

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																						
<b>1.3</b>	<b>Run 2b DAQ and Trigger Project</b>	<b>\$4,113,571.00</b>	<b>\$3,958,243.00</b>	<b>\$155,328.00</b>	<b>1</b>	<b>1</b>	<b>0</b>																						
	<u>Notes</u>																												
	WBS Description:																												
	Project includes TDC upgrade, XFT upgrade, L2 upgrade, SVT upgrade, EVB upgrade and L3 PC replacements.																												
<b>1.3.1</b>	<b>Run 2b TDC Project</b>	<b>\$1,183,030.00</b>	<b>\$1,085,982.00</b>	<b>\$97,048.00</b>	<b>1</b>	<b>1</b>	<b>0</b>																						
	<u>Notes</u>																												
	WBS Description:																												
	This summary element covers the development and construction of new time to digital converters (TDC) used in the readout of the CDF central outer tracker (COT).																												
1.3.1.1	Start Run 2b TDC Subproject	\$0.00	\$0.00	\$0.00	1	1	4																						
	<u>Notes</u>																												
	WBS Description:																												
	Milestone - denoting the start of the Run 2b TDC level 3 subproject																												
<b>1.3.1.2</b>	<b>Specification &amp; Development</b>	<b>\$50,840.00</b>	<b>\$44,240.00</b>	<b>\$6,600.00</b>	<b>1</b>	<b>1</b>	<b>0</b>																						
	<u>Notes</u>																												
	WBS Description:																												
	This summary task covers the new TDC's specification and development on hit time digitization, buffer management, front-end ASDQ and trigger interfaces and data compression																												
<b>1.3.1.2.1</b>	<b>Formal Specification</b>	<b>\$1,120.00</b>	<b>\$1,120.00</b>	<b>\$0.00</b>	<b>1</b>	<b>1</b>	<b>0</b>																						
	<u>Notes</u>																												
	WBS Description:																												
	This task covers cost of TDC functionality specifications and their physics justification																												
1.3.1.2.1.1	Block Diagram	\$1,120.00	\$1,120.00	\$0.00	1	1	0																						
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>ElecEngUChi</td> <td>100%</td> <td>16 hrs</td> <td>0 days</td> <td>Mon 6/24/02</td> <td>Tue 6/25/02</td> <td>\$1,120.00</td> <td>\$0.00</td> <td>\$1,120.00</td> <td>\$0.00</td> </tr> </tbody> </table>							ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	10	ElecEngUChi	100%	16 hrs	0 days	Mon 6/24/02	Tue 6/25/02	\$1,120.00	\$0.00	\$1,120.00	\$0.00
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																			
10	ElecEngUChi	100%	16 hrs	0 days	Mon 6/24/02	Tue 6/25/02	\$1,120.00	\$0.00	\$1,120.00	\$0.00																			
	<u>Notes</u>																												
	WBS Description:																												
	This item covers the TDC functional block diagram design																												

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Block Diagram" continued

Notes

M&S BOE: N/A

Labor BOE:

This is reimbursement for time spent on the task.

1.3.1.2.1.2	Physics Justification	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	160 hrs	0 days	Thu 7/11/02	Wed 8/7/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers physics justification for the design from Run IIa experience and Run IIb luminosity conditions

M&S BOE: N/A

Labor BOE:

This is the time spent on the task

1.3.1.2.2	Interface Specification	\$17,800.00	\$11,200.00	\$6,600.00	1	1	0
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Notes

WBS Description:

This summary task covers cost of the specification for the interfaces to COT ASDQ, XFT and other DAQ components

1.3.1.2.2.1	Trigger	\$6,600.00	\$0.00	\$6,600.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	240 hrs	0 days	Mon 9/30/02	Fri 11/8/02	\$0.00	\$0.00	\$0.00	\$0.00
4	ElecEngF	50%	120 hrs	0 days	Mon 9/30/02	Fri 11/8/02	\$6,600.00	\$0.00	\$0.00	\$6,600.00

Notes

WBS Description:

This item covers inference specification to Level 1 XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Trigger" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.2	ASDQ	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	120 hrs	0 days	Mon 9/30/02	Fri 10/18/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers interface specification to the COT front-end ASDQ

M&S BOE: N/A

Labor BOE:

Labor estimated base upon recent experience with system of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.3	Crate - Hardware	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	120 hrs	0 days	Mon 10/21/02	Fri 11/8/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers interface specification to VME crate

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.4	Data Transmission	\$11,200.00	\$11,200.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	50%	160 hrs	0 days	Mon 9/30/02	Tue 11/26/02	\$11,200.00	\$0.00	\$0.00	\$11,200.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Data Transmission" continued

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.2.3	Front End Timing	\$17,920.00	\$17,920.00	\$0.00	1	1	0
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Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

1.3.1.2.3.1	Simulation	\$6,720.00	\$6,720.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	20%	96 hrs	0 days	Thu 8/8/02	Thu 10/31/02	\$6,720.00	\$0.00	\$3,360.00	\$3,360.00

Notes

WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquisition system.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.2.3.2	Test Board	\$11,200.00	\$11,200.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	160 hrs	0 days	Fri 11/1/02	Fri 1/3/03	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	50%	160 hrs	0 days	Fri 11/1/02	Fri 1/3/03	\$11,200.00	\$0.00	\$0.00	\$11,200.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Test Board" continued

Notes

WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the characteristics of the Altera Stratix FPGA.

M&S BOE: N/A

Altera chip quotation at \$1035 from Arrow Electronics. Remaining aspects of board are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

1.3.1.2.4	<b>Buffer Management</b>	<b>\$6,440.00</b>	<b>\$6,440.00</b>	<b>\$0.00</b>	<b>1</b>	<b>1</b>	<b>0</b>
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Notes

WBS Description:

This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol

1.3.1.2.4.1	Simulation	\$2,240.00	\$2,240.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	20%	32 hrs	0 days	Thu 8/8/02	Thu 9/5/02	\$2,240.00	\$0.00	\$2,240.00	\$0.00

Notes

WBS Description:

This item covers the cost of simulation for buffer management

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.2.4.2	Trial Implementation	\$4,200.00	\$4,200.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	50%	60 hrs	0 days	Fri 9/6/02	Thu 9/26/02	\$0.00	\$0.00	\$0.00	\$0.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Trial Implementation" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	50%	60 hrs	0 days	Fri 9/6/02	Thu 9/26/02	\$4,200.00	\$0.00	\$3,150.00	\$1,050.00

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.2.5	VME Interface	\$5,880.00	\$5,880.00	\$0.00	1	1	0
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Notes

WBS Description:

This summary task covers the design of the TDC chip to VME interface and other related issues

1.3.1.2.5.1	Simulation	\$1,680.00	\$1,680.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	20%	24 hrs	0 days	Fri 9/6/02	Thu 9/26/02	\$1,680.00	\$0.00	\$1,260.00	\$420.00

Notes

WBS Description:

This item covers the cost of the simulation for the TDC chip to VME interface

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.2.5.2	Trial Implementation	\$4,200.00	\$4,200.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	50%	60 hrs	0 days	Fri 9/27/02	Thu 10/17/02	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	50%	60 hrs	0 days	Fri 9/27/02	Thu 10/17/02	\$4,200.00	\$0.00	\$0.00	\$4,200.00

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.2.6	Design Review	\$1,680.00	\$1,680.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	24 hrs	0 days	Mon 1/6/03	Wed 1/8/03	\$1,680.00	\$0.00	\$0.00	\$1,680.00

Notes

WBS Description:

The TDC design review task is a milestone.

Note: A successful review on the "Specification & Development" means we are ready to proceed to the "Detailed Design" stage.

M&S BOE: N/A

Labor BOE :

Cost of an engineer attending the review

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.3	Detailed Design	\$126,060.00	\$98,560.00	\$27,500.00	1	1	0

Notes

WBS Description:

This summary tasks covers the detailed design for the specifications developed previously.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.3.1	Front End	\$11,200.00	\$11,200.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	160 hrs	0 days	Thu 1/9/03	Thu 2/6/03	\$11,200.00	\$0.00	\$0.00	\$11,200.00

Notes

WBS Description:

This task covers the cost of the detailed design for the time window digitization

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.3.2	Trigger Interface	\$11,200.00	\$11,200.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	160 hrs	0 days	Fri 2/7/03	Thu 3/6/03	\$11,200.00	\$0.00	\$0.00	\$11,200.00

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.3.3	Compression	\$8,400.00	\$8,400.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	120 hrs	0 days	Fri 3/7/03	Thu 3/27/03	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

Detailed Design of the on board data format compression design

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Compression" continued

Notes  
Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.4	Buffers	\$8,400.00	\$8,400.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	120 hrs	0 days	Fri 3/28/03	Thu 4/17/03	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes  
WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.5	VME	\$5,600.00	\$5,600.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	80 hrs	0 days	Fri 4/18/03	Thu 5/1/03	\$5,600.00	\$0.00	\$0.00	\$5,600.00

Notes  
WBS Description:

Detailed design for the TDC-VME interfaces

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.3.6	Test Paths	\$5,600.00	\$5,600.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	80 hrs	0 days	Fri 5/2/03	Thu 5/15/03	\$5,600.00	\$0.00	\$0.00	\$5,600.00

Notes

WBS Description:

This task covers the cost of the board testing paths

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.7	Board Layout	\$16,800.00	\$16,800.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	240 hrs	0 days	Fri 5/16/03	Fri 6/27/03	\$16,800.00	\$0.00	\$0.00	\$16,800.00

Notes

WBS Description:

This task describes the TDC board layout design

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.8	Board Simulation	\$16,800.00	\$16,800.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	240 hrs	0 days	Mon 6/30/03	Mon 8/11/03	\$16,800.00	\$0.00	\$0.00	\$16,800.00

Notes

WBS Description:

This task covers the simulation tests of the board layout and functions

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Board Simulation" continued

Notes

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.9                      Documentation                      \$14,000.00                      \$14,000.00                      \$0.00                      1                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	200 hrs	0 days	Tue 7/15/03	Mon 8/18/03	\$14,000.00	\$0.00	\$0.00	\$14,000.00

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.10                      Firmware development                      \$27,500.00                      \$0.00                      \$27,500.00                      1                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	500 hrs	0 days	Tue 1/21/03	Wed 7/16/03	\$27,500.00	\$0.00	\$0.00	\$27,500.00

Notes

WBS Description:

This task covers the cost for firmware development for FPGA functions

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.11                      Design Review                      \$560.00                      \$560.00                      \$0.00                      1                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	8 hrs	0 days	Tue 8/19/03	Tue 8/19/03	\$560.00	\$0.00	\$0.00	\$560.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Design Review" continued

Notes

This milestone is a design review is for the detailed design of the TDC boards.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

1.3.1.3.12	TDC Design Review	\$0.00	\$0.00	\$0.00	1	1	4
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Notes

WBS Description:

milestone on TDC Design Review . The TDC's have been successfully designed and prototype board fabrication can begin.

1.3.1.4	<b>Prototype - V1.0</b>	<b>\$143,265.00</b>	<b>\$143,265.00</b>	<b>\$0.00</b>	<b>1</b>	<b>1</b>	<b>0</b>
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Notes

WBS Description:

This summary task covers the first round of TDC prototypes including building the boards, debugging and evaluating their performance.

1.3.1.4.1	ASDQ test stand	\$35,000.00	\$35,000.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	35,000	35,000	0 days	Wed 8/20/03	Wed 9/3/03	\$35,000.00	\$0.00	\$0.00	\$35,000.00

Notes

WBS Description:

This task covers the cost for assembling a teststand with VME crate and connecting it to a set of COT ASDQ boards. This will be the first true measure of timing performance using real ASDQ signals and calibration pulses. These tests will be followed by reading out the CDF full-length COT prototype chamber with prototype TDCs.

M&S BOE:

Purchase scope , dvm's etc ~ \$20K

VME crate - \$15K

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.4.2	Develop Test Protocols	\$33,600.00	\$33,600.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	240 hrs	0 days	Wed 8/20/03	Wed 11/12/03	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	100%	480 hrs	0 days	Wed 8/20/03	Wed 11/12/03	\$33,600.00	\$0.00	\$0.00	\$33,600.00

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.4.3	Board Fabrication	\$5,055.00	\$5,055.00	\$0.00	0.5	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	5,055	5,055	0 days	Wed 8/20/03	Wed 9/10/03	\$5,055.00	\$0.00	\$0.00	\$5,055.00

Notes

WBS Description:

This item covers the cost of prototype TDC board fabrication

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

FPGA cost based upon quotations. Prototype board estimates based upon experience with Run 2a calorimeter calibration card.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Board Fabrication" continued

Notes

Labor BOE: N/A

1.3.1.4.4	Parts Procurement	\$19,540.00	\$19,540.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	19,540	19,540	0 days	Wed 8/20/03	Wed 9/10/03	\$19,540.00	\$0.00	\$0.00	\$19,540.00

Notes

WBS Description:

This item covers the cost for the parts of the prototype TDC board

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

Labor BOE: N/A

1.3.1.4.5	First Board Assembly	\$350.00	\$350.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	350	350	0 days	Thu 9/11/03	Wed 9/24/03	\$350.00	\$0.00	\$0.00	\$350.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"First Board Assembly" continued

Notes

This item covers the cost for assembly of the first test board

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

Labor BOE: N/A

1.3.1.4.6	First Prototype TDC available for testing	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

Milestone - noting the first prototype TDC board available for testing

1.3.1.4.7	Bench Tests	\$23,648.00	\$23,648.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	320 hrs	0 days	Thu 9/25/03	Wed 11/19/03	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	100%	320 hrs	0 days	Thu 9/25/03	Wed 11/19/03	\$22,400.00	\$0.00	\$0.00	\$22,400.00
15	ElecTechUChi	10%	32 hrs	0 days	Thu 9/25/03	Wed 11/19/03	\$1,248.00	\$0.00	\$0.00	\$1,248.00

Notes

WBS Description:

This task covers the bench tests for the first prototype TDC board

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Bench Tests" continued

Notes  
Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.4.8	Multiple Board Assy	\$1,400.00	\$1,400.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	1,400	1,400	0 days	Thu 10/16/03	Wed 10/29/03	\$1,400.00	\$0.00	\$0.00	\$1,400.00

Notes  
WBS Description:

This item covers the cost for assembly of 4 more prototype TDC boards.

M&S BOE:

4 x \$350.00 = \$1400.00

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.4.9	Bench Tests	\$5,912.00	\$5,912.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	80 hrs	0 days	Thu 10/30/03	Wed 11/12/03	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	80 hrs	0 days	Thu 10/30/03	Wed 11/12/03	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	100%	80 hrs	0 days	Thu 10/30/03	Wed 11/12/03	\$5,600.00	\$0.00	\$0.00	\$5,600.00
15	ElecTechUChi	10%	8 hrs	0 days	Thu 10/30/03	Wed 11/12/03	\$312.00	\$0.00	\$0.00	\$312.00

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.4.10	B0 Tests	\$8,400.00	\$8,400.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	200%	480 hrs	0 days	Thu 11/13/03	Tue 12/30/03	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	240 hrs	0 days	Thu 11/13/03	Tue 12/30/03	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	50%	120 hrs	0 days	Thu 11/13/03	Tue 12/30/03	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the prototype TDC tests in B0 VME crates, both standalone and with the full length COT prototype chamber.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.4.11	Documentation	\$9,800.00	\$9,800.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	140 hrs	0 days	Thu 11/13/03	Thu 1/8/04	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	50%	140 hrs	0 days	Thu 11/13/03	Thu 1/8/04	\$9,800.00	\$0.00	\$0.00	\$9,800.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Documentation" continued

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.4.12	Design Review	\$560.00	\$560.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	8 hrs	0 days	Fri 1/9/04	Fri 1/9/04	\$560.00	\$0.00	\$0.00	\$560.00

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production.

