23 May 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 April 2003 Report

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

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

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RunIIb CDF Detector Project
Progress Report No. 5
1 - 30 April 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 and 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

Overall, the Project status is very good. Technical development activities are yielding steady improvements and system refinements in numerous areas. Several subsystems of both the silicon data acquisition and the mechanical structures have working prototypes that are in the process of being tested. Preshower detector light collection efforts are advancing smoothly. The new design for the TDC is well advanced and alternatives for reading out the older TDCs are being studied. This may open options for simplifying the Project in the future.

Project tracking tools are now being used to calculate earned value on a regular basis. Our overall schedule performance is good, and our cost performance is well ahead of where we are scheduled to be. Cost reductions have been realized because of the better than expected performance of the custom transceiver circuits used for the silicon detector.

III. PROJECT MILESTONE SUMMARY

CDF Level 2 Schedule Milestones from the Resource Loaded schedules

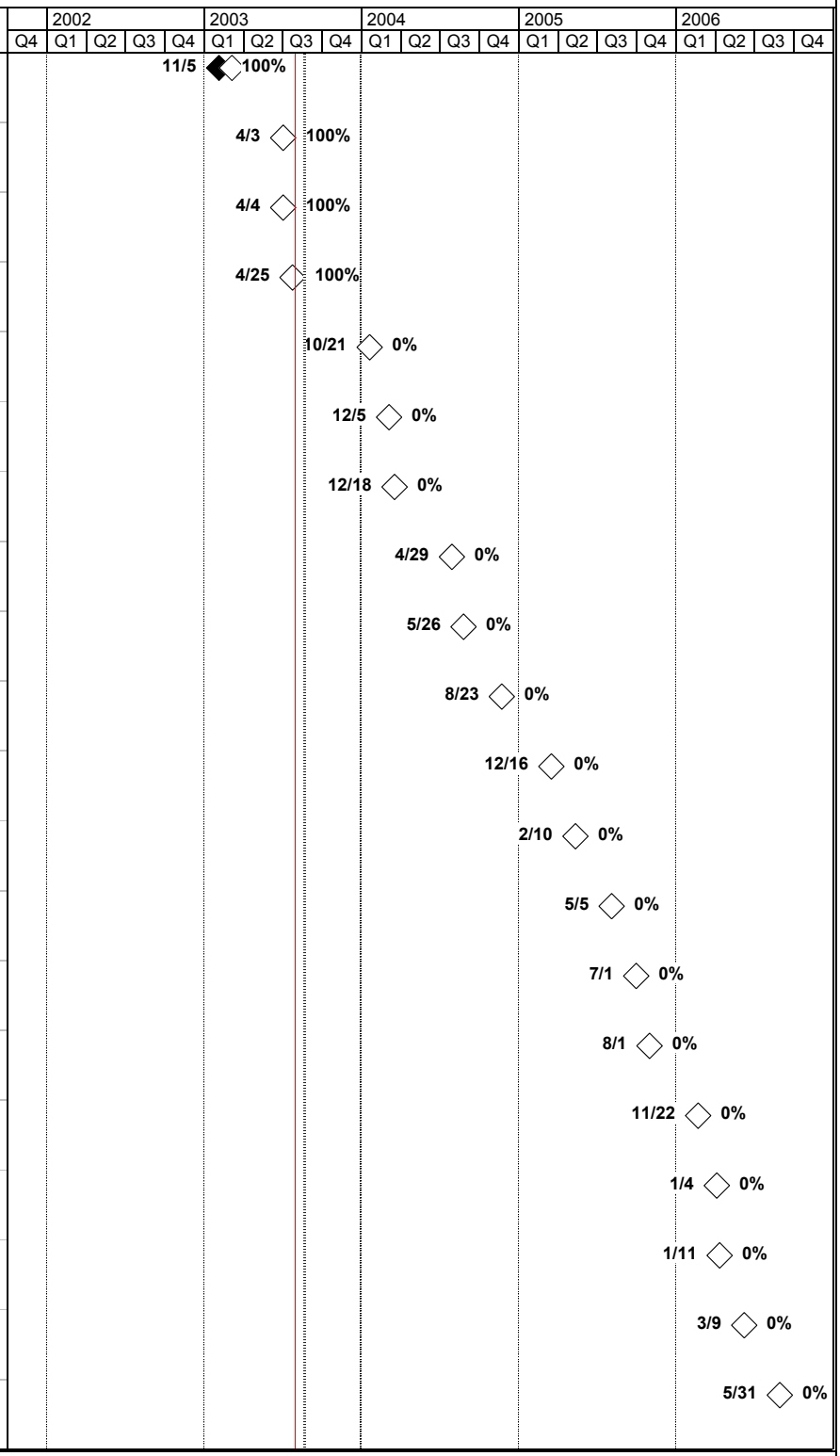
WBS	Title	Baseline Completion Date	Forecast/Actual Completion Date	Complete
1.1.5.4.1.13	Prototype stave #1 complete	5-Dec-02	5 Nov 02	Yes
1.1.2.10.2.4	Testing #1 complete- go ahead for #2	3-Apr-03	3-Apr-03	Yes
1.1.2.1.2.4	2nd chip submission	4-Apr-03	4-Apr-03	Yes
1.3.3.2.3.4	Begin fabrication of Prototype 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-Feb-03	Yes
1.2.2.2.7.4	ASD->TDC Cables ready for install	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 WLS fiber holder finished	7-Oct-03	12-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	21-Oct-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	20-Feb-04	
