

Accelerator Systems Division Highlights Ending November 5, 2004

ASD/JLAB: Cold Linac

ASD/BNL: Ring

Power Supplies - Bob Lambiase and Ken Rust were at IE Power this week to witness 1st article acceptance testing of the last two production models (UD1300A95V & UD1405A390V). In his last e-mail report, Bob stated: "The 1300A, 95V has been tested, and will be shipped next week. The 1405A, 390V is now undergoing a heat run and will be shipped the following week, and at least four more 900A, 51V units are in test, and will be shipped by the week after that." See attached photos.

A design review update of the 36Q85 magnet assembly was conducted today by telecom between principal parties at ASD and BNL. The purpose of the meeting was to review and confirm the recent exchange of technical information and updates.

The first 36Q85 magnet has been delivered to Peter Wanderer (mag measure test station). Magnet connections (power, water, interlocks and instrumentation) are now being made. See attached photo.

Magnet stand "foot print" drawings (used for installation) for the Injection kicker magnets were completed this week and are being prepared for electronic transfer to ASD.

Shipping crates are being built for three Injection magnets and two stands. The magnets are chicane #1, the injection septum magnet and the injection septum spare. The equipment will be shipped to SNS/OR on or about November 16.

The next enclosed shipping container is being packed for delivery to SNS/OR. It will include RF equipment, vacuum components and the #2 long injection kicker magnet. It too will depart the week of November 16.

Jim Rank traveled to Pioneer Steel and Iverson Industries this week for a pre-production review of the 17D224 magnet core (RTBT bend magnet). Jim reported that the meeting was informative and productive for all parties.

We have been advised by ASD that the Ring primary collimator was received at Oak Ridge this week and has been set in final position on its support stand. Our contract with SDMS is now complete and final payments have been authorized.

Mike Hemmer is working to confirm global coordinates of the HEBT/Injection foils for the SNS Lattice drawing.

Charlie Pearson has provided distances from the 36Q85s to the rad hard correctors (see below). Upon agreement (Plum, Raparia, Hemmer) these positions will be included in the new coordinate listing:

- The center of a 36CDR30 corrector is located 39.625 inches downstream of Q28
- The center of a 36CDR30 corrector is located 39.625 inches downstream of Q30.

Extraction Lambertson Magnet – Alpha Magnetics reported that their sub-contractor is having difficulty with the Ni plating of the inside surface of the circulating beam tube vacuum chamber. Flaking has been observed at the stainless steel to carbon steel interface. The issue is being addressed by Jim Rank and Joe Tuozzolo.

The Laser Tracker that was on loan to the BNL Survey Group has been returned to Oak Ridge.

Vacuum Systems

- Fabrication of the HEBT drift pipes (downstream of the 30cm dump quadrupole) is underway at BNL Shops.
- The extraction doublet vacuum chambers (d/s) are assembled and ready for welding.
- Mounting brackets for ring arc gate valves are being fabricated by BNL Shops.
- An order has been placed for heating jackets for the extraction kicker chambers.

- Extraction kicker modules #9 has been coated (#9/14). Module #10 is being set-up for coating.
- The HEBT vacuum control software has been finished and released into CVS. The control software for Ring and RTBT vacuum is under way. Work on HEBT PLC terminal block layout and wiring documentation is in progress.
- RTBT - All 21cm drift pipes have been assembled. They will be vacuum degassed then leak checked before delivery to Oak Ridge.

Foils – The first two test samples of rigidized carbon foils were received this week from Fiber Materials Inc. (FMI). We will discuss their final production process at our teleconference next Wednesday.

Revision #2 to the Ring Diagnostics Production Plan is complete and ready for review and signatures (next week).

Talks are being prepared for the upcoming DOE Review.

