



Monthly Progress Report
Stanford Synchrotron Radiation Laboratory

April 2003

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A. SPEAR 3 PROJECT SUMMARY

1. Technical Progress

SPEAR 2 is gone



SPEAR tunnel near the end of April



SPEAR 2 Boneyard

SPEAR 3 begins

The SPEAR 3 Installation Program began ON SCHEDULE March 31, 2003. The SPEAR 2 beam turn-off occurred at 6:00 am followed by a brief celebration during which Burton Richter and Keith Hodgson highlighted the history and the significant research from SPEAR 2 as well as a vision of the bright future anticipated with SPEAR 3.

The Installation Program involves 3 phases: demolition of SPEAR 2, modification of the facilities to meet SPEAR 3 needs, and finally the actual installation of SPEAR 3 technical systems and components. Each phase is a complex procedure that is planned in great detail with overall completion projected by the end of October 2003. Phase one was completed ON SCHEDULE near the end of this month.

In phase one, the first two weeks included the regimented shutdown process for electrical and vacuum systems together with radiation measurements within the tunnel followed by the removal of useful components of the ring. All magnet power supply units were removed from bldg. 118. The removal process of various cable systems for power, controls, and monitoring was initiated. This overall effort was completed ahead of schedule thanks to the outstanding efforts of many SSRL and SLAC staff members.

During the third week, the cable cutting process inside the tunnel was completed. Appropriate shielding blocks were removed such that all of the Insertion Devices could be removed and stored. The fourth week initiated the removal of the eighteen main magnet girders. Most of these 30 foot long concrete supports with installed magnets and vacuum chambers were transported through the tunnel to a roof opening near the West straight section, removed by crane, and transported to the salvage area pictured above. The remaining work including cable removal outside the tunnel, removal of beam line front end components, and overall tunnel clean up was completed on May 5 allowing tunnel excavation (the beginning of phase two) to begin on schedule. The overall timeline for the major installation activities is provided below.

SPEAR 3 Installation timeline

- Begin Apr 2003
- SPEAR 2 remove: Mar 31 – May 8
- B118 renovation: Mar 31 – Oct 6
- Pour concrete floor: May 8 – Jun 20
- Install new monuments: Jun 20 – Jul 25
- Install mounting plates & holes: Jul 1 – Aug 11
- Install Girder & Straights & shielding: Aug 11 – Aug 29
- Install cable plant: Aug 25 – Oct 15
- Install vacuum hardware & BL Front Ends: Aug 18 – Oct 16
- Leakcheck ring/beamlines-pumpdown: Sep 8 – Oct 22
- Final survey: Oct 22 – Oct 30
- Lock Ring-Installation complete: Oct 30, 2003

2. Cost Data

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

Table A1
Costs and Obligations
(through April 2003)

	K\$	
	<u>Direct</u>	<u>Direct & Indirects</u>
Costs	39,978	45,305
Commitments	3,926	4,318
Total	43,904	49,623

