

# **Closeout Presentations**

from the

Director's Review

of

# **CDF Run IIb Detector Upgrade**

January 18-19, 2005

## 2a. Calorimeter Commissioning

### **Findings**

WBS 1.2 covers the Calorimeter Upgrades and consists of two subprojects, 1.2.1 Central Preshower and Crack Detectors and 1.2.2 Electromagnetic timing. Both subprojects have completed construction and were installed during the recent 2004 shutdown.

Both systems have been tested with cosmic rays and more recently with collision data. The EM timing is working as planned with ~ 1 nsec timing and with only 3 of ~ 1700 channels not functioning. The Preshower and Crack modules are also working as planned with reasonable occupancies and signals with expected pulse heights. The Preshower detector has 99.7% of its channels operational.

Work continues on ~5 spare Preshower modules and associated photomultiplier boxes and optical cables. The Estimate to Complete is now only \$ 19 K with the lion's share of this a known expense for cost overrun labor at Michigan State associated with these spares. The contingency on these projects has been set at \$ 20 K,

### **Comments**

The Project Management and the collaborating institutions are to be congratulated for completing these two subprojects since the last review. The installation of the Preshower and Crack modules was tricky and was completed successfully and safely with the help of a large number of collaborators and several technician and engineering groups at Fermilab.

The contingency estimate of \$ 20 K was not well justified and seems high (105%) relative to the remaining invoices expected on the projects. However the amount is small.

The old adage used to be that "the job is not finished until the paperwork is done". Unfortunately we now live in an era where the job is not finished until someone drives a stack into it and prevents anyone from generating any more paperwork that has to be dealt with. The project management should consider setting a deadline for closing down these projects (say by May 1, in three months), make sure all invoices are in hand before then, and then shut down the associated task codes. Any remaining contingency at that point should be formally returned to the laboratory. This could serve as a model for closing the rest of the subprojects.

### **Recommendations**

None

## 2b. Operation Plans and Commission Plan for the Balance of the Project

### **Findings**

This is not a formal WBS element, but the end game of the project involves commissioning and operations of the various parts and such plans were presented.

The TDC Project is best accomplished with installation of small batches of 30 – 60 boards in short ~1 shift accesses during the current collider running. The Project expects sufficient access opportunities before an August 2005 shutdown, but if this work cannot be fully accomplished by then they have a fallback option of replacing a priority batch of about 100 TDCs (about 1/3 of the total) during the shutdown. Commissioning is not a problem since all cards are fully checked out on test stands before installation so that this work is just like replacing a broken card during regular operations.

The Level 2 project is expected to be installed by March 2005 and the system is parasitic so that commissioning can be done without downtime to the experiment.

The Event Builder commissioning requires down time and is therefore scheduled for the shutdown. A full vertical slice of the system is planned for this summer before the shutdown and can be done parasitically.

The Level 3 Computer upgrade is scheduled for the August 2005 shutdown so as to have no impact on operations.

The SVT upgrade has new boards which will initially be tested in a test stand. It is hoped to then test each piece of this upgrade with real data prior to the August shutdown, but this project has “in kind” contributions that might miss the shutdown window. Since new crate(s) are required for this upgrade, it will be possible to do some vertical slice tests even during collider running after the 2005 shutdown if required. Some real downtime to the experiment would occur for final commissioning, but in most scenarios only the SVT itself would be unavailable for operations. This could impact secondary vertex triggering in CDF for a period after the 2005 shutdown.

The revised XFT project requires collision hall access for installation of optical fibers and some electronics boards. This XFT work drives the project’s “ready for shutdown” date. The XFT installation is also coupled to the TDC work. Still, there is a good chance for the collision hall components to be ready by August, and the infrastructure work (including the optical fibers) can be done in advance. Eventual commissioning requires collisions, but this work can be done in parallel with data taking by the experiment.

In all the subprojects, physicists are the primary source of effort for the commissioning and operations. Some effort from the Particle Physics Division support crew for CDF is required in several cases. A small amount of contract labor is required and effort on the TDC cards is expected from a separate PPD electronics fabrication group with checkout by the CD PREP enterprise.

## **Comments**

In most cases the installation, commissioning and operations impact for each of these subprojects seems well thought out and the Project has backup plans for various disaster scenarios. The required effort by physicists, engineers, and technicians has been identified and should be available since it is quite similar to (maybe even less than?) the effort required in the 2004 shutdown.

The largest uncertainties are the rate of TDC installation and the arrival of all parts for the SVT installation. The recent glitch with one board in the XFT project may cause trouble, but it is too early to tell. The biggest impact on the experiment would be reduced operational efficiency during collider running for a short period following the August 2005 shutdown.

The Project management clearly should continue to monitor progress in these critical areas and develop more detailed backup plans as required

## **Recommendations**

The laboratory should understand the status of all the critical parts before starting the “August” 2005 shutdown. It may be that a short delay in this schedule would be obvious by June 2005.

