

Accelerator Systems Division Highlights for the Week Ending October 12, 2001

ASD/LBNL: Front End Systems

A wiring mistake was discovered in the Blue-Box and identified as the probable cause for most of the glitches reported a week earlier. This defect is now fixed, and the commissioning continues. Ion Source #3 and the LEBT diagnostics box with Faraday cup and two-channel emittance device is mounted at the exit of the LEBT tank.

The RFQ bead pull measurements are in their last phase, checking on the effects that insertion of the power-coupler loops might cause.

The conditioning speed for the RFQ coupler windows is still slow, and we are improving the vacuum system on the conditioning stand. A fact-finding meeting with outside experts has been called for next Monday, Oct. 15.

The fully assembled MEBT raft #3 was fiducialized on a Coordinate-Measurement Machine; the distribution of residual positional errors of all beamline elements is excellent, and the raft was mounted again on the MEBT support stand.

We submitted the Work Packages for FY 2002 to the SNS Project Office.

M. Hechler and P. Gibson of ASD visited the FES for three days and discussed details of the front-end installation-plan.

Preparations for the DOE Review have begun with coordination for a specific Front-End Subcommittee breakout session and discussions of the ASD Parallel Session talks on FE subsystems and Accelerator Physics issues.

ASD/LANL: Warm Linac

Jim Stovall visited Marconi Applied Technologies in England last week. The first 402-MHz klystron has been pulsed conditioned to 130 kV, 38 A, 1.5 msec, 23 Hz (3.5% duty factor, full operating voltage and current). The pulse width is 125% that needed on SNS; this give some confidence that high-voltage breakdown will not be a problem. Marconi is working towards 60 Hz. (WBS 1.4.1.1)

JLab prototype SRF fundamental power coupler tests were suspended this week due to failures in the BMEWS klystron modulator SCR controller and unavailability of the SNS prototype high-voltage converter modulator (HVCM). They will be rescheduled shortly. (WBS 1.4.1.1)

Work on the JLab RF test stand was interrupted this week when the team was called on to rebuild three RF stations for the LANSCE accelerator. We expect them to return to the JLab test stand next week. (WBS 1.4.1.1)

An independent checker has reviewed the revised HVCM drawings for the 80-kV system that will be released as part of a modification of the RFP early next week. (WBS 1.4.1.2)

New IGBT cooling hoses installed in the prototype HVCM were found to be electrically conducting, contrary to specification. Replacement hoses are being purchased and will be installed next week. (WBS 1.4.1.2)

We completed measurements of the phase angle for a PMQ in the body of a DTL drift tube. It is found to be less than 0.2 degrees off relative to the drift tube stem, well within the 0.5-degree specification. PMQ assemblies are now being inserted into the drift tubes and soon will be welded. A vacuum test was conducted on an assembled drift tube without a stem. Outgassing measurements are in progress and we achieved 10^{-9} Torr pressure. (WBS 1.4.2.3)

The BPM drift tubes suffered a minor setback due to a vacuum leak at the feedthrough. We are now expecting to receive completed BPM drift tubes by the end of November. Assuming we can quickly map the electrical center, this should not have a large affect on the assembly of Tank 3. (WBS 1.4.2.3)

We mapped the electrical center of the EMD coils. Preliminary measurements indicate that the production coils are stronger than the earlier prototypes. In addition, the harmonics above $n=3$ are higher than the earlier prototypes. This is most likely due to a slight offset between the coil and the pole pieces. Preliminary review from the physics teams indicates that this will not be an issue. (WBS 1.4.2.3)

Two PCRs were approved at LANL this week. PCR LI 02 001 enables us to purchase IGBT spares. This PCR is awaiting SNS Project Office approval. PCR LI 02 004 reallocates BCWS and associated BCWP and ACWP for WBS 1.4.1.1.5.3 to 1.4.7.10 from LANL responsibility to ASD who control the activity. (WBS 1.4.6.1)

Blue Bentley, Kay Matsumoto, Ivan Medalen, Russ Mitchell, and Art Romero have returned to LANL ESA Division this week after successful assignments with the SNS Mechanical Engineering Group. During their tenure, they performed design and analyses for a number of systems, including cooling and vacuum systems, magnets, and SRF cryomodules. We thank them for a job well done and wish them continued success on their new assignments in support of ESA Division. (WBS 1.4.6.7)

ASD/JLAB: Cold Linac

Refrigeration: Orders have been placed for the cold box top plate, cold compressor housings and the cold box PLC.

