

Accelerator Systems Division Highlights for the Week Ending April 13, 2001

ASD/LBNL: Front End Systems

Ion source #1 has been tested with -0.3-mm offset, and there was no reduction in emittance as compared to zero offset. For the RFQ beam tests, the offset will be restored to zero because of the ease of verification.

A comprehensive set of emittance measurements has been made to map out the tuning space of the two LEBT lenses. RFQ simulations show transmission of up to 85% for these measured phase-space distributions.

The LEBT choppers have been tested with beam, and beam-pulse rise times of about 25 ns have been recorded, well below the anticipated 50-ns times which are assumed for the design of the MEBT chopper target. The attenuation factor cannot be measured at this time because RFQ Module #1 will be an integral component of the intercepting system.

RFQ Module #1 has been conditioned to 175kW peak power (full field) for 500 ms, 60 Hz pulses (3% duty factor, the maximum achievable with the single installed rf window).

RFQ Module #2 has been leak-checked after brazing and is vacuum tight, except for a minor leak at one pi-mode stabilizer rod that can easily be fixed. The module has been installed on the bead-pull stand for final frequency verification.

The MEBT chopper-target box has been fabricated, and one chopper target is ready for installation after successful brazing. A minor crack that had developed during the brazing process was sealed by the braze material itself; the part subsequently passed pressure and vacuum-leak tests.

All hardware items for the redesigned MEBT BPMs have been completed.

The MEBT rebuncher cavity #1 underwent a corrective machining operation to shift the resonant frequency into the center of the tuning range.

A decision was made to proceed with LBNL in-house fabrication of the Low-Level RF systems for the MEBT rebunchers. Assistance by staff of LBNL's Advanced Light Source is available for this effort.

The FES project underwent a Project Director's Review on 4/10, observed by an Inspector General representative.

ASD/LANL: Warm Linac

The contract for the CCL waveguide has been placed. Delivery to the RATS building is expected in August. (WBS 1.4.1.1)

RFPs for the high-voltage converter modulator SCR controller, rectifier/transformer, and control racks have been reopened in accordance with the new procurement strategy approved by SNS. Details have been submitted to ASD in accordance with the new procurement supplemental reopened. (WBS 1.4.1.2)

We are preparing for the high-average-power tests of the prototype 140-kV high-voltage converter modulator. Utility cable pulls to the building and cable tray installation are complete. We can now start inter-connections of SCR controller and modulator. During this down time we have been also upgrading modulator diagnostics and protect circuits. (WBS 1.4.1.2)

The LLRF APP has been revised with guidance from ASD and approved by the Project Director. We are proceeding to place the PLC contract. (WBS 1.4.1.3)

The first 402 MHz Klystron has been built (Fig. 1) and installed onto the manufacturers pump stand. Pumpout and bakeout are underway with pinch-off scheduled for April 23. (WBS 1.4.1.1)



Fig. 1: The first 402.5-MHz klystron for SNS

Bids for the DTL drift tubes have been evaluated and a vendor has been selected. The RFP and bid details have been shared with ASD. (WBS 1.4.2.3)

We have received the first article for the production PMQ magnets. It appears to be well within our specifications, which means we may not have to sort the magnets prior to installation in the drift tubes. We are expecting to receive 50 magnets within the next 3 weeks and the entire shipment by June 1. (WBS 1.4.2.3)

The drawings and statement of work for the final machining of the DTL tank sections are complete and the RFP package has been submitted to purchasing. They will also be forwarded to ASD. We plan to issue the RFP this month and award the contract before May 31. Sections have been machined from the copper-plated prototype tank and our preliminary results indicate good plating adhesion to the base carbon steel tank. (WBS 1.4.2)

Dynamic tests of the high-energy prototype drift tube were performed to verify the dynamic performance and stiffness of the assembly, measure system damping, and benchmark finite element calculations. Test results indicated that the dynamic behavior is close to what we expected. In addition, our estimate for the structural damping in the assembly is conservative and no anomalies were detected. (WBS 1.4.2.3)

Dynamic displacement measurements of the high-energy prototype drift tube were made to ascertain the resulting effects of flow-induced excitation (an ASAC issue). The drift tube was instrumented with accelerometers while mounted in its production mount and connected to an experimental flow loop. Coolant flow was metered to the nominal 2.2-gpm flow. Measurements were also made with the drift tube bypassed to establish a baseline measurement. The measured RMS displacement due only to the coolant flow is less than 10 micro-inches. This value is very low and is a small fraction of the anticipated drift tube response to the facility background vibration environment. (WBS 1.4.2.3)

The final design review for the DTL and CCL water cooling systems was conducted this week. There were productive exchanges with an excellent review committee consisting of ORNL, ANL, and LANL personnel. In their outbrief, the committee unanimously concluded that the requirements were complete, the design sound, the costs

reasonable, the schedule on track, and that the design team should proceed with their procurement plan. (WBS 1.4.2.5 and 1.4.4.5).

