

Accelerator Systems Division Highlights for the Week Ending January 11, 2002

ASD/LBNL: Front End Systems

After making the mechanical connection between RFQ and LEPT, the LEPT tank is now being supported off the RFQ support frame in the final configuration. The remaining installation work on RFQ ancillary systems was completed, and RF conditioning of the RFQ cavities started on Jan. 3. After reaching 530 kW pulse power at 0.1% duty factor, however, the RF circulator that protects the klystron from reflected power began sparking, and this kept us from reaching the desired level of 650 kW that would be suitable for beam transport through the RFQ. Repair of the circulator under supervision of a technical expert from the German manufacturer are scheduled to start on Sunday, 1/13. We are also preparing a backup solution that would involve the loan of a waveguide-type circulator and of other RF components from SNS-ORNL and LANL. The goal is to obtain valid emittance measurements with the RFQ beam before the next ASAC review, February 12. The collegial attitude shown and help extended by our partners at ORNL and LANL in dealing with the circulator problem is greatly appreciated.

We have received three more RF antennas from Cherokee Porcelain with 0.7-mm ('thick') coating. Ion Source #4 was operated to produce plasma after the holiday break and is ready to create beam as soon as the RFQ can receive it. Sources # 2 and 3 are being assembled for stand-by and checked for compliance with the latest detailed design features.

Final (LBNL) installation of the remaining MEPT electrical and mechanical infrastructure items is proceeding.

The fourth MEPT rebuncher cavity was received at LBNL and has been conditioned to 20 kW RF power by Y. Kang, SNS-ASD, who was visiting us this past week. Y. Kang also gave valuable contributions to preparing a backup solution for the RF circulator, discussed above.

The "prototype/first article" wire scanner received from BNL was installed in a MEPT beam box to check on possible installation and mechanical integration issues. As requested by LANL, the scanner has now been shipped to their diagnostics group to enable them commissioning the associated electronics.

Our response to Accelerator Physics comments in the DOE-Review closeout report that affect the Front End were received by S. Peggs who agreed in principle on its merits.

We submitted one abstract on Front-End commissioning to the EPAC conference to be held in June.

ASD/LANL: Warm Linac

We continue having nearly daily interactions with Marconi Corp. The second 402.5-MHz klystron has been fully conditioned (130 kV, 35 A, full duty). RF operation has begun. (WBS 1.4.1.1)

The delayed factory acceptance tests of the 402.5-MHz transmitter are receiving increased management attention by both LANL and the vendor, Titan Beta. The vendor is committing overtime to complete software, and now forecasts completion of acceptance tests on 1/25/02. (WBS 1.4.1.1)

LANL and ASD personnel began factory acceptance testing of the first production electrical substation for the high-voltage converter modulator (HVCM). Tests have been fully satisfactory, to date. Meanwhile, the vendor is well ahead of schedule in the manufacturing of the subsequent units (Figs 1 and 2). (WBS 1.4.2.2)

LANL and ASD personnel conducted the final design review for the SCR controller for the production HVCMs. Results was satisfactory. The vendor is proceeding with construction of the first article. (WBS 1.4.1.2)

The contract for the 17 production converter modulators for the HVCM was awarded to Dynapower Corp. (WBS 1.4.1.2)

All of the PMQ and empty drift tubes were returned to the vendor for additional inspection to obtain information regarding the geometric center of the magnet relative to the bore and optical targets. The drift tubes

will also be modified to accommodate spherical targets instead of the target holders. This should improve the repeatability and accuracy of our measurements. (WBS 1.4.2.3)

The top hats (mounts) for the drift tubes in Tank 4-6 have been modified to increase the chamfer at the location where the piston o-rings start to compress. This should reduce the chances of damaging the o-rings as they slide up into the top hat. (WBS 1.4.2.3)

The endwalls for DTL tank 3 were completed and shipped. (WBS 1.4.2.2)

The fabrication of Tanks 1 (Fig. 5) and 2 is on schedule. DTL Tank 1A is currently in inspection. (WBS 1.4.2.2)

We installed the RTD (Fig. 3) and the BPM diagnostic (Fig. 4) into the two BPM drift tubes for tank 3. (WBS 1.4.2.3)



Fig. 1: First article HVCM substation.