The instrument air compressor and surge tank have been delivered to JLab.

Six piezo-electric actuators are on order, to test one of the options for dealing with the possibility of larger than expected dynamic Lorentz force detuning effects in medium- β cavities.

160 niobium disks for high- β cavities have been received.

Mechanical testing of niobium samples subjected to vacuum bakeout to remove hydrogen has revealed that material properties are more significantly affected at 800°C than was expected. The room temperature yield stress was reduced from 8000 psi to 5000 psi, and Young's modulus from 15×10^6 psi to 3.8×10^6 psi. It is speculated that high material RRR is responsible for these unexpected effects, but neither is likely to have significant negative impact on the project.

Fundamental Power Coupler Testing of the second pair of fundamental power couplers was cut short, when in spite of the best efforts of LANL staff; problems with the power supply for the RF test stand could not be rectified in the time available.

Testing of the high- β single-cell niobium cavity equipped with an HOM coupler has been successfully completed. Neither field emission nor multipactoring was observed and gradients achieved were acceptable.

Preliminary drawings of the electropolish cabinet have been received from the vendor, ahead of schedule.

The High Pressure Rinse cabinet testing has been completed and shipment from the vendor to JLab has been authorized.

First article end cans for the prototype cryomodule have been shipped from the vendor.

Work continues on infrastructure installation.

ASD/BNL: Ring

Revised the Ring ETC in accordance with the agreements made with Norbert Holtkamp during the 10/4 teleconference.

Continued work on FY02 Funding Packages and Work Statements.

The design review of extraction kicker system, originally scheduled for October 18, has been rescheduled for October 24th. We are making arrangements for a videoconference link with the Project Office.

Work was completed on the 17D120 power supply reference magnet, including installation of its Hall probe. The magnet is being made ready for shipment to SNS/OR in time for the DOE review.

The first half-cell vacuum chamber assembly was successfully leak tested and is being prepared for bake-out.

The Vacuum group is working on the final draft of the Gauge Controller specifications for the Ring vacuum systems. The RFQ should be ready by mid November.

Staff continued with their iteration of design parameters for the smaller injection kicker magnets. Power supplies for these magnets are to be ordered later this year.

Nuria Catalan Lasheras provided documentation to the Project Office outlining the history of the HEBT collimator changes as recorded, approved and implemented by PCR RI 01 022.

Our magnet vendor, Tesla, reported that their first article HEBT dipole (8D533) and ring quadrupole (21Q40) will be ready for shipment this week. All efforts are being made to get the dipole to SNS/OR in time for the DOE review.

Bases for the shorter half-cell assemblies have been released to our Shops for fabrication. (Phase-two, eight)

The design of the Ring's moveable collimator is complete. Drawings are in checking.

The contract for the 30Q44/58 Budker quadrupoles is with DOE for review and approval.

Our magnet vendor, New England Technicoil, reported that they will be shipping first article magnets (21CO26/21CS26) to BNL in two weeks.

The spec package for the Medium Range Power Supplies has been reviewed and adjusted for the 1.3 GeV option.

Ion pump controllers: two first articles have been ordered. Expected delivery is Nov. 5th.

Norbert's memo on procurement package reviews by the Project Office has been given full circulation to the BNL/SNS staff.

The "BNL Quality Assurance Assessment 2001" for the Spallation Neutron Source, prepared by Michael H. Skonicki and dated 9/21/01, has been received. In it, BNL's Quality Assurance Representative, Mel van Essendelft, earned high grades for his pro-active and effective management of this overall effort.

Controls:

Dave Thompson and Steve Hicks started work with the controls team. Dave will work on VXWorks issues, and Steve on embedded system design.

It was decided to have Sverdrup Tullahoma procure CF controls sensors and control elements.

Procurement action on the CF controls and Site Communications Backbone installation contract was kicked off, and Design Criteria for the Site Communications Backbone was completed.

