

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																										
1.3	Run 2b DAQ and Trigger Project	\$4,750,589.47	\$3,951,743.00	\$97,048.00	0	0	0																										
	<u>Notes</u>																																
	WBS Description:																																
	Project includes TDC upgrade, XFT upgrade, L2 upgrade, SVT upgrade, EVB upgrade and L3 PC replacements.																																
1.3.1	Run 2b TDC Project	\$1,224,999.23	\$1,085,982.00	\$97,048.00	0	0	0																										
	<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	0	0	3																										
	<u>Notes</u>																																
	WBS Description:																																
	Milestone - denoting the start of the Run 2b TDC level 3 subproject																																
1.3.1.2	Specification & Development	\$50,840.00	\$44,240.00	\$6,600.00	0	0	0																										
	<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																																
1.3.1.2.1	Formal Specification	\$1,120.00	\$1,120.00	\$0.00	0	0	0																										
	<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 (Chicago)	\$560.00	\$1,120.00	\$0.00	0	0	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>INKIND</td> <td>560</td> <td>560</td> <td>0 days</td> <td>6/24/02</td> <td>6/25/02</td> <td>\$560.00</td> <td>\$560.00</td> <td>\$560.00</td> <td>\$0.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	11	INKIND	560	560	0 days	6/24/02	6/25/02	\$560.00	\$560.00	\$560.00	\$0.00										
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																							
11	INKIND	560	560	0 days	6/24/02	6/25/02	\$560.00	\$560.00	\$560.00	\$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 (Chicago)" continued

Notes

M&S BOE: N/A

Labor BOE:

100% - Chicago Electrical Eng. - 2d (16 hrs)@\$70/hr = \$1120

1.3.1.2.1.2	Physics Justification	\$0.00	\$0.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	PostDoc	100%	160 hrs	0 days	7/11/02	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

1.3.1.2.1.3	Block Diagram (FNAL)	\$560.00	\$0.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	560	560	0 days	6/24/02	6/25/02	\$560.00	\$560.00	\$560.00	\$0.00

1.3.1.2.2	Interface Specification	\$17,800.00	\$11,200.00	\$6,600.00	0	0	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	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	120 hrs	0 days	9/30/02	11/8/02	\$6,600.00	\$6,600.00	\$6,600.00	\$0.00
13	Physicist	100%	240 hrs	0 days	9/30/02	11/8/02	\$0.00	\$0.00	\$0.00	\$0.00

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

Notes

WBS Description:

This item covers inferace specification to Level 1 XFT

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	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	120 hrs	0 days	9/30/02	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	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	120 hrs	0 days	10/21/02	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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.2.4	Data Transmission (FNAL)	\$5,600.00	\$11,200.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	9/30/02	11/26/02	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission
The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

50% - Chicago Electrical Eng. - 8wks (160 hrs)@\$70/hr = \$11200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.2.5	Data Transmission (Chicago)	\$5,600.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	5,600	5,600	13.5 days	10/17/02	11/26/02	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.3	Front End Timing (FNAL)	\$8,960.00	\$17,920.00	\$0.00	0	0	0

Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.3.1	Simulation					\$3,360.00	\$6,720.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
12	MANDSPASSL	3,360	3,360	0 days	8/8/02	10/31/02	\$3,360.00	\$3,360.00	\$3,360.00	\$0.00	

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. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

20% - Chicago Electrical Eng. - 12w (96 hrs)@\$70/hr = \$6720

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.3.2	Test Board					\$5,600.00	\$11,200.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
12	MANDSPASSL	5,600	5,600	0 days	11/1/02	1/3/03	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00	
13	Physicist	50%	120 hrs	0 days	11/1/02	12/16/02	\$0.00	\$0.00	\$0.00	\$0.00	

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. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.4	Front End Timing (Chicago)	\$8,960.00	\$0.00	\$0.00	0	0	0

Notes
WBS Description:

This summary task covers the hit time window digitization and programmability

1.3.1.2.4.1	Simulation	\$3,360.00	\$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
11	INKIND	3,360	3,360	0 days	8/8/02	10/31/02	\$3,360.00	\$3,360.00	\$3,360.00	\$0.00

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. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

20% - Chicago Electrical Eng. - 12w (96 hrs)@\$70/hr = \$6720

1.3.1.2.4.2	Test Board	\$5,600.00	\$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
11	INKIND	5,600	5,600	20 days	12/3/02	1/3/03	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

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. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

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

Notes

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

1.3.1.2.5	Buffer Management (FNAL)	\$3,220.00	\$4,200.00	\$0.00	0	0	0
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Notes

WBS Description:

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

1.3.1.2.5.1	Simulation	\$1,120.00	\$0.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,120	1,120	0 days	8/8/02	9/5/02	\$1,120.00	\$1,120.00	\$1,120.00	\$0.00

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

20% - Chicago Electrical Eng. - 4w (32 hrs)@\$70/hr = \$2240

1.3.1.2.5.2	Trial Implementation	\$2,100.00	\$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
12	MANDSPASSL	2,100	2,100	11.25 days	9/23/02	9/26/02	\$2,100.00	\$2,100.00	\$2,100.00	\$0.00
14	PostDoc	150%	45 hrs	11.25 days	9/23/02	9/26/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

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

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.6	Buffer Management (Chicago)	\$3,220.00	\$2,240.00	\$0.00	0	0	0
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Notes

WBS Description:

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

1.3.1.2.6.1	Simulation	\$1,120.00	\$2,240.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1,120	1,120	0 days	8/8/02	9/5/02	\$1,120.00	\$1,120.00	\$1,120.00	\$0.00

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

20% - Chicago Electrical Eng. - 4w (32 hrs)@\$70/hr = \$2240

1.3.1.2.6.2	Trial Implementation	\$2,100.00	\$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
11	INKIND	2,100	2,100	7.5 days	9/17/02	9/26/02	\$2,100.00	\$2,100.00	\$2,100.00	\$0.00

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The

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

Notes

resources provided by FNAL are listed in the other identical tasks.

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.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.7	VME Interface (FNAL)	\$2,940.00	\$4,200.00	\$0.00	0	0	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

1.3.1.2.7.1	Trial Implementation	\$2,100.00	\$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
12	MANDSPASSL	2,100	2,100	0 days	11/27/02	12/17/02	\$2,100.00	\$2,100.00	\$2,100.00	\$0.00
14	PostDoc	50%	60 hrs	0 days	11/27/02	12/17/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.7.2	Simulation	\$840.00	\$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
11	INKIND	840	840	0 days	9/6/02	9/26/02	\$840.00	\$840.00	\$840.00	\$0.00

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

Notes

WBS Description:

This item covers the cost of the simulation for the TDC chip to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

20% - Chicago Electrical Eng. - 3w (24 hrs)@\$70/hr = \$1680

1.3.1.2.8	VME Interface (Chicago)	\$2,940.00	\$1,680.00	\$0.00	0	0	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

1.3.1.2.8.1	Simulation	\$840.00	\$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
11	INKIND	840	840	0 days	9/6/02	9/26/02	\$840.00	\$840.00	\$840.00	\$0.00

Notes

WBS Description:

This item covers the cost of the simulation for the TDC chip to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

20% - Chicago Electrical Eng. - 3w (24 hrs)@\$70/hr = \$1680

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.8.2	Trial Implementation	\$2,100.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,100	2,100	0 days	11/27/02	12/17/02	\$2,100.00	\$2,100.00	\$2,100.00	\$0.00

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.9	Design Review (FNAL)	\$840.00	\$1,680.00	\$0.00	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	840	840	0 days	7/14/03	7/16/03	\$840.00	\$840.00	\$840.00	\$0.00

Notes

WBS Description:

The TDC design review task is a milestones.

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

100% Chicago Electrical Eng. - 3 days (24 hrs) @\$70/hr = \$1680

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.10	Design Review (Chicago)	\$840.00	\$1,680.00	\$0.00	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	840	840	0 days	7/14/03	7/16/03	\$840.00	\$840.00	\$840.00	\$0.00

Notes

WBS Description:

The TDC design review task is a milestones.

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

Notes

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

100% Chicago Electrical Eng. - 3 days (24 hrs) @\$70/hr = \$1680

1.3.1.3	Detailed Design (FNAL)	\$90,673.80	\$98,560.00	\$27,500.00	0	0	0
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Notes

WBS Description:

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

1.3.1.3.1	Front End	\$5,600.00	\$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
12	MANDSPASSL	5,600	5,600	0 days	1/9/03	7/22/03	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

Notes

WBS Description:

This task covers the cost of the detailed design for the time window digitization. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.3.2	Trigger Interface	\$5,600.00	\$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
12	MANDSPASSL	5,600	5,600	0 days	2/7/03	7/28/03	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

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

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.3.3	Compression	\$4,200.00	\$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
12	MANDSPASSL	4,200	4,200	0 days	3/7/03	7/31/03	\$4,200.00	\$4,200.00	\$4,200.00	\$0.00

Notes

WBS Description:

Detailed Design of the on board data format compression design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.3.4	Buffers	\$4,200.00	\$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
12	MANDSPASSL	4,200	4,200	0 days	3/28/03	4/17/03	\$4,200.00	\$4,200.00	\$4,200.00	\$0.00

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Buffers" 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.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.3.5	VME	\$2,800.00	\$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
12	MANDSPASSL	2,800	2,800	0 days	4/18/03	1/9/04	\$2,800.00	\$2,800.00	\$2,800.00	\$0.00

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.3.6	Test Paths	\$1.00	\$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
12	MANDSPASSL	1	1	0 days	5/2/03	1/22/04	\$1.00	\$2,800.00	\$0.75	\$0.25

Notes

WBS Description:

This task covers the cost of the board testing paths. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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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"Test Paths" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.3.7	Board Layout	\$5,460.00	\$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
12	MANDSPASSL	5,460	5,460	0 days	5/23/03	6/20/03	\$5,460.00	\$8,400.00	\$5,460.00	\$0.00

Notes

WBS Description:

This task describes the TDC board layout design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

1.3.1.3.8	Board Simulation	\$8,400.00	\$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
12	MANDSPASSL	8,400	8,400	0 days	7/7/03	5/13/04	\$8,400.00	\$8,400.00	\$6,300.00	\$2,100.00

Notes

WBS Description:

This task covers the simulation tests of the board layout and functions. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

WBS Dictionary as of 7/7/04
CDF Run11b DAQ

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.3.9	Documentation					\$7,000.00	\$14,000.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
12	MANDSPASSL	7,000	7,000	0 days	8/18/03	9/23/03	\$7,000.00	\$7,000.00	\$5,250.00	\$1,750.00	

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @\$70/hr = \$14000

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.3.10	Firmware development					\$47,132.80	\$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	52%	856.97 hrs	0 days	7/28/03	5/20/04	\$47,132.80	\$27,500.00	\$42,419.52	\$4,713.28	

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.

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.3.11	Design Review					\$280.00	\$560.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
12	MANDSPASSL	280	280	0 days	5/21/04	5/21/04	\$280.00	\$280.00	\$0.00	\$280.00	

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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

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

Notes
M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.4	Detailed Design (Chicago)	\$46,481.00	\$0.00	\$0.00	0	0	0
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Notes
WBS Description:

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

1.3.1.4.1	Front End	\$5,600.00	\$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
11	INKIND	5,600	5,600	3 days	1/14/03	2/6/03	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

Notes
WBS Description:

This task covers the cost of the detailed design for the time window digitization. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.4.2	Trigger Interface	\$5,600.00	\$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
11	INKIND	5,600	5,600	2.66 days	2/11/03	2/12/03	\$5,600.00	\$5,600.00	\$5,600.00	\$0.00

Notes
WBS Description:

Detailed design of the interface to the XFT Trigger. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.4.3	Compression	\$4,200.00	\$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
11	INKIND	4,200	4,200	0 days	3/7/03	3/18/03	\$4,200.00	\$4,200.00	\$4,200.00	\$0.00

Notes

WBS Description:

Detailed Design of the on board data format compression design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.4.4	Buffers	\$4,200.00	\$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
11	INKIND	4,200	4,200	0.75 days	3/28/03	4/17/03	\$4,200.00	\$4,200.00	\$4,200.00	\$0.00

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Buffers" 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.

100% Chicago Electrical Eng. - 3 wks (8400 hrs) @\$70/hr = \$8400

1.3.1.4.5	VME	\$2,800.00	\$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
11	INKIND	2,800	2,800	1.78 days	4/21/03	1/9/04	\$2,800.00	\$2,800.00	\$2,800.00	\$0.00

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.4.6	Test Paths	\$1.00	\$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
11	INKIND	1	1	0 days	5/2/03	1/29/04	\$1.00	\$2,800.00	\$0.89	\$0.11

Notes

WBS Description:

This task covers the cost of the board testing paths. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 3 wks (80 hrs) @\$70/hr = \$5600

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

Notes

1.3.1.4.7 Board Layout \$8,400.00 \$0.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	8,400	8,400	0 days	5/23/03	1/16/04	\$8,400.00	\$8,400.00	\$8,400.00	\$0.00

Notes

WBS Description:

This task describes the TDC board layout design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 6wks (240 hrs) @\$70/hr = \$16800

1.3.1.4.8 Board Simulation \$8,400.00 \$0.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	8,400	8,400	0 days	7/7/03	8/18/03	\$8,400.00	\$8,400.00	\$6,300.00	\$2,100.00

Notes

WBS Description:

This task covers the simulation tests of the board layout and functions. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.4.9	Documentation	\$7,000.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	7,000	7,000	0 days	8/18/03	9/23/03	\$7,000.00	\$7,000.00	\$5,250.00	\$1,750.00

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @\$70/hr = \$14000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.4.10	Design Review	\$280.00	\$0.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	280	280	0 days	5/21/04	5/21/04	\$280.00	\$280.00	\$0.00	\$280.00

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.4.11	TDC Prototype fabrication contingency task	\$0.00	\$0.00	\$0.00	0	0	0

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.5	TDC Design Review	\$0.00	\$0.00	\$0.00	0	0	3

Notes

WBS Description:

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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6	Prototype - V1.0 (FNAL)	\$102,319.43	\$143,265.00	\$0.00	0	0	0

Notes
WBS Description:

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

1.3.1.6.1	ASDQ test stand	\$10,854.43	\$35,000.00	\$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
9	MANDS	10,854.43	10,854.43	0 days	4/19/04	6/25/04	\$10,854.43	\$35,000.00	\$10,854.43	\$0.00

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

1.3.1.6.2	Develop Test Protocols	\$16,800.00	\$33,600.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	16,800	16,800	0 days	10/22/03	1/6/05	\$16,800.00	\$16,800.00	\$8,400.00	\$8,400.00
13	Physicist	50%	1,200 hrs	0 days	10/22/03	1/6/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Task to develop the TDC test protocols, including teststand software. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 12 wks (480 hrs) @\$70/hr = \$33600

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.3	Board Fabrication	\$5,055.00	\$5,055.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	5,055	5,055	0 days	1/12/04	1/30/04	\$5,055.00	\$5,055.00	\$5,055.00	\$0.00

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.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.4	Parts Procurement	\$19,540.00	\$19,540.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	19,540	19,540	0 days	1/12/04	1/30/04	\$19,540.00	\$19,540.00	\$19,540.00	\$0.00

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

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

Notes

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

1.3.1.6.5	First Board Assembly	\$350.00	\$350.00	\$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
10	MANDSPASS	350	350	0 days	2/2/04	2/27/04	\$350.00	\$350.00	\$350.00	\$0.00

Notes

WBS Description:

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

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

Notes

	5	350	1750	
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Labor BOE: N/A

1.3.1.6.6	First Prototype TDC available for testing	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - noting the first prototype TDC board available for testing.

1.3.1.6.7	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
12	MANDSPASSL	23,648	23,648	0 days	3/1/04	4/30/04	\$23,648.00	\$23,648.00	\$23,648.00	\$0.00
13	Physicist	100%	360 hrs	0 days	3/1/04	4/30/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the bench tests for the first prototype TDC board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @\$70/hr = \$22400

10% Chicago Electrical Tech. - 8 wks (32 hrs) @\$39/hr = \$1248

1.3.1.6.8	Multiple Board Assy	\$1,400.00	\$1,400.00	\$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
10	MANDSPASS	1,400	1,400	0 days	3/22/04	3/31/04	\$1,400.00	\$1,400.00	\$1,400.00	\$0.00

Notes

WBS Description:

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

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

Notes

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

1.3.1.6.9	Bench Tests (multi boards)	\$5,912.00	\$5,912.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,912	5,912	0 days	4/1/04	4/14/04	\$5,912.00	\$5,912.00	\$5,320.80	\$591.20
13	Physicist	100%	80 hrs	0 days	4/1/04	4/14/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	80 hrs	0 days	4/1/04	4/14/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The resources (money and/or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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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"Bench Tests (multi boards)" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600
10% Chicago Electrical Tech. - 2 wks (8 hrs) @\$39/hr = \$312

1.3.1.6.10	B0 Tests	\$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
12	MANDSPASSL	8,400	8,400	0 days	1/6/05	2/18/05	\$8,400.00	\$8,400.00	\$0.00	\$8,400.00
13	Physicist	200%	480 hrs	0 days	1/6/05	2/18/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	240 hrs	0 days	1/6/05	2/18/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the prototype TDC tests in B0 VME crates, both standalone and with the full length COT prototype chamber. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

50% Chicago Electrical Eng. - 6 wks (120 hrs) @\$70/hr = \$8400

1.3.1.6.11	Documentation	\$9,800.00	\$9,800.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	9,800	9,800	0 days	4/15/04	6/3/04	\$9,800.00	\$9,800.00	\$4,900.00	\$4,900.00
13	Physicist	50%	140 hrs	0 days	4/15/04	6/3/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

Notes

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

50% Chicago Electrical Eng. - 7 wks (140 hrs) @\$70/hr = \$9800

1.3.1.6.12	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
12	MANDSPASSL	560	560	0 days	4/1/05	4/4/05	\$560.00	\$560.00	\$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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.7	Prototype - V1.0 (Chicago)	\$16,804.00	\$0.00	\$0.00	0	0	0
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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.