Fig. 2: Second article HVCM substation

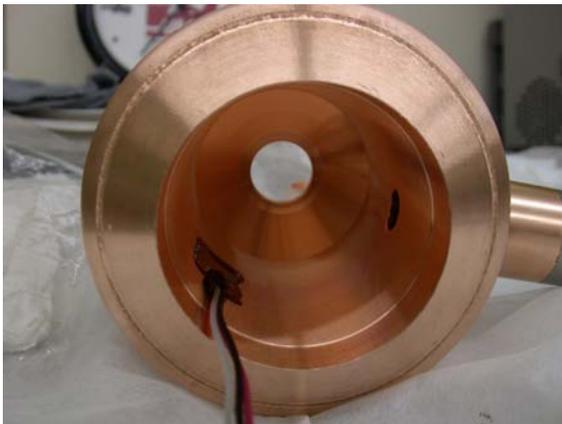


Fig. 3: Production BPM after RTD assembly.

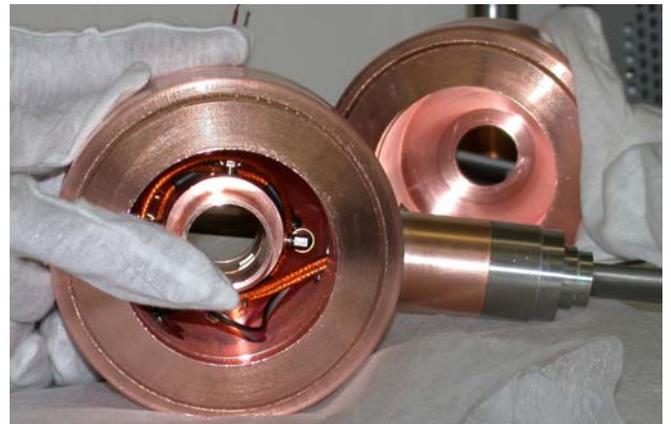


Fig. 4: Production BPM after diagnostic assembly.



Fig. 5: DTL Tank 1B

Fabrication of the MEBT chopper pulser is complete. Acceptance tests are scheduled for next week. (WBS 1.4.5.1)

The physics team is preparing for studies on MEBT and end-to-end simulations with mismatch. Codes are being modified and particle distributions are being generated from the measured distribution in front of the RFQ received from the LBNL. (WBS 1.4.5.3)

ASD/JLAB: Cold Linac

The recovery compressors have arrived at JLab.

Fabrication of bayonets and Y-valves is complete. The devices have been packaged and will be shipped to ORNL next week with a transportainer of other transfer line parts. Work can now begin on the production of U-tubes, but this is a relatively low-priority activity and will be used to maintain a level workload in the assembly area.

The surface of the iris in cavity #3 where the high-pressure rinse wand impacted was ground to remove contamination. The resonant frequency and field flatness were remeasured and found to have changed, but not by enough to preclude further use of the cavity in the prototype cryomodule. The cavity has been subjected to a further round of Buffered Chemical Polishing and high pressure rinsing. It has been assembled into a test fixture (see Figure 1) and lowered into a dewar in the Vertical Test Area for further cryogenic testing.

Cavities #2 and #4 have been used in a pre-assembly of the cavity string to check out tooling, processes and the availability of supporting hardware.

Fundamental Power Couplers processed at LANL have been packaged for return to JLab, where they will be used in the assembly of the prototype cryomodule.

The third pair of couplers is being prepared for high power processing at LANL in February. The run, originally scheduled to begin February 4, has been delayed by 1-2 weeks by the need to recommission the high voltage power supply after repair and modification.

The vacuum vessel for the prototype cryomodule has been received.

All major components for the RF test stand are on hand, with the exception of a water manifold to be provided by LANL, a circulator provide by ORNL and waveguide switches and shutters being procured by JLab. All racks have been placed in the test area and work is underway to install, plumb and rewire all internal subassemblies. (See Figure 2)



Figure 1: Cavity 3 prior to insertion into dewar.



Figure 2: Assembly of 1 MW RF Test Stand

ASD/BNL: Ring

BNL's comments on draft #2 proposal for roles and responsibilities related to "Installation: Lead / Mentor / Consult." proposal were returned to N. Holtkamp.

An RFQ was approved to award a production contract to Alpha Magnetics (Ca.) for the 41CDM30 corrector magnets. BNL staff will visit Alpha next week to conduct a pre-award/QA visit.

While in California, BNL staff will also travel to Stangenes, Inc. to perform a first article inspection of the 26Q40 production quadrupoles.

All parts for the 21cm BPM/PUEs are in house. Assembly for brazing is underway.

