

ID	WBS	Name	M&S Cost	Labor Cost	Cost
1	1.1	Run 2b Silicon	\$8,739,692.01	\$5,231,328.30	\$13,971,020.31

Notes

WBS Definition-

This summary task covers the effort to develop, build, test, and install the silicon tracker for the D0 Run 2b upgrade project. The detector will replace the existing silicon microstrip tracker currently in use for Run 2a, and will enable operations up to integrated luminosities of 15 pb-1 or more.

Design Parameters

Layer	Nphi	R (mm)		# Sensors in z	# Sensors Total	Sensor Width (mm)	Readout Pitch (µm)	# Readout in z	# Chips per Readout	Total Chips	# Hybrids Total
		Axial	Stereo								
0A	12	18.55	---	12	72	15.50	50	12	2	144	72
0B	12	24.80	---	12	72	15.50	50	12	2	144	72
1A	12	34.80	---	12	72	24.97	58	12	3	216	36
1B	12	39.00	---	12	72	24.97	58	12	3	216	36
2A	12	53.23	56.33	10	120	41.10	60	8	5	480	48
2B	12	68.93	72.03	10	120	41.10	60	8	5	480	48
3A	18	89.31	86.22	10	180	41.10	60	8	5	720	72
3B	18	103.38	100.28	10	180	41.10	60	8	5	720	72
4A	24	116.91	120.00	12	288	41.10	60	8	5	960	96
4B	24	130.58	133.67	12	288	41.10	60	8	5	960	96
5A	30	150.08	146.99	12	360	41.10	60	8	5	1200	120
5B	30	163.59	160.49	12	360	41.10	60	8	5	1200	120
Total					2184					7440	888

2	1.1.1	Sensors	\$2,678,530.98	\$233,323.20	\$2,911,854.18
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Notes

WBS Definition-

This summary element includes the development and procurement of commercial silicon sensors for all layers of the detector, as well as the setup of detector probing stations, sensor probing and acceptance testing, radiation testing, and vendor qualification and monitoring.

3	1.1.1.1	Probing Equipment Setup	\$166,000.00	\$15,480.00	\$181,480.00
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Notes

WBS Definition-

This summary element includes the the setup of detector probing stations.

4	1.1.1.1.1	Kansas State Site	\$0.00	\$0.00	\$0.00
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	2,320 h	0 h	0 h	400 h	1,920 h

Notes

WBS Definition-

The setup of detector probing stations at Kansas State Univ.

Labor BOE-

Overseen at KSU by PHYSU

5	1.1.1.1.2	CINVESTAV Site	\$83,000.00	\$0.00	\$83,000.00
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	1,920 h	0 h	0 h	0 h	1,920 h

Notes

WBS Definition-

The setup of detector probing stations at CINVESTAV in Mexico.

Labor BOE-

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"CINVESTAV Site" continued											
<u>Notes</u> Overseen at CINVESTAV by PHYSU											
6	1.1.1.1.3	Stony Brook Site	\$83,000.00	\$0.00	\$83,000.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	1,760 h	0 h	0 h	0 h	1,760 h
<u>Notes</u> WBS Definition- The setup of detector probing stations at SUNY StonyBrook Labor BOE- Overseen at Stony Brook by PHYSU											
7	1.1.1.1.4	Fermilab Site	\$0.00	\$14,520.00	\$14,520.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
11	ETSF	0.5	\$14,520.00	\$0.00	\$120.00	\$14,400.00	484 h	0 h	0 h	4 h	480 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	968 h	0 h	0 h	8 h	960 h
<u>Notes</u> WBS Definition- The setup of detector probing stations at Fermilab Labor BOE- based on Run2a and projections from MRI institution estimates											
8	1.1.1.1.5	Sensor Probing Equipment Setup Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
9	1.1.1.1.6	Certify probing stations/site	\$0.00	\$960.00	\$960.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
11	ETSF	0.2	\$960.00	\$0.00	\$0.00	\$960.00	32 h	0 h	0 h	0 h	32 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- Verifying the calibrations of each probe station site with common sensors Labor BOE- Overseen by MRI PHYSU, with only FNAL manpower listed											
10	1.1.1.2	L0 Sensors	\$292,427.28	\$22,634.00	\$315,061.28						
<u>Notes</u> WBS Definition- Summary task that describes the design, prototyping, production, and testing of all sensors for L0											
11	1.1.1.2.1	Prototypes	\$55,000.00	\$11,316.00	\$66,316.00						
<u>Notes</u> WBS Definition- Summary task that describes the design, prototyping, and testing of L0 sensors											
12	1.1.1.2.1.1	Develop Specifications	\$0.00	\$11,316.00	\$11,316.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
6	EEO	1	\$11,316.00	\$0.00	\$0.00	\$11,316.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u> WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Develop Specifications" continued											
<u>Notes</u> Design and layout specifications for sensors											
Labor BOE- Based on MRI estimate											
13	1.1.1.2.1.2	ELMA	\$55,000.00	\$0.00	\$55,000.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	152 h	0 h	0 h	0 h	152 h
<u>Notes</u> WBS Definition- Prototype sensors will be purchased from ELMA and probed											
Labor BOE- Based on MRI estimate											
14	1.1.1.2.1.3	Choose L0 Technology	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
15	1.1.1.2.2	Preproduction	\$126,200.00	\$7,546.00	\$133,746.00						
<u>Notes</u> WBS Definition- Summary task that describes the design, production, and testing of preproduction L0 sensors											
16	1.1.1.2.2.1	Develop preproduction specifications (KSU)	\$0.00	\$1,886.00	\$1,886.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
6	EEO	1	\$1,886.00	\$0.00	\$0.00	\$1,886.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<u>Notes</u> WBS Definition- Design and layout specifications for sensors											
Labor BOE- Based on MRI estimate											
17	1.1.1.2.2.2	Order preproduction sensors (Fermilab)	\$10,000.00	\$0.00	\$10,000.00						
<u>Notes</u> WBS Definition- Procurement process to get vendor order in											
18	1.1.1.2.2.3	Develop masks	\$55,000.00	\$5,660.00	\$60,660.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
21	DESF	1	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- Drawings made to describe the L0 sensor masks											
Labor BOE- Run2a experience											
19	1.1.1.2.2.4	Produce preproduction sensors (Fermilab)	\$48,000.00	\$0.00	\$48,000.00						
<u>Notes</u> WBS Definition- Vendor production of silicon sensors with their testing											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Produce preproduction sensors (Fermilab)" continued											
<u>Notes</u> Labor BOE- Run2a experience											
20	1.1.1.2.2.5	Probe preproduction sensors (Fermilab)	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u> WBS Definition- QC Testing done by D0 Labor BOE- Based on MRI estimate											
21	1.1.1.2.2.6	Perform irradiation testing (Fermilab)	\$13,200.00	\$0.00	\$13,200.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u> WBS Definition- Tests to assure performance done at radiation facility Labor BOE- Based on prototyping work											
22	1.1.1.2.2.7	Analyze test results	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u> WBS Definition- Analysis of all test results including radiation studies Labor BOE- Based on prototyping work											
23	1.1.1.2.3	Production	\$111,227.28	\$3,772.00	\$114,999.28						
<u>Notes</u> WBS Definition- Summary task that describes all design, production, and testing of final sensors											
24	1.1.1.2.3.1	Develop final sensor specifications	\$0.00	\$3,772.00	\$3,772.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
6	EEO	1	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Design and layout specifications for sensors Labor BOE- MRI estimates and prototyping work											
25	1.1.1.2.3.2	Develop sensor probing procedures (KSU)	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Develop sensor probing procedures (KSU)" continued											
<i>Notes</i>											
WBS Definition- Development of QC procedures for sensors to be tested by D0											
Labor BOE- Overseen by PHYSU at MRI institutes											
26	1.1.1.2.3.3	Bid final sensor order	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Vendor qualification and bidding for production order											
27	1.1.1.2.3.4	Order production sensors	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Placement of the order at chosen vendor											
28	1.1.1.2.3.5	L0 Sensors Released For Production	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
29	1.1.1.2.3.6	Produce L0 Sensors (Fermilab)	\$64,800.00	\$0.00	\$64,800.00						
<i>Notes</i>											
WBS Definition- Vendor production of silicon sensors with their testing											
30	1.1.1.2.3.7	Probe L0 sensors (MRI)	\$46,427.28	\$0.00	\$46,427.28						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.15	\$0.00	\$0.00	\$0.00	\$0.00	72 h	0 h	0 h	0 h	72 h
<i>Notes</i>											
WBS Definition- QC Testing done by D0 at MRI centers											
Labor BOE- Overseen by PHYSU at MRI institutes											
31	1.1.1.2.3.8	Probe L0 sensors (Fermilab)	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<i>Notes</i>											
WBS Definition- QC Testing done by D0 at Fermilab including cataloging of sensors											
Labor BOE- Run2a experience											
32	1.1.1.2.3.9	1st L0 Sensor Delivered	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
33	1.1.1.2.3.10	All L0 Sensors Delivered And Tested	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																				
34	1.1.1.3	L1 Sensors	\$356,178.64	\$26,576.00	\$382,754.64																																				
<p><i>Notes</i></p> <p>WBS Definition- Summary task that describes the design, prototyping, production, and testing of all sensors for L1</p>																																									
35	1.1.1.3.1	Prototypes	\$201,751.36	\$22,804.00	\$224,555.36																																				
<p><i>Notes</i></p> <p>WBS Definition- Summary task that describes the design, prototyping, and testing of L1 sensors</p>																																									
36	1.1.1.3.1.1	Develop specifications	\$0.00	\$7,544.00	\$7,544.00																																				
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
6	EEO	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h																														
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																														
37	1.1.1.3.1.2	ELMA	\$94,275.68	\$0.00	\$94,275.68																																				
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	152 h	0 h	0 h	0 h	152 h																														
38	1.1.1.3.1.3	Hamamatsu	\$94,275.68	\$15,260.00	\$109,535.68																																				
<p><i>Notes</i></p> <p>WBS Definition- Summary task that describes design, prototype sensors, and testing of HPK sensors</p>																																									
39	1.1.1.3.1.3.1	Order sensors (KSU)	\$5,000.00	\$0.00	\$5,000.00																																				
<p><i>Notes</i></p> <p>WBS Definition- Vendor contact and PO placed for sensors</p>																																									
40	1.1.1.3.1.3.2	Develop prototype masks	\$60,000.00	\$5,660.00	\$65,660.00																																				
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
21	DESF	1	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h																														
41	1.1.1.3.1.3.3	Produce prototype sensors (KSU)	\$12,000.00	\$0.00	\$12,000.00																																				
<p><i>Notes</i></p> <p>WBS Definition- Vendor production of silicon sensors with their testing</p>																																									

ID	WBS	Name	M&S Cost				Labor Cost			Cost		
42	1.1.1.3.1.3.4	Probe prototypes sensors (MRI)	\$17,275.68				\$9,600.00			\$26,875.68		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	14	ETO	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- QC Testing done by D0											
	Labor BOE- Based on MRI estimate											
43	1.1.1.3.1.4	Perform irradiation testing (KSU)	\$13,200.00				\$0.00			\$13,200.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Tests to assure performance done at radiation facility											
	Labor BOE- Based on prototyping work											
44	1.1.1.3.1.5	Analyze test results (KSU)	\$0.00				\$0.00			\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Analysis of all test results including radiation studies											
	Labor BOE- Based on prototyping work											
45	1.1.1.3.1.6	Choose L1 Technology	\$0.00				\$0.00			\$0.00		
	<i>Notes</i>											
	WBS Definition- Milestone											
46	1.1.1.3.2	Production	\$154,427.28				\$3,772.00			\$158,199.28		
	<i>Notes</i>											
	WBS Definition- Summary task that describes all design, production, and testing of final sensors											
47	1.1.1.3.2.1	Develop final sensor specifications	\$0.00				\$3,772.00			\$3,772.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	6	EEO	1	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and layout specifications for sensors											
	Labor BOE- Based on MRI estimate											
48	1.1.1.3.2.2	Develop sensor probing procedures	\$0.00				\$0.00			\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Develop sensor probing procedures" continued											
<i>Notes</i>											
WBS Definition- Development of QC procedures for sensors to be tested by D0											
Labor BOE- Based on MRI estimate											
49	1.1.1.3.2.3	Bid final sensor order	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Vendor qualification and bidding for production order											
50	1.1.1.3.2.4	Order production sensors (KSU)	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Placement of the order at chosen vendor											
51	1.1.1.3.2.5	L1 Sensors Released For Production	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
52	1.1.1.3.2.6	Produce L1 (KSU)	\$108,000.00	\$0.00	\$108,000.00						
<i>Notes</i>											
WBS Definition- Vendor production of silicon sensors with their testing											
53	1.1.1.3.2.7	Probe L1 sensors (MRI)	\$46,427.28	\$0.00	\$46,427.28						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.15	\$0.00	\$0.00	\$0.00	\$0.00	72 h	0 h	0 h	0 h	72 h
<i>Notes</i>											
WBS Definition- QC Testing done by D0 at MRI centers											
Labor BOE- Overseen by PHYSU at MRI institutes											
54	1.1.1.3.2.8	Probe L1 sensors (Fermilab)	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<i>Notes</i>											
WBS Definition- QC Testing done by D0 at Fermilab including cataloging of sensors											
Labor BOE- Based on Run2a experience											
55	1.1.1.3.2.9	1st L1 Sensor Delivered	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
56	1.1.1.3.2.10	All L1 Sensors Delivered And Tested	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																				
57	1.1.1.4	L2-L5 Sensors	\$1,863,925.06	\$157,143.20	\$2,021,068.26																																				
	<u>Notes</u> WBS Definition- Summary task that describes the design, prototyping, production, and testing of all sensors for L2-5																																								
58	1.1.1.4.1	Preproduction	\$180,027.28	\$61,391.00	\$241,418.28																																				
	<u>Notes</u> WBS Definition- Summary task that describes the design, production, and testing of preproduction L2-5 sensors																																								
59	1.1.1.4.1.1	Develop preproduction specifications	\$0.00	\$37,720.00	\$37,720.00																																				
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>EEO</td> <td>1</td> <td>\$37,720.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$37,720.00</td> <td>800 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>800 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>800 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>800 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	6	EEO	1	\$37,720.00	\$0.00	\$0.00	\$37,720.00	800 h	0 h	0 h	0 h	800 h	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	800 h	0 h	0 h	0 h	800 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
6	EEO	1	\$37,720.00	\$0.00	\$0.00	\$37,720.00	800 h	0 h	0 h	0 h	800 h																														
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	800 h	0 h	0 h	0 h	800 h																														
	<u>Notes</u> WBS Definition- Design and layout specifications for sensors Labor BOE- Based on MRI estimate																																								
60	1.1.1.4.1.2	Order preproduction sensors	\$0.00	\$0.00	\$0.00																																				
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.25</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																														
	<u>Notes</u> WBS Definition- Placement of the order at chosen vendor Labor BOE- Overseen by MRI institutes																																								
61	1.1.1.4.1.3	Develop masks (Fermilab)	\$0.00	\$7,075.00	\$7,075.00																																				
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>PHYSF</td> <td>0.3</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>1</td> <td>\$7,075.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,075.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h	21	DESF	1	\$7,075.00	\$0.00	\$0.00	\$7,075.00	200 h	0 h	0 h	0 h	200 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h																														
21	DESF	1	\$7,075.00	\$0.00	\$0.00	\$7,075.00	200 h	0 h	0 h	0 h	200 h																														
	<u>Notes</u> WBS Definition- Drawings made to describe the L2-5 sensor masks Labor BOE- Based on Run2a experience																																								
62	1.1.1.4.1.4	Produce preproduction sensors (Stony Brook)	\$120,000.00	\$0.00	\$120,000.00																																				
	<u>Notes</u> WBS Definition- Vendor production of silicon sensors with their testing																																								
63	1.1.1.4.1.5	Probe preproduction sensors (MRI)	\$46,427.28	\$12,000.00	\$58,427.28																																				
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>ETO</td> <td>1</td> <td>\$12,000.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$12,000.00</td> <td>400 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>400 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	14	ETO	1	\$12,000.00	\$0.00	\$0.00	\$12,000.00	400 h	0 h	0 h	0 h	400 h	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																														
14	ETO	1	\$12,000.00	\$0.00	\$0.00	\$12,000.00	400 h	0 h	0 h	0 h	400 h																														
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h																														
	<u>Notes</u> WBS Definition- QC Testing done by D0 at MRI centers Labor BOE- Based on MRI estimate																																								

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
64	1.1.1.4.1.6	Probe preproduction sensors (Fermilab)	\$0.00	\$0.00	\$0.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	<u>Notes</u>											
	WBS Definition- QC Testing done by D0 at Fermilab including cataloging of sensors											
	Labor BOE- Based on Run2a experience											
65	1.1.1.4.1.7	Perform irradiation testing	\$13,600.00	\$4,596.00	\$18,196.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
	<u>Notes</u>											
	WBS Definition- Tests to assure performance done at radiation facility											
	Labor BOE- Based on Prototyping work											
66	1.1.1.4.1.8	Analyze test results	\$0.00	\$0.00	\$0.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<u>Notes</u>											
	WBS Definition- Analysis of all test results including radiation studies											
	Labor BOE- Based on Prototyping work											
67	1.1.1.4.2	Production	\$1,683,897.78	\$95,752.20	\$1,779,649.98							
	<u>Notes</u>											
	WBS Definition- Summary task that describes all design, production, and testing of final sensors											
68	1.1.1.4.2.1	Develop final sensor specifications	\$0.00	\$0.00	\$0.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<u>Notes</u>											
	WBS Definition- Design and layout specifications for final sensors											
	Labor BOE- Based on Run2a experience											
69	1.1.1.4.2.2	Develop sensor probing procedures	\$0.00	\$0.00	\$0.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<u>Notes</u>											
	WBS Definition- Development of QC procedures for sensors to be tested by D0											
	Labor BOE- Based on MRI estimate											

WBS Dictionary and Labor BOE as of 4/8/02
Run 2b Silicon Schedule

ID	WBS	Name				M&S Cost	Labor Cost	Cost				
70	1.1.1.4.2.3	Develop final masks (Fermilab)				\$40,000.00	\$4,245.00	\$44,245.00				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.75	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Drawings made to describe the final L2-L5 sensor masks											
	Labor BOE- Based on Run2a experience											
71	1.1.1.4.2.4	Bid final sensor order				\$0.00	\$0.00	\$0.00				
	<i>Notes</i>											
	WBS Definition- Vendor qualification and bidding for production order											
72	1.1.1.4.2.5	Order production sensors				\$0.00	\$0.00	\$0.00				
	<i>Notes</i>											
	WBS Definition- Placement of the order at chosen vendor											
73	1.1.1.4.2.6	L2-L5 Sensors Released For Production				\$0.00	\$0.00	\$0.00				
	<i>Notes</i>											
	WBS Definition- Milestone											
74	1.1.1.4.2.7	Produce L2-L5 sensors (Fermilab)				\$1,487,049.98	\$0.00	\$1,487,049.98				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	256 h	0 h	0 h	0 h	256 h
	<i>Notes</i>											
	WBS Definition- Vendor production of silicon sensors with their testing paid by Fermilab											
	Labor BOE- Based on Run2a experience											
75	1.1.1.4.2.8	Produce L2-L5 sensors (Stony Brook)				\$76,950.00	\$0.00	\$76,950.00				
	<i>Notes</i>											
	WBS Definition- Vendor production of silicon sensors with their testing paid by MRI											
76	1.1.1.4.2.9	Probe L2-L5 sensors (Fermilab)				\$0.00	\$14,707.20	\$14,707.20				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.2	\$14,707.20	\$0.00	\$0.00	\$14,707.20	512 h	0 h	0 h	0 h	512 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	1,280 h	0 h	0 h	0 h	1,280 h
	<i>Notes</i>											
	WBS Definition- QC Testing done by D0 at MRI centers											
	Labor BOE- Based on Run2a experience											
77	1.1.1.4.2.10	Probe L2-L5 sensors (MRI)				\$79,897.80	\$76,800.00	\$156,697.80				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	14	ETO	1	\$76,800.00	\$0.00	\$0.00	\$76,800.00	2,560 h	0 h	0 h	0 h	2,560 h
	16	PHYSU	0.6	\$0.00	\$0.00	\$0.00	\$0.00	1,536 h	0 h	0 h	0 h	1,536 h
	<i>Notes</i>											
	WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																
"Probe L2-L5 sensors (MRI)" continued																																																					
<i>Notes</i> QC Testing done by D0 at Fermilab including cataloging of sensors																																																					
Labor BOE- Based on MRI estimate																																																					
78	1.1.1.4.2.11	25% L2-L5 Sensors Delivered	\$0.00	\$0.00	\$0.00																																																
<i>Notes</i> WBS Definition- Milestone																																																					
79	1.1.1.4.2.12	75% L2-L5 Sensors Delivered	\$0.00	\$0.00	\$0.00																																																
<i>Notes</i> WBS Definition- Milestone																																																					
80	1.1.1.4.2.13	All L2-L5 Sensors Delivered And Tested	\$0.00	\$0.00	\$0.00																																																
<i>Notes</i> WBS Definition- Milestone																																																					
81	1.1.1.5	Radiation Testing	\$0.00	\$11,490.00	\$11,490.00																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>MTSF</td> <td>0.1</td> <td>\$11,490.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$11,490.00</td> <td>400 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>400 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>2,000 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>2,000 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.2</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>800 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>800 h</td> </tr> </tbody> </table>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	8	MTSF	0.1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	2,000 h	0 h	0 h	0 h	2,000 h	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	800 h	0 h	0 h	0 h	800 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
8	MTSF	0.1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h																																										
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	2,000 h	0 h	0 h	0 h	2,000 h																																										
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	800 h	0 h	0 h	0 h	800 h																																										
<i>Notes</i> WBS Definition- The continual testing at a radiation facility to ensure quality and help optimize the designs of the detectors																																																					
Labor BOE- Based on prototyping work																																																					
82	1.1.2	Readout System	\$4,240,515.04	\$1,589,309.50	\$5,829,824.54																																																
<i>Notes</i> WBS Definition- This summary element includes the development, procurement, and testing of SVX4 readout chips, readout hybrids, cabling, junction cards, test cards, adaptor cards, interface boards, and power supplies, as well as improvements to selected elements of the front-end DAQ system.																																																					
83	1.1.2.1	SVX4 Chips	\$1,015,240.01	\$295,551.50	\$1,310,791.51																																																
<i>Notes</i> WBS Definition- This is a summary task that includes the development, procurement, and testing of SVX4 readout chips.																																																					
84	1.1.2.1.1	Develop prototype	\$183,045.61	\$54,694.00	\$237,739.61																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>1</td> <td>\$54,694.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$54,694.00</td> <td>1,160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>1,160 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.2</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>232 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>232 h</td> </tr> </tbody> </table>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	1	\$54,694.00	\$0.00	\$0.00	\$54,694.00	1,160 h	0 h	0 h	0 h	1,160 h	15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	232 h	0 h	0 h	0 h	232 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
4	EEF	1	\$54,694.00	\$0.00	\$0.00	\$54,694.00	1,160 h	0 h	0 h	0 h	1,160 h																																										
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	232 h	0 h	0 h	0 h	232 h																																										
<i>Notes</i> WBS Definition- This includes the design, layout, and production, and backplating and dicing of the first prototype chip																																																					
Labor BOE- Based on Ray Yarema estimate																																																					

