

Accelerator Systems Division Highlights for the Week Ending December 14, 2001

ASD/LBNL: Front End Systems

The magnetic-measurement data of the ion-source dumping-field were submitted to the SNS ion-source group.

The new LEBT-exit/RFQ-entrance plate was alternating installed on RFQ and LEBT and tested with an unchopped LEBT beam. After short conditioning, it performed better than its predecessor.

We are still experiencing occasional defects in the 2-MHz rf coax connectors, due to surface sparks, and are pursuing a long-term solution.

The fixed RFQ tuners were shortened, and the resonant frequency is now 5 kHz away from nominal, an excellent result. The field flatness is within $\pm 0.5\%$, twice better than specification. The RFQ couplers in Modules #3 and 4 are being re-adjusted to balance the power input between all 8 couplers. A mechanical defect was found inside one of the RF window assemblies and eliminated; this defect can easily explain why tuning of the couplers in the last two RFQ modules was much more difficult than for the first two modules.

On Dec. 14, the RFQ was moved within 1 foot of the LEBT tank in preparation for connecting both subsystems next week.

The third MEBT rebuncher cavity was received on Dec. 13. Y. Kang of ASD is visiting LBNL and led the conditioning work on Rebuncher Cavity #1 (the second one we received). First impressions are that the radiation emitted from this cavity is less intense than that seen with Cavity #4.

ASD/LANL: Warm Linac

We continue having nearly daily interactions with Marconi. The second 402.5-MHz klystron was installed on their test stand, and it is under dc high-voltage conditioning. To minimize schedule impact from tube #1 multipacting, Marconi agreed to implement two-shift, 16-hour-per-day operations starting next week to support our contract. They currently project tube #2 factory acceptance tests on 1/21/02. (WBS 1.4.1.1)

LANL staff D. Rees, J. Bradley, D. Jones, and P. Tallerico were at SNS/OR this week to discuss, comment, and iterate on the high-power RF installation plan. (WBS 1.4.1.1)

E. Partridge from the LANSCE RF Group was at JLab this week to help install the transmitter and LANSCE klystron for the JLab high-power RF test stand. (WBS 1.4.1.1)

We conducted a post-mortem on the high-voltage breakdown observed in the prototype SNS high-voltage converter modulator step-up transformer. A path forward was developed. In developing a solution, additional expert advice from Jim Sims (National High Magnetic Field Laboratory) and Ted Hunter was obtained. (WBS 1.4.1.2)

Preparations on DTL Tank 3 (*e.g.*, tank cleaning, o-ring groove inspection/smoothing, vacuum tests on completed drift tubes) is nearly complete (Fig. 1). LANL now has 12 PMQ drift tubes and all 4 empty drift tubes for DTL Tank 3. Drift tube installation begins next week. (WBS 1.4.2.2)

Manufacturing of DTL tank sections for tanks 1 and 2 is proceeding on schedule. LANL personnel were at Votaw (Los Angeles) to review their progress and discuss machining practices. We also visited Major Tool (Indianapolis) to review progress on the DTL end walls. (WBS 1.4.2.2)

The vertical taut wire system has been set up in the DTL assembly hall. Mapping of the magnetic center of the drift tubes begins next week. Magnetic center resolution is approximately 0.001 in. (WBS 1.4.2.3)

We received two potted EMD coils this week and immediately shipped them to Coronado to be incorporated into the drift tubes. (WBS 1.4.2.3)

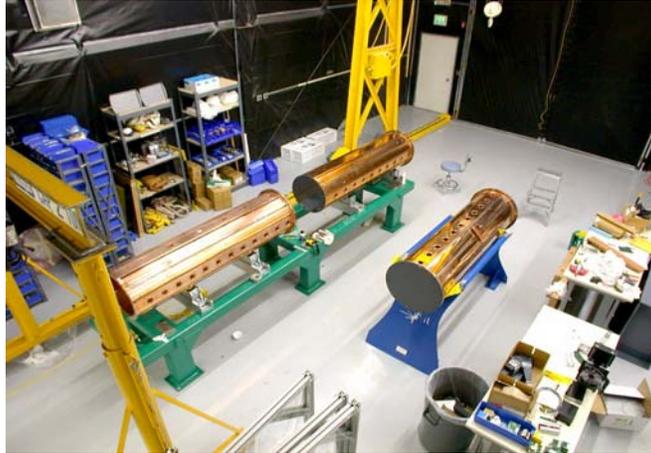


Fig. 1: DTL-3 tank sections.

