27 June 2003

To: Paul Philp
DOE Project Manager, Run IIb CDF Detector Project

From: Pat Lukens
Project Manager for the Run IIb CDF Detector Project

Subject: Run IIb CDF Detector Project May 2003 Report

Attached is the monthly report summarizing the May 2003 activities and progress for the Fermilab RunIIb CDF Detector Project. This report is available electronically at:

http://www-cdf.fnal.gov/run2b.html

electronic cc:
J. Appel
E. Arroyo
B. Ashmanskas
N. Bacchetta
D. Benjamin
G. Bolla
J. Cooper
B. Flaugher
H. Frisch
K. Hara
J. Huston
R. Hughes
D. Knapp
J. Kotcher
S. Kuhlmann
T. Liu
N. Lockyer
P. Lukens
T. Miao
J. Monhart
H. Montgomery
C. Paus
V. Pavlicek
K. Pitts
L. Ristori
R. Roser
TJ Sarlina
K. Stanfield
E. Temple
D. Toback
C. Trimby
V. White
B. Winer
M. Witherell
P. Wittich

RunIIb CDF Detector Project
Progress Report No. 6
1 - 31 May 2003

I. PROJECT DESCRIPTION

The primary goal of the CDF Run IIb Detector Project is to enable the detector to exploit the physics opportunities available during Tevatron operation through 2008. The data from Run II will represent a set of detailed measurements that can be compared with the predictions of the Standard Model at the highest available collision energy. The main focus of the experiment in Run IIb will be the continuation of the search for the Higgs boson. The increased size of the data sample will also allow us to study the top quark by measuring the details of its production and decay mechanism. In addition, we plan precision electroweak and QCD measurements, continued searches for a variety of phenomena that are predicted to exist beyond the Standard Model framework, and to explore CP violation in the *b* quark sector. The detailed physics goals of the upgrade are described in the Technical Design Report (TDR).

The major tasks of this upgrade are:

- Replace the silicon micro-vertex detector with a device capable of withstanding the expected radiation dose for Run IIb with fast r-ϕ (axial) and small angle stereo readout.
- Upgrade the calorimeter by replacing the Central Preradiator Chamber with a device with shorter response time to allow operation in a high-luminosity environment, and adding timing information to the electromagnetic calorimeters.
- Upgrade the data acquisition and trigger systems to increase throughput needed for higher luminosity operation and efficiently trigger on the higher multiplicity events of Run IIb.

II. OVERVIEW OF PROJECT STATUS – P. Lukens

A review of the accelerator and future luminosity projections is planned for this summer, and we expect this to address the long range plan for Tevatron operation. We also anticipate the report from P5 on the Run IIb Detector Upgrade Project. We are hopeful that these results will be sufficient for full Critical Decision 3 for the project. Recent analysis of our plans show that the project can continue without additional allocation of funds until the end of the calendar year, if we are permitted to continue to spend beyond the fiscal year boundary.

A Director's review of the project was scheduled and cancelled for the first week of June. Conflicts with the Fermilab User's meeting made the review unworkable.

The project continues to make steady technical progress. The silicon detector took delivery of the second round of SVX4 manufacture. Delivery was earlier than expected, and all tests with the new chip have been successful. We believe that this may be the production version, and no test yet performed conflicts with that plan. All the issues found in the first version appear to have been addressed. Orders are being placed for "preproduction" parts for the silicon detector. These are production versions, and should be of sufficiently high quality that they could be incorporated into the detector. The summer and fall will see construction of these parts, and we plan to be ready for production orders by the end of the year. This is well ahead of the schedule.

Memoranda of Understanding and Statements of Work were signed between the project and Univ of California, Davis, and University of Chicago in May.