Plans were developed for commissioning the Linac High Power RF System.

At Berkeley, an EPICS sequencer was developed to condition windows and/or RFQ using the 402MHz Klystron

PC software to test the Laser Wire hardware was completed at BNL. The hardware can now be installed for testing in the AGS Linac.

A test was started on the Power Supply Controllers to check that they operate properly with all 6 channels running simultaneously in software-triggered mode. After this test is completed, we will start testing the hardware-triggered mode.

In the baseline for the SNS controls for the 4.5 K Cold Box, it was assumed the vendor would provide interlocks and automatic sequences for the cold box turbines and equipment. However, the vendor does not plan to implement these interlocks and sequences and furnish them with the equipment. Instead, the vendor will provide a detailed specification for the implementation of these interlocks and sequences by SNS on SNS provided PLCs and EPICS systems. A preliminary version of the specification was received and is being evaluated. More details on these requirements are to be presented at the Final Design Review of the 4.5 K Cold Box System that is to be held at the vendor's site in Tulsa, OK next week. Once the interlocks and control algorithms are implemented, the vendor will review and approve the implementation. (We are concerned that the vendor may lack the technical expertise required to adequately review the EPICS-based automatic control algorithms.) Once the vendor approves our implementation, full warranty coverage for the equipment will be provided. Depending on the scope of the work, a PCR may be initiated to cover the additional costs for coordination, documentation, implementation, validation, and QA.

ASD/ORNL: Integration and Installation Support

DTL prototype chase insert was completed and inserted into the mock-up chase, all went well. Plan is to fab all 85 in RATS.

Received the power supply that will be tested in RATS and later shipped to J-Lab for their test stand.

Most ASD Engineers are now in RATS.

The receiving system is now operational in RATS.

Three doublewide trailers will be delivered to the site in the next couple of weeks. These will be the installation trailers for the installation team and will be located just north and west of the Front End building.

Accelerator Physics

A web based document post and retrieval system has been set up for the Accelerator System Division. This system allows external (from ORNL) document posts, and also has search capability for document retrieval. It is intended to be an easy way to gather SNS ORNL and partner lab personnel documents that may otherwise not be collected.

A list of process variables needed for accelerator physics applications has been created and circulated to the appropriate controls personnel. This list is presently being iterated.

Work is started on identifying the critical corrector elements along the accelerator, that require machine protection system control, if their failure results in unacceptable beam loss.

Work is started on collecting a full set of beam line device information, including proper names, Twiss parameters, global coordinates, aperture, and local longitudinal lattice coordinate. The devices include diagnostics, magnets, RF cavities, targets/ dumps, collimators and foils. Initially the diagnostics and their Twiss parameters are being gathered, but eventually the full set of information will be gathered, included in the global database and put in configuration control.

Operations

Ion Source Group

Paul Gibson visited together with Mike Hechler LBNL to discuss front-end installation. In addition Paul gathered more information on the Blue Box needed to install the Hot Spare Stand.

DCS is making substantial progress with the big blue box for our hot spare stand.

We updated a table with H- ion source data from other labs and started a new extended spreadsheet to gather more details of the various ion sources.

RF Group

The 100KV, 2A power supply for the Jlab test stand is in the Rats building. Installation and checkout will commence.

Hengjie Ma is at LANL working on the LLRF system and making good progress.

Summary of Lorentz Force Detuning videoconference: A videoconference on the topic of Lorentz Force Detuning was held 11 October with participants at Jlab, LANL and ORNL. Ron Sundelin gave a status report that summarizing the calculations and measurements performed to date. The main conclusion is that piezoelectric tuners will be needed on the medium beta cavities and will probably be needed on the high beta cavities. A prototype piezoelectric tuner is in development at Jlab with first bench tests expected in 8 - 10 weeks.

Cryo Transfer Line Group

Mechanical Group

Magnet Measurement Group

Eight spare Ring Dipole coils were received in the RATS building. We are preparing to perform hydrostatic checks of each coil and then freeze protect each coil prior to storage. Work continues on the 8D533, 12Q45, and CCL measurement systems.

