

Accelerator Systems Division Highlights for the Week Ending May 11, 2001

ASD/LBNL: Front End Systems

RFQ Module #3 has been received at LBNL after undergoing the final braze. The cavity is right on resonant frequency, and a vacuum leak test showed only one, very minor, leak at one of the pi-mode stabilizer rods. The module design provides for easily fixing this kind of leak with an o-ring.

A design review was held for the Low-Level RF Systems that LBNL plans to build for the MEBT rebuncher amplifiers. The review committee of ORNL, LANL, and non-FES LBNL experts endorsed the project as presented and made several technical suggestions.

The last three of six RF amplifiers for the MEBT rebuncher cavities have successfully passed weeklong tests with nominal power at the vendor's site, after operational issues with the main tubes had been sorted out.

ASD/LANL: Warm Linac

The first round of high-power RF conditioning of SNS prototype couplers was concluded by JLAB on the LANL RF test stand. An RF power up to 550 kW was successfully applied. Tests are scheduled to resume May 21. (WBS 1.4.1.1)

We have started first high-average-power tests of the prototype 140-kV high-voltage converter modulator. This week we testing the arc response to verify that no crowbar is needed. (WBS 1.4.1.2)

Our staff returned from the 5th Modulator-Klystron Workshop at CERN. While in Europe, they visited key suppliers for the SNS converter modulator capacitors, IGBTs, and transformer cores. We are confident in our choices of materials and suppliers. Delivery schedule appears to be acceptable; however, continued vigilant contact with the IGBT manufacturer is needed to maintain schedule. (WBS 1.4.1.2)

The DTL Final Design Review was held at LANL. In their outbrief, the review committee, chaired by Gary Johnson, reported that there were no show stoppers and that the DCD has been met. There remain some detailed issues that surfaced during the PDR that still need to be resolved (*e.g.*, radiation damage of elastomers, and drift tube fitting tolerances). To meet the aggressive IPS RFE early finish dates, the committee recommended we proceed with manufacturing with a graded approach, maintaining schedule and yet dealing with a few detailed issues. (WBS 1.4.2)

The Physics and Diagnostics DCD (WBS 1.4.5) was completed and signed. We expect to complete the CCL DCD (WBS 1.4.4) early next week. (WBS 1.4.6)

A SRF Warm Section preliminary design review was held at LANL. The committee, chaired by Mike Hechler, recommended a stop work until JLAB, LANL, and ORNL agree upon requirements. M. White will lead this effort with the goal of producing a requirements document, kept under configuration control, by May 18. (WBS 1.4.9)

ASD/JLAB: Cold Linac

Fabrication on the Warm Compressor Skids, Cold Compressors, and 4.5K Coldbox continues. The last of the warm compressors has reached the US and the first one has been mounted on the skid, photos attached. The three final oil removal C-D's were shipped to ORNL last week.

The first 40 ft section of CHL to Tee Supply TL was assembled at ORNL.

The first four tunnel female bayonet / valve assemblies are complete. The other 124 are in various stages of welding and brazing.

The MB single cell cavity has been installed in the vertical dewar and is being tested for HOM performance.

500 kW of forward power has been run into the coupler pair assembly; the crew will return to LANL in two weeks to try to reach full SNS duty factor. The second pair of couplers are expected at JLab in late May.

The final high beta HOM 7th harmonic mode has been found with the help of additional simulations by ORNL. This is the mode that could produce 473w of power with a $Q=10^8$ (see Sundelin's ASAC talk).

The EP parts bid was received and evaluated. Work on the specification for the EP cabinet is nearing completion.

The first two End Can heat exchangers have arrived, photo attached. The Cavity Stiffener Reactor Grade Nb contract was awarded. Cavity ends bids are due 28-May. The Cavity vendor Qualifications are being evaluated; final bids are due 16-May.

The first of three PCR's for R&D to improve the HB performance from 27.5 to 35.0 MV/m in the horizontal cryostat has been approval (LI 01-016). The remaining two have a drop dead date of 1-Jul-02 (LI 01-17 & 18)

The cost of the Work-a-Round of setting up and testing the FPCs at LANL has accelerated our expenditures. PCR LI 01-058 for JLab's increased cost of testing the first 5 pair at LANL is in draft form.

There is only one remaining \$250K procurement to release this year. We could productively use an additional \$3M of BA if the first \$1M became available on 1-Jul-01. Preparations for supplemental procurements are proceeding. The first of these supplemental RFP's (CM #14 – Production FPC) is in the process of being released. In addition we will have \$8M of phased contracts that can be forward funded.





ASD/BNL: Ring

Systems Integration: DCDs for Ring RF System, the Ring Magnet System and the Ring Collimation System were completed this week and sent to DCC for distribution.