# Schedule

- Findings
  - Project scheduled to end by 30 Sept 05
  - L1 milestone three months later
  - No explicit schedule contingency in the quoted ready for shutdown date (currently 28 July 05)
  - Project does not perceive any large advantage to delayed start of shutdown (but see XFT)
- Comments
  - see later
- Recommendations
  - see individual items

# Costs

- Findings
  - Estimated Cost to Completion determined from difference of baseline costs and ACWP\$
  - contingency estimates are calculated as fractions of ETC
  - contingencies do not include explicit additional considerations for recovering from schedule slippages
- Comments
  - Delays engender costs. The contingency on XFT is prudent.

# Costs (continued)

- Recommendations:
  - consider basing contingency on work yet to be done, including possibility of extra manpower.

# Installation

- Findings
  - No large demands for installation personnel
  - Much of the installation occurs as components become available.
  - Collision hall access is required for
    - TDC modification installation and checkout
    - XFT transition cards, XTC and cabling
  - Event Builder installation will cause a brief DAQ downtime
  - SVT installation is a disruption

# Installation

- Comments
  - Successful calorimeter upgrade completion and installation on tight schedule is an indication of the capabilities of this team.
  - The development of parallel paths for commissioning is admirable
  - it is important that a detailed schedule be developed (as is happening) to minimize downtime as new components are brought on-line.

# Installation

- Recommendations
  - Maintain adequate communication with Laboratory on progress on these projects to set a sensible shutdown date.

# 1.3.1 TDC Modifications

- Findings
  - Internal TDC Production Decision Review-Sept 28 2004
    - CDF terminated fabrication of Run IIb TDCs after successful fabrication and testing of prototypes because Run IIa TDCs were judged to be adequate and minimize potential risk of downtime due to commissioning effort
    - Rev D TDCs require modifications to implement fast clear capability to increase L2 accept rate
    - Project requires access to Collision Hall before shutdown. It intends to exploit opportunities (> few hours) to swap boards. If these are not available, may request 8hrs/month.
    - Project depends upon availability of Fermilab and Michigan resources for board modifications

# 1.3.1 TDC Modifications

- Comments
  - Project pursued plan to facilitate decision that was outlined during previous review
  - Not obvious that all TDC boards require modification
- Recommendations
  - Re-evaluate contingency as project gains experience.

## 1.3.2 Level 2 Trigger

- Findings
  - Internal Installation Readiness Review-Sept 27 2004
  - Almost all hardware already on hand
  - Commissioning is in progress
  - Expected to be fully operational in March
  - Planning for short and long-term PULSAR firmware support is in place
- Comments
  - Parasitic testing and commissioning using copies of inputs is prudent and effective
- Recommendations
  - None (congratulate participants?)