III. PROJECT MILESTONE SUMMARY

CDF Level 2 Schedule Milestones from the Resource Loaded schedules

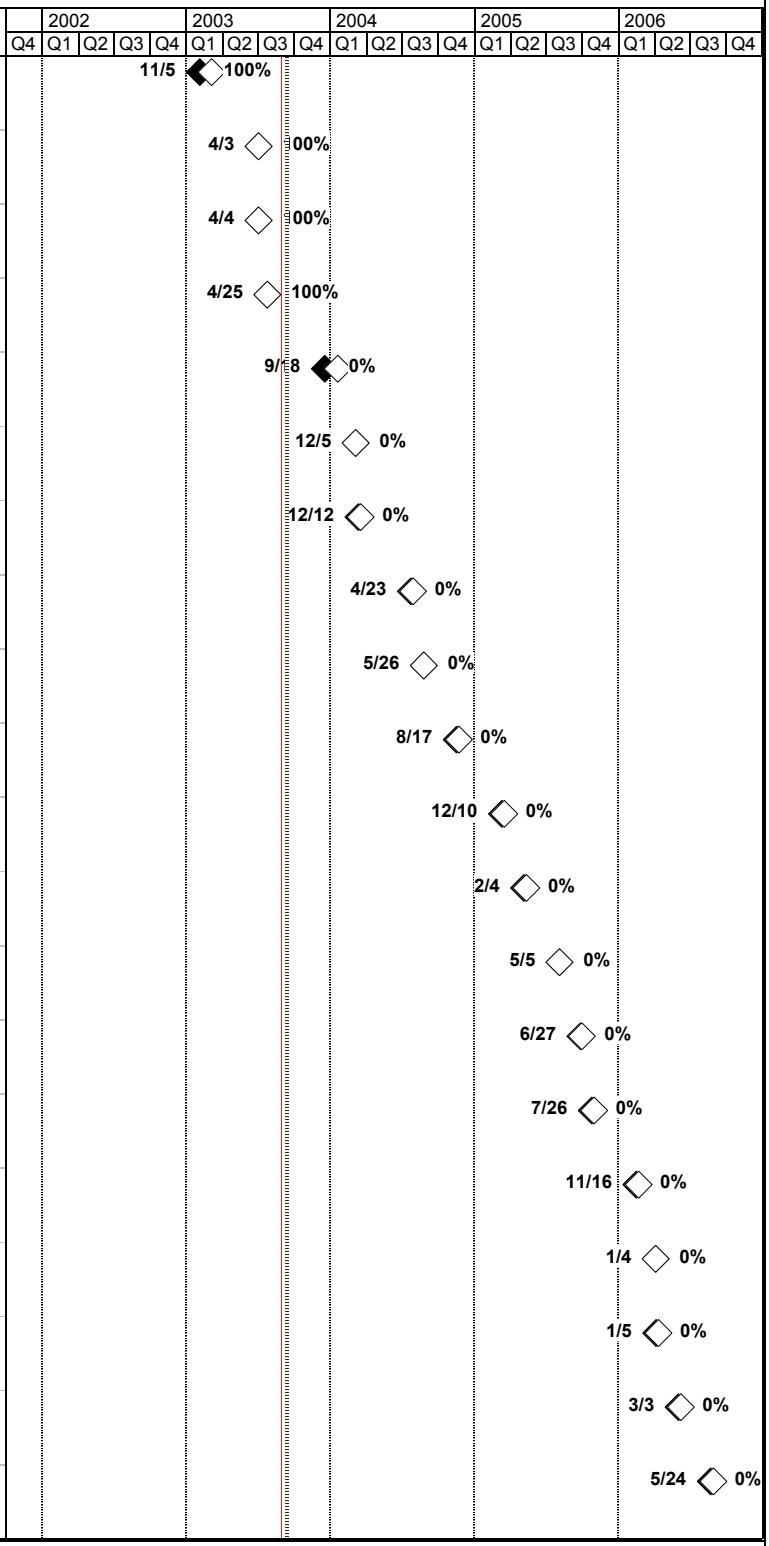
WBS	Title	Baseline Completion Date	Forecast/Actual Completion Date	Complete
1.1.5.4.1.13	Prototype stave #1 complete	5-Dec-02	5 Nov 02	Yes
1.1.2.10.2.4	Testing #1 complete- go ahead for #2	3-Apr-03	3-Apr-03	Yes
1.1.2.1.2.4	2nd chip submission	4-Apr-03	4-Apr-03	Yes
1.3.3.2.3.4	Begin fabrication of Prototype Finder 1/3 board	11-Apr-03	3-Sep-03	
1.1.3.1.2.4	Production Sensor submission	25-Apr-03	25-Apr-03	Yes
1.2.1.10.1	First phototube order placed	9-May-03	1-Apr-03	Yes
1.2.2.2.7.1	Prototype Testing Complete	16-May-03	28-Mar-03	Yes
1.2.2.2.7.4	ASD->TDC Cables ready for installation	16-May-03	26-Aug-03	
1.2.2.2.7.2	CEM Splitters ready for installation	19-May-03	29-Jul-03	
1.3.3.8.1.9	Prototype Linker Module avail for test	9-Jun-03	22-Jul-03	
1.2.2.2.7.3	PEM Harnesses ready for installation	2-Sep-03	28-Apr-03	Yes
1.2.2.2.7.5	All cables done and ready to install	2-Sep-03	26-Aug-03	
1.3.5.2.5	Arrival of 0/10 PCs from the vendor	10-Sep-03	10-Sep-03	
1.2.1.10.2	1st Calorimeter WLS fiber holder finished	7-Oct-03	4-Dec-03	
1.2.2.2.7.8	VME Crate ready for installation	7-Oct-03	30-Apr-03	Yes
1.1.2.1.3.5	Production chip submission	21-Oct-03	8-Sep-03	
1.3.1.6.7	First Prototype TDC available for test	19-Nov-03	19-Nov-03	
1.1.6.3.1.1.5	Stave & screen mounting tests complete	5-Dec-03	5-Dec-03	
1.2.1.10.4	1st CPR module finished and tested	11-Dec-03	12-Feb-04	
1.1.2.10.3.4	Go ahead for Preproduction	18-Dec-03	12-Dec-03	
1.2.2.2.7.10	Upstairs components ready to install	7-Jan-04	7-Jan-04	
1.2.2.2.7.11	All EM Timing components ready to install	7-Jan-04	8-Jan-04	
1.2.2.2.7.6	ASD/TB ready for installation	7-Jan-04	8-Jan-04	
1.2.2.2.7.7	Downstairs components ready to install	7-Jan-04	8-Jan-04	
1.2.2.2.7.9	TDC boards ready for installation	7-Jan-04	11-Jun-04	
1.2.1.10.3	First set of Calorimeter phototubes tested	30-Jan-04	20-Oct-03	
1.2.1.10.6	1st CCR module finished and tested	12-Feb-04	8-Apr-04	
1.1.2.3.1.3.12	Preproduction hybrid available	29-Apr-04	23-Apr-04	
1.2.1.10.5	2nd set of Calorimeter phototubes tested	21-May-04	18-Feb-04	
1.1.5.2.2.8	L0 prototype modules complete	26-May-04	26-May-04	
1.3.4.4.1.4	Prototype Event Builder hardware arrives	3-Jun-04	3-Jun-04	
1.2.1.10.7	50% Calorimeter CPR Detectors Tested	4-Jun-04	2-Aug-04	
1.3.3.10.3.3	Preproduction XFT Stereo Assoc Modules	21-Jun-04	19-Aug-04	
1.3.4.5.3	Production Readiness Rev - Event Builder	24-Jun-04	24-Jun-04	
1.1.2.10.4.6	Go ahead for DAQ production	23-Aug-04	17-Aug-04	
1.3.2.6.3	Begin production of Level 2 Pulsar system	17-Sep-04	17-Sep-04	

Milestone list continues on following page

WBS	Title	Baseline Completion Date	Forecast/Actual Completion Date	Complete
1.2.1.10.8	50% Calorimeter CCR Detectors tested	30-Aug-04	26-Oct-04	
1.3.3.2.6.9	Begin Production Finder SL7 boards	14-Oct-04	14-Mar-05	
1.3.3.8.3.3	Begin Production of XFT Linker Modules	13-Dec-04	8-Feb-05	
1.3.6.5	SVT ready for installation	13-Dec-04	13-Dec-04	
1.1.2.3.1.4.9	Production hybrid available	16-Dec-04	10-Dec-04	
1.3.1.12	Beginning of TDC Production	10-Jan-05	10-Jan-05	
1.3.4.5.4.4	Arrival of Event Builder hardware	3-Feb-05	3-Feb-05	
1.1.5.3.4.8	Production module available	10-Feb-05	4-Feb-05	
1.2.1.10.10	Final Calorimeter CCR Detector Tested	24-Mar-05	19-May05	
1.2.1.10.9	Final Calorimeter CPR Detector Tested	24-Mar-05	19-May05	
1.3.5.5.5	Arrival of 70 L3 & 15 DAQ PCs from the vendor	24-Mar-05	24-Mar-05	
1.3.5.6.5	Arrival of 140/20 PCs from the vendor	24-Mar-05	24-Mar-05	
1.3.5.8	Finish Purchase of Computers for L3/DAQ	14-Apr-05	14-Apr-05	
1.1.6.1.11.3.5	Layer Zero Silicon Supports Complete	5-May-05	5-May-05	
1.3.4.8	Finish Event-Builder Upgrade	5-May-05	5-May-05	
1.2.1.10.11	Final set of Calorimeter phototubes tested	6-May-05	29-Apr-05	
1.2.1.10.12	End of Central Preshower Project	6-May-05	19-May05	
1.2.3.5	End of Calorimetry Project: Level 2	6-May-05	19-May05	
1.3.1.14.16	Data Concentrator Production Completed	2-Jun-05	2-Jun-05	
1.3.2.9	Pulsar Level 2 subproject ready for installa	9-Jun-05	9-Jun-05	
1.1.5.4.4.11	100 Production staves complete	1-Jul-05	27-Jun-05	
1.3.3.10.4.6	Production Stereo Association Modules complete	6-Jul-05	2-Sep-05	
1.3.3.23	XFT Ready for Installation at CDF	6-Jul-05	15-Sep-05	
1.1.6.3.1.3.3	Stave Installation Begins	1-Aug-05	26-Jul-05	
1.3.1.13.10	TDC Production Board testing complete	30-Sep-05	30-Sep-05	
1.3.1.16	Run 2b TDC Ready for Installation	30-Sep-05	30-Sep-05	
1.3.8	Finish Run 2b Trigger DAQ project	30-Sep-05	30-Sep-05	
1.1.5.4.4.14	Production staves complete	22-Nov-05	16-Nov-05	
1.1.6.3.2.3.6	Inner detector complete	4-Jan-06	4-Jan-06	
1.1.6.3.1.3.8	Stave Installation Complete	11-Jan-06	5-Jan-06	
1.1.6.3.1.3.16	Outer detector complete	9-Mar-06	3-Mar-06	
1.1.6.4.8	SVX2b Ready for Installation into ISL	31-May-06	24-May-06	