Vacuum tests on the empty drift tube are complete and we are evaluating the data. We started vacuum tests on one of the PMQ drift tubes for Tank 3. We also successfully assembled the drift tube using only alcohol as a lubricant to slide the mount over the drift tube. (WBS 1.4.2.4)

E. Tanke (ASD) was at LANL this week. He and Gary tested the magnet orientation on several PMQ drift tubes. All of the tested drift tubes passed. (WBS 1.4.2.3)

The contract for the DTL beam boxes was placed. (WBS 1.4.2.4)

ACCEL personnel were at LANL to present their thoughts on manufacturing and tuning of the SNS CCL cavities. A formal review will be conducted at ACCEL the week of Jan 14, 2002. (WBS 1.4.4.2)

Ted Hunter was at LANL this week, working with our staff to formalize the CCL magnet-pole and wiring convention. (WBS 1.4.4.3)

Now that the two MEBT chopper structure assemblies are completed (Fig. 2) and shipped, we are finishing up documentation for LBL and ASD. DEI has successfully operated the chopper pulser for one-hour at full power, 3-kV, 60-Hz, 1-ms burst. The remaining problem is a series protection switch that fails. DEI fixed it and resumed tests. If satisfactory, we anticipate factory acceptance testing next week. (WBS 1.4.5.1)

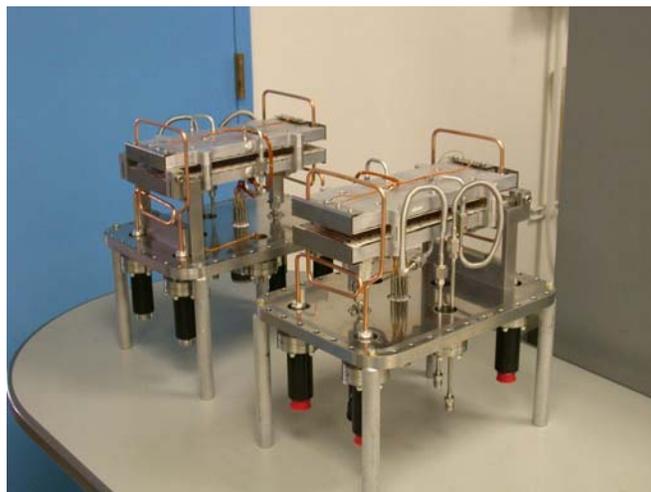


Fig. 2: Assembled MEBT choppers that were shipped to LBL.

The LANL physics team modified PARMILA to track-back halo particles; they prepared the code for delivery to and usage by ASD. (WBS 1.4.5.3)

LANL QA Representative, Mark Gardner, was at SNS/OR this week. While there he demonstrated the LANL SNS web-based records management system. (WBS 1.4.6.1)

ASD/JLAB: Cold Linac

The charcoal vessel of the Oil Removal system has completed tests of its electrical heaters and is ready for shipment to ORNL with the instrument air system.

The sixth and final warm compressor has been shipped to ORNL. Documentation is being incorporated into Acceptance Criteria Lists.

SNS comments on the first field construction design package have been addressed and final sign-off is in progress.

Assembly of the helium vessel on cavity #2 is complete, and the finished cavity is being assembled onto a test fixture in preparation for cooldown and further cryogenic testing.

Cavity #4, also with a completed helium vessel, is undergoing cryogenic testing. If its performance is still good, it will be subjected to an extended thermal soak at 120 K over the weekend to see if the 600°C bakeout removed enough hydrogen to eliminate Q-disease.