1.3.1.7.1	Develop Test Protocols	\$16,800.00	\$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
11	INKIND	16,800	16,800	0 days	10/22/03	1/23/04	\$16,800.00	\$16,800.00	\$10,080.00	\$6,720.00

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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

100% Chicago Electrical Eng. - 12 wks (480 hrs) @\$70/hr = \$33600

1.3.1.7.2	Bench Tests	\$1.00	\$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
11	INKIND	1	1	0 days	3/1/04	4/30/04	\$1.00	\$0.00	\$1.00	\$0.00

Notes
WBS Description:

This task covers the bench tests for the first prototype TDC board. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @\$70/hr = \$22400

1.3.1.7.3	Bench Tests (multi boards)	\$1.00	\$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
11	INKIND	1	1	0 days	4/1/04	4/14/04	\$1.00	\$0.00	\$0.90	\$0.10

Notes
WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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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"Bench Tests (multi boards)" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.7.4	B0 Tests	\$1.00	\$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
11	INKIND	1	1	0 days	2/18/05	4/1/05	\$1.00	\$0.00	\$0.00	\$1.00

Notes

WBS Description:

This task covers the prototype TDC tests in B0 VME crates, both standalone and with the full length COT prototype chamber. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

50% Chicago Electrical Eng. - 6 wks (120 hrs) @\$70/hr = \$8400

1.3.1.7.5	Documentation	\$1.00	\$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
11	INKIND	1	1	0 days	4/15/04	6/3/04	\$1.00	\$0.00	\$0.50	\$0.50

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @\$70/hr = \$9800

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

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	4/1/05	4/4/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.8	Design Review Milestone					\$0.00	\$0.00	\$0.00	0	0	3
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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

1.3.1.9	Preproduction (FNAL)					\$151,441.00	\$151,441.00	\$0.00	0	0	0
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Notes

WBS Description:

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

1.3.1.9.1	TDC Preproduction Contingency task					\$0.00	\$0.00	\$0.00	0	0	0
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1.3.1.9.2	TDC crate power supplies					\$2,000.00	\$2,000.00	\$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
9	MANDS	2,000	2,000	0 days	6/14/05	6/28/05	\$2,000.00	\$2,000.00	\$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:

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

Notes

Two new TDC power supplies

Subject:

TDC Power Supply for 2B

From:

Peter Wilson <pijw@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

1.3.1.9.3	Production test equipment	\$40,000.00	\$40,000.00	\$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
9	MANDS	40,000	40,000	0 days	6/14/05	6/28/05	\$40,000.00	\$40,000.00	\$0.00	\$40,000.00

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

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

1.3.1.9.4	Layout Modification	\$8,400.00	\$8,400.00	\$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	MANDSPASSL	8,400	8,400	0 days	6/14/05	7/6/05	\$8,400.00	\$8,400.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

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

1.3.1.9.5	Board Fabrication	\$5,297.00	\$5,297.00	\$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
9	MANDS	5,297	5,297	0 days	7/6/05	7/27/05	\$5,297.00	\$5,297.00	\$0.00	\$5,297.00

Notes

WBS Description:

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

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

Notes

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

1.3.1.9.6	Parts Procurement	\$50,800.00	\$50,800.00	\$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
9	MANDS	50,800	50,800	0 days	7/6/05	7/27/05	\$50,800.00	\$50,800.00	\$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
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	

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

Notes

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

1.3.1.9.7	First Board Assembly	\$150.00	\$150.00	\$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
9	MANDS	150	150	0 days	7/27/05	8/10/05	\$150.00	\$150.00	\$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	

Parts cost dominated by FPGAs and connectors.

Labor BOE: N/A

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

Notes

1.3.1.9.8 Bench Tests \$23,648.00 \$23,648.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	23,648	23,648	0 days	8/10/05	10/6/05	\$23,648.00	\$23,648.00	\$0.00	\$23,648.00
13	Physicist	100%	320 hrs	0 days	8/10/05	10/6/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	320 hrs	0 days	8/10/05	10/6/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of Electrical Engineer from U of Chicago 8 wks (320 hrs) @ \$70/hr
10% of Electrical Technician from U of Chicago 8 wks (32 hrs) @ \$39/hr

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

1.3.1.9.9 Multiple Board Assy \$2,850.00 \$2,850.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	2,850	2,850	0 days	10/6/05	10/20/05	\$2,850.00	\$2,850.00	\$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			
1.3.1.9.10	Bench Tests	\$2,800.00	\$2,800.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	2,800	2,800	0 days	10/20/05	11/3/05	\$2,800.00	\$2,800.00	\$0.00	\$2,800.00
13	Physicist	200%	160 hrs	0 days	10/20/05	11/3/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer from U of Chicago 2 wks (40 hrs) @ \$70/hr

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			
1.3.1.9.11	B0 Tests	\$5,136.00	\$5,136.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,136	5,136	0 days	11/3/05	12/12/05	\$5,136.00	\$5,136.00	\$0.00	\$5,136.00
13	Physicist	200%	400 hrs	0 days	11/3/05	12/12/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	200 hrs	0 days	11/3/05	12/12/05	\$0.00	\$0.00	\$0.00	\$0.00

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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

25% of Electrical Engineer from U of Chicago 6 weeks (60 hrs) @ \$70/hr
10% of Electrical Technician from U of Chicago 6 weeks (24 hrs) @ \$39/hr

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
1.3.1.9.12	Documentation	\$9,800.00	\$9,800.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	9,800	9,800	0 days	11/3/05	12/19/05	\$9,800.00	\$9,800.00	\$0.00	\$9,800.00
13	Physicist	50%	120 hrs	0 days	11/3/05	12/19/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers the costs associated with the documentation of the preproduction boards and testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer of U of Chicago 7 weeks (140h) @ \$70/hr

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
1.3.1.9.13	Design Review	\$560.00	\$560.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	560	560	0 days	12/19/05	12/20/05	\$560.00	\$560.00	\$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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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:

100% of Electrical Engineer from U of Chicago 1d (8 hours) @ \$70/hr

Cost of one engineer attending the review

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.10	Preproduction (U of Chicago)	\$0.00	\$0.00	\$0.00	0	0	0

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
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"Preproduction (U of Chicago)" continued

Notes

1.3.1.10.1 Layout Modification \$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
11	INKIND	0	0	0 days	6/14/05	6/14/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

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

1.3.1.10.2 Bench Tests (first board) \$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
11	INKIND	0	0	0 days	8/10/05	10/6/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of Electrical Engineer from U of Chicago 8 wks (320 hrs) @ \$70/hr

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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"Bench Tests (first board)" continued

Notes

1.3.1.10.3	Bench Tests(multiple 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
11	INKIND	0	0	0 days	10/20/05	11/3/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer from U of Chicago 2 wks (40 hrs) @ \$70/hr

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

1.3.1.10.4	B0 Tests	\$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
11	INKIND	0	0	0 days	11/3/05	12/19/05	\$0.00	\$0.00	\$0.00	\$0.00

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. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

25% of Electrical Engineer from U of Chicago 6 weeks (60 hrs) @ \$70/hr

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
1.3.1.10.5	Documentation					\$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
11	INKIND	0	0	0 days	11/3/05	11/3/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the costs associated with the documentation of the preproduction boards and testing. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer of U of Chicago 7 weeks (140h) @ \$70/hr

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

1.3.1.12	Beginning of TDC Production					\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

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

1.3.1.13	Production					\$478,714.00	\$471,850.00	\$9,048.00	0	0	0
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Notes

WBS Description:

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

1.3.1.13.1	TDC crate power supplies					\$28,000.00	\$28,000.00	\$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
9	MANDS	28,000	28,000	0 days	12/20/05	1/9/06	\$28,000.00	\$28,000.00	\$0.00	\$28,000.00

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

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

Notes

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, 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

1.3.1.13.2	Bid Documentation (FNAL)	\$8,400.00	\$8,400.00	\$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	MANDSPASSL	8,400	8,400	0 days	12/20/05	1/17/06	\$8,400.00	\$8,400.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the documentation required for the bid of the production TDC order. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Bid Documentation (FNAL)" continued

Notes

by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

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

1.3.1.13.3	Bid Documentation (Chicago)	\$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
11	INKIND	0	0	0 days	12/20/05	1/17/06	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the documentation required for the bid of the production TDC order. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

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

1.3.1.13.4	Board Fabrication	\$50,400.00	\$50,400.00	\$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
9	MANDS	50,400	50,400	0 days	1/17/06	2/28/06	\$50,400.00	\$50,400.00	\$0.00	\$50,400.00

Notes

WBS Description:

This item covers the cost for the TDC board fabrication

M&S BOE:

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

Notes

	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

1.3.1.13.5	Parts Procurement	\$295,150.00	\$295,150.00	\$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
9	MANDS	295,150	295,150	0 days	1/17/06	4/11/06	\$295,150.00	\$295,150.00	\$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	

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

Notes

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

Labor BOE: N/A

1.3.1.13.6	Board Assembly	\$45,500.00	\$45,500.00	\$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
9	MANDS	45,500	45,500	0 days	4/11/06	6/7/06	\$45,500.00	\$45,500.00	\$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	
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

1.3.1.13.7	Board Test (FNAL)	\$51,264.00	\$44,400.00	\$9,048.00	0	0	0
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Notes

WBS Description:

Summary task - production TDC board testing

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.13.7.1	Production Test Stands(hardware)	\$22,000.00	\$22,000.00	\$0.00	0.3	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>
9	MANDS	22,000	22,000	0 days	12/20/05	2/7/06	\$22,000.00	\$22,000.00	\$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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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:

100% of 1 Electrical Engineering from U of Chicago - 6 weeks (240 hrs) @ \$70/hr

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.13.7.2	Production Test Stands	\$16,800.00	\$16,800.00	\$0.00	0.3	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>
12	MANDSPASSL	16,800	16,800	0 days	12/20/05	2/7/06	\$16,800.00	\$16,800.00	\$0.00	\$16,800.00
13	Physicist	100%	240 hrs	0 days	12/20/05	2/7/06	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of a TDC test stand required for the testing of the production TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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:

100% of 1 Electrical Engineering from U of Chicago - 6 weeks (240 hrs) @ \$70/hr

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.1.13.7.3	Test Software Revision	\$0.00	\$0.00	\$0.00	0	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	440 hrs	0 days	2/7/06	4/25/06	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	440 hrs	0 days	2/7/06	4/25/06	\$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			
1.3.1.13.7.4	Test Data Base	\$0.00	\$0.00	\$0.00	0	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	PostDoc	100%	280 hrs	0 days	3/7/06	4/25/06	\$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			
1.3.1.13.7.5	First Pass Tests	\$2,800.00	\$2,800.00	\$0.00	0	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	2,800	2,800	0 days	6/7/06	8/3/06	\$2,800.00	\$2,800.00	\$0.00	\$2,800.00
13	Physicist	100%	320 hrs	0 days	6/7/06	8/3/06	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	320 hrs	0 days	6/7/06	8/3/06	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

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

Notes

This item covers the initial tests of the production TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

1.3.1.13.7.6	First Pass Tests(FNAL)	\$2,496.00	\$0.00	\$3,120.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	20%	64 hrs	0 days	6/7/06	8/3/06	\$2,496.00	\$2,496.00	\$0.00	\$2,496.00

Notes

WBS Description:

This item covers the initial tests of the production TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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

1.3.1.13.7.7	Rework	\$2,800.00	\$2,800.00	\$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
12	MANDSPASSL	2,800	2,800	0 days	6/21/06	8/17/06	\$2,800.00	\$2,800.00	\$0.00	\$2,800.00
13	Physicist	100%	320 hrs	0 days	6/21/06	8/17/06	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers a rework discovered during the first pass testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources

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

Notes
are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

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

1.3.1.13.7.8	Rework(FNAL)	\$2,496.00	\$0.00	\$3,120.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	20%	64 hrs	0 days	6/21/06	8/17/06	\$2,496.00	\$2,496.00	\$0.00	\$2,496.00

Notes
WBS Description:

This task covers a rework discovered during the first pass testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

1.3.1.13.7.9	Second Pass	\$1,872.00	\$0.00	\$2,808.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	20%	48 hrs	0 days	7/13/06	8/24/06	\$1,872.00	\$1,872.00	\$0.00	\$1,872.00
13	Physicist	100%	240 hrs	0 days	7/13/06	8/24/06	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	240 hrs	0 days	7/13/06	8/24/06	\$0.00	\$0.00	\$0.00	\$0.00

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
1.3.1.13.8	Board Test (Chicago)	\$0.00	\$0.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task - production TDC board testing

1.3.1.13.8.1	Production Test Stands	\$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
11	INKIND	0	0	0 days	12/20/05	12/20/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers the cost of a TDC test stand required for the testing of the production TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 6 weeks (240 hrs) @ \$70/hr

Cost estimate based upon previous experience with TDC test stands.

1.3.1.13.8.2	First Pass Tests	\$0.00	\$0.00	\$0.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	6/7/06	6/7/06	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers the intial tests of the production TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

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

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.13.8.3	Rework					\$0.00	\$0.00	\$0.00	0	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>	
11	INKIND	0	0	0 days	6/21/06	6/21/06	\$0.00	\$0.00	\$0.00	\$0.00	

Notes

WBS Description:

This task covers a rework discovered during the first pass testing. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

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

1.3.1.13.10	TDC Production Board testing complete					\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - marking the completion of the testing and QA of the production TDC boards.

1.3.1.14	Data Concentrator					\$287,726.00	\$176,626.00	\$53,900.00	0	0	0
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Notes

WBS Description:

Summary task covers design, prototyping and production of the Data Concentrator boards.

1.3.1.14.1	Data Concentrator (R&D)					\$106,600.00	\$23,000.00	\$26,400.00	0	0	0
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1.3.1.14.1.1	Readout Evaluation System					\$3,000.00	\$3,000.00	\$0.00	1	1	0
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<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>
9	MANDS	3,000	3,000	0 days	9/27/02	11/25/02	\$3,000.00	\$3,000.00	\$3,000.00	\$0.00
13	Physicist	30%	96 hrs	0 days	9/27/02	11/25/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the cost for a readout evaluation system .

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Readout Evaluation System" continued

Notes

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.

1.3.1.14.1.2	Design	\$81,400.00	\$0.00	\$17,600.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	1,480 hrs	0 days	5/6/03	2/2/04	\$81,400.00	\$35,200.00	\$81,400.00	\$0.00
14	PostDoc	100%	1,480 hrs	0 days	5/6/03	2/2/04	\$0.00	\$0.00	\$0.00	\$0.00

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.

1.3.1.14.1.3	Layout	\$2,200.00	\$0.00	\$8,800.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	40 hrs	0 days	2/3/04	2/9/04	\$2,200.00	\$8,800.00	\$2,200.00	\$0.00
14	PostDoc	100%	40 hrs	0 days	2/3/04	2/9/04	\$0.00	\$0.00	\$0.00	\$0.00

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.

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.1.4	Prototype fabrication					\$20,000.00	\$20,000.00	\$0.00	0.5	0	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>	
9	MANDS	20,000	20,000	0 days	2/10/04	2/16/04	\$20,000.00	\$20,000.00	\$20,000.00	\$0.00	

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

1.3.1.14.2	Data Concentrator (Production)					\$171,226.00	\$153,626.00	\$17,600.00	0	0	0
1.3.1.14.2.1	Data Concentrator schedule contingency task					\$0.00	\$0.00	\$0.00	0	0	0
1.3.1.14.2.2	Layout modification					\$8,800.00	\$0.00	\$8,800.00	0	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>	
4	ElecEngF	100%	160 hrs	0 days	7/26/04	8/20/04	\$8,800.00	\$8,800.00	\$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.

1.3.1.14.2.3	Data Concentrator Preproduction Review					\$0.00	\$0.00	\$0.00	0	0.5	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
1.3.1.14.2.4	Preproduction fabrication	\$20,000.00	\$20,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	20,000	20,000	0 days	8/24/04	10/5/04	\$20,000.00	\$20,000.00	\$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
1.3.1.14.2.5	Preproduction checkout	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	160 hrs	0 days	10/6/04	11/2/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	160 hrs	0 days	10/6/04	11/2/04	\$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
1.3.1.14.2.6	Layout modification	\$8,800.00	\$0.00	\$8,800.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	160 hrs	0 days	11/3/04	12/2/04	\$8,800.00	\$8,800.00	\$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.

1.3.1.14.2.7	Data Concentrator Production Review	\$0.00	\$0.00	\$0.00	0	0.5	0
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Notes

WBS Description:

Production rediness 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

1.3.1.14.2.8	Production fabrication	\$125,000.00	\$125,000.00	\$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
9	MANDS	125,000	125,000	0 days	5/2/05	6/13/05	\$125,000.00	\$125,000.00	\$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

1.3.1.14.2.9	Production checkout	\$0.00	\$0.00	\$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
13	Physicist	100%	320 hrs	0 days	6/14/05	8/9/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	320 hrs	0 days	6/14/05	8/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Tests required for QA of the production Data Concentrator boards

M&S BOE: N/A

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

Notes

Labor BOE: Based on Run 2a experience

1.3.1.14.2.10	Purchase optical fibers	\$8,626.00	\$8,626.00	\$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
9	MANDS	8,626	8,626	0 days	8/10/05	9/7/05	\$8,626.00	\$8,626.00	\$0.00	\$8,626.00
13	Physicist	20%	32 hrs	0 days	8/10/05	9/7/05	\$0.00	\$0.00	\$0.00	\$0.00

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

1.3.1.14.5	Test	\$9,900.00	\$0.00	\$9,900.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	25%	180 hrs	0 days	2/17/04	6/22/04	\$9,900.00	\$9,900.00	\$2,475.00	\$7,425.00
14	PostDoc	100%	720 hrs	0 days	2/17/04	6/22/04	\$0.00	\$0.00	\$0.00	\$0.00

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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																																		
"Test" continued																																									
	<u>Notes</u>																																								
1.3.1.14.16	TDC Data Concentrator Production complete	\$0.00	\$0.00	\$0.00	0	0	2																																		
	<u>Notes</u>																																								
	WBS Description:																																								
	Milestone - denoting the completion of the production Data Concentrator.																																								
1.3.1.16	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).																																								
1.3.2	Run 2b Level 2 Project	\$275,320.00	\$307,819.00	\$0.00	0	0	0																																		
	<u>Notes</u>																																								
	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	3																																		
	<u>Notes</u>																																								
	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	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>13</td> <td>Physicist</td> <td>150%</td> <td>768 hrs</td> <td>16 days</td> <td>9/27/02</td> <td>1/2/03</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> <tr> <td>14</td> <td>PostDoc</td> <td>250%</td> <td>1,280 hrs</td> <td>16 days</td> <td>9/27/02</td> <td>1/2/03</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	13	Physicist	150%	768 hrs	16 days	9/27/02	1/2/03	\$0.00	\$0.00	\$0.00	\$0.00	14	PostDoc	250%	1,280 hrs	16 days	9/27/02	1/2/03	\$0.00	\$0.00	\$0.00	\$0.00							
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																															
13	Physicist	150%	768 hrs	16 days	9/27/02	1/2/03	\$0.00	\$0.00	\$0.00	\$0.00																															
14	PostDoc	250%	1,280 hrs	16 days	9/27/02	1/2/03	\$0.00	\$0.00	\$0.00	\$0.00																															
	<u>Notes</u>																																								
	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																																								

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.2.3	Commission L2 Pulsar for each data path - proof of principle te:	\$0.00	\$0.00	\$0.00	0	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>
13	Physicist	150%	2,040 hrs	0 days	1/3/03	9/3/03	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	50%	680 hrs	0 days	1/3/03	9/3/03	\$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.

