Monthly Progress Report

Stanford Synchrotron Radiation Laboratory

August 2003

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A. SPEAR 3 PROJECT SUMMARY

1. Technical Progress

The final installation phase of SPEAR3 continues on schedule with two months remaining for the planned project completion. This month signaled the achievement of a number of important milestones.

One August 4th, the floor grouting of the last four support plates for the magnet rafts was completed thereby allowing the start of the installation process for the main magnet/vacuum system raft assemblies. The 54 rafts (weighing more than 1,250,000 lbs) were successfully rolled into the SPEAR tunnel and placed onto precision pins. This process was completed in 13 working days ending on August 27 thereby completing the SPEAR3 magnetic lattice.

During the month the injection system septum magnet and associated vacuum chamber were successfully assembled and electrical tests completed on the three-injection system kicker magnets.

The all-new magnet power supply system (units previously tested) has been installed and efforts continue in their electrical connection in Building 118. The RF klystron power supply, loads, and associated waveguides are now installed. All four RF cavities have been received and checked-out.

Six insertion devices were installed and beam-line front ends are in place except for BL10.

Work is on schedule for the final LCW connections to the magnet rafts, HCW piping to the RF system and electrical wiring in the tunnel.

Areas that require close attention for timely completion are the remaining vacuum system components (straight sections and bellows), availability of the required 1.2 MW klystron for the RF system, testing of remaining instrumentation and control system components, and new shielding additions now required.

The remaining work is scheduled for completion and the ring closed down by early November at which time accelerator and vacuum commissioning will commence. Those interested can view time lapsed video clips on the SPEAR3 installation process by visiting the SSRL home page at http://www-ssrl.slac.stanford.edu and clicking on the video links.

2. Cost Data

The total project costs and commitments through August 2003 are provided in Table A1. The integrated costs and commitments per month are plotted in Fig. A1

Table A1
Costs and Obligations
(through August 2003)

	K$	
	Direct	Direct & Indirects
Costs	46,655	52,852
Commitments	2,501	2,701
Total	49,156	55,553