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
85	1.1.2.1.2	Develop SVX chip probing procedures	\$4,950.00	\$30,176.00	\$35,126.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$30,176.00	\$0.00	\$0.00	\$30,176.00	640 h	0 h	0 h	0 h	640 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
<i>Notes</i>											
WBS Definition- Includes setting up all D0 manned testing systems for chips											
Labor BOE- Based on Run2a experience											
86	1.1.2.1.3	Test SVX4 prototype chips	\$26,128.40	\$60,352.00	\$86,480.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	2	\$60,352.00	\$0.00	\$0.00	\$60,352.00	1,280 h	0 h	0 h	0 h	1,280 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
<i>Notes</i>											
WBS Definition- This element includes probing, stimulus and any other tests D0 performs on chips											
Labor BOE- Based on Run2a experience											
87	1.1.2.1.4	Test SVX4 prototype chips(Brown)	\$82,100.00	\$0.00	\$82,100.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- This element includes the Brown University effort to testing chips											
Labor BOE- Overseen by PHYSU from Brown on MRI											
88	1.1.2.1.5	Develop second prototype	\$90,856.00	\$11,316.00	\$102,172.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$11,316.00	\$0.00	\$0.00	\$11,316.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition- This includes the design and layout for the second prototype run of the chip											
Labor BOE- Based on Ray Yarema estimate											
89	1.1.2.1.6	Produce second prototype	\$122,610.00	\$26,404.00	\$149,014.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$26,404.00	\$0.00	\$0.00	\$26,404.00	560 h	0 h	0 h	0 h	560 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	560 h	0 h	0 h	0 h	560 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	560 h	0 h	0 h	0 h	560 h
<i>Notes</i>											
WBS Definition- The production, and backplating and dicing of the second prototype chip											
Labor BOE- Based on Ray Yarema estimate											

ID	WBS	Name								M&S Cost	Labor Cost	Cost
90	1.1.2.1.7	Test second prototype								\$12,500.00	\$30,176.00	\$42,676.00
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	2	\$30,176.00	\$0.00	\$0.00	\$30,176.00	640 h	0 h	0 h	0 h	640 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	<i>Notes</i>											
	WBS Definition- This element includes probing, stimulus and any other tests D0 performs on the second prototype run of chips											
	Labor BOE- Based on Run2a experience											
91	1.1.2.1.8	SVX4 Released For Production								\$0.00	\$0.00	\$0.00
	<i>Notes</i>											
	WBS Definition- Milestone											
92	1.1.2.1.9	Produce final wafers(Fermilab)								\$275,700.01	\$0.00	\$275,700.01
	<i>Notes</i>											
	WBS Definition- This includes the procurement and production of the wafers, Fermilab's part											
93	1.1.2.1.10	Produce final wafers (Brown)								\$217,349.99	\$0.00	\$217,349.99
	<i>Notes</i>											
	WBS Definition- This includes the procurement and production of the wafers, Brown's part											
94	1.1.2.1.11	Wafers Delivered								\$0.00	\$0.00	\$0.00
	<i>Notes</i>											
	WBS Definition- Milestone											
95	1.1.2.1.12	Wafer backgrinding/plating								\$0.00	\$1,886.00	\$1,886.00
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	0.25	\$1,886.00	\$0.00	\$0.00	\$1,886.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- This includes all backgrinding, plating, and dicing of the chip											
	Labor BOE- Based on Ray Yarema estimate											
96	1.1.2.1.13	Test chips								\$0.00	\$80,547.50	\$80,547.50
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	1.25	\$68,367.50	\$0.00	\$0.00	\$68,367.50	1,450 h	0 h	0 h	0 h	1,450 h
	12	ETF	0.35	\$12,180.00	\$0.00	\$0.00	\$12,180.00	406 h	0 h	0 h	0 h	406 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	290 h	0 h	0 h	0 h	290 h
	<i>Notes</i>											
	WBS Definition- All testing done at Fermilab including documentation, packaging and shipping to hybrid vendor											
	Labor BOE- Based on Ray Yarema estimate											
97	1.1.2.1.14	All SVX4 Chips Produced And Tested								\$0.00	\$0.00	\$0.00
	<i>Notes</i>											
	WBS Definition- Milestone											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																
98	1.1.2.2	L0 Hybrids	\$107,229.00	\$74,003.00	\$181,232.00																																																
<p><i>Notes</i></p> <p>WBS Definition- This is a summary task that includes the development, procurement, stuffing, wirebonding, and testing of all Layer 0 hybrid assemblies</p>																																																					
99	1.1.2.2.1	Prototypes	\$23,950.00	\$35,483.60	\$59,433.60																																																
<p><i>Notes</i></p> <p>WBS Definition- This is a summary task that includes all prototyping work for the Layer 0 hybrid assemblies</p>																																																					
100	1.1.2.2.1.1	Develop prototype specifications	\$4,500.00	\$12,260.00	\$16,760.00																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>0.5</td> <td>\$9,430.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$9,430.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>0.2</td> <td>\$2,830.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,830.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- The design and layout of Layer 0 hybrids</p> <p>Labor BOE- Run2a experience and CDF Run2a experience</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	0.5	\$9,430.00	\$0.00	\$0.00	\$9,430.00	200 h	0 h	0 h	0 h	200 h	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h	21	DESF	0.2	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
4	EEF	0.5	\$9,430.00	\$0.00	\$0.00	\$9,430.00	200 h	0 h	0 h	0 h	200 h																																										
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h																																										
21	DESF	0.2	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h																																										
101	1.1.2.2.1.2	Procure prototypes	\$16,250.00	\$2,263.20	\$18,513.20																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>0.1</td> <td>\$2,263.20</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,263.20</td> <td>48 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>48 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- The vendor selection and procurement of bare prototype hybrids</p> <p>Labor BOE- Run2a experience</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	0.1	\$2,263.20	\$0.00	\$0.00	\$2,263.20	48 h	0 h	0 h	0 h	48 h																								
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
4	EEF	0.1	\$2,263.20	\$0.00	\$0.00	\$2,263.20	48 h	0 h	0 h	0 h	48 h																																										
102	1.1.2.2.1.3	Develop bare hybrid probing procedures	\$3,200.00	\$4,800.00	\$8,000.00																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>ETO</td> <td>0.5</td> <td>\$4,800.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$4,800.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- The testing procedures are designed for the bare Layer 0 hybrids</p> <p>Labor BOE- Run2a experience</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	14	ETO	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
14	ETO	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h																																										
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																										
103	1.1.2.2.1.4	Perform mechanical tests	\$0.00	\$3,816.40	\$3,816.40																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>MEU</td> <td>0.2</td> <td>\$1,518.40</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,518.40</td> <td>32 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>32 h</td> </tr> <tr> <td>8</td> <td>MTSF</td> <td>0.5</td> <td>\$2,298.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,298.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Studies of the mechanical properties of bare hybrids</p> <p>Labor BOE- Assume 0.5 hour per hybrid for technician with a supervisor for some of that</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	2	MEU	0.2	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
2	MEU	0.2	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h																																										
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																										
104	1.1.2.2.1.5	Test prototypes	\$0.00	\$12,344.00	\$12,344.00																																																
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>0.5</td> <td>\$7,544.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,544.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>14</td> <td>ETO</td> <td>0.5</td> <td>\$4,800.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$4,800.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> </tbody> </table>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h	14	ETO	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h																																										
14	ETO	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h																																										

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
"Test prototypes" continued																																																																	
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																						
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																						
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h																																																						
33	SASEQTestStandU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h																																																						
<u>Notes</u>																																																																	
WBS Definition- Probing, stuffing, wirebonding, and all testing of prototype L0 hybrids																																																																	
Labor BOE- Run2a experience, MRI estimate																																																																	
105	1.1.2.2.2	Production	\$83,279.00	\$38,519.40	\$121,798.40																																																												
<u>Notes</u>																																																																	
WBS Definition- This is a summary task that includes all production and testing work for the Layer 0 hybrid assemblies																																																																	
106	1.1.2.2.2.1	Develop final specifications	\$0.00	\$4,904.00	\$4,904.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>0.5</td> <td>\$3,772.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$3,772.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>0.2</td> <td>\$1,132.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,132.00</td> <td>32 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>32 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	21	DESF	0.2	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h															
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21	DESF	0.2	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h																																																						
<u>Notes</u>																																																																	
WBS Definition- Design and layout for final L0 hybrids																																																																	
Labor BOE- Run2a experience																																																																	
107	1.1.2.2.2.2	Bid hybrid production	\$0.00	\$0.00	\$0.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.2</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>32 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>32 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h																																							
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16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h																																																						
<u>Notes</u>																																																																	
WBS Definition- Vendor qualification and selection for final L0 hybrids																																																																	
Labor BOE- Run2a experience																																																																	
108	1.1.2.2.2.3	L0 Hybrids Released For Production	\$0.00	\$0.00	\$0.00																																																												
<u>Notes</u>																																																																	
WBS Definition- Milestone																																																																	
109	1.1.2.2.2.4	Produce hybrids (KU)	\$53,200.00	\$0.00	\$53,200.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.2</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>96 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>96 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h																																							
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h																																																						
<u>Notes</u>																																																																	
WBS Definition- The production of the bare hybrid at vendor																																																																	
Labor BOE- Vendor estimate with Overseer																																																																	
110	1.1.2.2.2.5	Probe bare hybrids (KU)	\$0.00	\$7,200.00	\$7,200.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>ETO</td> <td>1</td> <td>\$7,200.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,200.00</td> <td>240 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>240 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	14	ETO	1	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h																																							
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
14	ETO	1	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h																																																						

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
"Probe bare hybrids (KU)" continued																																																																	
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16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h																																																						
<u>Notes</u>																																																																	
WBS Definition- Probing and testing of bare hybrid at MRI institute																																																																	
Labor BOE- Run2a experience, 1 hour per hybrid																																																																	
111	1.1.2.2.2.6	Design, procure, and qualify hybrid fixtures	\$1,800.00	\$13,252.00	\$15,052.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>0.5</td> <td>\$7,592.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,592.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.2</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>64 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>64 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>0.5</td> <td>\$5,660.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$5,660.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	0.5	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h	21	DESF	0.5	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h															
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<u>Notes</u>																																																																	
WBS Definition- Fixtures needed for stuffing and wirebonding as well as testing of hybrids are designed and produced																																																																	
Labor BOE- Run2a experience																																																																	
112	1.1.2.2.2.7	Stuff and wirebond hybrids (Fresno)	\$13,300.00	\$0.00	\$13,300.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.2</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>96 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>96 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h																																							
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16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h																																																						
<u>Notes</u>																																																																	
WBS Definition- At vendor, components are placed and attached including SVX4 die and then all wirebonding is done																																																																	
Labor BOE- Run2a experience																																																																	
113	1.1.2.2.2.8	L0 Hybrid Production Complete	\$0.00	\$0.00	\$0.00																																																												
<u>Notes</u>																																																																	
WBS Definition- Milestone																																																																	
114	1.1.2.2.2.9	Develop functionality test	\$1,500.00	\$0.00	\$1,500.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																							
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16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
<u>Notes</u>																																																																	
WBS Definition- Design of testing for stuffed hybrids and run through with equipment																																																																	
Labor BOE- Run2a experience, UIC estimate																																																																	
115	1.1.2.2.2.10	Perform initial functionality test (KU)	\$0.00	\$4,800.00	\$4,800.00																																																												
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>ETO</td> <td>1</td> <td>\$4,800.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$4,800.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>32</td> <td>SASEQTestStandF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>33</td> <td>SASEQTestStandU</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	14	ETO	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h	33	SASEQTestStandU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h			
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
14	ETO	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h																																																						
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																						
33	SASEQTestStandU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																						
<u>Notes</u>																																																																	
WBS Definition- Tests of basic readout and noise functions done at MRI institute																																																																	
Labor BOE-																																																																	

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Perform initial functionality test (KU)" continued											
<i>Notes</i> Run2a experience, UIC estimate											
116	1.1.2.2.2.11	Procure and qualify hybrid burn-in fixtures	\$11,979.00	\$5,963.40	\$17,942.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.3	\$3,416.40	\$0.00	\$0.00	\$3,416.40	72 h	0 h	0 h	0 h	72 h
21	DESF	0.3	\$2,547.00	\$0.00	\$0.00	\$2,547.00	72 h	0 h	0 h	0 h	72 h
<i>Notes</i> WBS Definition- Fixtures needed for the hybrid burn-in stands and repair work Labor BOE- Run2a experience, prototyping work											
117	1.1.2.2.2.12	Develop hybrid burn-in test	\$1,500.00	\$2,400.00	\$3,900.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i> WBS Definition- Designing and testing of the burn-in stands that will power cycle and readout hybrids continuously for a few day period including analysis software Labor BOE- Run2a experience, UIC estimate											
118	1.1.2.2.2.13	Perform hybrid burn-in test	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
37	HybridBurnInStand	2	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
<i>Notes</i> WBS Definition- Power cycling and reading out L0 hybrids for a few days and analyzing noise and other performance characteristics of hybrids Labor BOE- 32 hybrids per station, 0.5 hours per hybrid every 3 days, (Run2a experience)											
119	1.1.2.2.2.14	L0 Hybrid Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
120	1.1.2.3	L1 Hybrids	\$129,229.00	\$123,248.70	\$252,477.70						
<i>Notes</i> WBS Definition- This is a summary task that includes the development, procurement, stuffing, wirebonding, and testing of all Layer 1 hybrid assemblies											
121	1.1.2.3.1	Prototypes	\$65,450.00	\$70,460.80	\$135,910.80						
<i>Notes</i> WBS Definition- This is a summary task that includes all prototyping work for the Layer 1 hybrid assemblies											
122	1.1.2.3.1.1	Develop prototype specifications	\$2,250.00	\$39,042.00	\$41,292.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$33,948.00	\$0.00	\$0.00	\$33,948.00	720 h	0 h	0 h	0 h	720 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	360 h	0 h	0 h	0 h	360 h
21	DESF	0.2	\$5,094.00	\$0.00	\$0.00	\$5,094.00	144 h	0 h	0 h	0 h	144 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Develop prototype specifications" continued											
<i>Notes</i>											
WBS Definition- The design and layout of Layer 1 hybrids											
Labor BOE- Run2a experience and CDF Run2a experience											
123	1.1.2.3.1.2	Procure prototypes (KU)	\$28,875.00	\$2,263.20	\$31,138.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.1	\$2,263.20	\$0.00	\$0.00	\$2,263.20	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition- The vendor selection and procurement of bare prototype hybrids											
Labor BOE- Run2a experience											
124	1.1.2.3.1.3	Develop hybrid testing procedures	\$3,200.00	\$4,800.00	\$8,000.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- The testing procedures are designed for the bare Layer 1 hybrids											
Labor BOE- Run2a experience											
125	1.1.2.3.1.4	Perform mechanical tests	\$0.00	\$3,816.40	\$3,816.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.2	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Studies of the mechanical properties of bare hybrids											
Labor BOE- Assume 0.5 hour per hybrid for technician with a supervisor for some of that											
126	1.1.2.3.1.5	Test prototypes	\$0.00	\$4,800.00	\$4,800.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
33	SASEQTestStandU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Probing, stuffing, wirebonding, and all testing of prototype L1 hybrids											
Labor BOE- Run2a experience, MRI estimate											
127	1.1.2.3.1.6	Develop second prototype specifications	\$2,250.00	\$8,676.00	\$10,926.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Develop second prototype specifications" continued												
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	21	DESF	0.2	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- The design and layout of Layer 1second prototype hybrids											
	Labor BOE- Run2a experience and CDF Run2a experience											
128	1.1.2.3.1.7	Procure second prototypes (KU)		\$28,875.00	\$2,263.20	\$31,138.20						
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	0.1	\$2,263.20	\$0.00	\$0.00	\$2,263.20	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Procurement of second bare prototype hybrid and stuffing and wirebonding											
	Labor BOE- Run2a experience											
129	1.1.2.3.1.8	Test second prototype		\$0.00	\$4,800.00	\$4,800.00						
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	12	ETF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- All electrical tests needed to verify performance of second prototype											
	Labor BOE- Run2a experience, MRI estimate											
130	1.1.2.3.2	Production		\$63,779.00	\$52,787.90	\$116,566.90						
	<i>Notes</i>											
	WBS Definition- This is a summary task that includes all production and testing work for the Layer 1 hybrid assemblies											
131	1.1.2.3.2.1	Develop final specifications		\$0.00	\$10,374.00	\$10,374.00						
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and layout for final L1 hybrids											
	Labor BOE- based on prototype design time											
132	1.1.2.3.2.2	Bid hybrid production		\$0.00	\$0.00	\$0.00						
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Vendor qualification and selection for final L1 hybrids											
	Labor BOE- Run2a experience											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																						
133	1.1.2.3.2.3	L1 Hybrids Released For Production	\$0.00	\$0.00	\$0.00																																																						
	<u>Notes</u> WBS Definition- Milestone																																																										
134	1.1.2.3.2.4	Produce hybrids (KU)	\$25,850.00	\$0.00	\$25,850.00																																																						
	<u>Notes</u> WBS Definition- The production of the bare hybrid at vendor(KU-MRI part)																																																										
135	1.1.2.3.2.5	Produce hybrids (Fermilab)	\$14,100.00	\$0.00	\$14,100.00																																																						
	<u>Notes</u> WBS Definition- The production of the bare hybrid at the vendor (Fermilab part)																																																										
136	1.1.2.3.2.6	Test bare hybrids (Fresno)	\$0.00	\$3,523.50	\$3,523.50																																																						
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																
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16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h																																																
	<u>Notes</u> WBS Definition- Probing and testing of bare hybrid at MRI institute Labor BOE- Run2a experience, 1 hour per hybrid																																																										
137	1.1.2.3.2.7	Design, procure, and qualify hybrid fixtures	\$1,800.00	\$16,082.00	\$17,882.00																																																						
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																
2	MEU	0.5	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h																																																
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h																																																
21	DESF	0.75	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h																																																
	<u>Notes</u> WBS Definition- Fixtures needed for stuffing and wirebonding as well as testing of hybrids are designed and produced Labor BOE- Run2a experience, prototyping work																																																										
138	1.1.2.3.2.8	Stuff and wire-bond hybrids (Fresno)	\$7,050.00	\$0.00	\$7,050.00																																																						
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.25</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>100 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>100 h</td> </tr> </tbody> </table>											ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																								
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																
16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																																																
	<u>Notes</u> WBS Definition- At vendor, components are placed and attached including SVX4 die and then all wirebonding is done Labor BOE- Run2a experience																																																										
139	1.1.2.3.2.9	L1 Hybrid Production Complete	\$0.00	\$0.00	\$0.00																																																						
	<u>Notes</u> WBS Definition- Milestone																																																										
140	1.1.2.3.2.10	Develop functionality test	\$1,500.00	\$0.00	\$1,500.00																																																						
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Develop functionality test" continued											
<i>Notes</i>											
WBS Definition- Design of testing for stuffed hybrids and run through with equipment											
Labor BOE- Run2a experience, UIC estimate											
141	1.1.2.3.2.11	Perform functionality test	\$0.00	\$2,400.00	\$2,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
14	ETO	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
33	SASEQTestStandU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Tests of basic readout and noise functions done at MRI institute											
Labor BOE- Run2a experience, UIC estimate, 1 hour per hybrid											
142	1.1.2.3.2.12	Procure and qualify hybrid burn-in fixtures	\$11,979.00	\$12,008.40	\$23,987.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.3	\$3,416.40	\$0.00	\$0.00	\$3,416.40	72 h	0 h	0 h	0 h	72 h
9	MTU	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
21	DESF	0.2	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition- Fixtures needed for the hybrid burn-in stands and repair work											
Labor BOE- Run2a experience, prototyping work											
143	1.1.2.3.2.13	Develop hybrid burn-in test	\$1,500.00	\$7,200.00	\$8,700.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
13	ETU	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
<i>Notes</i>											
WBS Definition- Designing and testing of the burn-in stands that will power cycle and readout hybrids continuously for a few day period including analysis software											
Labor BOE- Run2a experience, UIC estimate											
144	1.1.2.3.2.14	Perform hybrid burn-in test	\$0.00	\$1,200.00	\$1,200.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.25	\$1,200.00	\$0.00	\$0.00	\$1,200.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
37	HybridBurnInStand	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Power cycling and reading out L0 hybrids for a few days and analyzing noise and other performance characteristics of hybrids											
Labor BOE- 32 hybrids per station, 0.5 hours per hybrid every 3 days, (Run2a experience)											