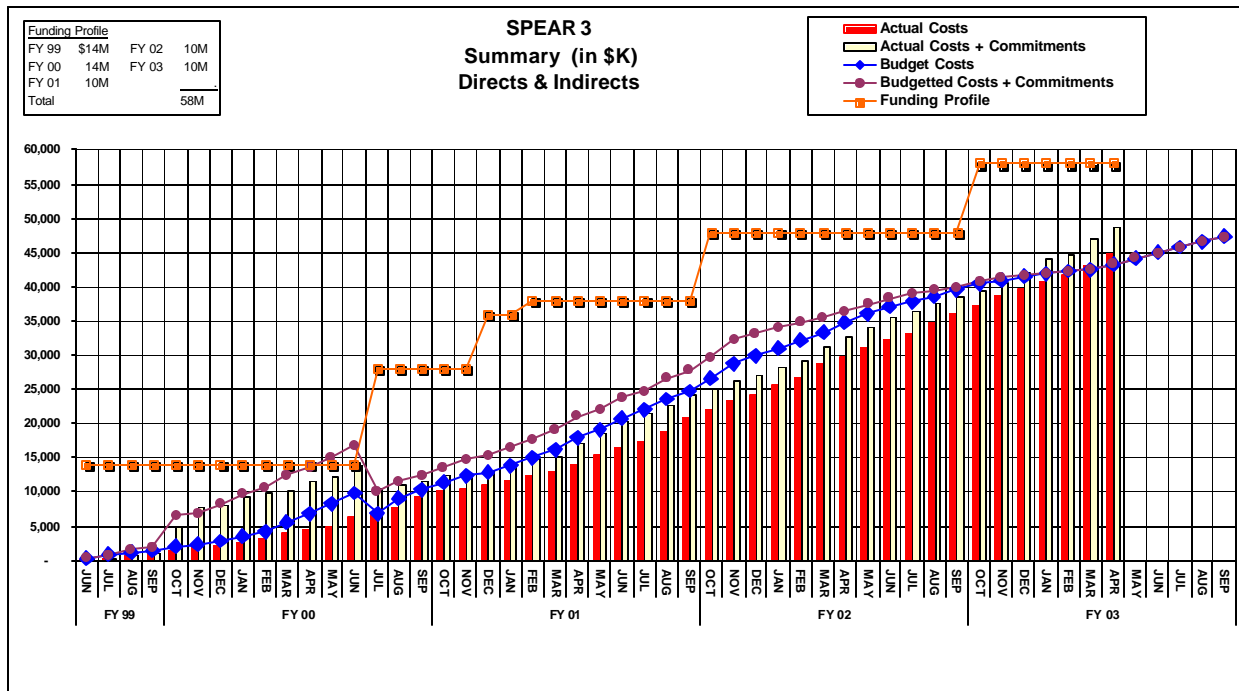


Figure A1

An analysis has been made for the remaining cost to completion. The results are given in Table A2 for each WBS 2 area. Column one provides the actual costs through April 2003 and column two gives the current projected costs to completion from May through October 2003. Column three provides the associated total project costs projected at completion.

The remaining costs to completion total 10,707 K\$ with remaining contingency of 1,988 K\$ which is 18.6%. Appropriate CCB's relative to the baseline budget established August 2002 are underway to reflect the current estimate. Accordingly the budgeted projected costs and costs plus commitments shown in Fig. A1 will be revised in next month's report.

As indicated above, the focus of the SPEAR 3 project is changing from Design, Fabrication, and Production to Installation. The Installation program is based on a fast track schedule and future reports will be on a monthly basis. While we will continue to report on the remaining WBS 2 level efforts until their completion, the major focus of the monthly report will be the Installation effort (WBS 1.9) as provided in Section C of this report.

Table A2
Project Costs (K\$)

<u>WBS</u>	<u>Actual April 30</u>	<u>Estimate to Completion</u>	<u>Total at Completion</u>
1.1 Magnets	8,588	117	8,705
1.2 Vacuum	10,195	1,755	11,950
1.3 Power Supply	2,708	398	3,106
1.4 RF	4,227	305	4,532
1.5 I&C	3,040	1,016	4,056
1.6 Cable	2,084	0	2,084
1.7 Beam Line	1,039	76	1,115
1.9 Installation	873	5,499	6,372
<u>2.0 Management</u>	<u>3,837</u>	178	<u>4,015</u>
Direct Total	39,378		49,571
<u>Indirects</u>	<u>5,328</u>		<u>6,441</u>
Total Cost	45,306		56,012
Contingency			<u>1,988</u>
Project Total			58,000

B. Design and Fabrication Reports

1.1 Magnets and Supports

- The magnet raft assembly program was paused for two weeks due to the SPEAR 2 removal. Production of 47 rafts is complete (17 rafts type 50Q, 14 rafts type 145D-T1, 14 rafts 145D-T2, 2 rafts MCA-QT). Work continued on preassembling magnets on the 7 remaining rafts and jumpering the LCW lines on the vacuum chambers.
- The templates to mark the anchor holes to be drilled on the SPEAR 3 concrete floor are being manufactured.
- The installation of magnets and vacuum chambers on the injection Beam Transport System raft was started.
- The magnetic measurements of the septum magnet were started. A first quick measurement of the injected beam integrated transfer function with a translating wire showed good agreement with the design parameters and no saturation effects up to 3 GeV were noticed. Next measurement will be the integrated leakage field at the stored beam using a translating wire.

1.2 Vacuum System

- Bake-out continued on the final 3 magnet raft chambers (54 total).
- Tubes were cut and formed for the straight sections.
- Septum magnet chamber production halted pending resolution of mirror plate interference.
- The Personnel Protection System beam stopper is partially assembled and awaiting brazement.
- Girder and straight section bellows parts completed.
- RF bellows brazements completed.
- Tune driver bellows parts completed.
- DCCT parts completed except center chamber and shielding.
- Isolation valve order placed.
- Valve support design complete and out for purchase.
- Designs partially completed for support of girder pumps, RF section pumps, and b15 section vacuum.
- Design of anchor bolt templates completed.
- Requisition placed for anchor bolt and grout installation.