1.3.2.4	Preproduction run of Pulsar L2 system	\$145,516.00	\$145,515.00	\$0.00	0	0	0
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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 Pulsar L2 system schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.2.4.2	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:

1.3.2.4.3	Engineering on preproduction L2 system (FNAL)	\$11,200.00	\$22,400.00	\$0.00	0.2	0.2	0
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<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>
12	MANDSPASSL	11,200	11,200	0 days	9/19/03	11/13/03	\$11,200.00	\$11,200.00	\$11,200.00	\$0.00

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Engineering on preproduction L2 system (FNAL)" continued

Notes

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ \$70/hr

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

1.3.2.4.4 Engineering on preproduction L2 system (Chicago) \$11,200.00 \$0.00 \$0.00 0.2 0.2 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	11,200	11,200	0 days	9/19/03	11/13/03	\$11,200.00	\$11,200.00	\$11,200.00	\$0.00

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ \$70/hr

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

1.3.2.4.5 Motherboards Fabrication \$18,600.00 \$18,600.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	18,600	18,600	0 days	7/14/03	1/12/04	\$18,600.00	\$18,600.00	\$18,600.00	\$0.00

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

Notes

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

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

1.3.2.4.6 Mezzanine boards Fabrication \$13,000.00 \$13,000.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	13,000	13,000	0 days	7/14/03	8/25/03	\$13,000.00	\$13,000.00	\$13,000.00	\$0.00

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

1.3.2.4.7 S-link Auxiliary boards \$900.00 \$900.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	900	900	0 days	7/14/03	8/22/03	\$900.00	\$900.00	\$900.00	\$0.00

Notes

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

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

Notes

M&S BOE:

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

1.3.2.4.8 LSC/LDL + fiber boards \$6,828.00 \$6,828.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	6,828	6,828	0 days	7/14/03	8/26/03	\$6,828.00	\$6,828.00	\$6,828.00	\$0.00

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

1.3.2.4.9 PCI-> S-link boards \$2,574.00 \$2,574.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	2,574	2,574	0 days	7/14/03	8/26/03	\$2,574.00	\$2,574.00	\$2,574.00	\$0.00

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

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

Notes

Labor BOE: N/A

1.3.2.4.10 S-link -> PCI boards \$3,213.00 \$3,213.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,213	3,213	0 days	7/14/03	8/22/03	\$3,213.00	\$3,213.00	\$3,213.00	\$0.00

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	Quan	Cost	Total
Boards	3	\$1,071.00	\$3,213.00

Labor BOE: N/A

1.3.2.4.11 L2 decision processor \$8,000.00 \$8,000.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	8,000	8,000	0 days	7/14/03	1/27/04	\$8,000.00	\$8,000.00	\$8,000.00	\$0.00

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	Quan	Cost	Total
PC	2	\$4,000.00	\$8,000.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.2.4.12	software development/memory management (FNAL)	\$70,000.00	\$70,000.00	\$0.00	0.2	0.2	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	70,000	70,000	0 days	9/19/03	9/16/04	\$70,000.00	\$70,000.00	\$55,440.00	\$14,560.00

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

50% of 1 Electrical Engineering from U of Chicago - 50 weeks (1000 hrs) @ \$70/hr

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.2.4.13	software development/memory management (Chicago)	\$1.00	\$0.00	\$0.00	0.2	0.2	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1	1	0 days	9/19/03	9/16/04	\$1.00	\$0.00	\$0.79	\$0.21

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	150%	1,200 hrs	0 days	1/27/04	6/16/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	50%	400 hrs	0 days	1/27/04	6/16/04	\$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	\$129,804.00	\$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.

1.3.2.6.1	Production Readiness Review for Level 2 Pulsar 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 preproduction tests / vertical slice results in preparation for the production run.

M&S BOE: N/A

Labor BOE:

1.3.2.6.3	Begin production of Level2 Pulsar system	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone denoting beginning of production of Level 2 system.

1.3.2.6.4	L2 Pulsar system - schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.2.6.5	Motherboards Fabrication	\$80,600.00	\$80,600.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	80,600	80,600	0 days	3/16/04	5/10/04	\$80,600.00	\$80,600.00	\$80,600.00	\$0.00

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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.6	Mezzanine boards Fabrication	\$0.00	\$32,500.00	\$0.00	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	0	0	0 days	9/5/03	9/5/03	\$0.00	\$0.00	\$0.00	\$0.00

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
1.3.2.6.7	S-link Auxiliary boards	\$3,900.00	\$3,900.00	\$0.00	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,900	3,900	0 days	9/22/03	10/31/03	\$3,900.00	\$3,900.00	\$3,900.00	\$0.00

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:

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

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.8	LSC/LDL + fiber boards	\$29,588.00	\$29,588.00	\$0.00	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	29,588	29,588	0 days	10/6/03	2/2/04	\$29,588.00	\$29,588.00	\$29,588.00	\$0.00

Notes

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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"LSC/LDL + fiber boards" continued

Notes

M&S BOE:

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

Labor BOE: N/A

1.3.2.6.9	PCI-> S-link boards	\$3,432.00	\$3,432.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,432	3,432	0 days	10/31/03	2/2/04	\$3,432.00	\$3,432.00	\$3,432.00	\$0.00

Notes

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

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

1.3.2.6.10	S-link -> PCI boards	\$4,284.00	\$4,284.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	4,284	4,284	0 days	11/14/03	2/2/04	\$4,284.00	\$4,284.00	\$4,284.00	\$0.00

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

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

Notes

Boards	4	\$1,071.00	\$4,284.00
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Labor BOE: N/A

1.3.2.6.11 L2 decision processor \$8,000.00 \$8,000.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	8,000	8,000	0 days	3/1/04	6/7/04	\$8,000.00	\$8,000.00	\$8,000.00	\$0.00

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
PC	2	\$4,000.00	\$8,000.00

Labor BOE: N/A

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

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	150%	720 hrs	0 days	6/8/04	8/31/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	50%	240 hrs	0 days	6/8/04	8/31/04	\$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.

1.3.2.9 Pulsar Level 2 subproject ready for installation \$0.00 \$0.00 \$0.00 0 0 2

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																							
"Pulsar Level 2 subproject ready for installation" continued																														
	<u>Notes</u> 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																							
	<u>Notes</u> 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	3																							
	<u>Notes</u> WBS Description: Milestone - marking the start of the XFTII upgrade project.																													
1.3.3.2	Finder Boards	\$638,480.00	\$638,480.00	\$0.00	0	0	0																							
	<u>Notes</u> 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	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>13</td> <td>Physicist</td> <td>30%</td> <td>288 hrs</td> <td>0 days</td> <td>10/29/02</td> <td>4/23/03</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	13	Physicist	30%	288 hrs	0 days	10/29/02	4/23/03	\$0.00	\$0.00	\$0.00	\$0.00							
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																				
13	Physicist	30%	288 hrs	0 days	10/29/02	4/23/03	\$0.00	\$0.00	\$0.00	\$0.00																				
	<u>Notes</u> WBS Description: Implementation of Firmware with Finder Algorithm M&S BOE: N/A Labor BOE:																													
1.3.3.2.2	Prototype Finder boards (OSU)	\$26,730.00	\$26,730.00	\$0.00	0	0	0																							
	<u>Notes</u> WBS Description: Summary task for development of prototype finder boards.																													

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.1	Study existing boards	\$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
13	Physicist	30%	96 hrs	0 days	10/29/02	1/2/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Study data readout with existing finder boards for testing purposes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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	\$2,640.00	\$2,640.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,640	2,640	0 days	2/3/03	9/3/03	\$2,640.00	\$2,640.00	\$1,650.00	\$990.00
13	Physicist	20%	240 hrs	0 days	2/3/03	9/3/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Prototype Finder 1/3 Board Schematic Design: choice of parts, routing of signals between parts. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 8 w (80 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$2640

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.3	Prototype Finder 1/3 board layout	\$11,550.00	\$11,550.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	11,550	11,550	0 days	5/27/03	12/11/03	\$11,550.00	\$11,550.00	\$231.00	\$11,319.00

Notes

WBS Description:

Prototype Finder 1/3 board layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Finder 1/3 board layout" continued

Notes

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 14 w (280 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$11550

1.3.3.2.2.4	Test Stand Setup	\$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
13	Physicist	20%	32 hrs	0 days	1/9/04	2/6/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Setup of the VME crate and associated software for communication with crate. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

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

Labor BOE:

1.3.3.2.2.5	Finder 1/3 board Prototype 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
13	Physicist	200%	960 hrs	0 days	2/9/04	4/30/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of fully loaded Finder 1/3 Prototypes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Finder 1/3 board Prototype Testing" continued

Notes

Labor BOE:
Based on experience with Run 2A XFT

1.3.3.2.2.6	Prototype Finder 2/4 Board Schematic Design	\$1,320.00	\$1,320.00	\$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	INKIND	1,320	1,320	0 days	1/9/04	2/6/04	\$1,320.00	\$1,320.00	\$0.00	\$1,320.00
13	Physicist	20%	32 hrs	0 days	1/9/04	2/6/04	\$0.00	\$0.00	\$0.00	\$0.00

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. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4 w (32 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$1320

1.3.3.2.2.7	Prototype Finder SL7 Board Schematic Design	\$1,320.00	\$1,320.00	\$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	INKIND	1,320	1,320	0 days	1/9/04	2/6/04	\$1,320.00	\$1,320.00	\$0.00	\$1,320.00
13	Physicist	20%	32 hrs	0 days	1/9/04	2/6/04	\$0.00	\$0.00	\$0.00	\$0.00

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. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Finder SL7 Board Schematic Design" continued

Notes

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4 w (32 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$1320

1.3.3.2.2.8	Prototype Finder 2/4 board layout	\$4,950.00	\$4,950.00	\$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	INKIND	4,950	4,950	0 days	2/9/04	3/19/04	\$4,950.00	\$4,950.00	\$0.00	\$4,950.00

Notes

WBS Description:

Prototype Finder 2/4 PC board layout - start from Finder 1/3 board layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A experience

50% OSU Electrical Eng. - 6 w (120 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$4950

1.3.3.2.2.9	Prototype Finder SL7 board layout	\$4,950.00	\$4,950.00	\$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	INKIND	4,950	4,950	0 days	3/22/04	4/30/04	\$4,950.00	\$4,950.00	\$0.00	\$4,950.00

Notes

WBS Description:

Prototype Finder SL7 PC board layout - start from Finder 1/3 board layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Run 2A XFT experience

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

Notes

50% OSU Electrical Eng. - 6 w (120 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$4950

1.3.3.2.2.10	Finder 2/4 board Prototype 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
13	Physicist	200%	640 hrs	0 days	5/17/04	7/13/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of fully loaded Finder 2/4 Prototypes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience with Run 2A Finder Boards

1.3.3.2.2.11	Finder SL 7 board Prototype 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
13	Physicist	200%	640 hrs	0 days	6/29/04	8/24/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of fully loaded Finder SL7 prototypes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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	Prototype Finder boards (FNAL)	\$106,410.00	\$106,410.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.3.2.3.1	Prototype Finder 1/3 Board Schematic Design	\$8,880.00	\$8,880.00	\$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	MANDSPASSL	8,880	8,880	0 days	2/3/03	3/28/03	\$8,880.00	\$8,880.00	\$4,440.00	\$4,440.00

Notes

WBS Description:

Prototype Finder 1/3 Board Schematic Design: choice of parts, routing of signals between parts. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 8w (80 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$880
100% OSU Electrical Tech - 8w (3200 hrs)@\$25/hr = \$8000

1.3.3.2.3.2	Prototype Finder 1/3 board layout	\$10,850.00	\$10,850.00	\$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	MANDSPASSL	10,850	10,850	0 days	5/27/03	1/8/04	\$10,850.00	\$10,850.00	\$1,193.08	\$9,656.92

Notes

WBS Description:

Prototype Finder 1/3 board layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 14w (280 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$3850
50% OSU Electrical Tech - 14 w (280 hrs)@\$25/hr = \$7000

WBS Dictionary as of 7/7/04
CDF RunIb DAQ

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.3.4	Fabrication of Prototype XFT Finder 1/3 board	\$0.00	\$0.00	\$0.00	0	0	2

Notes
WBS Description:

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

1.3.3.2.3.5	Fabricate Prototype Finder 1/3 board	\$12,500.00	\$12,500.00	\$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
10	MANDSPASS	12,500	12,500	0 days	1/9/04	3/5/04	\$12,500.00	\$12,500.00	\$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

Total Cost/Board \$5200

Labor BOE:

1.3.3.2.3.6	Test Stand Setup	\$25,400.00	\$25,400.00	\$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
10	MANDSPASS	25,000	25,000	0 days	1/9/04	2/6/04	\$25,000.00	\$25,000.00	\$0.00	\$25,000.00
12	MANDSPASSL	400	400	0 days	1/9/04	2/6/04	\$400.00	\$400.00	\$0.00	\$400.00

Notes
WBS Description:

Setup of the VME crate and associated software for communication with crate. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by

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

Notes

other sources are listed in the other identical tasks.

M&S BOE:

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

Labor BOE:

10% OSU Electrical Tech - 4w (16 hrs)@\$25/hr = \$400

1.3.3.2.3.7	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
12	MANDSPASSL	2,400	2,400	0 days	2/9/04	4/30/04	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00

Notes

WBS Description:

Testing of fully loaded Finder 1/3 Prototypes. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Tech - 12w (96hrs)@\$25/hr = \$2400

1.3.3.2.3.8	Prototype Finder 2/4 Board Schematic Design	\$4,440.00	\$4,440.00	\$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
12	MANDSPASSL	4,440	4,440	0 days	1/9/04	2/6/04	\$4,440.00	\$4,440.00	\$0.00	\$4,440.00

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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Finder 2/4 Board Schematic Design" continued

Notes

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4w (32 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$440
100% OSU Electrical Tech - 4 w (160 hrs)@\$25/hr = \$4000

1.3.3.2.3.9	Prototype Finder SL7 Board Schematic Design	\$4,440.00	\$4,440.00	\$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
12	MANDSPASSL	4,440	4,440	0 days	1/9/04	2/6/04	\$4,440.00	\$4,440.00	\$0.00	\$4,440.00

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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4w (32 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$440
100% OSU Electrical Tech - 4 w (160 hrs)@\$25/hr = \$4000

1.3.3.2.3.10	Prototype Finder 2/4 board layout	\$4,650.00	\$4,650.00	\$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	MANDSPASSL	4,650	4,650	0 days	2/9/04	3/19/04	\$4,650.00	\$4,650.00	\$0.00	\$4,650.00

Notes

WBS Description:

Prototype Finder 2/4 PC board layout - start from Finder 1/3 board layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

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

Notes

Labor BOE:

Based on experience with Run 2A experience

50% OSU Electrical Eng. - 6 w (120 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$1650

50% OSU Electrical Tech - 6 w (120 hrs)@\$25/hr = \$3000

1.3.3.2.3.11	Prototype Finder SL7 board layout	\$4,650.00	\$4,650.00	\$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	MANDSPASSL	4,650	4,650	0 days	3/22/04	4/30/04	\$4,650.00	\$4,650.00	\$0.00	\$4,650.00

Notes

WBS Description:

Prototype Finder SL7 PC board layout - start from Finder 1/3 board layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Run 2A XFT experience

50% OSU Electrical Eng. - 6 w (120 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$1650

50% OSU Electrical Tech - 6 w (120 hrs)@\$25/hr = \$3000

1.3.3.2.3.12	Fabrication of Prototype Finder 2/4 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 2/4 board.

1.3.3.2.3.13	Fabricate Prototype Finder 2/4 board	\$12,500.00	\$12,500.00	\$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
10	MANDSPASS	12,500	12,500	0 days	3/22/04	5/14/04	\$12,500.00	\$12,500.00	\$0.00	\$12,500.00

Notes

WBS Description:

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

Notes

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

Total Cost/Board \$5808

Total Cost for

24+6 spares Boards: \$174,240

Labor BOE:

1.3.3.2.3.14	Fabrication of Prototype Finder SL7 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 SL7 board.

1.3.3.2.3.15	Fabricate Prototype Finder SL7 board	\$12,500.00	\$12,500.00	\$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
10	MANDSPASS	12,500	12,500	0 days	5/3/04	6/28/04	\$12,500.00	\$12,500.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

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

Notes

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

Total Cost/Board \$5200

Labor BOE:

1.3.3.2.3.16	Finder 2/4 board Prototype Testing	\$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
12	MANDSPASSL	1,600	1,600	0 days	5/17/04	7/13/04	\$1,600.00	\$1,600.00	\$0.00	\$1,600.00

Notes

WBS Description:

Testing of fully loaded Finder 2/4 Prototypes. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience with Run 2A Finder Boards

20% OSU Electrical Tech - 8 w (64 hrs)@\$25/hr = \$1600

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.3.17	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
12	MANDSPASSL	1,600	1,600	0 days	6/29/04	8/24/04	\$1,600.00	\$1,600.00	\$0.00	\$1,600.00

Notes

WBS Description:

Testing of fully loaded Finder SL7 prototypes. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience of Run 2A Finder boards

20% OSU Electrical Tech - 8 w (64 hrs)@\$25/hr = \$1600

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.4	Preproduction Finder Boards (OSU)	\$6,600.00	\$6,600.00	\$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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.4.1	Finder Board FPGA chp Firmware refinement	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	10%	120 hrs	0 days	5/22/03	12/26/03	\$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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.4.2	Modification of Finder 1/3 board Schematic and Layout	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	5/3/04	6/14/04	\$4,950.00	\$4,950.00	\$0.00	\$4,950.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Modification of Finder 1/3 board Schematic and Layout" continued

Notes

Modification of Finder 1/3 PC board schematic and layout: implement changes determined during prototype testing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Engineer 6 weeks (120 hrs) @ \$55/hr * 0.75 (In kind labor contribution rate) = \$4950

1.3.3.2.4.3	Testing Finder 1/3 preproduction boards	\$0.00	\$0.00	\$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
13	Physicist	200%	320 hrs	0 days	8/11/04	9/8/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of finder 1/3 preproduction boards. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4.4	Modification of Finder 2/4 Board Schematic and Layout	\$1,650.00	\$1,650.00	\$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	INKIND	1,650	1,650	0 days	7/21/04	8/3/04	\$1,650.00	\$1,650.00	\$0.00	\$1,650.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Modification of Finder 2/4 Board Schematic and Layout" continued

Notes

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng. - 2 weeks (40 hrs) @ \$55/hr * 0.75 (InKind labor contribution factor) = \$1650