1.1.2.10.3.4	Go ahead for Preproduction	18-Dec-03	18-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	7-Jan-04	
1.2.2.2.7.6	ASD/TB ready for installation	7-Jan-04	7-Jan-04	
1.2.2.2.7.7	Downstairs components ready to install	7-Jan-04	7-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 phototubes tested	30-Jan-04	20-Oct-03	
1.2.1.10.6	1st CCR module finished and tested	12-Feb-04	16-Apr-04	
1.1.2.3.1.3.12	Preproduction hybrid available	29-Apr-04	29-Apr-04	
1.2.1.10.5	Second set of 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	Arrival of the hardware	3-Jun-04	3-Jun-04	
1.2.1.10.7	50% CPR Detectors Tested	4-Jun-04	10-Aug-04	
1.3.3.10.3.3	Preproduction of 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	23-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% CCR Detectors tested	30-Aug-04	3-Nov-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 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	16-Dec-04	
1.3.1.12	Beginning of TDC Production	10-Jan-05	10-Jan-05	
1.3.4.5.4.4	Arrival of the hardware	3-Feb-05	3-Feb-05	
1.1.5.3.4.8	Production module available	10-Feb-05	10-Feb-05	
1.2.1.10.10	Final CCR Detector Tested	24-Mar-05	27-May05	
1.2.1.10.9	Final CPR Detector Tested	24-Mar-05	27-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	L0 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 phototubes tested	6-May-05	29-Apr-05	
1.2.1.10.12	End of Central Preshower Project	6-May-05	27-May05	
1.2.3.5	End of Calorimetry Project: Level 2	6-May-05	27-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	1-Jul-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	1-Aug-05	
1.3.1.13.10	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	22-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	11-Jan-06	
1.1.6.3.1.3.16	Outer detector complete	9-Mar-06	9-Mar-06	
1.1.6.4.8	SVX2b Ready for Installation into ISL	31-May-06	31-May-06	