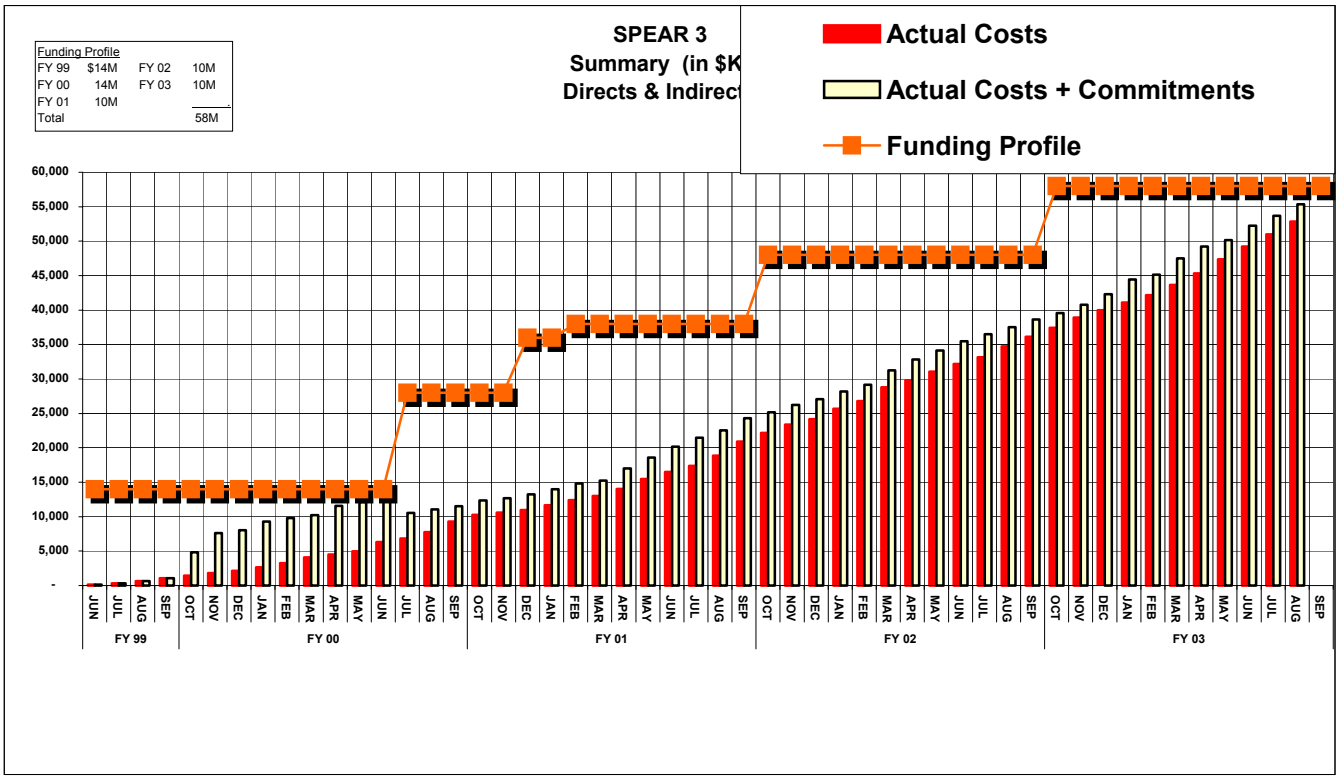


Figure A1

B. Design and Fabrication Reports

1.2 Vacuum System

Apart form the installed main magnet vacuum chambers, work continues on girder and straight section bellows, transition chambers, straight section chambers and associated components.

Components installed in the tunnel include:

- The K1, K2, and K3 kicker magnet chambers
- Septum magnet chamber
- Injection straight section transition/pump chamber and spool pieces
- Beam line 4 and 7 chambers
- Straight section support rafts

Components completed and ready for installation include:

- RF drift sections
- Girder and wiggler pumps
- Straight section pumps
- RF isolation valves
- Personnel Protection System Stopper
- Tune Driver and associated bellows
- New support stand for BL5 wiggler chamber
- BL5 transition chamber

1.4 RF System

- **Cavities:** All four cavities have been RF processes up to 850kV accelerating voltage.

  Klystron: The CPI repaired Marconi klystron S/N 03 is on the high power test stand and is being configured for testing. This klystron will be employed on SPEAR3 initially and upgraded at a later date to a SLAC built tube. The klystron is required to be installed, by October 15 to enable final configuration of the RF system. The second CPI repaired Marconi klystron S/N 04 is now at SLAC and will be tested immediately following the Marconi S/N 03 tube.

- **Low Level RF (LLRF):** Expect to have all the LLRF modules tested and completed by end September. Still have problems with the voltage control crystal oscillator (VCXO) for the SP3 clock module. This module is required to complete testing of the IQA and RFP modules, which are completed and partially tested.

1.5 Instrumentation and Control Systems

- Work on the computer control system is ongoing and progress was made in the detailed programming and configuration of the BPM data acquisition system, the SPEAR control database, and the device control panels. A full-crate test of the MCOR power supply controllers is in progress. Design and fabrication of the prototype Time-Stamp/Sync Module is complete and testing is underway. Computer network components have been received and are being installed.

- Testing, of the "SDEMOD" mode of data acquisition for the 60 4-button multiplexed BPM processing modules from Bergoz is in progress. Fabrication and testing of BPM system interconnection components is complete. Installation of BPM processing equipment in the East and West I&C rooms is in progress, and installation of AC power for those rooms is nearly complete. Fabrication of the LO, Clock and Test Tone fan-out units, the Tune/Bunch Monitor units and the BPM-based current monitor is nearly complete.

- The design and the Injection Timing Controller, which communicates with the Booster FR Signal Generator, is nearly complete, with delivery now expected in October. Other timing control units and the Booster RF generator are complete.