1.3.3.2.4.5	Testing Finder 2/4 preproduction boards	\$0.00	\$0.00	\$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
13	Physicist	200%	320 hrs	0 days	2/2/05	3/1/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of Finder 2/4 preproduction boards. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4.6	Modification of Finder SL7 board Schematic and Layout	\$0.00	\$0.00	\$0.00	0	0.5	0
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Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Modification of Finder SL7 board Schematic and Layout" continued

Notes

Based on experience with Run 2A XFT

1.3.3.2.4.7	Testing Finder SL7 preproduction boards	\$0.00	\$0.00	\$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
13	Physicist	200%	320 hrs	0 days	12/13/04	1/13/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing Finder SL7 preproduction boards. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4.8	Preproduction Finder 2/4 Board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.2.4.9	Preproduction Finder SL7 Board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.2.4.10	Preproduction Finder 1/3 Board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.2.5	Preproduction Finder Boards(FNAL)	\$47,100.00	\$47,100.00	\$0.00	0	0	0
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Notes

WBS Description:

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

1.3.3.2.5.1	Modification of Finder 1/3 board Schematic and Layout	\$4,650.00	\$4,650.00	\$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	MANDSPASSL	4,650	4,650	0 days	5/3/04	6/14/04	\$4,650.00	\$4,650.00	\$0.00	\$4,650.00

Notes

WBS Description:

Modification of Finder 1/3 PC board schematic and layout: implement changes determined during prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Modification of Finder 1/3 board Schematic and Layout" continued

Notes
M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Engineer - 6 weeks (120hrs) @ \$55/hr * 0.25 (FNAL reimburtment factor) = \$1650

50% - OSU Electrical Tech - 6 weeks (120hrs) @ \$25/hr = \$3000

1.3.3.2.5.2	Preproduction Finder1/3 board Fabrication	\$12,500.00	\$12,500.00	\$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
10	MANDSPASS	12,500	12,500	0 days	6/15/04	8/10/04	\$12,500.00	\$12,500.00	\$0.00	\$12,500.00

Notes
WBS Description:

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:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.5.3	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
12	MANDSPASSL	800	800	0 days	8/11/04	9/8/04	\$800.00	\$800.00	\$0.00	\$800.00

Notes

WBS Description:

Testing of finder 1/3 preproduction boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

20% - OSU Electrical Tech 4 weeks (32 hrs) @ \$25/hr

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.5.4	Modification of Finder 2/4 Board Schematic and Layout	\$1,550.00	\$1,550.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,550	1,550	0 days	7/21/04	8/3/04	\$1,550.00	\$1,550.00	\$0.00	\$1,550.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Engineer - 2 weeks (40hrs) @ \$55/hr * 0.25 (FNAL reimbursement factor) = \$550

50% - OSU Electrical Tech - 2 weeks (40hrs) @ \$25/hr = \$1000

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

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	8/4/04	9/29/04	\$12,500.00	\$12,500.00	\$0.00	\$12,500.00

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

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

Total Cost/Board \$5808

Total Cost for

24+6 spares Boards: \$174,240

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

Labor BOE:

1.3.3.2.5.6	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
12	MANDSPASSL	800	800	0 days	2/2/05	3/1/05	\$800.00	\$800.00	\$0.00	\$800.00

Notes

WBS Description:

Testing of Finder 2/4 preproduction boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

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

Notes

Labor BOE:
Based on experience with Run 2A XFT

20% OSU Electrical Tech - 4 weeks (32 hrs) @ \$25/hr

1.3.3.2.5.7	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
12	MANDSPASSL	1,000	1,000	0 days	9/30/04	10/13/04	\$1,000.00	\$1,000.00	\$0.00	\$1,000.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% OSU Electrical Tech - 2 weeks (40h) @ \$25/hr

Based on experience with Run 2A XFT

1.3.3.2.5.8	Preproduction Finder SL7 board Fabrication	\$12,500.00	\$12,500.00	\$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
10	MANDSPASS	12,500	12,500	0 days	10/14/04	12/10/04	\$12,500.00	\$12,500.00	\$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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Finder SL7 board Fabrication" continued

Notes

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:

1.3.3.2.5.9		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		
12	MANDSPASSL	800	800	0 days	12/13/04	1/13/05	\$800.00	\$800.00	\$0.00	\$800.00		

Notes

WBS Description:

Testing Finder SL7 preproduction boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

20% OSU Electrical Tech 4 weeks (32 hrs) @ \$25/hr
Based on experience with Run 2A XFT

1.3.3.2.6		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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.6.1	Production Readiness Review - Finder 1/3 boards	\$0.00	\$0.00	\$0.00	0	0	0

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

1.3.3.2.6.2	Production of Finder 1/3 boards	\$156,000.00	\$156,000.00	\$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
10	MANDSPASS	156,000	156,000	0 days	11/5/04	2/21/05	\$156,000.00	\$156,000.00	\$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:

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

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.6.3	Test Production Finder 1/3 boards	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	2,400	2,400	0 days	2/22/05	5/16/05	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
13	Physicist	150%	720 hrs	0 days	2/22/05	5/16/05	\$0.00	\$0.00	\$0.00	\$0.00

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

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.2.6.4	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

1.3.3.2.6.5	Production of Finder 2/4 boards	\$174,240.00	\$174,240.00	\$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
10	MANDSPASS	174,240	174,240	0 days	4/1/05	7/11/05	\$174,240.00	\$174,240.00	\$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

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

Notes

2/4 Boards:

Major Components:

Altera Stratix: \$2200

Altera Flex 10K: \$232

Xilinx FPGAs: \$1435

Secondary Components: \$971

PCB Fabrication: \$600

PCB Assembly: \$370

Total Cost/Board \$5808

Labor BOE: N/A

1.3.3.2.6.6	Test Production Finder 2/4 boards	\$2,400.00	\$2,400.00	\$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
12	MANDSPASSL	2,400	2,400	0 days	7/12/05	9/29/05	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
13	Physicist	150%	684 hrs	0 days	7/12/05	9/29/05	\$0.00	\$0.00	\$0.00	\$0.00

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

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.2.6.7	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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Readiness Review - Finder SL 7 boards" continued

Notes

Labor BOE: N/A

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

1.3.3.2.6.9	Begin Production XFT Finder SL7 boards	\$0.00	\$0.00	\$0.00	0	0	2
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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.

1.3.3.2.6.10	Production of Finder SL7 boards	\$109,200.00	\$109,200.00	\$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
10	MANDSPASS	109,200	109,200	0 days	3/29/05	7/6/05	\$109,200.00	\$109,200.00	\$0.00	\$109,200.00

Notes

WBS Description:

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

M&S BOE:

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

Total Cost/Board \$5200

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.6.11	Test Production Finder SL7 boards	\$2,400.00	\$2,400.00	\$0.00	0	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>
12	MANDSPASSL	2,400	2,400	0 days	7/7/05	9/29/05	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
13	Physicist	150%	720 hrs	0 days	7/7/05	9/29/05	\$0.00	\$0.00	\$0.00	\$0.00

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

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.2.7	Finder3D backplane	\$5,000.00	\$5,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Finder 3D backplane.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.7.1	Finder3d backplane Layout	\$1,000.00	\$1,000.00	\$0.00	0	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>
12	MANDSPASSL	1,000	1,000	0 days	6/23/03	9/16/03	\$1,000.00	\$1,000.00	\$0.00	\$1,000.00
13	Physicist	10%	48 hrs	0 days	6/23/03	9/16/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Layout of Finder 3D backplane

M&S BOE: N/A

Labor BOE:

Run 2A Finder backplane layout

25% - OSU Electrical Tech 4 wks (40 hrs) @\$25/hr = \$1000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.7.2	Finder3d Backplane Production Readiness Review	\$0.00	\$0.00	\$0.00	0	0	0

Notes
WBS Description:

Production Readiness review for the Finder3D Backplane.

MS BOE: N/A

Labor BOE:

1.3.3.2.7.3	Finder3d backplane Fabrication and Stuffing	\$4,000.00	\$4,000.00	\$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
10	MANDSPASS	4,000	4,000	0 days	9/18/03	10/15/03	\$4,000.00	\$4,000.00	\$0.00	\$4,000.00

Notes
WBS Description:

Finder 3D backplane Fabrication and Stuffing

M&S BOE:

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

\$4,000 + contingency for two finder3d backplanes

Labor BOE: N/A

1.3.3.2.8	Prototype Finder boards schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.3	Test equipment	\$25,000.00	\$25,000.00	\$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
9	MANDS	25,000	25,000	0 days	12/1/03	12/12/03	\$25,000.00	\$25,000.00	\$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:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.4	TDC Transition Module	\$31,400.00	\$31,400.00	\$0.00	0	0	0

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:

1.3.3.4.2	TDC Transition Module board Fabrication	\$29,000.00	\$29,000.00	\$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
10	MANDSPASS	29,000	29,000	0 days	9/19/03	12/15/03	\$29,000.00	\$29,000.00	\$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

1.3.3.4.3	TDC Transition Module board production checkout	\$2,400.00	\$2,400.00	\$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
12	MANDSPASSL	2,400	2,400	0 days	12/16/03	3/15/04	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
13	Physicist	80%	384 hrs	0 days	12/16/03	3/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
"TDC Transition Module board production checkout" continued										
<u>Notes</u>										
TDC Transition Module production board testing and QA.										
M&S BOE: N/A										
Labor BOE:										
Checkout time for Run 2A boards										
20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400										
1.3.3.4.4	TDC Transition Module schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0			
1.3.3.5	Finder Transition Module	\$21,600.00	\$21,600.00	\$0.00	0	0	0			
<u>Notes</u>										
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										
1.3.3.5.1	Production Readiness Review - Finder Transition board	\$0.00	\$0.00	\$0.00	0	0	0			
<u>Notes</u>										
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	0.3	0	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	MANDSPASS	20,000	20,000	0 days	5/20/03	7/16/03	\$20,000.00	\$20,000.00	\$1,000.00	\$19,000.00
<u>Notes</u>										
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										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.5.3	Production Finder Transition Module checkout	\$1,600.00	\$1,600.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,600	1,600	0 days	7/17/03	9/11/03	\$1,600.00	\$1,600.00	\$0.00	\$1,600.00
13	Physicist	80%	256 hrs	0 days	7/17/03	9/11/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Production Finder Transition Module testing and QA.

M&S BOE: N/A

Labor BOE:

Testing time for Run 2A boards

20% - OSU Electrical Tech 8 wks (64 hrs) @\$25/hr = \$1600

1.3.3.5.4	Finder Transition Module schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.6	Finder3D Tester Board	\$13,600.00	\$13,600.00	\$0.00	0	0	0
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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 (OSU)	\$4,950.00	\$4,950.00	\$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	INKIND	4,950	4,950	0 days	5/19/03	6/30/03	\$4,950.00	\$4,950.00	\$0.00	\$4,950.00
13	Physicist	10%	24 hrs	0 days	5/19/03	6/30/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Finder 3D Tester board schematic design and layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Design time for run 2a tester boards

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Finder3D Tester Board schematic design and layout (OSU)" continued

Notes

50% - OSU Electrical Engineer - 6 wks (120 hrs) @ \$55/hr * 0.75 (INKIND labor contribution factor) = \$4950

1.3.3.6.2	Finder3D Tester Board schematic design and layout (FNAL)	\$4,650.00	\$4,650.00	\$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	MANDSPASSL	4,650	4,650	0 days	5/19/03	6/30/03	\$4,650.00	\$4,650.00	\$0.00	\$4,650.00

Notes

WBS Description:

Finder 3D Tester board schematic design and layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Design time for run 2a tester boards

50% - OSU Electrical Tech - 6 wks (120 hrs) @ \$25/hr = \$3000

50% - OSU Electrical Eng - 6 wks (120 hrs) @ \$55/hr * 0.25 (Eng labor reimbursement rate) = \$1650

1.3.3.6.3	Finder3D Tester board fabrication	\$4,000.00	\$4,000.00	\$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
10	MANDSPASS	4,000	4,000	0 days	7/1/03	7/29/03	\$4,000.00	\$4,000.00	\$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

1.3.3.6.4	Finder3D tester board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
"Finder3D tester board schedule contingency task" continued							
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	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	4,000	4,000	0 days	10/30/03	11/26/03	\$4,000.00	\$4,000.00	\$0.00	\$4,000.00
13	Physicist	10%	16 hrs	0 days	10/30/03	11/26/03	\$0.00	\$0.00	\$0.00	\$0.00

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	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	4,000	4,000	0 days	12/1/03	12/30/03	\$4,000.00	\$4,000.00	\$0.00	\$4,000.00
13	Physicist	10%	16 hrs	0 days	12/1/03	12/30/03	\$0.00	\$0.00	\$0.00	\$0.00

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:

1.3.3.7.4	Cables schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Cables schedule contingency task" continued

1.3.3.8	Linker Modules	\$259,544.00	\$259,544.00	\$0.00	0	0	0
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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 (FNAL)	\$6,200.00	\$6,200.00	\$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
12	MANDSPASSL	6,200	6,200	0 days	10/31/02	4/16/03	\$6,200.00	\$6,200.00	\$5,143.18	\$1,056.82
13	Physicist	50%	450 hrs	0 days	10/31/02	4/16/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Schematic design of the Linker PC board including all I/O, control, and processing components. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 8 w (160 hrs) @\$55/hr * 0.25 (Eng. labor reimbursement rate) = \$2200

50% - OSU Electrical Tech - 8 w (160 hrs) @\$25/hr = \$4000

1.3.3.8.1.2	Prototype Linker Module Schematic Design (OSU)	\$6,600.00	\$6,600.00	\$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
11	INKIND	6,600	6,600	0 days	10/31/02	4/16/03	\$6,600.00	\$6,600.00	\$5,475.00	\$1,125.00
13	Physicist	50%	450 hrs	0 days	10/31/02	4/16/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Linker Module Schematic Design (OSU)" continued

Notes

Schematic design of the Linker PC board including all I/O, control, and processing components. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 8 w (160 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$6600

1.3.3.8.1.3	Prototype Linker Module pc board layout (FNAL)	\$10,850.00	\$10,850.00	\$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	MANDSPASSL	10,850	10,850	0 days	4/17/03	9/26/03	\$10,850.00	\$10,850.00	\$2,006.74	\$8,843.26

Notes

WBS Description:

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

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 14 w (280 h) @\$55/hr * 0.25 (Eng. labor reimbursment rate) = \$3850

50% - OSU Electrical Tech - 14 w (280 h) @\$25/hr = \$7000

1.3.3.8.1.4	Prototype Linker Module pc board layout (OSU)	\$11,550.00	\$11,550.00	\$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	INKIND	11,550	11,550	0 days	4/17/03	9/26/03	\$11,550.00	\$11,550.00	\$2,136.21	\$9,413.79

Notes

WBS Description:

Prototype Linker Module PC board layout, including parts placement and trace routing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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

Notes

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 14 w (280 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$11550

1.3.3.8.1.5	FPGA Firmware Development	\$0.00	\$0.00	\$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
13	Physicist	50%	240 hrs	0 days	4/17/03	7/11/03	\$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

1.3.3.8.1.6	Prototype Linker Module pc board fabrication	\$14,037.00	\$14,037.00	\$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
10	MANDSPASS	14,037	14,037	0 days	9/29/03	11/7/03	\$14,037.00	\$14,037.00	\$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:

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

Notes

Major Components:
 Altera Stratix: \$3300
 Altera Flex 10K: \$1035
 Secondary Components: \$ 384
 PCB Fabrication: \$ 600
 PCB Assembly: \$ 370

 Total Cost/Board \$5689

Labor BOE: N/A

1.3.3.8.1.7	Linker Module Test Stand Setup	\$10,400.00	\$10,400.00	\$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
10	MANDSPASS	10,000	10,000	0 days	10/28/03	11/24/03	\$10,000.00	\$10,000.00	\$0.00	\$10,000.00
12	MANDSPASSL	400	400	0 days	10/28/03	11/24/03	\$400.00	\$400.00	\$0.00	\$400.00
13	Physicist	20%	32 hrs	0 days	10/28/03	11/24/03	\$0.00	\$0.00	\$0.00	\$0.00

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.

10% OSU Electrical Tech - 4w (16hrs) @\$25/hr = \$400

1.3.3.8.1.9	Prototype XFT Linker Module available for testing	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

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

1.3.3.8.1.10	Prototype Linker Module testing	\$2,400.00	\$2,400.00	\$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
12	MANDSPASSL	2,400	2,400	0 days	11/25/03	2/25/04	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
14	PostDoc	200%	960 hrs	0 days	11/25/03	2/25/04	\$0.00	\$0.00	\$0.00	\$0.00

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

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:

Based on experience with Run 2A XFT

20% OSU Electrical Tech - 12w (96 hrs)@\$25/hr = \$2400

1.3.3.8.1.11	Prototype Linker Modules schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.8.2	Preproduction Linker Modules	\$24,437.00	\$24,437.00	\$0.00	0	0	0
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Notes

WBS Description:

Preproduction version of Linker Module

1.3.3.8.2.1	Modification of Schematic Design and Layout (FNAL)	\$4,650.00	\$4,650.00	\$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	MANDSPASSL	4,650	4,650	0 days	3/4/04	4/14/04	\$4,650.00	\$4,650.00	\$0.00	\$4,650.00

Notes

WBS Description:

Modification of Schematic Design of Layout based on performance of prototype Linker Module PC board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) @\$55/hr * 0.25 (Eng. labor reimbursment rate) = \$1650

50% - OSU Electrical Tech - 6 wks (120 hrs) @\$25/hr = \$3000

1.3.3.8.2.2	Modification of Schematic Design and Layout (OSU)	\$4,950.00	\$4,950.00	\$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	INKIND	4,950	4,950	0 days	3/4/04	4/14/04	\$4,950.00	\$4,950.00	\$0.00	\$4,950.00

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

Notes

WBS Description:

Modification of Schematic Design of Layout based on performance of prototype Linker Module PC board. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) * 0.75 (INKIND Labor contribution) = \$4950

1.3.3.8.2.3	Preproduction Linker Module pc board fabrication	\$14,037.00	\$14,037.00	\$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
10	MANDSPASS	14,037	14,037	0 days	4/15/04	6/10/04	\$14,037.00	\$14,037.00	\$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)

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

Total Cost/Board	\$5689

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.8.2.4	FPGA Firmware Refinement	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	10%	72 hrs	0 days	3/4/04	7/9/04	\$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

1.3.3.8.2.5	Preproduction Linker Module pc board testing	\$800.00	\$800.00	\$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
12	MANDSPASSL	800	800	0 days	6/11/04	7/9/04	\$800.00	\$800.00	\$0.00	\$800.00
14	PostDoc	200%	320 hrs	0 days	6/11/04	7/9/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

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

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% - OSU Electrical Tech 4 wks (32 hrs) @\$25/hr = \$800

1.3.3.8.2.6	Preproduction Linker Modules schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Production Readiness Review Linker Modules" continued

Notes

M&S BOE: N/A

Labor BOE: N/A

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

1.3.3.8.3.3	Begin Production XFT Linker Modules	\$0.00	\$0.00	\$0.00	0	0	2
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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.