CDF Run2b Silicon Detector Schedule Level 2 Milestones

ID	Task Name	
116	**Prototype stave #1 complete**	11/5 100%
293	**Testing #1 complete- go ahead for #2**	4/3 100%
219	**2nd chip submission**	4/4 100%
43	**Production Sensor submission**	4/25 100%
231	**Production chip submission**	10/21 0%
707	**All stave installation & screen mounting tests complete**	12/5 0%
298	**Go ahead for Preproduction**	12/18 0%
380	**Preproduction hybrid available**	4/29 0%
66	**L0 prototype modules complete**	5/26 0%
305	**Go ahead for DAQ production**	8/23 0%
390	**Production hybrid available**	12/16 0%
102	**Production module available**	2/10 0%
629	**L0 Supports Complete**	5/5 0%
150	**100 Production staves complete**	7/1 0%
717	**Stave Installation Begins**	8/1 0%
155	**Production staves complete**	11/22 0%
700	**Inner detector complete**	1/4 0%
722	**Stave Installation Complete**	1/11 0%
730	**Outer detector complete**	3/9 0%
739	**SVX2b Ready for Installation into ISL**	5/31 0%

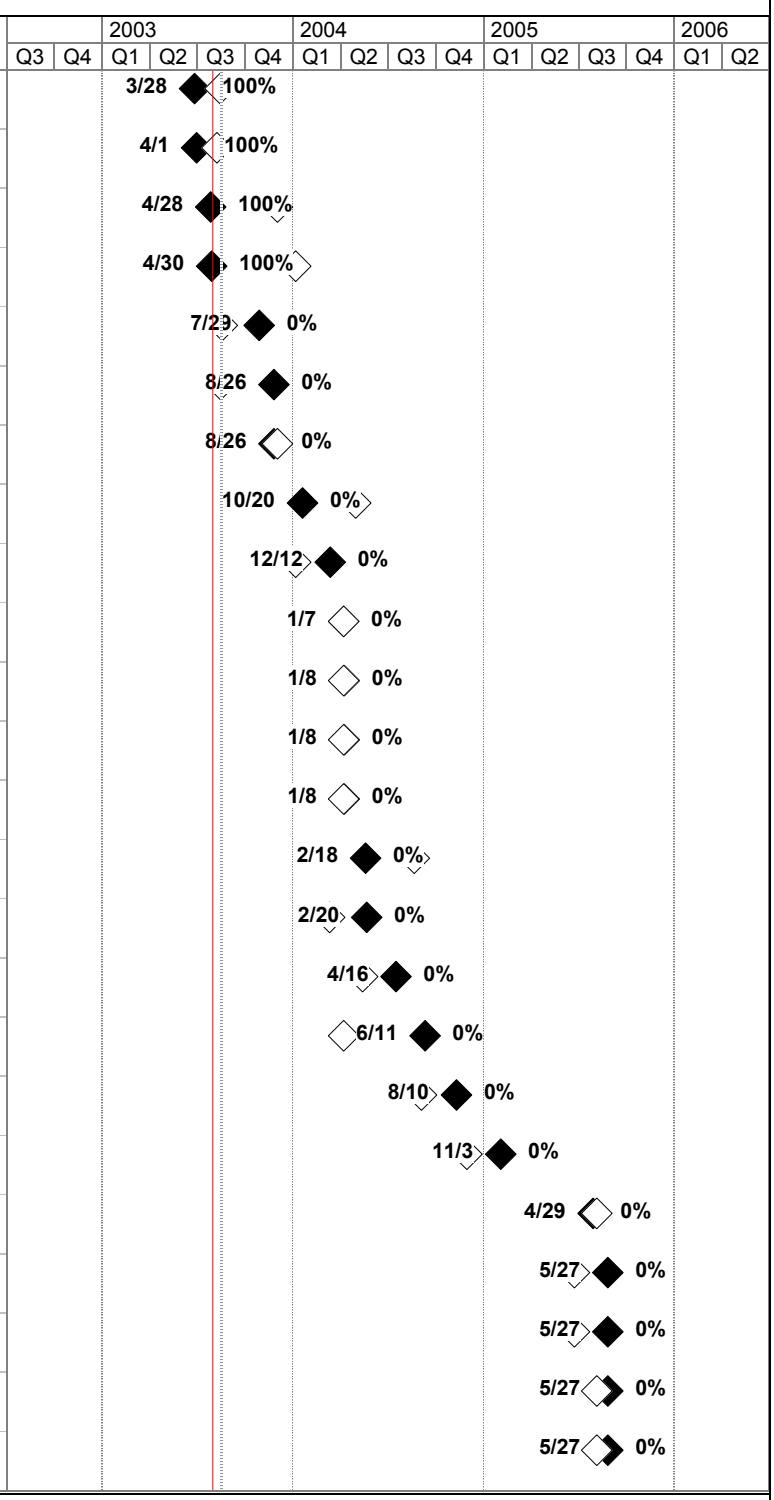


Project: CDF Run2b Silicon
Date: May 21 '03

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 RunIIb Calorimeter Schedule Level 2 Milestones

WBS	Name	Start	Finish	%
1.2.2.2.7.1	**Prototype Testing Complete**	3/28	3/28	100%
1.2.1.10.1	**First phototube order placed**	4/1	4/1	100%
1.2.2.2.7.3	**PEM Harnesses ready for installation**	4/28	4/28	100%
1.2.2.2.7.8	**VME Crate ready for installation**	4/30	4/30	100%
1.2.2.2.7.2	**CEM Splitters ready for installation**	7/29	7/29	0%
1.2.2.2.7.4	**ASD->TDC Cables ready for installation**	8/26	8/26	0%
1.2.2.2.7.5	**All cables done and ready for installation**	8/26	8/26	0%
1.2.1.10.3	**First set of phototubes tested**	10/20	10/20	0%
1.2.1.10.2	**1st WLS fiber holder finished**	12/12	12/12	0%
1.2.2.2.7.10	**Upstairs components ready for installation**	1/7	1/7	0%
1.2.2.2.7.6	**ASD/TB ready for installation**	1/8	1/8	0%
1.2.2.2.7.7	**Downstairs components ready for installation**	1/8	1/8	0%
1.2.2.2.7.11	**All EMTiming components ready for installation**	1/8	1/8	0%
1.2.1.10.5	**Second set of phototubes tested**	2/18	2/18	0%
1.2.1.10.4	**1st CPR module finished and tested**	2/20	2/20	0%
1.2.1.10.6	**1st CCR module finished and tested**	4/16	4/16	0%
1.2.2.2.7.9	**TDC boards ready for installation**	6/11	6/11	0%
1.2.1.10.7	**50% CPR Detectors Tested**	8/10	8/10	0%
1.2.1.10.8	**50% CCR Detectors Tested**	11/3	11/3	0%
1.2.1.10.11	**Final set of phototubes tested**	4/29	4/29	0%
1.2.1.10.9	**Final CPR Detector Tested**	5/27	5/27	0%
1.2.1.10.10	**Final CCR Detector Tested**	5/27	5/27	0%
1.2.1.10.12	**End of Central Preshower Project**	5/27	5/27	0%
1.2.3.5	**End of Calorimetry Project: Level 2**	5/27	5/27	0%