CDF Run2b Silicon Detector Schedule Level 2 Milestones

ID	WBS	Task Name
115	1.1.5.4.1.13	Silicon Project Outer Layer Prototype Stave #1 complete
293	1.1.2.10.2.4	Silicon Project DAQ 1st round testing complete
219	1.1.2.1.2.4	2nd SVX4 Chip submission
43	1.1.3.1.2.4	Silicon Project Outer Layer Production Sensor submission
231	1.1.2.1.3.5	SVX4 Production chip submission
707	1.1.6.3.1.1.5	Silicon Project - All stave installation & screen mounting tests complete
298	1.1.2.10.3.4	Go ahead for Silicon Project DAQ Preproduction
380	1.1.2.3.1.3.12	Silicon Project preproduction hybrid available
66	1.1.5.2.2.8	Silicon Project Layer Zero prototype modules complete
305	1.1.2.10.4.6	Go ahead for Silicon Project DAQ Production
390	1.1.2.3.1.4.9	Silicon Project production hybrid available
102	1.1.5.3.4.8	Silicon Project Outer Layer Production module available
629	1.1.6.1.11.3.5	Silicon Project Layer Zero Silicon Supports Complete
150	1.1.5.4.4.11	Silicon Project - 100 Production Staves complete
717	1.1.6.3.1.3.3	Silicon Project Stave Installation Begins
155	1.1.5.4.4.14	Silicon Project - All Production Staves complete
700	1.1.6.3.2.3.6	Silicon Project Inner Detector complete
722	1.1.6.3.1.3.8	Silicon Project Stave Installation Complete
730	1.1.6.3.1.3.16	Silicon Project Outer Detector complete
739	1.1.6.4.8	SVX2b Ready for Installation into ISL

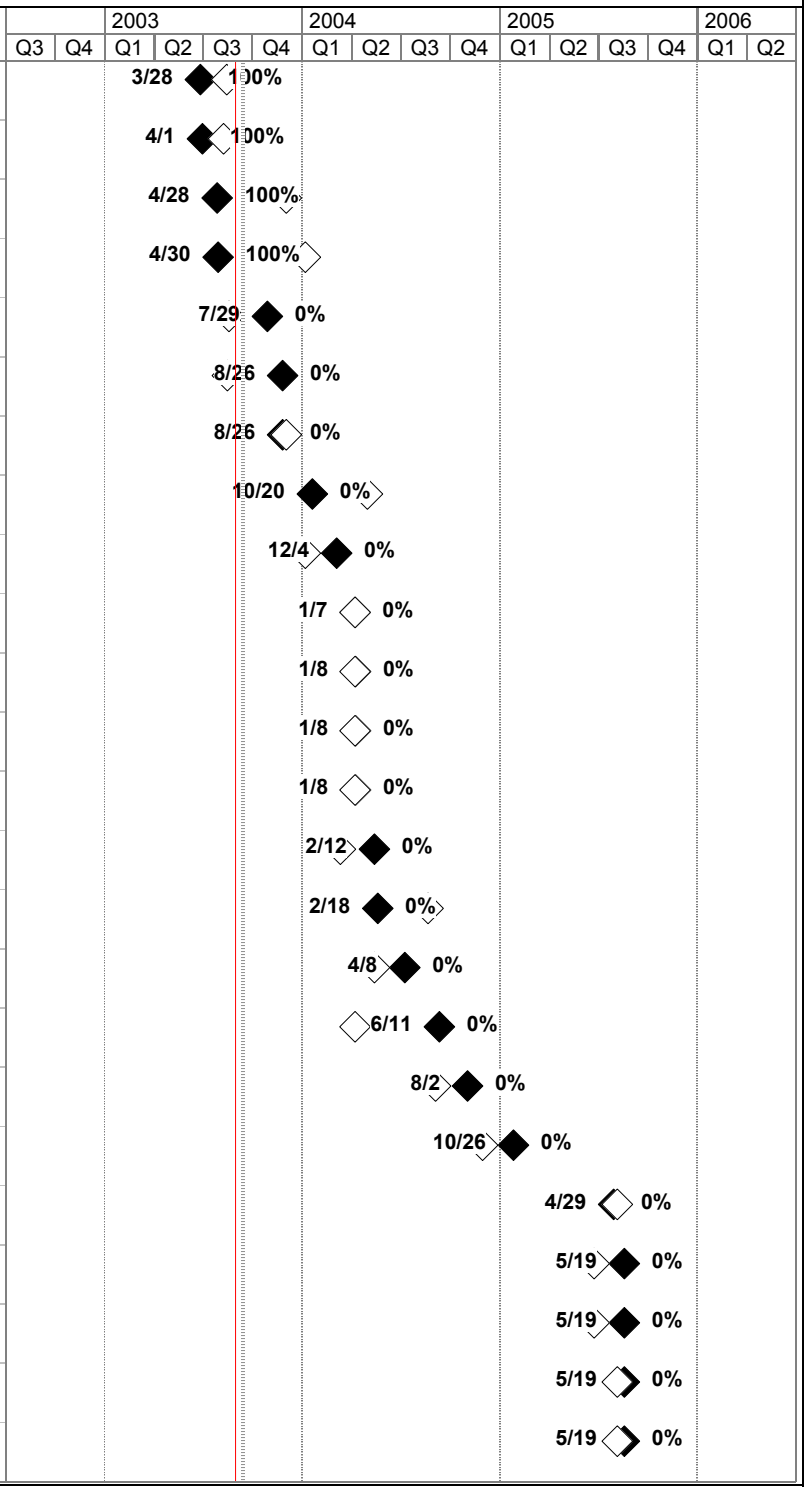


Project: CDF Run2b Silicon
Date: Jun 12 '03

Task		Baseline Summary	
Progress		Rolled Up Baseline	
Baseline		Rolled Up Baseline Milestone	
Milestone		Rolled Up Progress	
Baseline Milestone		Split	
Summary		External Tasks	
Rolled Up Task		Project Summary	
Rolled Up Milestone			

CDF Run2b Calorimeter Schedule Level 2 Milestones

WBS	Name
1.2.2.2.7.1	**EMTiming Prototype Testing Complete**
1.2.1.10.1	**1st Calorimeter phototube order placed**
1.2.2.2.7.3	**EMTiming PEM Harnesses ready to install**
1.2.2.2.7.8	**EMTiming VME Crate ready to installn**
1.2.2.2.7.2	**EMTiming CEM Splitters ready to install**
1.2.2.2.7.4	**EMTiming ASD->TDC Cables ready to installn**
1.2.2.2.7.5	**All EMTiming cables done and ready to install**
1.2.1.10.3	**1st set of Calorimeter phototubes tested**
1.2.1.10.2	**1st Calorimeter WLS fiber holder finished**
1.2.2.2.7.10	**EMTiming Upstairs components ready to install**
1.2.2.2.7.6	**EMTiming ASD/TB ready to install**
1.2.2.2.7.7	**Downstairs EMTiming components ready to install**
1.2.2.2.7.11	**All EMTiming components ready to install**
1.2.1.10.4	**1st Calorimeter CPR module finished and tested**
1.2.1.10.5	**2nd set of Calorimeter phototubes tested**
1.2.1.10.6	**1st Calorimeter CCR module finished and tested**
1.2.2.2.7.9	**EMTiming TDC boards ready to install**
1.2.1.10.7	**50% Calorimeter CPR Detectors Tested**
1.2.1.10.8	**50% Calorimeter CCR Detectors Tested**
1.2.1.10.11	**Final set of Calorimeter phototubes tested**
1.2.1.10.9	**Final Calorimeter CPR Detector Tested**
1.2.1.10.10	**Final Calorimeter CCR Detector Tested**
1.2.1.10.12	**End of Central Preshower Project**
1.2.3.5	**End of Calorimetry Project: Level 2**