Note: A successful review on the "Prototype-V1.0" means that we are ready to proceed to the preproduction phase

M&S BOE: N/A

Labor BOE:

The cost of one day labor coverage of an engineer at the review meeting

1.3.1.4.13	Design Review Milestone	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

Milestone - completion of TDC design review after prototyping as a requirement for the commencement of preproduction and production

1.3.1.5	Preproduction	\$151,441.00	\$151,441.00	\$0.00	1	1	0
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Notes

WBS Description:

This summary task covers preproduction TDC board fabrication and performance testing with single and multiple boards.

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.5.1	TDC crate power supplies				\$2,000.00	\$2,000.00	\$0.00	0.5	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	2,000	2,000	0 days	Mon 1/12/04	Mon 1/26/04	\$2,000.00	\$0.00	\$0.00	\$2,000.00

Notes

WBS Description:

This item covers the cost of power supplies to meet the TDC low voltage needs

M&S BOE:

Two new TDC power supplies

Subject:

TDC Power Supply for 2B

From:

Peter Wilson <pjw@fnal.gov>

Date:

Thu, 08 Aug 2002 14:06:58 -0500

To:

Kevin Pitts <kpitts@fnal.gov>

CC:

Robert Roser <roser@fnal.gov>

Hi Kevin,

I am assuming that the 1.8V requirements for the new TDC would be <5A/card or 100A/crate. In that case we would replace the 5V 150A module with a 2V 150A module which would be adjusted down to 1.8V. A rough estimate is as follows:

Materials per supply: \$900 for module + \$100 for misc materials for internal and external cable harness

Labor: 3 man-days/supply to remove, modify, re-install and modify PS->Crate power harness. (Tech Time)  
Probably need ~2 man day total of engineer time to go over plans

Assume: 30 total supplies (20 + spares)

Total cost = \$30K

Total manpower = 30 man-days (tech) modify and install  
2 man days engineering

Peter

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"TDC crate power supplies" continued

Notes

1.3.1.5.2                      Production test equipment                      \$40,000.00                      \$40,000.00                      \$0.00                      0.5                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	40,000	40,000	0 days	Mon 1/12/04	Mon 1/26/04	\$40,000.00	\$0.00	\$0.00	\$40,000.00

Notes

WBS Description:

This item covers the cost for equipment for testing/debugging TDC boards

M&S BOE:

test equipment for testing/debugging the new board logic analyzer and various other apparatus - \$40K

Labor BOE: N/A

1.3.1.5.3                      Layout Modification                      \$8,400.00                      \$8,400.00                      \$0.00                      1                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	120 hrs	0 days	Mon 1/12/04	Mon 2/2/04	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.5.4                      Board Fabrication                      \$5,297.00                      \$5,297.00                      \$0.00                      0.5                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	5,297	5,297	0 days	Tue 2/3/04	Mon 2/23/04	\$5,297.00	\$0.00	\$0.00	\$5,297.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Board Fabrication" continued

Notes

WBS Description:

This task covers the cost of fabrication of the preproduction TDC boards

Note: We assume we still need the cost of "tooling/testing" after some moderate rework of design.

M&S BOE:

Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				\$ 5,297
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	
Parts				\$ 50,080
FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				\$ 3,000
	20	150	3000	

Labor BOE: N/A

1.3.1.5.5	Parts Procurement	\$50,800.00	\$50,800.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	50,800	50,800	0 days	Tue 2/3/04	Mon 2/23/04	\$50,800.00	\$0.00	\$0.00	\$50,800.00

Notes

WBS Description:

This item covers the cost for the parts required for the preproduction TDC boards

M&S BOE:

Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				\$ 5,297

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Parts Procurement" continued

Notes

Tooling	1	575	575				
Testing	1	850	850				
Boards	22	176	3872				
Parts					\$ 50,080		
FPGAs	45	1000	45000				
Connectors	160	8	1280				
Panels	20	40	800				
Misc.	20	150	3000				
Assembly Svcs.					\$ 3,000		
	20	150	3000				

Labor BOE: N/A

1.3.1.5.6	First Board Assembly	\$150.00	\$150.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	150	150	0 days	Tue 2/24/04	Mon 3/8/04	\$150.00	\$0.00	\$0.00	\$150.00

Notes

WBS Description:

This item covers the cost for the assembly of the first preproduction TDC board

M&S BOE:

Item	Quan	Cost	Line Total
PreProduction Run (20 copies)			
Board Fabrication			\$ 5,297
Tooling	1	575	575
Testing	1	850	850
Boards	22	176	3872
Parts			\$ 50,080
FPGAs	45	1000	45000
Connectors	160	8	1280
Panels	20	40	800
Misc.	20	150	3000
Assembly Svcs.			\$ 3,000
	20	150	3000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"First Board Assembly" continued

Notes

Parts cost dominated by FPGAs and connectors.

Labor BOE: N/A

1.3.1.5.7                      Bench Tests                      \$23,648.00                      \$23,648.00                      \$0.00                      1                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	320 hrs	0 days	Tue 3/9/04	Mon 5/3/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	320 hrs	0 days	Tue 3/9/04	Mon 5/3/04	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	100%	320 hrs	0 days	Tue 3/9/04	Mon 5/3/04	\$22,400.00	\$0.00	\$0.00	\$22,400.00
15	ElecTechUChi	10%	32 hrs	0 days	Tue 3/9/04	Mon 5/3/04	\$1,248.00	\$0.00	\$0.00	\$1,248.00

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.5.8                      Multiple Board Assy                      \$2,850.00                      \$2,850.00                      \$0.00                      0.5                      1                      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	2,850	2,850	0 days	Tue 5/4/04	Mon 5/17/04	\$2,850.00	\$0.00	\$0.00	\$2,850.00

Notes

WBS Description:

This task covers the cost for the assembly of 19 preproduction TDC boards.

M&S BOE:

19 x \$150 = \$2850 (note: M&S here only covers assembly. Parts, board fabrication and NRE covered in previous items.)

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.5.9	Bench Tests	\$2,800.00	\$2,800.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	200%	160 hrs	0 days	Tue 5/18/04	Tue 6/1/04	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	50%	40 hrs	0 days	Tue 5/18/04	Tue 6/1/04	\$2,800.00	\$0.00	\$0.00	\$2,800.00

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.5.10	B0 Tests	\$5,136.00	\$5,136.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	200%	480 hrs	0 days	Wed 6/2/04	Wed 7/14/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	240 hrs	0 days	Wed 6/2/04	Wed 7/14/04	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	25%	60 hrs	0 days	Wed 6/2/04	Wed 7/14/04	\$4,200.00	\$0.00	\$0.00	\$4,200.00
15	ElecTechUChi	10%	24 hrs	0 days	Wed 6/2/04	Wed 7/14/04	\$936.00	\$0.00	\$0.00	\$936.00

Notes

WBS Description:

This task covers the preproduction TDC tests in B0 VME crates. Full crate tests will be the first opportunity to begin to investigate system effects both in board operation and timing precision/resolution.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.5.11	Documentation	\$9,800.00	\$9,800.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	140 hrs	0 days	Wed 6/2/04	Wed 7/21/04	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	50%	140 hrs	0 days	Wed 6/2/04	Wed 7/21/04	\$9,800.00	\$0.00	\$0.00	\$9,800.00

Notes

WBS Description:

This item covers the costs associated with the documentation of the preproduction boards and testing

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Documentation" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.5.12	Design Review	\$560.00	\$560.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	8 hrs	0 days	Thu 7/22/04	Thu 7/22/04	\$560.00	\$0.00	\$0.00	\$560.00

Notes

WBS Description:

This milestone describes a TDC design review help to evaluate the status of the TDC boards ahead of the production phase of the project. This is a production readiness review.

Note: a successful review at this stage means that we are ready to proceed to the production phase.

M&S BOE: N/A

Labor BOE:

Cost of one engineer attending the review

1.3.1.5.13	Beginning of TDC Production	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

Milestone - marking the beginning of TDC production after a successful production readiness review

1.3.1.6	Production	\$480,898.00	\$471,850.00	\$9,048.00	1	1	0
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Notes

WBS Description:

This summary task covers the mass production of the TDC boards including quality assurance tests

1.3.1.6.1	TDC crate power supplies	\$28,000.00	\$28,000.00	\$0.00	0.5	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	28,000	28,000	0 days	Fri 7/23/04	Thu 8/5/04	\$28,000.00	\$0.00	\$0.00	\$28,000.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"TDC crate power supplies" continued

Notes

WBS Description:

This item covers the cost of 28 new low voltage power supplies for the TDC boards

M&S BOE:

28 new TDC power supplies

Subject:

TDC Power Supply for 2B

From:

Peter Wilson <pjw@fnal.gov>

Date:

Thu, 08 Aug 2002 14:06:58 -0500

To:

Kevin Pitts <kpitts@fnal.gov>

CC:

Robert Roser <roser@fnal.gov>

Hi Kevin,

I am assuming that the 1.8V requirements for the new TDC would be <5A/card or 100A/crate. In that case we would replace the 5V 150A module with a 2V 150A module which would be adjusted down to 1.8V. A rough estimate is as follows:

Materials per supply: \$900 for module + \$100 for misc materials for internal and external cable harness

Labor: 3 man-days/supply to remove, modify, re-install and modify PS->Crate power harness. (Tech Time)  
Probably need ~2 man day total of engineer time to go over plans

Assume: 30 total supplies (20 + spares)

Total cost = \$30K

Total manpower = 30 man-days (tech) modify and install  
2 man days engineering

Peter

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.2	Bid Documentation	\$8,400.00	\$8,400.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	120 hrs	0 days	Fri 7/23/04	Thu 8/12/04	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the documentation required for the bid of the production TDC order

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.3	Board Fabrication	\$50,400.00	\$50,400.00	\$0.00	0.5	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	50,400	50,400	0 days	Fri 8/13/04	Fri 9/24/04	\$50,400.00	\$0.00	\$0.00	\$50,400.00

Notes

WBS Description:

This item covers the cost for the TDC board fabrication

M&S BOE:

	item	cost	line Total	
Production Run (350 copies)				
Board Fabrication				\$ 50,400
Tooling	0	575	0	
Testing	0	850	0	
Boards	360	140	50400	
Parts				\$ 295,150
FPGAs	750	275	206250	
Connectors	2800	8	22400	
Panels	350	40	14000	
Misc.	350	150	52500	
Assembly Svcs.				\$ 45,500
	350	130	45500	

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.6.4	Parts Procurement	\$295,150.00	\$295,150.00	\$0.00	0.5	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	295,150	295,150	0 days	Fri 8/13/04	Fri 11/5/04	\$295,150.00	\$0.00	\$0.00	\$295,150.00

Notes

WBS Description:

This item covers the cost of the parts for the TDC boards

M&S BOE:

	item	cost	line Total	
Production Run (350 copies)				
Board Fabrication				\$ 50,400
Tooling	0	575	0	
Testing	0	850	0	
Boards	360	140	50400	
Parts				\$ 295,150
FPGAs	750	275	206250	
Connectors	2800	8	22400	
Panels	350	40	14000	
Misc.	350	150	52500	
Assembly Svcs.				\$ 45,500
	350	130	45500	

Cost for production quantity of Altera Stratix FPGAs \$275 as shown in quote from Altera.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.6.5	Board Assembly	\$45,500.00	\$45,500.00	\$0.00	0.5	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	45,500	45,500	0 days	Mon 11/8/04	Mon 1/10/05	\$45,500.00	\$0.00	\$0.00	\$45,500.00

Notes

WBS Description:

This item covers the cost of TDC board assembly

M&S BOE:

	item	cost	line Total	
Production Run (350 copies)				
Board Fabrication				\$ 50,400
Tooling	0	575	0	
Testing	0	850	0	

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Board Assembly" continued

Notes

Boards	360	140	50400				
Parts				\$ 295,150			
FPGAs	750	275	206250				
Connectors	2800	8	22400				
Panels	350	40	14000				
Misc.	350	150	52500				
Assembly Svcs.				\$ 45,500			
	350	130	45500				

Labor BOE: N/A

1.3.1.6.6	Board Test	\$53,448.00	\$44,400.00	\$9,048.00	1	1	0
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Notes

WBS Description:

Summary task - production TDC board testing

1.3.1.6.6.1	Production Test Stands	\$38,800.00	\$38,800.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	240 hrs	0 days	Fri 7/23/04	Thu 9/2/04	\$0.00	\$0.00	\$0.00	\$0.00
10	ElecEngUChi	100%	240 hrs	0 days	Fri 7/23/04	Thu 9/2/04	\$16,800.00	\$0.00	\$0.00	\$16,800.00
16	MANDS	22,000	22,000	0 days	Fri 7/23/04	Thu 9/2/04	\$22,000.00	\$0.00	\$0.00	\$22,000.00

Notes

WBS Description:

This item covers the cost of a TDC test stand required for the testing of the production TDC boards

M&S BOE:

Test fixtures include: pulser, crate power supply, computers and assorted test equipment

Test Fixtures and Misc. - Est.				\$ 22,000
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Cost estimate based upon previous experience with TDC test stands.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.6.2	Test Software Revision	\$0.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	440 hrs	0 days	Fri 9/3/04	Fri 11/19/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	440 hrs	0 days	Fri 9/3/04	Fri 11/19/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the revision of the software required for the TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.6.3	Test Data Base	\$0.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	280 hrs	0 days	Mon 10/4/04	Fri 11/19/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task describes the formation of a database required for the QA tests of the production TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.6.4	First Pass Tests	\$5,920.00	\$2,800.00	\$3,120.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	400 hrs	0 days	Tue 1/11/05	Tue 3/22/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	400 hrs	0 days	Tue 1/11/05	Tue 3/22/05	\$0.00	\$0.00	\$0.00	\$0.00
5	ElecTechF	20%	80 hrs	0 days	Tue 1/11/05	Tue 3/22/05	\$3,120.00	\$0.00	\$0.00	\$3,120.00
10	ElecEngUChi	10%	40 hrs	0 days	Tue 1/11/05	Tue 3/22/05	\$2,800.00	\$0.00	\$0.00	\$2,800.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"First Pass Tests" continued

Notes

WBS Description:

This item covers the initial tests of the production TDC boards.

M&S BOE: N/A

Labor BOE:

The tests will mostly be done by physicists with help from technicians and engineer to fix the problems. 10 weeks is based on Run 2a experience

1.3.1.6.6.5 Rework \$5,920.00 \$2,800.00 \$3,120.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	400 hrs	0 days	Wed 1/26/05	Tue 4/5/05	\$0.00	\$0.00	\$0.00	\$0.00
5	ElecTechF	20%	80 hrs	0 days	Wed 1/26/05	Tue 4/5/05	\$3,120.00	\$0.00	\$0.00	\$3,120.00
10	ElecEngUChi	10%	40 hrs	0 days	Wed 1/26/05	Tue 4/5/05	\$2,800.00	\$0.00	\$0.00	\$2,800.00

Notes

WBS Description:

This task covers a rework discovered during the first pass testing

M&S BOE: N/A

Labor BOE:

This task will be done in parallel to the later part of the first pass testing

1.3.1.6.6.6 Second Pass \$2,808.00 \$0.00 \$2,808.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	360 hrs	0 days	Wed 2/16/05	Tue 4/19/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	360 hrs	0 days	Wed 2/16/05	Tue 4/19/05	\$0.00	\$0.00	\$0.00	\$0.00
5	ElecTechF	20%	72 hrs	0 days	Wed 2/16/05	Tue 4/19/05	\$2,808.00	\$0.00	\$0.00	\$2,808.00

Notes

WBS Description:

This task describes the testing done after the rework of the TDC boards. Boards passing this test will be declared ready for installation.

M&S BOE: N/A

Labor BOE:

This task will have large overlap with the first pass tests and rework

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.6.6.7	Production Board testing complete	\$0.00	\$0.00	\$0.00	0	1	3

Notes  
WBS Description:  
Milestone - marking the completion of the testing and QA of the production TDC boards.