Assembly of the helium vessel on cavity #3 is about 60% complete.

Investigation of the problems with the aluminum-magnesium gaskets continues.

In light of the successful tests at LANL last week, plans for the Final Design Review of the power coupler are being developed. It is tentatively scheduled for Feb. 15, 2002.

The transmitter cabinet was put into position, the klystron was installed, and the cabinet filled with insulating oil (see photo).



ASD/BNL: Ring

Magnetic measurements of the first article 21CS26 sextupole corrector magnet were started this week.

17D120 Ring Dipole: magnet #5 is in the high field test stand. The cycle time for magnet testing is slowly improving towards our production goal of two magnets per week.

BNL's PS Group participated in a video design review of the Ring dipole magnet power supply. The RFP and spec data sheet were reviewed in detail. The PS spec will be finalized and sent to the SNS/PO prior to a final design review in early January.

W. Meng's Design Summary of the 21S26 magnet analysis (integrated gradient) was sent to Ted Hunter. Meeting minutes of V. Badea's 11/23 video design review of the 21S26 sextupole magnets were also issued.

Nick Simos traveled to SDMS to observe a critical point inspection of the RTBT collimator fabrication.

George Mahler traveled to Stangenes to observe vendor progress on first article fabrication of the 26Q40 quadrupole.

J. Wei was at LANL this week to participate in e-P machine studies.

A PCR is being prepared for the rad-hard coils for the RTBT downstream quads. The PCR will include a spare magnet assembly for SNS/PO consideration.

Engineering efforts are continuing on the RTBT vacuum, injection magnets, extraction systems, dumps and windows, the RTBT collimator outer shield and support stand, the high field sextupoles, and the 36CDM30 corrector magnets.

Tom Shea was at BNL this week to coordinate plans for the Berkeley wire scanners. Efforts are underway to ship a first unit on 12/17/01. The remaining units are due by mid January.

Other visitors this week included Sarah Cousineau (ORNL) and Yuri Fedotov from IHEP (Russia).

Jim Rank published minutes of the "SNS Beam Dump Windows" video design review that was held on 11/29.

BNL's comments on the Accelerator Turnover Plan (WBS 1.5) were sent to Dan Stout.

Assembly of the extraction kicker PFN and tank was finished this week. POP testing should begin next week.

Our Contracts Department issued an RFQ for the 41CDM30 corrector magnets. Bids are due back on Jan. 3.

This week's BNL newsletter, the Bulletin, published a front-page story on Congressional Appropriation for the SNS Project at ORNL. On the Web, the Bulletin is located at www.bnl.gov/bnlweb/pubaf/bulletin.html.