ID	WBS	Name			M&S Cost	Labor Cost	Cost				
145	1.1.2.3.2.15	L1 Hybrid Testing Complete			\$0.00	\$0.00	\$0.00				
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>											
146	1.1.2.4	L2-L5 Hybrids			\$682,917.00	\$184,939.10	\$867,856.10				
<p><i>Notes</i></p> <p>WBS Definition- This is a summary task that includes the development, procurement, stuffing, wirebonding, and testing of all Layer 2-5 hybrid assemblies</p>											
147	1.1.2.4.1	Prototypes			\$141,537.25	\$96,124.70	\$237,661.95				
<p><i>Notes</i></p> <p>WBS Definition- This is a summary task that includes all prototyping work for the Layer 2-5 hybrid assemblies</p>											
148	1.1.2.4.1.1	Develop prototype specifications			\$4,500.00	\$33,808.50	\$38,308.50				
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.5	\$20,746.00	\$0.00	\$0.00	\$20,746.00	440 h	0 h	0 h	0 h	440 h
12	ETF	0.2	\$5,280.00	\$0.00	\$0.00	\$5,280.00	176 h	0 h	0 h	0 h	176 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	440 h	0 h	0 h	0 h	440 h
21	DESF	0.25	\$7,782.50	\$0.00	\$0.00	\$7,782.50	220 h	0 h	0 h	0 h	220 h
<p><i>Notes</i></p> <p>WBS Definition- The design and layout of Layer 2-5 hybrids</p> <p>Labor BOE- Run2a experience and CDF Run2a experience</p>											
149	1.1.2.4.1.2	Procure prototypes			\$24,000.00	\$3,017.60	\$27,017.60				
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.1	\$3,017.60	\$0.00	\$0.00	\$3,017.60	64 h	0 h	0 h	0 h	64 h
<p><i>Notes</i></p> <p>WBS Definition- The vendor selection and procurement of bare prototype hybrids</p> <p>Labor BOE- Run2a experience</p>											
150	1.1.2.4.1.3	Develop bare hybrid probing procedures			\$64,537.25	\$4,800.00	\$69,337.25				
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
13	ETU	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- The testing procedures are designed for the bare Layer 2-5 hybrids</p> <p>Labor BOE- Run2a experience</p>											
151	1.1.2.4.1.4	Perform mechanical tests			\$0.00	\$3,816.40	\$3,816.40				
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.2	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Studies of the mechanical properties of bare hybrids</p>											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Perform mechanical tests" continued											
<i>Notes</i>											
Labor BOE- Assume 0.5 hour per hybrid for technician with a supervisor for some of that											
152	1.1.2.4.1.5	Perform temperature cycles	\$0.00	\$1,149.00	\$1,149.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Testing the bare and stuffed hybrids at temperatures of -10C											
Labor BOE- 0.5 of each day for 2 weeks											
153	1.1.2.4.1.6	Test prototypes(fermilab)	\$20,000.00	\$15,088.00	\$35,088.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Probing, stuffing, wirebonding, and all testing of prototype L2-5 hybrids at Fermilab											
Labor BOE- 2 weeks for 1st hybrid, 0.5 week for next ones											
154	1.1.2.4.1.7	Test prototypes(MRI)	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Probing, stuffing, wirebonding, and all testing of prototype L2-5 hybrids at MRI institutes											
Labor BOE- Run2a experience, MRI estimate											
155	1.1.2.4.1.8	Develop second prototype specifications	\$4,500.00	\$12,294.00	\$16,794.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
12	ETF	0.2	\$1,920.00	\$0.00	\$0.00	\$1,920.00	64 h	0 h	0 h	0 h	64 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.25	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- The design and layout of Layer 2-5 second prototype hybrids											
Labor BOE- Run2a experience and CDF Run2a experience											
156	1.1.2.4.1.9	Procure second prototypes	\$24,000.00	\$2,263.20	\$26,263.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.1	\$2,263.20	\$0.00	\$0.00	\$2,263.20	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition- Procurement of second bare prototype hybrid and stuffing and wirebonding											
Labor BOE-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Procure second prototypes" continued											
<u>Notes</u> Run2a experience											
157	1.1.2.4.1.10	Test second prototypes	\$0.00	\$19,888.00	\$19,888.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
4	EEF	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
13	ETU	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<u>Notes</u> WBS Definition- All electrical tests needed to verify performance of second prototype Labor BOE- Run2a experience, MRI estimate											
158	1.1.2.4.2	Production	\$541,379.75	\$88,814.40	\$630,194.15						
<u>Notes</u> WBS Definition- This is a summary task that includes all production and testing work for the Layer 2-5 hybrid assemblies											
159	1.1.2.4.2.1	Develop final specifications	\$0.00	\$10,374.00	\$10,374.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
4	EEF	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Design and layout for final L2-5 hybrids Labor BOE- based on prototype design time											
160	1.1.2.4.2.2	Bid hybrid production	\$0.00	\$0.00	\$0.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u> WBS Definition- Vendor qualification and selection for final L2-5 hybrids Labor BOE- Run2a experience											
161	1.1.2.4.2.3	L2-L5 Hybrids Released For Production	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
162	1.1.2.4.2.4	Produce hybrids (Fermilab)	\$220,000.00	\$0.00	\$220,000.00						
<u>Notes</u> WBS Definition- The production of the bare hybrid at vendor(Fermilab part)											
163	1.1.2.4.2.5	Produce hybrids (KU)	\$154,000.00	\$0.00	\$154,000.00						
<u>Notes</u> WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Produce hybrids (KU)" continued											
<u>Notes</u> The production of the bare hybrid at vendor(KU-MRI part)											
164	1.1.2.4.2.6	Probe bare hybrids (MRI)	\$0.00	\$33,600.00	\$33,600.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
13	ETU	1	\$16,800.00	\$0.00	\$0.00	\$16,800.00	560 h	0 h	0 h	0 h	560 h
14	ETO	1	\$16,800.00	\$0.00	\$0.00	\$16,800.00	560 h	0 h	0 h	0 h	560 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	280 h	0 h	0 h	0 h	280 h
<u>Notes</u> WBS Definition- Probing and testing of bare hybrid at MRI institute Labor BOE- Run2a experience, 1 hour per hybrid											
165	1.1.2.4.2.7	Design, procure, and qualify hybrid fixtures	\$10,050.00	\$18,912.00	\$28,962.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.5	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
21	DESF	1	\$11,320.00	\$0.00	\$0.00	\$11,320.00	320 h	0 h	0 h	0 h	320 h
<u>Notes</u> WBS Definition- Fixtures needed for stuffing and wirebonding as well as testing of hybrids are designed and produced Labor BOE- Run2a experience, prototyping work											
166	1.1.2.4.2.8	Stuff and wire-bond hybrids (Fresno)	\$66,000.00	\$0.00	\$66,000.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	192 h	0 h	0 h	0 h	192 h
<u>Notes</u> WBS Definition- At vendor, components are placed and attached including SVX4 die and then all wirebonding is done Labor BOE- Run2a experience											
167	1.1.2.4.2.9	L2-L5 Hybrid Production Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
168	1.1.2.4.2.10	Develop functionality test	\$0.00	\$0.00	\$0.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Design of testing for stuffed hybrids and run through with equipment Labor BOE- Run2a experience, UIC estimate											
169	1.1.2.4.2.11	Perform initial functionality test (MRI)	\$58,201.50	\$0.00	\$58,201.50						
<u>Notes</u> WBS Definition- Tests of basic readout and noise functions done at MRI institute											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Perform initial functionality test (MRI)" continued											
<i>Notes</i>											
Labor BOE- Run2a experience, UIC estimate, 1 hour per hybrid											
170	1.1.2.4.2.12	Procure and qualify hybrid burn-in fixtures	\$0.00	\$12,008.40	\$12,008.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.3	\$3,416.40	\$0.00	\$0.00	\$3,416.40	72 h	0 h	0 h	0 h	72 h
9	MTU	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
21	DESF	0.2	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition- Fixtures needed for the hybrid burn-in stands and repair work											
Labor BOE- Run2a experience, prototyping work											
171	1.1.2.4.2.13	Develop hybrid burn-in test(MRI)	\$33,128.25	\$2,400.00	\$35,528.25						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Designing and testing of the burn-in stands that will power cycle and readout hybrids continuously for a few day period including analysis software											
Labor BOE- Run2a experience, UIC estimate											
172	1.1.2.4.2.14	Perform hybrid burn-in test	\$0.00	\$11,520.00	\$11,520.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.4	\$11,520.00	\$0.00	\$0.00	\$11,520.00	384 h	0 h	0 h	0 h	384 h
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	1,920 h	0 h	0 h	0 h	1,920 h
37	HybridBurnInStand	2	\$0.00	\$0.00	\$0.00	\$0.00	1,920 h	0 h	0 h	0 h	1,920 h
<i>Notes</i>											
WBS Definition- Power cycling and reading out L0 hybrids for a few days and analyzing noise and other performance characteristics of hybrids											
Labor BOE- 32 hybrids per station, 0.5 hours per hybrid every 3 days, (Run2a experience)											
173	1.1.2.4.2.15	L2-L5 Hybrid Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
174	1.1.2.5	L0 Analog Flex Cables	\$232,000.00	\$37,054.40	\$269,054.40						
<i>Notes</i>											
WBS Definition- Summary task that includes design, prototyping, production, and testing of L0 analog flex cables											
175	1.1.2.5.1	Design cables	\$10,000.00	\$13,014.00	\$23,014.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.5	\$11,316.00	\$0.00	\$0.00	\$11,316.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition-											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
"Design cables" continued												
<u>Notes</u> Design and layout for Analog flex cables for L0												
Labor BOE- Based on prototype layouts												
176	1.1.2.5.2	Produce pre-production cables			\$40,000.00	\$0.00	\$40,000.00					
<u>Notes</u> WBS Definition- Vendor production of analog flex cables												
177	1.1.2.5.3	Test preproduction cables			\$10,000.00	\$6,638.40	\$16,638.40					
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	8	MTSF	0.2	\$1,838.40	\$0.00	\$0.00	\$1,838.40	64 h	0 h	0 h	0 h	64 h
	11	ETSF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<u>Notes</u> WBS Definition- electrical and mechanical testing of cables												
Labor BOE- Assume wirebonding and testing as for the prototype cables												
178	1.1.2.5.4	Develop final specifications			\$0.00	\$6,602.00	\$6,602.00					
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	4	EEF	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Design and layout of final analog flex cables												
Labor BOE- Based on prototype layouts												
179	1.1.2.5.5	Bid cable production			\$0.00	\$0.00	\$0.00					
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u> WBS Definition- The vendor selection and bidding for final analog cables												
Labor BOE- Run2a experience												
180	1.1.2.5.6	L0 Flex Cables Released For Production			\$0.00	\$0.00	\$0.00					
<u>Notes</u> WBS Definition- Milestone												
181	1.1.2.5.7	Produce cables			\$172,000.00	\$0.00	\$172,000.00					
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<u>Notes</u> WBS Definition-												

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Produce cables" continued												
<u>Notes</u> Vendor production of analog flex cables												
Labor BOE- Based on prototype procurements												
182	1.1.2.5.8	Test cables	\$0.00	\$10,800.00	\$10,800.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	11	ETSF	0.25	\$3,600.00	\$0.00	\$0.00	\$3,600.00	120 h	0 h	0 h	0 h	120 h
	12	ETF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u> WBS Definition- electrical and mechanical testing of cables												
Labor BOE- Assume ETF has to fix every 4th cable, based on CDF experience in Run2a												
183	1.1.2.5.9	L0 Flex Cable Production And Testing Complete	\$0.00	\$0.00	\$0.00							
<u>Notes</u> WBS Definition- Milestone												
184	1.1.2.6	L0 Digital Jumper Cables	\$128,502.01	\$15,310.00	\$143,812.01							
<u>Notes</u> WBS Definition- Summary task that includes design, prototyping, production, and testing of L0 digital jumper cables												
185	1.1.2.6.1	Design cables	\$1,452.00	\$4,338.00	\$5,790.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
<u>Notes</u> WBS Definition- Design and layout of L0 Digital jumper cables												
Labor BOE- KSU estimate												
186	1.1.2.6.2	Prepare prototypes	\$24,486.00	\$0.00	\$24,486.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<u>Notes</u> WBS Definition- Construction of cable including ablating to produce a working prototype												
Labor BOE- KSU estimate												
187	1.1.2.6.3	Test prototypes	\$4,950.00	\$2,400.00	\$7,350.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition-												

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test prototypes" continued											
<u>Notes</u> electrical and mechanical testing of cables Labor BOE- KSU estimate based on design											
188	1.1.2.6.4	Develop final specifications	\$0.00	\$3,772.00	\$3,772.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- Design and layout of final Digital jumper cable Labor BOE- KSU estimate											
189	1.1.2.6.5	Bid cable production	\$0.00	\$0.00	\$0.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<u>Notes</u> WBS Definition- Vendor selection and bidding for procurement of cables Labor BOE- KSU estimate											
190	1.1.2.6.6	L0 Digital Jumper Cables Released For Production	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
191	1.1.2.6.7	Produce cables	\$97,614.00	\$0.00	\$97,614.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<u>Notes</u> WBS Definition- Construction of cable including ablating to produce a working cable Labor BOE- Run2a experience											
192	1.1.2.6.8	Test cables	\$0.00	\$4,800.00	\$4,800.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
13	ETU	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u> WBS Definition- electrical and mechanical testing of cables Labor BOE- Run2a experience											
193	1.1.2.6.9	L0 Digital Jumper Cables Produced And Tested	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											

ID	WBS	Name			M&S Cost	Labor Cost			Cost			
194	1.1.2.7	L1 Digital Jumper Cables			\$128,502.01	\$13,707.00			\$142,209.01			
<p><i>Notes</i></p> <p>WBS Definition- Summary task that includes design, prototyping, production, and testing of L1 Digital jumper cables</p>												
195	1.1.2.7.1	Design cables			\$1,452.00	\$6,507.00			\$7,959.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$5,658.00	\$0.00	\$0.00	\$5,658.00	120 h	0 h	0 h	0 h	120 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	21	DESF	0.1	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h
<p><i>Notes</i></p> <p>WBS Definition- Design and layout of prototype L1 Digital jumper cable</p> <p>Labor BOE- KSU estimate</p>												
196	1.1.2.7.2	Prepare prototypes			\$24,486.00	\$0.00			\$24,486.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<p><i>Notes</i></p> <p>WBS Definition- Construction of cable including ablating to produce a working cable</p> <p>Labor BOE- KSU estimate</p>												
197	1.1.2.7.3	Test prototypes			\$4,950.00	\$2,400.00			\$7,350.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- electrical and mechanical testing of cables</p> <p>Labor BOE- KSU estimate based on design</p>												
198	1.1.2.7.4	Develop final specifications			\$0.00	\$0.00			\$0.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Design and layout of final Digital jumper cable</p> <p>Labor BOE- KSU estimate</p>												
199	1.1.2.7.5	Bid cable production			\$0.00	\$0.00			\$0.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<p><i>Notes</i></p> <p>WBS Definition- Vendor selection and bidding for procurement of cables</p> <p>Labor BOE- Run2a experience</p>												

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																
200	1.1.2.7.6	L1 Digital Jumper Cables Released For Production	\$0.00	\$0.00	\$0.00																																																
	<u>Notes</u> WBS Definition- Milestone																																																				
201	1.1.2.7.7	Produce cables	\$97,614.00	\$0.00	\$97,614.00																																																
	<u>Notes</u> WBS Definition- Construction of cable including ablating to produce a working cable Labor BOE- Run2a experience																																																				
202	1.1.2.7.8	Test cables	\$0.00	\$4,800.00	\$4,800.00																																																
	<u>Notes</u> WBS Definition- electrical and mechanical testing of cables Labor BOE- KSU estimate based on design																																																				
203	1.1.2.7.9	L1 Digital Jumper Cables Produced And Tested	\$0.00	\$0.00	\$0.00																																																
	<u>Notes</u> WBS Definition- Milestone																																																				
204	1.1.2.8	L2-L5 Digital Jumper Cables	\$132,396.00	\$40,223.00	\$172,619.00																																																
	<u>Notes</u> WBS Definition- Summary task that includes design, prototyping, production, and testing of L2-5 Digital jumper cables																																																				
205	1.1.2.8.1	Design cables	\$748.00	\$3,678.00	\$4,426.00																																																
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>EEU</td> <td>0.25</td> <td>\$2,829.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,829.00</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>240 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>240 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>0.1</td> <td>\$849.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$849.00</td> <td>24 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>24 h</td> </tr> </tbody> </table> <u>Notes</u> WBS Definition- Design and layout of prototype L2-L5 Digital jumper cable Labor BOE- KSU estimate					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	5	EEU	0.25	\$2,829.00	\$0.00	\$0.00	\$2,829.00	60 h	0 h	0 h	0 h	60 h	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h	21	DESF	0.1	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
5	EEU	0.25	\$2,829.00	\$0.00	\$0.00	\$2,829.00	60 h	0 h	0 h	0 h	60 h																																										
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h																																										
21	DESF	0.1	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h																																										
206	1.1.2.8.2	Prepare prototypes	\$12,614.00	\$0.00	\$12,614.00																																																
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>0.1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>64 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>64 h</td> </tr> </tbody> </table> <u>Notes</u> WBS Definition- Construction of cable including ablating to produce a working prototype cable Labor BOE- KSU estimate					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h																								
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																										
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h																																										

ID	WBS	Name	M&S Cost			Labor Cost			Cost			
207	1.1.2.8.3	Test prototypes	\$5,100.00			\$2,400.00			\$7,500.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- electrical and mechanical testing of cables											
	Labor BOE- KSU estimate based on design											
208	1.1.2.8.4	Design preproduction cables	\$748.00			\$8,300.00			\$9,048.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.25	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	21	DESF	0.4	\$4,528.00	\$0.00	\$0.00	\$4,528.00	128 h	0 h	0 h	0 h	128 h
	<i>Notes</i>											
	WBS Definition- Design and layout of preproduction L2-L5 Digital jumper cable											
	Labor BOE- KSU estimate											
209	1.1.2.8.5	Prepare preproduction cables	\$12,614.00			\$0.00			\$12,614.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Construction of cable including ablating to produce a working cable											
	Labor BOE- Run2a experience											
210	1.1.2.8.6	Test preproduction cables	\$0.00			\$4,800.00			\$4,800.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	13	ETU	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- electrical and mechanical testing of cables											
	Labor BOE- KSU estimate based on design											
211	1.1.2.8.7	Develop final specifications	\$0.00			\$4,245.00			\$4,245.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	21	DESF	0.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Design and layout of final Digital jumper cable											
	Labor BOE- KSU estimate											
212	1.1.2.8.8	Bid cable production	\$0.00			\$0.00			\$0.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Bid cable production" continued											
<i>Notes</i>											
WBS Definition- Vendor selection and bidding for procurement of cables											
Labor BOE- Run2a experience											
213	1.1.2.8.9	L2-L5 Digital Jumper Cables Released For Production	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
214	1.1.2.8.10	Produce cables	\$100,572.00	\$0.00	\$100,572.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<i>Notes</i>											
WBS Definition- Construction of cable including ablating to produce a working cable											
Labor BOE- Run2a experience											
215	1.1.2.8.11	Test cables	\$0.00	\$16,800.00	\$16,800.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
14	ETO	1	\$16,800.00	\$0.00	\$0.00	\$16,800.00	560 h	0 h	0 h	0 h	560 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	112 h	0 h	0 h	0 h	112 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	112 h	0 h	0 h	0 h	112 h
<i>Notes</i>											
WBS Definition- electrical and mechanical testing of cables											
Labor BOE- KSU estimate based on Run2a experience											
216	1.1.2.8.12	L2-L5 Digital Jumper Cables Produced And Tested	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
217	1.1.2.9	L0 Junction Cards	\$51,612.00	\$18,903.20	\$70,515.20						
<i>Notes</i>											
WBS Definition- The summary task that describes the design, prototyping, production and testing of the L0 junction cards which are fit at the end of the active region											
218	1.1.2.9.1	Design cards	\$10,692.00	\$6,422.40	\$17,114.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.2	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
21	DESF	0.2	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h
<i>Notes</i>											
WBS Definition- Design and layout of cards											
Labor BOE- KSU estimate											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
219	1.1.2.9.2	Prepare prototypes			\$9,900.00	\$0.00	\$9,900.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Vendor production and stuffing of prototype cards											
	Labor BOE- KSU estimate											
220	1.1.2.9.3	Test prototypes			\$2,310.00	\$3,908.80	\$6,218.80					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.2	\$1,508.80	\$0.00	\$0.00	\$1,508.80	32 h	0 h	0 h	0 h	32 h
	13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Electrical and mechanical testing of cards											
	Labor BOE- KSU estimate											
221	1.1.2.9.4	Develop final specifications			\$0.00	\$3,772.00	\$3,772.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and layout of final cards											
	Labor BOE- KSU estimate											
222	1.1.2.9.5	Bid card production			\$0.00	\$0.00	\$0.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
	<i>Notes</i>											
	WBS Definition- Bidding and vendor selection for final cards											
	Labor BOE- Run2a experience											
223	1.1.2.9.6	L0 Junction Cards Released For Production			\$0.00	\$0.00	\$0.00					
	<i>Notes</i>											
	WBS Definition- Milestone											
224	1.1.2.9.7	Produce cards			\$28,710.00	\$0.00	\$28,710.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Vendor production and stuffing of final cards											
	Labor BOE- Run2a experience											