Peter Cameron and Tom Shea are working on a January delivery schedule for the remaining four MEBT wire scanners. BNL manpower has been added to accelerate assembly.

From ASD, received the final report on the Design Review of the SNS Ring, HEBT and Injection Vacuum Systems that was held via videoconference on 11/15/01.

A PCR for the extraction magnet ferrite studies has been “withdrawn” while one for a radiation resistant quad / corrector design (RTBT – 36Q85) was submitted. At the request of ASD, a spec drawing for the mineral insulated conductor was sent to a Russian vendor for quotation.

PCR efforts are underway to cover the procurement of spare parts for the low field power supplies, medium field power supplies and PSI/PSC interface modules. R. Lambiase and R. Cutler are coordinating this effort.

Bids for the vacuum turbo pumps are due to be opened today.

An order was placed with “MKS Instruments” for the vacuum gauge controllers.

Engineers completed winding a ¼ scale model coil for the 30Q44/58 quadrupoles. This model coil is being sent to BINP so they can see the winding arrangement required for these coils.

The sixth half-cell vacuum chamber assembly has been welded. A second chamber assembly was coated. BPMs for the next six chambers will be available next week.

Efforts are underway to update magnet, power supply and lattice documents to reflect the latest magnet names, nomenclature, quantities and locations. A revision of the Ring lattice drawing will follow.

Retesting is underway to determine the cause of the electro/mechanical offset observed in first measurements of the 21CO26.

The Magnet group is measuring ring dipole #8. Two of these magnets show a slightly different integrated field from the other six. A retest of an earlier magnet did not account for observed differences. At this time there is no correlation to material lot (steel) or physical dimensions. More studies are planned.



Fig. #1 – Half-cell vacuum chamber assembly with BPM

Controls:

The logic description provided by the 4.5K cold box vendor for the control of the first stage turbine was reviewed by SNS and JLab personnel. The vendor logic description data was compared with the specification, the vendor's offer, and design review notes. A list of comments and questions is being prepared for internal review. Once all corrections are incorporated, the list will be transmitted to the vendor.

Power was connected to controls for one of the warm compressor skids in the RATS building. Checkout of the instrumentation and controls for the compressor skid was started. So far, no major problems have been encountered.

The 90% review of the CHL package for Conventional Facilities (CF) controls was completed, the functional system design (FSD) for Front End CF Controls software were received for review and specifications for all CF controls sensors were issued CFC.

The Target Utilities and associated I&C underwent a 90% review on January 9. Some unresolved issues were identified, but the instrument drawings required for the Target GC contract will be issued CFC on January 18. The outstanding issues will continue to be resolved, and the remainder of the Target Utilities I&C drawings not required by the GC will be issued CFC on March 1, 2002.

At LANL, the EPICS Database tools were revised to reflect recent changes to the database schema at ORNL.

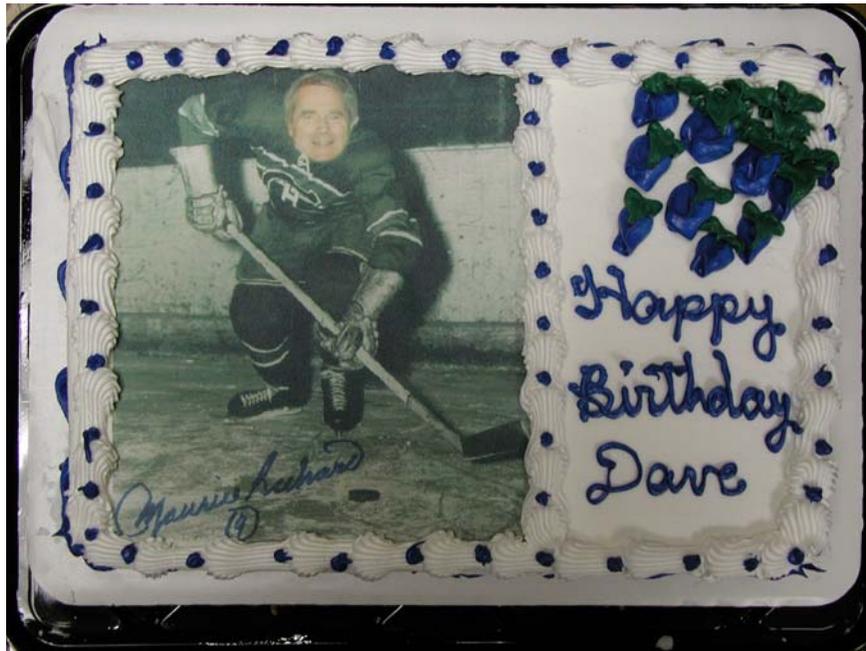
At BNL, the Power Supply Controller (PSC) and Power Supply Interface (PSI) have passed their acceptance tests. All requested changes have been made to the hardware. The FPGA code will be updated to the latest version and a few units shipped to ORNL this month. Preparations are in progress for the PSI/PSC and timing System software driver reviews scheduled for later this month.