Controls

The Central Control Room (CCR) design continues to evolve. A meeting was held with DCS on the CCR consoles. DCS is designing and fabricating a prototype console section, and may be assigned the task of fabricating the rest of the consoles once the design is finalized. Most of the detailed design issues have been worked out at this point. An AC power distribution plan drawing is nearly completed. Communication cabling system design and installation are also nearly completed. A design workshop will be held next week and design review will be a week after that.

The "Ring Foils and Scrapers Functional System Design (FSD)" document was updated to include latest information.

MPS-related activities continue. MPS configuration tables were updated to include warm linac RF status inputs. An MPS mobile test stand was finished. Old versions of MPS Chassis are being replaced with new fiber MPS Chassis in the CCL beam stop MPS chain. Problems with wiring on MEBT Rebuncher Trip Readbacks were corrected.

Preparations are being made for the first field test of EPICS software for SCL magnets. Timing hardware was installed in the first SCL power supply IOC in preparation for this test.

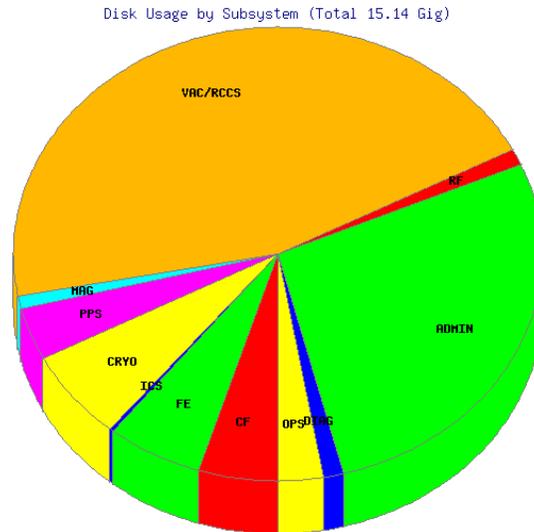
Preliminary checks of the SCL vacuum systems for MB-3 through MB-8 have been completed. Ion pumps and cold cathode gauges for cryomodules MB-3 through MB-8 are now connected to the control racks and are being monitored through EPICS.

Roll-off activities continue at BNL. The BLM development laboratory has been disassembled in preparation for delivering the last of the BLM IOCs. This freed up 3 SNS electronic cabinets which have been sent to ORNL. 6 desktop computers have been identified which can be sent to ORNL at any time they are desired. All 6 computers are older models and may not be particularly useful.

Hardware development activities continued this week. Design of the LEBT Chopper controller is in progress. Research continues on possible solutions for the communication link of the new LEBT Chopper controller design. (Possibilities include: use of NanoEngine single board computers and use of Digi Connect ME modules). The existing LLRF Doolittle NanoEngine board is being investigated as an interim prototype platform for the LEBT Chopper Controller. This option would include some of the ADC channel fault feedback functionality.

Computer system administrative activities included the following:

- A holding area was created on the archive server for transient data (~400GB). Archive data older than Oct 1, 2004 was then moved to this transient data area. This allows us to manage that data much more efficiently. E.g. we can move this data at our leisure with little or no effect on the archiver processes.
- We can now show disk usage on the archive server graphically by subsystem in pie chart form:



Checkout/startup of the cryogenic control systems continue. Checkout of the interfaces among the CHL 2.1 K Cold Box PLC, Magnetic Bearing Cabinets, and Variable Frequency Drives (VFD) was completed. Several problems were uncovered and corrected. These included:

- Failed amplifier board in the magnetic bearing cabinet #2.
- All spare boards did not function properly.
- Bad relay sockets in VFDs 3 and 1.
- Incorrect programming in all VFDs
- Normal start-up changes in the PLC logic.

All start-up and testing activities were done in accordance with the JHA for the 2.1 K cold box controls. The picture below shows the proper attire for LOTO verification of the VFD cabinets.