ID	WBS	Name	M&S Cost			Labor Cost			Cost			
225	1.1.2.9.8	Test cards	\$0.00	\$4,800.00	\$4,800.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	13	ETU	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<u>Notes</u>											
	WBS Definition- Electrical and mechanical testing of cards											
	Labor BOE- KSU estimate											
226	1.1.2.9.9	L0 Junction Cards Produced and Tested	\$0.00	\$0.00	\$0.00							
	<u>Notes</u>											
	WBS Definition- Milestone											
227	1.1.2.10	L1 Junction Cards	\$51,612.00	\$27,121.80	\$78,733.80							
	<u>Notes</u>											
	WBS Definition- The summary task that describes the design, prototyping, production and testing of the L1 junction cards which are fit at the end of the active region											
228	1.1.2.10.1	Design cards	\$10,692.00	\$14,641.00	\$25,333.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.2	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	5	EEU	0.5	\$9,430.00	\$0.00	\$0.00	\$9,430.00	200 h	0 h	0 h	0 h	200 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.1	\$1,415.00	\$0.00	\$0.00	\$1,415.00	40 h	0 h	0 h	0 h	40 h
	<u>Notes</u>											
	WBS Definition- Design and layout of cards											
	Labor BOE- KSU estimate											
229	1.1.2.10.2	Prepare prototypes	\$9,900.00	\$0.00	\$9,900.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<u>Notes</u>											
	WBS Definition- Vendor production and stuffing of prototype cards											
	Labor BOE- KSU estimate											
230	1.1.2.10.3	Test prototypes	\$2,310.00	\$3,908.80	\$6,218.80							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.2	\$1,508.80	\$0.00	\$0.00	\$1,508.80	32 h	0 h	0 h	0 h	32 h
	13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<u>Notes</u>											
	WBS Definition- Electrical and mechanical testing of cards											
	Labor BOE- KSU estimate											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
231	1.1.2.10.4	Develop final specifications	\$0.00	\$3,772.00	\$3,772.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and layout of final cards											
	Labor BOE- KSU estimate											
232	1.1.2.10.5	Bid card production	\$0.00	\$0.00	\$0.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
	<i>Notes</i>											
	WBS Definition- Bidding and vendor selection for final cards											
	Labor BOE- Run2a experience											
233	1.1.2.10.6	L1 Junction Cards Released For Production	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											
234	1.1.2.10.7	Produce cards	\$28,710.00	\$0.00	\$28,710.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Vendor production and stuffing of final cards											
	Labor BOE- Run2a experience											
235	1.1.2.10.8	Test cards	\$0.00	\$4,800.00	\$4,800.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	13	ETU	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Electrical and mechanical testing of cards											
	Labor BOE- KSU estimate											
236	1.1.2.10.9	L1 Junction Cards Produced and Tested	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											
237	1.1.2.11	L2-5 Junction Cards	\$53,176.00	\$34,990.80	\$88,166.80							
	<i>Notes</i>											
	WBS Definition- The summary task that describes the design, prototyping, production and testing of the L2-5 junction cards which are fit at the end of the active region											

ID	WBS	Name	M&S Cost				Labor Cost			Cost		
238	1.1.2.11.1	Design cards	\$11,016.00				\$8,110.00			\$19,126.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	21	DESF	0.05	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
	<i>Notes</i>											
	WBS Definition- Design and layout of cards											
	Labor BOE- KSU estimate											
239	1.1.2.11.2	Prepare prototypes	\$10,200.00				\$0.00			\$10,200.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Vendor production and stuffing of prototype cards											
	Labor BOE- KSU estimate											
240	1.1.2.11.3	Test prototypes	\$2,380.00				\$3,908.80			\$6,288.80		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.2	\$1,508.80	\$0.00	\$0.00	\$1,508.80	32 h	0 h	0 h	0 h	32 h
	13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Electrical and mechanical testing of cards											
	Labor BOE- KSU estimate											
241	1.1.2.11.4	Develop final specifications	\$0.00				\$3,772.00			\$3,772.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and layout of final cards											
	Labor BOE- KSU estimate											
242	1.1.2.11.5	Bid card production	\$0.00				\$0.00			\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
	<i>Notes</i>											
	WBS Definition- Bidding and vendor selection for final cards											
	Labor BOE- Run2a experience											
243	1.1.2.11.6	L2-5 Junction Cards Released For Production	\$0.00				\$0.00			\$0.00		
	<i>Notes</i>											
	WBS Definition- Milestone											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
244	1.1.2.11.7	Produce cards			\$29,580.00	\$0.00	\$29,580.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Vendor production and stuffing of final cards											
	Labor BOE- Run2a experience											
245	1.1.2.11.8	Test cards			\$0.00	\$19,200.00	\$19,200.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	13	ETU	1	\$19,200.00	\$0.00	\$0.00	\$19,200.00	640 h	0 h	0 h	0 h	640 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	128 h	0 h	0 h	0 h	128 h
	<i>Notes</i>											
	WBS Definition- Electrical and mechanical testing of cards											
	Labor BOE- KSU estimate											
246	1.1.2.11.9	L2-5 Junction Cards Produced and Tested			\$0.00	\$0.00	\$0.00					
	<i>Notes</i>											
	WBS Definition- Milestone											
247	1.1.2.12	Twisted-Pair Cables			\$338,000.00	\$134,490.00	\$472,490.00					
	<i>Notes</i>											
	WBS Definition- The summary task that describes the design, layout, procurement, testing of the Twisted pair cables and also includes the connection of the twisted pair cables to the junction cards.											
248	1.1.2.12.1	Design cables			\$1,500.00	\$7,544.00	\$9,044.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and layout of cables and connectors											
	Labor BOE- Based on run2a experience and consultation with Computing group											
249	1.1.2.12.2	Prepare prototypes			\$19,500.00	\$7,200.00	\$26,700.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Procurement of cables, connectors and termination of the cables											
	Labor BOE- Assume 1/2 day per cable for the ETF + supervision											
250	1.1.2.12.3	Test prototypes			\$3,900.00	\$2,400.00	\$6,300.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test prototypes" continued											
<p><i>Notes</i></p> <p>WBS Definition- Electrical and mechanical testing of cables including connections to junction cards</p> <p>Labor BOE- Assume 4 cables tested per day (1/hour)</p>											
251	1.1.2.12.4	Design preproduction cables	\$1,500.00	\$7,544.00	\$9,044.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Design and layout of cables and connectors</p> <p>Labor BOE- Based on run2a experience and consultation with Computing group</p>											
252	1.1.2.12.5	Prepare preproduction cables	\$19,500.00	\$7,200.00	\$26,700.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<p><i>Notes</i></p> <p>WBS Definition- Procurement of cables, connectors and termination of the cables</p> <p>Labor BOE- Assume 1 hour per cable for termination</p>											
253	1.1.2.12.6	Test preproduction cables	\$0.00	\$2,400.00	\$2,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
13	ETU	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<p><i>Notes</i></p> <p>WBS Definition- Electrical and mechanical testing of cables including connections to junction cards</p> <p>Labor BOE- Assume 4 cables tested per day (1/hour)</p>											
254	1.1.2.12.7	Develop final specifications	\$0.00	\$6,602.00	\$6,602.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Design and layout of final cables</p> <p>Labor BOE- Based on run2a experience and consultation with Computing group</p>											
255	1.1.2.12.8	Bid cable production	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Bid cable production" continued												
<p><i>Notes</i></p> <p>WBS Definition- Vendor selection and bidding for procurement of cables</p> <p>Labor BOE- Run2a experience</p>												
256	1.1.2.12.9	Twisted-Pair Cables Released For Production	\$0.00	\$0.00	\$0.00							
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>												
257	1.1.2.12.10	Produce cables	\$290,000.00	\$0.00	\$290,000.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<p><i>Notes</i></p> <p>WBS Definition- Procurement of cables, connectors and termination of the cables</p> <p>Labor BOE- Assume 1 hour per cable for termination</p>												
258	1.1.2.12.11	Connect cables to junction cards	\$0.00	\$62,400.00	\$62,400.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	1	\$31,200.00	\$0.00	\$0.00	\$31,200.00	1,040 h	0 h	0 h	0 h	1,040 h
	12	ETF	1	\$31,200.00	\$0.00	\$0.00	\$31,200.00	1,040 h	0 h	0 h	0 h	1,040 h
<p><i>Notes</i></p> <p>WBS Definition- Connection of the twisted pair cable to the junction card</p> <p>Labor BOE- Assume 1 hour per cable for termination</p>												
259	1.1.2.12.12	Test cables	\$2,100.00	\$31,200.00	\$33,300.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	12	ETF	1	\$31,200.00	\$0.00	\$0.00	\$31,200.00	1,040 h	0 h	0 h	0 h	1,040 h
	15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	208 h	0 h	0 h	0 h	208 h
<p><i>Notes</i></p> <p>WBS Definition- Electrical and mechanical testing of cables</p> <p>Labor BOE- Assume 10 cables tested per day</p>												
260	1.1.2.12.13	Twisted-Pair Cables Ready	\$0.00	\$0.00	\$0.00							
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>												
261	1.1.2.13	Adapter Cards	\$379,800.00	\$82,005.20	\$461,805.20							
<p><i>Notes</i></p> <p>WBS Definition- This summary task includes all design, prototyping, production, and testing of adapter cards which regulate the power and pass the signals to the SVX4 chips on the hybrid.</p>												

ID	WBS	Name	M&S Cost			Labor Cost			Cost			
262	1.1.2.13.1	Design cards	\$29,600.00			\$24,330.00			\$53,930.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$22,632.00	\$0.00	\$0.00	\$22,632.00	480 h	0 h	0 h	0 h	480 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	22	DESU	0.05	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Design and layout of cards											
	Labor BOE- KSU estimate based on Run2a experience											
263	1.1.2.13.2	Prepare prototypes	\$34,000.00			\$0.00			\$34,000.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Production including stuffing of first prototype cards											
	Labor BOE- KSU estimate based on Run2a experience											
264	1.1.2.13.3	Test prototypes	\$9,000.00			\$7,544.00			\$16,544.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- All electrical and mechanical tests in conjunction with SVX4 testing											
	Labor BOE- KSU estimate based on Run2a experience											
265	1.1.2.13.4	Design preproduction cards	\$29,600.00			\$12,165.00			\$41,765.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$11,316.00	\$0.00	\$0.00	\$11,316.00	240 h	0 h	0 h	0 h	240 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	22	DESU	0.05	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h
	<i>Notes</i>											
	WBS Definition- Design and layout of cards											
	Labor BOE- KSU estimate based on Run2a experience											
266	1.1.2.13.5	Prepare preproduction cards	\$34,000.00			\$0.00			\$34,000.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Production including stuffing of cards											
	Labor BOE- KSU estimate based on Run2a experience											
267	1.1.2.13.6	Test preproduction cards	\$0.00			\$7,544.00			\$7,544.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																																		
273	1.1.2.13.12	Adapter Cards Produced And Tested	\$0.00	\$0.00	\$0.00																																																																		
	<u>Notes</u> WBS Definition- Milestone																																																																						
274	1.1.2.14	SASEQ Test Stands	\$169,900.00	\$145,966.00	\$315,866.00																																																																		
	<u>Notes</u> WBS Definition- Summary task that describes design and building of the test stands for production testing using stand alone sequencers (SASEQs)																																																																						
275	1.1.2.14.1	Procure parts through MRI grant	\$10,000.00	\$0.00	\$10,000.00																																																																		
	<u>Notes</u> WBS Definition- Procurement of all parts used in test stands from the MRI funds																																																																						
276	1.1.2.14.2	SASEQs	\$0.00	\$50,060.00	\$50,060.00																																																																		
	<u>Notes</u> WBS Definition- Summary task that describes the procurement, refurbishing, and testing of all stand alone sequencers																																																																						
277	1.1.2.14.2.1	Procure parts for SASEQs	\$0.00	\$7,200.00	\$7,200.00																																																																		
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>12</td> <td>ETF</td> <td>0.5</td> <td>\$7,200.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,200.00</td> <td>240 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>240 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>48 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>48 h</td> </tr> </tbody> </table>											ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	12	ETF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h																								
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																												
12	ETF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h																																																												
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h																																																												
	<u>Notes</u> WBS Definition- Procurement of the new sequencers and replacement parts for existing sequencers Labor BOE- Run2a experience																																																																						
278	1.1.2.14.2.2	Assemble and test SASEQs	\$0.00	\$8,572.00	\$8,572.00																																																																		
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>0.5</td> <td>\$3,772.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$3,772.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>11</td> <td>ETSF</td> <td>1</td> <td>\$4,800.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$4,800.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>0.1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>16 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>16 h</td> </tr> </tbody> </table>											ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h	11	ETSF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																												
4	EEF	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h																																																												
11	ETSF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h																																																												
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h																																																												
	<u>Notes</u> WBS Definition- The stuffing, programming, and testing of all new sequencers Labor BOE- Run2a experience																																																																						
279	1.1.2.14.2.3	Refurbish Run 2a SASEQs	\$0.00	\$34,288.00	\$34,288.00																																																																		
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>EEF</td> <td>0.5</td> <td>\$7,544.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,544.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>5</td> <td>EEU</td> <td>0.5</td> <td>\$7,544.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$7,544.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>11</td> <td>ETSF</td> <td>1</td> <td>\$9,600.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$9,600.00</td> <td>320 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>320 h</td> </tr> <tr> <td>13</td> <td>ETU</td> <td>1</td> <td>\$9,600.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$9,600.00</td> <td>320 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>320 h</td> </tr> </tbody> </table>											ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h	5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h	11	ETSF	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h	13	ETU	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																												
4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h																																																												
5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h																																																												
11	ETSF	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h																																																												
13	ETU	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h																																																												
	<u>Notes</u> WBS Definition- The reprogramming and testing of all existing Run2a sequencers Labor BOE- Run2a experience																																																																						

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
280	1.1.2.14.3	Purple Card (KSU)	\$74,900.00	\$39,606.00	\$114,506.00						
<p><i>Notes</i></p> <p>WBS Definition- Summary task that describes the design, procurement, and testing of cards to be used to process signals and power to the SVX4 chip in the SASEQ test stands</p>											
281	1.1.2.14.3.1	Design prototype purple card	\$11,400.00	\$15,088.00	\$26,488.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
<p><i>Notes</i></p> <p>WBS Definition- Design and layout of prototype card</p> <p>Labor BOE- KSU estimate</p>											
282	1.1.2.14.3.2	Produce prototype	\$8,500.00	\$7,544.00	\$16,044.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Procurement including stuffing of prototype cards</p> <p>Labor BOE- Run2a experience</p>											
283	1.1.2.14.3.3	Test prototype	\$5,000.00	\$5,658.00	\$10,658.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.5	\$5,658.00	\$0.00	\$0.00	\$5,658.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
<p><i>Notes</i></p> <p>WBS Definition- Testing of prototype cards in conjunction with SVX4 testing</p> <p>Labor BOE- KSU estimate</p>											
284	1.1.2.14.3.4	Develop final specification	\$0.00	\$3,772.00	\$3,772.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.5	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<p><i>Notes</i></p> <p>WBS Definition- Design and layout of final cards</p> <p>Labor BOE- KSU estimate</p>											
285	1.1.2.14.3.5	Procure cards	\$50,000.00	\$0.00	\$50,000.00						
<p><i>Notes</i></p> <p>WBS Definition- Procurement including stuffing of final cards</p>											
286	1.1.2.14.3.6	Test cards	\$0.00	\$7,544.00	\$7,544.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test cards" continued											
<i>Notes</i>											
WBS Definition- Testing of cards to insure viability in teststand with SVX4 chip											
Labor BOE- KSU estimate based on Run2a experience											
287	1.1.2.14.4	High Voltage System	\$0.00	\$51,500.00	\$51,500.00						
<i>Notes</i>											
WBS Definition- Summary task that includes procurement and testing of high voltage supplies to be used in testing and burn-in stands											
288	1.1.2.14.4.1	Procure HV modules and pods	\$0.00	\$8,640.00	\$8,640.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	0.2	\$8,640.00	\$0.00	\$0.00	\$8,640.00	288 h	0 h	0 h	0 h	288 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	288 h	0 h	0 h	0 h	288 h
<i>Notes</i>											
WBS Definition- Procurement of all parts used in test stands											
Labor BOE- Run2a experience											
289	1.1.2.14.4.2	Install and test HV system	\$0.00	\$42,860.00	\$42,860.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	0.5	\$18,860.00	\$0.00	\$0.00	\$18,860.00	400 h	0 h	0 h	0 h	400 h
12	ETF	1	\$24,000.00	\$0.00	\$0.00	\$24,000.00	800 h	0 h	0 h	0 h	800 h
<i>Notes</i>											
WBS Definition- Testing of the HV system with the burn-in stand software											
Labor BOE- Run2a experience											
290	1.1.2.14.5	Commercial Products	\$85,000.00	\$4,800.00	\$89,800.00						
<i>Notes</i>											
WBS Definition- Summary task that includes procurement and testing of the other parts of all teststands including computers, software, VME interfaces, and low voltage power supplies.											
291	1.1.2.14.5.1	Procure PC and software	\$85,000.00	\$960.00	\$85,960.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	0.2	\$960.00	\$0.00	\$0.00	\$960.00	32 h	0 h	0 h	0 h	32 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<i>Notes</i>											
WBS Definition- Procurement of PCs and software for all SASEQ teststands											
Labor BOE- Run2a experience											
292	1.1.2.14.5.2	Procure bit3	\$0.00	\$1,920.00	\$1,920.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	0.2	\$1,920.00	\$0.00	\$0.00	\$1,920.00	64 h	0 h	0 h	0 h	64 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<i>Notes</i>											
WBS Definition- Procurement of the VME Bit3 interface cards for all SASEQ teststand											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Procure bit3" continued											
<u>Notes</u>											
Labor BOE- Run2a experience											
293	1.1.2.14.5.3	Procure low voltage power supplies	\$0.00	\$1,920.00	\$1,920.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
12	ETF	0.2	\$1,920.00	\$0.00	\$0.00	\$1,920.00	64 h	0 h	0 h	0 h	64 h
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<u>Notes</u>											
WBS Definition- Procurement and testing of all low voltage power supplies used in SASEQ teststands											
Labor BOE- Run2a experience											
294	1.1.2.15	Interface Boards And Low Voltage System	\$167,800.00	\$50,265.20	\$218,065.20						
<u>Notes</u>											
WBS Definition- Summary task that describes all rework to existing interface boards and the power distribution system as well as the procurement and testing of new interface boards											
295	1.1.2.15.1	Develop specifications for re-worked boards	\$8,800.00	\$2,400.00	\$11,200.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
12	ETF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Design and figure out modifications to existing IB boards											
Labor BOE- Run2a IB experience											
296	1.1.2.15.2	Prepare prototypes	\$4,500.00	\$11,521.20	\$16,021.20						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	0.35	\$7,921.20	\$0.00	\$0.00	\$7,921.20	168 h	0 h	0 h	0 h	168 h
13	ETU	0.25	\$3,600.00	\$0.00	\$0.00	\$3,600.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Prepare new prototype boards including stuffing											
Labor BOE- KSU estimate based on Run2a experience											
297	1.1.2.15.3	Test prototypes	\$0.00	\$7,544.00	\$7,544.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Test new prototypes and reworked old boards with new SVX4 chip readout											
Labor BOE- KSU estimate											
298	1.1.2.15.4	Interface Boards Released For Modifications	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Interface Boards Released For Modifications" continued											
<i>Notes</i> Milestone											
299	1.1.2.15.5	Rework and test existing boards	\$119,500.00	\$28,800.00	\$148,300.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	3	\$28,800.00	\$0.00	\$0.00	\$28,800.00	960 h	0 h	0 h	0 h	960 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i> WBS Definition- Put all modifications in existing IB boards and test them with SVX4 chip readout Labor BOE- KSU estimate based on Run2a experience											
300	1.1.2.15.6	Procure additional boards	\$35,000.00	\$0.00	\$35,000.00						
<i>Notes</i> WBS Definition- Procure and stuff new IB boards needed.											
301	1.1.2.15.7	Interface Boards Ready	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
302	1.1.2.16	High-mass Cables	\$27,000.00	\$4,320.00	\$31,320.00						
<i>Notes</i> WBS Definition- Summary task to describe the production and testing of new high mass cables											
303	1.1.2.16.1	Produce new cables	\$27,000.00	\$1,920.00	\$28,920.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	0.1	\$1,920.00	\$0.00	\$0.00	\$1,920.00	64 h	0 h	0 h	0 h	64 h
<i>Notes</i> WBS Definition- Production including connectors of new high mass cables Labor BOE- Run2a experience											
304	1.1.2.16.2	Test new cables	\$0.00	\$2,400.00	\$2,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
12	ETF	1	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<i>Notes</i> WBS Definition- Electrical and mechanical testing of cables Labor BOE- Run2a experience											
305	1.1.2.16.3	High-mass Cables Ready	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
306	1.1.2.17	High Voltage System	\$285,600.00	\$32,232.00	\$317,832.00							
<p><i>Notes</i></p> <p>WBS Definition- Summary task to describe the design, procurement, and testing of the new system for L0/L1 as well as verifying the current system use for L2-L5</p>												
307	1.1.2.17.1	Design L0-L1 system	\$0.00	\$22,632.00	\$22,632.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	1	\$22,632.00	\$0.00	\$0.00	\$22,632.00	480 h	0 h	0 h	0 h	480 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
<p><i>Notes</i></p> <p>WBS Definition- Design system to deliver up to 1000 V to Layers 0 and Layers 1</p> <p>Labor BOE- Based on prototyping work and Run2a experience</p>												
308	1.1.2.17.2	High Voltage Modules Released For Production	\$0.00	\$0.00	\$0.00							
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>												
309	1.1.2.17.3	Procure new modules(Cinvestav)	\$217,152.00	\$0.00	\$217,152.00							
<p><i>Notes</i></p> <p>WBS Definition- Procurement of VME backplanes and new pods for system at Cinvestav</p>												
310	1.1.2.17.4	Procure new modules (Fermilab)	\$68,448.00	\$0.00	\$68,448.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<p><i>Notes</i></p> <p>WBS Definition- Procurement of VME backplanes and new pods for system at Fermilab</p> <p>Labor BOE- Run2a experience</p>												
311	1.1.2.17.5	Test new modules	\$0.00	\$4,800.00	\$4,800.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	12	ETF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Testing of new modules in current and L0/L1 system</p> <p>Labor BOE- Assume full time work based on Run2a experience</p>												
312	1.1.2.17.6	High Voltage Modules Ready	\$0.00	\$0.00	\$0.00							
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>												
313	1.1.2.17.7	Test system	\$0.00	\$4,800.00	\$4,800.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	12	ETF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test system" continued											
<i>Notes</i>											
WBS Definition- Testing of the HV system for viability with all readout elements											
Labor BOE- Assume full time work based on Run2a experience											
314	1.1.2.18	Downstream Readout Ready	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
315	1.1.2.19	Modify monitoring and control system	\$100,000.00	\$24,688.00	\$124,688.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
12	ETF	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Make sure that the software and control system is setup to handle all of the high voltage modules in the system											
Labor BOE- Run2a experience											
316	1.1.2.20	Stand-alone system integration test	\$0.00	\$91,722.40	\$91,722.40						
<i>Notes</i>											
WBS Definition- This is a summary task describing system integration testing using the Stand alone Sequencers with the downstream electronics.											
317	1.1.2.20.1	Readout Layer 1 hybrid with Purple Card	\$0.00	\$13,103.20	\$13,103.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.05	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
12	ETF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Test to readout 1 Layer 1 hybrid with Purple card through the SASEQ teststand											
Labor BOE- Run2a teststand experience											
318	1.1.2.20.2	Readout multiple hybrids	\$0.00	\$13,103.20	\$13,103.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.05	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
4	EEF	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
12	ETF	0.5	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Test to readout many L2 hybrids with the purple card in SASEQ teststand											
Labor BOE- Run2a experience											
319	1.1.2.20.3	Successful readout of more than 1 hybrid	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											