1.3.3.8.3.4	Production Linker Module pc board fabrication	\$170,670.00	\$170,670.00	\$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
10	MANDSPASS	170,670	170,670	0 days	3/25/05	7/1/05	\$170,670.00	\$170,670.00	\$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

Linker System:

Major Components:

Altera Stratix: \$3300

Altera Flex 10K: \$1035

Secondary Components: \$ 384

PCB Fabrication: \$ 600

PCB Assembly: \$ 370

Total Cost/Board \$5689

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.8.3.5	Production Linker Module pc board testing	\$2,400.00	\$2,400.00	\$0.00	0	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>
12	MANDSPASSL	2,400	2,400	0 days	7/5/05	9/27/05	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
14	PostDoc	200%	960 hrs	0 days	7/5/05	9/27/05	\$0.00	\$0.00	\$0.00	\$0.00

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

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

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 (FNAL)	\$4,650.00	\$4,650.00	\$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>
12	MANDSPASSL	4,650	4,650	0 days	7/1/04	8/12/04	\$4,650.00	\$4,650.00	\$0.00	\$4,650.00

Notes
WBS Description:

Linker Output Module Schematic Design and Layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) @\$55/hr * 0.25 (Eng labor reimbursment factor) = \$1650

50% - OSU Electrical Tech - 6 wks (120 hrs)@\$25/hr = \$3000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.9.2	Linker Output Module Schematic Design and Layout (OSU)	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	7/1/04	8/12/04	\$4,950.00	\$4,950.00	\$0.00	\$4,950.00

Notes

WBS Description:

Linker Output Module Schematic Design and Layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) @\$55/hr * 0.75 (INKIND Eng labor contrib factor) = \$4950

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.9.3	Linker Output Module Preproduction PC board Fabrication	\$2,000.00	\$2,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	2,000	2,000	0 days	8/13/04	9/24/04	\$2,000.00	\$2,000.00	\$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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.9.4	PreProduction Link Output Module Preproduction board check	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	160 hrs	0 days	9/27/04	10/22/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

M&S 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

Labor BOE:

1.3.3.9.5	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:

1.3.3.9.6	Linker Output Module board Fabrication	\$24,000.00	\$24,000.00	\$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
10	MANDSPASS	24,000	24,000	0 days	10/26/04	1/26/05	\$24,000.00	\$24,000.00	\$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

1.3.3.9.7	Production Link Output Module board checkout	\$1,200.00	\$1,200.00	\$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
12	MANDSPASSL	1,200	1,200	0 days	1/27/05	3/9/05	\$1,200.00	\$1,200.00	\$0.00	\$1,200.00
13	Physicist	200%	480 hrs	0 days	1/27/05	3/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
"Production Link Output Module board checkout" continued							
<u>Notes</u>							
M&S BOE: N/A							
Labor BOE:							
Based on experience with Run 2A XFT							
20% - OSU Electrical Tech 6 wks (48 hrs) @\$25/hr = \$1200							

1.3.3.9.8	Linker Output Module II schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.10	Stereo Association Modules	\$296,326.00	\$296,326.00	\$0.00	0	0	0
<u>Notes</u>							
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	Prototype Stereo Association Module (FNAL)	\$33,870.00	\$33,870.00	\$0.00	0	0	0
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<u>Notes</u>							
WBS Description:							
Summary item for prototype stereo association module development.							

1.3.3.10.1.1	Prototype Stereo Association Module Schematic Design	\$6,510.00	\$6,510.00	\$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	MANDSPASSL	6,510	6,510	0 days	3/4/02	6/16/03	\$6,510.00	\$6,510.00	\$1,995.22	\$4,514.78

<u>Notes</u>										
WBS Description:										
Schematic design of CDF XFT II Stereo Association Module (SAM). The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.										

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.										
30% UIUC Electrical Eng - 35w (420h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$6510										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.3.10.1.2	Prototype Stereo Association Module pc board layout	\$7,440.00	\$7,440.00	\$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>
12	MANDSPASSL	7,440	7,440	0 days	10/3/03	1/2/04	\$7,440.00	\$7,440.00	\$0.00	\$7,440.00

Notes

WBS Description:

Printed circuit board layout will proceed from the schematic. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

100% UIUC Electrical Eng - 12w (480h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$7440

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	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	MANDSPASS	10,000	10,000	0 days	1/20/04	3/15/04	\$10,000.00	\$10,000.00	\$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

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

Notes

total cost = 9114.03 + 4228.90 = 13342.93

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

Labor BOE: N/A

1.3.3.10.1.5	Prototype Stereo Association Module testing	\$9,920.00	\$9,920.00	\$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	MANDSPASSL	9,920	9,920	0 days	4/12/04	8/31/04	\$9,920.00	\$9,920.00	\$0.00	\$9,920.00

Notes

WBS Description:

Prototype test and evaluation will be performed by combination of engineering and physicist labor. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

80% UIUC Electrical Eng - 20w (640h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$9920

1.3.3.10.2	Prototype Stereo Association Module (ILL)	\$71,610.00	\$71,610.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary item for prototype stereo association module development.

1.3.3.10.2.1	Prototype Stereo Association Module Schematic Design	\$19,530.00	\$19,530.00	\$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	INKIND	19,530	19,530	0 days	3/4/02	10/1/03	\$19,530.00	\$19,530.00	\$4,807.38	\$14,722.62

Notes

WBS Description:

Schematic design of CDF XFT II Stereo Association Module (SAM). The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Stereo Association Module Schematic Design" continued

Notes

Labor BOE:

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

30% UIUC Electrical Eng - 35w (420h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$19530

1.3.3.10.2.2	Prototype Stereo Association Module pc board layout	\$22,320.00	\$22,320.00	\$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	INKIND	22,320	22,320	0 days	10/3/03	1/2/04	\$22,320.00	\$22,320.00	\$0.00	\$22,320.00
14	PostDoc	100%	480 hrs	0 days	10/3/03	1/2/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Printed circuit board layout will proceed from the schematic. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

100% UIUC Electrical Eng - 12w (480h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$22320

1.3.3.10.2.3	Prototype Stereo Association Module testing	\$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
11	INKIND	29,760	29,760	0 days	4/12/04	8/10/04	\$29,760.00	\$29,760.00	\$0.00	\$29,760.00
14	PostDoc	200%	1,360 hrs	0 days	4/12/04	8/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Prototype test and evaluation will be performed by combination of engineering and physicist labor. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

80% UIUC Electrical Eng - 20w (640h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$29760

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																									
1.3.3.10.3	Preproduction Stereo Association Module	\$16,726.00	\$16,726.00	\$0.00	0	0	0																									
	<u>Notes</u>																															
	WBS Description:																															
	Summary task for preproduction SAM development.																															
1.3.3.10.3.1	Preproduction Readiness Review Stereo Association Module	\$0.00	\$0.00	\$0.00	0	0	0																									
	<u>Notes</u>																															
	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																															
1.3.3.10.3.3	Begin Preproduction XFT Stereo Association Modules	\$0.00	\$0.00	\$0.00	0	0	2																									
	<u>Notes</u>																															
	WBS Description:																															
	Milestone marking the completion of the prototyping phase of the development of the Stereo Association Modules.																															
1.3.3.10.3.4	Modification of Schematic Design and Layout (FNAL)	\$744.00	\$744.00	\$0.00	0.5	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>12</td> <td>MANDSPASSL</td> <td>744</td> <td>744</td> <td>0 days</td> <td>11/30/04</td> <td>12/20/04</td> <td>\$744.00</td> <td>\$744.00</td> <td>\$0.00</td> <td>\$744.00</td> </tr> </tbody> </table>										ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	12	MANDSPASSL	744	744	0 days	11/30/04	12/20/04	\$744.00	\$744.00	\$0.00	\$744.00
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																						
12	MANDSPASSL	744	744	0 days	11/30/04	12/20/04	\$744.00	\$744.00	\$0.00	\$744.00																						
	<u>Notes</u>																															
	WBS Description:																															
	Modification of schematic design and layout based upon results of prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.																															
	M&S BOE: N/A																															
	Labor BOE:																															
	Time based upon experience from Run 2a XTRP system.																															
	20% - UIUC Electrical Eng. - 6 wks (48h) @\$62/hr * 0.25 (Eng. labor reimbursment rate) = \$744																															
1.3.3.10.3.5	Modification of Schematic Design and Layout (ILL)	\$2,232.00	\$2,232.00	\$0.00	0.5	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>INKIND</td> <td>2,232</td> <td>2,232</td> <td>0 days</td> <td>11/30/04</td> <td>12/20/04</td> <td>\$2,232.00</td> <td>\$2,232.00</td> <td>\$0.00</td> <td>\$2,232.00</td> </tr> </tbody> </table>										ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	11	INKIND	2,232	2,232	0 days	11/30/04	12/20/04	\$2,232.00	\$2,232.00	\$0.00	\$2,232.00
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																						
11	INKIND	2,232	2,232	0 days	11/30/04	12/20/04	\$2,232.00	\$2,232.00	\$0.00	\$2,232.00																						

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

Notes

WBS Description:

Modification of schematic design and layout based upon results of prototype testing. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

20% - UIUC Electrical Eng. - 6 wks (48h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$2232

1.3.3.10.3.6	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

1.3.3.10.3.7	Preproduction Stereo Association Module pc board fabrication	\$13,750.00	\$13,750.00	\$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
10	MANDSPASS	13,750	13,750	0 days	12/30/04	1/31/05	\$13,750.00	\$13,750.00	\$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

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

Notes

total cost = 9114.03 + 4228.90 = 13342.93

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

Labor BOE: N/A

1.3.3.10.3.8	Preproduction Stereo Association Module pc board testing	\$0.00	\$0.00	\$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
14	PostDoc	100%	160 hrs	0 days	2/1/05	2/28/05	\$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.

1.3.3.10.3.9	Preproduction Stereo Association Module schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.10.4	Production Stereo Association Module (FNAL)	\$133,080.00	\$133,080.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM production run.

1.3.3.10.4.1	Modification of Schematic Design and 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
12	MANDSPASSL	1,240	1,240	0 days	3/1/05	3/28/05	\$1,240.00	\$1,240.00	\$0.00	\$1,240.00

Notes

WBS Description:

Modification of schematic design and layout based upon results of preproduction testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

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

Notes

50% - UIUC Electrical Eng. - 4 wks (80h) @\$62/hr * 0.25 (Eng. labor reimbursment rate) = \$1240

1.3.3.10.4.2	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

1.3.3.10.4.3	Production Stereo Association Module pc board fabrication	\$110,000.00	\$110,000.00	\$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
10	MANDSPASS	110,000	110,000	0 days	3/30/05	5/24/05	\$110,000.00	\$110,000.00	\$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

1.3.3.10.4.4	Production Stereo Association Module pc board testing	\$21,840.00	\$21,840.00	\$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
12	MANDSPASSL	21,840	21,840	0 days	5/25/05	7/28/05	\$21,840.00	\$21,840.00	\$0.00	\$21,840.00

Notes

WBS Description:

Test of production boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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

Notes

M&S BOE: N/A

Labor BOE:

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

100% - UIUC Electrical Tech - 12 wks (480h) @\$30/hr = \$14400

100% - UIUC Electrical Eng. - 12 wks (480h) @\$62/hr * 0.25 (Eng. labor reimbursment rate) = \$7440

1.3.3.10.4.6	XFT Production Stereo Association Modules complete	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

Description

Milestone denoting the completion of the Stereo Association Modules.

1.3.3.10.5	Production Stereo Association Module (ILL)	\$26,040.00	\$26,040.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM production run.

1.3.3.10.5.1	Modification of Schematic Design and Layout	\$3,720.00	\$3,720.00	\$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	INKIND	3,720	3,720	0 days	3/1/05	3/28/05	\$3,720.00	\$3,720.00	\$0.00	\$3,720.00

Notes

WBS Description:

Modification of schematic design and layout based upon results of preproduction testing. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

50% - UIUC Electrical Eng. - 4 wks (80h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$3720

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.10.5.2	Production Stereo Association Module pc board testing	\$22,320.00	\$22,320.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	22,320	22,320	0 days	5/25/05	8/18/05	\$22,320.00	\$22,320.00	\$0.00	\$22,320.00
14	PostDoc	200%	960 hrs	0 days	5/25/05	8/18/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Test of production boards. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

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

100% - UIUC Electrical Eng. - 12 wks (480h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$22320

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

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	7/23/03	8/19/03	\$15,000.00	\$15,000.00	\$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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.11	Stereo Association Module Custom Backplane (FNAL)	\$11,540.00	\$11,540.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task for SAM custom backplane.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.11.1	Stereo Assoc. Module Custom Backplane Schematic design	\$744.00	\$744.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	744	744	0 days	3/3/03	10/15/03	\$744.00	\$744.00	\$95.72	\$648.28

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Assoc. Module Custom Backplane Schematic design" continued

Notes

WBS Description:

Schematic depends upon SAM signal routing and detector geometry. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$744

1.3.3.11.2	Stereo Association Module Backplane layout	\$372.00	\$372.00	\$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	MANDSPASSL	372	372	0 days	10/16/03	1/15/04	\$372.00	\$372.00	\$0.00	\$372.00

Notes

WBS Description:

Task will be performed in parallel with SAM design. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

5% - UIUC Electrical Eng. - 12 wks (24h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$372

1.3.3.11.3	Stereo Association Module Backplane fabrication	\$10,000.00	\$10,000.00	\$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
10	MANDSPASS	10,000	10,000	0 days	1/16/04	2/13/04	\$10,000.00	\$10,000.00	\$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.

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

Notes
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

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	300	300	0 days	2/16/04	2/20/04	\$300.00	\$300.00	\$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.

25% - UIUC Electrical Tech. - 1 wk (10hrs) @\$30/hr = \$300

1.3.3.11.5 Stereo Association Module Backplane testing \$124.00 \$124.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	124	124	0 days	2/23/04	3/19/04	\$124.00	\$124.00	\$0.00	\$124.00

Notes
WBS Description:

Backplane testing happens in conjunction with prototype SAM testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

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

5% - UIUC Electrical Eng. - 4 wks (8h) @\$62/hr * 0.25 (Eng. labor reimbursment rate) = \$124

1.3.3.11.6 Stereo Assoc. Module Custom Backplane schedule contingency \$0.00 \$0.00 \$0.00 0 0 0

1.3.3.12 Stereo Association Module Custom Backplane (ILL) \$3,720.00 \$3,720.00 \$0.00 0 0 0

Notes
WBS Description:

Summary task for SAM custom backplane.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Custom Backplane (ILL)" continued

Notes

1.3.3.12.1 Stereo Assoc. Module Custom Backplane Schematic design \$2,232.00 \$2,232.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,232	2,232	0 days	3/3/03	5/23/03	\$2,232.00	\$2,232.00	\$223.20	\$2,008.80

Notes

WBS Description:

Schematic depends upon SAM signal routing and detector geometry. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$2232

1.3.3.12.2 Stereo Association Module Backplane layout \$1,116.00 \$1,116.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1,116	1,116	0 days	10/16/03	1/15/04	\$1,116.00	\$1,116.00	\$0.00	\$1,116.00
14	PostDoc	5%	24 hrs	0 days	10/16/03	1/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Task will be performed in parallel with SAM design. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

5% - UIUC Electrical Eng. - 12 wks (24h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$1116

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.12.3	Stereo Association Module Backplane testing					\$372.00	\$372.00	\$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>	
11	INKIND	372	372	0 days	2/23/04	3/19/04	\$372.00	\$372.00	\$0.00	\$372.00	
14	PostDoc	10%	16 hrs	0 days	2/23/04	3/19/04	\$0.00	\$0.00	\$0.00	\$0.00	

Notes

WBS Description:

Backplane testing happens in conjunction with prototype SAM testing. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

5% - UIUC Electrical Eng. - 4 wks (8h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$372

1.3.3.13	Stereo Association Module Tester Board (FNAL)					\$28,888.00	\$28,888.00	\$0.00	0	0	0
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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.

1.3.3.13.1	Stereo Association Module Tester Board schematic design					\$2,976.00	\$2,976.00	\$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>	
12	MANDSPASSL	2,976	2,976	0 days	10/16/03	2/13/04	\$2,976.00	\$2,976.00	\$148.80	\$2,827.20	

Notes

WBS Description:

Schematic design of SAM tester board will occur in conjunction with SAM board design. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

30% - UIUC Electrical Eng. - 16 wks (8h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$2976

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

Notes

1.3.3.13.2 Stereo Association Module Tester Board layout \$3,472.00 \$3,472.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	3,472	3,472	0 days	2/16/04	4/9/04	\$3,472.00	\$3,472.00	\$0.00	\$3,472.00

Notes

WBS Description:

Layout of the SAM tester board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

70% - UIUC Electrical Eng. - 8 wks (224h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$3472

1.3.3.13.3 Stereo Association Module Tester Board Fabrication \$15,000.00 \$15,000.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	4/12/04	6/7/04	\$15,000.00	\$15,000.00	\$0.00	\$15,000.00

Notes

WBS Description:

SAM Tester board fabrication, assembly and components. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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

1.3.3.13.4 Stereo Association Module TestStand Setup and software \$1,240.00 \$1,240.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,240	1,240	0 days	4/12/04	8/31/04	\$1,240.00	\$1,240.00	\$0.00	\$1,240.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module TestStand Setup and software" continued

Notes

WBS Description:

Development of test stand software will be performed mostly by physicists. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

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.

10% - UIUC Electrical Eng. - 20 wks (80h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1240

1.3.3.13.5	Stereo Association Module Tester Board testing	\$6,200.00	\$6,200.00	\$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
12	MANDSPASSL	6,200	6,200	0 days	9/1/04	11/10/04	\$6,200.00	\$6,200.00	\$0.00	\$6,200.00

Notes

WBS Description:

SAM Tester Board testing occurs in parallel with the testing of the SAM and backplane. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

100% - UIUC Electrical Eng. - 10 wks (400h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$6200

1.3.3.14	Stereo Association Module Tester Board (ILL)	\$41,664.00	\$41,664.00	\$0.00	0	0	0
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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.

1.3.3.14.1	Stereo Association Module Tester Board schematic design	\$8,928.00	\$8,928.00	\$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	INKIND	8,928	8,928	0 days	10/16/03	2/13/04	\$8,928.00	\$8,928.00	\$446.40	\$8,481.60

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

Notes

WBS Description:

Schematic design of SAM tester board will occur in conjunction with SAM board design. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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.