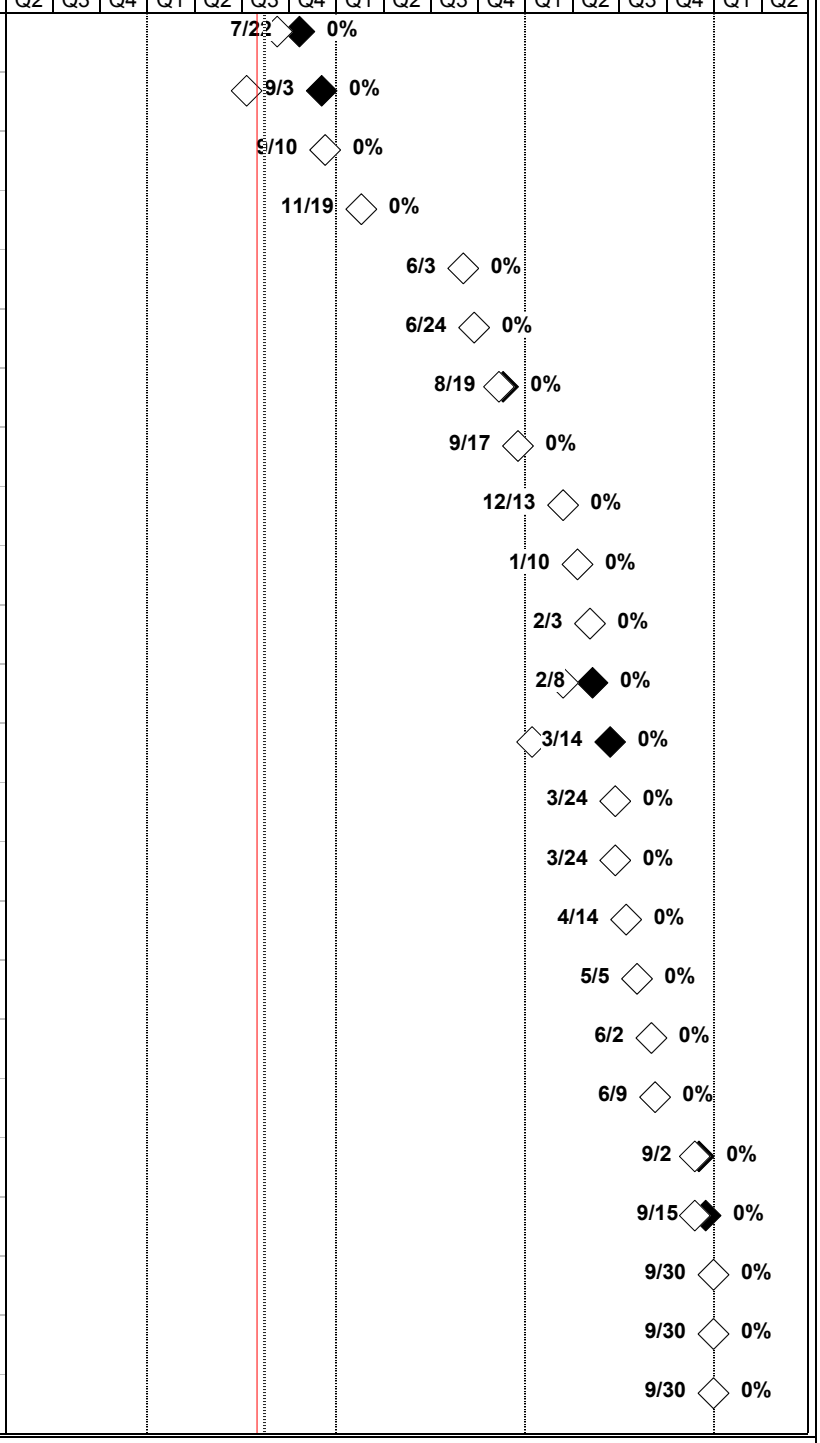


Project: CDF RunIIb Calorim
Date: May 16 '03

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

CDF Run2b Trigger/DAQ Schedule Level 2 Milestones

ID	Name	Start	Finish	%
214	Prototype Linker Module available for testing	7/22	7/22	0%
280	Fabrication of Prototype Finder 1/3 board	9/3	9/3	0%
19	arrival of 0/10 PCs from the vendor	9/10	9/10	0%
387	First Prototype TDC available for testing	11/19	11/19	0%
61	arrival of the hardware	6/3	6/3	0%
72	Production Readiness Review - Event Builder	6/24	6/24	0%
243	Begin Preproduction Stereo Association Modules	8/19	8/19	0%
105	Begin production of Level2 Pulsar system	9/17	9/17	0%
11	SVT ready for installation	12/13	12/13	0%
423	Beginning of TDC Production	1/10	1/10	0%
78	arrival of the hardware	2/3	2/3	0%
225	Begin Production Linker Modules	2/8	2/8	0%
319	Begin Production Finder SL7 boards	3/14	3/14	0%
36	arrival of 70 Level3 and 15 DAQ PCs from the vendor	3/24	3/24	0%
49	arrival of 140/20 PCs from the vendor	3/24	3/24	0%
52	Finish Purchase of Computers for Level3/DAQ system	4/14	4/14	0%
83	Finish Event-Builder Upgrade	5/5	5/5	0%
442	Data Concentrator Production Completed	6/2	6/2	0%
115	Pulsar Level 2 subproject ready for installation	6/9	6/9	0%
254	Production Stereo Association Modules complete	9/2	9/2	0%
326	XFT Ready for Installation at CDF	9/15	9/15	0%
464	Production Board testing complete	9/30	9/30	0%
465	Run 2b TDC Ready for Installation	9/30	9/30	0%
466	Finish Run 2b Trigger DAQ project	9/30	9/30	0%



Project: CDF Run 2B Data A
Date: May 14 '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 purchase orders for silicon sensors were placed in April 2003 as was the order for the second version of the SVX4 chip. The latter item was delayed relative to our original schedule and resulted in a slip of several milestones. Since the placement of the order, we have learned that the chips will likely be shipped after four weeks, rather than the eight weeks we had scheduled.