<b>1.3.1.7</b>	<b>Data Concentrator</b>	<b>\$230,526.00</b>	<b>\$176,626.00</b>	<b>\$53,900.00</b>	<b>1</b>	<b>1</b>	<b>0</b>
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Notes  
WBS Description:  
Summary task covers design, prototyping and production of the Data Concentrator boards.

1.3.1.7.1	Readout Evaluation System	\$3,000.00	\$3,000.00	\$0.00	1	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	30%	96 hrs	0 days	Fri 9/27/02	Mon 11/25/02	\$0.00	\$0.00	\$0.00	\$0.00
16	MANDS	3,000	3,000	0 days	Fri 9/27/02	Mon 11/25/02	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes  
WBS Description:  
This task covers the cost for a readout evaluation system .

M&S BOE:

Based on PO of VME control model 620 from SBS inc.

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.7.2	Design	\$17,600.00	\$0.00	\$17,600.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	320 hrs	0 days	Tue 5/6/03	Tue 7/1/03	\$0.00	\$0.00	\$0.00	\$0.00
4	ElecEngF	100%	320 hrs	0 days	Tue 5/6/03	Tue 7/1/03	\$17,600.00	\$0.00	\$0.00	\$17,600.00

Notes  
WBS Description:  
This task covers the design of the data concentrator board

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Design" continued

Notes

1.3.1.7.3	Layout	\$8,800.00	\$0.00	\$8,800.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	160 hrs	0 days	Wed 7/2/03	Wed 7/30/03	\$0.00	\$0.00	\$0.00	\$0.00
4	ElecEngF	100%	160 hrs	0 days	Wed 7/2/03	Wed 7/30/03	\$8,800.00	\$0.00	\$0.00	\$8,800.00

Notes

WBS Description:

This task covers the cost of the data concentrator board layout

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.7.4	Prototype fabrication	\$20,000.00	\$20,000.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	20,000	20,000	0 days	Thu 7/31/03	Thu 9/11/03	\$20,000.00	\$0.00	\$0.00	\$20,000.00

Notes

WBS Description:

Fabrication of the prototype data concentrator boards

M&S BOE:

Cost estimate based upon cost of CDF TRACER board for Run 2a system.

Labor BOE: N/A

1.3.1.7.5	Test	\$9,900.00	\$0.00	\$9,900.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	720 hrs	0 days	Fri 9/12/03	Mon 1/26/04	\$0.00	\$0.00	\$0.00	\$0.00

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Test" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	25%	180 hrs	0 days	Fri 9/12/03	Mon 1/26/04	\$9,900.00	\$0.00	\$0.00	\$9,900.00

Notes

WBS Description:

Test of the prototype data concentrator boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.7.6	Layout modification	\$8,800.00	\$0.00	\$8,800.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	160 hrs	0 days	Tue 1/27/04	Mon 2/23/04	\$8,800.00	\$0.00	\$0.00	\$8,800.00

Notes

WBS Description:

This task describes the modification of the data concentrator boards based on the results from the testing of the prototype boards.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.7.7	Data Concentrator Preproduction Review	\$0.00	\$0.00	\$0.00	1	1	0
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Notes

WBS Description:

One day preproduction readiness review of data concentrator boards

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.7.8	Preproduction fabrication	\$20,000.00	\$20,000.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	20,000	20,000	0 days	Wed 2/25/04	Tue 4/6/04	\$20,000.00	\$0.00	\$0.00	\$20,000.00

Notes

WBS Description:

The cost for fabrication of the preproduction data concentration board

M&S BOE:

Cost estimate based upon similar prototype runs for the Run 2a system.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.7.9	Preproduction checkout	\$0.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	160 hrs	0 days	Wed 4/7/04	Tue 5/4/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	160 hrs	0 days	Wed 4/7/04	Tue 5/4/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of the preproduction data concentrator boards

M&S BOE: N/A

Labor BOE: based on experience from Run 2a

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.7.10	Layout modification	\$8,800.00	\$0.00	\$8,800.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	160 hrs	0 days	Wed 5/5/04	Wed 6/2/04	\$8,800.00	\$0.00	\$0.00	\$8,800.00

Notes

WBS Description:

Layout modification of the Data Concentrator board based on the testing results of the preproduction boards

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Layout modification" continued

Notes

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.7.11	Data Concentrator Production Review	\$0.00	\$0.00	\$0.00	1	1	0
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Notes

WBS Description:

Production readiness review for the Data Concentrator board.

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 100 days due to anticipated funding for FY2004

1.3.1.7.12	Production fabrication	\$125,000.00	\$125,000.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
16	MANDS	125,000	125,000	0 days	Tue 10/26/04	Wed 12/8/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	125,000	\$125,000.00	\$0.00	\$0.00	\$125,000.00

Notes

WBS Description:

The fabrication of the production Data Concentrator boards

M&S BOE:

Cost estimated from previous experience with Run 2a TRACER and similar 9U VME boards.

Labor BOE: N/A

1.3.1.7.13	Production checkout	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	320 hrs	0 days	Thu 12/9/04	Wed 2/9/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	320 hrs	0 days	Thu 12/9/04	Wed 2/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Tests required for QA of the production Data Concentrator boards

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production checkout" continued

Notes

M&S BOE: N/A

Labor BOE: Based on Run 2a experience

1.3.1.7.14	Purchase optical fibers	\$8,626.00	\$8,626.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	20%	32 hrs	0 days	Thu 2/10/05	Wed 3/9/05	\$0.00	\$0.00	\$0.00	\$0.00
16	MANDS	8,626	8,626	0 days	Thu 2/10/05	Wed 3/9/05	\$8,626.00	\$0.00	\$0.00	\$8,626.00

Notes

WBS Description:

The purchase of the optical fibers required for the production data concentrator

M&S BOE:

Cost estimated by: \$5/terminated end + \$0.50/foot of optical fiber.

Quantity required = 315 2 foot fibers + 35 spares = 350 2 foot fibers  
20 250' fibers + 5 spares = 25 250' fibers

cost = 375 fibers \* 2 ends\* \$5/end + [350fibers\*(2' length)+25fibers\*(250'length)]\*\$0.5/foot=\$8626

Estimates based upon recent optical fiber purchases for CDF.

Labor BOE:

Based on Run 2a experience

1.3.1.7.15	Data Concentrator Production Completed	\$0.00	\$0.00	\$0.00	1	1	3
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Notes

WBS Description:

Milestone - denoting the completion of the production Data Concentrator

1.3.1.8	Run 2b TDC Ready for Installation	\$0.00	\$0.00	\$0.00	1	1	3
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Notes

WBS Description:

Milestone - denoting that the Run 2b TDC project is ready for installation at B0 (end of level 3 subproject)

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.2	Run 2b Level 2 Project	\$292,819.00	\$292,819.00	\$0.00	0	1	0

Notes

WBS Description: This summary task covers the development and production of the Level 2 Trigger system

1.3.2.1	Start of Run 2b Level 2 Project	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description: Milestone denoting the start of the Level 2 Trigger Project

1.3.2.2	Testing and Software work existing L2 Pulsar test stand	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	150%	960 hrs	0 days	Wed 9/4/02	Mon 12/30/02	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	320 hrs	0 days	Wed 9/4/02	Mon 12/30/02	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	200%	1,280 hrs	0 days	Wed 9/4/02	Mon 12/30/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description: The prototype Pulsar board will be commissioned as part of a test stand for the Run 2A system. Specific tasks are: finish all mezzanine/Aux cards, Pulsar prototype testing, Rev B if needed; SLINK to PCI software work, test stand software, additional firmware work for testing ALL basic functionalities of prototypes

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

1.3.2.3	Commission L2 Pulsar for each data path - proof of principle te:	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	150%	1,680 hrs	0 days	Thu 1/2/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	560 hrs	0 days	Thu 1/2/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	200%	2,240 hrs	0 days	Thu 1/2/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description: The Pulsar board will be commissioned for each data path coming in to and out of the Level 2 decision system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.2.4	Preproduction run of Pulsar L2 system	\$130,515.00	\$130,515.00	\$0.00	0	0	0

Notes

WBS Description: This task covers the preproduction run of the Level 2 system, which consists of three Pulsar boards, associated mezzanine cards, S-link boards and interface hardware, and L2 decision processor, and will be configured for a vertical slice test.

1.3.2.4.1	Preproduction Readiness Review Pulsar L2 system	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description: This milestone refers to a review of the results from commissioning the prototype Pulsar in teststand and for all data paths in preparation for preproduction

M&S BOE: N/A

Labor BOE:

1.3.2.4.2	Engineering on preproduction L2 system	\$22,400.00	\$22,400.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	ElecEngUChi	100%	320 hrs	0 days	Wed 7/23/03	Wed 9/17/03	\$22,400.00	\$0.00	\$0.00	\$22,400.00

Notes

WBS Description: This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning.

M&S BOE: N/A

Labor BOE:

Based on information from Run 2a - Pulsar test stand quotes			
Engineering	Quan	Cost	Total
2 months	2	\$10,000.00	\$20,000.00

U of C rate (as of Summer '02) \$55.25/hr

1.3.2.4.3	Motherboards Fabrication	\$18,600.00	\$18,600.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	18,600	18,600	0 days	Thu 9/18/03	Wed 11/12/03	\$18,600.00	\$0.00	\$0.00	\$18,600.00

Notes

WBS Description: This item covers the cost of components and fabrication for three Pulsar motherboards for the preproduction run.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Motherboards Fabrication" continued

Notes  
M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	3	\$6,200.00	\$18,600.00

Labor BOE: N/A

1.3.2.4.4	Mezzanine boards Fabrication	\$13,000.00	\$13,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	13,000	13,000	0 days	Mon 9/29/03	Fri 11/7/03	\$13,000.00	\$0.00	\$0.00	\$13,000.00

Notes  
WBS Description: This item covers the cost of fabrication and components for 20 mezzanine cards for the preproduction run.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	20	\$650.00	\$13,000.00

Labor BOE: N/A

1.3.2.4.5	S-link Auxiliary boards	\$900.00	\$900.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	900	900	0 days	Mon 9/29/03	Fri 11/7/03	\$900.00	\$0.00	\$0.00	\$900.00

Notes  
WBS Description: This item covers the fabrication and component costs for three S-Link boards for preproduction.

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"S-link Auxiliary boards" continued

Notes

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	3	\$300.00	\$900.00

Labor BOE: N/A

1.3.2.4.6	LSC/LDL + fiber boards	\$6,828.00	\$6,828.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	6,828	6,828	0 days	Mon 10/6/03	Fri 11/14/03	\$6,828.00	\$0.00	\$0.00	\$6,828.00

Notes

WBS Description: This item covers the cost of purchasing three Link Source Cards / Link Destination Cards and fibers for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	3	\$2,276.00	\$6,828.00

Labor BOE: N/A

1.3.2.4.7	PCI-> S-link boards	\$2,574.00	\$2,574.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	2,574	2,574	0 days	Mon 10/13/03	Fri 11/21/03	\$2,574.00	\$0.00	\$0.00	\$2,574.00

Notes

WBS Description: This item covers the cost of purchasing three PCI -> S-Link interface boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	3	\$858.00	\$2,574.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"PCI-> S-link boards" continued

Notes

1.3.2.4.8	S-link -> PCI boards	\$3,213.00	\$3,213.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	3,213	3,213	0 days	Mon 10/13/03	Fri 11/21/03	\$3,213.00	\$0.00	\$0.00	\$3,213.00

Notes

WBS Description: This item covers the cost of purchasing three S-Link -> PCI boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI Boards	Quan	Cost	Total
	3	\$1,071.00	\$3,213.00

Labor BOE: N/A

1.3.2.4.9	L2 decision processor	\$8,000.00	\$8,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	8,000	8,000	0 days	Fri 5/16/03	Tue 9/30/03	\$8,000.00	\$0.00	\$0.00	\$8,000.00

Notes

WBS Description: This item covers the cost of purchasing two PC's for use as the L2 decision processor for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor PC	Quan	Cost	Total
	2	\$4,000.00	\$8,000.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.4.10	software development/memory management	\$55,000.00	\$55,000.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecEngU	50%	1,000 hrs	0 days	Mon 2/10/03	Fri 2/6/04	\$55,000.00	\$0.00	\$0.00	\$55,000.00

Notes

WBS Description: This item covers the engineering required to design and develop the Level 2 decision system software/memory management.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.5	Vertical Slice Test	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	150%	1,200 hrs	0 days	Mon 11/24/03	Tue 4/20/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	400 hrs	0 days	Mon 11/24/03	Tue 4/20/04	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	200%	1,600 hrs	0 days	Mon 11/24/03	Tue 4/20/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description: This item covers assembly of a vertical slice of the Level 2 system. Specific tasks include: use test stand to fine tune receiver firmware for each data path; system integration at crate level with test stand; L2 code testing for new system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6	Production run of Pulsar L2 system	\$162,304.00	\$162,304.00	\$0.00	0	0	0

Notes

WBS Description: Summary task for Production Run of Pulsar Level 2 system: fabrication and purchase of boards, link hardware, L2 decision processors.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.1	Production Readiness Review for Level 2 Pulsar system	\$0.00	\$0.00	\$0.00	0	0	0

Notes

WBS Description: This milestone refers to a review of the preproduction tests / vertical slice results in preparation for the production run.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.2	Begin production of Level2 Pulsar system	\$0.00	\$0.00	\$0.00	0	0	3

Notes

WBS Description:  
Milestone denoting beginning of production of Level 2 system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Begin production of Level2 Pulsar system" continued

Notes

1.3.2.6.3	Motherboards Fabrication	\$80,600.00	\$80,600.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	80,600	80,600	0 days	Thu 4/22/04	Thu 6/17/04	\$80,600.00	\$0.00	\$0.00	\$80,600.00

Notes

WBS Description: This item covers the cost of components and fabrication for 13 Pulsar motherboards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	13	\$6,200.00	\$80,600.00

Labor BOE: N/A

1.3.2.6.4	Mezzanine boards Fabrication	\$32,500.00	\$32,500.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	32,500	32,500	0 days	Mon 4/26/04	Mon 6/21/04	\$32,500.00	\$0.00	\$0.00	\$32,500.00

Notes

WBS Description: This item covers the cost of components and fabrication of 50 mezzanine cards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	50	\$650.00	\$32,500.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.2.6.5	S-link Auxiliary boards	\$3,900.00	\$3,900.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	3,900	3,900	0 days	Mon 5/10/04	Mon 6/21/04	\$3,900.00	\$0.00	\$0.00	\$3,900.00

Notes

WBS Description: This item covers the cost of components and fabrication for 13 S-Link Auxilliary boards for the production system.

M&S BOE:

	Quan	Cost	Total
from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board			
Boards	13	\$300.00	\$3,900.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.2.6.6	LSC/LDL + fiber boards	\$29,588.00	\$29,588.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	29,588	29,588	0 days	Mon 5/24/04	Tue 7/6/04	\$29,588.00	\$0.00	\$0.00	\$29,588.00

Notes

WBS Description: This item covers the cost of purchasing 13 Link Source Card/ Link Destination Cards and fibers for the production system.