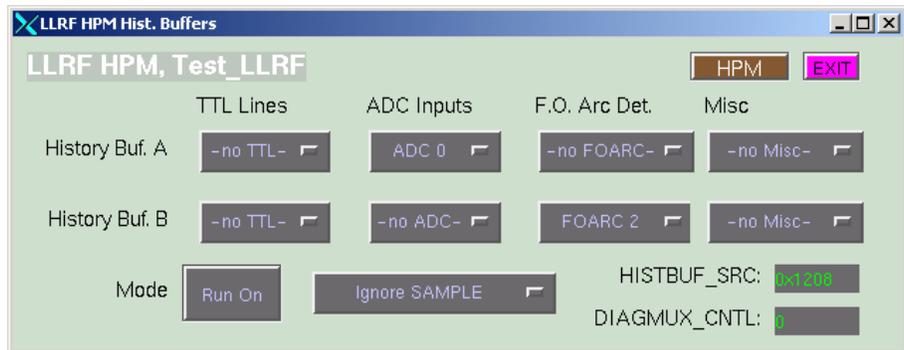
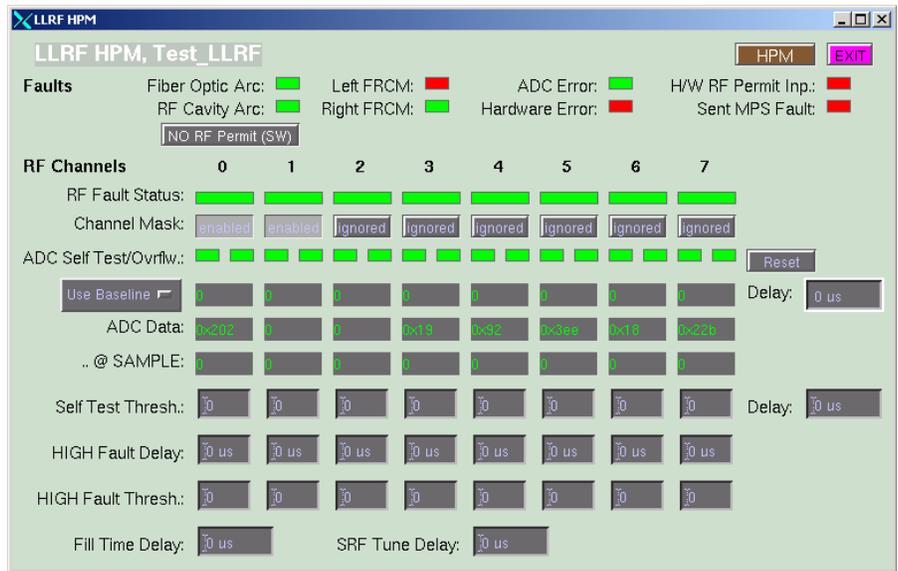
Efforts are underway to increase the size of the lifting eyes in the HEBT dipoles to 1.5"- 6 threads as requested by the Project Office.

Nuria Catalan-Lasheras has accepted a two-year Fellowship at CERN. This is Nuria's last week at BNL.

Bill Weng announced his plan to step down as Senior Team Leader of the Brookhaven Group. Details to follow.

Controls:

At LANL, the low-level RF HPM board was installed for the first time in an IOC. Most register-based screens worked from the start (see examples below). That means only that the EPICS HPM board communication works. The LLRF group can now intend to use these screens to test & debug hardware and PLD code instead of having to use signal analyzers. Additional EPICS-based software support will be added as the HPM matures.



The IOC + host for SNS HPRF Transmitter vendor-site test was prepared and shipped by the LANL team.

The first VME utility module was received at LANL and is being tested.

Equipment was ordered for the warm-linac high-power RF, low-level RF, vacuum, and resonance-cooling systems.

A “synchronous data-request” layer has been added to the channel-access client library to support high-level physics applications.

Several SNS VME64x crates were received at BNL and are being evaluated. The 160mm transition card depth is a potential problem, and options are being considered.

The latest version of the timing software has been placed in the CVS repository at ORNL.

A Power Supply Controller and Interface have been packaged for shipment to ORNL for evaluation of power supply testing software there.

The RFP for the Instrumentation and Controls installation contract that will be used to install CF, Target, and selected Accelerator controls was issued for bid.

The 90% package for CF controls in the CHL building was received.

ASD/ORNL: Integration and Installation Support

We distributed a first issue of the Component Delivery Schedule in the Installation Meeting this morning at 10:30. It is now considered an official, working document. The CDS will be updated weekly for the Friday Installation Meeting. I would recommend that the critical items be discussed with the Division Director each Friday afternoon at 1:00 PM. This should be the top 10 or 12 items.

Rudy assigned individuals to be the focal point for specific technical subsystem components. These individuals are to provide me with timely updates for the weekly revision. I would like you and the Division Director to support this activity as a division priority in the weekly staff meeting. We need to have "their" attention.

Accelerator Physics

The correctness of MEBT quad polarities has been verified with a magnetic probe at LBNL this week by Daryl Oshatz and Eugène Tanke (all had the correct polarity). The same probe has been used by Gary Johnson and Eugène to verify consistency of these polarities with those of the DTL quads at LANL. So far 15 complete drift tube/quadrupole assemblies (ready for installation in tank 3) have been verified (all these had the correct polarity). As soon as more such assemblies will be completed, the quadrupole polarity will be tested in the same way, prior to installation. The picture shows a measurement made at the Coronado workshop in Albuquerque.