V. PROJECT HIGHLIGHTS

1.1 – Silicon Detector

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

The manufacturing of the 2nd prototype SVX4 chip is proceeding well and the vendor currently anticipates an early delivery on May 13th rather than in June. We are preparing for the post-processing and testing at LBL and at FNAL.

The prototype transceiver chips were received in January 2003. These chips are used on the Mini-port card to receive and retransmit the signals from the hybrids. All tests have found that the transceivers are functioning as planned. The manufacturing of these chips piggy-backed onto the submission of another chip (from a different project) by filling in wasted space on the wafers. The quantity that we received is sufficient for production (we need ~ 1000 transceivers). Three out of five wafers have been processed and tested, yielding 1000 good parts.

The preproduction outer layer hybrid design was completed and submitted to the vendor for fabrication. Estimated delivery is mid. July. Layer 0 hybrids were received from the assembly house and tested at LBL. The preliminary tests showed that all of them perform as expected. They will be brought to Fermilab for further evaluation in early May.

The Polyamide Mini-port card was ordered in March with an expected delivery date in April. Unfortunately, the vendor is experiencing technical difficulties and had not yet delivered by the end of April. The vendor has been given a deadline of May 16th. If they miss that, we will cancel the order and proceed with an alternative vendor.

A final review of the BeO Mini-port card layout was completed in mid-April. Final drawings are being generated and will be submitted in May.

1.1.3 Sensors – Brenna Flaugher, Nicola Bacchetta

The purchase order for the Fermilab part of the production sensor order was placed this month. We look forward to delivery starting in June and are preparing a database to track the sensors when they begin to arrive at Fermilab.

1.1.5 Construction of Modules, Staves, and L0 – Brenna Flaugher, Nicola Bacchetta

Construction of the first small angle stereo modules began in April. These will be glued to the back of stave #3 when the need arises. Work continues on updating the drawings for the preproduction stave and module design.

1.1.6 Support Mechanics – Brenna Flaugher, Nicola Bacchetta

Modifications to the bulkhead assembly fixture were incorporated into the drawings. The final drawings were ready to go out for bids by the end of the April.

Analysis of the spacetube design has been directed towards a lower mass construction and is making progress.

An outer screen for the barrel was fabricated and measured. It was then cut into 3 parts and will be re-measured. This will be the model to fabricate a prototype barrel that will be used for testing the stave installation fixturing.

A prototype stave installation fixture was assembled from leftover parts to illustrate overall scale and concepts. The preproduction parts are in various stages of completion. Some are being fabricated while others are still being designed. Our goal is to have a full test of the stave installation this fall.

Tests of the L0 cooling system concepts were performed. Coaxial cooling tubes seem to be a viable solution to the minimal space available for L0. Testing will continue during the coming month.

1.2 – Calorimeter

1.2.1 Central Preshower and Crack Detector – Steve Kuhlmann

The Central Preshower/Crack Upgrade continued to make progress in April on many fronts. The first shipment of production phototubes arrived in Tsukuba, one month before the schedule (without contingency) called for it. Since this is the project's critical path item, this is a very significant event. The first two fiber bundles, called pigtails, were fabricated at Michigan State University. Argonne National Lab fabricated the mechanical shell for the first full-scale prototype. On April 10th, an assembly-festival was held at ANL, attended by members of the MSU, INFN, and Rockefeller groups. The first two pigtails were installed that day into the mechanical shell. This prototype will be finished and scanned at ANL in May. INFN began the study of "superreflectors," from 3M, which we hope will give better light yield than Tyvek. INFN also continued uniformity studies with different preshower groove types.

1.2.2 Electromagnetic Timing – Dave Toback

April 2003 saw the continued success of the EM Timing project. Nearly every component is on schedule and many are well ahead of schedule. Specifically, the completion of the production and testing of the PEM harnesses occurred, well ahead of the September 2003 deadline. As previously mentioned, we began on the PEM harnesses instead of first constructing the CEM harnesses due to operational reasons. The CEM parts have long since arrived, the harnesses themselves are now in production, and they are approximately 50% done. We believe both will be done by the schedule for the PEM harness completion in September 2003. 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 currently operating on the detector. This milestone is now complete, well ahead of the October 2003 finish date. We have roughly 20% of the TDC's in hand and have been using them interchangeably in the system. It is expected the others will arrive on, or before, schedule. The current Italian funding situation has limited us to only having 50% of the funds available and has delayed the ordering of the final production components of the ASD, the TB, and the long cables. It is believed that the rest of the money will be released on May 15 so that the long cables, the ASD's, and TB printed circuit boards can be ordered. While this sets back the long cable production time line, it does not affect the overall schedule. The long cable order is expected to be placed on or about May 15th with an 8-12 week lead time. The parts for the ASD and TB's have been purchased and have arrived at INFN. The printed circuit boards have not yet been purchased but will be ordered as soon as Italian funding is released. 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

In regard to the design effort of the new TDC card, we are moving to the point in our design work where we are integrating the missing major components of the planned system into the chip. Our efforts were also focused on the potential impact on TDC readout speed from the proposed multi-board readout scheme utilizing Chained BLock Transfer (CBLT). We are looking at implementing a CBLT similar to the scheme on the existing TDCs for prototype testing. A request for electronic engineer help was submitted to Fermilab PPD division.

