

17 February 2006

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 January 2006 Report

Attached is the monthly report summarizing the January 2006 activities and progress for the Fermilab RunIIb CDF Detector Project.

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RunIIb CDF Detector Project
Progress Report No. 38
1 - 31 January 2006

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 increased size of the data sample will 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:

- 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 – Pat Lukens

The project completed its technical objectives in December, 2005. All components of the project are either installed into the experiment or are actively being tested with simulated data. This fulfills the technical objective as stated in the DOE Project Execution Plan for Run IIb CDF Detector Project and Run IIb D-Zero Detector Project, Section 7. Remaining work on the project consists of documentation, and completion of miscellaneous work needed to close out the construction.

III. SUBPROJECT SUMMARY AND STATUS

1.1 Silicon Detector Upgrade

This detector construction was cancelled by the Director in September 2003. Closeout activities included demonstration of a small scale device. Results of the development for this detector have been submitted to Nuclear Instruments and Methods and accepted for publication

1.2 Calorimeter Upgrades

1.2.1 Central Pre-shower Upgrade

1.2.2 Electromagnetic Calorimeter Timing

These systems were installed in Autumn 2004, and have been included in operations since January, 2005.

1.3 – Data Acquisition and Trigger

1.3.1 TDC (Time to Digital Converter)

A full set of modified TDCs have been used in COT operations since December, 2005. Completion of the remaining boards will occur during the March, 2006 shutdown

1.3.2 Level 2 Trigger Upgrade

This system has been included in operations since April, 2005

1.3.11 XFT (eXtremely Fast Tracker) II

All the hardware for this system has been installed and is being commissioned. The system will enter operations after the spring, 2006 shutdown.

1.3.4 Event Builder Upgrade

This system has been included in operations since September, 2005

1.3.5 Level 3 computers upgrade

The additional computers purchased for the upgrade are either in operations or are being installed.

1.3.6 SVT (Silicon Vertex Tracker)

The majority of this system is currently included in operations. Only the Hit Buffer boards are not fully included in operations, and 25% of these have been installed.

IV. FINANCIAL STATUS (as of 31 January 2006)

The baseline cost of the Project is \$8,196K, consisting of Run Iib Project costs (\$6,855K) plus closeout costs of the silicon detector upgrade (\$1,341K), which will no longer be constructed.

Current Financial Tracking Report - The table below contains current values for financial tracking quantities that do not appear in the standard Obligations or Cost Performance Reports.

| | ACWP | | BCWP | | BAC | | Cont. | EAC | ETC | Complete |
|-----------------|---------|---------|---------|---------|---------|---------|-------|------|------|----------|
| | Silicon | Non-Sil | Silicon | Non-Sil | Silicon | Non-Sil | | | | |
| CY 2005 | | | | | | | | | | |
| October | 1341 | 4510 | 1341 | 4942 | 1341 | 5846 | 1009 | 6755 | 1913 | 87% |
| November | 1341 | 5243 | 1341 | 5567 | 1341 | 5846 | 1009 | 6863 | 1288 | 96% |
| December | 1341 | 5641 | 1341 | 5672 | 1341 | 5846 | 1009 | 7156 | 1183 | 98% |
| CY 2006 | | | | | | | | | | |
| January | 1341 | 5521 | 1341 | 5704 | 1341 | 5846 | 1009 | 7004 | 1151 | 98% |

CDF Run Iib Obligations Report - This report provides a Level 2 summary of outstanding Purchase Orders where funds have been committed but for which the Project hasn't been invoiced. This does not include requisitions in the system where a Fermilab PO number has not yet been assigned. Brief descriptions of the columns in this report are given below:

- Current Month Total Cost – The cost charged to the project for the reporting month.
- Current Month Obligation – This is the total of the obligations made against the project for the reporting month.
- Year to Date Total Cost – This is the total cost charged to the project in this fiscal year.
- Year to Date Obligations with Indirect – This is the total of the obligations made against the project for this fiscal year.
- Current Purchase Orders Open Commitment – The total of the open commitments against the project. It includes open commitments from the current and all prior years.
- Prior Year Total Cost - The total cost charged to the project in all prior fiscal years.

The total project cost is simply the sum of the Year-to-Date costs and the Prior Year costs. The total committed and spent is the Total Project Cost plus the Open Commitment value.