M&S BOE:

	Quan	Cost	Total
from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber			
Boards	13	\$2,276.00	\$29,588.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.2.6.7	PCI-> S-link boards	\$3,432.00	\$3,432.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	3,432	3,432	0 days	Mon 6/21/04	Mon 8/2/04	\$3,432.00	\$0.00	\$0.00	\$3,432.00

Notes

WBS Description: This item covers the cost of purchasing 4 PCI -> S-link boards for the production system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"PCI-> S-link boards" continued

Notes

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	4	\$858.00	\$3,432.00

Labor BOE: N/A

1.3.2.6.8	S-link -> PCI boards	\$4,284.00	\$4,284.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	4,284	4,284	0 days	Tue 7/6/04	Mon 8/16/04	\$4,284.00	\$0.00	\$0.00	\$4,284.00

Notes

WBS Description: This item covers the cost of purchasing 4 S-link -> PCI boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	4	\$1,071.00	\$4,284.00

Labor BOE: N/A

1.3.2.6.9	L2 decision processor	\$8,000.00	\$8,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	8,000	8,000	0 days	Mon 5/10/04	Tue 8/17/04	\$8,000.00	\$0.00	\$0.00	\$8,000.00

Notes

WBS Description: This item covers the cost of purchasing two PC's to be used as L2 decision processors.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"L2 decision processor" continued

Notes

PC	2	\$4,000.00	\$8,000.00
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Labor BOE: N/A

1.3.2.7 System Integration standalone w/ test stand \$0.00 \$0.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	150%	720 hrs	0 days	Wed 8/18/04	Wed 11/10/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	240 hrs	0 days	Wed 8/18/04	Wed 11/10/04	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	200%	960 hrs	0 days	Wed 8/18/04	Wed 11/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description: This item covers integration of the system, first using the Pulsar teststand to drive the Pulsar L2 system, and after studying/optimizing the performance, testing the L2 decision system using test runs with beam data.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

1.3.2.8 Pulsar Level 2 subproject ready for installation \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description: Milestone :

Level 2 subproject ready for installation.

1.3.3 Run 2b XFTII Project \$1,529,842.00 \$1,529,842.00 \$0.00 0 0 0

Notes

WBS Description:

Project to Upgrade the CDF Level 1 tracking trigger system.

1.3.3.1 Start of XFTII Project \$0.00 \$0.00 \$0.00 0 0 4

Notes

WBS Description:

Milestone - marking the start of the XFTII upgrade project.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2	Finder Boards	\$638,480.00	\$638,480.00	\$0.00	0	0	0

Notes  
WBS Description:

Development of axial and stereo segment Finder boards. These boards take hit information from the COT and find track segments in the COT superlayers.

1.3.3.2.1	Finder Board FPGA chip Firmware development	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	30%	288 hrs	0 days	Tue 10/1/02	Wed 3/26/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes  
WBS Description:

Implementation of Firmware with Finder Algorithm

M&S BOE: N/A

Labor BOE:

1.3.3.2.2	Prototype Finder boards	\$133,140.00	\$133,140.00	\$0.00	0	0	0
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Notes  
WBS Description:

Summary task for development of prototype finder boards.

1.3.3.2.2.1	Study existing boards	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	30%	96 hrs	0 days	Tue 10/1/02	Wed 11/27/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes  
WBS Description:

Study data readout with existing finder boards for testing purposes

M&S BOE: N/A

Labor BOE:  
Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.2	Prototype Finder 1/3 Board Schematic Design	\$11,520.00	\$11,520.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	64 hrs	0 days	Tue 10/1/02	Wed 11/27/02	\$0.00	\$0.00	\$0.00	\$0.00
12	ElecEngUOSU	20%	64 hrs	0 days	Tue 10/1/02	Wed 11/27/02	\$3,520.00	\$0.00	\$0.00	\$3,520.00
14	ElecTechUOSU	100%	320 hrs	0 days	Tue 10/1/02	Wed 11/27/02	\$8,000.00	\$0.00	\$0.00	\$8,000.00

Notes

WBS Description:

Prototype Finder 1/3 Board Schematic Design: choice of parts, routing of signals between parts.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

1.3.3.2.2.3	Prototype Finder 1/3 board layout	\$22,400.00	\$22,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	280 hrs	0 days	Thu 11/28/02	Wed 3/12/03	\$15,400.00	\$0.00	\$0.00	\$15,400.00
14	ElecTechUOSU	50%	280 hrs	0 days	Thu 11/28/02	Wed 3/12/03	\$7,000.00	\$0.00	\$0.00	\$7,000.00

Notes

WBS Description:

Prototype Finder 1/3 board layout

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.2.4	Fabrication of Prototype Finder 1/3 board	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder 1/3 board.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.5	Fabricate Prototype Finder 1/3 board	\$12,500.00	\$12,500.00	\$0.00	0.3	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	12,500	12,500	0 days	Thu 3/13/03	Wed 5/7/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

M&S BOE:

Actual Costs of Run 2A Finger and current quotes for new parts

Fabricate 2 PC boards, purchase parts and stuff them - private company \$6250/board

for production quantities -

Finder System:

1/3 Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

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 Total Cost/Board \$5200

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.6	Test Stand Setup	\$25,400.00	\$25,400.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	10%	16 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$400.00	\$0.00	\$0.00	\$400.00
17	MANDSPASS	25,000	25,000	0 days	Thu 3/13/03	Wed 4/9/03	\$25,000.00	\$0.00	\$0.00	\$25,000.00

Notes

WBS Description:

Setup of the VME crate and associated software for communication with crate

M&S BOE:

Actual costs of Run 2A Finger and current quotes for new parts

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test Stand Setup" continued

Notes

Labor BOE:

1.3.3.2.2.7	Finder 1/3 board Prototype Testing	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	960 hrs	0 days	Thu 5/8/03	Fri 8/1/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Thu 5/8/03	Fri 8/1/03	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Testing of fully loaded Finder 1/3 Prototypes.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.2.8	Prototype Finder 2/4 Board Schematic Design	\$5,760.00	\$5,760.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$0.00	\$0.00	\$0.00	\$0.00
12	ElecEngUOSU	20%	32 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$1,760.00	\$0.00	\$0.00	\$1,760.00
14	ElecTechUOSU	100%	160 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes

WBS Description:

Prototype Finder 2/4 PC board Schematic design: choice of parts, routing of signals between parts.  
Very Similar to Finder 1/3 board.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.9	Prototype Finder SL7 Board Schematic Design	\$5,760.00	\$5,760.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$0.00	\$0.00	\$0.00	\$0.00
12	ElecEngUOSU	20%	32 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$1,760.00	\$0.00	\$0.00	\$1,760.00
14	ElecTechUOSU	100%	160 hrs	0 days	Thu 3/13/03	Wed 4/9/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes

WBS Description:

Prototype Finder SL7 PC board Schematic design: choice of parts, routing of signals between parts.  
 Very Similar to Finder 1/3 board.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.10	Prototype Finder 2/4 board layout	\$9,600.00	\$9,600.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	120 hrs	0 days	Thu 4/10/03	Wed 5/21/03	\$6,600.00	\$0.00	\$0.00	\$6,600.00
14	ElecTechUOSU	50%	120 hrs	0 days	Thu 4/10/03	Wed 5/21/03	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes

WBS Description:

Prototype Finder 2/4 PC board layout - start from Finder 1/3 board layout.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A experience

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.11	Prototype Finder SL7 board layout	\$9,600.00	\$9,600.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	120 hrs	0 days	Thu 5/22/03	Thu 7/3/03	\$6,600.00	\$0.00	\$0.00	\$6,600.00
14	ElecTechUOSU	50%	120 hrs	0 days	Thu 5/22/03	Thu 7/3/03	\$3,000.00	\$0.00	\$0.00	\$3,000.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Finder SL7 board layout" continued

Notes

WBS Description:

Prototype Finder SL7 PC board layout - start from Finder 1/3 board layout.

M&S BOE: N/A

Labor BOE:

Based on Run 2A XFT experience

1.3.3.2.2.12	Fabrication of Prototype Finder 2/4 board	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder 2/4 board.

1.3.3.2.2.13	Fabricate Prototype Finder 2/4 board	\$12,500.00	\$12,500.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	12,500	12,500	0 days	Thu 5/22/03	Fri 7/18/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Fabricate 2 PC boards, purchase parts and stuff them - private company \$6250/board

For production quantities

2/4 Boards:

Major Components:

Altera Stratix: \$2200

Altera Flex 10K: \$232

Xilinx FPGAs: \$1435

Secondary Components: \$971

PCB Fabrication: \$600

PCB Assembly: \$370

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WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Fabricate Prototype Finder 2/4 board" continued

Notes

Total Cost/Board \$5808  
Total Cost for  
24+6 spares Boards: \$174,240

Labor BOE:

1.3.3.2.2.14	Fabrication of Prototype Finder SL7 board	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder SL7 board.

1.3.3.2.2.15	Fabricate Prototype Finder SL7 board	\$12,500.00	\$12,500.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	12,500	12,500	0 days	Mon 7/7/03	Fri 8/29/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Fabricate 2 PC boards, purchase parts and stuff them - private company \$6250/board

for production quantities -

Finder System:

1/3 Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

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Total Cost/Board \$5200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Fabricate Prototype Finder SL7 board" continued

Notes

Labor BOE:

1.3.3.2.2.16 Finder 2/4 board Prototype Testing \$1,600.00 \$1,600.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	640 hrs	0 days	Mon 7/21/03	Mon 9/15/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	64 hrs	0 days	Mon 7/21/03	Mon 9/15/03	\$1,600.00	\$0.00	\$0.00	\$1,600.00

Notes

WBS Description:

Testing of fully loaded Finder 2/4 Prototypes.

M&S BOE: N/A

Labor BOE:

Based on Experience with Run 2A Finder Boards

1.3.3.2.2.17 Finder SL 7 board Prototype Testing \$1,600.00 \$1,600.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	640 hrs	0 days	Tue 9/2/03	Mon 10/27/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	64 hrs	0 days	Tue 9/2/03	Mon 10/27/03	\$1,600.00	\$0.00	\$0.00	\$1,600.00

Notes

WBS Description:

Testing of fully loaded Finder SL7 prototypes

M&S BOE: N/A

Labor BOE:

Based on Experience of Run 2A Finder boards

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.3	Preproduction Finder Boards	\$53,700.00	\$53,700.00	\$0.00	0	0	0

Notes  
WBS Description:

Preproduction Finder Boards: develop a small number (3) preproduction boards to test modifications determined during prototype testing.

1.3.3.2.3.1	Finder Board FPGA chp Firmware refinement	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	72 hrs	0 days	Thu 3/27/03	Fri 8/1/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes  
WBS Description:

Task to refine firmware on the finder board.

M&S BOE: N/A

Labor BOE:  
Based on experience with Run 2A XFT

1.3.3.2.3.2	Modification of Finder 1/3 board Schematic and Layout	\$9,600.00	\$9,600.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	120 hrs	0 days	Mon 8/4/03	Mon 9/15/03	\$6,600.00	\$0.00	\$0.00	\$6,600.00
14	ElecTechUOSU	50%	120 hrs	0 days	Mon 8/4/03	Mon 9/15/03	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes  
WBS Description:

Modification of Finder 1/3 PC board schematic and layout: implement changes determined during prototype testing

M&S BOE: N/A

Labor BOE:  
Based on experience with Run 2A XFT

1.3.3.2.3.3	Preproduction Finder1/3 board Fabrication	\$12,500.00	\$12,500.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	12,500	12,500	0 days	Tue 9/16/03	Mon 11/10/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes  
WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Preproduction Finder1/3 board Fabrication" continued

Notes

Fabrication of PC board and stuffing of components

Produce 2 preproduction 1/3 Finder boards including PC board fabrication and stuffing

M&S BOE:

Actual osts of Run 2A Finder and current quotes for new parts

Produce 2 preproduction boards including fabrication and stuffing-

Finder System: - production quantities

1/3 Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

-----  
Total Cost/Board \$5200

Since this is two board run - use prototype cost. \$6250/board

Labor BOE:

1.3.3.2.3.4      Testing Finder 1/3 preproduction boards      \$800.00      \$800.00      \$0.00      0.5      0.5      0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	320 hrs	0 days	Tue 11/11/03	Wed 12/10/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	32 hrs	0 days	Tue 11/11/03	Wed 12/10/03	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Testing of finder 1/3 preproduction boards.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.3.5	Modification of Finder 2/4 Board Schematic and Layout	\$3,200.00	\$3,200.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	40 hrs	0 days	Tue 9/16/03	Mon 9/29/03	\$2,200.00	\$0.00	\$0.00	\$2,200.00
14	ElecTechUOSU	50%	40 hrs	0 days	Tue 9/16/03	Mon 9/29/03	\$1,000.00	\$0.00	\$0.00	\$1,000.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.3.6	Preproduction Finder 2/4 board Fabrication	\$12,500.00	\$12,500.00	\$0.00	0.3	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	12,500	12,500	0 days	Tue 9/30/03	Mon 11/24/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Produce 2 preproduction 2/4 Finder boards including PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Produce 2 preproduction boards including fabrication and stuffing-

Finder System: - production quantities

2/4 Boards:

Major Components:

Altera Stratix: \$2200

Altera Flex 10K: \$232

Xilinx FPGAs: \$1435

Secondary Components: \$971

PCB Fabrication: \$600

PCB Assembly: \$370

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Total Cost/Board \$5808

Total Cost for

24+6 spares Boards: \$174,240

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Finder 2/4 board Fabrication" continued

Notes

Since this is two board run - use prototype cost. \$6250/board

Labor BOE:

1.3.3.2.3.7	Testing Finder 2/4 preproduction boards	\$800.00	\$800.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	320 hrs	0 days	Tue 11/25/03	Fri 12/26/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	32 hrs	0 days	Tue 11/25/03	Fri 12/26/03	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Testing of Finder 2/4 preproduction boards.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.3.8	Modification of Finder SL7 board Schematic and Layout	\$1,000.00	\$1,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	ElecTechUOSU	50%	40 hrs	0 days	Tue 10/28/03	Mon 11/10/03	\$1,000.00	\$0.00	\$0.00	\$1,000.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.3.2.3.9	Preproduction Finder SL7 board Fabrication	\$12,500.00	\$12,500.00	\$0.00	0.3	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	12,500	12,500	0 days	Tue 11/11/03	Tue 1/13/04	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Produce 2 preproduction SL 7 Finder boards including PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Produce 2 preproduction boards including fabrication and stuffing-

**Get updated price list**

Finder System: - production quantities

SL Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

-----  
 Total Cost/Board \$5200

Since this is two board run - use prototype cost. \$6250/board

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.3.2.3.10	Testing Finder SL7 preproduction boards	\$800.00	\$800.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	320 hrs	0 days	Wed 1/14/04	Wed 2/11/04	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	32 hrs	0 days	Wed 1/14/04	Wed 2/11/04	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Testing Finder SL7 preproduction boards

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Testing Finder SL7 preproduction boards" continued

Notes

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4	Production Finder boards	\$446,640.00	\$446,640.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Finder Boards: Fabrication, stuffing and testing of full set of Finder 1/3, Finder 2/4, Finder SL7 boards, including spares.

1.3.3.2.4.1	Production Readiness Review - Finder 1/3 boards	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Readiness Review Finder 1/3 boards: CDF Finder 1/3 PC board, testing and QA certification

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 150 days due to anticipated funding for FY2004

1.3.3.2.4.2	Production of Finder 1/3 boards	\$156,000.00	\$156,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDSPASS	156,000	156,000	0 days	Tue 7/20/04	Tue 10/26/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	156,000	\$156,000.00	\$0.00	\$0.00	\$156,000.00

Notes

WBS Description:

Production of Finder 1/3 boards: Fabrication of PC boards and stuffing of components.

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Need 24 + (6 spare) Finder 1/3

Total boards - Finder 1/3 - SL7 boards - \$5200/board = \$156,000

1/3 Boards:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production of Finder 1/3 boards" continued

Notes

Major Components:  
Altera Stratix: \$1650  
Altera Flex 10K: \$174  
Xilinx FPGAs: \$1455  
Secondary Components: \$951  
PCB Fabrication: \$600  
PCB Assembly: \$370  
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Total Cost/Board \$5200

Labor BOE: N/A

1.3.3.2.4.3	Test Production Finder 1/3 boards	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	150%	720 hrs	0 days	Wed 10/27/04	Thu 1/27/05	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Wed 10/27/04	Thu 1/27/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Test and checkout of Production Finder 1/3 boards.