Ken Chipley's draft of the Ring / Target ICD, including Appendix A for the beam dump interface, has been received by Jim Rank.

First article Ring half-cell vacuum chamber was received from our vendor, SDMS, and is currently being inspected by BNL's QA staff.

Vendor bids were received on the 26Q40 quadrupoles. The initial bids exceeded engineering estimates. Value engineering and re-bid (best and final) are likely to follow.

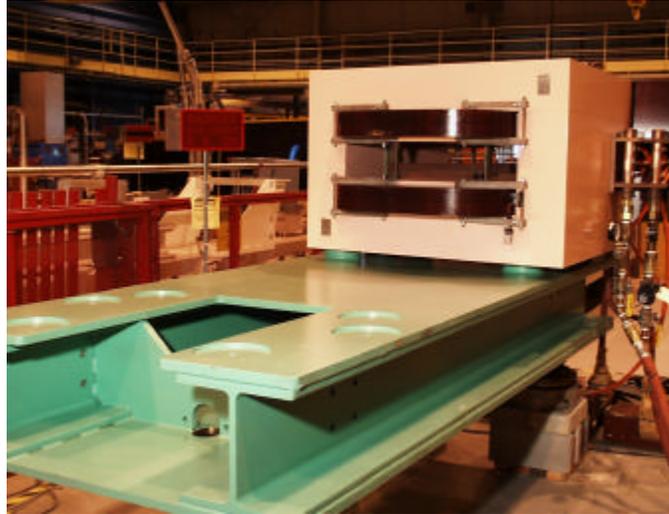
The design of the Injection Septum magnet was completed and drawings are now in checking.

The design of the Injection Dump Septum was completed and drawings are now in checking.

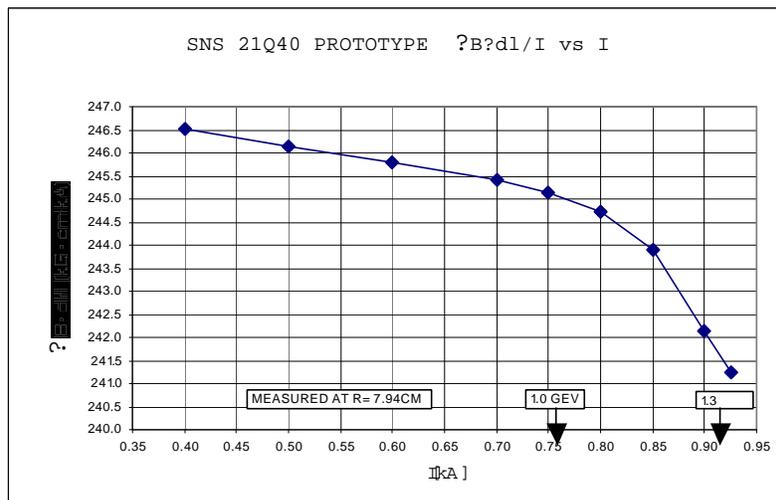
Magnetic measurements were completed on the 21Q40 quadrupole at 1.0 and 1.3 GeV. See excitation curve, attached.

P.K. Feng submitted AUTOCAD files to CF of the revised embedded conduit plan and the duct bank between the tunnel and Ring Service Building at the 9 o'clock area. The 3 o'clock area is next in his sights.

Engineering ECNs have been signed-off for the released 21cm (HEBT and Ring) and 12cm (HEBT) BPMs.



Ring Arc Dipole on Base for Mag Measure



Excitation curve for the 21Q40 Yaphank prototype.

Controls:

Dave Gurd and Steve Lewis participated in the FE LLRF review at LBNL.

The procurement specification for a first-article "Chipmunk" radiation monitor has been reviewed. Plans are to get the spec signed off and issued next week.

The Conventional Facilities EPICS and PLC software development system (1 server, 4 IOCs, 2 Linux OPIs, and 4 NT PCs) is being set up in the SNS building. The plan is to have the complete system tested and operating before shipment to Sverdrup in Tullahoma, TN (probably next month).

The target controls design team is posting a standard cabinet design for the Target control system PLCs. This standard cabinet will be included in the 60% Target building submittal.

The EPICS Controls Software Development Lab has been reconfigured to accommodate new equipment shelving. Two each four-monitor computer systems have been set up under Red Hat Linux 7.0. These systems are mock-ups of possible Operator Interface configurations for SNS.

Other software-related progress included:

- Installed and set-up LINUX RH 7.0 on the three Compaq Workstations to be used for Conventional Facilities Development.
- Installed additional software to support EPICS Applications.
- Provided files to automatically set-up the EPICS environment for users.
- Set-up EPICS test stand with PLC for development of Personnel Protection System (PPS) operator interface software.