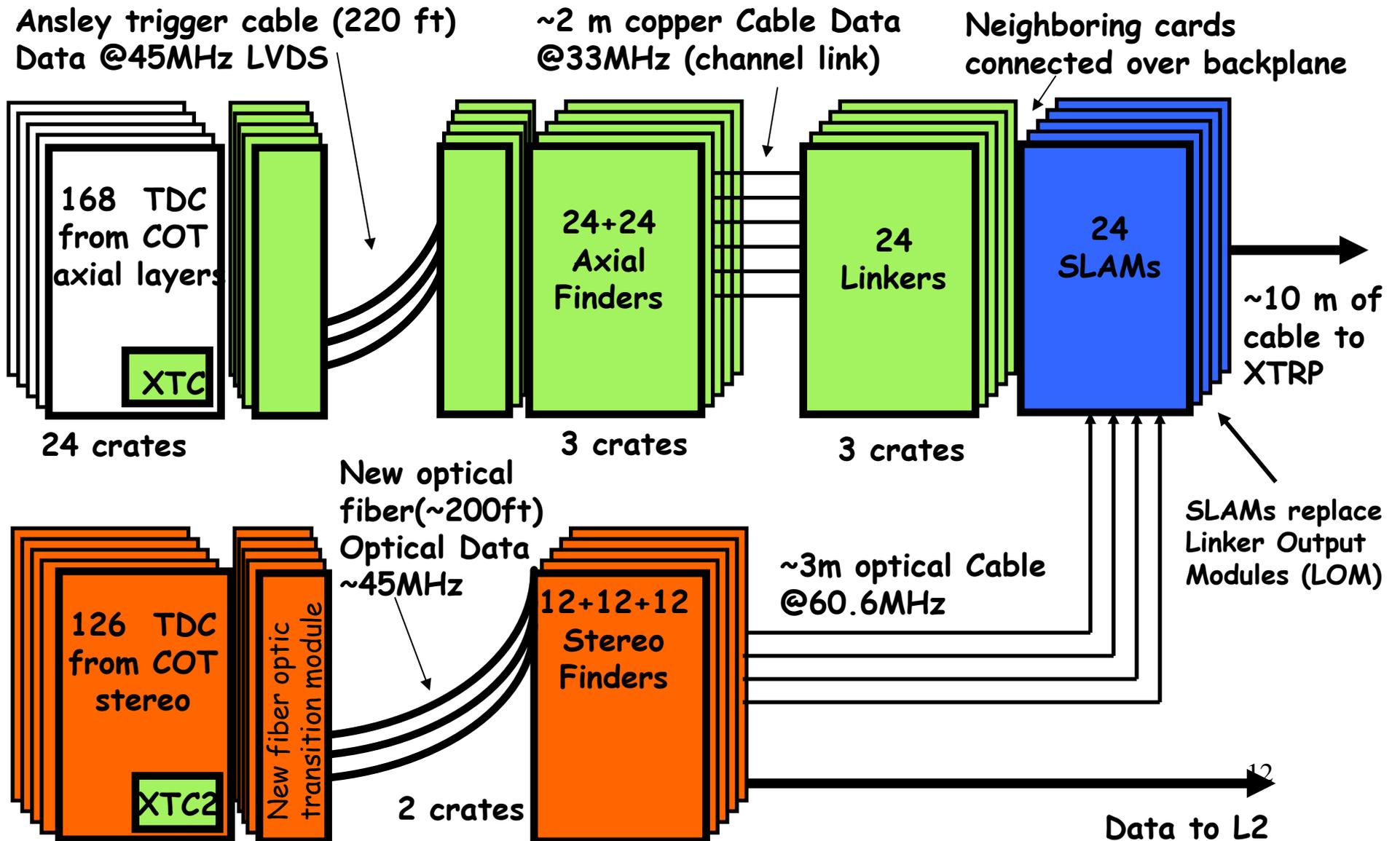
# 1.3.4/1.3.5 L3 Farm and Event Builder

- Findings
  - Internal EB progress Review – Dec 17 2004
  - EB hardware acquisition nearly complete
- Comments
  - 1 kHz readout should be achievable
  - A range of dates was given - the sooner (seems to be) the better
- Recommendations
  - Adopt Change Request for additional VRB crates and associated SCPUs

# 1.3.6 Silicon Vertex Trigger

- Findings
  - Internal progress review –Jan 4 2005.
  - yield of AM chips lower than anticipated
  - Change in Level 3 manager anticipated in Feb
- Comments
  - Impressive amount of work achieved.
  - Project manager reports that there is significant schedule risk associated with the software, firmware and AM
  - Schedule in mind of Level 2 manager and subproject seemed different.
- Recommendations
  - Establish timetable for decision to acquire additional AM chips
  - Monitor management transition period to reduce risk that something be missed during this crucial time

# XFT Upgrade Configuration



## 1.3.11 XFT II

- Findings
  - Recent internal review (Dec 8 2004) emphasized need to complete firmware, generate detailed plan for board testing, and identify additional personnel for software and management of commissioning
  - SLAM and Finder were a month behind schedule before the latest news on the Finder prototype fabrication issue was reported
  - XTC, transition cards and optical fibers drive ready for shutdown date.
  - Huge amount of work done.

## 1.3.11 XFT II

- Comments
  - Significant progress over the past six months - huge work
  - Final determination regarding latency is an open issue; this could impact schedule and is a substantial concern
    - What is plan for deciding on option to install two chips on SLAMs (60K\$ in chips plus design costs)
  - Status of Finder prototype boards highlights schedule concerns and has potential impact on plans for XTC transition card schedule
  - Minimal (if any) schedule contingency remaining

## 1.3.11 XFT II

- Recommendations
  - Continue to push for slice test asap (currently expected in late spring)
  - Address recommendations of internal review committee. Consider all aspects of project.
  - The Laboratory should monitor progress as it may affect installation and shutdown timing.

# Run IIb CDF Detector Upgrade Director's Review

## Installation Plans for 2005

January 18-19, 2005

M. Crisler

# Findings

- Although the installation is “off-Project” the committee heard fairly detailed installation plans for each element of the upgrade project.
- The installation plans were fully integrated with the construction plans down to level 3, and were discussed both in the level 2 and level 3 presentations.

# Findings

- A summary of upgrade installation plans was included in an overall summary of maintenance, repair, and installation plans for the August 8<sup>th</sup> accelerator shutdown.
- The planning and estimates are firmly grounded in the successful experience with the FY04 shutdown in which all scheduled work was completed.

# Findings

- The project managers are well aware that not all installation work can be completed during the 8-week shutdown and have developed staging plans which include:
  - Utilization of downtimes for partial installation
  - Schemes which allow commissioning of new electronics during operation.