- Detailed configuration of the programmable logic controller systems for the vacuum and magnet water protection interlocks is nearly complete. Production of the Orbit Interlock Position Limit Detector units is complete, and fabrication of the Orbit Interlock Summary will be completed by the end of September.

- Fabrication of the Average Current Monitors for the Beam Containment System is complete. Fabrication of the Long Ion Chamber (LION) control chassis and the Beam Current Interlock will continue over the next month.

- Installation of I&C equipment into racks is in progress. AC power is now being installed for the I&C racks in B118.

1.8 Conventional Facilities

Low Conductivity Water System (LCW)

- East and West Straights- Performed high pressure water leak test and the system passed. There were no leaks observed on the welds or joints.

- North and South Arcs- The modifications of the pipes to meet the SPEAR3 LCW specifications are now completed.

- LCW Headers, Flexible Hoses Connections and Manifolds- All connections are now complete.

- Building 118 LCW for power supply- Final connections are in progress and work will be completed by September 12, 2003.

- SPEAR3 LCW System Flushing- This final task is scheduled for September 10, 2003.

High Conductivity Water System (HCW)

- The overall High Conductivity Water System is 95% complete.

- The 4" supply and return piping installation is complete, as well as the fill/make-up piping and surge tank standpipe. The piping will be painted for temperature stabilization and corrosion protection. The system will be powered by a circuit from Substation 532.

- Task to be completed by mid-September include start-up/testing , and setting of the conductivity meter and chemical injection pump (to maintain 1700 microsiemen conductivity).

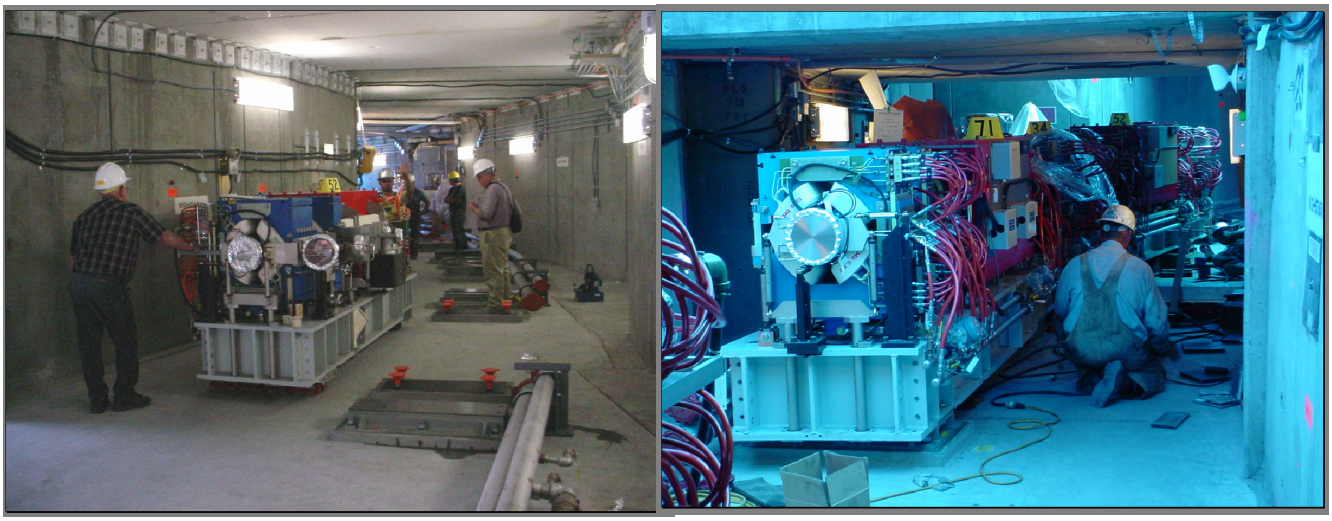
- Final HCW connections to the RF cavity loads (Magic Tee) and klystron load will be accomplished by the Klystron group.