1.3 Magnet Power Supplies

All magnet power supplies have been delivered with the following exceptions:

- Seventeen Intermediate (rack-mounted) power supplies. These are due by the end of May from IE Power. Their delivery will support installation.
- Twenty recently-ordered MCOR30s. These are due by the end of June from BiRa. The delivery will support the field test program.

All power supplies have been bench tested with the two exceptions noted above and the dipole bulk power supply. Because of its large electrical size the dipole bulk power supply will be “bench tested” in Building 758 in May. This power supply will be ready when needed for installation.

1.4 RF System

- The first two SPEAR 3 cavities have been successfully processed up to 850kv accelerating voltage. See processing record for the first unit below.
- The third cavity has arrived and being prepared for tests.
- Design reviews were held for the klystron power supply oil secondary containment system and the required overhead hoist for servicing.
- In Building 118 wiring of the control termination box was completed and the enclosure for a programmable logic controller was installed.
- In Building 132 the termination tank was secured to the floor and all cables terminated with the exception of the RG220 HV cable and a ground wire. These items will be completed in May.

1.5 Instrumentation and Control Systems

- Work on the computer control system continued with the configuration of the power supply control software, the BPM data acquisition system, digital output module hardware, and field bus application. The network system was specified and Ethernet switches were ordered.
- Software has been written to automate the testing of the 60 4-button-multiplexed BPM processing modules from Bergoz. Interconnection components needed between the BPM processing system are being fabricated. The first BPM-ADC Interconnect chassis was tested successfully.
- The design of the LO, Clock and Test Tone fan-out units continues, as does the design of the tune monitor, bunch monitor, and BPM-based current monitor.
- Detailed configuration of the programmable logic controller systems for the vacuum and magnet water protection interlocks continues.
- The first Orbit Interlock Position Limit Detector chassis is complete and is being tested.
- The design of the Beam Current Interlock that prevents beam lines not rated for high current operation from being opened above specified beam current levels is in progress.
- I&C equipment racks were delivered.

1.7 Beam Line Front Ends

- The machining of all ID fixed masks is now complete.
- The Beam Line 10 moveable mask has successfully completed all braze and weld operations. Final assembly and alignment fiducialization is in progress.
- The moveable masks for Beam Lines 4, 7, and 9 have commenced braze assembly. Several heats have been completed successfully.

1.8 Facilities

- The final piping drawings and specifications for the HCW system (required for the RF systems) have been completed and will be out for bid May 16.
- The “skid” for the HCW system has been completed (see photo below). Installation is scheduled for early June.
- Phase 1 of the LCW piping modifications for distribution in the East and West straight section areas has been completed. The completion of this work (Phase 2) is scheduled for June after the new concrete floor for the tunnel has been completed.



C. Installation Reports

Approximately 480 tons of SPEAR 2 hardware was successfully removed from the ring tunnel during the month of April. Vacuum chambers and other hardware that were to be saved were prepared and removed before the rigging contractor began the major removal work. LCW piping was modified and prepared for concrete work in the East and West straights. The SPEAR tunnel was emptied by the end of April and ready for new tunnel floor construction on schedule



SPEAR 2 girders being removed from the ring housing

1.9.1 Mechanical Systems

The staff supported the removal of SPEAR 2 components and the continued planning for installation of SPEAR 3.

1.9.2 Vacuum System

The staff supported the removal of SPEAR 2 components and the continued planning for installation of SPEAR 3.

1.9.3 Power Supplies

- The lockout procedures that were developed by the Lockout Committee were successfully implemented and there were no discoveries of live electrical circuits in B118 after the shutdown and lock out.
- Farris Electric completed B118 electrical demolition on schedule. They are waiting for cable tray and other minor material so they can begin the installation of the feeders from Substation 507 to two new B118 switchboards that will be installed after the new B118 floor is in place.
- Farris Electric will also install all the other new B118 electrical equipment. Installation of this equipment will begin after the new B118 floor has been poured.

1.9.4 RF System

- Work centered on installation completion of the RF High Voltage power supply.

1.9.6 Cable Plant

- The demolition of SPEAR 2 Tray and Cableplant System (Building and Ring) was the primary task this month. This major undertaking was accomplished on schedule, within budget, and without incident/injury.
- We conducted intensive coordination between many different organizations of both SLAC and SSRL to acquire a large number of demolition workers. Workers were trained on SLAC Safety together with formal briefings to familiarize them with the demolition work specifics. Nineteen T&M staff were released at the completion of the demolition work except for journeyman electricians reassigned to the SPEAR 3 RF HV power supply installation.
- Work in preparation for the installation of the new cableplant system has intensified this month in order to produce the complete and detailed listing of cable, connectors, and routings for the next, and final, contract package to be released for bid. Interaction continues with SSRL engineering in our goal of quantifying cable and connector types and quantities. This is the last precursor to ordering the balance of cable material.