We have developed an integrated design for the DTL Faraday cups and energy degraders. This design reduces costs for actuators, cooling, and controls. (WBS 1.4.5.2)

ASD and LANL physicists have determined, and successfully simulated, the phase and amplitude schemes for DTL commissioning. (WBS 1.4.5.3)

In preparation for the SRF prototype coupler tests next week, we have scheduled the site-specific ES&H training sessions for JLAB and ORNL visitors.

We received authorization to implement 20 approved PCRs. (WBS 1.4.6.1)

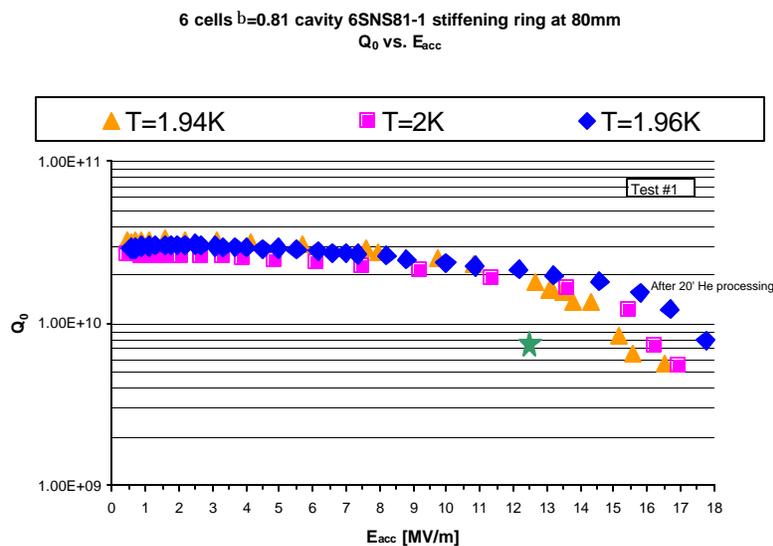
A PCR (LI 01 052) was submitted this week to correct the burden rate associated with the SRF transmitter contract. When implemented, this PCR will return \$335K back to contingency. (WBS 1.4.6.1)

ASD/JLAB Cold Linac

Fabrication on the Warm Compressors, Cold Compressors, and 4.5K Coldbox continues. The Cold Compressor procurement FDRR is scheduled for 18 & 19-Apr.

The first set of four tunnel female bayonet / valve assemblies are 90% complete. The other 31 sets are in various stages of welding and brazing.

HB cavity #5 has been vertical dewar tested; it reached 150% of specified gradient after He processing, but had strong field emission (>10 Rads/hr) above 75% of specified gradient, see attachment. More chemistry and testing will follow.



The final machining of the MB dumbbells for cavities #2-4 is in progress. Preparations continue for the high power Fundamental Power Coupler test at LANL. The first pair has been powered to the 1 kW for check out, and are being shipped to LANL.

Two HOM couplers are complete and welded to the MB single cell cavity (#S3), see attachment. This cavity will be used for the first SC test of the couplers. Ten additional HOM's are being e-beam welded.



The two-cavity MB HOM configuration system test was completed, which completed the MB HOM modes study. The single cell MB Nb cavity with couplers should be tested next week.

Activities continue for the three high beta HOM modes considered dangerous for power generation if not sufficiently damped. The two 5th harmonic modes have been found. In contrast to the situation in the MB cavities, the 7th harmonic mode, the final mode being looked for, does not propagate into the beam tube and must be damped. This is the mode that could produce 473w of power with a $Q=10^8$ (see Sundelin's ASAC talk).

The EP parts bid is due in 2 weeks. Work on the specification for the EP cabinet continues. Reactor grade Nb bids are due back by 23-Apr. Cavity ends bids are due back by 30-Apr. The Cavities prebid meeting will be held 18-Apr; bids are due 16-May.

The three PCR's for R&D to improve the HB performance in the horizontal cryostat has been submitted (LI 01-016, 17 & 18). The goal is to improve the HB performance from 27.5 to 35.0 MV/m.

There is only one remaining \$250K procurement to be release this year. At the STL meeting, we stated that we could productively use an additional \$1-2M of BA if it became available.