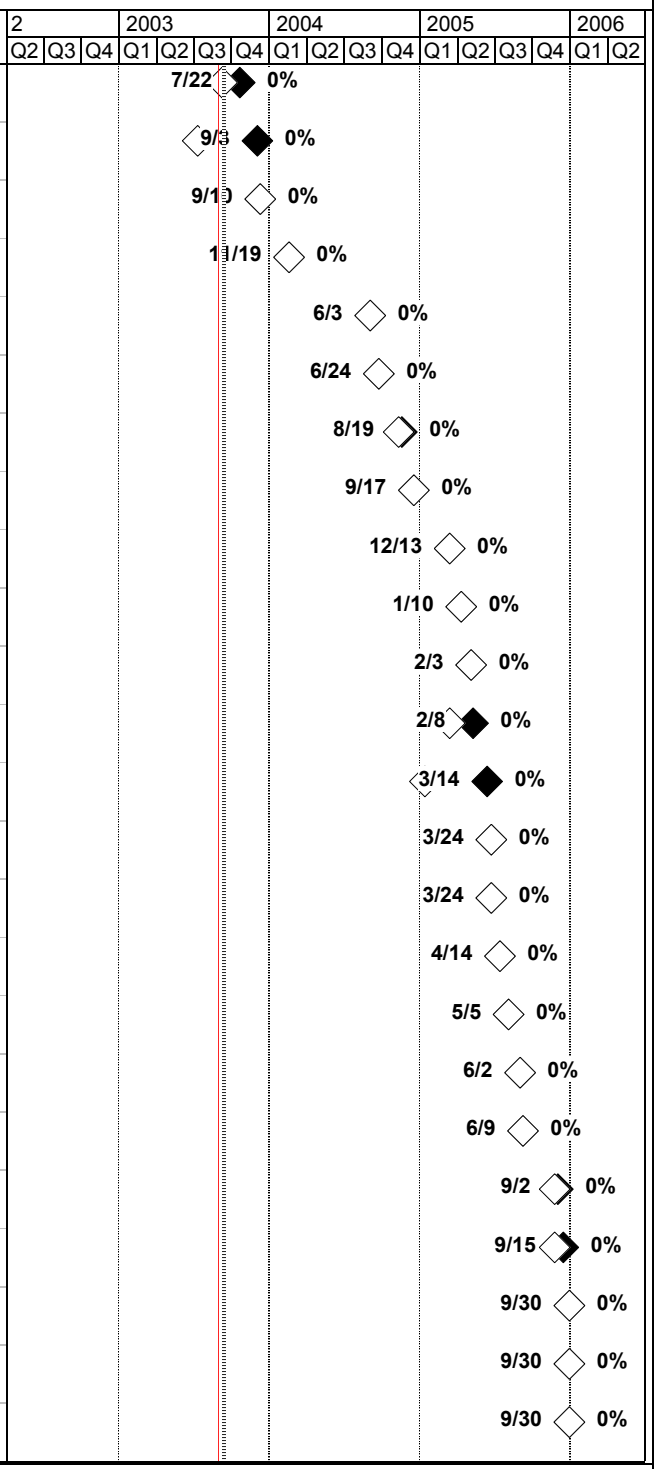


Project: CDF RunIIb Calorim
Date: Jun 12 '03

Task		Baseline Summary	
Progress		Rolled Up Baseline	
Baseline		Rolled Up Baseline Milestone	
Milestone		Rolled Up Progress	
Baseline Milestone		Split	
Summary		External Tasks	
Rolled Up Task		Project Summary	
Rolled Up Milestone			

CDF Run2b Trigger/DAQ Schedule Level 2 Milestones

ID	WBS	Name
214	1.3.3.8.1.9	Prototype XFT Linker Module available for testing
280	1.3.3.2.3.4	Fabrication of Prototype XFT Finder 1/3 board
19	1.3.5.2.5	Arrival of 0/10 PCs from the vendor
387	1.3.1.6.6	First Prototype TDC available for testing
61	1.3.4.4.1.4	Arrival of the prototype Event Builder hardware
72	1.3.4.5.3	Event Builder Production Readiness Review
243	1.3.3.10.3.3	Begin Preproduction XFT Stereo Association Modules
105	1.3.2.6.3	Begin production of Level2 Pulsar system
11	1.3.6.5	SVT ready for installation
423	1.3.1.12	Beginning of TDC Production
78	1.3.4.5.4.4	Arrival of the Event Builder hardware
225	1.3.3.8.3.3	Begin Production XFT Linker Modules
319	1.3.3.2.6.9	Begin Production XFT Finder SL7 boards
36	1.3.5.5.5	Arrival of 70 Level3 and 15 DAQ PCs from the vendor
49	1.3.5.6.5	Arrival of 140/20 PCs from the vendor
52	1.3.5.8	Finish Purchase of Computers for Level3/DAQ system
83	1.3.4.8	Finish Event-Builder Upgrade
442	1.3.1.14.16	TDC Data Concentrator Production complete
115	1.3.2.9	Pulsar Level 2 subproject ready for installation
254	1.3.3.10.4.6	XFT Production Stereo Association Modules complete
326	1.3.3.23	XFT Ready for Installation at CDF
464	1.3.1.13.10	TDC Production Board testing complete
465	1.3.1.16	Run 2b TDC Ready for Installation
466	1.3.8	Finish Run 2b Trigger DAQ project



Project: CDF Run 2B Data A
Date: Jun 12 '03

Task
Progress
Baseline
Milestone
Baseline Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Baseline Summary
Rolled Up Baseline
Rolled Up Baseline Milestone
Rolled Up Progress
Split
External Tasks
Project Summary

IV. PROCUREMENT – P. Lukens

The requisition for preproduction hybrid work at UC, Davis was prepared, and awaits laboratory approval (MOU and SOW have been signed). Other requisitions for preproduction parts have been placed as well.

V. PROJECT HIGHLIGHTS

1.1 – Silicon Detector

1.1.2 DAQ (Data AcQuisition) – Brenna Flaugher, Nicola Bacchetta

The 2nd prototype of the SVX4 chip arrived at Fermilab around the middle of May, ahead of schedule. Preliminary testing is very promising and the chip appears to be functional in all aspects. Detailed testing is in process at both Fermilab and LBL. Some of the chips delivered to LBL will actually be mounted on hybrids.

The prototype transceiver chips were received in January 2003. They function as designed and will be used for production. The wafers that have been processed will provide enough available chips for production.

Manufacturing continues on the second prototype outer layer hybrids. Five Layer Zero hybrids were assembled to be used for the initial testing and all of them performed well. Three hybrids were brought to Fermilab and one of these was used to build the first Layer Zero prototype module. Initial testing of the module looks promising.

The capacitance of one set of prototype analog cables was measured and found to be higher than we would like. We are pursuing two alternative designs with two new vendors. Both of these alternative designs were ordered and delivery is expected at the end of June. Acceptance testing will begin as soon as the cables arrive and the results of the tests will determine which vendor will be selected to manufacture the final cables.