Installation

Craft Snapshot 11/03/04

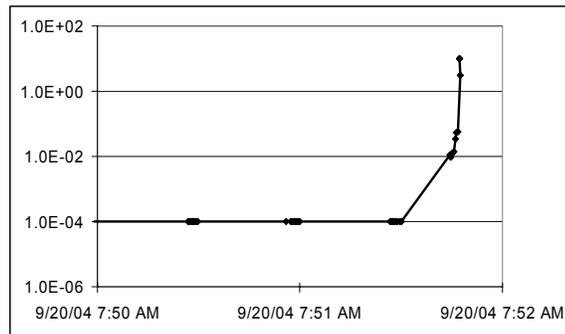
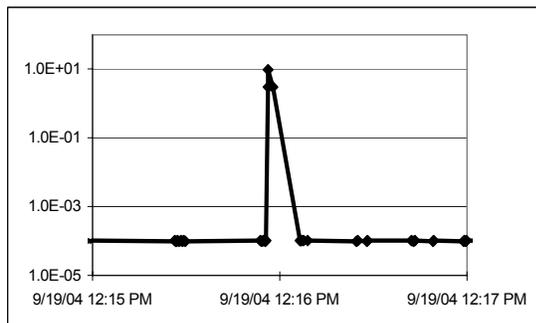
ASD productive craft workers	60.0
Foremen (Pd by 15% OH)	5.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	68.0
Less WBS 1.9, 1.2 etc	6.0
Less absent	0.0
TOTAL PD BY ASD/ORNL DB WPs	54.0

Accelerator Physics

Operations

Ion Source

We have analyzed archived data to obtain insights into the problems that ended with discovering a water leak in the cooled electron target mounted on the extractor. There was some concern that a prolonged water leak may have contributed to the RFQ problems that started around this time. On September 19, 2004, 12:15 PM, all source HV supplies tripped, while a LEBT vacuum excursion was noted. The archived pressure data show only 3 records with an excessive pressure in the Torr range, as one can see in the left figure. Within 11 seconds the pressure recovered to exactly the previous value (all 5 digits). The hydrogen flow did not change. Reaching 10 Torr in less than 0.7 seconds would require a leak in excess of 6 standard liters per second. This would slow down, if not destruct, the turbo pumps. A pump down of 9 orders of magnitude in 10.8 second is impossible. Therefore we concluded that no water-leak developed on September 19.



The pressure stayed the same until 7:51 AM of September 20, 2004, when the water leak developed. As one can see in the right figure, the pressure reached 10 Torr in less than 17, but more than 3 seconds. The high pressure shut of the systems and closed the vacuum valves. Therefore we concluded that the RFQ problems that were noted on September 19, 2004, were definitely not caused by the LEBT water leak.

Survey and Alignment

RTBT: S & A has received new information which has allowed for the calculated global positions for more additional components. This week we completed floor bolt hole layouts for the RTBT Collimators, magnet RTBT_QH01 AND RTBT QV02. We have now completed the layout of 26 RTBT Magnets. We are also performing the validation of the RTBT steering magnet locations. Next scheduled RTBT deformation monitoring is next week. Settlement for October, places the low point (RTBT/Target Interface) at about 7.00 inches.

RING: Our work this week has been focused on the RF upstream straight section where we have identified the locations of all upstream RF equipment. Calculations are also underway for the installation of injection equipment.

HEBT alignment is continuing. This week we completed the re-alignment of the HEBT dipoles and to 21Q40 assemblies. HEBT dipole vacuum chamber alignment is not yet complete. S & A also re-aligned the laser pipe in the HEBT/LINAC area leading to the LINAC dump.

We have moved the laser tracker from the instrument floor to the CLO to begin measuring 8Q35's on Monday the 8th.

S&A aligned medium beta cryomodules MB09 and MB10 located in slots MB09 and MB10. Eight out of eleven medium beta cryomodules have been aligned.

The outer reflector plug as-built data (10/28 – 10/29) was analyzed, sorted into a useful format and distributed to the appropriate personnel.