ID	WBS	Name	M&S Cost			Labor Cost			Cost			
320	1.1.2.20.4	Readout full stave with Purple Card				\$0.00	\$19,654.80	\$19,654.80				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.05	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
	4	EEF	0.5	\$11,316.00	\$0.00	\$0.00	\$11,316.00	240 h	0 h	0 h	0 h	240 h
	12	ETF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	<u>Notes</u>											
	WBS Definition- Full stave (4 modules) testing with SASEQ test stand											
	Labor BOE- Run2a experience											
321	1.1.2.20.5	Successful readout of full stave				\$0.00	\$0.00	\$0.00				
	<u>Notes</u>											
	WBS Definition- Milestone											
322	1.1.2.20.6	Readout full stave with all prototype components in final configuration				\$0.00	\$26,206.40	\$26,206.40				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.05	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
	4	EEF	0.5	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
	12	ETF	0.5	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
	<u>Notes</u>											
	WBS Definition- Testing of full stave (4 modules) with prototype final components connected to SASEQ test stand											
	Labor BOE- Run2a experience											
323	1.1.2.20.7	Successful readout of full stave with all prototype components in final cor				\$0.00	\$0.00	\$0.00				
	<u>Notes</u>											
	WBS Definition- Milestone											
324	1.1.2.20.8	Readout multiple staves with all final components				\$0.00	\$19,654.80	\$19,654.80				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.05	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
	4	EEF	0.5	\$11,316.00	\$0.00	\$0.00	\$11,316.00	240 h	0 h	0 h	0 h	240 h
	12	ETF	0.5	\$7,200.00	\$0.00	\$0.00	\$7,200.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	<u>Notes</u>											
	WBS Definition- Testing of multiple staves with final components using SASEQ teststand											
	Labor BOE- Run2a experience											
325	1.1.2.20.9	Successful readout of multiple staves with all final components				\$0.00	\$0.00	\$0.00				
	<u>Notes</u>											
	WBS Definition- Milestone											
326	1.1.2.21	L0-L1 System Integration Test				\$15,000.00	\$71,348.20	\$86,348.20				
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.07	\$9,300.20	\$0.00	\$0.00	\$9,300.20	196 h	0 h	0 h	0 h	196 h
	4	EEF	0.25	\$33,005.00	\$0.00	\$0.00	\$33,005.00	700 h	0 h	0 h	0 h	700 h
	8	MTSF	0.1	\$8,043.00	\$0.00	\$0.00	\$8,043.00	280 h	0 h	0 h	0 h	280 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Procure beam tube" continued											
<u>Notes</u>											
WBS Definition- Procurement actions prior to award of contract, awarding of contract, procurement of beam tube assemblies to be supplied by Fermilab to the vendor, fabrication of the beam tube, testing of the beam tube by the vendor, and receipt of the beam tube at D0											
Labor BOE- Run2a experience											
333	1.1.3.1.4	Test beam tube for acceptance	\$0.00	\$13,308.00	\$13,308.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
8	MTSF	0.3	\$4,136.40	\$0.00	\$0.00	\$4,136.40	144 h	0 h	0 h	0 h	144 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
25	CMMT	0.25	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
26	CMMP	0.25	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Vacuum leak checks, bake-out, verification that flanges mate with those of other beamline components, and certification of the beam tube by the Beams Division and D0											
Labor BOE- Run2a experience											
334	1.1.3.1.5	Beam Tube Accepted	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
335	1.1.3.2	South silicon barrel assembly	\$727,056.00	\$1,220,747.51	\$1,947,803.51						
<u>Notes</u>											
WBS Definition- Summary task that includes all mechanical parts and assembly for the L0/L1 as well as L2-5 South silicon barrel, the cooling and gas systems as well as testing for all of it											
336	1.1.3.2.1	L0-L1 barrel assembly	\$446,700.00	\$674,507.87	\$1,121,207.87						
<u>Notes</u>											
WBS Definition- Summary task that includes all mechanical parts and assembly for the L0/L1 South silicon barrel, including the L0 Barrel, L1 Barrel and the mating between them											
337	1.1.3.2.1.1	L0 Barrel	\$218,900.00	\$337,007.60	\$555,907.60						
<u>Notes</u>											
WBS Definition- The summary task that includes all of the L0 readout module fixturing and structures that compose and are mounted onto the L0 Barrel											
338	1.1.3.2.1.1.1	L0 readout module fixtures	\$8,000.00	\$40,679.80	\$48,679.80						
<u>Notes</u>											
WBS Definition- The summary task that includes all of the L0 readout module fixture design, production, and QC											
339	1.1.3.2.1.1.1.1	Design fixtures (Fermilab)	\$0.00	\$15,633.00	\$15,633.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
21	DESF	0.25	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Design and produce drawings for fixtures to be used for L0 modules											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Design fixtures (Fermilab)" continued											
<p><i>Notes</i></p> <p>Labor BOE- Run2a experience</p>											
340	1.1.3.2.1.1.1.2	Procure initial layer 0 readout module fixtures(MRI)	\$8,000.00	\$0.00	\$8,000.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<p><i>Notes</i></p> <p>WBS Definition- Machining and parts procurement for initial fixtures</p> <p>Labor BOE- Machining time based on Run2a experience</p>											
341	1.1.3.2.1.1.1.3	QC readout module fixtures(Fermilab)	\$0.00	\$4,903.50	\$4,903.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
21	DESF	0.25	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Verify that the initial set of fixtures meet specifications and perform as designed</p> <p>Labor BOE- Assume full time measurements at CMM and consulting with DESF and MEF to understand results based on Run2a measurement times</p>											
342	1.1.3.2.1.1.1.4	Finalize readout module fabrication fixtures	\$0.00	\$9,939.00	\$9,939.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	1.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
<p><i>Notes</i></p> <p>WBS Definition- Revise fixture drawings and specifications to take into account information learned from the first fixture set</p> <p>Labor BOE- One full time designer consulting with 2 physicists and 1 engineer. There are also consultations with 0.5 designer and 0.5 of another engineer, based on Run2a fixtures</p>											
343	1.1.3.2.1.1.1.5	Procure remaining layer 0 module fixtures	\$0.00	\$5,300.80	\$5,300.80						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
21	DESF	0.1	\$2,264.00	\$0.00	\$0.00	\$2,264.00	64 h	0 h	0 h	0 h	64 h
<p><i>Notes</i></p> <p>WBS Definition- Machining and parts procurement for final fixtures</p> <p>Labor BOE- Run2a experience</p>											
344	1.1.3.2.1.1.1.6	QC readout module fixtures	\$0.00	\$4,903.50	\$4,903.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
21	DESF	0.25	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"QC readout module fixtures" continued											
<i>Notes</i>											
WBS Definition- Verify that the remaining fixtures meet specifications and perform as designed											
Labor BOE- Assume full time measurements at CMM and consulting with DESF and MEF to understand results based on Run2a measurement times											
345	1.1.3.2.1.1.2	L0 structures	\$210,900.00	\$296,327.80	\$507,227.80						
<i>Notes</i>											
WBS Definition- The summary task that includes the design, prototyping, production of the L0 support structure and the modules mounted in it											
346	1.1.3.2.1.1.2.1	Materials R&D (UW)	\$0.00	\$16,702.40	\$16,702.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.15	\$6,263.40	\$0.00	\$0.00	\$6,263.40	132 h	0 h	0 h	0 h	132 h
2	MEU	0.25	\$10,439.00	\$0.00	\$0.00	\$10,439.00	220 h	0 h	0 h	0 h	220 h
15	PHYSF	0.15	\$0.00	\$0.00	\$0.00	\$0.00	132 h	0 h	0 h	0 h	132 h
16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	220 h	0 h	0 h	0 h	220 h
<i>Notes</i>											
WBS Definition- Survey of available materials for fabrication of sensor supports, contact vendors, obtain samples, order pre-prototype material for evaluation, selection of base line material for TDR. Material defined in this period to be further evaluated during the se											
Labor BOE- Based on UW estimate											
347	1.1.3.2.1.1.2.2	Design sensor supports(UW)	\$96,800.00	\$86,138.00	\$182,938.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
2	MEU	2	\$49,348.00	\$0.00	\$0.00	\$49,348.00	1,040 h	0 h	0 h	0 h	1,040 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	520 h	0 h	0 h	0 h	520 h
22	DESU	2	\$36,790.00	\$0.00	\$0.00	\$36,790.00	1,040 h	0 h	0 h	0 h	1,040 h
<i>Notes</i>											
WBS Definition- Design supports sufficient to fabricate engineering prototypes											
Labor BOE- Based on UW estimate											
348	1.1.3.2.1.1.2.3	Design sensor support fabrication tooling (fermilab)	\$13,100.00	\$1,839.50	\$14,939.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.4	\$0.00	\$0.00	\$0.00	\$0.00	208 h	0 h	0 h	0 h	208 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	520 h	0 h	0 h	0 h	520 h
21	DESF	0.1	\$1,839.50	\$0.00	\$0.00	\$1,839.50	52 h	0 h	0 h	0 h	52 h
<i>Notes</i>											
WBS Definition- Design sensor supports to fabrication tooling needed to fabricate engineering prototypes											
Labor BOE- Run2a experience											
349	1.1.3.2.1.1.2.4	Design cooling tubes and connections(UW)	\$0.00	\$13,252.00	\$13,252.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
2	MEU	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
22	DESU	1	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Design cooling tubes and connections for engineering prototypes at UW											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Design cooling tubes and connections(UW)" continued											
<u>Notes</u>											
Labor BOE- Based on UW estimate											
350	1.1.3.2.1.1.2.5	Design cooling tubes and connections(Fermilab)	\$2,500.00	\$3,596.00	\$6,096.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
21	DESF	0.3	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
<u>Notes</u>											
WBS Definition- Design cooling tubes and connections for engineering prototypes at Fermilab											
Labor BOE- Based on the expected number of drawings to be made											
351	1.1.3.2.1.1.2.6	Design support of readout(UW)	\$0.00	\$33,130.00	\$33,130.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	1	\$18,980.00	\$0.00	\$0.00	\$18,980.00	400 h	0 h	0 h	0 h	400 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
22	DESU	1	\$14,150.00	\$0.00	\$0.00	\$14,150.00	400 h	0 h	0 h	0 h	400 h
<u>Notes</u>											
WBS Definition- Design supports sufficient to fabricate engineering prototypes at UW											
Labor BOE- Based on UW estimate											
352	1.1.3.2.1.1.2.7	Design support of readout (fermilab)	\$0.00	\$1,415.00	\$1,415.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$1,415.00	\$0.00	\$0.00	\$1,415.00	40 h	0 h	0 h	0 h	40 h
<u>Notes</u>											
WBS Definition- Design supports sufficient to fabricate engineering prototypes at Fermilab											
Labor BOE- One week of designer time to complete drawings											
353	1.1.3.2.1.1.2.8	Design connection to layer 1(UW)	\$0.00	\$33,130.00	\$33,130.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	1	\$18,980.00	\$0.00	\$0.00	\$18,980.00	400 h	0 h	0 h	0 h	400 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
22	DESU	1	\$14,150.00	\$0.00	\$0.00	\$14,150.00	400 h	0 h	0 h	0 h	400 h
<u>Notes</u>											
WBS Definition- Design connection to Layer1 for engineering prototypes											
Labor BOE- Based on UW estimate											
354	1.1.3.2.1.1.2.9	Design connection to layer 1 (Fermilab)	\$0.00	\$1,415.00	\$1,415.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$1,415.00	\$0.00	\$0.00	\$1,415.00	40 h	0 h	0 h	0 h	40 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Design connection to layer 1 (Fermilab)" continued											
<u>Notes</u>											
WBS Definition- Design connection to Layer1 for engineering prototypes											
Labor BOE- Based on the expected number of drawings to be made											
355	1.1.3.2.1.1.2.10	Procure prototype fabrication fixtures(UW)	\$3,650.00	\$2,277.60	\$5,927.60						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
16	PHYSU	0.05	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
<u>Notes</u>											
WBS Definition- Procure/fabricate fixtures necessary to make engineering prototypes											
Labor BOE- Based on UW estimate											
356	1.1.3.2.1.1.2.11	Prototype sensor supports(UW)	\$0.00	\$7,312.80	\$7,312.80						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.3	\$4,555.20	\$0.00	\$0.00	\$4,555.20	96 h	0 h	0 h	0 h	96 h
9	MTU	0.3	\$2,757.60	\$0.00	\$0.00	\$2,757.60	96 h	0 h	0 h	0 h	96 h
15	PHYSF	0.05	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
16	PHYSU	0.3	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<u>Notes</u>											
WBS Definition- Fabricate, evaluate and test support structure and redesign based on information obtained											
Labor BOE- Based on UW estimate											
357	1.1.3.2.1.1.2.12	Prototype cooling tubes and connections(UW)	\$0.00	\$7,312.80	\$7,312.80						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.3	\$4,555.20	\$0.00	\$0.00	\$4,555.20	96 h	0 h	0 h	0 h	96 h
9	MTU	0.3	\$2,757.60	\$0.00	\$0.00	\$2,757.60	96 h	0 h	0 h	0 h	96 h
15	PHYSF	0.05	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
16	PHYSU	0.3	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<u>Notes</u>											
WBS Definition- Fabricate, evaluate and test cooling tubes and connections and redesign based on information obtained											
Labor BOE- Based on UW estimate											
358	1.1.3.2.1.1.2.13	Prototype support of readout(UW)	\$0.00	\$7,312.80	\$7,312.80						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.3	\$4,555.20	\$0.00	\$0.00	\$4,555.20	96 h	0 h	0 h	0 h	96 h
9	MTU	0.3	\$2,757.60	\$0.00	\$0.00	\$2,757.60	96 h	0 h	0 h	0 h	96 h
15	PHYSF	0.05	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
16	PHYSU	0.3	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<u>Notes</u>											
WBS Definition- Fabricate, evaluate and test readout supports and redesign based on information obtained											
Labor BOE- Based on UW estimate											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
359	1.1.3.2.1.1.2.14	Prototype connection to layer 1(UW)	\$0.00	\$12,188.00	\$12,188.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	9	MTU	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Fabricate, evaluate and test connection to Layer 1 and redesign based on information obtained											
	Labor BOE- Based on UW estimate											
360	1.1.3.2.1.1.2.15	Verify mechanical dimensions and precision of prototypes(UW)	\$0.00	\$2,847.00	\$2,847.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	<i>Notes</i>											
	WBS Definition- Analyze detailed measurements and make design corrections if necessary											
	Labor BOE- Based on UW estimate											
361	1.1.3.2.1.1.2.16	Verify mechanical dimensions and precision of prototypes(Fermilab)	\$2,500.00	\$6,231.75	\$8,731.75							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	21	DESF	0.25	\$1,061.25	\$0.00	\$0.00	\$1,061.25	30 h	0 h	0 h	0 h	30 h
	25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	26	CMMP	1	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Make detailed measurements on CMM, help to make design corrections if necessary											
	Labor BOE- Number of measurements to be made based on Run2a experience											
362	1.1.3.2.1.1.2.17	Procure final fabrication fixtures(UW)	\$50,350.00	\$3,036.80	\$53,386.80							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
	16	PHYSU	0.05	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Procure/fabricate final fabrication fixtures											
	Labor BOE- Based on UW estimate											
363	1.1.3.2.1.1.2.18	Procure materials for cooling and mechanical support(Fermilab)	\$42,000.00	\$2,650.40	\$44,650.40							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.05	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
	21	DESF	0.05	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Procure materials needed for fabrication and assembly of cooling and mechanical support											
	Labor BOE- Based on UW estimate											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
364	1.1.3.2.1.1.2.19	Fabricate south layer 0 mechanical assemblies(UW)	\$0.00	\$18,282.00	\$18,282.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	9	MTU	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	16	PHYSU	0.4	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
	<i>Notes</i>											
	WBS Definition- Fabricate all Layer 0 south mechanical assemblies											
	Labor BOE- Based on UW estimate											
365	1.1.3.2.1.1.2.20	Verify mechanical dimensions and precision(UW)	\$0.00	\$2,847.00	\$2,847.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	<i>Notes</i>											
	WBS Definition- Analyze detailed measurements to certify mechanical precision											
	Labor BOE- Based on UW estimate											
366	1.1.3.2.1.1.2.21	Verify mechanical dimensions and precision(Fermilab)	\$0.00	\$3,129.45	\$3,129.45							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	21	DESF	0.25	\$1,061.25	\$0.00	\$0.00	\$1,061.25	30 h	0 h	0 h	0 h	30 h
	25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	26	CMMP	0.1	\$344.70	\$0.00	\$0.00	\$344.70	12 h	0 h	0 h	0 h	12 h
	29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Make detailed QC measurements on CMM and help analyze measurements to certify mechanical precision											
	Labor BOE- Number of measurements to be made based on Run2a experience											
367	1.1.3.2.1.1.2.22	Layer 0 South Mechanical Assemblies Complete	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											
368	1.1.3.2.1.1.2.23	Mount sensor modules for layer 0, south(Fermilab)	\$0.00	\$27,842.00	\$27,842.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	21	DESF	0.1	\$1,415.00	\$0.00	\$0.00	\$1,415.00	40 h	0 h	0 h	0 h	40 h
	25	CMMT	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
	26	CMMP	0.3	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	<i>Notes</i>											
	WBS Definition- Mount sensor modules on Layer 0 support structure											
	Labor BOE- Based on CDF experience in Run2a, assume 2 physicists and one CMMT working full time will mount 2 modules per day and include some slack time put 1 week on consultation by DES to update drawings											