# Comments

- The integration of installation and commissioning planning to Level 3 is commendable.
- The feeling of the committee is that the collaboration and the project managers have prepared a complete and robust installation plan which includes workable fallback positions for most potential problems.

## CDF Run II b Director's Review – Cost, Schedule and Management

### Findings

- CDF project manager presented:
  - Estimate to Complete = \$3,724K
  - Contingency = \$1,174K.
- The contingency represents 32% of the remaining cost.
- The available contingency = \$3,131K.
  - Agreed to DOE Funding = \$10,375K
  - ACWP = \$3,520K
  - ETC = \$3,724K
- The Run IIb silicon project is complete (ETC = 0).
- The calorimeter upgrades are essentially complete.
- Remaining costs are for the DAQ and Trigger Project and for Administration.
- Schedule is driven by shutdown schedule:
  - Currently have a milestone for this at 28 July 2005.
- And Level 1 milestone for Data Acquisition and Trigger Upgrades Ready to Install:
  - Forecast date is 22 Sep 2005.
  - Baseline date is 17 Jan 2006.

## Comments

- CDF has a strong management team in place. Managers at all levels were well-informed about their projects and gave excellent status reports.
- The Estimate to Complete was examined by the committee in some detail. There are a couple of places where the Committee felt the Estimate to Complete might be slightly high:
  - **Administration**
    - Baseline = \$959K
    - ACWP = \$430K
    - ETC = **\$529K**
    - Administration cost is mostly salaries, with some cost for travel and M&S added in; fairly flat in time.
    - The project is about 60% complete (in time).
    - At current rate of spending, ETC for administration would be about **\$380K**.
    - Project managers mentioned that they had used almost none of the budgeted travel cost.
  - **Event Builder**
    - There were a few items here that were finished or nearly finished where actual cost was below the baseline cost.
    - Also – engineering for TDC readout will not be needed since the new TDCs will not be built.

- Contingency: The contingency of 30% for most projects was felt to be reasonable.
  - The contingency of 40% for XFT II is reasonable since this project has the largest estimate to complete and greatest uncertainty.
  - The contingency of 40% for the Run II b TDC project could be reassessed after more boards have been modified.
- Overall, the Committee felt that CDF could complete the Run II b projects with funding = to their ETC + contingency estimate (= \$8,418K).
- Schedule: The Committee believes that the 22 Sep 2005 completion date for the DAQ and Trigger upgrades may not be met for some items.
  - The news about the XFT Finder prototypes was very new, but some delay is inevitable.
  - Many of the electronics/trigger projects need not be complete in time for the 2005 shutdown.
- Even the January, 2006 date may not be met for some parts of some systems.
  - The project managers are doing a good job of planning the electronics installation and commissioning to minimize impact on data taking.

## Recommendations

- The committee encourages the management to monitor the costs closely and adjust the baseline

cost when there are actual costs for complete tasks.

- Management should ensure that additional costs due to schedule delays are adequately included in the contingency estimate.

## Executive Summary of CDF Run IIb Detector's Review

### Technical

A major element of the CDF Run IIb Detector Upgrade was finished with the installation of the Central Preshower and Crack Calorimeter during the FY04 Shutdown. Good progress has been and is being made on the other work to complete.

### Cost

The overall project is about 50% complete. A current estimate to complete (ETC) of \$3.7M was presented. This includes over \$300K of anticipated adjustments to the baseline. The Project Manager proposes a 32% contingency on the ETC. The new budget at completion (BAC) including contingency is \$8,418K. This is to be compared to the Major Item of Equipment (MIE) funding total of \$10,375K. The difference of \$1,957K may represent an amount of funding greater than needed.

Earned Value tracking and reporting is not required on this project. The project however does update the project status in the schedule and prepares a cost performance report (CPR) on a monthly basis.

A detailed "bottoms up" estimate to complete was not prepared by the project team. The committee was unable to verify that the proposed ETC is exact. The committee did perform some spot checks of the ETC using an assembly of data available. We believe the ETC presented may be taken as a good indicator. Thus, the BAC including contingency should be adequate to complete the project.

### Schedule

The project identified items that need to be completed in time for installation in the Collision Hall during the FY05 Shutdown planned for the last 8 weeks of the fiscal year. Barring unforeseen problems, these items should be completed in time for this installation. Several systems have boards that do not require extended access to the Collision Hall. They will likely be completed prior to the January 2006 formal Level 1 milestone date for Trigger and DAQ upgrades ready to install. The project is shooting to complete these by September 2005. The committee believes meeting the September 2005 date is at risk. In fact, the January 2006 date may not be met by all parts of all systems.

### Management

In the last review major improvements in Level 2 and 3 managements were identified. These improvements are paying off well. Some of the outstanding personnel needs from the prior review have been met. Other needs have been identified in the intervening period, but the management believes these needs can be met within the collaboration.