1.9.7 Beam Line Front Ends

- All FE and in-alcove beam line components scheduled for removal from the ring have been successfully removed.
- All remaining in-alcove beam line components have been protected from dust and debris associated with the tunnel floor excavation.
- All bend beam line out-of-alcove hardware has been coarse re-aligned. Over half the out-of-alcove bend beam line hardware has been fine re-aligned as well.

1.9.8 Facilities

- Efforts continued in preparation for the contract start for excavation of the tunnel floor and the Building 118 (power supply building) floor. The work is scheduled to begin May 6.

1.9.9 Management

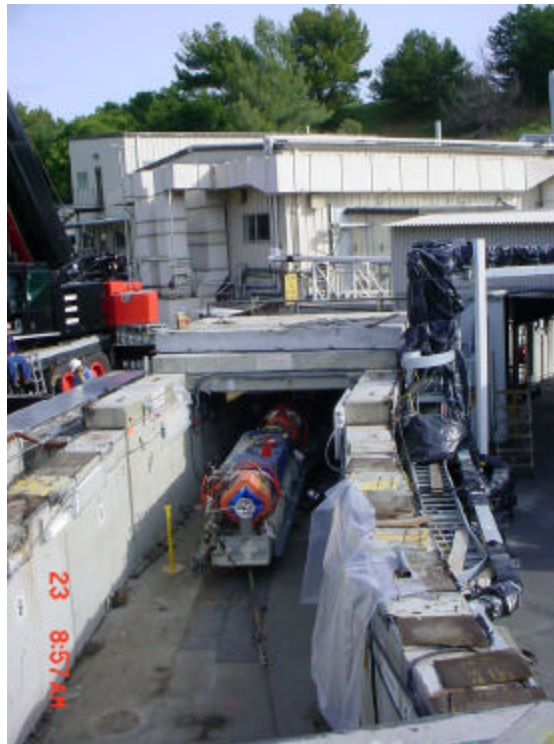
The main tasks and responsibilities underway for the management group by the Installation effort include the following:

- Detailed planning, scheduling, and monitoring of all efforts.
- Coordination efforts involving project staff, several contractors, and T&M labor.
- Oversee contracts and modifications. Execute change orders when required.
- Monitoring of Costs and Schedule variations.
- Insure that all safety rules and regulations are followed and that staff and contractors are properly informed of these regulations.

2.0.1 SPEAR 2 Decommissioning/SPEAR 3 Rigging

The Decommissioning of SPEAR 2 was the major effort in April. The staff in other areas above participated in this work which is summarized below. In progress views of the activities are provided below.

- A total of 46 roof and wall shielding blocks were removed to allow access to the ring for removal of SPEAR 2. They are stored in areas close to SPEAR until replacement near the end of the shutdown. These weigh in excess of 500,000 lbs. Replacement of several weakened roof blocks is anticipated.
- All 18 magnet rafts were removed from SPEAR and transported to the RMMA storage area at Sector 0. The weight of these components is about 750,000 lbs.
- All components from the SPEAR ring straight sections were removed. Five of the Insertion Devices were transported to workshop areas where they will be prepared for installation into SPEAR 3. The two electro-magnet devices will be used on other projects.
- The 11 beam line ‘front ends’ (from the ring to the injection stoppers) were removed. Support frames were also un-bolted and removed, or cutoff, as required. The remaining components were boxed to prevent damage during the ring floor excavation and forming process.



SPEAR 2 Raft – pulled through tunnel



SPEAR2 Raft – removal from tunnel



SPEAR 2 Raft – in sector 0 storage area

2.0.2 Survey and Alignment

Summary of the Alignment Engineering Group progress and accomplishments:

- Set new monumentation for all bending beamlines. This activity was completed ahead of schedule on April 24.
- Realigned bending magnet beamlines. This activity started ahead of schedule in accordance with Hal Tompkins.
- Surveyed concrete test pad for tunnel floor. Surface plots were generated from leveling and total station measurements. The 3D monuments were surveyed weekly for deformation studies. Test pad met specifications.
- Building 750 raft assembly.
 - Final alignment of rafts 73 and 74.
 - Pre-alignment of rafts 75 and 76.
- Miscellaneous
 - Provided elevation on BL10 ID pads.
 - Fiducialized BTS septum.