Power Supply Group

Survey and Alignment Group

Beam Diagnostics Group

1.5.7.1 BPM:

We continue efforts to accommodate the Vacuum Group's need to fire the vacuum chamber at 400C before applying the TiN coating. ANSYS transient thermal analysis was completed, and indicates ceramic supports will probably be overstressed in the present configuration. Fabricated a test sample, which includes two SStl plates and two ceramic supports, for a bake-out evaluation test. The sample was cycled with thermocouples to 350C (the max. temperature of that particular oven), and the thermal portion of the ANSYS analysis was confirmed. However, there was no sign of damage to the ceramic supports. While this was encouraging, in the interest of assured reliability thermal shunts have been designed and are in the shops for the first article bake-out. Design of production PUEs will be modified to permit thermal expansion. The feed-through and contact must be removed during this process. A second 21cm Ring BPM was delivered to the vacuum group. Parts for a partial delivery of additional 21cm Ring BPMs have been received from shops will move to assembly and brazing. Feed-through have been received from Ceramaseal. The Ring BPM analog front-end electronics is under review.

1.5.7.2 IPM:

Efforts to quantify effect of beam loss on RHIC IPMs and compare with expected SNS losses are in progress. Magnetic field calculations continue. Preliminary layout is progressing.

1.5.7.3 BLM:

We received an aluminum Ion chamber from LND, Inc. It has been mounted in one of the RHIC BLM enclosures.

Next we will test it with the Cesium source. We will then arrange to have it installed in the accelerator enclosure to measure its response from a pulsed beam loss. Work continues on the design of the 2nd front-end prototype circuit (focus will be on improvements to the high sensitivity (1W/m) stage), and are working on a preliminary design for a parallel plate ion chamber.

1.5.7.4 BCM:

The circuit board for Berkeley was stuffed. Errors in the board have been corrected and we are obtaining signals and data from both channels. Schematics are being updated.

Familiarization with Matt's digital board continues. LBus operation and the associated vi's have been tested, along with the 40MHz clock generator. The vi for data collection seems to be functional and we do not foresee any difficulties interfacing the AFE with the digital board. We expect to accomplish that next week. Labview software development continues.

1.5.7.6a Carbon Wire Scanner:

Revised delivery estimate was submitted to LBNL; initial response was that we are not on the critical path for vacuum pump-down.

1.5.7.6b Laser Wire Scanner:

The Laser Wire hardware is installed on the HEBT line of the BNL linac. The laser optics are aligned and the chamber is under vacuum. The LPM software parts have all been tested (we can move the motors, read the scope and control the laser). These pieces are being integrated into a complete data acquisition program. An InGaAs photodiode pulse will be used as a scope trigger. BPM detector sensitivity estimates for the Laser Wire current measurements, to be taken in the BNL Linac, are completed. A laser was ordered to do a radiation test. Work on MEBT laser wire continues in the shops.

LANL SNS Beam Diagnostics Weekly Report:

BPMs: Feedthrough problems continue for the DTL pickups. Two of the 12 have leaks, affecting two of the three pickups. One leak is at a weld joint; the other is due to a cracked feedthrough. The defective feedthrough assemblies will be replaced. The optimistic estimate for delivery is 7/Nov. The CCL, TR, and SCL pickups went out for bid 4/Nov. The PCI board has been successfully tested with the digital front end (DFE) board installed. We plan to test it with the analog front end (AFE) soon. We are on track to deliver prototype electronics to LBL by 1/Dec.

WSs: The prototype SCL actuator is now being fabricated. Delivery is estimated in about six or seven weeks. One channel of revision 1 of the signal processor is now being tested. Initial results look good, although some wiring errors crept in during the revision and a new rev. will eventually be needed. We believe we are on track to deliver prototype electronics to LBL by 1/Dec, but to do this we must get the budget from ORNL soon.

D-plate: Design work continues. Preliminary design is about 95% complete, final design is about 35% complete. Work continues on material selection for the beam stop. We are investigating using copper rather than nickel.

ED/FC: The air actuator arrived 9/Oct. We plan to test it soon. A problem arose with fitting the ED/FC units through the beam box ports for installation. The units downstream of DTL tanks 4 and 5 are too big. We are investigating design modifications.