The integration work has now conclusively shown that we cannot fit the required functionality into the chip we had originally considered long ago, but must pick the next size larger. We, in fact, had already decided to use a larger chip in order to have the capability to add further functionality in the future. The package size is the same and the feature speed is the same.

We still expect all components of the design to function at the initial target rates. One compromise will have to be faced: it is that the latency after a level 2 accept until the data is available to the VME bus will be greater than an ideal 4 microseconds, maybe as great as 7.5 microseconds. This is still on the order of 100 times faster than the previous design. We are still working on this area. The forming of the XFT trigger seeds is also near completion and yet not integrated into the total design.

In the next month, we expect to finalize these unfinished areas and conduct comprehensive simulations. 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.

In summary, we have designed the majority of the chip and we believe we are hitting the desired targets except for final data latency. We have increased the chip size and may explore using even a bigger chip. This has an impact in cost of perhaps raising the chip price by 50%. The

cost of these chips was about 50% of the cost of the total board. This can mean a board cost increase of 25%. It should be noted that the price of these chips is falling faster than expected. I am not sure of the final impact of this choice. This change allows the flexibility to add functionality in the future, as well as ease of layout in the present.

1.3.2 Level 2 – Ted Liu, Peter Wittich

Testing of Level 2 data pathways is being conducted at Fermilab. No problems or delays have been experienced and we expect progress to continue smoothly. No other work is scheduled to begin until later in fiscal year 2003.

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

A Gigabit prototype system has been constructed and a technical evaluation is currently underway. The prototype will continue to be monitored for satisfactory operation over the next month. No other work is scheduled to begin until much 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 Financial Plot - This plot provides a monthly indication of the work scheduled, work performed, and the actual costs.

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

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: 4/1/2003 4/30/2003

	BCWS	BCWP	ACWP	SV in $	SV in %	CV in $	CV %	SPI	CPI
Current:	237,585	258,407	69,635	20,822	9%	188,771	73%	1.09	3.71
Cumulative:	397,172	380,549	129,335	-16,623	-4%	251,214	66%	0.96	2.94
	BAC	EAC	VAC in $	VAC in %	CPI to BAC	CPI to EAC			
At Complete:	17,379,944	17,131,058	248,886	1%	0.99	1.00			

Explanation of Variance/Description of Problem:

Impact:

Corrective Action:

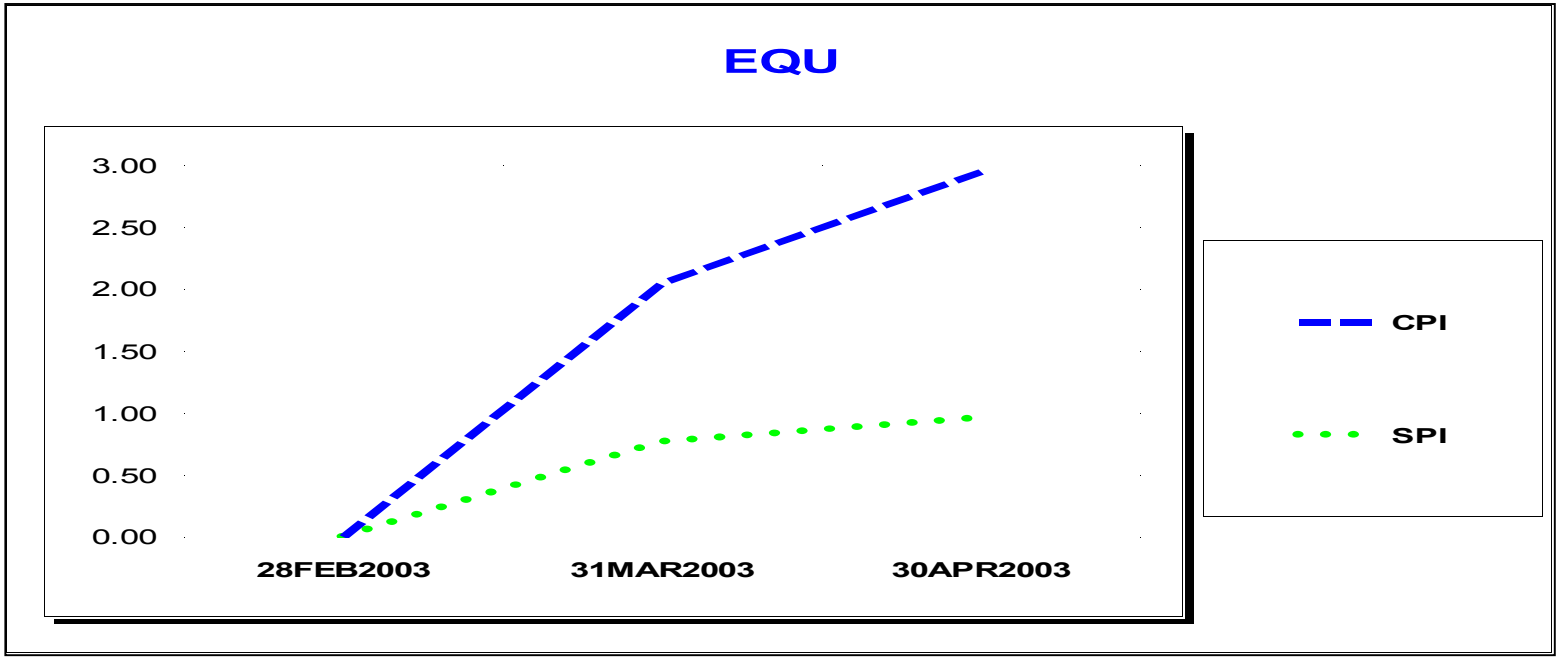
Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):