Mechanical

The past week has been a maintenance period for all systems on the Front End and Warm Linac.

- All RCCS water systems were drained to allow for the addition of a new fill system will greatly reduce filling time and increase safety and convenience. Bottles used for polishing the water systems have been checked, replaced, or added if missing.
- Vacuum pumps on the MEBT system which were waiting a longer down time are being evaluated and possibly replaced.
- Many small items on the Front End such as flow meter and pressure sensor repairs were initiated.
- We have regenerated all cryo and NEG pumping systems in preparation for restarting activities.
- Restart of water and subsequently the RF systems is currently planned for early next week.

Water Systems Installation

- Installation of the DI piping to SCL-ME7 continued.
- The installation of the DTL DI auto-fill tie-in was started this week.
- The installation of the CCL DI auto-fill tie-in was completed this week.
- The N2 blanket system piping was added to all RCCS & QMCS systems.
- The HEBT SB power supply cooling system checkout was checked out and larger flow valves have been ordered.
- Installation of the RING SB power supply cooling system upgrade continued.
- Installation of the HEBT tunnel magnet cooling system continued.
- An extensive amount of maintenance was performed this week involving cleaning of filters and strainers, calibrations and replacement of the 3-way trim valve on the DTL3 RCCS cart.

Ring Systems Installation

- The HEBT magnet stands for 12Q45 units #31, 32, 33 and 34 grout forms were removed and the area cleaned.
- The HEBT beamline drift pipe was installed between magnets #31 and #32.
- The HEBT diagnostic installation continued.
- The RING RF straight section diagnostic mounting holes were surveyed into position.
- The assembly of the RING RF diagnostic QMM/Kicker chambers was started.
- The RING Primary Collimator was received and installed in position.
- The installation of the magnet cables on RING arc C continued.
- The RTBT magnet stands for 21Q40 units #11, 12, 13 grout forms were removed and the area cleaned.
- The RTBT collimator baseplate mounting holes were surveyed into position.

Magnet Task

Electrical Group

Ken Rust visited IE Power to witness the last 2 first article medium power supplies acceptance tests (1300A, 95V and 1405A, 390V). Both supplies passed their acceptance tests and will be shipped in the next 2 weeks along with 6 other production units.

We received the final 3 (of 14) extraction kicker power supplies, completing the order. One additional unit, a spare, is at BNL to perform kicker magnet test and will be shipped here next month.

We are installing corrector power supplies in the Ring Service Building. All of the corrector power supplies for this building should be installed by next week.

Testing of SCL ME4 will commence next week. The installation of SCL ME-5 has started.

Linac Klystron Gallery:

Diagnostic and vacuum cable pulls in SCL ME-4 area.

AC wiring and RF cabling in the SCL ME-5 area.

Rack installation and cable trays in the SCL ME-6 area.

Linac Tunnel:

Cable Terminations on HB1 and HB2

Ring:

Started Magnet terminations

HPRF

We took advantage of the maintenance week to install a 5 gpm constant-flow valve across each RFQ klystron Body-1 and Body-2 cooling circuit. This boosted the flow into an accurate range for the flow meter and ensured we have protection in case of a blockage in klystron internal water passages. Three other klystrons among the DTL RF stations are candidates for this procedure on their Body-2 circuits and will be modified later during downtime.

MEBT: A mis-wired cable connector was discovered that explained erroneous EPICS indicators on the MEBT indicator screens.

Modified the PLC code on ten RF stations to correct misleading Solid State Amplifier status messages to Operations.

CCL4 RF: Work proceeded in the tunnel to bring the waveguide to the CCL4 structure windows. We expect to be ready for differential phase measurements to the two CCL RF ports early next week.

SCL ME3 RF: AC power is now available to the transmitters. Two klystrons/magnet assemblies with slow water leaks will be replaced early next week. At that point, full system checkouts can begin.

RFTF: Cryo-coupler processing resumed after a repaired LabVIEW VXI control chassis was returned from JLAB.