The printed circuit board design for the MPS test station is being finalized. It should be sent to a PCB board house next week.

At Berkeley, the Source/LEBT IOC now runs completely using SNS standards. Work continues in collaboration with ORNL on emittance measurement hardware and software. The MEBT cooling design has been finalized and parts are on order. First deliveries of controls equipment for the Ion Source test stand at ORNL were received, and some is mounted in the controls area of the RATS building.

Compilers for VXWorks and EPICS now run under Linux. Within the constraints of license agreements, these files will be released to the international EPICS community shortly.

This amazing cake was presented to the Controls Group Leader. (Anyone else old enough to recognize #9 (number retired) of the Montreal Canadiens?)



ASD/ORNL: Integration and Installation Support

Accelerator Physics

Nine EPAC abstracts were submitted from the ORNL AP group.

The ring collimator location is being studied. Optimizations indicate that rearranging the locations within the existing north straight can reduce the loads on the quads, and also slightly improve the collimation efficiency.

The EPICS time correlator was tested with up to 24 simultaneous process variables. Correlated sets were retrieved at up to ~ 10 Hz, the limit being related to the soft-PV generation on the IOC, not the correlator software.

Operations

Ion Source Group

Syd Murray started his work as the Senior Ion Source Technician. He brings with him a wealth of ion source related experience, which he accumulated during his previous assignments at Holifield. He started to assemble the hot spare stand as his first major assignment.

The order for the ceramic standoffs needed for our hot-spare, glue-less LEPT has been placed with Schuler.

We received several components of the LEPT vacuum enclosure from TTI.

Rahul Rauniyar started PBGun simulations to model the extraction of the JAERI source.

Robert Welton proofed the galleys of his two papers to be published in the proceedings of the ion source conference.

Robert also started to post his tech not on in the ASD web based tech. note depository.

Martin Stockli performed the acceptance test of the 80 kW 2 MHz amplifier at the vendor's location in Williamstown, NJ. All required testing was successfully completed on Thursday, January 3. At high power levels the droop was slightly higher than specified, which could be easily corrected by adding capacitance to the corresponding high voltage supply. However, we do not favor such a change because we want a unit, which is identical to the ones delivered to LBNL, which also had a droop slightly higher than specified. The tests at lower power-levels revealed the need for 60 Hz synchronization. Friday, January 4, was used to repeat the required tests with mismatched loads of 25 ohm and 100 ohms. It was impressive to see the measured output waveform to be practically unaffected by the severely mismatched loads. Additional tests focused on the controllability at low power levels, which may become an issue for ring commissioning. We found that the output power levels could be smoothly reduced to levels as small as 5 mW. This means that if needed, we could have smooth control over the RF output power covering an impressive 6 orders of magnitude. On Friday morning Ed Etschman modified the pulse generator to allow testing a 2-level operation. An added potentiometer allows to control the power level between the high power pulses, rather than being at zero. Operation at 280 Watt continuous with 60 Hz of 1 ms long 68 kW pulses was highly successful, although the exhaust air temperature was at 110 C up from 75 C. Peak power controllability remained the same and mismatched loads did not affect the wave-form. Operation at 180 W continuous with 60 Hz, 1 ms, 75 kW pulses occasionally tripped the circuit breaker. An full 8-hour test with 180 W continuous and 60 Hz, 1 ms, 65 kW pulses was conducted on Monday, January 7. The tests culminated on January 9 with 60 Hz, 1 ms, 80 kW peak pulses and about 150 Watt CW with an average plate current of 1.2 Amps. The increased electrical and thermal burden is caused by the high duty cycle of the continuous power and the inefficiency of RF generation at those low power levels. This two level operation is very interesting because the low power level could be used to maintain the plasma between the high power pulses, a task which currently is accomplished with an additional 13 MHz supply and its own matching network. However, the reduction in complexity and increase in reliability may be well worth the roughly 1 kW additional power requirement.