**CDF Project
Obligations Report
Through 31 January 2006**

| CDF RIIb EQU - January FY06 IN \$K | | | | | | | | |
|------------------------------------|----------------------|---------|--------------------------|--------------------------|----------------|----------------------------|----------------------|---------------------|
| Task Number | Expenditure Category | | Current Month Total Cost | Current Month Obligation | YTD Total Cost | YTD Obligations w/Indirect | Current PO Open Comm | Prior Yr Total Cost |
| Silicon | M&S | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 538.8 |
| | SWF | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 570.0 |
| | OH | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 228.2 |
| | Total 1.1 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1,336.9 |
| Calorimeter | M&S | | 1.6 | 0.0 | 1.6 | 0.0 | 0.0 | 275.0 |
| | SWF | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 139.1 |
| | OH | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 52.6 |
| | Total 1.2 | | 1.6 | 0.0 | 1.6 | 0.0 | 0.0 | 466.7 |
| Trigger/DAQ | M&S | | (137.9) | (185.5) | 779.4 | 59.8 | 79.4 | 2,315.0 |
| | SWF | | 23.2 | 23.2 | 136.7 | 136.7 | 0.0 | 641.8 |
| | OH | | (24.2) | 0.0 | 154.1 | 154.1 | 0.0 | 377.3 |
| | Total 1.3 | | (138.9) | (162.3) | 1,070.2 | 350.6 | 79.4 | 3,334.1 |
| Administration | M&S | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 42.2 |
| | SWF | | 13.2 | 13.2 | 48.7 | 48.7 | 0.0 | 412.6 |
| | OH | | 4.1 | 0.0 | 15.1 | 15.1 | 0.0 | 129.2 |
| | Total 1.4 | | 17.4 | 13.3 | 63.8 | 63.8 | 0.0 | 584.0 |
| Total Project | M&S | | (136.3) | (185.4) | 781.0 | 59.8 | 79.4 | 3,170.9 |
| | SWF | | 36.4 | 36.4 | 185.4 | 185.4 | 0.0 | 1,763.5 |
| | OH | | (20.1) | 0.0 | 169.2 | 169.2 | 0.0 | 787.3 |
| Grand Total | | (120.0) | (149.0) | 1,135.6 | 414.4 | 79.4 | 5,721.7 | |

Total Project Cost (Inception To Date): 6,857.2

CDF Project Cost Performance Report (CPR) – This report is generated from COBRA and provides a summary of the WBS 1.2-1.4 costs of the Project down to Level 3 of the Work Breakdown Structure. Silicon detector subproject closeout costs are not tracked here. Input data originates with the status (% Complete) of the Project schedules as reported by the Level 2 managers and actual costs extracted from the Fermilab accounting system. Where possible, costs are accrued for items that have been delivered, but not yet invoiced. This is only possible for a small fraction of our cost. Financial summaries are shown for this reporting period (columns 2-6) as well as the project to date (columns 7-11). Column 12 contains our baseline BAC, and will only be changed after the formal implementation of the Change Control process. Column 13 is the projected BAC, based on the current month's schedule. A number of specialized financial terms and abbreviations used in the CPR 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.

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. $EAC = (BAC (current) - BCWP) + ACWP$