No progress has been made on finishing off the last details of the bus cable design. Effort was concentrated on testing related to the next version of the bus cable. These quick turn-around items will be submitted during June to prepare for preproduction stave construction.

The design of the preproduction MiniPort Card (MPC) was reviewed and finalized. The drawings were submitted to the vendor.

Work continued on defining the specifications for the Junction Port Cards (JPC's), the Fiber Transition Modules (FTM's), and the cables and connectors that join them together. Sixty five percent of the cables from the MPC to the JPC have been fully specified and ordered.

We held a series of meetings to evaluate the capacity of the existing DAQ system given the existing SRC and the upgraded FTM. The existing SRC is technically limited and uses firmware that is difficult to maintain. Development of a new Silicon Readout Controller (SRC) was anticipated and definition of the design specifications is beginning.

1.1.3 Sensors – Brenna Flaugher, Nicola Bacchetta

Manufacturing continues to proceed smoothly on the outer layer sensors. We expect Tsukuba to receive the first delivery of sensors around the end of June.

1.1.5 Construction of Modules, Staves, and Layer Zero (L0) – Brenna Flaugher, Nicola Bacchetta

The first Layer Zero module was completed and is ready for testing. Construction of outer layer modules continues on an as needed basis. Three more stereo modules were built and used to populate the back of Stave #2. Stave #3 is being used to study different grounding configurations. Parts are being assembled in preparation for preproduction module and stave construction late this summer.

1.1.6 Support Mechanics – Brenna Flaugher, Nicola Bacchetta

We received new prototype barrel bulkheads. These were machined at an offsite shop to qualify this shop for production work. These bulkheads will be used to construct a prototype barrel. Analysis work of the CF spacetube shell was completed and the design was finalized. Drawings are under preparation. The cooling tubes for the Layer Zero carbon fiber structure were assembled and tested. The results for this coaxial system look promising. Design is almost complete for the stave installation fixturing and many parts are already being fabricated.

1.2 – Calorimeter

1.2.1 Central Preshower and Crack Detector – Steve Kuhlmann

The Central Preshower/Crack Upgrade continued to make progress in May on many fronts. The final 22 tiles of the first full-scale Preshower prototype were assembled at Argonne National Lab. This module is in the process of being scanned with a moving radioactive source. Scintillator for the first full-scale Crack prototype was purchased by Michigan State University and shipped to Fermilab Lab 8 for preparation. Fibers for a second Preshower prototype were purchased by MSU as well and shipped to FNAL Lab 7 for preparation. Small prototype tests to optimize light yield and optimize the assembly procedure continued at INFN.

1.2.2 Electromagnetic Timing – Dave Toback

May 2003 saw the continued success of the EM Timing project. Nearly every component is on schedule and many are well ahead of schedule. The PEM harnesses are complete, tested and ready to be installed. The CEM splitter harnesses are into production and testing, and are over 50% done. We believe we are on track to successfully meet the milestone for having all of the cables constructed and ready for use. The on-detector integration of the CEM splitters and PEM wedges into normal data continues to go well as we improve calibrations and monitoring. All of the parts for the TDC crate have been installed, and the cabling connections to the rest of the TDC system are now done, integrated, tested and operating on the detector currently, well ahead of schedule. We have 20% of the TDC's in hand and it is expected the others will be available before the scheduled arrival date. As previously mentioned, the Italian funding situation of only having 50% of the funding available delayed the ordering of the final production components of the ASD, the TB and the long cables. This money was released in May and the long cables,

ASD's and TB printed circuit boards (PCBs) were ordered. While this sets back the long cable production time line, it does not affect the overall cabling schedule, or the ASD or TB schedule. Most of the parts for the ASD and TB's have been purchased and have arrived at INFN. The remaining parts have been ordered or will be ordered soon and are expected to be available this summer. Our test stand room is fully functional with production quality components. The bulk of our efforts have been in debugging individual problems with the existing hardware and the online and offline software for the project. It is believed that all components are on schedule to be here by the end of the summer.

1.3 –Data Acquisition and Trigger

1.3.1 TDC (Time to Digital Converter) – Henry Frisch, Ting Miao

On the TDC readout prototype work, PPD has assigned two electronic engineers to work on the implementation of the multi-board readout scheme on the existing TDCs. Several options were discussed and we hope to make a decision in a few weeks. There is a tentative planned review of the chip in late June with the users to ascertain that the functionality of this device is satisfactory before we start on the design of the PC board layout.

1.3.2 Level 2 – Ted Liu, Peter Wittich

The CDF Level 2 Trigger system continues to make progress on the following fronts:

- Pulsar hardware, firmware and VME software,
- PCI and CPU performance studies, and
- S-LINK data format definition for all data paths.

All Pulsar prototypes have been fully tested for robustness. No design problems have been identified therefore we are convinced there is no need for any design revisions. This includes the following components:

- Pulsar motherboard,
- Hotlink transmitter and receiver mezzanine cards,
- Taxi transmitter and receiver mezzanine cards, and
- Back of crate transition module.

Both Pulsar firmware and VME software have been greatly improved to allow fully automated testing. With the automated testing procedures and the complete success of all prototypes, we are getting ready for Pulsar hardware preproduction. The original schedule for Pulsar hardware preproduction was November 2003 so, at this point, we are roughly six months ahead of the schedule.

The work on testing the CPU performance on modern CPUs with Linux operating system for the Level 2 trigger decision algorithm latency has been completed. The results indicate that modern CPUs (~2 GHz desktop PCs) with Linux operating systems have much better performance than the old Alpha's (500MHz without operating system) being used in the current Level 2 trigger system. The work on testing the SLINK to PCI card (S32PCI64,

designed at CERN for Atlas) performance is continuing. The work on SLINK data format definition for each data path is finished.

More specific details about the project progress can be found at:
http://hep.uchicago.edu/~thliu/projects/Pulsar/L2_upgrade_meeting.html

1.3.3 XFT (eXtremely Fast Tracker) II – Richard Hughes, Brian Winer

The Linker upgrade work at OSU has been focused on implementing the improved tracking linking algorithm in the latest Altera Stratix devices. We have fit the design into the target device (an EP1S25), but we are struggling with trying to pass a set of test vectors through the Altera simulator. We have successfully tested smaller portions of the design with the simulator, but not yet the full design.

1.3.4 Event Builder – Christoph Paus

The technical evaluation of the Gigabit prototype system has been completed. System operation was satisfactory and the design has proven reliable. No other work is scheduled to begin until later in calendar year 2003.

1.3.6 SVT (Silicon Vertex Tracker) – Bill Ashmanskas, Luciano Ristori

No work is scheduled to begin on the Silicon Vertex tracker trackfitter and merger boards until early in calendar year 2004.

VI. FINANCIAL STATUS

The accompanying tables and charts are the Cost Performance Reports generated from COBRA. These give a summary of the financial tracking of the project, as measured by the Earned Value. Input data for the earned value calculation originates with the status of project completion, as reported by the Level 2 managers, and actual costs extracted from the Fermilab accounting system.

The following charts and tables are attached:

CDF Project Variance Analysis Report - This report gives a high level summary of the cost and schedule variances of the project as a whole.

