Accelerator Systems Division Highlights for the Week Ending July 26, 2002

ASD/LANL: Warm Linac

We completed the 96-hour heat run of the third Marconi 402.5-MHz, 2.5-MW klystron. This tube met the full power and efficiency specifications. WBS 1.4.1.1)

With the full power klystron from Marconi, we completed testing of three of the 402.5 MHz high power loads. (WBS 1.4.1.1)

CPI completed a full dry run of the acceptance test of the first 805-MHz, 550-kW klystron. The actual acceptance test is scheduled for next week. (WBS 1.4.1.1)

We have reconfigured our RF test area in preparation for a full week of high power testing next week of the 402.5 MHz circulators. Representatives from AFT will be here to witness and help with those tests (since they have no high power test capability at AFT). (WBS 1.4.1.1)

Klystron transmitter S/N 9 was delivered at ORNL. (WBS 1.4.1.1)

We have been testing the most recent model of Eupec IGBT's and have seen relatively poor results. Eupec IGBT's have 60% higher losses than Mitsubishi's. Eupec IGBT's generate significantly higher switching noise (3dB) also. (WBS 1.4.1.2)

As promised at the May DOE review, we had an independent consultant (Bill North) on-site to review our overall HVCM system design. He offered some suggestions for improvement, which we will consider within the constraints of the current schedule. Overall, he felt this was an "impressive design". (WBS 1.4.1.2)

We held a HVCM utility modeling teleconference call with ORNL ASD and CF. Some items were clarified. CF has decided to use higher capacitance direct burial cable, and not to include infrastructure at this time for series connected 13.8 kV bus components (*e.g.*, inductors). (WBS 1.4.1.2)

LANL and ASD send personnel to Dynapower this week to review and support production converter modulators. (WBS 1.4.1.2)

The LLRF schedule has been updated. We estimate a one-day slip in the delivery of the SC LLRF system to JLab. The delay is driven by additional time needed for FRCM integration testing which was increased from 16 hours to 40 hours. The SC LLRF schedule had previously been driven by the completion of DSP software but is now being driven by the completion of FRCM. The NC LLRF schedule is still being driven by DSP software. (WBS 1.4.1.3)

We have 2 assembled LLRF RF boards in house. We had some initial manufacturing problems that have been solved. (WBS 1.4.1.3)

In the LLRF FRCM, an interface problem was uncovered with the second DSP board. This requires both hardware and PLD code modifications. (WBS 1.4.1.3)

We have two LLRF CDM's completed. (WBS 1.4.1.3)

We now have two LLRF HPM's completed. (WBS 1.4.1.3)

The cabling interface between the LLRF system and the JLAB facility has been identified for the installation at JLab. (WBS 1.4.1.3)

We delivered documentation on the LLRF FRCM Register Definitions for all of the FRCM registers. There are the Cavity Channel Registers, the Beam Channel Registers, the Resonance DSP Registers, the Forward Channel Registers, the Reflected Channel Registers, the Control DSP Registers, and finally the VXI and Control Status

Registers. This information was released to provide timely information for the collaboration. Eventually it will be an appendix in the RF Control System Definition/Description book. (WBS 1.4.1.3)

All of the DTL drift tubes are currently on hold due to fabrication and vacuum related concerns. (WBS 1.4.2.3) The new delivery date for the DTL Tank 3 drive iris is mid August. The delivery date for the Tank 1 drive iris is early September. (WBS 1.4.2.2)

The delivery date for the DTL Tank 2 support stand is mid August. (WBS 1.4.2.6)

The Tank 3 post couplers are expected to be finished by mid August. However, we may delay shipping due priority issues associated with the drift tubes. (WBS 1.4.2.2)

We have now performed a vacuum test on 16 of the Tank 1 drift tubes. Of those, 6 have failed our vacuum test. Four of those six failed at an elevated helium pressure. (WBS 1.4.2.3)

This physics team conducted a study on the risk of beam scraping in case of relaxed misalignment tolerance of the DTL quads was completed. (WBS 1.4.5.3)

LANL workers at ORNL this week include Joe Bradley (high-power RF installation).

LANL visitors at ORNL next week include T. Ilg (DTL stiffening prototype tests).

LANL SNS Division Operations Officer, Scotty Jones, disseminated information from his recent visit to ORNL. Specifically, he reviewed the initial ES&H briefing on facility specific ES&H issues from the respective ORNL Group Leader and/or ES&H personnel, and additional facility specific training when required, such as lock out / tag out and fork lift operation. We will provide guidelines to each LANL employee traveling to ORNL. Also, as they become available, we will provide ORNL training materials as well as other important materials for advance review by the traveler (for example the ORNL-SNS Lock out /tag out procedure). (WBS 1.4.6.7)

ASD/JLAB: Cold Linac

High power pulsed testing of the prototype cryomodule was interrupted by an apparent failure of the circulator, leading to high reflected power trips of the klystron. Investigation revealed that the real cause of the problem was the failure of a load resistor in the directional coupler, causing spurious high-level signals. This problem was subsequently uncovered in several other directional couplers. Additional load resistors are being acquired, but enough could be scavenged from other couplers in the system to allow operations to resume. The first test confirmed the 21 MV/m quench limit of cavity #3.