M&S BOE: N/A

Labor BOE:

Testing Experience with Run 2A boards

1.3.3.2.4.4	Production Readiness Review - Finder 2/4 boards	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Readiness Review Finder 2/4 boards: CDF Finder 2/4 PC board, testing and QA certification

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 150 days due to anticipated funding for FY2004

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Production Readiness Review - Finder 2/4 boards" continued

Notes

1.3.3.2.4.5	Production of Finder 2/4 boards	\$174,240.00	\$174,240.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	174,240	174,240	0 days	Tue 8/3/04	Tue 11/9/04	\$174,240.00	\$0.00	\$0.00	\$174,240.00

Notes

WBS Description:

Production of Finder 2/4 boards: Fabrication of PC boards and stuffing of components

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.  
 Need 24 + (6 spare) Finder 2/4 boards for SL 4 and SL 8

Total boards - 30 Finder 2/4 boards - \$5808/board = \$174,240.00

2/4 Boards:

Major Components:	
Altera Stratix:	\$2200
Altera Flex 10K:	\$232
Xilinx FPGAs:	\$1435
Secondary Components: \$971	
PCB Fabrication:	\$600
PCB Assembly:	\$370
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Total Cost/Board	\$5808

Labor BOE: N/A

1.3.3.2.4.6	Test Production Finder 2/4 boards	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	150%	720 hrs	0 days	Wed 11/10/04	Thu 2/10/05	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Wed 11/10/04	Thu 2/10/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Test and checkout of Production Finder 1/3 boards.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Test Production Finder 2/4 boards" continued

Notes

M&S BOE: N/A

Labor BOE:

Testing Experience with Run 2A boards

1.3.3.2.4.7	Production Readiness Review - Finder SL 7 boards	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Readiness Review Finder SL boards: CDF Finder SL7 PC board, testing and QA certification

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 125 days due to anticipated funding for FY2004

1.3.3.2.4.8	Begin Production Finder SL7 boards	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

This milestone marks the beginning of production for the Finder SL7 boards after a successful production readiness review

1.3.3.2.4.9	Production of Finder SL7 boards	\$109,200.00	\$109,200.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDSPASS	109,200	109,200	0 days	Tue 8/10/04	Tue 11/16/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	109,200	\$109,200.00	\$0.00	\$0.00	\$109,200.00

Notes

WBS Description:

Production of Finder SL boards: Fabrication of PC boards and stuffing of components

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Production of Finder SL7 boards" continued

Notes

Actual costs of Run 2A Finder and current quotes for new parts.

**Need updated costs**

Need 18 + (3 spare) Finder SL 7 boards  
 Total boards - SL7 boards - \$5200/board = \$109,200

SL Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

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 Total Cost/Board \$5200

Labor BOE: N/A

1.3.3.2.4.10	Test Production Finder SL7 boards	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	150%	720 hrs	0 days	Wed 11/17/04	Thu 2/17/05	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Wed 11/17/04	Thu 2/17/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Test and checkout of Production Finder 1/3 boards.

M&S BOE: N/A

Labor BOE:

Testing Experience with Run 2A boards

:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.5	Finder3D backplane	\$5,000.00	\$5,000.00	\$0.00	0	0	0

Notes  
WBS Description:  
Finder 3D backplane.

1.3.3.2.5.1	Finder3d backplane Layout	\$1,000.00	\$1,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	16 hrs	0 days	Mon 6/23/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	25%	40 hrs	0 days	Mon 6/23/03	Mon 7/21/03	\$1,000.00	\$0.00	\$0.00	\$1,000.00

Notes  
WBS Description:  
Layout of Finder 3D backplane  
M&S BOE: N/A  
Labor BOE:  
Run 2A Finder backplane layout

1.3.3.2.5.2	Finder3d Backplane Production Readiness Review	\$0.00	\$0.00	\$0.00	0	0	0
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Notes  
WBS Description:  
Production Readiness review for the Finder3D Backplane.  
MS BOE: N/A  
Labor BOE:

1.3.3.2.5.3	Finder3d backplane Fabrication and Stuffing	\$4,000.00	\$4,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	4,000	4,000	0 days	Wed 7/23/03	Tue 8/19/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes  
WBS Description:  
Finder 3D backplane Fabrication and Stuffing  
M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Finder3d backplane Fabrication and Stuffing" continued

Notes

Actual costs of Run 2A Finder and current quotes for new parts.

\$4,000 + contingency for two finder3d backplanes

Labor BOE: N/A

1.3.3.3	Test equipment	\$25,000.00	\$25,000.00	\$0.00	0.5	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	25,000	25,000	0 days	Thu 11/14/02	Fri 11/29/02	\$25,000.00	\$0.00	\$0.00	\$25,000.00

Notes

WBS Description:

purchase test equipment for production testing of boards

M&S BOE:

DVM's , oscilloscope, probes.

Labor BOE:

1.3.3.4	TDC Transition Module	\$31,400.00	\$31,400.00	\$0.00	0	0	0
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Notes

WBS Description:

TDC Transition Module: The design for these boards already exists and is being used in the Run 2A design. Additional boards are required for the Stereo Segment Finding. We need 54 boards + 6 spares.

1.3.3.4.1	TDC Transition Module Production Readiness Review	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Definition:

Production Readiness Review for TDC Transition Module

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.4.2	TDC Transition Module board Fabrication	\$29,000.00	\$29,000.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	29,000	29,000	0 days	Tue 2/4/03	Mon 4/28/03	\$29,000.00	\$0.00	\$0.00	\$29,000.00

Notes

WBS Description:

This board uses an existing Design -  
This includes stuffing board  
PC board cost - 54+ 6 spares = \$29,000 + contingency

M&S BOE:

Actual cost of Run 2A boards

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.4.3	TDC Transition Module board production checkout	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	80%	384 hrs	0 days	Tue 4/29/03	Wed 7/23/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Tue 4/29/03	Wed 7/23/03	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

TDC Transition Module production board testing and QA.

M&S BOE: N/A

Labor BOE:

Checkout time for Run 2A boards

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.5	Finder Transition Module	\$21,600.00	\$21,600.00	\$0.00	0	0	0

Notes

WBS Description:

Finder Transition Module: The design for this board already exists and is being used. Additional boards are required for the Stereo segment finders. We need 18 boards + 12 spares

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.5.1	Production Readiness Review - Finder Transition board	\$0.00	\$0.00	\$0.00	0	0	0

Notes  
 WBS Definition:  
 Production Readiness Review for Finder Transition Module

1.3.3.5.2	Finder Transition board Fabrication	\$20,000.00	\$20,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	20,000	20,000	0 days	Tue 4/29/03	Tue 6/24/03	\$20,000.00	\$0.00	\$0.00	\$20,000.00

Notes  
 WBS Definition:  
 Fabricate and stuff 18 + 2 spare Finder Transition Module cost \$20K with contingency  
 This board uses an existing design

M&S BOE:  
 Actual Costs of Run 2A boards  
 Labor BOE: N/A

1.3.3.5.3	Production Finder Transition Module checkout	\$1,600.00	\$1,600.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	80%	256 hrs	0 days	Wed 6/25/03	Wed 8/20/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	64 hrs	0 days	Wed 6/25/03	Wed 8/20/03	\$1,600.00	\$0.00	\$0.00	\$1,600.00

Notes  
 WBS Description:  
 Production Finder Transition Module testing and QA.  
 M&S BOE: N/A  
 Labor BOE:  
 Testing time for Run 2A boards

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.6	Finder3D Tester Board	\$13,600.00	\$13,600.00	\$0.00	0	0	0

Notes  
 WBS Description:

Finder 3D Tester Board used to test Stereo Finder boards  
 need 1 board

1.3.3.6.1	Finder3D Tester Board schematic design and layout	\$9,600.00	\$9,600.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	24 hrs	0 days	Mon 4/28/03	Mon 6/9/03	\$0.00	\$0.00	\$0.00	\$0.00
12	ElecEngUOSU	50%	120 hrs	0 days	Mon 4/28/03	Mon 6/9/03	\$6,600.00	\$0.00	\$0.00	\$6,600.00
14	ElecTechUOSU	50%	120 hrs	0 days	Mon 4/28/03	Mon 6/9/03	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes  
 WBS Description:

Finder 3D Tester board schematic design and layout

M&S BOE: N/A

Labor BOE:

Design time for run 2a tester boards

1.3.3.6.2	Finder3D Tester board fabrication	\$4,000.00	\$4,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	4,000	4,000	0 days	Tue 6/10/03	Tue 7/8/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes  
 WBS Description:

Fabrication and stuffing of 1 Finder 3D tester board - \$4K + contingency

M&S BOE:

Cost of Run 2A Tester Boards

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.7	Cables	\$8,000.00	\$8,000.00	\$0.00	0	0	0

Notes  
 WBS Description:

1.3.3.7.1	Finder3D to Stereo Association Module cables fab	\$4,000.00	\$4,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	16 hrs	0 days	Thu 10/2/03	Wed 10/29/03	\$0.00	\$0.00	\$0.00	\$0.00
16	MANDS	4,000	4,000	0 days	Thu 10/2/03	Wed 10/29/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes  
 WBS Description:

Finder3D to Stereo Association Module cable fabrication + installation -

M&S BOE:

cost \$8000 + contingency Cost of Run 2A Linker to XTRP Cables

Labor BOE:

1.3.3.7.2	Linker Output Module-II to Stereo Assoc. Module cable Fab.	\$4,000.00	\$4,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	16 hrs	0 days	Thu 10/30/03	Wed 11/26/03	\$0.00	\$0.00	\$0.00	\$0.00
16	MANDS	4,000	4,000	0 days	Thu 10/30/03	Wed 11/26/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes  
 WBS Description:

Linker Output Module-II to Stereo Association Module cable fabrication

M&S BOE:

Linker Output Module-II to Stereo Association Module cables fabrication and installation  
 \$8000 + 15% contingency - done at Shutdown

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.8	Linker Modules	\$259,544.00	\$259,544.00	\$0.00	0	0	0

Notes  
WBS Description:

Linker Modules provide the segment linking between axial layers of the COT. It uses input from the Finders and outputs a track list with Pt and Phi information to the rest of the trigger system. We require 12 boards + 4 spares.

1.3.3.8.1	Prototype Linker Modules	\$62,037.00	\$62,037.00	\$0.00	0	0	0
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Notes  
WBS Description:

Prototype Linker Modules provide a means to test the PC board layout and algorithms.

1.3.3.8.1.1	Prototype Linker Module Schematic Design	\$12,800.00	\$12,800.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	50%	160 hrs	0 days	Thu 10/3/02	Fri 11/29/02	\$0.00	\$0.00	\$0.00	\$0.00
12	ElecEngUOSU	50%	160 hrs	0 days	Thu 10/3/02	Fri 11/29/02	\$8,800.00	\$0.00	\$0.00	\$8,800.00
14	ElecTechUOSU	50%	160 hrs	0 days	Thu 10/3/02	Fri 11/29/02	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes  
WBS Description:

Schematic design of the Linker PC board including all I/O, control, and processing components

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.8.1.2	Prototype Linker Module pc board layout	\$22,400.00	\$22,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	280 hrs	0 days	Mon 12/2/02	Fri 3/14/03	\$15,400.00	\$0.00	\$0.00	\$15,400.00
14	ElecTechUOSU	50%	280 hrs	0 days	Mon 12/2/02	Fri 3/14/03	\$7,000.00	\$0.00	\$0.00	\$7,000.00

Notes  
WBS Description:

Prototype Linker Module PC board layout, including parts placement and trace routing.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Linker Module pc board layout" continued

Notes

Based on experience with Run 2A XFT

1.3.3.8.1.3	FPGA Firmware Development	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	50%	240 hrs	0 days	Thu 10/3/02	Thu 1/2/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition:

Development of the FPGA algorithms and firmware to implement the track linking algorithms

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.8.1.4	Prototype Linker Module pc board fabrication	\$14,037.00	\$14,037.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	14,037	14,037	0 days	Mon 3/17/03	Fri 5/9/03	\$14,037.00	\$0.00	\$0.00	\$14,037.00

Notes

WBS Description:

Prototype Linker Module PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Linker boards and current quotes for new parts

Prototype Linker board cost - 2 boards - \$14,037

Production board costs

Linker System:

Major Components:

Altera Stratix:	\$3300
Altera Flex 10K:	\$1035
Secondary Components:	\$ 384
PCB Fabrication:	\$ 600
PCB Assembly:	\$ 370
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Total Cost/Board	\$5689

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Linker Module pc board fabrication" continued

Notes

Labor BOE: N/A

1.3.3.8.1.5 Linker Module Test Stand Setup \$10,400.00 \$10,400.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Mon 3/17/03	Fri 4/11/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	10%	16 hrs	0 days	Mon 3/17/03	Fri 4/11/03	\$400.00	\$0.00	\$0.00	\$400.00
17	MANDSPASS	10,000	10,000	0 days	Mon 3/17/03	Fri 4/11/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Definition:

Test stand for Link Board and for Linker Output Modules. It will be used for both prototype testing and production checkout and QA.

M&S BOE:

Based on experience with Run 2A XFT and the use of existing infrastructure

Labor BOE:

Based on experience with Run 2A XFT.

1.3.3.8.1.6 Prototype Linker Module available for testing \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

This milestone denotes when the first prototype Linker module will be available for testing.

1.3.3.8.1.7 Prototype Linker Module testing \$2,400.00 \$2,400.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	960 hrs	0 days	Mon 5/12/03	Tue 8/5/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Mon 5/12/03	Tue 8/5/03	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Prototype Linker Module testing including at speed input of data and capture of output data to verify board operation.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Linker Module testing" continued

Notes

Based on experience with Run 2A XFT

1.3.3.8.2	<b>Preproduction Linker Modules</b>	<b>\$24,437.00</b>	<b>\$24,437.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Preproduction version of Linker Module

1.3.3.8.2.1	Modification of Schematic Design and Layout	\$9,600.00	\$9,600.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	120 hrs	0 days	Wed 8/6/03	Wed 9/17/03	\$6,600.00	\$0.00	\$0.00	\$6,600.00
14	ElecTechUOSU	50%	120 hrs	0 days	Wed 8/6/03	Wed 9/17/03	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes

WBS Description:

Modification of Schematic Design of Layout based on performance of prototype Linker Module PC board.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.8.2.2	Preproduction Linker Module pc board fabrication	\$14,037.00	\$14,037.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	14,037	14,037	0 days	Thu 9/18/03	Wed 11/12/03	\$14,037.00	\$0.00	\$0.00	\$14,037.00

Notes

WBS Description:

Preproduction Linker Module PC board fabrication and stuffing.

M&S BOE:

Actual Costs of Run 2A Linker Boards and current quotes for new parts

2 Preproduction Linker Modules -  
cost - \$14037 (same cost as prototypes)

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Linker Module pc board fabrication" continued

Notes

Production quantity linker board cost

Linker System:

Major Components:

Altera Stratix: \$3300

Altera Flex 10K: \$1035

Secondary Components: \$ 384

PCB Fabrication: \$ 600

PCB Assembly: \$ 370

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Total Cost/Board \$5689

Labor BOE: N/A

1.3.3.8.2.3	FPGA Firmware Refinement	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	72 hrs	0 days	Wed 8/6/03	Fri 12/12/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition:

Refinement of the FPGA firmware based on experience with prototype and preproduction boards.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.8.2.4	Preproduction Linker Module pc board testing	\$800.00	\$800.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	320 hrs	0 days	Thu 11/13/03	Fri 12/12/03	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	32 hrs	0 days	Thu 11/13/03	Fri 12/12/03	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Preproduction Linker Module PC board testing including full speed I/O

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Preproduction Linker Module pc board testing" continued

Notes

Based on experience with Run 2A XFT

1.3.3.8.3	Production Linker Modules	\$173,070.00	\$173,070.00	\$0.00	0	0	0
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Notes

WBS Description:

Production version of Linker Modules.

1.3.3.8.3.1	Production Readiness Review Linker Modules	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Readiness Review for Linker Module production

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 175 days due to anticipated funding for FY2004

1.3.3.8.3.2	Begin Production Linker Modules	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

This milestone marks the beginning of production of the Linker Modules and comes after a successful Production readiness review.