The RFTF was reorganized to make room for Cryo warm-section staging and preparation. We are moving ready spares to a room in the klystron gallery.

Ring RF

- Resolved a control cable availability issue and have the cable on-the-way.
- Working on resolving a High Voltage cable availability issue.
- Electrical work on hold until cable is in hand.
- Planning a Brookhaven visit next week

LLRF

MEBT Upgrade: The upgrade of the MEBT Rebuncher LLRF control system began this week and will be completed by Nov 19 at the latest. This upgrade consists of replacing the 1st generation LLRF control chassis with the 3rd generation Field Control Module and related equipment. Subsequent to this upgrade, all linac RF stations will use the same hardware, firmware and software for LLRF control.

Installation: Our primary focus is the completion of SCL ME-3. Work is also in progress in SCL ME-4 and in the SCL tunnel.

Cryo Group

Beam Diagnostics

BPM:

DTL BPM 308 were found to be swapped inside the PC. Removed the PC and corrected the problem. The problem of the Cal RF and the LO RF being swapped on CCL BPM 411 was also corrected. The cables were swapped at the back of the RF Distribution chassis.

Loss monitors:

An inventory of BLM components was performed. A very cost effective quote was received for the ICS digitizers required to complete the system. We are working with controls on this procurement since the budget is in WBS 1.9. A first version of middle server for BLM has been deployed. Viktor changed AFE chassis for DTL, CCL and the system was re-tested. Also we had a discussion with INR about a connector problem on the new neutron detectors.

BCM:

A differential amplifier has been constructed. It is part of the noise mitigation efforts. The cables for BCM02 in MEBT have been replaced to assure that the shield remains isolated from the adjacent magnet.

Software/Configuration

A data logging utility is available to that allows set up of experiments through a diagnostics PV browser with a drag and drop interface. A screenshot is shown.

Pvs	BEAM ON	Condition	Value	Timestamp	Ch	Status
DTL_Diag:IOC_Time01:Event00_Rb		Do Not Delete	36.000000	11316434507	0	x
SCL_Diag:BCM00:currentAvg	%		0.444529	11318716911	1	x
CCL_Diag:BCM102:currentAvg	%		0.000000	11318468441	2	x
MEBT_Diag:BCM02:currentAvg	>2		30.106169	11318177361	3	x
MEBT_Diag:BCM11:currentAvg	%		29.554494	11318177361	4	x
DTL_Diag:BCM22:currentAvg	%		0.000000	11318702353	5	x
DTL_Diag:BCM40:currentAvg	%		0.000000	11318712287	6	x
DTL_Diag:BCM428:currentAvg	%		0.000000	11318677385	7	x
DTL_Diag:BCM400:currentAvg	%		0.218998	11318677344	8	x
DTL_Diag:BCM200:currentAvg	%		28.546120	11318177361	9	x
DTL_Diag:BCM248:currentAvg	%		28.593600	11318177361	10	x
MEBT_Diag:BCM02:currentMax	%		35.120112	11318177361	11	x
MEBT_Diag:BCM11:currentMax	%		33.553642	11318177361	12	x
DTL_Diag:BCM400:currentMax	< .9 >.8		0.880007	11318677344	13	x
DTL_Diag:BCM200:currentMax	%		33.419122	11318177361	14	x
DTL_Diag:BCM248:currentMax	%		33.494750	11318177361	15	x

We held a meeting to discuss the requirements for our supervisory servers. An introductory meeting was also held with Steve Miller in XFD to compare requirements and plans for experimental data acquisition, analysis, and retrieval. The diagnostic EDM screens have been updated along with the operation screens that look at ours. A VI has been completed that looks at the PC motherboard statistics. Work on the Notes/Activity log for equipment has begun. This information will be integrated with the device information in the global database. A QA process of our base software images has begun and will merge disparate versions into one maintainable image.