The BNL controls group held several meetings with BNL technical systems groups:

- There was a meeting with the Collimator group to discuss their schedule and requirements for Collimator testing to be done at BNL in late summer or fall.
- There was a meeting to define the requirements for testing of the injection kicker power supply at the factory in June. A system to control the power supply has been requested.
- There was a meeting on the laser wire requirements. In mid-summer a system is expected to be set up at a working linac to acquire data. Some motor control and data acquisition hardware will be needed.

Some of the issues with the measurement of temperatures at the beam dumps have been resolved. BNL's current understanding is that ORNL will run the cables as needed and BNL is expected to do the routing.

ASD/ORNL: Integration

ASD has issued revised global coordinates that bring the locations of the linac and injection dumps into agreement with the conventional facilities design. A revised lattice drawing (SNS 100000000-G8E-8000-A001-R02) and revised Accelerator/Conventional Facilities interface drawing (SNS 100000000-G8E-8000-A002-R01) have been approved and issued for release in iMAN. The current CF location for the extraction dump differs by 1/2" from the ASD coordinates, and this will be corrected in the next Dump design submittal.

Tunnel cross section drawings for the DTL, CCL and SRF linac have been completed and issued for signature.

Transmittals have been issued to standardize welding receptacles, install remotely operated switchgear for RF power supplies and the main dipole, and to maintain current control network sightlines for survey and alignment.

Transmittals are underway to finalize UPS requirements throughout SNS, to finalize the smoke removal system design, and to transfer the responsibility for technical component electrical panel and cable tray design/installation to Conventional Facilities.

Efforts continued on scope transfer and hand off planning. LANL revised the summary-level transfer matrix in the RF area and the ASD RF group is reviewing the matrix.

Accelerator Physics

ORNL Accelerator Physics staff participated in several reviews. Sahsa Aleksandrov participated the LBNL LLRF review and John Galambos participated in the warm section review at LANL.

A program to provide time synchronized channel access data collection was written and tested using signals generated by the controls group. Initially only two signals have been gathered synchronously.

The new ring space charge model in ORBIT was benchmarked successfully. This model permits incorporation of the wall boundary conditions.

Operations

Ion Source Group

Thermal Spray Technology received the antennas. Unfortunately a non-work related injury of the best-qualified technician has delayed the schedule. When coated with Al₂O₃ and Cr₂O₃, the antenna will be tested in Berkeley to verify a substantially prolonged lifetime.

Efforts continue to improve ion beam extraction simulations. Jack Boers, the author of PBGun, is modifying his code to account for the space charge effect of the electrons in the extraction region.

Yoon Kang has performed a 3-dimensional HFSS simulation of the RF antenna without the plasma present. Efforts are underway to include the plasma effects. These simulations will become very interesting when they can be compared with observations using the antenna test dome.

A proposal for a cooperative grant from U.S. Civilian Research & Development Foundation (CRFD) for the independent states of the Former Soviet Union (FSU) has been drafted. If successful, a team from the Institute of Applied Physics of the National Academy of Science in Sumy, Ukraine, will, over a two-year period, modify and develop an inverse magnetron source for possible use at SNS. This source may be rather interesting because it does not require cesium. A relatively high gas flow and high electron current pose a potential problem. If you like a copy of the proposal, please request one from stockli@sns.gov. Logistics require that the proposal is finalized by 5/15/01.

RF Group

High power testing of the srf couplers at LANL went very well over the weekend. On Monday (5/7), two couplers in series were powered up to 550kW for about an hour after almost three days of slow increase of power. Due to arcing problems at that power level, the power was lowered to ~350kW and stayed for almost 6 hours on Monday. The average RF power used this time in the testing was only ~30% of the specified, 11kW for ~550kW-peak and 8kW for ~350kW-peak. The DC biasing was not used.

The RF power test data is available upon request. The JLAB staff left LANL Tuesday morning and will be back sometime next week. Latest photos of the test setup can be found in 'SRF CavityCoupler/Los Alamos1' subdirectory under my name (Kang) on the snsnta/users directory.

Fuja worked on the RF Groups testing Plan and a list of things needed covered at the power supply review at LANL on the 24th.

Cryo Transfer Line Group

We have completed the installation of the return transfer line tooling on the assembly table #1.

We have begun assembly of the first article for the return transfer line sections of the CHL to "T" portion of the Helium cold gas transfer lines.