The LANL 1MW RF system plan for JLab testing needs to be approved (LANL LI 01-035 & JLab LI 00-068). In the fall of 1999 as part of the MOU discussion, it was agreed that SNS would provide a skidded RF system for the JLab testing of CM's and power couplers. It is needed in the 2ndQ FY02 to test the Prototype CM at full power. If the PCR is approved now, the best LANL can do is deliver a system after we start full 1 CM per month production. (Depending on interpretation, this is also a 6-month slip in the Milestones #1b-3 and 2-30.) The ASAC last year raised this as one of the highest priorities. This system is a key element not only for conditioning and acceptance testing but also is the key to raising the High Beta Gradient from 27.5 to 35.0 MV/m. The immediate approval of these PCR's is required to get started working on this. LANL requires a minimum funding of 20% of LI 01-035 to get started planning, and JLab requires a minimum funding of 25% of LI 00-068 in order to procure long lead items (vacuum circuit breakers, heat exchangers, pumps, pipe, and valves). We want to have the system installed and checked out when the Klystron arrived.

The CHL BOD has slipped 8 months; it is now after the last of the refrigeration equipment has been delivered. The installation, commissioning, and burn in schedule has been compressed by 4 months to recover half of this slip, but the sub-system acceptance test deadlines and most of the warranties will have expired. The A&E has supplied an RFE date 6weeks before BOD, which matches the delivery date of the 4.5 K Coldbox. Discussions are continuing.

ASD/BNL: Ring and Beamlines

PO visit to BNL for Ring Systems Handoff Meeting #1 with Dan Stout, et al, to establish clear lines of transfer, authority and responsibility for selected technical components.

Visit by PO/ASD to BNL to participate in a design review of Ring magnets conducted by Joe Tuozzolo and his staff. This review included: Magnet Parameters, Production Schedule, 26Q40, 30Q40, Injection Kicker Magnet, Ring Multipole Magnet Design, and Update on the Ring Extraction Components.

Diagnostics – given the small incremental cost, the decision was made to add PUEs to all HEBT 12cm quadrupoles.

“DCD” for Ring vacuum systems has been imitated.

Discussions between ASD, BNL and LANL addressed issues related to procurement add-ons to existing contracts. Of immediate interest is the order for Low Field Power Supplies and the PS Interface/Control modules.

The Ring Lattice drawing, rev. “D” per PCR RI 01 022, has been signed-off and released to the Project Office.

PCR backup efforts (P3 and MPM) for the Project Office were focused on the chromaticity sextupoles, beam height correction, split quad power supplies, radiation hardened coils for RTBT quadrupoles, and production order “give backs” and first article procurement evaluations.

Controls:

A new Linux Server has been received from Compaq for evaluation. This is a dual 1-GHz Pentium 3, with a RAID level 5-disk array. EPICS has been installed. A similar server from Dell will also be acquired for evaluation.

Two of our existing Linux systems, one of which is the file server scheduled to go to Tullahoma, have been upgraded from RH6.2 to RH7.0. One system remains to be upgraded. We are learning the not-so-obvious idiosyncrasies of backing up these Linux systems on CD-ROM.

Simple channel access has been integrated with MATLAB running under both Solaris and Linux. This has been provided to both the Diagnostics and Physics Groups for testing and application development.

Collaboration began between LANL, LBNL and ORNL (Holifield) on the definition of improvements to be made to EDM, the display manager selected for SNS. Considerable progress was made, including the addition of expressions to the tool, and agreement on a mechanism for adding “color rules.”

The controls team at LBNL has completed the modular Flex-I/O interface box for the vacuum systems for RFQ modules one and two.

The Controls Team at LANL participated in the Warm Linac Cooling Final design Review.

Rack Assignments for all Linac controls equipment have been completed.

Cost estimates for FELK cable trays were completed. They are consistent with the AE/CM estimates, show a modest cost savings, and show the PCR processed to transfer money to ASD is sufficient.

Conventional Facilities drawings from 7 design packages covering all buildings and site utilities were reviewed in detail; the CF controls IO listing updated to match the drawings and the CF controls cost estimate revised accordingly. A better estimating method, more use of DeviceNet and reduction in mechanical hardware resulted in approximately \$2.0M in savings.

A list of abstract for presentation at ICALEPCS, the International Accelerator Controls Conference, is being prepared. The first deals with the use of EPICS for Conventional Facilities.

ASD/ORNL: Integration

Participated in planning and turnover discussions, continued linac/front end and ring coordination, including turnover and conventional facilities. Reviewing CCL fabrication specifications and others.

Accelerator Physics

Mark Doleans and Sang-Ho Kim evaluated the transverse kick to the beam from the fundamental power coupler and found it to be 10 micro radians per cavity, which is small.

Sasha Alexandrov tested the MTALAB interface to the test EPICS channel access signals, and found the time to acquire data is independent of the data buffer size.

The global coordinate table was expanded to 55 points, and modified to use the nominal device names.

The design for a model server using the Cdev infrastructure was made. The initial server implementation will incorporate Trace-3D for MEBT and linac modeling.