CHL end can bayonets, end can cooldown valves, miscellaneous water valves and other parts have been shipped to SNS.

ASD/BNL: Ring

Final bids for the Ring high field power supply have been received and are being evaluated.

An RFQ for the extraction PFN package is on the street; vendor bids are due back by mid August.

Two first article injection kicker magnets and their associated power supply are being set-up in Bldg. 902 for system testing.

21Q40 (60) – six units arrived at BNL and are undergoing initial QA inspections. We now have seventeen of these magnets in house.

30Q58 first article: QA inspections are complete and the magnet has been surveyed into the test stand for acceptance testing.

An order has been placed with New England Techni-Coil for the Chicane (#2 & #3) and dump septum magnets.

Bids on the 27CD30 magnet are due to be opened later today.

Bill Birkholz traveled to Alpha Magnetics this week to inspect their first article 41CDM30 corrector magnet and review the production work plans for the 21S26 (12) high field sextupoles.

Our Diagnostics Group participated in a Design Review of Diagnostic Systems via videoconference on July 23, 24 and 25.

Power supply and circuit configurations were finalized based on ASD's thin window design for the linac dump window.

Contingency Risk Analysis – efforts are underway to identify potential contingency needs for WBS 1.5, Ring Systems.

Our Physics Group is working with ASD to develop a "magnet check list" that will be used for acceptance of individual magnets by assuring that all tests, inspections, travelers, documentation and QA are complete and on hand before being shipped from BNL.

Parameter List Configuration Control – our Physics/Engineering Groups continue to work with ASD to provide configuration control of magnet and power supply parameters. Efforts are underway to produce a signed data sheet for each element. Parameter changes will be controlled by BNL's "ECN" authorization / documentation process.

Design Manual for WBS 1.5 – a web link has been provided to the outline page of the newly proposed design manual. You can access it by going to http://sns.bnl.gov/.

The work package for the RTBT 17D244 (bending magnet) is being prepared for review.

Controls

This week we were able to demonstrate to Conventional Facilities management the first operating IOC on the site - viewed remotely from 701 Scarboro. Loop testing of CF Controls for the Front End building was completed. Archiving is operational, as evidenced by the attached plot of FE Building air handler exhaust flow.

The Title II 60% Design Review of the Communication Backbone design package was completed.

RF control system development continued at LANL:
* LLRF HPM "Rev B" interrupt tests were conducted with and without the V124S decoder module
* LLRF FRCM I/Q to Phase/Amplitude conversions were tested
* HPRF: Supported a 96-hour heat run by checking if IOCs were up, archiver was running, etc.
* Continuing documentation for EPICS RF software

An EPICS-based arbitrary waveform generator, required for the JLAB RF test stand, was made functional.

Timing system progress included the addition of the first stage of arbitrary rep-rate support to V124S decoder module software.

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The award for the design/ build contract for PPS phase I (LINAC segment) PLC equipment was awarded to Sverdrup Technology in Tullahoma (the same organization involved with CF and target control designs. A kickoff meeting was held this week. This contract will provide all of the PLC equipment needed for the LINAC PPS.

The development phase of the PLC B Phase 0 (Front End and DTL tank 1) program is complete. We have started programming the "gold code" for PLC B. This code is based on the development code but is developed much more rigorously and will involve extensive testing during implementation.

We have agreed with the RF group on the salient features for the PPS RF transmitter control and have developed a prototype "PPS box" to install in the transmitter. The design will be complete next week. This will complete the design for all of the PPS interfaces for controlled devices in the front end and LINAC.

The last remaining issues with the Power Supply Interface module firmware have finally been resolved. Previous versions did not always power up in the correct state, and took a long time to complete the calibration sequence. New PSI firmware has been delivered, and has undergone significant testing without error. The process of refitting PSI modules with this final firmware is underway.

Front-End Installation

Rack FER02 was installed into the Big Blue Box.

FER03 transformers were wired.

Utility connections were made to the Ion Source.

A preliminary vacuum leak check was performed on the IS/LEBT, and no leaks were found.

Cable routing continued between the racks and technical equipment.

The last section of cable tray was installed over the RFQ.

All chassis were installed in FER02.

MEBT magnet cable pulls were completed.