1.3.3.8.3.3	Production Linker Module pc board fabrication	\$170,670.00	\$170,670.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	170,670	170,670	0 days	Thu 8/26/04	Mon 12/6/04	\$170,670.00	\$0.00	\$0.00	\$170,670.00

Notes

WBS Description:

Production Linker Module PC Board fabrication and stuffing.

M&S BOE:

Actual Costs of Run 2A Linker Boards and current quotes for new parts.

Require 24 + (6 spares) Linker Modules Cost = \$170,670.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Linker Module pc board fabrication" continued

Notes

Linker System:

Major Components:

Altera Stratix: \$3300

Altera Flex 10K: \$1035

Secondary Components: \$ 384

PCB Fabrication: \$ 600

PCB Assembly: \$ 370

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 Total Cost/Board \$5689

Labor BOE:

1.3.3.8.3.4	Production Linker Module pc board testing	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	960 hrs	0 days	Tue 12/7/04	Mon 3/7/05	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	96 hrs	0 days	Tue 12/7/04	Mon 3/7/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Production Linker Module PC board checkout and final certification of boards prior to installation.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.9	Linker Output Module II	\$36,800.00	\$36,800.00	\$0.00	0	0	0
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Notes

WBS Description:

Linker Output Module II captures the track list from Linker Modules and drives the data to the XTRP and the Stereo Association Module. We need 24 boards + 6 spares

1.3.3.9.1	Linker Output Module Schematic Design and Layout	\$9,600.00	\$9,600.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecEngUOSU	50%	120 hrs	0 days	Mon 2/2/04	Fri 3/12/04	\$6,600.00	\$0.00	\$0.00	\$6,600.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Linker Output Module Schematic Design and Layout" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	ElecTechUOSU	50%	120 hrs	0 days	Mon 2/2/04	Fri 3/12/04	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes

WBS Description:

Linker Output Module Schematic Design and Layout

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

1.3.3.9.2	Linker Output Module Preproduction PC board Fabrication	\$2,000.00	\$2,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	2,000	2,000	0 days	Mon 3/15/04	Fri 4/23/04	\$2,000.00	\$0.00	\$0.00	\$2,000.00

Notes

WBS Description:

Linker Output Module Preproduction PC board fabrication and stuffing for 2 boards.

M&S BOE:

Actual Costs of Run 2A Linke boards and current quotes for new parts. Cost for two boards \$2000.

Labor BOE: N/A

1.3.3.9.3	PreProduction Link Output Module Preproduction board checkc	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	100%	160 hrs	0 days	Mon 4/26/04	Fri 5/21/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

M&S BOE:

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"PreProduction Link Output Module Preproduction board checkout" continued

Notes

1.3.3.9.4	Production Readiness Review Linker Output Module	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Definition:

Production Readiness Review for Linker Output Module.

M&S BOE: N/A

Labor BOE:

1.3.3.9.5	Linker Output Module board Fabrication	\$24,000.00	\$24,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	24,000	24,000	0 days	Tue 5/25/04	Wed 8/18/04	\$24,000.00	\$0.00	\$0.00	\$24,000.00

Notes

WBS Description:

Linker Output Module PC board Fabrication.

M&S BOE:

Actual Costs of Run 2A Linker Output Module boards and current quotes for new parts. Cost includes PC board fabrication and stuffing - 24 boards + 6 spares - \$24,000 + contingency

Labor BOE: N/A

1.3.3.9.6	Production Link Output Module board checkout	\$1,200.00	\$1,200.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	480 hrs	0 days	Thu 8/19/04	Thu 9/30/04	\$0.00	\$0.00	\$0.00	\$0.00
14	ElecTechUOSU	20%	48 hrs	0 days	Thu 8/19/04	Thu 9/30/04	\$1,200.00	\$0.00	\$0.00	\$1,200.00

Notes

WBS Description:

Production Linker Output Module PC board checkout, including driving data at speed from the new Linker Module.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Link Output Module board checkout" continued

Notes

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.10	<b>Stereo Association Modules</b>	\$296,326.00	\$296,326.00	\$0.00	0	0	0
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Notes

WBS Description:

The stereo association system associates axial XFT tracks with COT SL7 segments to produce 3D tracks in the trigger.

1.3.3.10.1	<b>Prototype Stereo Association Module</b>	\$105,480.00	\$105,480.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary item for prototype stereo association module development.

1.3.3.10.1.1	Prototype Stereo Association Module Schematic Design	\$26,040.00	\$26,040.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	30%	420 hrs	0 days	Mon 3/4/02	Wed 11/6/02	\$26,040.00	\$0.00	\$0.00	\$26,040.00

Notes

WBS Description:

Schematic design of CDF XFT II Stereo Association Module (SAM).

M&S BOE: N/A

Labor BOE:

Engineering labor time estimated based upon design of CDF Run 2a XTRP and Track Trigger systems, which are similar in nature.

1.3.3.10.1.2	Prototype Stereo Association Module pc board layout	\$29,760.00	\$29,760.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	480 hrs	0 days	Fri 11/8/02	Mon 2/10/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	100%	480 hrs	0 days	Fri 11/8/02	Mon 2/10/03	\$29,760.00	\$0.00	\$0.00	\$29,760.00

Notes

WBS Description:

Printed circuit board layout will proceed from the schematic.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Stereo Association Module pc board layout" continued

Notes

M&S BOE: N/A

Labor BOE:

Engineering labor is estimated based upon experience with the CDF Run 2a XTRP and Two Track Trigger systems.

1.3.3.10.1.3	Prototype Stereo Association Module Component procurement	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

The procurement task for prototype stereo association module components. The component costs are listed in M&S BOE for the Prototype Stereo Association Module pc board fabrication task

M&S BOE: N/A

Component cost shown in Bill-of-materials estimated from CDF Run 2a XTRP Databoard.

Labor BOE: N/A

1.3.3.10.1.4	Prototype Stereo Association Module pc board fabrication	\$10,000.00	\$10,000.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	10,000	10,000	0 days	Tue 12/10/02	Mon 2/10/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Description:

Fabrication of prototype boards.

M&S BOE: N/A

Cost estimate based upon fabrication and assembly of similar quantity of CDF Run 2a Two-track trigger boards. Cost as follows:

fabrication cost from Ambitech purchase order (2000):

4 boards = 8285.48 \* 1.10 (inflation factor) = 9114.03

assembly cost from Mercury EMS-Iowa purchase order (2000):

2 boards = 1293.28 (assembly)+800(stencils)+1751.17(test fixture) = 3844.45

cost = 3844.45\*1.10 (inflation factor) = 4228.90

total cost = 9114.03 + 4228.90 = 13342.93

estimate based upon previous experience and actual purchase orders => 30% contingency

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.10.1.5	Prototype Stereo Association Module testing	\$39,680.00	\$39,680.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	1,600 hrs	0 days	Wed 8/20/03	Thu 1/15/04	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	80%	640 hrs	0 days	Wed 8/20/03	Thu 1/15/04	\$39,680.00	\$0.00	\$0.00	\$39,680.00

Notes

WBS Description:

Prototype test and evaluation will be performed by combination of engineering and physicist labor.

M&S BOE: N/A

Labor BOE:

Task duration (calendar time) estimated based upon time to debug and evaluate XTRP prototype databoards.

<b>1.3.3.10.2</b>	<b>Preproduction Stereo Association Module</b>	<b>\$16,726.00</b>	<b>\$16,726.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task for preproduction SAM development.

1.3.3.10.2.1	Preproduction Readiness Review Stereo Association Module	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Preproduction Readiness Review to sign off on prototype evaluation and prototype layout of the Stereo Association Modules.

M&S BOE: N/A

Labor BOE: N/A

1.3.3.10.2.2	Begin Preproduction Stereo Association Modules	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

Milestone. Marking the beginning of the preproduction phase of the Stereo Association Modules

1.3.3.10.2.3	Modification of Schematic Design and Layout	\$2,976.00	\$2,976.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	20%	48 hrs	0 days	Tue 1/20/04	Mon 3/1/04	\$2,976.00	\$0.00	\$0.00	\$2,976.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Modification of Schematic Design and Layout" continued

Notes

WBS Description:

Modification of schematic design and layout based upon results of prototype testing.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

1.3.3.10.2.4	Preproduction Stereo Association Module component procurem	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Components for preproduction SAM.

M&S BOE: N/A

Parts cost same as listed for prototype SAM.

Labor BOE: N/A

1.3.3.10.2.5	Preproduction Stereo Association Module pc board fabrication	\$13,750.00	\$13,750.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	13,750	13,750	0 days	Tue 2/3/04	Mon 3/29/04	\$13,750.00	\$0.00	\$0.00	\$13,750.00

Notes

WBS Description:

Fabrication of preproduction boards.

M&S BOE: N/A

Cost estimate based upon fabrication and assembly of similar quantity of CDF Run 2a Two-track trigger boards. Cost as follows:

fabrication cost from Ambitech purchase order (2000):

4 boards = 8285.48 \* 1.10 (inflation factor) = 9114.03

assembly cost from Mercury EMS-Iowa purchase order (2000):

2 boards = 1293.28 (assembly)+800(stencils)+1751.17(test fixture) = 3844.45  
cost = 3844.45\*1.10 (inflation factor) = 4228.90

total cost = 9114.03 + 4228.90 = 13342.93

estimate based upon previous experience and actual purchase orders => 30% contingency

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.2.6	Preproduction Stereo Association Module pc board testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	320 hrs	0 days	Tue 3/30/04	Mon 5/24/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Board checkout and debug.

M&S BOE: N/A

Labor BOE:

Time for this task based upon Preproduction Run 2a XTRP databoard checkout and test.

<b>1.3.3.10.3</b>	<b>Production Stereo Association Module</b>	<b>\$159,120.00</b>	<b>\$159,120.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task for SAM production run.

1.3.3.10.3.1	Modification of Schematic Design and Layout	\$4,960.00	\$4,960.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	50%	80 hrs	0 days	Tue 5/25/04	Tue 6/22/04	\$4,960.00	\$0.00	\$0.00	\$4,960.00

Notes

WBS Description:

Modification of schematic design and layout based upon results of preproduction testing.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

1.3.3.10.3.2	Production Readiness Review Stereo Association Module	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Review for production readiness.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.3.3	Production Stereo Association Module pc board fabrication	\$110,000.00	\$110,000.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	110,000	110,000	0 days	Thu 6/24/04	Fri 9/17/04	\$110,000.00	\$0.00	\$0.00	\$110,000.00

Notes

WBS Description:

Production run for SAM modules. Cost includes board fabrication, components and assembly.

M&S BOE: N/A

Cost estimate based upon fabrication of Run 2a XTRP databoard production run:

fabricate: \$25k (Ambitech P.O.)  
assemble: \$10k (Mercury P.O.)  
parts: \$85k (BOM)

Note that parts for XTRP databoard and SAMs are similar but not identical. Contingency on this item reflects uncertainty in board components.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.3.4	Production Stereo Association Module pc board testing	\$44,160.00	\$44,160.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	960 hrs	0 days	Mon 9/20/04	Tue 12/14/04	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	100%	480 hrs	0 days	Mon 9/20/04	Tue 12/14/04	\$29,760.00	\$0.00	\$0.00	\$29,760.00
13	ElecTechUILL	100%	480 hrs	0 days	Mon 9/20/04	Tue 12/14/04	\$14,400.00	\$0.00	\$0.00	\$14,400.00

Notes

WBS Description:

Test of production boards.

M&S BOE: N/A

Labor BOE:

Checkout and testing time based upon Run 2a XTRP databoard experience.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.3.5	Production Stereo Association Modules complete	\$0.00	\$0.00	\$0.00	0	0	3

Notes

WBS Description:

Milestone marking the completion of the Stereo Association Modules.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.4	Purchase VME crate	\$15,000.00	\$15,000.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	15,000	15,000	0 days	Fri 1/3/03	Fri 1/31/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:  
Purchase a VME crate for the Stereo Association Module for use during testing at U of Ill.

M&S BOE:

Cost based upon CDF Run2a VME crate purchases. Includes power supplies.

Labor BOE: N/A

1.3.3.11	<b>Stereo Association Module Custom Backplane</b>	<b>\$15,260.00</b>	<b>\$15,260.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task for SAM custom backplane.

1.3.3.11.1	Stereo Assoc. Module Custom Backplane Schematic design	\$2,976.00	\$2,976.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	10%	48 hrs	0 days	Thu 10/3/02	Thu 1/2/03	\$2,976.00	\$0.00	\$0.00	\$2,976.00

Notes

WBS Description:

Schematic depends upon SAM signal routing and detector geometry.

M&S BOE: N/A

Labor BOE:  
Estimate based upon custom XTRP backplane developed in Run 2a.

1.3.3.11.2	Stereo Association Module Backplane layout	\$1,488.00	\$1,488.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	5%	24 hrs	0 days	Fri 1/3/03	Fri 3/28/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	5%	24 hrs	0 days	Fri 1/3/03	Fri 3/28/03	\$1,488.00	\$0.00	\$0.00	\$1,488.00

Notes

WBS Description:

Task will be performed in parallel with SAM design.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Backplane layout" continued

Notes  
M&S BOE: N/A

Labor BOE:  
Estimate based upon custom XTRP backplane developed in Run 2a.

1.3.3.11.3	Stereo Association Module Backplane fabrication	\$10,000.00	\$10,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	10,000	10,000	0 days	Mon 3/31/03	Fri 4/25/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes  
WBS Description:

Backplane fabrication.

M&S BOE: N/A  
Cost of backplane estimated from custom backplanes produced for the CDF Run 2a XTRP project. The cost to construct four backplanes was  $4251.12 * 1.10(\text{inflation}) = 4676.32 + \$300$  in non-connector components.

Labor BOE: N/A

1.3.3.11.4	Stereo Association Module Backplane assembly	\$300.00	\$300.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	ElecTechUILL	25%	10 hrs	0 days	Mon 4/28/03	Fri 5/2/03	\$300.00	\$0.00	\$0.00	\$300.00

Notes  
WBS Description:

Backplane assembly consists of connectors and a modest number of termination resistors.

M&S BOE: N/A

Labor BOE:  
Estimate based upon custom XTRP backplane developed in Run 2a.

1.3.3.11.5	Stereo Association Module Backplane testing	\$496.00	\$496.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	10%	16 hrs	0 days	Mon 5/5/03	Mon 6/2/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	5%	8 hrs	0 days	Mon 5/5/03	Mon 6/2/03	\$496.00	\$0.00	\$0.00	\$496.00

Notes  
WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Backplane testing" continued

Notes

Backplane testing happens in conjunction with prototype SAM testing.

M&S BOE: N/A

Labor BOE:

Estimate based upon custom XTRP backplane developed in Run 2a.

1.3.3.12	<b>Stereo Association Module Tester Board</b>	<b>\$70,552.00</b>	<b>\$70,552.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task for SAM tester board. Tester board serves as both data source and sync, allowing SAM testing at full clock speed for a large number of events.

1.3.3.12.1	Stereo Association Module Tester Board schematic design	\$11,904.00	\$11,904.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	30%	192 hrs	0 days	Fri 1/3/03	Fri 4/25/03	\$11,904.00	\$0.00	\$0.00	\$11,904.00

Notes

WBS Description:

Schematic design of SAM tester board will occur in conjunction with SAM board design.

M&S BOE: N/A

Labor BOE:

Time estimate based upon working knowledge of similar test setup utilized in the Run 2a XFT system. The Run 2a XFT test board, known as a LinkerTester, was utilized in the Run 2a XFT and XTRP test and commissioning phases.

1.3.3.12.2	Stereo Association Module Tester Board layout	\$13,888.00	\$13,888.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	64 hrs	0 days	Mon 4/28/03	Mon 6/23/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	70%	224 hrs	0 days	Mon 4/28/03	Mon 6/23/03	\$13,888.00	\$0.00	\$0.00	\$13,888.00

Notes

WBS Description:

Layout of the SAM tester board.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Tester Board layout" continued

Notes

Layout time estimate based upon experience with boards of similar complexity. This will occur in parallel with backplane layout.