5% - UIUC Electrical Eng. - 16 wks (192h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$8928

1.3.3.14.2	Stereo Association Module Tester Board layout	\$10,416.00	\$10,416.00	\$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	INKIND	10,416	10,416	0 days	2/16/04	4/9/04	\$10,416.00	\$10,416.00	\$0.00	\$10,416.00
14	PostDoc	20%	64 hrs	0 days	2/16/04	4/9/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Layout of the SAM tester board. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

70% - UIUC Electrical Eng. - 8 wks (224h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$10416

1.3.3.14.3	Stereo Association Module TestStand Setup and software	\$3,720.00	\$3,720.00	\$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	INKIND	3,720	3,720	0 days	4/12/04	8/31/04	\$3,720.00	\$3,720.00	\$0.00	\$3,720.00
14	PostDoc	200%	1,600 hrs	0 days	4/12/04	8/31/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Development of test stand software will be performed mostly by physicists. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module TestStand Setup and software" continued

Notes

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.

10% - UIUC Electrical Eng. - 20 wks (80h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$3720

1.3.3.14.4	Stereo Association Module Tester Board testing	\$18,600.00	\$18,600.00	\$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
11	INKIND	18,600	18,600	0 days	9/1/04	11/10/04	\$18,600.00	\$18,600.00	\$0.00	\$18,600.00
14	PostDoc	200%	800 hrs	0 days	9/1/04	11/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

SAM Tester Board testing occurs in parallel with the testing of the SAM and backplane. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

100% - UIUC Electrical Eng. - 10 wks (400h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$18,600

1.3.3.15	Stereo Association Module Transition Module (FNAL)	\$16,054.00	\$16,054.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM transition module.

1.3.3.15.1	Stereo Association Module Transition Module Schematic design	\$744.00	\$744.00	\$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	MANDSPASSL	744	744	0 days	5/12/03	8/5/03	\$744.00	\$744.00	\$37.20	\$706.80

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Transition Module Schematic design" continued

Notes

Transition board design will proceed in parallel with SAM development.
Task start time determined by the need to finalize digital link specifications. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$744

1.3.3.15.2	Stereo Association Module Transition Module layout	\$310.00	\$310.00	\$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	MANDSPASSL	310	310	0 days	8/6/03	9/10/03	\$310.00	\$310.00	\$0.00	\$310.00

Notes

WBS Description:

Transition module layout to be performed by a physicist in consultation with an engineer. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

10% - UIUC Electrical Eng. - 5 wks (20h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$310

1.3.3.15.3	Stereo Association Module Transition Module fabrication	\$15,000.00	\$15,000.00	\$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
10	MANDSPASS	15,000	15,000	0 days	9/11/03	11/5/03	\$15,000.00	\$15,000.00	\$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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Transition Module fabrication" continued

Notes

Labor BOE:

1.3.3.15.4	Stereo Association Module Transition Module testing	\$0.00	\$0.00	\$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
14	PostDoc	100%	240 hrs	0 days	11/6/03	12/19/03	\$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.

1.3.3.15.5	Stereo Assoc. Module Transition Module schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.16	Stereo Association Module Transition Module (ILL)	\$3,162.00	\$3,162.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM transition module.

1.3.3.16.1	Stereo Association Module Transition Module Schematic design	\$2,232.00	\$2,232.00	\$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	INKIND	2,232	2,232	0 days	5/12/03	8/5/03	\$2,232.00	\$2,232.00	\$111.60	\$2,120.40

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. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$2232

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.16.2	Stereo Association Module Transition Module layout					\$930.00	\$930.00	\$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>
	11	INKIND	930	930	0 days	8/6/03	9/10/03	\$930.00	\$930.00	\$0.00	\$930.00
	14	PostDoc	100%	200 hrs	0 days	8/6/03	9/10/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Transition module layout to be performed by a physicist in consultation with an engineer. . The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

10% - UIUC Electrical Eng. - 5 wks (20h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$930

1.3.3.17	Stereo Association Module Clock and Control Board (FNAL					\$13,348.00	\$13,348.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM Clock and Control board.

1.3.3.17.1	Stereo Association Module Clock and Control Board Schematic					\$1,488.00	\$1,488.00	\$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>
	12	MANDSPASSL	1,488	1,488	0 days	6/3/03	8/26/03	\$1,488.00	\$1,488.00	\$0.00	\$1,488.00

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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1488

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.17.2	Stereo Association Module Clock and Control Board Layout	\$1,860.00	\$1,860.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,860	1,860	0 days	8/27/03	10/8/03	\$1,860.00	\$1,860.00	\$0.00	\$1,860.00

Notes

WBS Description:

Layout of the SAM Clock & control board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1860

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.17.3	Stereo Association Module Clock and Control Board Fabrication	\$10,000.00	\$10,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	10,000	10,000	0 days	10/9/03	11/26/03	\$10,000.00	\$10,000.00	\$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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.17.4	Stereo Association Module Clock and Control Board testing	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	PostDoc	100%	160 hrs	0 days	12/1/03	12/30/03	\$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

Labor BOE:

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

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

1.3.3.17.5	Stereo Assoc. Module Clock and Control board schedule contin	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.18	Stereo Association Module Clock and Control Board (ILL)	\$10,044.00	\$10,044.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task for SAM Clock and Control board.

1.3.3.18.1	Stereo Association Module Clock and Control Board Schematic	\$4,464.00	\$4,464.00	\$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	INKIND	4,464	4,464	0 days	6/3/03	8/26/03	\$4,464.00	\$4,464.00	\$0.00	\$4,464.00

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. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$4464

1.3.3.18.2	Stereo Association Module Clock and Control Board Layout	\$5,580.00	\$5,580.00	\$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	INKIND	5,580	5,580	0 days	8/27/03	10/8/03	\$5,580.00	\$5,580.00	\$0.00	\$5,580.00
14	PostDoc	100%	240 hrs	0 days	8/27/03	10/8/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Layout of the SAM Clock & control board. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

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 Clock and Control Board Layout" continued

Notes

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

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$5580

1.3.3.19	SAM Clock and Control Transition Module (FNAL)	\$13,348.00	\$13,348.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM clock and control transition module.

1.3.3.19.1	SAM Clock and Control TM Schematic Design	\$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
12	MANDSPASSL	1,488	1,488	0 days	6/3/03	8/26/03	\$1,488.00	\$1,488.00	\$0.00	\$1,488.00

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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1488

1.3.3.19.2	SAM Clock and Control TM Layout	\$1,860.00	\$1,860.00	\$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	MANDSPASSL	1,860	1,860	0 days	8/27/03	10/8/03	\$1,860.00	\$1,860.00	\$0.00	\$1,860.00

Notes

WBS Description:

SAM clock and control TM layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

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

Notes

Labor BOE:

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

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1860

1.3.3.19.3	SAM Clock and Control TM Fabrication	\$10,000.00	\$10,000.00	\$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
10	MANDSPASS	10,000	10,000	0 days	10/9/03	11/26/03	\$10,000.00	\$10,000.00	\$0.00	\$10,000.00

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

1.3.3.19.4	SAM Clock and Control TM testing	\$0.00	\$0.00	\$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
14	PostDoc	100%	160 hrs	0 days	12/1/03	12/30/03	\$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.

1.3.3.19.5	SAM Clock and Control Transition Module schedule contingenc	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.20	SAM Clock and Control Transition Module (ILL)	\$10,044.00	\$10,044.00	\$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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"SAM Clock and Control Transition Module (ILL)" continued

Notes

Summary task for SAM clock and control transition module.

1.3.3.20.1	SAM Clock and Control TM Schematic Design	\$4,464.00	\$4,464.00	\$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	INKIND	4,464	4,464	0 days	6/3/03	8/26/03	\$4,464.00	\$4,464.00	\$0.00	\$4,464.00

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. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$4464

1.3.3.20.2	SAM Clock and Control TM Layout	\$5,580.00	\$5,580.00	\$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	INKIND	5,580	5,580	0 days	8/27/03	10/8/03	\$5,580.00	\$5,580.00	\$0.00	\$5,580.00
14	PostDoc	100%	240 hrs	0 days	8/27/03	10/8/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

SAM clock and control TM layout. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

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

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$5580

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.21	Level 2 Interface Board	\$47,280.00	\$47,280.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task for XFT-> Level 2 interface board.

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
1.3.3.21.1	Level 2 Interface Board Schematic and PCB Layout (ILL)						\$14,880.00	\$14,880.00	\$0.00	0.5	0.5	0
11	INKIND	14,880	14,880	0 days	1/2/04	2/27/04	\$14,880.00	\$14,880.00	\$0.00	\$14,880.00		

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. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

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

100% UIUC Electrical Eng - 8w (320h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$14880

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
1.3.3.21.2	Level 2 Interface Board Schematic and PCB Layout (FNAL)						\$4,960.00	\$4,960.00	\$0.00	0.5	0.5	0
12	MANDSPASSL	4,960	4,960	0 days	1/2/04	2/27/04	\$4,960.00	\$4,960.00	\$0.00	\$4,960.00		

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. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

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

100% UIUC Electrical Eng - 8w (320h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$4960

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.21.3	Prototype Level 2 Interface Board fabrication and testing	\$5,000.00	\$5,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	5,000	5,000	0 days	3/1/04	4/23/04	\$5,000.00	\$5,000.00	\$0.00	\$5,000.00

Notes

WBS Description:

Prototype L2 interface board.

M&S BOE: N/A

Physicist estimate.

Labor BOE: N/A

1.3.3.21.4	Modification Level 2 Interface Board Schematic and PCB Layout	\$5,580.00	\$5,580.00	\$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	INKIND	5,580	5,580	0 days	4/26/04	5/14/04	\$5,580.00	\$5,580.00	\$0.00	\$5,580.00

Notes

WBS Description:

Schematic modification based upon results of prototype tests. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Physicist's estimate.

100% UIUC Electrical Eng - 3w (120h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$5580

1.3.3.21.5	Modification Level 2 Interface Board Schematic and PCB Layout	\$1,860.00	\$1,860.00	\$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	MANDSPASSL	1,860	1,860	0 days	4/26/04	5/14/04	\$1,860.00	\$1,860.00	\$0.00	\$1,860.00

Notes

WBS Description:

Schematic modification based upon results of prototype tests. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

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

Notes

Labor BOE:
Physicist's estimate.

100% UIUC Electrical Eng - 3w (120h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$1860

1.3.3.21.6 Production Level 2 Interface Board Fabrication and assembly \$15,000.00 \$15,000.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	5/17/04	7/13/04	\$15,000.00	\$15,000.00	\$0.00	\$15,000.00

Notes

WBS Description:

Production run.

M&S BOE: N/A
Cost is physicist's estimate.

Labor BOE: N/A

1.3.3.21.7 Level 2 Interface Board checkout \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	320 hrs	0 days	7/14/04	9/8/04	\$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.

1.3.3.23 XFT Ready for Installation at CDF \$0.00 \$0.00 \$0.00 0 0 2

Notes

WBS Description:
Milestone indicating XFT project complete.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.4	Event-Builder Upgrade	\$379,938.24	\$414,000.00	\$0.00	0	0	0

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.

1.3.4.1	Start Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	3
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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	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	PostDoc	40%	384 hrs	0 days	12/5/02	5/30/03	\$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	\$96,891.44	\$0.00	\$0.00	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.

1.3.4.3.1	decide on the OS versions	\$0.00	\$0.00	\$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
14	PostDoc	50%	40 hrs	0 days	10/20/03	10/31/03	\$0.00	\$0.00	\$0.00	\$0.00

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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"decide on the OS versions" continued

Notes
M/S BOE: N/A

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

1.3.4.3.2	write Control Software	\$0.00	\$0.00	\$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
8	StudentU	100%	2,920 hrs	0 days	11/4/03	4/20/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	584 hrs	0 days	11/4/03	4/20/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Write the control software that talks to the Single board computers in VME create and the converter node.
M/S BOE: N/A

Labor BOE:
Based upon experience with the D0 Run 2a system.

1.3.4.3.3	Write Monitoring Software	\$0.00	\$0.00	\$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
8	StudentU	100%	2,920 hrs	0 days	11/4/03	4/20/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	584 hrs	0 days	11/4/03	4/20/05	\$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

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	3
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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

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
"MS: establish general functionality of software" continued										
<u>Notes</u>										
end of the Event-Builder upgrade leave time for this last test.										
1.3.4.3.6	Software commissioning	\$96,891.44	\$0.00	\$0.00	0	0	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>
3	CompProfF	73%	2,061.52 hrs	0 days	11/4/03	4/4/05	\$96,891.44	\$96,891.44	\$0.00	\$96,891.44
1.3.4.4	construct prototype	\$140,246.80	\$103,500.00	\$0.00	0	0	0			
<u>Notes</u>										
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)	\$54,200.00	\$103,500.00	\$0.00	0	0	0			
<u>Notes</u>										
WBS Description:										
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	3			
<u>Notes</u>										
WBS Description:										
The submission of the purchase order and the implementation plan is a milestone.										
1.3.4.4.1.2	purchase formalities for switch	\$40,000.00	\$103,500.00	\$0.00	0.3	0	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>
9	MANDS	40,000	40,000	0 days	10/2/03	10/24/03	\$40,000.00	\$40,000.00	\$40,000.00	\$0.00
<u>Notes</u>										
WBS Description:										
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS. For Cisco 6509 switch. M/S BOE:										
FNAL PO 553957 - cost \$36,181.14										
Labor BOE: N/A										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.4.4.1.3	Purchase formalities for single board computers	\$5,200.00	\$0.00	\$0.00	0	0	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>
9	MANDS	5,200	5,200	0 days	10/2/03	10/24/03	\$5,200.00	\$5,200.00	\$5,200.00	\$0.00

Notes

WBS Description:
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.
For 2 VMIC single board computers for VME crates. VMIVME-7805-110
M/S BOE:

Quote to FNAL 21-Aug-03 Quote # C03-5819 price \$2600 per SBC - 2 required - \$5200

Labor BOE: N/A

1.3.4.4.1.4	Arrival of the prototype Event Builder hardware	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

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

1.3.4.4.1.5	EVB Construct prototype schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.4.4.1.6	Purchase formalities for Cisco 3750 switch	\$9,000.00	\$0.00	\$0.00	0	0	0
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<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>
9	MANDS	9,000	9,000	0 days	1/16/04	3/12/04	\$9,000.00	\$9,000.00	\$9,000.00	\$0.00

Notes

WBS Description:
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.
For 1 Cisco Catalyst 3750 Switch and SFP GBIC daughter/transceiver cards

M/S BOE:
from e-mail message from Bruce Knuteson 27-Nov-03:

=====
Cisco Catalyst 3750 switch for test system

Cisco part number should be : WS-C3750G-24TS-S
The switch is a 24-port 10/100/1000 copper ports, and 4 SFP Gigabit ports.
List Price is \$7000

You will need to order the SFP GBIC daughter/transceiver cards Cisco part number: GLC-SX-MM, GE SFP, LC connector SX transceiver List Price is \$500Each

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WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Purchase formalities for Cisco 3750 switch" continued

Notes

Labor BOE: N/A

1.3.4.4.2 install test stand \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	512 hrs	0 days	10/27/03	2/2/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	102.4 hrs	0 days	10/27/03	2/2/04	\$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

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 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	512 hrs	0 days	2/3/04	4/30/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	102.4 hrs	0 days	2/3/04	4/30/04	\$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 3

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	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.4.4.6	Engineering for Prototype system	\$38,926.80	\$0.00	\$0.00	0	0	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>
4	ElecEngF	50%	707.77 hrs	0 days	10/2/03	6/21/04	\$38,926.80	\$38,926.80	\$19,126.80	\$19,800.00
<u>Notes</u>										
WBS Description:										
The engineering effort by Ron Rechenmacher of FNAL on Prototype Event Builder system										
M&S BOE: N/A										
Labor BOE:										
Estimation based on similar work done with D0 collaboration on their existing system										
1.3.4.4.7	Network Stetup for Prototype system	\$7,520.00	\$0.00	\$0.00	0	0	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>
3	CompProfF	100%	160 hrs	0 days	2/3/04	3/1/04	\$7,520.00	\$7,520.00	\$7,520.00	\$0.00
<u>Notes</u>										
WBS Description:										
The effort by FNAL Computing Division Network group on setting up the network switch for the Prototype Event Builder system										
M&S BOE: N/A										
Labor BOE:										
Estimation based on similar work done through out the lab										
1.3.4.4.8	Engineering for TDC readout	\$39,600.00	\$0.00	\$0.00	0	0	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>
4	ElecEngF	50%	720 hrs	0 days	10/30/03	7/20/04	\$39,600.00	\$39,600.00	\$0.00	\$39,600.00
1.3.4.5	construct full size system	\$132,800.00	\$310,500.00	\$0.00	0	0	0			

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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																						
1.3.4.5.1	Production Readiness Review - Event Builder	\$0.00	\$0.00	\$0.00	0	0	0																						
	<u>Notes</u>																												
	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.																												
	M&S BOE: N/A																												
	Labor BOE: N/A																												
	Schedule BOE: lag of 100 days due to anticipated funding for FY2004																												
1.3.4.5.3	Event Builder Production Readiness Review	\$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.																												
1.3.4.5.4	purchase remaining hardware	\$80,000.00	\$310,500.00	\$0.00	0	0	0																						
	<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.																												
1.3.4.5.4.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3																						
	<u>Notes</u>																												
	WBS Description:																												
	The submission of the purchase order and the implementation plan is a milestone.																												
1.3.4.5.4.2	purchase formalities	\$80,000.00	\$310,500.00	\$0.00	0.3	0	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>9</td> <td>MANDS</td> <td>80,000</td> <td>80,000</td> <td>0 days</td> <td>6/23/04</td> <td>8/30/04</td> <td>\$80,000.00</td> <td>\$80,000.00</td> <td>\$12,000.00</td> <td>\$68,000.00</td> </tr> </tbody> </table>							ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	9	MANDS	80,000	80,000	0 days	6/23/04	8/30/04	\$80,000.00	\$80,000.00	\$12,000.00	\$68,000.00
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																			
9	MANDS	80,000	80,000	0 days	6/23/04	8/30/04	\$80,000.00	\$80,000.00	\$12,000.00	\$68,000.00																			
	<u>Notes</u>																												
	WBS Description:																												
	Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.																												
	These include the purchase of 24 single board computers and 2 48 port Cisco WS-X6748-GE-TX Gigabit Ethernet over copper modules.																												
	M/S BOE:																												
	Vendor quote August 21,2003 24 Single board computers - \$2457.90/each = \$58,989.60																												
	Cisco WS-X6748-GE-TX module price comes from PO 553957 - \$10,000/each = \$20,000																												
	Labor BOE: N/A																												

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.4.5.4.4	Arrival of the Event Builder hardware	\$0.00	\$0.00	\$0.00	0	0	2

Notes
WBS Description:

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

1.3.4.5.4.6	Contingency on arrival of event builder hardware	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.4.5.5	assemble new hardware in B0 third floor	\$8,800.00	\$0.00	\$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
4	ElecEngF	100%	160 hrs	0 days	10/18/04	11/12/04	\$8,800.00	\$8,800.00	\$0.00	\$8,800.00
8	StudentU	100%	160 hrs	0 days	10/18/04	11/12/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	32 hrs	0 days	10/18/04	11/12/04	\$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.