Accelerator Physics

Operations Group

The Commissioning Program Plan Submitted to DOE for signature, our second and final pre-ARR commissioning document

We concluded the FSAD for Linac Closeout last Friday with a face to face meeting with DOE to clear up points of discussion

ASD Operations participated in the SPEAR III Review at SLAC

Assisted with the roll-out of the new version of the Equipment Tracking System and did some one-on-one training

Worked on electrical safety LOTO issues in the Front End and Klystron buildings

Began the hiring process for 2 Chief Accelerator Operators

Ion Source Group

On Monday, July 15, Sonali Shukla and Robert Welton operated the start-up ion source with the capacitive matcher at 34 kW RF power with a full 6% duty cycle for the entire day.

The inductive matcher and the ion source cage have been installed. RF testing has started and continues.

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

The results of the PIXE analysis of the RFQ smear samples have been obtained. The samples were taken by RSS after the discoloration found in the first RFQ module raised concerns. The analyzed smear sample contains 95% Cu, 2% Fe, 0.6% Cr, and possible some Zn (0.5% +/- 0.3%) and Ca (2% +/- 2%). No Cs has been found above the detection limit of 136 ng, which corresponds to approximately 1 monolayer of Cs in a 1 cm^2 area. These results are in full agreement with John Staples account that the discoloration is an oxide layer caused by a small air-leak during the cool-down cycle in the brazing furnace.

Mechanical Group

Magnet Systems

We have received 9 12Q45 Quads from Danfysik. We are drilling fiducial holes in each on of them. We have started field measurements on one of them.

Field measurements of three leaking DTL Quad Drift Tubes have been completed.

A purchase order for two "Laser Dipoles" has been awarded. This design went fairly fast.

Vacuum Systems

RF Group

Electrical Systems Group

Survey and Alignment Group

The S & A Group is in the process of extending the global survey network through the ring. We have completed an initial traverse and have identified a significant number of monument locations for coring/installation.

Still in the process of verifying the coordinate location of the target base plate. Further during this week we have attended a number of meetings in support of upcoming target activities including placement of the bulk shield liner. We also gave an alignment/measurement presentation for the Target/Instrument Group.

Ongoing magnet fiducialization, primarily HEBT Dipoles and Quads. Measured vacuum chambers for HEBT Dipoles. Additionally, strengthened control network in DTL area.

Cryogenics Group

Beam Diagnostics

LANL Beam Diagnostics Progress Report:

BPM pickups: Two new (repaired) DTL BPMs are now at Coronado and ready for our testing. Parts for three more were sent to ISYS 24/Jul. The CCL and SCL prototypes should be finished 29/Jul. The second 4-inch BPM for the D-plate will be shipped to ISYS for welding. Work began this week on the assembly drawing for the CCL-style BPM and beam box in the CCL to SCL transition region. Fabrication is complete on the parts needed to mount the SCL BPM in the mapper.

BPM electronics: John Power had a very productive visit with Bergoz last week. Detailed solutions were worked out for improvements to the analog front end (AFE) for the calibration pulse bleed through, rise time, and amplitude; and for the LO bleed through. There will be some NRE charges for this modification, and the new AFE's will cost a bit more.

WS actuators: Fabrication continues at Huntington on the prototype and D-plate actuators. The new shipping date for the prototypes is 9/Aug. A BNL WS design review was held 23/Jul. LANL personnel attended and presented via video link.

WS electronics: Fabrication continues on the positive HV bias daughter cards. Wynn Christensen will take over responsibility for the wire scanner electronics from Chris Rose, who will leave soon to go back to graduate school.

ED/FC: A design modification is in progress to increase the cooling tube wall thickness to 0.028".

D-plate: Fabrication continues on the D-plate mechanical systems. The third D-plate interface video conference was held 22/Jul. One outcome was the identification of specific people at both ORNL and LANL to be responsible for the water, vacuum, controls, cabling, alignment, and magnet power, .

Cabling: The DTL-3 diagnostics cable drawing was modified to send the BPM cables through conduit N in chase LC-DTL5. We will share this conduit with LLRF.

BNL had a successful final design review of their systems. Their presentations is/will be available via the diagnostic web page.

ORNL SNS Beam Diagnostics Progress Report:

Dave Thomson has completed coding and initial testing of the windows shared memory DLL and Epics device support for the shared memory dll. This will initially be
used on a windows PC or smart oscilloscope to pass data between a Lab View
program and Epics. The this approach is intended to have better performance
and increased flexibility over the Active X object that it is replacing. This software will be turned over to diagnostics folks today for testing. Still planned for implementation are performance diagnostics for the Epics device support routines, wav- form output capability in the IOC device support, and a means to pass events from Epics to Lab View. Joanna is done with her summer project and Nick is the next this week. Dave and Wim are working on the ESEPS performance besides participating in the BNL final design review. Craig is at school plus the usual RF tuning work and Laser wire detection engineering. Over all, we have done very well.