping our reference dipole and mapping two previously mapped Quads. All is well with this system.

We are also setting up the 21Q system in preparation for mapping RTBT Quads.

And, there has been much attention devoted to warm section equipment and installation.

Electrical Group

HPRF

Supported Beam Operations for RFQ through CCL3.

CCL4 RF Station: Calibrated the klystron output forward power up to 4.4 MW within +/- 1%

SCL-ME3: Completed terminations and HV tanks preparation. Ready for AC Power.

RF Systems: Tested the EPICS automated RF start-up and shut-down sequence with good results; code is still being refined.

RF TF: Cryo-coupler testing interrupted by control card failure. Unit returned to JLAB for repair.

Tom Hardek gave a presentation to the RF technicians on the purpose and structure of the Ring RF System.

Miscellaneous: All RF Group lifting equipment has been tested and certified by the ORNL Lift Authority.

Worked on obtaining cable to finish control wiring in RSB.

Verified we have necessary connectors on hand for Ring RF system.

LLRF

Cryo Group

Found and solved problem with magnetic bearing power amplifier board (2KCold Box)

2KCBox installation will be completed next week

22 Utubes to go

Beam Diagnostics

BPM:

A data acquisition program was written to support LLRF and Diagnostics. After the RF group confirmed stable operation, a correlated data set was acquired that contained waveforms from LLRF and BPM systems. This will be used to understand the phase control and measurement performance within the pulse.

Loss monitors:

Installation of loss monitor electronics in SCL row 15 has begun. Work on the middle tier software continues. The fast BLMs are now available on Channel 13 and as expected, appear to be very sensitive. Ion chamber performance has been examined in the DTL and CCL. They appear to be immune to the X-rays in this area.

D-Box:

The emittance scanner received updated software and is working well. System documentation is being prepared. The microchannel plate for the laser system will be removed and examined during the upcoming maintenance period.

Wires

Usage statistics were collected from all wire scanners and are shown in the plot.