CDF Project Cost Performance Report - This report gives a complete earned value calculation of the project down to Level 3 of the Work Breakdown Structure. Earned value calculations are shown for this reporting period (columns 2-6) as well as the project to date (columns 7-11). Column 12 contains our current value of BAC, and will only be changed after the formal implementation of the Change Control process.

CDF Project Performance Indicator Plot - This graph provides a display of the Schedule and Cost Performance Indicators over time. SPI and CPI tracking bands are as follows:

Green	-	Between 0.9 and 1.15
Yellow	-	Between 0.85 and 0.95 or between 1.15 and 1.25
Red	-	Less than 0.85 or Greater than 1.25

CDF Project Financial Plot - This plot provides a monthly indication of the work scheduled, work performed, and the actual costs.

CDF RunIIb Baseline BCWS - This plot provides an integrated view of the work scheduled, work performed, and the actual costs of the Project to date.

A number of specialized terms and abbreviations are used in the reports. They are defined here for convenience:

ACWP – Actual Cost of Work Performed. This is the actual cost of tasks that have been completed.

BAC – Budget at Completion. The BAC is the estimated total cost of the project when completed. It is equivalent to the BCWS at completion. The baseline value of the BCWS is contained in column 12 of the **Cost Performance Report**.

BCWP – Budgeted Cost of Work Performed. This is the scheduled cost profile of tasks that have been completed.

BCWS – Budgeted Cost of Work Scheduled. This is the sum of the budgets for all planned work to be accomplished within a given time period.

CPI – Cost Performance Index. $CPI = \frac{BCWP}{ACWP}$

CV – Cost Variance. $CV = BCWP - ACWP$

EAC – Estimate At Completion. This is the ACWP to date, plus the BCWS (current scheduled estimate) of remaining tasks. $EAC = (BAC\ (current) - BCWP) + ACWP$

EV – Earned Value. $EV = BCWP$

ETC – Estimate to Completion. $ETC = EAC - ACWP - Contingency$

Percent Complete - $\%Com = \frac{BCWP}{BAC}$

SPI – Schedule Performance Index. $SPI = \frac{BCWP}{BCWS}$

SV – Schedule Variance. $SV = BCWP - BCWS$

CDF Project Variance Analysis Report

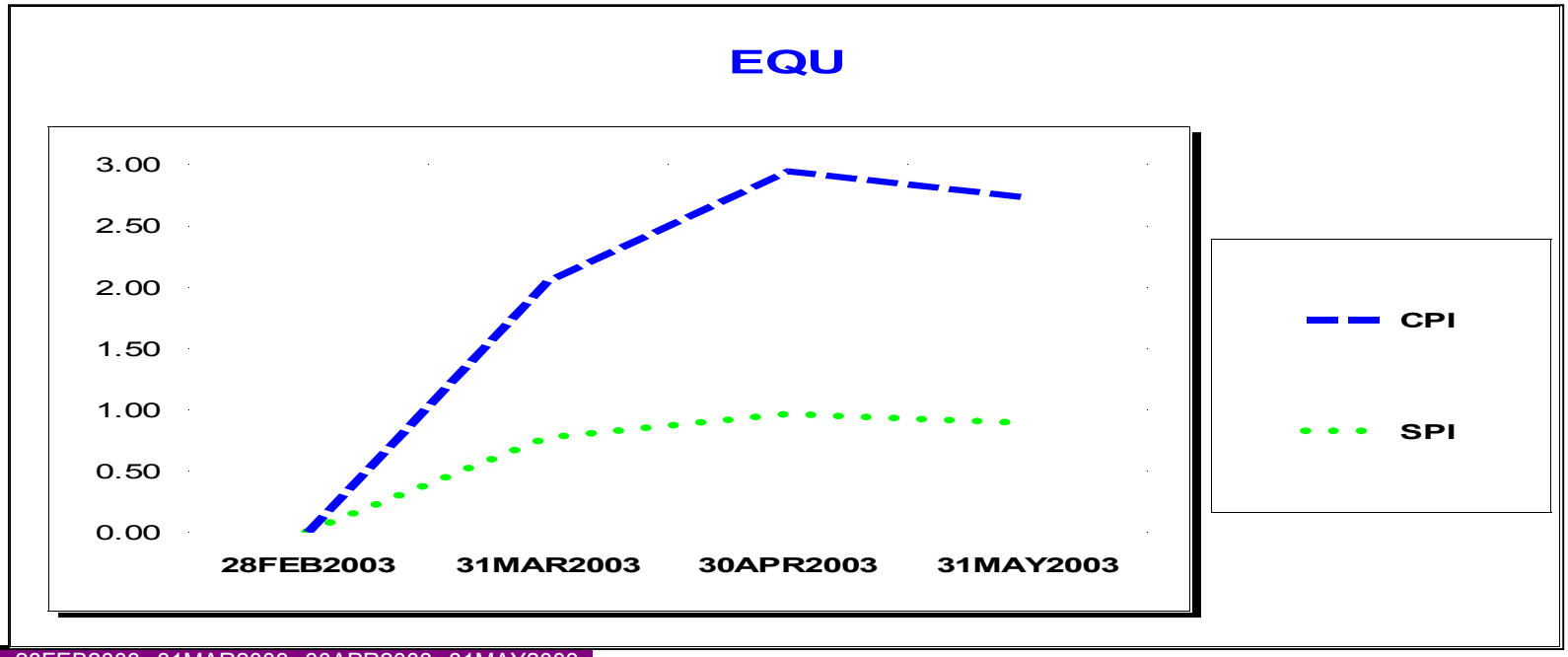
Reporting Period: 4/30/2003 to 5/31/2003

	BCWS	BCWP	ACWP	SV in $	SV in %	CV in $	CV %	SPI	CPI
Current:	232,251	176,539	74,882	-55,712	-24%	101,657	58%	0.76	2.36
Cumulative:	629,423	557,089	204,217	-72,335	-11%	352,872	63%	0.89	2.73
	BAC	**EAC**	**VAC in $**	**VAC in %**	**CPI to BAC**	**CPI to EAC**			
At Complete:	17,379,944	17,211,008	168,936	1%	0.98	0.99			