Mechanical Group

Installation and RATS Building

The tunnel mockups continue to be worked. The ring mockup now has an RF cavity with power amplifier, Quad assembly, and ductbank conduit layout. Cable tray and cable has been ordered and is due in early next week. The Linac tunnel mockup now has DTL #1 partially complete.

The DI water skid and cooling tower will be tested today. (5/11/01)

Surplus furniture for the offices is trickling in from all over the Lab thanks in part to the many people within SNS and the Lab supporting our effort to keep costs down.

A proposed Front End Installation Team has been circulated for comment. We are currently holding weekly installation meetings every Friday at 10:30 in the RATS building covering specific systems within the accelerator. The current thinking is that once a month (to start) we can focus on the Front End and get LBNL involved either by video or phone.

Magnet Measurement Group

Power Supply Group

Participated in the DTL design review at LANL

Computerized test set up for power supply testing in the RATS Bldg. Specified and ordered high voltage cage for kicker power supply testing erected in RATS bldg. DI water system for RATS magnet and power supply testing installed and ready for testing.

Design and coordination with BNL to eliminate 3,6 and 9 o'clock alcoves in the RING tunnel

Six o'clock region mock-up in RATS partially done, but proves that 6 o'clock alcove may not be necessary. Three and 9 o'clock region design done, mock-up necessary because of HEBT and RTBT embedded conduits.

Survey and Alignment Group

Completed pre-bid meeting for installation and construction of first phase of site monuments.

Attended DTL and Warm Girder review at Los Alamos.

Continued setup of Alignment area in the RATS building.

Continued Lattice Control.

Beam Diagnostics Group

Beam diagnostic progress report from LANL:

Wire scanners: The Huntington actuator order has finally been placed, for a couple hundred dollars less than the original quote. We expect to have the SCL WS drawing package signed off by Monday (13/May). We hope to be ready to fabricate the WS PC card by the beginning of next week. We are considering adding a wire protection circuit to the electronics package that would shut off the beam if the charge from the wire exceeds a preset limit. Initial estimates are that it would roughly double the circuitry on the PC card.

D-plate: Work continues on the D-plate final design.

BPMs: PCI motherboard PC card and DFE PC card are expected to arrive on May/15. The Bergoz AFE should arrive in about two weeks. Work continues on the shared memory DLL routines and the channel access server software.

Announcements: The wire scanner systems PDR would not happen at the last week of May due to unavailability of personnel. The next realistic dates are in July.

Beam diagnostic progress report from BNL:

1.5.7.1 BPM: Signed-off the ECNs for the released of 21cm Ring, 21cm HEBT, and 12cm HEBT BPMs. Models for structural analysis have been developed for the 26cm and 30cm Ring BPMs. The shop and outside vendor continued work on cost estimates. The holding tool for the wire cutting of the striplines for the two 12cm HEBT BPMs is complete, and cutting is expected to start on May 11-2001.

1.5.7.2 IPM: Work has begun on the envelope for the instrument box in the Ring at 6 o'clock. The electron detectors are in the shop and the work is expected to be completed by next Friday (May-18-2001).

1.5.7.3 BLM: Follow-up discussions continue after last weeks meeting at LANL. Amplifiers have been ordered in preparation for testing of prototype circuits. Arranging for ion chamber testing at JLAB to determine X-Ray response from SCRF cavities.

1.5.7.4 BCM: The BCM layout is complete. Gerber files have been prepared and board manufacturing has started. Expect four boards by the end of next week. Schematics are being revised to reduce the number of gains to four as a result of a relaxed resolution requirement.

The BCM differential current measurement tie into the MPS needs more discussion. The impact of quality specifications and techniques employed could cause delays in the general BCM system if this measurement becomes part of the system requirements. The possibility of getting a prototype PCI interface board from LANL was discussed during the Monday phone conference. Getting a look at this hardware would be very helpful to us.

1.5.7.5 Tune: Work continues on the prototype tune meter system.

1.5.7.6a Carbon Wire Scanner: The MEBT wire scanner fork is in the shop and expected at the end of the month. A diagnostics box from LBNL is expected at about the same time. The fork will be mated to the box for evaluation of position accuracy and repeatability.

1.5.7.6b Laser Wire Scanner: Work continues on the installation of a laser wire at 200 MeV in the AGS BLIP line.

Beam diagnostic progress report from ORNL:

Tom and Coles gained some insight into data acquisition and application frameworks from their visit to Swiss Light Source. Tom learned that the BPM hardware at SLS is similar to our linac units. This confirms the soundness of our approach and architecture. Saeed worked on SNS loss monitors and needs. He attended the preliminary design review of SCL Inter-Segment at LANL. Dave Purcell continues work on Diagnostic Web page and Database needs. Craig Deibele will start work at the ORNL-SNS on May-14-2001