ID	WBS	Name						M&S Cost	Labor Cost	Cost			
369	1.1.3.2.1.1.2.24	Verify sensor alignment(Fermilab)						\$0.00	\$2,439.50	\$2,439.50			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>	
	8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h	
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h	
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h	
	21	DESF	0.1	\$141.50	\$0.00	\$0.00	\$141.50	4 h	0 h	0 h	0 h	4 h	
	25	CMMT	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h	
	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h	
	<i>Notes</i>												
	WBS Definition- Make detailed QC measurements on CMM and analyze measurements to certify mechanical precision												
	Labor BOE- Based on Run2a experience, full time measurements will be done 6 hours/day for 1 week												
370	1.1.3.2.1.1.2.25	Final electrical test of readout(Fermilab)						\$0.00	\$0.00	\$0.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>	
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	
	<i>Notes</i>												
	WBS Definition- Perform electrical tests of L0 south readout and certify												
	Labor BOE- Each module will be plugged in to check (1 hour/module), groups of modules will be checked together for 3 days and final tests will be run for 1 week												
371	1.1.3.2.1.2	L0 South Complete						\$0.00	\$0.00	\$0.00			
	<i>Notes</i>												
	WBS Definition- Milestone												
372	1.1.3.2.1.3	L1 Barrel						\$227,800.00	\$337,500.27	\$565,300.27			
	<i>Notes</i>												
	WBS Definition- The summary task that includes all of the L1 readout module fixturing and structures that compose and are mounted onto the L1 South Barrel												
373	1.1.3.2.1.3.1	L1 Readout module fixtures						\$0.00	\$58,715.60	\$58,715.60			
	<i>Notes</i>												
	WBS Definition- The summary task that includes all of the L1 readout module fixture design, production, and QC												
374	1.1.3.2.1.3.1.1	Design fixtures(Fermilab)						\$0.00	\$28,368.00	\$28,368.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>	
	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h	
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h	
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h	
	21	DESF	1	\$16,980.00	\$0.00	\$0.00	\$16,980.00	480 h	0 h	0 h	0 h	480 h	
	<i>Notes</i>												
	WBS Definition- Design and produce drawings of L1 readout module fixtures used to mount the L1 sensors with the hybrids												
	Labor BOE- Run2a experience												
375	1.1.3.2.1.3.1.2	Procure initial layer 1 readout module fixtures						\$0.00	\$3,975.60	\$3,975.60			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>	
	1	MEF	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h	
	21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h	

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Procure initial layer 1 readout module fixtures" continued											
<i>Notes</i>											
WBS Definition- Machining and parts procurement for initial fixtures											
Labor BOE- Run2a experience											
376	1.1.3.2.1.3.1.3	QC readout module fixtures	\$0.00	\$4,903.50	\$4,903.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
21	DESF	0.25	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Verify that the initial set of fixtures meet specifications and perform as designed											
Labor BOE- Assume full time measurements at CMM and consulting with DESF and MEF to understand results based on Run2a measurement times											
377	1.1.3.2.1.3.1.4	Finalize readout module fabrication fixtures	\$0.00	\$9,939.00	\$9,939.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	1.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Revise fixture drawings and specifications to take into account information learned from the first fixture set											
Labor BOE- One full time designer consulting with 2 physicists and 1 engineer. There are also consultations with 0.5 designer and 0.5 of another engineer, based on Run2a fixtures											
378	1.1.3.2.1.3.1.5	Procure remaining layer 1 module fixtures	\$0.00	\$6,626.00	\$6,626.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Machining and parts procurement for final fixtures											
Labor BOE- Run2a experience											
379	1.1.3.2.1.3.1.6	QC readout module fixtures	\$0.00	\$4,903.50	\$4,903.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
21	DESF	0.25	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Verify that the remaining fixtures meet specifications and perform as designed											
Labor BOE- Assume full time measurements at CMM and consulting with DESF and MEF to understand results based on Run2a measurement times											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
380	1.1.3.2.1.3.2	L1 structures	\$227,800.00	\$278,784.67	\$506,584.67						
<p><i>Notes</i></p> <p>WBS Definition- The summary task that includes the design, prototyping, production of the L0 support structure and the modules mounted in it</p>											
381	1.1.3.2.1.3.2.1	Materials R&D(UW)	\$0.00	\$8,541.00	\$8,541.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
2	MEU	0.25	\$8,541.00	\$0.00	\$0.00	\$8,541.00	180 h	0 h	0 h	0 h	180 h
15	PHYSF	0.15	\$0.00	\$0.00	\$0.00	\$0.00	108 h	0 h	0 h	0 h	108 h
16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	180 h	0 h	0 h	0 h	180 h
<p><i>Notes</i></p> <p>WBS Definition- Survey of available materials for fabrication of sensor supports, contact vendors, obtain samples, order pre-prototype material for evaluation, selection of base line material for TDR. Material defined in this period to be further evaluated during the se</p> <p>Labor BOE- Based on UW estimate</p>											
382	1.1.3.2.1.3.2.2	Design sensor supports(UW)	\$83,700.00	\$43,069.00	\$126,769.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
2	MEU	1	\$24,674.00	\$0.00	\$0.00	\$24,674.00	520 h	0 h	0 h	0 h	520 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	520 h	0 h	0 h	0 h	520 h
22	DESU	1	\$18,395.00	\$0.00	\$0.00	\$18,395.00	520 h	0 h	0 h	0 h	520 h
<p><i>Notes</i></p> <p>WBS Definition- Design supports sufficient to fabricate engineering prototypes</p> <p>Labor BOE- Based on UW estimate</p>											
383	1.1.3.2.1.3.2.3	Design sensor supports(Fermilab)	\$0.00	\$3,679.00	\$3,679.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	104 h	0 h	0 h	0 h	104 h
21	DESF	0.2	\$3,679.00	\$0.00	\$0.00	\$3,679.00	104 h	0 h	0 h	0 h	104 h
<p><i>Notes</i></p> <p>WBS Definition- Design supports sufficient to fabricate engineering prototypes</p> <p>Labor BOE- Based on the expected number of drawings to be made</p>											
384	1.1.3.2.1.3.2.4	Design sensor support fabrication tooling(UW)	\$13,100.00	\$43,069.00	\$56,169.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
2	MEU	1	\$24,674.00	\$0.00	\$0.00	\$24,674.00	520 h	0 h	0 h	0 h	520 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	104 h	0 h	0 h	0 h	104 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	520 h	0 h	0 h	0 h	520 h
22	DESU	1	\$18,395.00	\$0.00	\$0.00	\$18,395.00	520 h	0 h	0 h	0 h	520 h
<p><i>Notes</i></p> <p>WBS Definition- Design sensor supports to fabrication tooling needed to fabricate engineering prototypes</p> <p>Labor BOE- Based on UW estimate</p>											
385	1.1.3.2.1.3.2.5	Design cooling tubes(UW)	\$0.00	\$13,252.00	\$13,252.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
2	MEU	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
22	DESU	1	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Design cooling tubes(UW)" continued											
<u>Notes</u>											
WBS Definition- Design cooling tubes and connections for engineering prototypes											
Labor BOE- Based on UW estimate											
386	1.1.3.2.1.3.2.6	Design cooling tubes(Fermilab)	\$0.00	\$2,464.00	\$2,464.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
<u>Notes</u>											
WBS Definition- Design cooling tubes and connections for engineering prototypes											
Labor BOE- Based on the expected number of drawings to be made											
387	1.1.3.2.1.3.2.7	Design cooling tube connections(UW)	\$0.00	\$33,130.00	\$33,130.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	1	\$18,980.00	\$0.00	\$0.00	\$18,980.00	400 h	0 h	0 h	0 h	400 h
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
22	DESU	1	\$14,150.00	\$0.00	\$0.00	\$14,150.00	400 h	0 h	0 h	0 h	400 h
<u>Notes</u>											
WBS Definition- Design cooling tubes and connections for engineering prototypes											
Labor BOE- Based on UW estimate											
388	1.1.3.2.1.3.2.8	Design connection to layer 2(UW)	\$0.00	\$29,817.00	\$29,817.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	1	\$17,082.00	\$0.00	\$0.00	\$17,082.00	360 h	0 h	0 h	0 h	360 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	360 h	0 h	0 h	0 h	360 h
22	DESU	1	\$12,735.00	\$0.00	\$0.00	\$12,735.00	360 h	0 h	0 h	0 h	360 h
<u>Notes</u>											
WBS Definition- Design connection to Layer 2 for engineering prototypes											
Labor BOE- Based on UW estimate											
389	1.1.3.2.1.3.2.9	Design connection to layer 2(Fermilab)	\$0.00	\$3,183.75	\$3,183.75						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	72 h	0 h	0 h	0 h	72 h
21	DESF	0.25	\$3,183.75	\$0.00	\$0.00	\$3,183.75	90 h	0 h	0 h	0 h	90 h
<u>Notes</u>											
WBS Definition- Design connection to Layer 2 for engineering prototypes											
Labor BOE- Based on the expected number of drawings to be made											

ID	WBS	Name	M&S Cost				Labor Cost			Cost		
390	1.1.3.2.1.3.2.10	Procure prototype fabrication fixtures(UW)	\$3,150.00				\$2,277.60			\$5,427.60		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
	16	PHYSU	0.05	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
	<i>Notes</i>											
	WBS Definition- Procure/fabricate fixtures necessary to make engineering prototypes											
	Labor BOE- Based on UW estimate											
391	1.1.3.2.1.3.2.11	Prototype sensor supports(UW)	\$2,500.00				\$7,312.80			\$9,812.80		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.3	\$4,555.20	\$0.00	\$0.00	\$4,555.20	96 h	0 h	0 h	0 h	96 h
	9	MTU	0.3	\$2,757.60	\$0.00	\$0.00	\$2,757.60	96 h	0 h	0 h	0 h	96 h
	15	PHYSF	0.05	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
	16	PHYSU	0.3	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
	<i>Notes</i>											
	WBS Definition- Fabricate, evaluate and test support structure and redesign based on information obtained											
	Labor BOE- Based on UW estimate											
392	1.1.3.2.1.3.2.12	Prototype cooling tubes(UW)	\$0.00				\$7,312.80			\$7,312.80		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.3	\$4,555.20	\$0.00	\$0.00	\$4,555.20	96 h	0 h	0 h	0 h	96 h
	9	MTU	0.3	\$2,757.60	\$0.00	\$0.00	\$2,757.60	96 h	0 h	0 h	0 h	96 h
	15	PHYSF	0.05	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
	16	PHYSU	0.3	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
	<i>Notes</i>											
	WBS Definition- Fabricate, evaluate and test cooling tubes and connections and redesign based on information obtained											
	Labor BOE- Based on UW estimate											
393	1.1.3.2.1.3.2.13	Prototype cooling tube connections(UW)	\$0.00				\$182.82			\$182.82		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.3	\$113.88	\$0.00	\$0.00	\$113.88	2.4 h	0 h	0 h	0 h	2.4 h
	9	MTU	0.3	\$68.94	\$0.00	\$0.00	\$68.94	2.4 h	0 h	0 h	0 h	2.4 h
	15	PHYSF	0.05	\$0.00	\$0.00	\$0.00	\$0.00	0.4 h	0 h	0 h	0 h	0.4 h
	16	PHYSU	0.3	\$0.00	\$0.00	\$0.00	\$0.00	2.4 h	0 h	0 h	0 h	2.4 h
	<i>Notes</i>											
	WBS Definition- Fabricate, evaluate and test cooling tubes and connections and redesign based on information obtained											
	Labor BOE- Based on UW estimate											
394	1.1.3.2.1.3.2.14	Prototype connection to layer 2(UW)	\$0.00				\$12,188.00			\$12,188.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	9	MTU	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Fabricate, evaluate and test connection to Layer 2 and redesign based on information obtained											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Prototype connection to layer 2(UW)" continued											
<u>Notes</u>											
Labor BOE- Based on UW estimate											
395	1.1.3.2.1.3.2.15	Verify mechanical dimensions and precision of prototypes(UW)	\$0.00	\$2,847.00	\$2,847.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
<u>Notes</u>											
WBS Definition- Help make detailed measurements and analyze and make design corrections if necessary											
Labor BOE- Based on UW estimate											
396	1.1.3.2.1.3.2.16	Verify mechanical dimensions and precision of prototype(Fermilab)	\$0.00	\$6,231.75	\$6,231.75						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
21	DESF	0.25	\$1,061.25	\$0.00	\$0.00	\$1,061.25	30 h	0 h	0 h	0 h	30 h
25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
26	CMMP	1	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Make detailed measurements on CMM and help make design corrections if necessary											
Labor BOE- Number of measurements to be made based on Run2a experience											
397	1.1.3.2.1.3.2.17	Procure final fabrication fixtures(UW)	\$48,350.00	\$3,036.80	\$51,386.80						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
16	PHYSU	0.05	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u>											
WBS Definition- Procure/fabricate final fabrication fixtures											
Labor BOE- Based on UW estimate											
398	1.1.3.2.1.3.2.18	Procure materials for cooling and mechanical support(UW)	\$77,000.00	\$2,650.40	\$79,650.40						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.05	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
22	DESU	0.05	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u>											
WBS Definition- Procure materials needed for fabrication and assembly of cooling and mechanical support											
Labor BOE- Based on UW estimate											
399	1.1.3.2.1.3.2.19	Fabricate south layer 1 mechanical assemblies(UW)	\$0.00	\$18,282.00	\$18,282.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
9	MTU	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
16	PHYSU	0.4	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate south layer 1 mechanical assemblies(UW)" continued											
<u>Notes</u>											
WBS Definition- Fabricate all south Layer 1 mechanical assemblies											
Labor BOE- Based on UW estimate											
400	1.1.3.2.1.3.2.20	Verify mechanical dimensions and precision(UW)	\$0.00	\$2,847.00	\$2,847.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
2	MEU	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
<u>Notes</u>											
WBS Definition- Help make detailed measurements and analyze measurements to certify mechanical precision											
Labor BOE- Based on UW estimate											
401	1.1.3.2.1.3.2.21	Verify mechanical dimensions and precision(Fermilab)	\$0.00	\$3,129.45	\$3,129.45						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
21	DESF	0.25	\$1,061.25	\$0.00	\$0.00	\$1,061.25	30 h	0 h	0 h	0 h	30 h
25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
26	CMMP	0.1	\$344.70	\$0.00	\$0.00	\$344.70	12 h	0 h	0 h	0 h	12 h
29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Make detailed QC measurements on CMM and analyze measurements to certify mechanical precision											
Labor BOE- Number of measurements to be made based on Run2a experience											
402	1.1.3.2.1.3.2.22	Layer 1 South Mechanical Assemblies Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
403	1.1.3.2.1.3.2.23	Mount sensor modules for layer 1, south(Fermilab)	\$0.00	\$27,842.00	\$27,842.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
8	MTSF	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
21	DESF	0.1	\$1,415.00	\$0.00	\$0.00	\$1,415.00	40 h	0 h	0 h	0 h	40 h
25	CMMT	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
26	CMMP	0.3	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
<u>Notes</u>											
WBS Definition- Mount sensor modules for Layer 0 support structure											
Labor BOE- Based experience in Run2a, assume 2 physicists and one CMMT working full time will mount 1 module per day and include some slack time put 1 week on consultation by DES to update drawings											
404	1.1.3.2.1.3.2.24	Verify sensor alignment(Fermilab)	\$0.00	\$2,439.50	\$2,439.50						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
21	DESF	0.1	\$141.50	\$0.00	\$0.00	\$141.50	4 h	0 h	0 h	0 h	4 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost
"Verify sensor alignment(Fermilab)" continued					
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		25 CMMT 1 \$1,149.00 \$0.00 \$0.00 \$1,149.00 40 h 0 h 0 h 0 h 40 h			
		30 CMLL 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
	<u>Notes</u>				
	WBS Definition- Make detailed QC measurements on CMM and analyze measurements to certify mechanical precision				
	Labor BOE- Based on Run2a experience, full time measurements will be done 6 hours/day for 1 week				
405	1.1.3.2.1.3.2.25	Final electrical test of readout(Fermilab)	\$0.00	\$0.00	\$0.00
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
		16 PHYSU 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
		32 SASEQTestStandF 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
	<u>Notes</u>				
	WBS Definition- Perform electrical tests of south L1 readout and certify				
	Labor BOE- Each module will be plugged in to check (1 hour/module), groups of modules will be checked together for 2 days and final tests will be run for 1 day				
406	1.1.3.2.1.4	L1 South Complete	\$0.00	\$0.00	\$0.00
	<u>Notes</u>				
	WBS Definition- Milestone				
407	1.1.3.2.2	Mate layer 0 with layer 1, south(Fermilab)	\$11,500.00	\$10,207.00	\$21,707.00
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		1 MEF 1 \$1,898.00 \$0.00 \$0.00 \$1,898.00 40 h 0 h 0 h 0 h 40 h			
		8 MTSF 1 \$1,149.00 \$0.00 \$0.00 \$1,149.00 40 h 0 h 0 h 0 h 40 h			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
		16 PHYSU 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
		21 DESF 1 \$1,415.00 \$0.00 \$0.00 \$1,415.00 40 h 0 h 0 h 0 h 40 h			
		25 CMMT 1 \$1,149.00 \$0.00 \$0.00 \$1,149.00 40 h 0 h 0 h 0 h 40 h			
		26 CMMP 4 \$4,596.00 \$0.00 \$0.00 \$4,596.00 160 h 0 h 0 h 0 h 160 h			
		30 CMLL 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
	<u>Notes</u>				
	WBS Definition- Install Layer 0 inside of Layer 1, make mechanical connections and verify relative positioning				
	Labor BOE- 1 CMM full time with tech and physicist based on mating procedures in Run2a				
408	1.1.3.2.3	Final electrical test of layers 0-1 south(Fermilab)	\$0.00	\$0.00	\$0.00
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 80 h 0 h 0 h 0 h 80 h			
		16 PHYSU 1 \$0.00 \$0.00 \$0.00 \$0.00 80 h 0 h 0 h 0 h 80 h			
		32 SASEQTestStandF 1 \$0.00 \$0.00 \$0.00 \$0.00 80 h 0 h 0 h 0 h 80 h			
	<u>Notes</u>				
	WBS Definition- Make final electrical tests of Layers 0-1 south				
	Labor BOE- Run2a experience to plug in and fix all modules				

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																																														
409	1.1.3.2.4	L0-L1 South Complete	\$0.00	\$0.00	\$0.00																																																																														
	<u>Notes</u> WBS Definition- Milestone																																																																																		
410	1.1.3.2.5	L2-L5 barrel assembly	\$268,856.00	\$514,630.04	\$783,486.04																																																																														
	<u>Notes</u> WBS Definition- Summary task that includes all work on L2-L5 readout module fixtures stave fabrication, assembly, stave mounting and testing																																																																																		
411	1.1.3.2.5.1	L2-L5 readout module fixtures	\$110,600.00	\$62,628.60	\$173,228.60																																																																														
	<u>Notes</u> WBS Definition- The summary task that includes all of the L2-L5 readout module fixture design, production, and QC																																																																																		
412	1.1.3.2.5.1.1	Procure CMM	\$35,000.00	\$0.00	\$35,000.00																																																																														
	<u>Notes</u> WBS Definition- Develop specifications, bid, and procure CMM																																																																																		
413	1.1.3.2.5.1.2	Design fixtures	\$0.00	\$39,756.00	\$39,756.00																																																																														
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>1</td> <td>\$22,776.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$22,776.00</td> <td>480 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>480 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>480 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>480 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>480 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>480 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>1</td> <td>\$16,980.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$16,980.00</td> <td>480 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>480 h</td> </tr> </tbody> </table>											ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	1	\$22,776.00	\$0.00	\$0.00	\$22,776.00	480 h	0 h	0 h	0 h	480 h	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h	21	DESF	1	\$16,980.00	\$0.00	\$0.00	\$16,980.00	480 h	0 h	0 h	0 h	480 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																								
1	MEF	1	\$22,776.00	\$0.00	\$0.00	\$22,776.00	480 h	0 h	0 h	0 h	480 h																																																																								
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h																																																																								
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h																																																																								
21	DESF	1	\$16,980.00	\$0.00	\$0.00	\$16,980.00	480 h	0 h	0 h	0 h	480 h																																																																								
	<u>Notes</u> WBS Definition- Design and produce drawings for fixtures to be used for L2-L5 modules Labor BOE- Run2a experience																																																																																		
414	1.1.3.2.5.1.3	Procure initial layer 2-5 readout module fixtures	\$35,480.00	\$3,126.60	\$38,606.60																																																																														
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>0.1</td> <td>\$2,277.60</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,277.60</td> <td>48 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>48 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>0.05</td> <td>\$849.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$849.00</td> <td>24 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>24 h</td> </tr> </tbody> </table>											ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h	21	DESF	0.05	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h																																				
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																								
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21	DESF	0.05	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h																																																																								
	<u>Notes</u> WBS Definition- Machining and parts procurement for initial fixtures Labor BOE- Time is allocated for consultation both with DESF and MEF																																																																																		
415	1.1.3.2.5.1.4	QC readout module fixtures	\$0.00	\$4,903.50	\$4,903.50																																																																														
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28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																																								
	<u>Notes</u> WBS Definition- Verify that the initial set of fixtures meet specifications and perform as designed Labor BOE- Assume full time measurements at CMM and consulting with DESF and MEF to understand results based on Run2a measurement times																																																																																		