CDF Project EQU Cost Performance Report at WBS Level 3

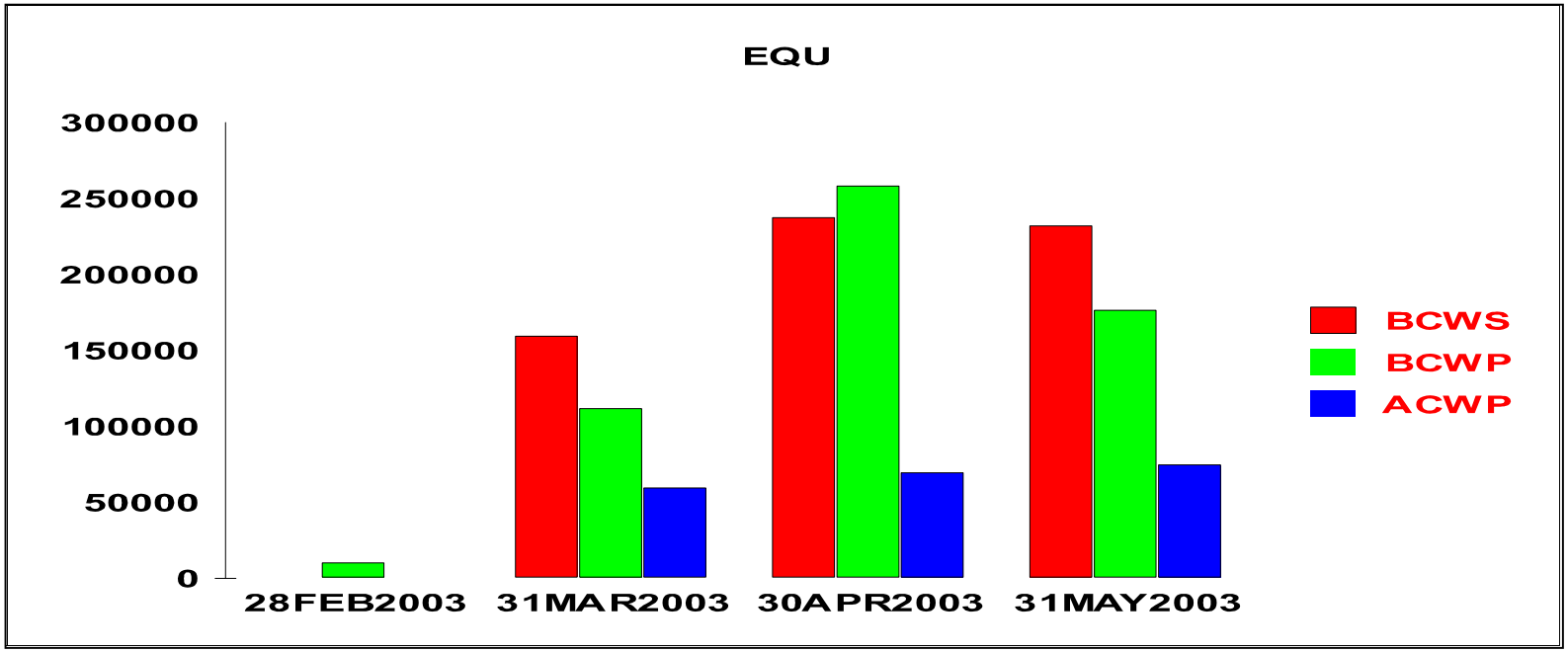
Cost Performance Report - Work Breakdown Structure											
Contractor: Location:					Contract Type/No:			Project Name/No: CDF RIIb Master EQU		Report Period: 4/30/2003	5/31/2003
Quantity	Negotiated Cost		Est. Cost Authorized Unpriced Work		Tgt. Profit/ Fee %	Tgt. Price	Est Price	Share Ratio	Contract Ceiling	Estimated Contract Ceiling	
1	24,987,050		0		0	24,987,050	0		0	0	
Funding Type-CA WBS[2] WBS[3]	Current Period					Cumulative to Date					At Completion
	Budgeted Cost		Actual Cost	Variance		Budgeted Cost		Actual Cost	Variance		
Item	Work Scheduled	Work Performed	Work Performed	Schedule	Cost	Work Scheduled	Work Performed	Work Performed	Schedule	Cost	Budgeted
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
EQU											
1.1 Run 2b Silicon Project											
1.1.1 Administration	11,369	11,369	0	0	11,369	33,591	33,591	0	0	33,591	461,456
1.1.2 DAQ	69,326	60,888	16,307	-8,438	44,581	155,128	203,845	26,127	48,716	177,717	5,307,465
1.1.3 Sensors	6,166	0	0	-6,166	0	20,554	10,277	0	-10,277	10,277	874,755
1.1.4 Cooling and Monitoring	21,120	7,119	0	-14,001	7,119	62,411	10,423	0	-51,989	10,423	464,851
1.1.5 Construction of Modules, Staves and L0	0	0	0	0	0	0	0	0	0	0	2,141,524
1.1.6 Support Mechanics	64,315	56,801	26,652	-7,514	30,149	167,530	162,281	98,579	-5,249	63,702	2,825,975
WBS[2]Totals:	172,296	136,177	42,959	-36,119	93,219	439,215	420,416	124,706	-18,799	295,710	12,076,026
1.2 Calorimeter Upgrades											
1.2.1 Central Preshower and Crack Detectors	3,211	1,965	0	-1,246	1,965	5,108	1,965	0	-3,143	1,965	306,093
1.2.2 Electromagnetic timing	3,519	1,602	6,206	-1,917	-4,604	22,434	24,638	6,206	2,204	18,431	35,630
WBS[2]Totals:	6,730	3,567	6,206	-3,163	-2,640	27,542	26,602	6,206	-939	20,396	341,723
1.3 Run 2b DAQ and Trigger Project											
1.3.1 Run 2b TDC Project	0	0	0	0	0	0	0	0	0	0	994,942
1.3.2 Run 2b Level 2 Project	0	0	0	0	0	0	0	0	0	0	366,655
1.3.3 Run 2b XFTII Project	16,091	0	0	-16,091	0	52,953	0	0	-52,953	0	1,146,925
1.3.4 Event-Builder Upgrade	0	0	0	0	0	0	0	0	0	0	515,472
1.3.5 Computer for Level3 PC Farm / DAQ	0	0	0	0	0	0	0	0	0	0	478,410
1.3.6 SVT upgrade	0	0	0	0	0	0	0	0	0	0	174,441
WBS[2]Totals:	16,091	0	0	-16,091	0	52,953	0	0	-52,953	0	3,676,845
1.4 Administration											
1.4.3 Construction Phase	37,134	36,795	25,717	-339	11,078	109,714	110,070	73,304	356	36,765	1,285,349
WBS[2]Totals:	37,134	36,795	25,717	-339	11,078	109,714	110,070	73,304	356	36,765	1,285,349
Funding Type-CATotals:	232,251	176,539	74,882	-55,712	101,657	629,423	557,089	204,217	-72,335	352,872	17,379,944
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0
Sub Total	232,251	176,539	74,882	-55,712	101,657	629,423	557,089	204,217	-72,335	352,872	17,379,944
Management Resrv.											7,607,106
Total	232,251	176,539	74,882	-55,712	101,657	629,423	557,089	204,217	-72,335	352,872	24,987,050