Topics of this week's linac commissioning videoconference were a talk by Tom Owens on phase scan matching (this method for finding the correct RF set point in cavities can be used for commissioning the CCL) and a discussion on Bunch Shape Monitors (BSM). Saeed gave a brief description of this device, which can measure phase profiles of bunches with high resolution. It can also measure transverse profiles. BSMs have been used with H- beams at Fermi lab and DESY. One may wish to use this device in the CCL and the HEBT, but further investigation is needed to better estimate their well functioning with H- beams.

Operations

Frank Kornegay Mario and I met with the DOE Project Office. We presented and discussed the Commissioning Program Plan and schedule. This ASD approach and schedule were accepted. Suggestions were made and these are being incorporated into the schedule.

Operations and the SNS Project Office met with another vendor (SAP) of MIS software systems. The decision on which system to adopt will be coming soon.

We continue to work on Operations Procedures including Configuration Control, in general and as it applies to Safety Systems, including the PPS.

Ion Source Group

The analysis of the 7x24 test run has been completed. It discusses most of the experienced problems and the lessons learned. It shows time graphs for all parameters of interest such as the delivered current, duty-cycle, and pulse width.

The seminar "Ion source 101", presented on Wednesday, December 5, in 101 at Scarboro road, was attended by approximately 50 people. The presentation is posted on our seminar web site. A fully animated power-point presentation can be viewed from \\Snsnta\users\Stockli\presentations\IS101.ppt. The seminar presents the basic physics of ion sources in an easy to understand fashion, starting with general ion sources, then zooms in on high current ion sources, then on RF-ion sources, and finally on negative ion sources.

Paul Gibson will perform the acceptance test for the big blue box ducted at the vendor's location on Monday, December 17.

Paul Gibson and Martin Stockli visited a machine shop in Coalfield, TN. The shop and the staff made a very favorable impression and definitely seem to be capable of fabricating the LEBT for the Hot Spare Stand.

The 80 kW 2 MHz amplifier has been completed and will be tested for two 8-hour periods at the vendor's location.

RF Group

Work on the power supply for the Jlab HPRF system power supply is proceeding a little slowly but progress is being made. Wiring errors in the supply have slowed us a bit. High Voltage testing is scheduled for this week with shipment to Jlab by years end.

LLRF & Controls videos with Jlab & LANL continue, good progress being made, not many issues raised lately and decisions on issues needing resolutions are still several months away waiting HPRF tests.

First 402.5 transmitter factory acceptance test begin the 17th, they are scheduled for 2 weeks. Trying to staff up with engineers & technicians, should add a few more early in 2002.

RF front-end/MEBT: The second delivered buncher cavity (candidate for MEBT #1 cavity) has been completely tested and RF conditioned to 30kW at full duty cycle with an adjustable tuner. Mechanical/vacuum preparation of the third delivered cavity (candidate for MEBT #2 cavity) for RF testing is being done.

The Lances modulator and klystron were unpacked and set up in the test lab at JLab this week.

There was a meeting at JLab where we discussed the program for testing the piezoelectric tuner and the performance expectations for the prototype cryomodule.

I had numerous discussions with JLab staff to assess the progress on the prototype cryomodule. In general things are going well and there is a high level of activity in the test lab.

Mechanical Group

Magnet Measurement Group

Cryogenics Group

The instrument air compressor system for the CHL and oil removal (Charcoal Vessel) for the helium refrigerator will arrive here the 18. The vessel will be stored at the site with the oil removal system. The instrument air system will be placed in storage.

Assembly of the 4.5K cold box top plate continues at Pro-Quip/Linde.

Oil sample bottles have been sent to PHPG to acquire a test sample of the oil they are processing for the helium compressors. This sample will be compared for purity compared to samples submitted by Jefferson Lab from their operating compressors.

The retooling of the transfer line assembly station in the RATS building has been completed and is ready to assemble the transfer lines for the tunnel modules.