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
416	1.1.3.2.5.1.5	Finalize readout module fabrication fixtures	\$0.00	\$9,939.00	\$9,939.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	1.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Revise fixture drawings and specifications to take into account information learned from the first fixture set											
	Labor BOE- Assume full time DES and MEF with 2 full time PHYS and consultation with another 1/2 of DES and MEF											
417	1.1.3.2.5.1.6	Procure remaining layer 2-5 module fixtures(MRI)	\$40,120.00	\$0.00	\$40,120.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.15	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Procure the remaining fixtures to be used for L2-L5 modules											
	Labor BOE- Time is allocated for consultation both with DESF and MEF											
418	1.1.3.2.5.1.7	QC readout module fixtures	\$0.00	\$4,903.50	\$4,903.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
	21	DESF	0.25	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
	25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Verify that the remaining fixtures meet specifications and perform as designed											
	Labor BOE- Assume full time measurements at CMM and consulting with DESF and MEF to understand results based on Run2a measurement times											
419	1.1.3.2.5.2	Staves	\$158,256.00	\$441,494.44	\$599,750.44							
	<i>Notes</i>											
	WBS Definition- The summary task that includes all prototyping work, design, production, testing, and assembly of: stave cores, modules onto the stave, and stave shells for Layers 2-5 South											
420	1.1.3.2.5.2.1	Prototype Mechanical Stave	\$0.00	\$8,958.00	\$8,958.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
	29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Building using mechanical parts (not able to read out) full stave using all suggested assembly procedures											
	Labor BOE- Full time MT with 1/2 time PHYS and MEF, small DESF in case drawings need to be modified											
421	1.1.3.2.5.2.2	Prototype Mechanical Stave built	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
422	1.1.3.2.5.2.3	Finalize stave design			\$0.00	\$9,939.00	\$9,939.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	1.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Establish the design of staves and fixtures for stave fabrication, approve stave and fixture fabrication drawings											
	Labor BOE- Drawings to be completed using 1.5DESF. MEF and 2 PHYS needed to verify all parts and make sure measurements are OK											
423	1.1.3.2.5.2.4	Stave cores			\$63,616.00	\$165,368.80	\$228,984.80					
	<i>Notes</i>											
	WBS Definition- Summary task that includes all design and prototyping of stave cores, and all assembly of L2-L5 stave cores											
424	1.1.3.2.5.2.4.1	Design & prototyping of stave cores			\$9,458.72	\$114,098.40	\$123,557.12					
	<i>Notes</i>											
	WBS Definition- Summary task that includes all design and prototyping of stave cores											
425	1.1.3.2.5.2.4.1.1	Design cooling tubes			\$0.00	\$19,878.00	\$19,878.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	21	DESF	0.5	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Develop cooling tube mechanical designs sufficiently to begin fabrication of cooling tube prototypes											
	Labor BOE- Based on other design projects, each of PHYS, MEF, DES works 1/2 time to complete											
426	1.1.3.2.5.2.4.1.2	Conduct cooling analyses and tests			\$2,238.72	\$19,780.00	\$22,018.72					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$15,184.00	\$0.00	\$0.00	\$15,184.00	320 h	0 h	0 h	0 h	320 h
	8	MTSF	0.5	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	<i>Notes</i>											
	WBS Definition- Perform finite element and hand calculations to understand heat removal by the cooling structures, perform testing to verify the calculations											
	Labor BOE- MEF specifies and conducts tests, MT assists, PHYS analyzes data											
427	1.1.3.2.5.2.4.1.3	Design stave hybrid mounting			\$0.00	\$19,878.00	\$19,878.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	21	DESF	1	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Design the attachment of hybrids to the remainder of the stave structure, including insulators and ground connections											
	Labor BOE- Based on number of drawings and Run2a design experiences											

WBS Dictionary and Labor BOE as of 4/8/02
Run 2b Silicon Schedule

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
428	1.1.3.2.5.2.4.1.4	Design stave core fiducial and locating features	\$0.00	\$19,878.00	\$19,878.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	21	DESF	0.5	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Design fiducials to be used in placing silicon onto the stave cores and to be used in measuring stave positions within the completed silicon support structure; design the mechanical connections between the stave and its support structures											
	Labor BOE- Based on other design projects, each of PHYS, MEF, DES works 1/2 time to complete											
429	1.1.3.2.5.2.4.1.5	Procure stave core prototype fixtures	\$0.00	\$2,277.60	\$2,277.60							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Complete fixture drawings for prototypes, submit fixtures for fabrication, and complete fabrication of fixtures for prototypes, QC fixtures											
	Labor BOE- Time is allocated for consultation both with DESF and MEF											
430	1.1.3.2.5.2.4.1.6	Procure carbon fiber prepreg and other materials for core prototypes	\$7,220.00	\$3,036.80	\$10,256.80							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Procure carbon fiber, epoxy, insulating materials, and other materials needed for fabrication of stave core prototypes											
	Labor BOE- Based on other carbon fiber procurements											
431	1.1.3.2.5.2.4.1.7	Fabricate prototype stave cores	\$0.00	\$12,188.00	\$12,188.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Fabricate sufficient core prototypes to ensure that the fabrication process works well											
	Labor BOE- Full time design work based on other design projects											
432	1.1.3.2.5.2.4.1.8	Design and procure stave core QC fixtures	\$0.00	\$9,939.00	\$9,939.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	21	DESF	0.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Design and procure sufficient fixturing to allow QC of prototype cores to be carried out											
	Labor BOE- Based on other design experiences											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
433	1.1.3.2.5.2.4.1.9	QC prototype stave cores			\$0.00	\$4,196.00	\$4,196.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	25	CMMT	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	28	CMMS	0.5	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Perform and analyze measurements sufficient to ensure that stave core prototypes are dimensionally acceptable											
	Labor BOE- Based on Run2a experience with measurements and fixtures											
434	1.1.3.2.5.2.4.1.10	Conduct cooling tests			\$0.00	\$3,047.00	\$3,047.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Measure and analyze the thermal performance of completed stave cores											
	Labor BOE- Based on Run2a experience											
435	1.1.3.2.5.2.4.2	L4-L5 stave core fabrication			\$27,078.64	\$25,635.20	\$52,713.84					
	<i>Notes</i>											
	WBS Definition- Summary task that includes all assembly of the L4-L5 stave cores											
436	1.1.3.2.5.2.4.2.1	Procure stave core fixtures			\$0.00	\$3,975.60	\$3,975.60					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
	21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Make any revisions to core fixture fabrication drawings taking into account knowledge gained from prototypes and procure the final core fabrication fixtures, QC fixtures											
	Labor BOE- Time is allocated for consultation both with DESF and MEF											
437	1.1.3.2.5.2.4.2.2	Procure stave core materials			\$27,078.64	\$3,036.80	\$30,115.44					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Procure carbon fiber, epoxy, insulating materials, and other materials needed for fabrication of L4-L5 stave cores											
	Labor BOE- Run2a experience											
438	1.1.3.2.5.2.4.2.3	Fabricate stave cores			\$0.00	\$12,328.80	\$12,328.80					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
	8	MTSF	1.5	\$10,341.00	\$0.00	\$0.00	\$10,341.00	360 h	0 h	0 h	0 h	360 h
	21	DESF	0.1	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h
	<i>Notes</i>											
	WBS Definition- Fabricate the cores for L4-L5 south staves											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate stave cores" continued											
<u>Notes</u>											
Labor BOE- Full time work by MT with MEF supervising and support if drawings need to be changed											
439	1.1.3.2.5.2.4.2.4	QC stave cores	\$0.00	\$6,294.00	\$6,294.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Measure stave cores and verify that they meet dimensional requirements, verify that insulating materials are intact, verify that cooling passages are leak free and not plugged											
Labor BOE- Based on Run2a experience with measurements											
440	1.1.3.2.5.2.4.3	L4-L5 Cores For South Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
441	1.1.3.2.5.2.4.4	L2-L3 stave core fabrication	\$27,078.64	\$25,635.20	\$52,713.84						
<u>Notes</u>											
WBS Definition- Summary task that includes all assembly of the L2-L3 stave cores											
442	1.1.3.2.5.2.4.4.1	Procure stave core fixtures	\$0.00	\$3,975.60	\$3,975.60						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
<u>Notes</u>											
WBS Definition- Make any revisions to core fixture fabrication drawings taking into account knowledge gained from prototypes and procure the final core fabrication fixtures, QC fixtures											
Labor BOE- Time is allocated for consultation both with DESF and MEF											
443	1.1.3.2.5.2.4.4.2	Procure stave core materials	\$27,078.64	\$3,036.80	\$30,115.44						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
<u>Notes</u>											
WBS Definition- Procure carbon fiber, epoxy, insulating materials, and other materials needed for fabrication of L2-L3 stave cores											
Labor BOE- Run2a experience											
444	1.1.3.2.5.2.4.4.3	Fabricate stave cores	\$0.00	\$12,328.80	\$12,328.80						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
8	MTSF	1.5	\$10,341.00	\$0.00	\$0.00	\$10,341.00	360 h	0 h	0 h	0 h	360 h
21	DESF	0.1	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h
<u>Notes</u>											
WBS Definition- Fabricate the cores for L2-L3 south staves											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate stave cores" continued											
<u>Notes</u>											
Labor BOE- Full time work by MT with MEF supervising and support if drawings need to be changed											
445	1.1.3.2.5.2.4.4.4	QC stave cores	\$0.00	\$6,294.00	\$6,294.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Measure stave cores and verify that they meet dimensional requirements, verify that insulating materials are intact, verify that cooling passages are leak free and not plugged											
Labor BOE- Based on Run2a experience with measurements											
446	1.1.3.2.5.2.4.5	L2-L3 Cores For South Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
447	1.1.3.2.5.2.5	Stave core/hybrid modules	\$20,240.00	\$136,460.00	\$156,700.00						
<u>Notes</u>											
WBS Definition- Summary task that includes designing and fabrication of the fixtures as well as the module assembly onto and testing of the L2-L5 staves											
448	1.1.3.2.5.2.5.1	Design core/hybrid fabrication fixtures	\$0.00	\$93,300.00	\$93,300.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	2	\$45,552.00	\$0.00	\$0.00	\$45,552.00	960 h	0 h	0 h	0 h	960 h
8	MTSF	1	\$13,788.00	\$0.00	\$0.00	\$13,788.00	480 h	0 h	0 h	0 h	480 h
15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	960 h	0 h	0 h	0 h	960 h
21	DESF	2	\$33,960.00	\$0.00	\$0.00	\$33,960.00	960 h	0 h	0 h	0 h	960 h
<u>Notes</u>											
WBS Definition- Design the fixtures to mount and align hybrid / sensor modules on the stave cores, complete drawings of the fixtures											
Labor BOE- 2 of MEF, PHYS, DES based on Run2a design experience, need MT to test things											
449	1.1.3.2.5.2.5.2	Procure core/hybrid fabrication fixtures(MRI)	\$20,240.00	\$0.00	\$20,240.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<u>Notes</u>											
WBS Definition- Procure fixtures to mount and align hybrid / sensor modules on stave cores, QC fixtures											
Labor BOE- Time is allocated for consultation both with DESF and MEF											
450	1.1.3.2.5.2.5.3	Fabricate prototype core/hybrid	\$0.00	\$12,188.00	\$12,188.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate prototype core/hybrid" continued											
<u>Notes</u>											
WBS Definition- Fabricate a prototype core / hybrid /sensor module to verify fixture design and fabrication techniques / procedures											
Labor BOE- Assume it is full time work, gestimate											
451	1.1.3.2.5.2.5.4	L4-L5	\$0.00	\$15,486.00	\$15,486.00						
<u>Notes</u>											
WBS Definition- Summary task that includes all module assembly onto and testing of L4-L5 stave cores											
452	1.1.3.2.5.2.5.4.1	Install axial sensor modules on cores	\$0.00	\$6,452.50	\$6,452.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
21	DESF	0.1	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
25	CMMT	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h
<u>Notes</u>											
WBS Definition- Install axial hybrid / sensor modules on stave cores											
Labor BOE- 2 sets of cores per day, each taking 2 hours, consultation with DES included, include some setup time amounting to 1 week											
453	1.1.3.2.5.2.5.4.2	Verify alignment of sensor modules	\$0.00	\$2,581.00	\$2,581.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Perform and analyze CMM measurements to verify proper positioning of sensors on cores											
Labor BOE- Run2a experience											
454	1.1.3.2.5.2.5.4.3	Install stereo sensor modules on cores	\$0.00	\$3,871.50	\$3,871.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
21	DESF	0.1	\$424.50	\$0.00	\$0.00	\$424.50	12 h	0 h	0 h	0 h	12 h
25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Install stereo hybrid / sensor modules on stave cores											
Labor BOE- 3 sets of cores per day, each taking 1 hour											
455	1.1.3.2.5.2.5.4.4	Verify alignment of sensor modules	\$0.00	\$2,581.00	\$2,581.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Verify alignment of sensor modules" continued												
<u>Notes</u> WBS Definition- Perform and analyze CMM measurements to verify proper positioning of sensors on cores Labor BOE- Run2a experience												
456	1.1.3.2.5.2.5.5	L4-L5 Core/Hybrid Modules For South Complete	\$0.00	\$0.00	\$0.00							
<u>Notes</u> WBS Definition- Milestone												
457	1.1.3.2.5.2.5.6	L2-L3	\$0.00	\$15,486.00	\$15,486.00							
<u>Notes</u> WBS Definition- Summary task that includes all module assembly onto and testing of L2-L3 stave cores												
458	1.1.3.2.5.2.5.6.1	Install axial sensor modules on cores	\$0.00	\$6,452.50	\$6,452.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
	21	DES F	0.1	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
	25	CMMT	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h
	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h
<u>Notes</u> WBS Definition- Install axial hybrid / sensor modules on stave cores Labor BOE- 2 sets of cores per day, each taking 2 hours, consultation with DES included, include some setup time amounting to 1 week												
459	1.1.3.2.5.2.5.6.2	Verify alignment of sensor modules	\$0.00	\$2,581.00	\$2,581.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DES F	0.1	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
	25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Perform and analyze CMM measurements to verify proper positioning of sensors on cores Labor BOE- Run2a experience												
460	1.1.3.2.5.2.5.6.3	Install stereo sensor modules on cores	\$0.00	\$3,871.50	\$3,871.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	21	DES F	0.1	\$424.50	\$0.00	\$0.00	\$424.50	12 h	0 h	0 h	0 h	12 h
	25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u> WBS Definition- Install stereo hybrid / sensor modules on stave cores Labor BOE- 3 sets of cores per day, each taking 1 hour												

WBS Dictionary and Labor BOE as of 4/8/02
Run 2b Silicon Schedule

ID	WBS	Name	M&S Cost			Labor Cost			Cost			
461	1.1.3.2.5.2.5.6.4	Verify alignment of sensor modules	\$0.00	\$2,581.00	\$2,581.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.1	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
	25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	30	CMLL	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<u>Notes</u>											
	WBS Definition- Perform and analyze CMM measurements to verify proper positioning of sensors on cores											
	Labor BOE- Run2a experience											
462	1.1.3.2.5.2.5.7	L2-L3 Core/Hybrid Modules For South Complete	\$0.00	\$0.00	\$0.00							
	<u>Notes</u>											
	WBS Definition- Milestone											
463	1.1.3.2.5.2.6	Stave shells	\$59,600.00	\$59,968.60	\$119,568.60							
	<u>Notes</u>											
	WBS Definition- Summary task that includes the design, fabrication, and QC of the stave shells											
464	1.1.3.2.5.2.6.1	Design stave shells	\$0.00	\$26,172.00	\$26,172.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$22,776.00	\$0.00	\$0.00	\$22,776.00	480 h	0 h	0 h	0 h	480 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	21	DESF	0.1	\$3,396.00	\$0.00	\$0.00	\$3,396.00	96 h	0 h	0 h	0 h	96 h
	<u>Notes</u>											
	WBS Definition- Design the shells which provide mechanical stiffness to the staves, complete shell drawings											
	Labor BOE- Run2a design experience											
465	1.1.3.2.5.2.6.2	Design and procure shell QC fixtures	\$0.00	\$3,696.00	\$3,696.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.25	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	21	DESF	0.1	\$849.00	\$0.00	\$0.00	\$849.00	24 h	0 h	0 h	0 h	24 h
	<u>Notes</u>											
	WBS Definition- Design, document via drawings, and procure any fixtures needed to verify mechanical precision of stave shells, QC fixtures											
	Labor BOE- Run2a design and procurement experience											
466	1.1.3.2.5.2.6.3	Procure shell fabrication fixtures(MRI)	\$5,800.00	\$0.00	\$5,800.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	128 h	0 h	0 h	0 h	128 h
	<u>Notes</u>											
	WBS Definition- Design, document via drawings, and procure fixtures needed to fabricate stave shells, QC fixtures											
	Labor BOE- Time is allocated for consultation both with DESF and MEF											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
467	1.1.3.2.5.2.6.4	Procure carbon fiber prepreg for shell prototypes	\$7,400.00	\$3,036.80	\$10,436.80							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Procure carbon fiber prepreg for shell prototypes											
	Labor BOE- Based on other carbon fiber procurements											
468	1.1.3.2.5.2.6.5	Fabricate prototype stave shells	\$0.00	\$12,754.00	\$12,754.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
	<i>Notes</i>											
	WBS Definition- Fabricate prototype stave shells, verify that fixturing works, verify that mechanical precision and structural stiffness of prototypes are acceptable											
	Labor BOE- Full time prototyping estimate with DESF consultation											
469	1.1.3.2.5.2.6.6	Procure carbon fiber prepreg for shells	\$46,400.00	\$3,036.80	\$49,436.80							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$3,036.80	\$0.00	\$0.00	\$3,036.80	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Procure carbon fiber prepreg for shells											
	Labor BOE- Based on other carbon fiber procurements											
470	1.1.3.2.5.2.6.7	Fabricate stave shells	\$0.00	\$7,401.50	\$7,401.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$949.00	\$0.00	\$0.00	\$949.00	20 h	0 h	0 h	0 h	20 h
	8	MTSF	1	\$5,745.00	\$0.00	\$0.00	\$5,745.00	200 h	0 h	0 h	0 h	200 h
	21	DESF	0.1	\$707.50	\$0.00	\$0.00	\$707.50	20 h	0 h	0 h	0 h	20 h
	<i>Notes</i>											
	WBS Definition- Fabricate stave shells											
	Labor BOE- Full time MT with supervision of ME, consultation with DESF											
471	1.1.3.2.5.2.6.8	QC stave shells	\$0.00	\$3,871.50	\$3,871.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	1	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	30 h	0 h	0 h	0 h	30 h
	21	DESF	0.1	\$424.50	\$0.00	\$0.00	\$424.50	12 h	0 h	0 h	0 h	12 h
	<i>Notes</i>											
	WBS Definition- Perform and analyze CMM measurements to verify mechanical precision of stave shells											
	Labor BOE- Based on Run2a experience with measurements											