C. Installation Reports

1.9.1 Mechanical Systems

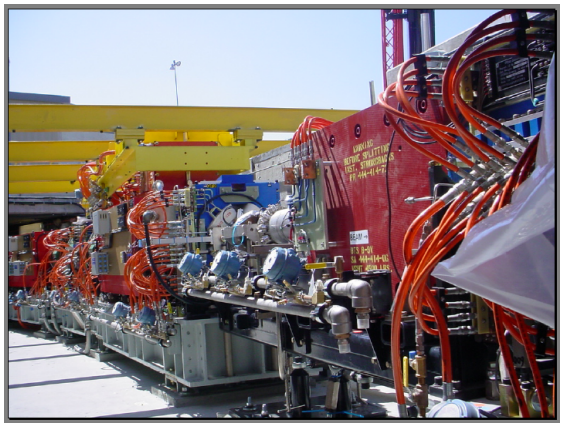
In the month of August, the SPEAR3 project made excellent headway in the installation of tunnel equipment working on completion of supports installation, installation of magnet/vacuum rafts, and starting the cable plant tray work.

The raft installation program began August 11th. Rafts were placed onto roller sets and pulled around the ring by an air-powered winch (see photos below). The rafts were then set on the support stands, which had been aligned to the tolerance of .005" and grouted, and these installed units met our tolerances of less then .020" to the magnets. While the first raft required ~ 3days to rig and install, the rigging company, Rigging International, developed techniques to allow them to install up to 9 rafts in a single day.



Raft installation process in SPEAR tunnel. Left photo shows raft rolling around ring, right photo shows raft being lowered onto support plate and precision pins.

Alternating with raft installation was the Insertion Device (ID) installation. During August six IDs were installed and concrete roof blocks placed over the ID to seal the ring. SPEAR shielding was 90% complete in August with the remainder to be done in September. During August the injection Beams Transport System (BTS) raft and Septum Magnet components were also installed.



BTS raft and Septum straight after installation in SPEAR

New ID & shielding blocks being installed in South Arc of SPEAR using the large 150T crane

The final raft installation on August 27th was a milestone achievement for the project. All 54 rafts were installed meeting the alignment requirements and on schedule without any complications or incidents. Both SLAC staff and Rigging International are to be complimented for their focus on safety and excellent work programs.

Celebration of last SPEAR3 raft installed on August 27th with SPEAR3 & Rigging International staff

Final raft being placed into SPEAR after the picture ceremony

The LCW system was complete in August with the installation of flex lines between girder headers around the ring. The system was pressure tested and cleaned, ready for hook up to the raft manifolds in September. LCW hook ups to the installed RF cavities were also done this month.

1.9.3 Power Supply System

- Farris Electric has installed all the AC power conduits for the power supplies, power supply racks, I & C racks and AC distribution equipment into B118. During September AC power cables will be run and terminated to all equipment. The installation is progressing well and is on schedule for an end of September completion.

- In B118 there is an overhead 4" diameter stainless steel LCW water pipe above Switchboard 4PB118-SWBD-02 which is impractical to move and which only protrudes into an electrical stay clear area for a distance of about three or four feet. The Electrical Safety Committee has agreed to the installation of a drip pan underneath the pipe for the offending length.

- Power source identification labels were affixed to the power supplies.

- The AC Power Restoration Committee met for the second time. A first draft of all the restoration sections was completed. The goal is to approve all sections of the procedure during September in anticipation of turn-on during September.

1.9.4 RF System

- The 4 RF cavities have been installed in the tunnel and the waveguide connection from the circulator to the cavities has been provisionally completed.

- The H-bend sections close to the cavities require removing and brackets installed to house IR detectors which monitor the cavity window temperature during normal operation.

- The NIRP air pressurization system is installed and requires the waveguide connections to be completed before verification of its operation.

- The HCW system for the water loads requires completing, by procuring and installing appropriate hoses and venturis.

- The main headers for the klystron water system are now available in B132-101 and all that remains is connecting these to the klystron water system and to the klystron when available.

- The LLRF modules are required to complete the LLRF system; all other units are now in place.

- When the klystron is available, this obviously requires installing into B132-101.