Operations

Installation and RATS Building

Magnet Measurement Group

Ion Source Group

In collaboration with the ORNL metals and ceramics division we continue to work towards improved antenna coatings. We also continue to order components for the hot spare stand and the antenna test facility. In addition we have entered three abstracts for the International Conference on Ion Sources, which will be held September 3-7, 2001, in Oakland, CA. The abstracts cover work being accomplished at ORNL in collaboration with LBNL, namely modeling of ion extraction and ion beam transport, antenna coating problems, and the antenna test dome.

RF Group

Ray, Dave, Yoon and Pam are at a three day class on DSP, in preparation for the LLRF workshop at Jlab in two weeks.

Anderson reworked the SNS plan for RF installation in a excel format generated by LANL, hopefully all will be able to understand the plan.

Cryo Transfer Line Group

The 25 KW portable power distribution systems are cabled and in service at the transfer line assembly area.

The pipe was station is completed and ready for service. The oak ridge water department is inspecting for a drain permit that would allow us to dump our waste water directly into the sewer system.

The supply water piping is installed to the D.I. system location in the magnet test area.

We held a meeting with the potential vendors that will be extracting the helium purifier located at the coil test facility at y-12. The meeting revealed several high dollar items in the scope of work. The scope is being revised and we are going out for the best and final offer for the cost of extraction. Those bids are due back the 19th of April. An award will be made shortly afterward.

Final tooling of the super insulation table is in the machine shop. WE anticipate completion of the table next week.

We are building up the tooling secured from Jefferson lab to produce the transfer lines. This tooling was stored outside and is requiring some cleaning prior to installing the assembly tooling.

Mechanical Group

Power Supply Group

Survey and Alignment Group

Beam Diagnostics Group

BPM: BNL received raw material for BPM flanges and returned strip-lines for the two pre-production 21cm HEFT BPMs to the shops for minor corrections. An ECN is in preparation to update the design drawings of the 21 cm Ring BPM to the newly built unit. The 30cm Ring BPM mounting flange is being redesigned for compatibility with the newly designed 30cm quadrupole. The Bergoz analog front end is now scheduled to be delivered to LANL at the end of April (original date was end of March). Matt Stettler has finished simulating the FPGA and has burned the first chip. The board was stuffed, a preliminary driver was written, and initial tests look good. The revised DFE design was delivered to an ECAD designer on Monday. We expect the PCB layout by the end of next week, then about 4 days to get the PCB made. Any requests or comments relating to this digital board should reach Matt by this Wednesday, April 18.

BLM: Tom Shea met with BNL personnel to discuss loss monitor design issues. A more refined set of requirements is required and Tom offered the Oak Ridge group as a clearing house for system and application requirements. Saeed will coordinate this effort. A meeting to discuss Linac BLM system design is tentatively arranged for May 3 at LANL.

BCM: BNL's design group has prepared a board template and a 1:1 print was compared with the actual LANL mother board for fit. The fit looked good, and board layout is continuing. Some parts were ordered for the clocking logic section of the circuit board. Work has started on presentation papers for PAC2001. Work continues to familiarize ourselves with the digital interface and IP module. A group member made a presentation on BCMS to the SNS Controls group. A meeting with Tom Shea covered calibration schemes and a brief review of the analog design.

Carbon Wire Scanner: At BNL: Revised drawings for the MEFT wire scanner are completed. Calculations and drawings have been submitted for review. At LANL: The Huntington stepper motor actuator order was placed early this week. The final design for the SCL actuator was checked, and the drawing package is now being revised.

Slits and Energy Degraders: LANL: The choice of a beryllium energy degrader for the D-plate has proven to be very unpopular. Thermal modeling shows that graphite will work if we can mount a foil 0.015 to 0.017 inch thick, 4 inches in diameter. We are working with two different manufacturers to fab these foils. Solid models are complete for all energy degraders and faraday cups in the DTL and CCL. The next step is to detail these designs.

LANL D-plate: Final detailing work continues on the first beam box and all devices that are mounted on it. We are investigating cost saving measures, such as using existing designs and/or equipment.

Global: Dave Purcell completed Linux and NT installations, arranged procurement of NT Embedded, and got familiar with MEDM and DM2K. With Wan, Saeed went to the Building 6000 pump room to measure the ground motion. They made 5 sets of low frequency (<100 Hz) measurements plus some calibration data. The analysis is under way. They could clearly see 30 Hz and 60 Hz vibrations on the FFT plot. In collaboration with Sasha, Saeed continues tests of Matlab as a channel access client and application platform. Performance tests are currently being run on a Windows 2000 laptop. At BNL, kids were out of school for Easter break and many group members took vacation. Tom Shea visited to prepare for Tuesday's Handoff meeting with ORNL personnel. The plan was presented to the Hand-off committee at that meeting.