1.3.4.5.6	evaluate the Full System	\$17,600.00	\$0.00	\$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
4	ElecEngF	100%	320 hrs	0 days	11/15/04	1/18/05	\$17,600.00	\$17,600.00	\$0.00	\$17,600.00
8	StudentU	100%	320 hrs	0 days	11/15/04	1/18/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	64 hrs	0 days	11/15/04	1/18/05	\$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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.4.5.7	MS: establish functionality of hardware	\$0.00	\$0.00	\$0.00	0	0	3			
<u>Notes</u>										
WBS Description:										
Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.										
1.3.4.5.9	Engineering support for full sized system	\$26,400.00	\$0.00	\$0.00	0	0	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>
4	ElecEngF	100%	480 hrs	0 days	6/23/04	9/16/04	\$26,400.00	\$26,400.00	\$0.00	\$26,400.00
1.3.4.6	Switch Data taking to new Event Builder	\$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	L3 MS: Finish Event Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	3			
1.3.4.8	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.										
1.3.4.9	Contingency on completion of Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	0			
1.3.4.10	Procure support hardware and software	\$10,000.00	\$0.00	\$0.00	0	0	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>
9	MANDS	10,000	10,000	0 days	10/2/03	3/11/05	\$10,000.00	\$10,000.00	\$7,500.00	\$2,500.00
<u>Notes</u>										
These funds are to cover miscellaneous expenses.										
1.3.5	Computer for Level3 PC Farm / DAQ	\$382,500.00	\$382,500.00	\$0.00	0	0	0			
<u>Notes</u>										
WBS Description:										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Computer for Level3 PC Farm / DAQ" continued

Notes

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	3
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Notes

WBS Description:

This milestone marks the beginning of the DAQ and Level3 computer purchases.

1.3.5.2	replace 10 DAQ PCs (2003)	\$15,000.00	\$15,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task describing the purchase of 10 DAQ computers in FY2003.

1.3.5.2.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

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

1.3.5.2.2	purchase formalities	\$15,000.00	\$15,000.00	\$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
9	MANDS	15,000	15,000	0 days	6/3/04	8/26/04	\$15,000.00	\$15,000.00	\$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

1.3.5.2.3	install and test one prototype machine	\$0.00	\$0.00	\$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
8	StudentU	100%	80 hrs	0 days	8/27/04	9/10/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	16 hrs	0 days	8/27/04	9/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"install and test one prototype machine" continued

Notes

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.

1.3.5.2.5	Arrival of 0/10 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

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

1.3.5.2.6	burn in phase	\$0.00	\$0.00	\$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
8	StudentU	50%	40 hrs	0 days	9/20/04	10/1/04	\$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.

1.3.5.2.7	installation into the DAQ system	\$0.00	\$0.00	\$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
8	StudentU	100%	40 hrs	0 days	10/4/04	10/8/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	8 hrs	0 days	10/4/04	10/8/04	\$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.

WBS Dictionary as of 7/7/04
CDF Run11b DAQ

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.5.2.8	Replace 10 DAQ PCs schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.5.3	replace 15 DAQ PCs (2004)	\$22,500.00	\$22,500.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task describing the purchase of 15 DAQ computers in FY004.

1.3.5.3.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
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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	\$22,500.00	\$22,500.00	\$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
9	MANDS	22,500	22,500	0 days	11/2/04	2/2/05	\$22,500.00	\$22,500.00	\$0.00	\$22,500.00

Notes

WBS Description:

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

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	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	2/3/05	2/16/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	16 hrs	0 days	2/3/05	2/16/05	\$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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.3.4	arrival of 15 DAQ 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			
1.3.5.3.5	burn in phase	\$0.00	\$0.00	\$0.00	0	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>
8	StudentU	50%	40 hrs	0 days	2/24/05	3/9/05	\$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:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.5.3.6	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0	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>
8	StudentU	100%	40 hrs	0 days	3/10/05	3/16/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	8 hrs	0 days	3/10/05	3/16/05	\$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.

1.3.5.3.8	Replace 15 DAQ PCs schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.5.4	replace 20 DAQ PCs (2005)	\$30,000.00	\$30,000.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task describing the purchase of 20 DAQ computers in FY2005.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.4.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3

Notes
WBS Description:

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

1.3.5.4.2	purchase formalities	\$30,000.00	\$30,000.00	\$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
9	MANDS	30,000	30,000	0 days	12/10/04	3/10/05	\$30,000.00	\$30,000.00	\$0.00	\$30,000.00

Notes
WBS Description:

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	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	3/11/05	3/24/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	16 hrs	0 days	3/11/05	3/24/05	\$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 20 DAQ 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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.5.4.5	burn in phase	\$0.00	\$0.00	\$0.00	0	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	3/25/05	4/7/05	\$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.

1.3.5.4.6	installation into the DAQ system	\$0.00	\$0.00	\$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
8	StudentU	100%	40 hrs	0 days	4/8/05	4/14/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	8 hrs	0 days	4/8/05	4/14/05	\$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.

1.3.5.4.8	Replace 20 DAQ PCs schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.5.5	replace 70 Level 3 PCs (2004)	\$105,000.00	\$105,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task describing the purchase of 70 level 3 computers in FY2004.

1.3.5.5.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

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
1.3.5.5.2	purchase formalities	\$105,000.00	\$105,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	105,000	105,000	0 days	11/2/04	2/2/05	\$105,000.00	\$105,000.00	\$0.00	\$105,000.00

Notes

WBS Description:

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

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

1.3.5.5.3	install and test one prototype machine	\$0.00	\$0.00	\$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
8	StudentU	100%	80 hrs	0 days	2/3/05	2/16/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	16 hrs	0 days	2/3/05	2/16/05	\$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.

1.3.5.5.5	Arrival of 70 Level3 and 15 DAQ PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 70 Level 3 worker node PC's and 15 DAQ PC's.

1.3.5.5.6	burn in phase	\$0.00	\$0.00	\$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
8	StudentU	50%	40 hrs	0 days	2/24/05	3/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

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.

1.3.5.5.7	installation into the DAQ system	\$0.00	\$0.00	\$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
8	StudentU	100%	40 hrs	0 days	3/10/05	3/16/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	8 hrs	0 days	3/10/05	3/16/05	\$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.

1.3.5.6	replace 140 Level 3 PCs (2005)	\$210,000.00	\$210,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task describing the purchase of 140 level 3 computers in FY2005.

1.3.5.6.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

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

1.3.5.6.2	purchase formalities	\$210,000.00	\$210,000.00	\$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
9	MANDS	210,000	210,000	0 days	12/10/04	3/10/05	\$210,000.00	\$210,000.00	\$0.00	\$210,000.00

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

Notes

WBS Description:

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

1.3.5.6.3 install and test one prototype machine \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	3/11/05	3/24/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	16 hrs	0 days	3/11/05	3/24/05	\$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.

1.3.5.6.5 Arrival of 140/20 PCs from the vendor \$0.00 \$0.00 \$0.00 0 0 2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 140 Level 3 PCs and 20 DAQ PC's.

1.3.5.6.6 burn in phase \$0.00 \$0.00 \$0.00 0 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	3/25/05	4/7/05	\$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.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.6.7 installation into the DAQ system \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	40 hrs	0 days	4/8/05	4/14/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	20%	8 hrs	0 days	4/8/05	4/14/05	\$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.

1.3.5.8 Finish Purchase of Computers for Level3/DAQ system \$0.00 \$0.00 \$0.00 0 0 2

Notes

WBS Description:

This milestone marks the end of the PC purchases for the DAQ and the Level3 PC Farm.

1.3.6 SVT upgrade \$231,600.00 \$231,600.00 \$0.00 0 0 0

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 3

Notes

WBS Description:

Milestone to begin SVT upgrade.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.6.2	trackfitter boards	\$161,600.00	\$161,600.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task to produce new Track Fitter boards. New boards necessary to handle SVX IIb geometry.

1.3.6.2.1	Upgrade SVT trackfitters (FNAL)	\$161,600.00	\$161,600.00	\$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
10	MANDSPASS	128,000	128,000	0 days	6/23/04	12/13/04	\$128,000.00	\$128,000.00	\$0.00	\$128,000.00
12	MANDSPASSL	33,600	33,600	0 days	6/23/04	12/13/04	\$33,600.00	\$33,600.00	\$0.00	\$33,600.00

Notes

WBS Description:

This task includes

The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

50% of 1 Electrical Engineering from U of Chicago - 6 mons (480 hrs) @ \$70/hr = \$33600

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
TOTAL	\$94K

This makes the grand total \$162K.

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.6.2.2	Upgrade SVT trackfitters (Chicago)					\$0.00	\$0.00	\$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>
	11	INKIND	0	0	0 days	6/23/04	12/13/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task includes

The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:

50% of 1 Electrical Engineering from U of Chicago - 6 mons (480 hrs) @ \$70/hr

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>

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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
TOTAL	\$94K

This makes the grand total \$162K.

Mel

1.3.6.2.3	SVT Trackfitter boards schedule contingency					\$0.00	\$0.00	\$0.00	0	0	0
1.3.6.3	Merger boards					\$70,000.00	\$70,000.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task for the production of new SVT Merger boards. These boards are identical to the Run 2a Merger boards.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level																						
1.3.6.3.1	Upgrade SVT merger boards	\$70,000.00	\$70,000.00	\$0.00	0.3	0.3	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> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>INKIND</td> <td>70,000</td> <td>70,000</td> <td>0 days</td> <td>2/3/04</td> <td>6/22/04</td> <td>\$70,000.00</td> <td>\$70,000.00</td> <td>\$0.00</td> <td>\$70,000.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	11	INKIND	70,000	70,000	0 days	2/3/04	6/22/04	\$70,000.00	\$70,000.00	\$0.00	\$70,000.00						
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																			
11	INKIND	70,000	70,000	0 days	2/3/04	6/22/04	\$70,000.00	\$70,000.00	\$0.00	\$70,000.00																			
	<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																												
1.3.6.5	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.																												
1.3.7	Silcon Detector DAQ Upgrades	\$726,390.00	\$527,900.00	\$144,418.00	0	0	0																						
1.3.7.1	Fiber Transition Module Replacements	\$285,846.00	\$165,500.00	\$120,786.00	0	0	0																						
	<u>Notes</u>																												
	WBS Definition -																												
	Fiber Transition Modules. These boards are part of the upper DAQ system and are the interface to the JPC. There are 2 JPC per FTM. New boards are needed to replace the Fiber Transition Modules (FTMs) because we are not using optical transmitter/receivers for the data.																												
	M&S BOE -																												
	Here we estimate the price of making a totally new card.																												
	There are 52 JPC's installed the project.																												
	There is one FTM every 2 JPC = 26 FTMs.																												
	We need to have spares and extra boards for test stands: need 36 total FTMs (6 spares + 4 for DAQ test stands)																												
	Runs:																												
	1. Prototype																												
	2. Preproduction																												
	3. Production																												
	Labor BOE -																												
1.3.7.1.1	FTM - 1st Preproduction	\$71,198.00	\$22,500.00	\$48,698.00	0	0	0																						
1.3.7.1.1.1	Explicit Slack: FTM design	\$0.00	\$0.00	\$0.00	0	0	5																						

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.7.1.1.2	FTM: spec, design and layout	\$40,698.00	\$0.00	\$40,698.00	0	0.4	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	25%	306 hrs	0 days	2/7/03	9/12/03	\$16,830.00	\$8,800.00	\$16,830.00	\$0.00
5	ElecTechF	50%	612 hrs	0 days	2/7/03	9/12/03	\$23,868.00	\$12,480.00	\$23,868.00	\$0.00

Notes

WBS Definition -

M&S BOE -

Labor BOE -

1. Electrical Eng. (50%) specifications, design and firmware development
2. Electrical Tech. (50%) layout

1.3.7.1.1.3	FTM Submission	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Definition -

M&S BOE -

Labor BOE -

1.3.7.1.1.4	FTM: procurement and assembly	\$22,500.00	\$22,500.00	\$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
9	MANDS	22,500	22,500	0 days	9/15/03	11/7/03	\$22,500.00	\$22,500.00	\$0.00	\$22,500.00

Notes

WBS Definition -

Procurement and Assembly of the Prototype of the Fiber Transition Module.

M&S BOE -

Cost is based on the price of the Run IIA FTM card.

\$1,000 PCB

\$500.00 FPGA

\$500.00 Ball Grid Array assembly of FPGA

\$2,500 for miscellaneous components and assembly.

Total is \$4,500 per FTM.

5 boards as prototype. Total is \$22,500

Labor BOE -

Schedule BOE -

It takes 20 days to manufacture the board + 20 days for installing and assembly FPGA and connectors.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.7.1.1.5	FTM: test and evaluation	\$8,000.00	\$0.00	\$8,000.00	0	0.4	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>
4	ElecEngF	10%	32 hrs	0 days	11/10/03	1/12/04	\$1,760.00	\$1,760.00	\$0.00	\$1,760.00
5	ElecTechF	50%	160 hrs	0 days	11/10/03	1/12/04	\$6,240.00	\$6,240.00	\$0.00	\$6,240.00
14	PostDoc	50%	160 hrs	0 days	11/10/03	1/2/04	\$0.00	\$0.00	\$0.00	\$0.00
<u>Notes</u>										
WBS Definition -										
M&S BOE -										
Labor BOE -										
1.3.7.1.1.6	FTM available	\$0.00	\$0.00	\$0.00	0	0	4			
<u>Notes</u>										
WBS Definition -										
M&S BOE -										
Labor BOE -										
1.3.7.1.2	FTM preproduction	\$69,560.00	\$35,000.00	\$34,560.00	0	0	0			
<u>Notes</u>										
WBS Definition -										
Preproduction run of the Fiber Transition module. Preproduction quantity is 10.										
M&S BOE -										
Labor BOE -										
1.3.7.1.2.1	Explicit Slack: Preproduction and Production FTMs	\$0.00	\$0.00	\$0.00	0	0	5			
1.3.7.1.2.2	Preproduction FTM: spec, design and layout	\$22,560.00	\$0.00	\$22,560.00	0	0.4	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>
4	ElecEngF	50%	240 hrs	0 days	3/2/05	5/24/05	\$13,200.00	\$13,200.00	\$0.00	\$13,200.00
5	ElecTechF	50%	240 hrs	0 days	3/2/05	5/24/05	\$9,360.00	\$9,360.00	\$0.00	\$9,360.00
<u>Notes</u>										
WBS Definition -										
This is intended to be the final FTM design (i.e. preproduction).										
M&S BOE -										
Labor BOE -										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction FTM: spec, design and layout" continued

Notes

Schedule BOE -

1.3.7.1.2.3	Preproduction FTM Submission	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Definition -

M&S BOE -

Labor BOE -

1.3.7.1.2.4	Preproduction FTM: procurement and assembly	\$35,000.00	\$35,000.00	\$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
9	MANDS	35,000	35,000	0 days	5/25/05	7/21/05	\$35,000.00	\$35,000.00	\$0.00	\$35,000.00

Notes

WBS Definition -

Preproduction of Fiber Transition Modules. Preproduction quantity is 10.

M&S BOE -

Cost is based on the price of the Run IIA FTM card.

\$3,500 per board (includes components, assembling, connectors etc.).

This is less expensive than the prototypes due to the larger quantity.

Preproduction quantity is 10.

Total Cost is **\$35,000** (Engineering Estimate)

50% contingency added

Labor BOE -

1.3.7.1.2.5	Preproduction FTM: test and evaluation	\$12,000.00	\$0.00	\$12,000.00	0	0.4	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	48 hrs	0 days	7/22/05	10/14/05	\$2,640.00	\$2,640.00	\$0.00	\$2,640.00
5	ElecTechF	50%	240 hrs	0 days	7/22/05	10/14/05	\$9,360.00	\$9,360.00	\$0.00	\$9,360.00
14	PostDoc	50%	240 hrs	0 days	7/22/05	10/13/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition -

Testing of the Fiber Transition Module card + evaluation of the FTMs performance with the DAQ system.

M&S BOE -

Labor BOE -

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
"Preproduction FTM: test and evaluation" continued										
<u>Notes</u>										
Assembling labor is costed in the manufacturing. The labor called out here is for testing the card functionality (test) and evaluating the FTM performance in within the DAQ chain (evaluation).										
1. Electrical Tech (50%) for testing										
2. Research Associate (50%) evaluation + testing software development										
3. Electrical Eng. (10%) support										
1.3.7.1.2.6	Preproduction FTM available	\$0.00	\$0.00	\$0.00	0	0	4			
<u>Notes</u>										
WBS Definition -										
M&S BOE -										
Labor BOE -										
1.3.7.1.3	FTM Production	\$145,088.00	\$108,000.00	\$37,088.00	0	0	0			
<u>Notes</u>										
WBS Definition -										
Prototype run of the Fiber Transition module. Production quantity is 26 + 10 spares for a total of 36.										
M&S BOE -										
Labor BOE -										
1.3.7.1.3.1	Production FTM: spec, design and layout	\$26,960.00	\$0.00	\$26,960.00	0	0.4	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>
4	ElecEngF	100%	320 hrs	0 days	10/17/05	12/13/05	\$17,600.00	\$17,600.00	\$0.00	\$17,600.00
5	ElecTechF	75%	240 hrs	0 days	10/17/05	12/13/05	\$9,360.00	\$9,360.00	\$0.00	\$9,360.00
<u>Notes</u>										
WBS Definition -										
M&S BOE -										
Labor BOE -										
1.3.7.1.3.2	Production go ahead on FTMs	\$0.00	\$0.00	\$0.00	0	0	4			
<u>Notes</u>										
WBS Definition -										
M&S BOE -										
Labor BOE -										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production go ahead on FTMs" continued

Notes

Schedule BOE -
Linked to the production go-ahead for cables.

1.3.7.1.3.3	Production FTM: procurement and assembly	\$108,000.00	\$108,000.00	\$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
9	MANDS	108,000	108,000	0 days	12/14/05	2/14/06	\$108,000.00	\$108,000.00	\$0.00	\$108,000.00

Notes

WBS Definition -
Procurement and assembly of the production FTM modules.