RF Group

The power supply we sent to Jlab will be setup next week, we will send a technician (Dale) to make internal connections and do HV testing, Mark will be at Jlab.

Much discussion is taking place concerning the RF reference line; Chip Piller will be at LANL next week to help come to some conclusion.

Yoon is at LBNL and is working to get the RFQ, RF system up after the circulator burned.

Jim Hicks will spend time, maybe 2-weeks at LANL helping repair the 20 KHz inverter transformer, which lost its windings, along with other upgrades.

The order for spare 402.5 Klystrons is in procurement and they are working on getting a bid package ready. We will go over this package before it is released.

The fourth rebuncher cavity, which is the last one for the MEBT system has been completely, RF conditioned to over 20 kW.

Sent power supply / crowbar cabinet to JLab for installation into the Jlab test stand. Unit was completely hi-potted to 100 kV and foil tested to simulated klystron arcs to -85 kV without any problems.

HVCM spares PCR (LI-01-090) was resubmitted for approval.

ORNL and LANL visited Dynapower to test first article substation transformer and review SCR controller. Unit tested uneventfully, with full load short circuit test scheduled for next week. 1st article delivery to ORNL is projected for week of January 21st.

Power Supply Group

RF grounding beneath the klystron gallery has been completed, visually checked before covering with 6" earth and then gavel.

Coordination meetings with Broadway Electric were initiated this week and will be scheduled every week.

Ring tunnel grounding is in progress, pictures of north straight section ground break are attached. The green protruding rebar is epoxy coating and against the excavated walls one can see the ground network breaks.





Survey and Alignment Group

Magnet Measurement Group

We have made "off-plane" measurements of the HEBT Dipole, which are virtually identical to the mid-plane measurements.

Magnet cycling studies are underway.

Work also continues in outfitting the 12Q45 measurement stand. Delivery of the first 12Q45 is expected by the end of the month.

A design is underway for the 8Q35, SRF Warm Section, measurement stand.

Beam Diagnostics Group

LANL beam diagnostics report:

BPM pickups: The DTL tank 3 BPM pickups were installed into the drift tubes 5-7/Jan, then shipped to the welders. We expect to have them back in about 2 weeks for mapping. Fabrication of the prototype CCL and SCL pickups continues.

BPM electronics: Four electronics chassis and one Rosco RF unit were shipped to LBL. Two chassis were held back to troubleshoot a noise problem due to calibration signal bleed through that limits the dynamic range.

WS actuators: SCL ball lead screw repairs continue. Fabrication continues on a prototype fork with collets to mount the carbon wires.

WS electronics: All PC boards have been stuffed and all chassis have been assembled for the LBL delivery. A prototype actuator will be shipped from LBL to LANL so we can solve any interface issues before we ship the electronics.

D-plate: Design work continues. An internal beam stop engineering review has been scheduled for 6/Feb.

ED/FC: Final design of the heads is complete and ready for checking. We still need to optimize how the cooling lines will be routed up through the actuators. Work continues on tech notes detailing the design and expected performance.

Software: Work continues on the software needed to serve data to the network. Initial tests are encouraging. We hope to have a functional prototype by the end of next week.

Misc: We plan to hold five final design reviews

ORNL beam diagnostics report:

New version of the Bar code scanner application, which includes waveform reading and displaying, is written. It is available for demonstration to the interested groups. Higher level edm screens for the Berkeley's emittance measurements are being prepared. The database improvements are being continued. Work continues on optimizing the LINAC BPM design. Craig has submitted an informal ASD note on the topic and Craig and Sergey will get together in 10 days to finalize this effort. There has been excellent progress in controls aspect of the Berkeley's emittance scanner sequencer by Ernest and Delphy. We will present the working system during the diagnostic team's biweekly videoconference. We met with the target group to discuss a possible location change for the target harp. The proton beam window box is now very space-constrained due to the addition of some backscatter collimators. We are now exploring an upstream location for this harp. Stuart Henderson is analyzing the optics in this area and will provide information on the required accuracy of the harp. We held a D-plate integration videoconference and several issues were identified. During follow up, Roy Cutler has estimated that significant radiation is expected from the nickel dump during full power operations. We will look into the impact. We began evaluation of a Java and XML based platform for networked instrumentation systems. A revised list of installation tasks was provided to the installation team. We prepared a strawman travel schedule for staff participating in front end activities at Berkeley. We identified a list of topics that will be covered in the controls/diagnostics interface PCR. Wim Blokland has accepted a position with the ORNL diagnostics group and will begin on February 11.