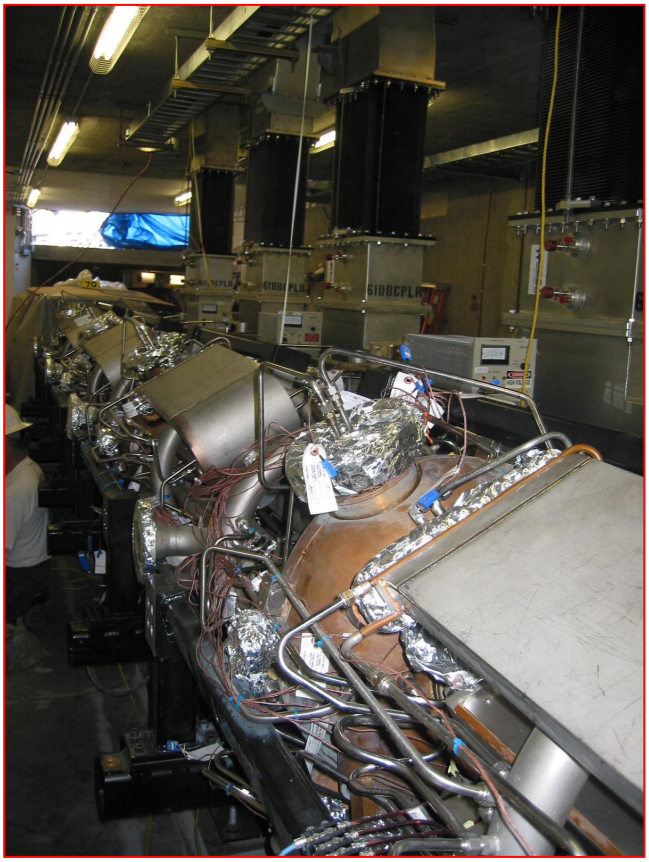
- All that remains is to enable power to the various systems to perform the necessary system operational checks.

- The RF klystron power supply installation is complete. The power supply Equipment Lockout Procedure (ELP) and a commissioning test procedure have also been completed and are in the approval cycle.

- The power supply secondary containment system was installed. The installation of a fixed stairway to the safety work platform was completed.

- A manhole sump in the B514 secondary containment has been filled with concrete to the level of the water table and the liner from the concrete fill to ground surface has been sealed. This will prevent transformer oil from leaking into ground water.

RF Cavity Installation



Four RF cavities installed

1.9.6 Cable Plant Installation

- The Cable Plant Phase 2 contract, which includes all the long haul cables for the project plus the interior ring trays, is underway. The installation started on August 11 and is progressing on schedule. Thirty percent of the new cable plant and seventy five percent of ring trays have been installed.

- Five Change Orders were necessary to accomplish a professional and code compliant installation in B118 and BTS areas for both tray and some cable additions. Ponciano Rodriquez is working with the Electrical Safety Committee to obtain the AHJ approval for the non-tray rated cables required for this project.

- Prepared documentation and pre-fabricated tray assemblies and BPM cable assemblies for speedy installation.

2.0.2 Survey and Alignment

- Straight Section Alignment:
  The first ID was set in the right on August 29th. BL4 ID was particular, as the chamber had been moved inside after the last set of fiducialisation measurements were performed in building 26. Consequently only the TBs on the chamber were used to place the wiggler in line.

- Front Eng Alignment:
  Progress was made in the alignment of all front-end components except for beam lines 5 and 11. BL3 was the first to be finished on August 27th. In parallel the in-alcove alignment of the bending magnet beam lines is almost done; only BL1 is waiting for parts to be put in.

- Miscellaneous Activities:
  - Mapping cells 10 and 11 following a quick check of cell 1- after the pin problem on raft 80.
  - Alignment of BL1 "coffin room."
  - Setting of the BTS caps before and after grouting.
  - BL4 Wiggler: aligning chamber and calibration counter.
  - Front end components for BL4, 5, 7, 9, and 11 and Kickers 1, 2, and 3: fiducialization, assembly monitoring.