Prepared by: Date: Approved by: Date:

CDF Project EQU Cost Performance Report at Work Breakdown Structure Level 3

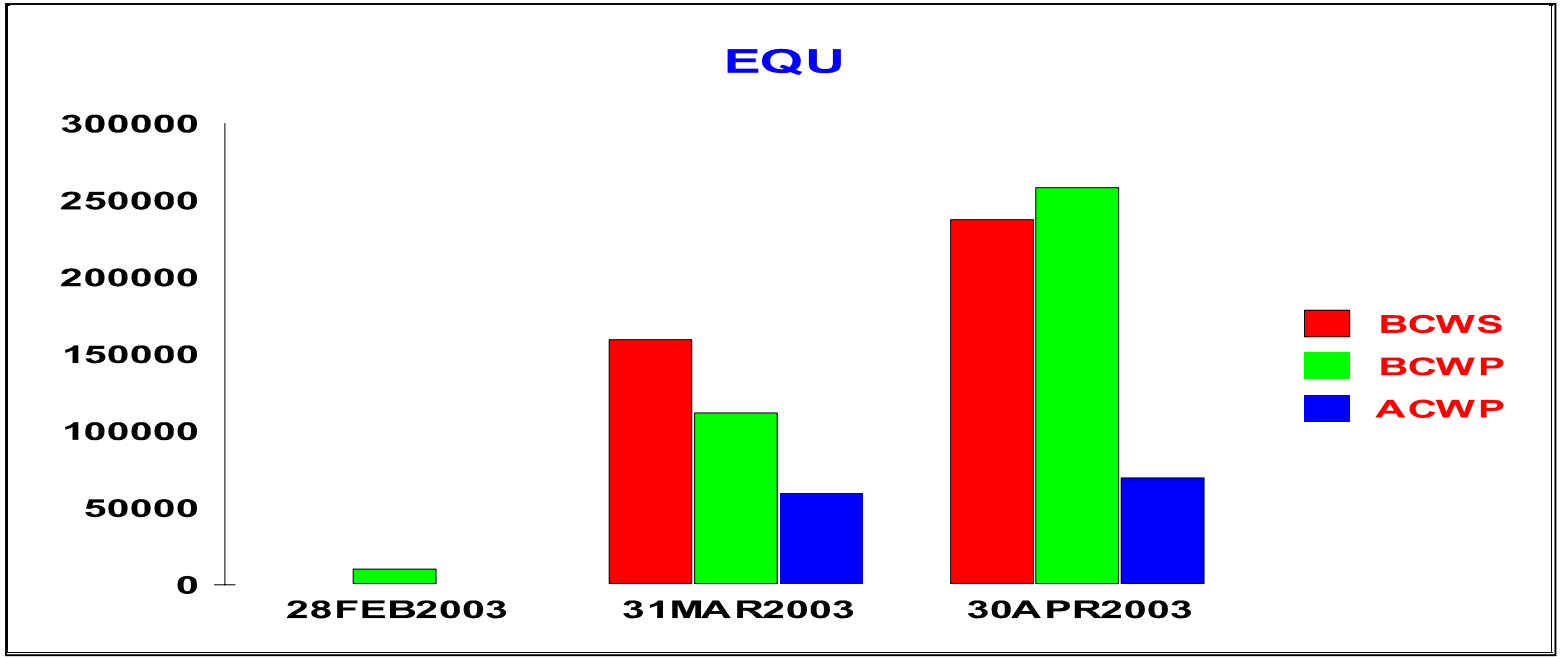
Cost Performance Report - Work Breakdown Structure											
Contractor: Location:					Contract Type/No:			Project Name/No: CDF RIIb Master EQU S		Report Period: 4/1/2003	4/30/2003
Quantity 1	Negotiated Cost 24,987,050		Est. Cost Authorized Unpriced Work 0		Tgt. Profit/ Fee % 0	Tgt. Price 24,987,050	Est Price 0	Share Ratio	Contract Ceiling 0		Estimated Contract Ceiling 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	9,199	0	-2,171	9,199	22,222	22,222	0	0	22,222	461,456
1.1.2 DAQ	65,340	121,191	8,621	55,851	112,570	85,802	142,957	9,821	57,154	133,136	5,307,465
1.1.3 Sensors	11,305	10,277	0	-1,028	10,277	14,388	10,277	0	-4,111	10,277	874,755
1.1.4 Cooling and Monitoring	28,388	3,304	0	-25,084	3,304	41,292	3,304	0	-37,988	3,304	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	61,331	60,956	38,227	-375	22,729	103,214	105,480	71,927	2,265	33,552	2,825,975
WBS[2]Totals:	177,733	204,926	46,848	27,194	158,079	266,918	284,239	81,748	17,321	202,491	12,076,026
1.2 Calorimeter Upgrades											
1.2.1 Central Preshower and Crack Detectors	1,897	0	0	-1,897	0	1,897	0	0	-1,897	0	306,093
1.2.2 Electromagnetic timing	9,677	16,306	0	6,628	16,306	18,915	23,036	0	4,121	23,036	35,630
WBS[2]Totals:	11,575	16,306	0	4,731	16,306	20,812	23,036	0	2,224	23,036	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	11,143	0	0	-11,143	0	36,862	0	0	-36,862	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:	11,143	0	0	-11,143	0	36,862	0	0	-36,862	0	3,676,845
1.4 Administration											
1.4.3 Construction Phase	37,134	37,175	22,787	41	14,387	72,580	73,275	47,587	695	25,687	1,285,349
WBS[2]Totals:	37,134	37,175	22,787	41	14,387	72,580	73,275	47,587	695	25,687	1,285,349
Funding Type-CATotals:	237,585	258,407	69,635	20,822	188,771	397,172	380,549	129,335	-16,623	251,214	17,379,944
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0
Sub Total	237,585	258,407	69,635	20,822	188,771	397,172	380,549	129,335	-16,623	251,214	17,379,944
Management Resrv.											7,607,106
Total	237,585	258,407	69,635	20,822	188,771	397,172	380,549	129,335	-16,623	251,214	24,987,050