CDF Project Performance Indicator Plot - 1 June 2003

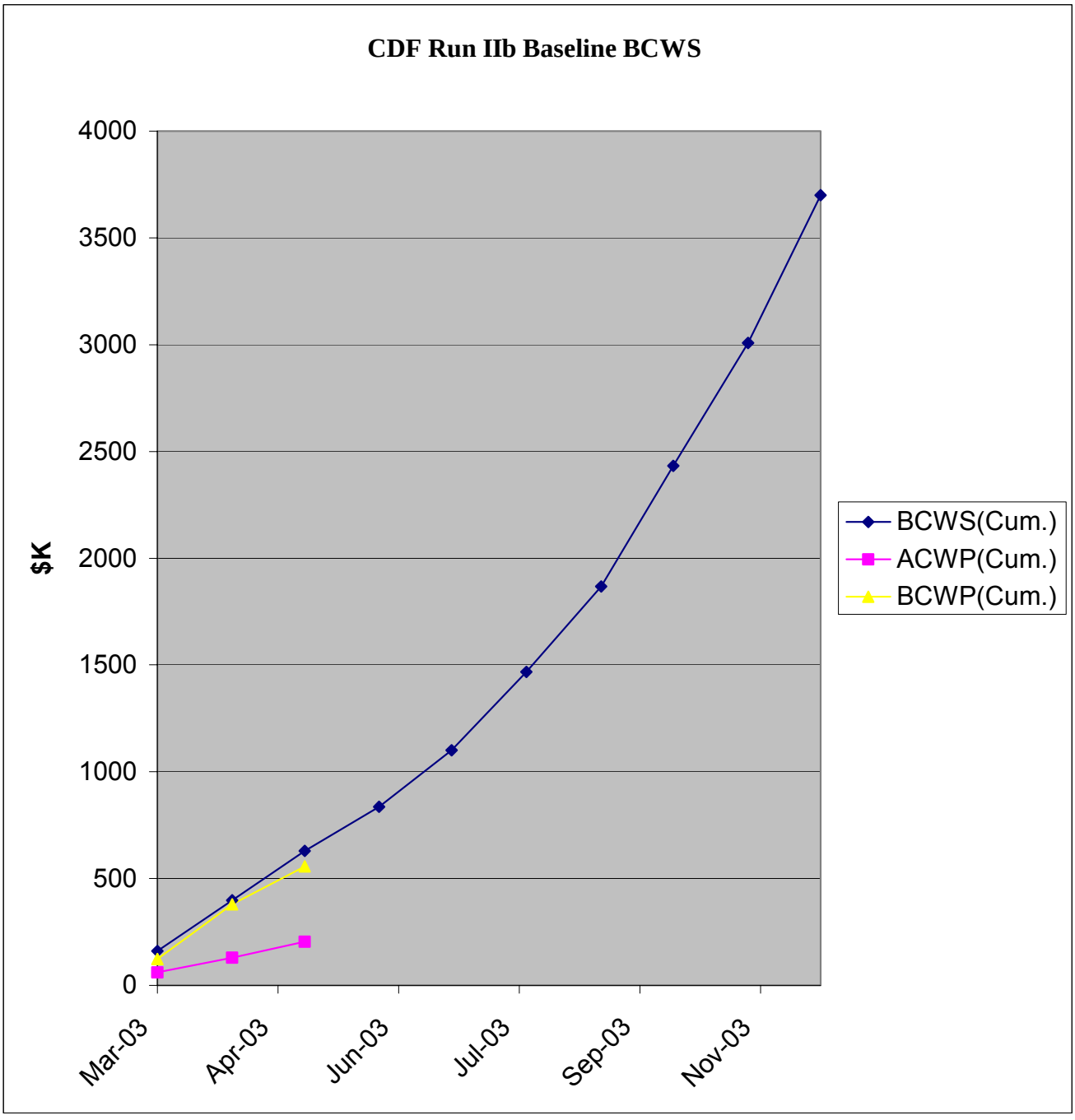


	28FEB2003	31MAR2003	30APR2003	31MAY2003
CPI	N/A	204.59%	294.23%	272.79%
SPI	N/A	76.54%	95.81%	88.51%

CDF Project Financial Plot - 1 June 2003



	28FEB2003	31MAR2003	30APR2003	31MAY2003
BCWS	0	159,588	237,585	232,251
BCWP	10,272	111,870	258,407	176,539
ACWP	0	59,700	69,635	74,882


CDF Run IIb Baseline BCWS
$K
4000
3500
3000
2500
2000
1500
1000
500
0
Mar-03
Apr-03
Jun-03
Jul-03
Sep-03
Nov-03
BCWS(Cum.)
ACWP(Cum.)
BCWP(Cum.)

VII. VARIANCE ANALYSIS – P. Lukens

The Schedule Performance Index has dropped to 0.89 this month. This is largely due to slippage in two areas of the project, neither of which is close to a critical path. First, the area of Cooling and Monitoring in the Silicon subproject is behind (W.B.S 1.1.4). This set of activities has not begun. The scheduling of it so early in the project is not needed, nor is it even the correct strategy, since it more naturally should occur after the mechanical construction is more mature. We plan to reschedule this next month to a more appropriate time. The second area of significant schedule slippage is in the track trigger (W.B.S 1.3.3). The group working on this is still in the R&D phase of this project. We plan on a group meeting in June to rework the schedule for this activity, and make its schedule more appropriate as well. Rescheduling of both items will occur in June.

The Cost Performance Index (CPI) has a value of almost 2.7 this month, slightly reduced from last month. The small quantity of work performed to date makes the CPI susceptible to "start-up" effects, as described last month. We expect this to reduce towards 1.0 as the project matures.

VIII. BASELINE CHANGES

One Change Request was submitted in May for the readjustment of the base cost.

The baseline cost and schedule estimates contained in the Project Execution Plan were obtained in October, 2002. Since that time, the resource loaded schedules have been reanalyzed by the CDF budget officer using the tool that will be used to prepare earned value calculations (the COBRA software package). This more recent analysis of the cost estimates is believed to be more sophisticated and accurate than the techniques used originally. In particular, the calculation of fringe benefit costs, general and administrative costs (G&A), and cost escalation are improved over the earlier technique.

In addition to a refinement of our cost estimates, the more recent analysis of the costs has turned up a significant error in the October estimate of G&A costs. This occurred in the silicon estimate. Our technique erroneously ignored G&A costs that will be incurred on items where we expect reimbursement from foreign collaborators. These costs will have to be covered, and represent an underestimate of approximately $125K. A summary of the DOE equipment funded costs appears below:

Subproject	Estimates ($K)	
	October, 2002	May, 2003
Silicon	11,814	12,076
Calorimeter	355	342
Data Acquisition	3,671	3,676
Administration	1,294	1,285
Totals	**17,134**	**17,380**

The May, 2003 estimates contain the cumulative effects of

1. Corrections for errors in the G&A costs of "buy back" items.
2. Rescheduling, due to our need to move the project start date from January, 2003 to March, 2003.
3. Refinements in the calculations of fringe benefits, escalation, and G&A costs.

This change updates the project baseline to make it consistent with this improved estimate. It should be noted that the improved estimate will be reported as the scheduled baseline in future financial tables for the project.

IX. FUNDING PROFILES

The table, below, contains the funding plan for the Project. Specific information relating to spending profiles for the current fiscal year is available above in Section VI, Financial Status. This is the funding profile submitted to the DOE Office of Science in the Project Execution Plan (PEP).

	2002	2003	2004	2005	2006	Totals
US - M&S	$ 2,750,000	$ 1,580,000	$ 5,292,456	$ 7,073,262	$ 242,418	$ 16,938,135
US - Labor	$ 250,000	$ 1,250,000	$ 1,989,300	$ 2,607,789	$ 651,352	$ 6,748,441
US - G&A	$ 500,000	$ 639,000	$ 1,114,182	$ 1,616,354	$ 219,344	$ 4,088,880
US - Equip. Total	$ 3,500,000	$ 3,469,000	$ 8,395,938	$ 8,508,623	$ 1,113,114	$ 24,986,676
US - R&D	$ 1,670,000	$ 480,000				$ 2,150,000
Japan	$ 235,465	$ 867,229	$ 1,080,700	$ 9,600	$ -	$ 2,192,994
Italy	$ 64,506	$ 350,838	$ 260,946	$ -	$ -	$ 676,290
University	$ 23,557	$ 224,780	$ 103,030	$ 26,040	$ -	$ 377,407
Total Funding	$ 5,493,528	$ 5,391,847	$ 9,840,614	$ 8,544,263	$ 1,113,114	$ 30,383,366

The following table contains current values for selected financial tracking quantities that do not appear in the Cost Performance Report.

	30 April 2003	31 May 2003
Estimate to Completion	$24,620 K	$24,614 K
Percent Complete	1.53 %	3.2 %