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

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

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

**CDF Project
Cost Performance Report
Through 31 January 2006**

| Cost Performance Report - Work Breakdown Structure | | | | | | | | | | | | | | | |
|--|-----------------|---------------|---------------------------------------|-------------------|-----------------------|--------------------|------------------|---|---------------------|--|------------------|------------------|----------------|---------|-------|
| Contractor: Location: | | | | Contract Type/No: | | | | Project Name/No: CDF RIIB Mstr Equ - D | | Report Period: 12/31/2005 1/31/2006 | | | | | |
| Quantity | Negotiated Cost | | Est. Cost Authorized Unpriced Work | | Tgt. Profit/ Fee % | Tgt. Price | Est Price | Share Ratio | Contract Ceiling | Estimated Contract Ceiling | | | | | |
| 1 | 6,855,000 | | 0 | | 0.00 | 6,855,000 | 0 | | 0 | 0 | | | | | |
| Funding Type-CA | Current Period | | | | | Cumulative to Date | | | | | At Completion | | | | |
| WBS[2] | Budgeted Cost | | Actual Cost | | Variance | | Budgeted Cost | | Actual Cost | | Variance | | Baseline | Latest | BAC |
| WBS[3] | Work | Work | Work | | | Work | Work | Work | | | Schedule | Cost | BAC | Revised | Delta |
| Item | Scheduled | Performed | Performed | Schedule | Cost | Scheduled | Performed | Performed | Schedule | Cost | | | | | |
| EQU Equipment | | | | | | | | | | | | | | | |
| 1.2 Calorimeter Upgrades | | | | | | | | | | | | | | | |
| 1.2.1 Central Preshower and Crack Detectors | 0 | 0 | 1,579 | 0 | -1,579 | 444,504 | 444,504 | 444,505 | 0 | 0 | 444,504 | 444,504 | 0 | | |
| 1.2.2 Electromagnetic timing | 0 | 0 | 0 | 0 | 0 | 23,403 | 23,403 | 23,403 | 0 | 1 | 23,403 | 23,403 | 0 | | |
| WBS[2]Totals: | 0 | 0 | 1,579 | 0 | -1,579 | 467,908 | 467,908 | 467,907 | 0 | 0 | 467,908 | 467,908 | 0 | | |
| 1.3 Run 2b DAQ and Trigger Project | | | | | | | | | | | | | | | |
| 1.3.1 Run 2b TDC Project | 18,759 | 6,375 | 50,526 | -12,384 | -44,151 | 643,870 | 627,552 | 546,329 | -16,319 | 81,223 | 651,795 | 652,473 | 678 | | |
| 1.3.2 Run 2b Level 2 Project | 0 | 0 | 877 | 0 | -877 | 473,959 | 473,959 | 471,070 | 0 | 2,889 | 473,959 | 473,959 | 0 | | |
| 1.3.4 Event-Builder Upgrade | 3,068 | 1,029 | 4,690 | -2,039 | -3,661 | 435,624 | 427,908 | 427,292 | -7,716 | 616 | 435,624 | 445,651 | 10,027 | | |
| 1.3.5 Computer for Level3 PC Farm / DAQ | 0 | 0 | -237,404 | 0 | 237,404 | 1,080,075 | 1,080,075 | 1,032,124 | 0 | 47,952 | 1,080,075 | 1,084,622 | 4,546 | | |
| 1.3.6 SVT upgrade | 0 | 0 | 21,915 | 0 | -21,915 | 362,639 | 362,639 | 349,092 | 0 | 13,547 | 362,639 | 362,639 | 0 | | |
| 1.3.11 Revised XFTII Project | 13,689 | 5,787 | 20,456 | -7,902 | -14,669 | 1,629,697 | 1,591,824 | 1,578,970 | -37,873 | 12,855 | 1,629,697 | 1,745,641 | 115,944 | | |
| WBS[2]Totals: | 35,516 | 13,190 | -138,942 | -22,326 | 152,132 | 4,625,864 | 4,563,957 | 4,404,876 | -61,907 | 159,081 | 4,633,789 | 4,764,984 | 131,195 | | |
| 1.4 Administration | | | | | | | | | | | | | | | |
| 1.4.3 Construction Phase | 18,650 | 18,650 | 17,368 | 0 | 1,282 | 671,693 | 671,693 | 647,769 | 0 | 23,923 | 744,322 | 744,322 | 0 | | |
| WBS[2]Totals: | 18,650 | 18,650 | 17,368 | 0 | 1,282 | 671,693 | 671,693 | 647,769 | 0 | 23,923 | 744,322 | 744,322 | 0 | | |
| Funding Type-CATotals: | 54,166 | 31,840 | -119,995 | -22,326 | 151,835 | 5,765,464 | 5,703,557 | 5,520,552 | -61,907 | 183,005 | 5,846,019 | 5,977,213 | 131,195 | | |
| Sub Total | 54,166 | 31,840 | -119,995 | -22,326 | 151,835 | 5,765,464 | 5,703,557 | 5,520,552 | -61,907 | 183,005 | 5,846,019 | 5,977,213 | 131,195 | | |
| Management Resrv. | | | | | | | | | | | 1,008,981 | 877,787 | -131,195 | | |
| Total | 54,166 | 31,840 | -119,995 | -22,326 | 151,835 | 5,765,464 | 5,703,557 | 5,520,552 | -61,907 | 183,005 | 6,855,000 | 6,855,000 | 0 | | |

V VARIANCE ANALYSIS

The cost variance that appeared in our December, 2005 report due to an accounting error was corrected in January, 2006. The remaining cost and schedule variances are insignificant.