The return "T" section of the tunnel transfer lines is 50% complete.

The supply "T" section of the tunnel transfer line is 25% complete.

SNS has completed the final review of the first field construction package and the documents have been returned to Jefferson Lab for release.

Electrical Systems Group

Foils research - latest progress report (Being sent in 2 parts - large file size) is available.

A final design review for the ring main dipole power supply was held with BNL via videoconference on 12/13/01. An additional video review will be held in a few weeks to settle details of procurement specifications.

A design review of the ring dc magnet buss design will be held on December 17, 2001, 15:00 at RATS conference room.

Tom Owens made a presentation to the SNS physics group on subject of phase-scan signature matching. This is a technique for longitudinal tuning of linac modules that was implemented at Fermilab in about 1993-1994. Excellent performance has been reported at Fermilab, and a version of the technique is being examined by the SNS physics group for tuning the SNS warm linac.

First two (of four) ring RF power tubes were delivered to SNS on 12/14/01.

Four 30" and four 36" equipment racks were ordered and they were shipped this week for building an equipment rack mock-up for the klystron gallery. They should be here Monday to start the work.

Purchase order for copper to construct the duct bank embedded DC water-cooled busses has been placed this week.

Survey and Alignment Group

Beam Diagnostics Group

LANL beam diagnostics progress report:

BPM pickups: The DTL BPM pickups appear to have a large impedance mismatch at the vacuum feedthrough, and 35 to 39 ohms impedance along the electrode length rather than the ideal 50 ohms. Although the pickups will meet requirements, Craig Deibele has offered to explore methods to improve their performance by modifying the electrode shape. A decision on how to proceed will be made in the next few days. The CCL and SCL pickups will probably have similar characteristics, and we have put a hold on machining this portion of our prototype CCL and SCL pickups.

BPM electronics: The timing/gain FPGA has been tested and it appears to work well. We will now proceed to stuff the digital front-end PC cards with this chip. We still need to test the improved I/Q FPGA chip. Modifications to the PC chassis for use in the LBL BPM system are in progress.

WS actuators: We expect to pick up the prototype SCL beam box today. We are in the process of wiring up the prototype SCL actuator, whereupon it will be mounted to the beam box and tested under vacuum.

WS electronics: One new signal processor PC board has been stuffed and is ready for testing. If it tests OK, we will proceed to stuff the balance of the boards needed for LBL.

D-plate: Design work continues.

ED/FC: Design work continues.

BNL Progress report:

The first MEBT wire scanner is being prepped for delivery to LBNL. With design and procurement nearly complete, final assembly of these scanners will be performed by the BNL Beam Components Group headed by Thomas Russo. Their experience with similar devices should assure timely delivery to LBNL.

Final assembly of the MEBT laser profile monitor is underway. Tests of the 200MeV monitor await beam.

Development of the BCM electronics and software continues. The system, including droop correction, was demonstrated to Bob Webber and Jim Zigel from FNAL.

ORNL SNS beam diagnostics progress report:

With production units now available, Craig Deibele and John Power have been measuring and analyzing the performance of BPM electrodes. Figures 1 and 2 are the TDR measurements of the MEBT and DTL BPMs, respectively. The scales of the two figures are different with the plot of the MEBT BPM a factor of 5 more sensitive. The DTL BPM suffers from a mismatch of up about 22 ohms and shows a transmission line impedance of 39 ohms, though this impedance is exaggerated due to the strong mismatch of the launch. Larry Doolittle's measurements of the MEBT pickup have been repeated here and show an acceptable 3.5-ohm mismatch. An HFSS model of a revised DTL design is shown below. As reported above, work is underway to analyze the effects of the mismatch and its impact on system performance. If required, slight changes will be made to the linac BPM designs.