M&S BOE -
Cost is based on FTM cost for Run Ila.
\$3,000 per board (includes components, assembling, etc.).
Engineering estimate. See "Preproduction: procurement and assembly" for more details.
Need 28 + spares = 36 FTM (+ 10 from the preproduction).
We increase the number of spares because we plan to purchase the most recent parts available (especially the FPGA) for which backward compatibility with the pre-production parts is not guaranteed.

Total cost is **\$108,000** based on the engineering estimate with 50% contingency added.

Labor BOE -

1.3.7.1.3.4	Production FTM: test	\$10,128.00	\$0.00	\$10,128.00	0	0.4	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	48 hrs	0 days	2/15/06	5/9/06	\$2,640.00	\$2,640.00	\$0.00	\$2,640.00
5	ElecTechF	40%	192 hrs	0 days	2/15/06	5/9/06	\$7,488.00	\$7,488.00	\$0.00	\$7,488.00
14	PostDoc	20%	96 hrs	0 days	2/15/06	5/9/06	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition -
Test of the production of the Fiber Transition Modules cards. Production Quantity (including spares) = 36.

M&S BOE -

Labor BOE -
Assembling labor is costed in the manufacturing. The labor called out here is just for testing the card functionality.

Schedule BOE -
Estimated time is based on testing 2 FTMs per day.

WBS Dictionary as of 7/7/04
CDF RunIIb DAQ

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.7.1.3.5	Production FTM available	\$0.00	\$0.00	\$0.00	0	0	4
	<u>Notes</u>						
	WBS Definition -						
	M&S BOE -						
	Labor BOE -						
1.3.7.1.3.6	Production FTMs complete	\$0.00	\$0.00	\$0.00	0	0	4
	<u>Notes</u>						
	WBS Definition -						
	M&S BOE -						
	Labor BOE -						
1.3.7.2	DAQ Testing & Readiness	\$291,200.00	\$262,400.00	\$23,632.00	0	0	0
	<u>Notes</u>						
	WBS Definition -						
	The upper data acquisition system will not change with respect to Run IIa. The lower data acquisition chain includes new pieces: svx4 chip, miniPC, JPC and FTM.						
	These are all tests needed to assure proper functionality of the new pieces in the overall DAQ scheme. Includes the hardware necessary to perform these tests and all other electrical tests aimed at establishing good and reliable DAQ performance. It also includes the possible upgrade and obsolescent part procurement for the Upper DAQ system (FIB, VRB and SCR).						
	M&S BOE -						
	Labor BOE -						
1.3.7.2.1	DAQ: upper DAQ upgrade	\$140,000.00	\$140,000.00	\$0.00	0	0	0
	<u>Notes</u>						
	WBS Definition -						
	Upgrade of the Upper Data Acquisition System (FIB, VRB and SRC).						
	The upper part of the Data Acquisition system should remain unchanged.						
	The number of channels needed for the the new silicon detector is ~25% less than what is now implemented for the present IIa detector. Number of spares is not a problem. Nonetheless obsolescence of parts, reliability and flexibility may of the key components (SRC, FIB and VRB) may become a problem.						
	M&S BOE -						
	Risk estimate is based on the need to re-do one board (the SRC) and to purchase spare components for the other boards (FIB and VRB) to cope with obsolescence.						
	1. new SRC \$120,000 Engineering Estimate						

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"DAQ: upper DAQ upgrade" continued

Notes

Total = \$140,000

We spread this over three fiscal years assuming that fy03 is spent primarily on the investigation of currently available parts, on the procurement of obsolescent parts and on the design and engineering (Labor will be University labor).

FY 2003 \$20,000

FY 2004 \$60,000

FY 2005 \$60,000

And assume a 50% contingency.

Labor BOE -

1.3.7.2.1.1 DAQ: SRC, FIB, VRB (FY 2003) \$20,000.00 \$20,000.00 \$0.00 0.5 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	20,000	20,000	0 days	5/19/03	9/10/03	\$20,000.00	\$20,000.00	\$11,419.56	\$8,580.44

Notes

WBS Definition -

Cost of possible upgrade of the Upper DAQ system for Fiscal Year 2003.

M&S BOE -

Labor BOE -

1.3.7.2.1.2 DAQ: SRC, FIB, VRB (FY 2004) \$60,000.00 \$60,000.00 \$0.00 0.5 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	60,000	60,000	0 days	6/2/04	6/8/04	\$60,000.00	\$60,000.00	\$0.00	\$60,000.00

Notes

WBS Definition -

Cost of possible upgrade of the Upper DAQ system for Fiscal Year 2004.

M&S BOE -

Labor BOE -

1.3.7.2.1.3 DAQ:SRC,FIB,VRB (FY 2005) \$60,000.00 \$60,000.00 \$0.00 0.5 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	60,000	60,000	0 days	1/4/05	1/10/05	\$60,000.00	\$60,000.00	\$0.00	\$60,000.00

Notes

WBS Definition -

Cost of possible upgrade of the Upper DAQ system for Fiscal Year 2005.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"DAQ:SRC,FIB,VRB (FY 2005)" continued

Notes

M&S BOE -

Labor BOE -

1.3.7.2.2	DAQ Testing Prototype	\$47,656.00	\$40,000.00	\$3,576.00	0	0	0
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Notes

WBS Definition -

Testing of the Prototype DAQ chain.

runs:

prototype #1

prototype #2

M&S BOE -

Here is the cost of all electrical testing (M&S) at FNAL. Includes DAQ stands, Burn-in stations, computers, miscellaneous PC boards and material, cables, tools and instrument (oscilloscope etc. is needed).

Labor BOE -

1.3.7.2.2.1	Testing of Prototype DAQ Chain	\$47,656.00	\$40,000.00	\$3,576.00	0.5	0.4	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	48 hrs	0 days	12/6/02	3/6/03	\$2,640.00	\$2,640.00	\$2,640.00	\$0.00
5	ElecTechF	5%	24 hrs	0 days	12/6/02	3/6/03	\$936.00	\$936.00	\$936.00	\$0.00
9	MANDS	40,000	40,000	0 days	12/6/02	2/27/03	\$40,000.00	\$40,000.00	\$40,000.00	\$0.00
13	Physicist	20%	96 hrs	0 days	12/6/02	2/27/03	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	480 hrs	0 days	12/6/02	2/27/03	\$0.00	\$0.00	\$0.00	\$0.00
15	MechTechSF	10%	48 hrs	0 days	12/6/02	2/27/03	\$1,632.00	\$0.00	\$1,632.00	\$0.00
16	MechEngSF	10%	48 hrs	0 days	12/6/02	2/27/03	\$2,448.00	\$0.00	\$2,448.00	\$0.00

Notes

WBS Definition -

Testing of the 1st prototype of DAQ system (1st prototype of stave).

M&S BOE -

Here is calculated the cost of all electrical testing (M&S) at FNAL up to this phase.

Includes upgrade to DAQ stands and Burn-in stations, new computers, bench power supplies, miscellaneous boards and material, cables, tools and instruments.

Most of the above equipment is already available from the IIa effort. This is mostly to upgrade and modify what is already there.

Labor BOE -

This is based on Run IIa experience and is the labor specifically assigned to understand the DAQ issues and get all the testing equipment ready for production. It is in parallel with the labor assigned to test chips, hybrids, modules and staves.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Testing of Prototype DAQ Chain" continued

Notes

Schedule BOE -

Test begins when 1st prototype electrical stave is available. These are specific tests aimed at understanding the functionality of the stave concept.

1.3.7.2.2.2	Testing of Prototype DAQ Chain Complete- go ahead for #2	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Definition -

This Milestone is the point where we decide which, if chips, hybrids, MPC, or the Bus cable need to have another prototype round before going into preproduction.

M&S BOE -

Labor BOE -

1.3.7.2.2.3	Contingency: Go ahead for 2nd round prototypes (20)	\$0.00	\$0.00	\$0.00	0	0	5
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Notes

WBS Definition -

M&S BOE -

Labor BOE -

1.3.7.2.2.4	Silicon Project DAQ 1st round testing complete	\$0.00	\$0.00	\$0.00	0	0	2
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1.3.7.2.3	DAQ Testing 2nd Round	\$2,928.00	\$0.00	\$2,384.00	0	0	0
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1.3.7.2.3.1	Testing of proto #2 DAQ chain	\$2,928.00	\$0.00	\$2,384.00	0	0.4	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	32 hrs	0 days	9/10/03	11/4/03	\$1,760.00	\$1,760.00	\$0.00	\$1,760.00
5	ElecTechF	5%	16 hrs	0 days	9/10/03	11/4/03	\$624.00	\$624.00	\$0.00	\$624.00
13	Physicist	20%	64 hrs	0 days	9/10/03	11/4/03	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	100%	320 hrs	0 days	9/10/03	11/4/03	\$0.00	\$0.00	\$0.00	\$0.00
15	MechTechSF	5%	16 hrs	0 days	9/10/03	11/4/03	\$544.00	\$0.00	\$0.00	\$544.00

Notes

WBS Definition -

Testing of the 2nd prototype of the DAQ chain.

M&S BOE -

This assumes that the test stand is already setup from prototype 1 testing.

Labor BOE -

This is based on Run IIa experience. The additional resources are small, except for the physicist labor for the testing.

WBS Dictionary as of 7/7/04
CDF RunIIb DAQ

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.7.2.3.2	Go ahead for Preproduction	\$0.00	\$0.00	\$0.00	0	0	3			
<u>Notes</u>										
WBS Definition - Ready for preproduction procurements for all DAQ parts (except svx4 chip). This is the completion of the tests of any second round prototypes for chips, hybrids, MPC or Bus cables. All modifications necessary for Production (preproduction) have been identified.										
M&S BOE -										
Labor BOE -										
1.3.7.2.3.3	Contingency: Go ahead for preproduction	\$0.00	\$0.00	\$0.00	0	0	5			
<u>Notes</u>										
WBS Definition -										
M&S BOE -										
Labor BOE -										
1.3.7.2.3.4	Go ahead for Silicon Project DAQ Preproduction	\$0.00	\$0.00	\$0.00	0	0	2			
1.3.7.2.4	DAQ Testing Preproduction and Production	\$100,616.00	\$82,400.00	\$17,672.00	0	0	0			
<u>Notes</u>										
WBS Definition - Testing of the Pre and Production DAQ chain.										
M&S BOE -										
Labor BOE -										
1.3.7.2.4.1	Develop a new test DAQ system	\$32,552.00	\$22,400.00	\$10,152.00	0.5	0.4	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work hrs</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>
4	ElecEngF	15%	108 hrs	0 days	11/5/03	3/18/04	\$5,940.00	\$5,940.00	\$0.00	\$5,940.00
5	ElecTechF	15%	108 hrs	0 days	11/5/03	3/18/04	\$4,212.00	\$4,212.00	\$0.00	\$4,212.00
9	MANDS	22,400	22,400	0 days	11/5/03	3/9/04	\$22,400.00	\$22,400.00	\$0.00	\$22,400.00
13	Physicist	50%	360 hrs	0 days	11/5/03	3/9/04	\$0.00	\$0.00	\$0.00	\$0.00
<u>Notes</u>										
WBS Definition - Develop of a simple DAQ system which can be used for hybrid testing. This system is based on a PMCI card wich generate the proper control an timing signals to the SVX4 chip										
M&S BOE - The estimate covers : a production run of 7 cards (considering spares). Cost:										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Develop a new test DAQ system" continued

Notes

Based on actual cost of hte first ptotype.

1. \$1,600 per complete card
 2. \$1,400 for each PC
 3. \$200 for connectors and cables
- Total \$3,200 per board for 7 boards = \$22,400
Contingency is 50%

Labor BOE -

(Engineering Estimate)

1. 15% of an electrical engineer for design and testing support
 2. 50% of a physicist for design, programming and testing
 3. 15% of an electrical technician for stuffing and testing.
- Contingency is 50%

Schedule BOE -

The system should be available by the time the 2nd DAQ full test start.

1.3.7.2.4.2	Ready to test Preproduction DAQ chain	\$0.00	\$0.00	\$0.00	0	0	4
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Notes

WBS Definition -

This is an important milestone. All preproduction parts are meant to be "final" part with provision for minor changes if needed between preproduction and production.

Preproduction parts that need to be ready are:

1. Stave
2. JPC (prototype)
3. FTM (prototype)
4. MPC-JPC cables
5. JPC-crates cables
6. Power Supply (prototype)

M&S BOE -

Labor BOE -

1.3.7.2.4.3	Testing of Preproduction DAQ chain	\$68,064.00	\$60,000.00	\$7,520.00	0.5	0.4	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	25%	80 hrs	0 days	5/28/04	7/26/04	\$4,400.00	\$4,400.00	\$0.00	\$4,400.00
5	ElecTechF	25%	80 hrs	0 days	5/28/04	7/26/04	\$3,120.00	\$3,120.00	\$0.00	\$3,120.00
9	MANDS	60,000	60,000	0 days	5/28/04	7/22/04	\$60,000.00	\$60,000.00	\$0.00	\$60,000.00
13	Physicist	20%	64 hrs	0 days	5/28/04	7/22/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	200%	640 hrs	0 days	5/28/04	7/22/04	\$0.00	\$0.00	\$0.00	\$0.00
15	MechTechSF	5%	16 hrs	0 days	5/28/04	7/22/04	\$544.00	\$0.00	\$0.00	\$544.00

Notes

WBS Definition -

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
"Testing of Preproduction DAQ chain" continued							
<u>Notes</u>							
Testing of the Preproduction and Production DAQ chain.							
M&S BOE - Further electrical testing equipment at FNAL, includes DAQ stands, Burn-in stations, computers, miscellaneous PC boards and material, cables, tools, and instruments. Most of the material is already in hand.							
Labor BOE - This is based on Run IIa experience.							
Schedule BOE - Testing begins when 1st preproduction stave is available. All of the various pieces should be ordered for production quantities based on this final test.							
1.3.7.2.4.4	DAQ Production Go-Ahead	\$0.00	\$0.00	\$0.00	0	0	3
<u>Notes</u>							
WBS Definition - Ready for production procurements of DAQ parts (except SVX4 chips). This date marks the end of all decisions regarding ordering production quantities for all DAQ parts.							
M&S BOE -							
Labor BOE -							
1.3.7.2.4.5	Contingency: Go ahead for production	\$0.00	\$0.00	\$0.00	0	0	5
<u>Notes</u>							
WBS Definition -							
M&S BOE -							
Labor BOE -							
1.3.7.2.4.6	Go ahead for Silicon Project DAQ Production	\$0.00	\$0.00	\$0.00	0	0	2
1.3.7.3	Interlocks	\$100,000.00	\$100,000.00	\$0.00	0	0	0
<u>Notes</u>							
WBS Definition - This is the system that monitors the power and temperature of the detectors. It will re-use most of the existing system.							
M&S BOE -							
Labor BOE -							

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.7.3.1	Upgrade existing system	\$100,000.00	\$100,000.00	\$0.00	0.3	0.4	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	100,000	100,000	0 days	9/9/04	6/28/05	\$100,000.00	\$100,000.00	\$0.00	\$100,000.00
14	PostDoc	50%	836 hrs	0 days	9/9/04	6/28/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition -
Additional temperature and current channels will be needed.

M&S BOE -
Physicist estimate. This is the cost to upgrade the interlock system for Run IIb.

Labor BOE -

1.3.7.4	Radiation Monitoring	\$49,344.00	\$40,000.00	\$9,344.00	0	0	0
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Notes

WBS Definition -

M&S BOE -

Labor BOE -

1.3.7.4.1	Radiation monitors for inner(SVX and ISL) detector	\$24,672.00	\$20,000.00	\$4,672.00	0.5	0.4	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	20%	64 hrs	0 days	10/1/04	11/29/04	\$2,496.00	\$2,496.00	\$0.00	\$2,496.00
9	MANDS	20,000	20,000	0 days	10/1/04	11/25/04	\$20,000.00	\$20,000.00	\$0.00	\$20,000.00
13	Physicist	10%	32 hrs	0 days	10/1/04	11/25/04	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	50%	160 hrs	0 days	10/1/04	11/25/04	\$0.00	\$0.00	\$0.00	\$0.00
15	MechTechSF	20%	64 hrs	0 days	10/1/04	11/25/04	\$2,176.00	\$0.00	\$0.00	\$2,176.00

Notes

WBS Definition -
These are the radiation monitors that will mount on the SVX and on the ISL.

M&S BOE -
Cost estimate is based on Run IIa experience.

Labor BOE -
Based on Run IIa experience. A physicist plus a postdoc design the system, a mechanical technician and an electrical technician are used to build the devices. These are installed in a later task during the final assembly sequence.

1.3.7.4.2	External radiation monitors and beam abort system	\$24,672.00	\$20,000.00	\$4,672.00	0.5	0.4	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	20%	64 hrs	0 days	6/1/05	7/27/05	\$2,496.00	\$2,496.00	\$0.00	\$2,496.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"External radiation monitors and beam abort system" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	20,000	20,000	0 days	6/1/05	7/26/05	\$20,000.00	\$20,000.00	\$0.00	\$20,000.00
13	Physicist	10%	32 hrs	0 days	6/1/05	7/26/05	\$0.00	\$0.00	\$0.00	\$0.00
14	PostDoc	50%	160 hrs	0 days	6/1/05	7/26/05	\$0.00	\$0.00	\$0.00	\$0.00
15	MechTechSF	20%	64 hrs	0 days	6/1/05	7/26/05	\$2,176.00	\$0.00	\$0.00	\$2,176.00

Notes

WBS Definition -

This is to update the system of radiation monitors on the endplug and around the collision hall and also to the beam abort system.

M&S BOE -

Cost estimate is based on Run IIa experience.

Labor BOE -

Labor estimate is based on Run IIa experience. A physicist plus a postdoc are responsible for the design. A mechanical and electrical tech will help with the assembly.

Schedule BOE -

This task starts after the installation fixturing for svx into ISL is finished so that space conflicts can be avoided. Installation of these devices occurs during the shutdown when the collision hall is open.

1.3.8	Finish Run 2b Trigger DAQ project	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject.

1.3.9	Data Acquisition and Trigger Upgrades Ready for Installation	\$0.00	\$0.00	\$0.00	0	0	1
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Notes

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.

1.3.10	Accelerator "Summer" Shutdown planning tasks	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.10.1	Accelerator Shutdown 2004	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Planning task to Cover 3 month accelerator shutdown in 2004.

1.3.10.2	Accelerator Shutdown 2005	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

WBS Dictionary as of 7/7/04
CDF RunIIb DAQ

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
"Accelerator Shutdown 2005" continued							
	<u>Notes</u>						
	Planning task to Cover 3 month accelerator shutdown in 2004.						
1.31	Start of Run 2b DAQ and Trigger Project	\$0.00	\$0.00	\$0.00	0	0	3
	<u>Notes</u>						
	WBS Description: Milestone - marking the beginning of the Run 2b DAQ and Trigger upgrade project						