CDF Project Performance Indicator Plot - 5/1/2003



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

CDF Project Financial Plot - 5/1/2003



	28FEB2003	31MAR2003	30APR2003
BCWS	0	159,588	237,585
BCWP	10,272	111,870	258,407
ACWP	0	59,700	69,635

VII. VARIANCE ANALYSIS – P. Lukens

No significant variance is indicated by the Schedule Performance Index this month.

The Cost Performance Index (CPI) has a value of almost 3 this month. This is due in part to the small amount of work performed so far in the project (this is our second month of reporting). Fluctuations in the CPI are expected due to the timing of invoices received and paid. The small total completion of the project makes the CPI particularly sensitive to the timing of payments. This is not considered significant. An additional component to the high value of the CPI arises from the success of the prototype transceiver chips used in the silicon detector (WBS 1.1.2.2). The early version of these chips appears to be sufficient for the production of the detector. Consequently, this item has been marked complete, and no cost was incurred. We expect the CPI to fall closer to 1.0 in subsequent months.

VIII. BASELINE CHANGES

One Change Request was submitted in April for the readjustment of several milestones affected by the delay in the SVX4 submission. This request was approved by the Fermilab Directorate and the DOE Project Manager. We hope to mitigate this delay by avoiding another round of prototype work on the SVX4 chip. The milestone changes are listed in the table below.

Milestone	Revised Date	Baseline Date	Slippage
Prototype stave #1 complete	12/5/2002	12/5/2002	0 days
2nd chip submission	4/9/2003	2/20/2003	34 days
Testing #1 complete- go ahead for #2	4/3/2003	4/3/2003	0 days
Production Sensor submission	5/16/2003	5/16/2003	0 days
Production chip submission	10/27/2003	9/9/2003	34 days
Go ahead for Preproduction	12/26/2003	11/11/2003	29 days
All stave installation & screen mounting	12/5/2003	12/5/2003	0 days
Preproduction hybrid available	5/5/2004	3/25/2004	29 days
L0 prototype modules complete	5/26/2004	5/26/2004	0 days
Go ahead for DAQ production	8/27/2004	7/19/2004	29 days
Production hybrid available	12/22/2004	11/9/2004	29 days
Production module available	2/16/2005	1/5/2005	29 days
L0 Supports Complete	5/5/2005	5/5/2005	0 days
100 Production staves complete	7/8/2005	5/26/2005	29 days
Stave Installation Begins	8/5/2005	6/24/2005	29 days
Production staves complete	11/30/2005	10/18/2005	29 days
Stave Installation Complete	1/18/2006	12/8/2005	24 days
Inner detector complete	1/4/2006	1/4/2006	0 days
Outer detector complete	3/15/2006	2/23/2006	14 days

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, Earned Value. 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	$ 210,000	$ 1,290,000	$ 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	$ 3,460,000	$ 3,509,000	$ 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	$ 5,453,528	$ 5,431,847	$ 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.

	31 March 2003	30 April 2003
Estimate to Completion	$24,853K	$24,620K
Percent Complete	0.45%	1.53%