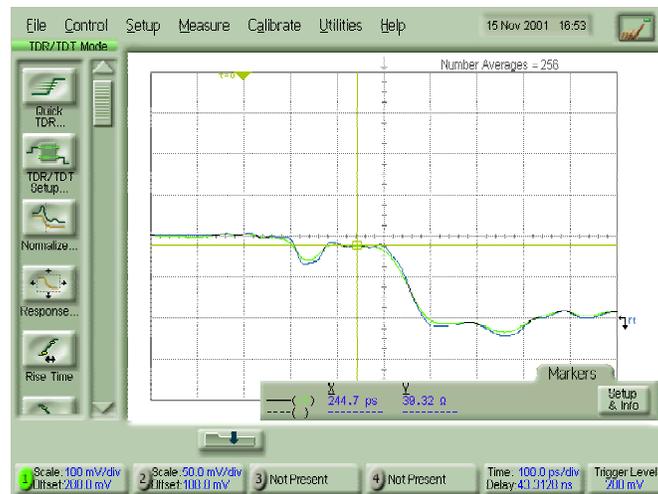


Figure 1) TDR on DTL BPM (100 mV/div).

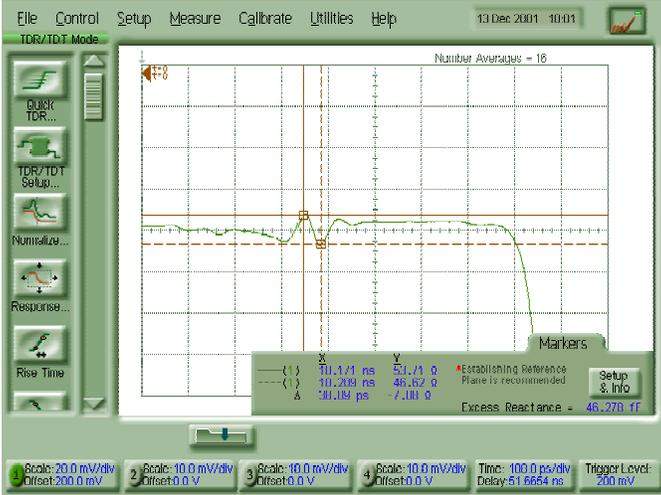


Figure 2) TDR on DTL BPM (20 mV/div).

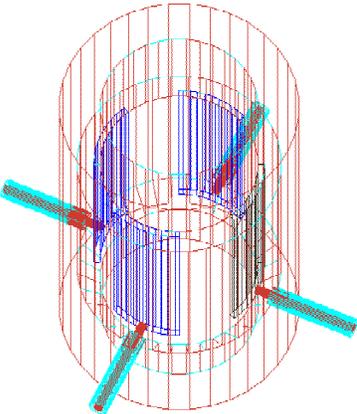
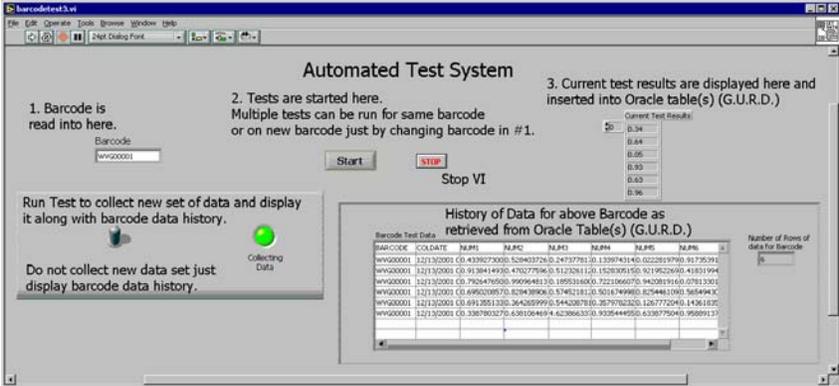


Figure 3) HFSS model of DTL BPM

The ORNL diagnostics group plans to develop automated test systems that utilize barcodes to identify equipment under test. In preparation, Dave Purcell has developed a Labview demonstration program that reads bar codes from a hand-held scanner and uploads data to the Oracle database server. Based on the barcode, data on the device can also be retrieved from the server. The LabView user interface is shown below:



Tom visited BNL to attend the Beam Instrumentation committee meeting and to discuss BCM