1.3.3.12.3	Stereo Association Module Tester Board Fabrication	\$15,000.00	\$15,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	15,000	15,000	0 days	Tue 6/24/03	Tue 8/19/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

SAM Tester board fabrication, assembly and components.

M&S BOE: N/A

Cost estimated based upon previously fabricated prototype boards of similar complexity. See for example the prototype SAM board.

Labor BOE: N/A

1.3.3.12.4	Stereo Association Module TestStand Setup and software	\$4,960.00	\$4,960.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	1,600 hrs	0 days	Wed 7/9/03	Wed 11/26/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	10%	80 hrs	0 days	Wed 7/9/03	Wed 11/26/03	\$4,960.00	\$0.00	\$0.00	\$4,960.00

Notes

WBS Description:

Development of test stand software will be performed mostly by physicists.

M&S BOE: N/A

Labor BOE:

The time and manpower estimates are based upon experience with the Run 2a XTRP system. In this task, engineering resources are only utilized in consultation.

1.3.3.12.5	Stereo Association Module Tester Board testing	\$24,800.00	\$24,800.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	800 hrs	0 days	Mon 12/1/03	Fri 2/13/04	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	100%	400 hrs	0 days	Mon 12/1/03	Fri 2/13/04	\$24,800.00	\$0.00	\$0.00	\$24,800.00

Notes

WBS Description:

SAM Tester Board testing occurs in parallel with the testing of the SAM and backplane.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Tester Board testing" continued

Notes

Labor BOE:  
Manpower estimates based upon experience with the Run 2a XTRP system.

1.3.3.13	<b>Stereo Association Module Transition Module</b>	<b>\$19,216.00</b>	<b>\$19,216.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:  
Summary task for SAM transition module.

1.3.3.13.1	Stereo Association Module Transition Module Schematic design	\$2,976.00	\$2,976.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	10%	48 hrs	0 days	Mon 3/17/03	Mon 6/9/03	\$2,976.00	\$0.00	\$0.00	\$2,976.00

Notes

WBS Description:  
Transition board design will proceed in parallel with SAM development.  
Task start time determined by the need to finalize digital link specifications.

M&S BOE: N/A

Labor BOE:  
Actual schematic development time is based upon Run 2a XTRP databoard transition module development time.

1.3.3.13.2	Stereo Association Module Transition Module layout	\$1,240.00	\$1,240.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	200 hrs	0 days	Tue 6/10/03	Tue 7/15/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	10%	20 hrs	0 days	Tue 6/10/03	Tue 7/15/03	\$1,240.00	\$0.00	\$0.00	\$1,240.00

Notes

WBS Description:  
Transition module layout to be performed by a physicist in consultation with an engineer.

M&S BOE: N/A

Labor BOE:  
Actual layout time is based upon Run 2a XTRP databoard transition module development time.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.13.3	Stereo Association Module Transition Module fabrication	\$15,000.00	\$15,000.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	15,000	15,000	0 days	Wed 7/16/03	Wed 9/10/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

SAM transition module fabrication, including components and assembly.

M&S BOE: N/A

Cost estimated from Run 2a XTRP databoard transition module. Purchase order from ADCO Circuits attached includes fabrication, parts and assembly.

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.13.4	Stereo Association Module Transition Module testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	240 hrs	0 days	Thu 9/11/03	Wed 10/22/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Transition module testing will follow SAM prototype testing.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP databoard transition module testing.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.14	Stereo Association Module Clock and Control Board	\$23,392.00	\$23,392.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task for SAM Clock and Control board.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.14.1	Stereo Association Module Clock and Control Board Schematic	\$5,952.00	\$5,952.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	20%	96 hrs	0 days	Mon 4/7/03	Mon 6/30/03	\$5,952.00	\$0.00	\$0.00	\$5,952.00

Notes

WBS Description:

SAM Clock and Control Module layout will proceed in parallel with other elements of the project. Design will be very similar to Run 2a XTRP Clock and Control Module.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Clock and Control Board Schematic Design" continued

Notes

Labor BOE:  
Schematic development time estimated from the Run 2a system.

1.3.3.14.2	Stereo Association Module Clock and Control Board Layout	\$7,440.00	\$7,440.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	240 hrs	0 days	Tue 7/1/03	Tue 8/12/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	50%	120 hrs	0 days	Tue 7/1/03	Tue 8/12/03	\$7,440.00	\$0.00	\$0.00	\$7,440.00

Notes

WBS Description:

Layout of the SAM Clock & control board.

M&S BOE: N/A

Labor BOE:  
Time estimated from Run 2a XTRP Clock and Control system.

1.3.3.14.3	Stereo Association Module Clock and Control Board Fabrication	\$10,000.00	\$10,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	10,000	10,000	0 days	Wed 8/13/03	Wed 10/1/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Description:

Fabrication cost includes assembly and components.

M&S BOE: N/A

Labor BOE:  
Cost based upon fabrication of Run 2a XTRP Clock and Control module. This task includes board fabrication, parts and assembly. Cost of \$19k from purchase order of Run 2a assembled boards.

1.3.3.14.4	Stereo Association Module Clock and Control Board testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	160 hrs	0 days	Thu 10/2/03	Wed 10/29/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing will begin in parallel with with prototype/preproduction SAM testing.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Clock and Control Board testing" continued

Notes

Labor BOE:  
Time estimated from Run 2a XTRP Clock and Control system.

1.3.3.15	<b>SAM Clock and Control Transition Module</b>	<b>\$23,392.00</b>	<b>\$23,392.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task for SAM clock and control transition module.

1.3.3.15.1	SAM Clock and Control TM Schematic Design	\$5,952.00	\$5,952.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	20%	96 hrs	0 days	Mon 4/7/03	Mon 6/30/03	\$5,952.00	\$0.00	\$0.00	\$5,952.00

Notes

WBS Description:

SAM Clock and Control Transition Module layout will proceed in parallel with other elements of the project. Design will be very similar to Run 2a XTRP Clock and Control TM.

M&S BOE: N/A

Labor BOE:  
Schematic development time estimated from the Run 2a system.

1.3.3.15.2	SAM Clock and Control TM Layout	\$7,440.00	\$7,440.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	240 hrs	0 days	Tue 7/1/03	Tue 8/12/03	\$0.00	\$0.00	\$0.00	\$0.00
11	ElecEngUILL	50%	120 hrs	0 days	Tue 7/1/03	Tue 8/12/03	\$7,440.00	\$0.00	\$0.00	\$7,440.00

Notes

WBS Description:

SAM clock and control TM layout.

M&S BOE: N/A

Labor BOE:  
Time estimated from Run 2a XTRP Clock and Control system.

1.3.3.15.3	SAM Clock and Control TM Fabrication	\$10,000.00	\$10,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	10,000	10,000	0 days	Wed 8/13/03	Wed 10/1/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"SAM Clock and Control TM Fabrication" continued

Notes

WBS Description:

Fabrication.

M&S BOE: N/A

Cost based upon fabrication of Run 2a XTRP Clock and Control module. This task includes board fabrication, parts and assembly. Cost of \$2.5k from purchase order of Run 2a bare boards. Parts and assembly performed in-house.

Labor BOE: N/A

1.3.3.15.4	SAM Clock and Control TM testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	160 hrs	0 days	Thu 10/2/03	Wed 10/29/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing will begin in parallel with with prototype/preproduction SAM TM testing.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP clock and control transition module testing.

1.3.3.16	Level 2 Interface Board	\$47,280.00	\$47,280.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for XFT-> Level 2 interface board.

1.3.3.16.1	Level 2 Interface Board Schematic and PCB Layout	\$19,840.00	\$19,840.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	100%	320 hrs	0 days	Thu 10/30/03	Tue 12/30/03	\$19,840.00	\$0.00	\$0.00	\$19,840.00

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Level 2 Interface Board Schematic and PCB Layout" continued

Notes

M&S BOE: N/A

Labor BOE:

Time estimate based upon Run 2a XTRP/L2 interface.

1.3.3.16.2 Prototype Level 2 Interface Board fabrication and testing \$5,000.00 \$5,000.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	5,000	5,000	0 days	Fri 1/2/04	Fri 2/27/04	\$5,000.00	\$0.00	\$0.00	\$5,000.00

Notes

WBS Description:

Prototype L2 interface board.

M&S BOE: N/A

Physicist estimate.

Labor BOE: N/A

1.3.3.16.3 Modification Level 2 Interface Board Schematic and PCB Layout \$7,440.00 \$7,440.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	ElecEngUILL	100%	120 hrs	0 days	Mon 3/1/04	Fri 3/19/04	\$7,440.00	\$0.00	\$0.00	\$7,440.00

Notes

WBS Description:

Schematic modification based upon results of prototype tests.

M&S BOE: N/A

Labor BOE:

Physicist's estimate.

1.3.3.16.4 Production Level 2 Interface Board Fabrication and assembly \$15,000.00 \$15,000.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDSPASS	15,000	15,000	0 days	Mon 3/22/04	Fri 5/14/04	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

Production run.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Level 2 Interface Board Fabrication and assembly" continued

Notes

Cost is physicist's estimate.

Labor BOE: N/A

1.3.3.16.5	Level 2 Interface Board checkout	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	100%	320 hrs	0 days	Mon 5/17/04	Tue 7/13/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Time to install and check out Level 2 interface board. Will be performed in conjunction with Level 2 system testing.

M&S BOE: N/A

Labor BOE:

Physicist's estimate.

1.3.3.17	XFT Ready for Installation at CDF	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

Milestone indicating XFT project complete.

1.3.4	Event-Builder Upgrade	\$472,280.00	\$414,000.00	\$58,280.00	0	0	0
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Notes

WBS Description:

This summary element covers the Event-Builder upgrade. It includes the complete software development, the construction of a prototype and the construction of the full system.

M&S BOE -

The details of the purchase and all parts are assumed to be equal to the purchase of the present Event Builder hardware. According to somewhat outdated quotes the hardware costs about 500k.

Contingency is included in the sense that these are old quotes and the hardware will only become cheaper, although not by much.

Further Details on the Hardware from a quote from December 2001

Raw cost

32 port ASX 4000 (Marconi) \$215k

16 OC12 PCI cards (ForeRunnerHE 622) \$30k

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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**"Event-Builder Upgrade" continued**

Notes

15 OC-12 PMC carss (Cyclonwe PMC59) \$60k

Total \$305k

Spares

1 Spare switch backbone \$51k

1 Spare switch module \$40k

3 Spare PCI cards \$6k

3 Spare ATM cards \$12k

Total \$109k

Total including spares \$414k

Including 30% contingency \$538k

1.3.4.1	Start Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

This milestone marks the beginning date for work on the upgrade of the Event-Builder.

1.3.4.2	technology evaluation	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	40%	384 hrs	0 days	Wed 10/30/02	Thu 4/24/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Before starting to buy a prototype system an evaluation of the present technology will be performed. This evaluation results in the purchase of a prototype which is the most promising technology. The further schedule has been designed to fit the schedule for an upgrade using more powerful successor of the ATM technology. In case a different technology is chosen the schedule should still be appropriate. The price for the ATM technology is almost certainly higher than an alternative technology like Gigabit Ethernet.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3	upgrade software	\$58,280.00	\$0.00	\$58,280.00	0	0	0
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Notes

WBS description:

This summary element covers the software development for the Event-Builder upgrade. It includes an evaluation of the operating system and the associated driver, the work needed for adjusting the drivers and the remaining software.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.4.3.1	decide on the OS versions	\$1,880.00	\$0.00	\$1,880.00	0.3	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	50%	40 hrs	0 days	Mon 11/24/03	Tue 12/9/03	\$1,880.00	\$0.00	\$0.00	\$1,880.00

**Notes**

WBS description:

The decision on the version of the operating system is important since it involves a number of tests. The operation system should be as recent as possible but it has to be well established since errors can be fatal. Drivers are dependent on the version of the operating system and upgrades usually involve extra work.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.4.3.2	test available drivers for compatibility with hardware	\$5,640.00	\$0.00	\$5,640.00	0.3	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	100%	120 hrs	0 days	Wed 12/10/03	Mon 1/5/04	\$5,640.00	\$0.00	\$0.00	\$5,640.00
7	PostDocU	20%	24 hrs	0 days	Wed 12/10/03	Mon 1/5/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	120 hrs	0 days	Wed 12/10/03	Mon 1/5/04	\$0.00	\$0.00	\$0.00	\$0.00

**Notes**

WBS Description:

Drivers for ATM network cards on the VxWorks and the Linux side are no commodity components so careful tests are necessary. Usually modifications are necessary or other drivers have to be identified.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.4.3.3	adjust drivers for special needs	\$48,880.00	\$0.00	\$48,880.00	0.3	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	100%	1,040 hrs	0 days	Tue 1/6/04	Thu 7/8/04	\$48,880.00	\$0.00	\$0.00	\$48,880.00
7	PostDocU	20%	208 hrs	0 days	Tue 1/6/04	Thu 7/8/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	1,040 hrs	0 days	Tue 1/6/04	Thu 7/8/04	\$0.00	\$0.00	\$0.00	\$0.00

**Notes**

WBS Description:

Since the ATM network switches are not used in general for the application described here modifications to the drivers are almost certainly necessary. In particular the driver on the VxWorks side needs work to optimize the data throughput.

M/S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"adjust drivers for special needs" continued

Notes

Labor BOE:  
Based upon experience with the Run 2a system.

1.3.4.3.4	adjust remaining software	\$1,880.00	\$0.00	\$1,880.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	100%	40 hrs	0 days	Fri 7/9/04	Thu 7/15/04	\$1,880.00	\$0.00	\$0.00	\$1,880.00
7	PostDocU	20%	8 hrs	0 days	Fri 7/9/04	Thu 7/15/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Fri 7/9/04	Thu 7/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Although the remaining software should to the largest part be independent of then drivers implementation the new drivers might reveal new features in the existing code. Time for adjusting the remaining software is included in this task.

M/S BOE: N/A

Labor BOE:  
Based upon experience with the Run 2a system.

1.3.4.3.5	MS: establish general functionality of software	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

This milestone marks the end of the software development. At this point we intent to freeze the development and move the code to the maintenance phase. During the commissioning further problems might be spotted but the core development is finished at this point. Establishing the general functionality is not necessarily connected to tests with real data. Two more month until the end of the Event-Builder upgrade leave time for this last test.

1.3.4.4	construct prototype	\$103,500.00	\$103,500.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary element covers the construction of a prototype. It includes the purchase of the necessary elements, the installation and evaluation of a test stand.

The cost is based on a quote from a possible vendor in December 2001.

1.3.4.4.1	purchase prototype system (1/4)	\$103,500.00	\$103,500.00	\$0.00	0	0	0
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Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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**"purchase prototype system (1/4)" continued**

Notes

This summary task covers the purchase of the prototype system. It includes the submission of the PO and the implementation plan, the purchase formalities and the arrival of the hardware.

1.3.4.4.1.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.4.4.1.2	purchase formalities	\$103,500.00	\$103,500.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
16	MANDS	103,500	103,500	0 days	Thu 12/11/03	Wed 3/10/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	103,500	\$103,500.00	\$0.00	\$0.00	\$103,500.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M/S BOE:

Vendor quote December 2001

Labor BOE: N/A

1.3.4.4.1.3	arrival of the hardware	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.4.4.2	install test stand	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Thu 3/11/04	Wed 3/17/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Thu 3/11/04	Wed 3/17/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the goes quick since the environment is prepared.

M/S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"install test stand" continued

Notes

Labor BOE:  
Based upon experience with the Run 2a system.

1.3.4.4.3	evaluate test stand	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Thu 3/18/04	Wed 3/31/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Thu 3/18/04	Wed 3/31/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The evaluation of the test stand is meant to establish the technical functionality of the hardware. Potential problems might require change of equipment.

M/S BOE: N/A

Labor BOE:  
Based upon experience with the Run 2a system.

1.3.4.4.4	MS: establish functionality of hardware	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

1.3.4.5	construct full size system	\$310,500.00	\$310,500.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary element covers the construction of the full size Event-Builder system. It includes a readiness review, the purchase, installation and evaluation of the hardware and finally the completion of the system.

M&S BOE:

The cost is based on a quote by a possible vendor from December 2001.

1.3.4.5.1	Production Readiness Review - Event Builder	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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Notes

WBS Description:

Production readiness review for the Event Builder. Successful outcome from the review means that we will proceed to the production phase of the project.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level														
"Production Readiness Review - Event Builder" continued																					
	<u>Notes</u>																				
	M&S BOE: N/A																				
	Labor BOE: N/A																				
	Schedule BOE: lag of 100 days due to anticipated funding for FY2004																				
1.3.4.5.2	Production Readiness Review - Event Builder	\$0.00	\$0.00	\$0.00	0	0	3														
	<u>Notes</u>																				
	WBS Description:																				
	Milestone: After the system has been proven to work as a prototype a readiness review formally approves the purchase of the full size system.																				
1.3.4.5.3	<b>purchase remaining hardware</b>	<b>\$310,500.00</b>	<b>\$310,500.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>														
	<u>Notes</u>																				
	WBS Description:																				
	This summary task covers the purchase of the remaining hardware to construct the full size system. It includes the submission of the purchase order and implementation plan, purchase formality and ends with the arrival of the hardware.																				
1.3.4.5.3.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	4														
	<u>Notes</u>																				
	WBS Description:																				
	The submission of the purchase order and the implementation plan is a milestone.																				
1.3.4.5.3.2	purchase formalities	\$310,500.00	\$310,500.00	\$0.00	0.3	0.5	0														
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>MANDS</td> <td>310,500</td> <td>310,500</td> <td>0 days</td> <td>Tue 8/24/04</td> <td>Tue 11/16/04</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	16	MANDS	310,500	310,500	0 days	Tue 8/24/04	Tue 11/16/04						
ID	Resource Name	Units	Work	Delay	Start	Finish															
16	MANDS	310,500	310,500	0 days	Tue 8/24/04	Tue 11/16/04															
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>MANDS</td> <td>310,500</td> <td>\$310,500.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$310,500.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	16	MANDS	310,500	\$310,500.00	\$0.00	\$0.00	\$310,500.00						
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost															
16	MANDS	310,500	\$310,500.00	\$0.00	\$0.00	\$310,500.00															
	<u>Notes</u>																				
	WBS Description:																				
	Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.																				
	M/S BOE:																				
	Vendor quote December 2001																				
	Labor BOE: N/A																				

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.4.5.3.3	arrival of the hardware	\$0.00	\$0.00	\$0.00	0	0	3

Notes  
 WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.4.5.4	assemble new hardware in B0 third floor	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Wed 11/17/04	Thu 12/2/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Wed 11/17/04	Thu 12/2/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes  
 WBS Description:

The assembly of the new hardware should go smoothly since the room is well prepared.

M/S BOE: N/A

Labor BOE:  
 Based upon experience with the Run 2a system.

1.3.4.5.5	evaluate the new hardware and software	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Fri 12/3/04	Thu 12/16/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Fri 12/3/04	Thu 12/16/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes  
 WBS Description:

The evaluation of the new hardware might reveal problems in some of the components and we leave some time in case hardware needs to be exchanged by the vendor. The new software is being tested as well.

M/S BOE: N/A

Labor BOE:  
 Based upon experience with the Run 2a system.

1.3.4.5.6	MS: establish functionality of hardware	\$0.00	\$0.00	\$0.00	0	0	4
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Notes  
 WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.4.6	commissioning of hardware and software	\$0.00	\$0.00	\$0.00	0.3	0.5	0
	<u>Notes</u>						
	WBS Description:						
	Hardware and software commissioning involves data taking since only then the last problems can be found and corrected. Experience from Run IIa show that 2 month is a reasonable time to fix the most important problems.						
	M/S BOE: N/A						
	Labor BOE: Based upon experience with the Run 2a system.						
1.3.4.7	Finish Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	3
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the end of the Event-Builder upgrade. This means that the hardware is in place and has been proven to technically work, the software development has been finished and its functionality has been proven with real data.						
1.3.5	Computer for Level3 PC Farm / DAQ	\$390,000.00	\$390,000.00	\$0.00	0	0	0
	<u>Notes</u>						
	WBS Description:						
	This summary task covers the computer purchases for the general DAQ system and the Level-3 PC Farm. The purchases are staged since they are replacing PCs which become obsolete. Prices are based on a recent purchase of similar hardware.						
1.3.5.1	Start Computers for Level3 PC Farm/DAQ	\$0.00	\$0.00	\$0.00	0	0	4
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the beginning of the DAQ and Level3 computer purchases.						
1.3.5.2	replace 0/10 PCs (2003)	\$15,000.00	\$15,000.00	\$0.00	0	0	0
	<u>Notes</u>						
	WBS Description:						
	Summary task describing the purchase of 0 level 3 computers and 10 DAQ computers in FY2003.						
1.3.5.2.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	4
	<u>Notes</u>						
	WBS Description:						
	The submission of the purchase order and the implementation plan is a milestone.						

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.2	purchase formalities	\$15,000.00	\$15,000.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	15,000	15,000	0 days	Fri 5/2/03	Mon 7/28/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

PO from recent run 2a equipment purchase.

LABOR BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.3	install and test one prototype machine	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Tue 7/29/03	Mon 8/11/03	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Tue 7/29/03	Mon 8/11/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: - N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.4	arrival of 0/10 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	3

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.5	burn in phase	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Tue 8/19/03	Tue 9/2/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

Labor BOE:  
Based upon experience with the Run 2a system.

1.3.5.2.6	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Wed 9/3/03	Tue 9/9/03	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Wed 9/3/03	Tue 9/9/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:  
Based upon experience with the Run 2a system.

1.3.5.3	replace 70/15 PCs (2004)	\$130,000.00	\$130,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task describing the purchase of 70 level 3 computers and 15 DAQ computers in FY2004.

1.3.5.3.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.3.2	purchase formalities	\$130,000.00	\$130,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
16	MANDS	130,000	130,000	0 days	Mon 10/4/04	Thu 12/30/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	130,000	\$130,000.00	\$0.00	\$0.00	\$130,000.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"purchase formalities" continued

Notes

M&S BOE:

Recent PO for similar purchase in run 2a.

Labor BOE: N/A

Schedule BOE: lag of 230 days due to anticipated funding for FY2004

1.3.5.3.3	install and test one prototype machine	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Tue 1/4/05	Tue 1/18/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Tue 1/4/05	Tue 1/18/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.3.4	arrival of 70/15 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.5.3.5	burn in phase	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Wed 1/26/05	Tue 2/8/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

1.3.5.3.6	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Wed 2/9/05	Tue 2/15/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Wed 2/9/05	Tue 2/15/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.4	replace 140/20 PCs (2005)	\$245,000.00	\$245,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task describing the purchase of 140 level 3 computers and 20 DAQ computers in FY2005.

1.3.5.4.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.4.2	purchase formalities	\$245,000.00	\$245,000.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
16	MANDS	245,000	245,000	0 days	Tue 10/12/04	Tue 1/11/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	MANDS	245,000	\$245,000.00	\$0.00	\$0.00	\$245,000.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"purchase formalities" continued

Notes

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

Based on recent PO from similar run 2a purchase

Labor BOE: N/A

1.3.5.4.3	install and test one prototype machine	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Wed 1/12/05	Wed 1/26/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Wed 1/12/05	Wed 1/26/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.4.4	arrival of 140/20 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.5.4.5	burn in phase	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Thu 1/27/05	Wed 2/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

Based upon experience with the Run 2a system.

1.3.5.4.6	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Thu 2/10/05	Wed 2/16/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Thu 2/10/05	Wed 2/16/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.5	Finish Purchase of Computers for Level3/DAQ system	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

This milestone marks the end of the PC purchases for the DAQ and the Level3 PC Farm.

<b>1.3.6</b>	<b>SVT upgrade</b>	<b>\$245,600.00</b>	<b>\$245,600.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

CDF Silicon Vertex Tracker Run 2b upgrade. Upgrade necessary due to differences between SVX IIa and SVX IIb detector geometry. System operation identical to the Run 2a SVT.

1.3.6.1	Start of SVT upgrade	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Description:

Milestone to begin SVT upgrade.

<b>1.3.6.2</b>	<b>trackfitter boards</b>	<b>\$161,600.00</b>	<b>\$161,600.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task to produce new Track Fitter boards. New boards necessary to handle SVX IIb geometry.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.6.2.1	Upgrade SVT trackfitters	\$161,600.00	\$161,600.00	\$0.00	0.5	0.5	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
10	ElecEngUChi	50%	480 hrs	0 days	Mon 2/2/04	Tue 7/20/04	\$33,600.00	\$0.00	\$0.00	\$33,600.00
17	MANDSPASS	128,000	128,000	0 days	Mon 2/2/04	Tue 7/20/04	\$128,000.00	\$0.00	\$0.00	\$128,000.00

Notes

WBS Description:

This task includes

M&S BOE:

Labor BOE:

Subject: Re: Run 2b SVT

Date: Tue, 27 Aug 2002 17:11:05 -0500 (CDT)

From: Mel Shochet <shochet@hep.uchicago.edu>

To: Kevin Pitts <kpitts@uiuc.edu>

CC: Luciano Ristori <luciano@fnal.gov>,  
 Bill Ashmanskas <ashmansk@hep.uchicago.edu>

Hi Kevin,

Based on discussions with Bill and Mircea (our engineer), it seems likely that the cost of parts, PC boards, and stuffing the new track fitters will be close to that for the original track fitters. However the new chips that will be used require a new PCB design and thus engineering time. The latter is estimated to be \$68K (6 months of an engineer). The cost of the original track fitters were:

PCBs	\$10K
assembly	\$11K
parts (with spares)	\$73K
<b>TOTAL</b>	<b>\$94K</b>

This makes the grand total \$162K.

Mel

<b>1.3.6.3</b>	<b>Merger boards</b>	<b>\$84,000.00</b>	<b>\$84,000.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
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Notes

WBS Description:

Summary task for the production of new SVT Merger boards. These boards are identical to the Run 2a Merger boards.

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																							
1.3.6.3.1	Upgrade SVT merger boards	\$84,000.00	\$84,000.00	\$0.00	1	0.5	0																							
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">ID</th> <th style="text-align: left;">Resource Name</th> <th style="text-align: right;">Units</th> <th style="text-align: right;">Work</th> <th style="text-align: left;">Delay</th> <th style="text-align: left;">Start</th> <th style="text-align: left;">Finish</th> <th style="text-align: right;">Cost</th> <th style="text-align: right;">Baseline Cost</th> <th style="text-align: right;">Act. Cost</th> <th style="text-align: right;">Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>18</td> <td>INKIND</td> <td style="text-align: right;">84,000</td> <td style="text-align: right;">84,000</td> <td>0 days</td> <td>Mon 2/2/04</td> <td>Mon 6/21/04</td> <td style="text-align: right;">\$84,000.00</td> <td style="text-align: right;">\$0.00</td> <td style="text-align: right;">\$0.00</td> <td style="text-align: right;">\$84,000.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	18	INKIND	84,000	84,000	0 days	Mon 2/2/04	Mon 6/21/04	\$84,000.00	\$0.00	\$0.00	\$84,000.00							
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																				
18	INKIND	84,000	84,000	0 days	Mon 2/2/04	Mon 6/21/04	\$84,000.00	\$0.00	\$0.00	\$84,000.00																				
	<u>Notes</u>																													
	WBS Description:																													
	Run 2b SVT Merger boards identical to Run 2a Merger boards. Additional boards required for Run 2b system.																													
	M&S BOE:																													
	Estimate from Run 2a Merger board production.																													
	Uncertainty based upon the need for some possible rework due obsolete components.																													
	Labor BOE: N/A																													
1.3.6.4	SVT ready for installation	\$0.00	\$0.00	\$0.00	0	0	3																							
	<u>Notes</u>																													
	WBS Description:																													
	Milestone denoting of the completion of the SVT.																													
1.3.7	Finish Run 2b Trigger DAQ project	\$0.00	\$0.00	\$0.00	0	0	3																							
	<u>Notes</u>																													
	WBS Description:																													
	Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject.																													
<b>1.3.8</b>	<b>Schedule Contingency and Reportable Milestones</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>																							
<b>1.3.8.1</b>	<b>Reportable Milestones Level 2</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>																							
1.3.8.1.1	First Prototype TDC available for testing	\$0.00	\$0.00	\$0.00	0	0	2																							
	<u>Notes</u>																													
	WBS Description:																													
	Milestone - noting the first prototype TDC board available for testing. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.																													
1.3.8.1.2	Beginning of TDC Production	\$0.00	\$0.00	\$0.00	0	0	2																							
	<u>Notes</u>																													
	WBS Description:																													
	Milestone - marking the beginning of TDC production after a successful production readiness review. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.																													

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.8.1.3	Production Board testing complete	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone - marking the completion of the testing and QA of the production TDC boards. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.4	Data Concentrator Production Completed	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone - denoting the completion of the production Data Concentrator. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.5	Run 2b TDC Ready for Installation	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone - denoting that the Run 2b TDC project is ready for installation at B0 (end of level 3 subproject). This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.6	Begin production of Level2 Pulsar system	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone denoting beginning of production of Level 2 system. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.7	Pulsar Level 2 subproject ready for installation	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Level 2 subproject ready for installation. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.8	Fabrication of Prototype Finder 1/3 board	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone denotes the fabrication of the first prototype Finder 1/3 board. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.9	Prototype Linker Module available for testing	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone denotes when the first prototype Linker module will be available for testing. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.8.1.10	Begin Production Finder SL7 boards	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the beginning of production for the Finder SL7 boards after a successful production readiness review. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.11	Begin Production Linker Modules	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the beginning of production of the Linker Modules and comes after a successful Production readiness review. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.12	Begin Preproduction Stereo Association Modules	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone marking the completion of the Stereo Association Modules. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.13	Production Stereo Association Modules complete	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.14	XFT Ready for Installation at CDF	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone indicating XFT project complete. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.15	arrival of the hardware	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	The arrival of the hardware is a milestone which marks the beginning of the test system installation. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.16	Production Readiness Review - Event Builder	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	After the system has been proven to work as a prototype a readiness review formally approves the purchase of the full size system. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.8.1.17	arrival of the hardware	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	The arrival of the hardware is a milestone which marks the beginning of the test system installation. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.18	Finish Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the end of the Event-Builder upgrade. This means that the hardware is in place and has been proven to technically work, the software development has been finished and its functionality has been proven with real data. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.19	arrival of 0/10 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	The arrival of the hardware is a milestone which marks the beginning of the test system installation. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.20	arrival of 70/15 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	The arrival of the hardware is a milestone which marks the beginning of the test system installation. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.21	arrival of 140/20 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	The arrival of the hardware is a milestone which marks the beginning of the test system installation. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.22	Finish Purchase of Computers for Level3/DAQ system	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the end of the PC purchases for the DAQ and the Level3 PC Farm. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						

WBS Dictionary as of Fri 9/20/02  
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.8.1.23	SVT ready for installation	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone denoting the completion of the SVT. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
1.3.8.1.24	Finish Run 2b Trigger DAQ project	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject. This milestone is coupled to the corresponding level 3 milestone with added schedule contingency.						
<b>1.3.8.2</b>	<b>Reportable Milestones - Level 1</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>
1.3.8.2.1	Data Acquisition and Trigger Upgrades Ready for Installation	\$0.00	\$0.00	\$0.00	0	0	1
	<u>Notes</u>						
	WBS Description:						
	Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject. This milestone is coupled to the corresponding level 2 milestone with added schedule contingency.						
1.31	Start of Run 2b DAQ and Trigger Project	\$0.00	\$0.00	\$0.00	1	1	4
	<u>Notes</u>						
	WBS Description:						
	Milestone - marking the beginning of the Run 2b DAQ and Trigger upgrade project						