ID	WBS	Name			M&S Cost	Labor Cost			Cost			
472	1.1.3.2.5.2.7	Stave Shells For South Complete			\$0.00	\$0.00			\$0.00			
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>												
473	1.1.3.2.5.2.8	Design shell attachment fixtures			\$0.00	\$8,003.04			\$8,003.04			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.33	\$3,758.04	\$0.00	\$0.00	\$3,758.04	79.2 h	0 h	0 h	0 h	79.2 h
	15	PHYSF	0.33	\$0.00	\$0.00	\$0.00	\$0.00	79.2 h	0 h	0 h	0 h	79.2 h
	21	DESF	0.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
<p><i>Notes</i></p> <p>WBS Definition- Design fixtures to attach stave shells to stave cores carrying hybrid / sensor modules, complete drawings of fixtures</p> <p>Labor BOE- Run2a experience with fixturing times</p>												
474	1.1.3.2.5.2.9	Procure shell attachment fixtures(MRI)			\$4,800.00	\$0.00			\$4,800.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<p><i>Notes</i></p> <p>WBS Definition- Procure fixtures to attach stave shells to stave cores carrying hybrid / sensor modules, QC fixtures</p> <p>Labor BOE- Time is allocated for consultation both with DESF and MEF</p>												
475	1.1.3.2.5.2.10	Fabricate prototype staves			\$0.00	\$12,754.00			\$12,754.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
<p><i>Notes</i></p> <p>WBS Definition- Fabricate prototype staves by combining cores carrying hybrid / sensor modules with stave shells</p> <p>Labor BOE- Full time prototyping estimate with DESF consultation</p>												
476	1.1.3.2.5.2.11	Perform deflection tests on stave prototypes			\$0.00	\$19,780.00			\$19,780.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$15,184.00	\$0.00	\$0.00	\$15,184.00	320 h	0 h	0 h	0 h	320 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	25	CMMT	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	26	CMMP	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	30	CMML	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Verify that deflections of stave prototypes under load are acceptable, modify designs / fabrication fixtures / fabrication procedures (if necessary) to obtain satisfactory deflections</p> <p>Labor BOE- Run2a experience with mechanical testing</p>												
477	1.1.3.2.5.2.12	Finalize stave fabrication fixtures			\$10,000.00	\$9,939.00			\$19,939.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	1.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Finalize stave fabrication fixtures" continued											
<u>Notes</u>											
WBS Definition- Modify designs / fabrication fixtures / fabrication procedures (if necessary) to obtain satisfactory deflections, revise and complete all related drawings											
Labor BOE- Run2a experience with fixturing times											
478	1.1.3.2.5.2.13	Fabricate L2-L3 staves	\$0.00	\$5,162.00	\$5,162.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Fabricate L2-L3 staves											
Labor BOE- 2 staves per day with 2 hours per stave											
479	1.1.3.2.5.2.14	Test L2-L3 staves	\$0.00	\$0.00	\$0.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Electrical test of all staves (temporary cooling connections may be required), mechanical tests of a subset of staves											
Labor BOE- 2 physicists full time based on Run2a experience											
480	1.1.3.2.5.2.15	Fabricate L4-L5 staves	\$0.00	\$5,162.00	\$5,162.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.1	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Fabricate L2-L3 staves											
Labor BOE- 2 staves per day with 2 hours per stave											
481	1.1.3.2.5.2.16	Test L4-L5 staves	\$0.00	\$0.00	\$0.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<u>Notes</u>											
WBS Definition- Electrical test of all staves (temporary cooling connections may be required), mechanical tests of a subset of staves											
Labor BOE-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test L4-L5 staves" continued											
<i>Notes</i>											
2 physicists full time based on Run2a experience											
482	1.1.3.2.5.3	South Staves Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
483	1.1.3.2.5.4	Align south support cylinder in fixture on CMM	\$0.00	\$2,439.50	\$2,439.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
21	DESF	0.1	\$141.50	\$0.00	\$0.00	\$141.50	4 h	0 h	0 h	0 h	4 h
25	CMMT	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
30	CMLL	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Align the cylinder in its fixture on CMM, set up coordinate system for measuring stave positions											
Labor BOE- Run2a experience											
484	1.1.3.2.5.5	Install staves in south support cylinder	\$0.00	\$6,777.00	\$6,777.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.05	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMLL	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Install staves and attach to outer stave positioning bulkhead, connect staves to coolant distribution manifolds, strain relieve cables											
Labor BOE- Assumes 5 staves per day taking 4 hours each of CMMT, MT time, Assumes 1 full time PHYS and 0.25 of another with consultation of ME and DESF											
485	1.1.3.2.5.6	Verify stave alignment	\$0.00	\$1,290.50	\$1,290.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	10 h	0 h	0 h	0 h	10 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
21	DESF	0.1	\$141.50	\$0.00	\$0.00	\$141.50	4 h	0 h	0 h	0 h	4 h
25	CMMT	0.5	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
30	CMLL	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Perform and analyze CMM measurements of stave positions											
Labor BOE- Run2a experience assumes 4 hours of 2 techs time and the rest is supervisory											
486	1.1.3.2.5.7	Final electrical test of south layers 2-5	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Final electrical test of south layers 2-5" continued												
<p><u>Notes</u> WBS Definition- Perform electrical tests of layer 2-5 staves (temporary cooling connections may be required)</p> <p>Labor BOE- 2 full time phys testing 6 staves per day</p>												
487	1.1.3.2.6	Layer 2-5 South Complete	\$0.00	\$0.00	\$0.00							
<p><u>Notes</u> WBS Definition- Milestone</p>												
488	1.1.3.2.7	Mate L0-L1 with L2-L5, south	\$0.00	\$12,871.00	\$12,871.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	8	MTSF	1.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	1.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	21	DESF	0.1	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
	25	CMMT	1.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><u>Notes</u> WBS Definition- Install layer 0-1 assembly into layer 2-5 assembly, complete mechanical connections at outer end, verify alignment, connect layers 0-1 to coolant distribution manifolds</p> <p>Labor BOE- Run2a experience, with 3 full time techs, 3 full time supervisors (1.5 PHYS, 1.5 ME) on large CMM</p>												
489	1.1.3.2.8	Install purge gas system, south	\$0.00	\$1,828.20	\$1,828.20							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
	8	MTSF	1	\$689.40	\$0.00	\$0.00	\$689.40	24 h	0 h	0 h	0 h	24 h
<p><u>Notes</u> WBS Definition- Install lines / manifolds to supply purge gas to south assembly</p> <p>Labor BOE- full time ME and MT based on Run2a experience</p>												
490	1.1.3.2.9	Install dew point sensors, south	\$0.00	\$609.40	\$609.40							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$379.60	\$0.00	\$0.00	\$379.60	8 h	0 h	0 h	0 h	8 h
	8	MTSF	1	\$229.80	\$0.00	\$0.00	\$229.80	8 h	0 h	0 h	0 h	8 h
<p><u>Notes</u> WBS Definition- Install gas sample lines on south assembly</p> <p>Labor BOE- full time ME and MT based on Run2a experience</p>												
491	1.1.3.2.10	Install and check cooling system, south	\$0.00	\$6,094.00	\$6,094.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><u>Notes</u> WBS Definition- Make connections from coolant distribution bulkheads to the outside world, perform coolant system pressure and vacuum leak checks</p>												

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Install and check cooling system, south" continued												
<i>Notes</i>												
Labor BOE- full time work based on Run2a experience												
492	1.1.3.2.11	Final electrical test of south silicon	\$0.00	\$0.00	\$0.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>												
WBS Definition- Perform electrical tests of south silicon, temporary local cooling system may be required												
Labor BOE- 2 full time phys testing 6 staves per day												
493	1.1.3.3	South Silicon Complete	\$0.00	\$0.00	\$0.00							
<i>Notes</i>												
WBS Definition- Milestone												
494	1.1.3.4	North silicon barrel assembly	\$0.00	\$207,868.00	\$207,868.00							
<i>Notes</i>												
WBS Definition- Summary task that includes all mechanical parts and assembly for the L0/L1 as well as L2-5 North silicon barrel, the cooling and gas systems as well as testing for all of it												
495	1.1.3.4.1	L0-L1 barrel assembly	\$0.00	\$103,619.00	\$103,619.00							
<i>Notes</i>												
WBS Definition- Summary task that includes all mechanical parts and assembly for the L0/L1 North silicon barrel, including the L0 Barrel, L1 Barrel and the mating between them												
496	1.1.3.4.1.1	L0 Barrel	\$0.00	\$50,748.25	\$50,748.25							
<i>Notes</i>												
WBS Definition- The summary task that includes all of the L0 readout module fixturing and structures that compose and are mounted onto the L0 Barrel												
497	1.1.3.4.1.1.1	L0 structures	\$0.00	\$50,748.25	\$50,748.25							
<i>Notes</i>												
WBS Definition- The summary task that includes the design, prototyping, production of the L0 support structure and the modules mounted in it												
498	1.1.3.4.1.1.1.1	Fabricate north layer 0 mechanical assemblies(UW)	\$0.00	\$18,282.00	\$18,282.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	9	MTU	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	16	PHYSU	0.4	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
<i>Notes</i>												
WBS Definition- Fabricate all north Layer 0 mechanical assemblies												
Labor BOE- Based on UW estimate												
499	1.1.3.4.1.1.1.2	Verify mechanical dimensions and precision(UW)	\$0.00	\$2,847.00	\$2,847.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h

ID	WBS	Name	M&S Cost			Labor Cost			Cost			
504	1.1.3.4.1.1.1.7	Final electrical test of readout	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Perform electrical tests of north L0 readout and certify											
	Labor BOE- Each module will be plugged in to check (1 hour/module), groups of modules will be checked together for 3 days and final tests will be run for 1 week											
505	1.1.3.4.1.2	L0 North Complete	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>Notes</i>											
	WBS Definition- Milestone											
506	1.1.3.4.1.3	L1 Barrel	\$0.00	\$52,870.75	\$52,870.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>Notes</i>											
	WBS Definition- The summary task that includes all of the L1 readout module fixturing and structures that compose and are mounted onto the North L1 Barrel											
507	1.1.3.4.1.3.1	L1 structures	\$0.00	\$52,870.75	\$52,870.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>Notes</i>											
	WBS Definition- The summary task that includes the design, prototyping, production of the L1 support structure and the modules mounted in it											
508	1.1.3.4.1.3.1.1	Fabricate north layer 1 mechanical assemblies(UW)	\$0.00	\$18,282.00	\$18,282.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	9	MTU	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	16	PHYSU	0.4	\$0.00	\$0.00	\$0.00	\$0.00	96 h	0 h	0 h	0 h	96 h
	<i>Notes</i>											
	WBS Definition- Fabricate all north Layer 1 mechanical assemblies											
	Labor BOE- Based on UW estimate											
509	1.1.3.4.1.3.1.2	Verify mechanical dimensions and precision(UW)	\$0.00	\$2,847.00	\$2,847.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	2	MEU	0.5	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	<i>Notes</i>											
	WBS Definition- Analyze CMM measurements to certify mechanical precision											
	Labor BOE- Based on UW estimate											
510	1.1.3.4.1.3.1.3	Verify mechanical dimensions and precision(Fermilab)	\$0.00	\$2,784.75	\$2,784.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	21	DESF	0.25	\$1,061.25	\$0.00	\$0.00	\$1,061.25	30 h	0 h	0 h	0 h	30 h
	25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Verify mechanical dimensions and precision(Fermilab)" continued											
<i>Notes</i>											
Make detailed QC measurements on CMM and analyze measurements to certify mechanical precision											
Labor BOE-											
Number of measurements to be made based on Run2a experience											
511	1.1.3.4.1.3.1.4	L1 North Mechanical Assemblies Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
512	1.1.3.4.1.3.1.5	Mount sensor modules for layer 1, north	\$0.00	\$26,517.50	\$26,517.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
21	DESF	0.25	\$3,537.50	\$0.00	\$0.00	\$3,537.50	100 h	0 h	0 h	0 h	100 h
25	CMMT	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
<i>Notes</i>											
WBS Definition- Mount sensor modules on Layer 1 support structure											
Labor BOE-											
Based on CDF experience in Run2a, assume 2 physicists and one CMMT working full time will mount 2 modules per day and include some slack time put 1 week on consultation by DES to update drawings											
513	1.1.3.4.1.3.1.6	Verify sensor alignment	\$0.00	\$2,439.50	\$2,439.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
21	DESF	0.1	\$141.50	\$0.00	\$0.00	\$141.50	4 h	0 h	0 h	0 h	4 h
25	CMMT	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
30	CMMML	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Make detailed QC measurements on CMM and analyze measurements to certify mechanical precision											
Labor BOE-											
Based on Run2a experience, full time measurements will be done 6 hours/day for 1 week											
514	1.1.3.4.1.3.1.7	Final electrical test of readout	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Perform electrical tests of north L1 readout and certify											
Labor BOE-											
Each module will be plugged in to check (1 hour/module), groups of modules will be checked together for 3 days and final tests will be run for 1 week											
515	1.1.3.4.1.4	L1 North Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
516	1.1.3.4.2	Mate layer 0 with layer 1, north			\$0.00	\$2,298.00	\$2,298.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	25	CMMT	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	30	CMLL	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Install Layer 0 inside of Layer 1, make mechanical connections and verify relative positioning											
	Labor BOE- 1 CMM full time with tech and physicist based on mating procedures in Run2a											
517	1.1.3.4.3	Final electrical test of layers 0-1 north			\$0.00	\$0.00	\$0.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Make final electrical tests of Layers 0-1 north and certify											
	Labor BOE- Run2a experience to plug in and fix all modules											
518	1.1.3.4.4	L0-L1 North Complete			\$0.00	\$0.00	\$0.00					
	<i>Notes</i>											
	WBS Definition- Milestone											
519	1.1.3.4.5	L2-L5 barrel assembly			\$0.00	\$80,831.40	\$80,831.40					
	<i>Notes</i>											
	WBS Definition- Summary task that includes all work on the North L2-L5 readout module fixtures stave fabrication, assembly, stave mounting and testing											
520	1.1.3.4.5.1	Staves			\$0.00	\$70,607.40	\$70,607.40					
	<i>Notes</i>											
	WBS Definition- The summary task that includes all prototyping work, design, production, testing, and assembly of: stave cores, modules onto the stave, and stave shells for Layers 2-5 North											
521	1.1.3.4.5.1.1	Stave cores			\$0.00	\$23,698.40	\$23,698.40					
	<i>Notes</i>											
	WBS Definition- Summary task that includes all design and prototyping of stave cores, and all assembly of L2-L5 stave cores											
522	1.1.3.4.5.1.1.1	L4-L5 stave core fabrication			\$0.00	\$11,849.20	\$11,849.20					
	<i>Notes</i>											
	WBS Definition- Summary task that includes all assembly of the L4-L5 stave cores											
523	1.1.3.4.5.1.1.1.1	Fabricate stave cores			\$0.00	\$7,653.20	\$7,653.20					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.1	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
	8	MTSF	1.5	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Fabricate the cores for L4-L5 north staves											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate stave cores" continued											
<u>Notes</u>											
Labor BOE- Full time work by MT with MEF supervising and support if drawings need to be changed											
524	1.1.3.4.5.1.1.1.2	QC stave cores	\$0.00	\$4,196.00	\$4,196.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
25	CMMT	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Measure stave cores and verify that they meet dimensional requirements, verify that insulating materials are intact, verify that cooling passages are leak free and not plugged											
Labor BOE- Based on Run2a experience with measurements											
525	1.1.3.4.5.1.1.2	L4-L5 Cores For North Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
526	1.1.3.4.5.1.1.3	L2-L3 stave core fabrication	\$0.00	\$11,849.20	\$11,849.20						
<u>Notes</u>											
WBS Definition- Summary task that includes all assembly of the L2-L3 stave cores											
527	1.1.3.4.5.1.1.3.1	Fabricate stave cores	\$0.00	\$7,653.20	\$7,653.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.1	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
8	MTSF	1.5	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u>											
WBS Definition- Fabricate the cores for L2-L3 north staves											
Labor BOE- Full time work by MT with MEF supervising and support if drawings need to be changed											
528	1.1.3.4.5.1.1.3.2	QC stave cores	\$0.00	\$4,196.00	\$4,196.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
25	CMMT	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Measure stave cores and verify that they meet dimensional requirements, verify that insulating materials are intact, verify that cooling passages are leak free and not plugged											
Labor BOE- Based on Run2a experience with measurements											
529	1.1.3.4.5.1.1.4	L2-L3 Cores For North Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
530	1.1.3.4.5.1.2	Stave core/hybrid modules	\$0.00	\$27,576.00	\$27,576.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Summary task that includes the module assembly onto and testing of the L2-L5 staves</p>																																																																	
531	1.1.3.4.5.1.2.1	L4-L5	\$0.00	\$13,788.00	\$13,788.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Summary task that includes the module assembly onto and testing of the L4-L5 staves</p>																																																																	
532	1.1.3.4.5.1.2.1.1	Install axial sensor modules on cores	\$0.00	\$5,745.00	\$5,745.00																																																												
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>MTSF</td> <td>0.5</td> <td>\$2,872.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,872.50</td> <td>100 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>100 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>100 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>100 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>0.5</td> <td>\$2,872.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,872.50</td> <td>100 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>100 h</td> </tr> <tr> <td>30</td> <td>CMML</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Install axial hybrid / sensor modules on stave cores</p> <p>Labor BOE- 2 sets of cores per day, each taking 2 hours, consultation with DES included, include some setup time amounting to 1 week</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	8	MTSF	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h	25	CMMT	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h
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15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																																																						
25	CMMT	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h																																																						
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h																																																						
533	1.1.3.4.5.1.2.1.2	Verify alignment of sensor modules	\$0.00	\$2,298.00	\$2,298.00																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																						
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
534	1.1.3.4.5.1.2.1.3	Install stereo sensor modules on cores	\$0.00	\$3,447.00	\$3,447.00																																																												
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>MTSF</td> <td>0.5</td> <td>\$1,723.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,723.50</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>0.5</td> <td>\$1,723.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,723.50</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>30</td> <td>CMML</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Install stereo hybrid / sensor modules on stave cores</p> <p>Labor BOE- 3 sets of cores per day, each taking 1 hour</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h	25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h																																																						
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h																																																						
25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h																																																						
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h																																																						
535	1.1.3.4.5.1.2.1.4	Verify alignment of sensor modules	\$0.00	\$2,298.00	\$2,298.00																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																						
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
536	1.1.3.4.5.1.2.2	L4-L5 Core/Hybrid Modules For North Complete	\$0.00	\$0.00	\$0.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																	
537	1.1.3.4.5.1.2.3	L2-L3	\$0.00	\$13,788.00	\$13,788.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Summary task that includes the module assembly onto and testing of the L2-L3 staves</p>																																																																	
538	1.1.3.4.5.1.2.3.1	Install axial sensor modules on cores	\$0.00	\$5,745.00	\$5,745.00																																																												
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30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h																																																						
539	1.1.3.4.5.1.2.3.2	Verify alignment of sensor modules	\$0.00	\$2,298.00	\$2,298.00																																																												
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>1</td> <td>\$2,298.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,298.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>30</td> <td>CMML</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Perform and analyze CMM measurements to verify proper positioning of sensors on cores</p> <p>Labor BOE- Run2a experience</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																						
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
540	1.1.3.4.5.1.2.3.3	Install stereo sensor modules on cores	\$0.00	\$3,447.00	\$3,447.00																																																												
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>MTSF</td> <td>0.5</td> <td>\$1,723.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,723.50</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>0.5</td> <td>\$1,723.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,723.50</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>30</td> <td>CMML</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Install stereo hybrid / sensor modules on stave cores</p> <p>Labor BOE- 3 sets of cores per day, each taking 1 hour</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h	25	CMMT	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
8	MTSF	0.5	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h																																																						
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h																																																						
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30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h																																																						
541	1.1.3.4.5.1.2.3.4	Verify alignment of sensor modules	\$0.00	\$2,298.00	\$2,298.00																																																												
<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>1</td> <td>\$2,298.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,298.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>30</td> <td>CMML</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Perform and analyze CMM measurements to verify proper positioning of sensors on cores</p> <p>Labor BOE- Run2a experience</p>						ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h	30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h												
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						
25	CMMT	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																						
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																						

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																																								
542	1.1.3.4.5.1.2.4	L2-L3 Core/Hybrid Modules For North Complete	\$0.00	\$0.00	\$0.00																																																																								
	<u>Notes</u> WBS Definition- Milestone																																																																												
543	1.1.3.4.5.1.3	Stave shells	\$0.00	\$10,141.00	\$10,141.00																																																																								
	<u>Notes</u> WBS Definition- Summary task that includes the fabrication, and QC of the stave shells																																																																												
544	1.1.3.4.5.1.3.1	Fabricate stave shells	\$0.00	\$6,694.00	\$6,694.00																																																																								
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>0.1</td> <td>\$949.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$949.00</td> <td>20 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>20 h</td> </tr> <tr> <td>8</td> <td>MTSF</td> <td>1</td> <td>\$5,745.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$5,745.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	0.1	\$949.00	\$0.00	\$0.00	\$949.00	20 h	0 h	0 h	0 h	20 h	8	MTSF	1	\$5,745.00	\$0.00	\$0.00	\$5,745.00	200 h	0 h	0 h	0 h	200 h																																				
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																		
1	MEF	0.1	\$949.00	\$0.00	\$0.00	\$949.00	20 h	0 h	0 h	0 h	20 h																																																																		
8	MTSF	1	\$5,745.00	\$0.00	\$0.00	\$5,745.00	200 h	0 h	0 h	0 h	200 h																																																																		
	<u>Notes</u> WBS Definition- Fabricate stave shells Labor BOE- Full time MT with supervision of ME, consultation with DESF																																																																												
545	1.1.3.4.5.1.3.2	QC stave shells	\$0.00	\$3,447.00	\$3,447.00																																																																								
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>MTSF</td> <td>1</td> <td>\$3,447.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$3,447.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.25</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>30 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>30 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	8	MTSF	1	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	30 h	0 h	0 h	0 h	30 h																																				
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8	MTSF	1	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h																																																																		
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	30 h	0 h	0 h	0 h	30 h																																																																		
	<u>Notes</u> WBS Definition- Perform and analyze CMM measurements to verify mechanical precision of stave shells Labor BOE- Based on Run2a experience with measurements																																																																												
546	1.1.3.4.5.1.4	Stave Shells For North Complete	\$0.00	\$0.00	\$0.00																																																																								
	<u>Notes</u> WBS Definition- Milestone																																																																												
547	1.1.3.4.5.1.5	Fabricate L2-L3 staves	\$0.00	\$4,596.00	\$4,596.00																																																																								
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																		
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																																		
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																																		
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																																		
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																																		
30	CMLL	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																																		
	<u>Notes</u> WBS Definition- Fabricate L2-L3 staves Labor BOE- 2 staves per day with 2 hours per stave																																																																												
548	1.1.3.4.5.1.6	Test L2-L3 staves	\$0.00	\$0.00	\$0.00																																																																								
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> <tr> <td>16</td> <td>PHYSU</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> <tr> <td>32</td> <td>SASEQTestStandF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> </tbody> </table>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h																								
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16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h																																																																		
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h																																																																		
	<u>Notes</u> WBS Definition-																																																																												

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test L2-L3 staves" continued											
<i>Notes</i>											
Electrical test of all staves (temporary cooling connections may be required), mechanical tests of a subset of staves											
Labor BOE- 2 physicists full time based on Run2a experience											
549	1.1.3.4.5.1.7	Fabricate L4-L5 staves	\$0.00	\$4,596.00	\$4,596.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Fabricate L2-L3 staves											
Labor BOE- 2 staves per day with 2 hours per stave											
550	1.1.3.4.5.1.8	Test L4-L5 staves	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Electrical test of all staves (temporary cooling connections may be required), mechanical tests of a subset of staves											
Labor BOE- 2 physicists full time based on Run2a experience											
551	1.1.3.4.5.2	North Staves Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
552	1.1.3.4.5.3	Align north support cylinder in fixture on CMM	\$0.00	\$2,298.00	\$2,298.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
25	CMMT	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Align the cylinder in its fixture on CMM, set up coordinate system for measuring stave positions											
Labor BOE- Run2a experience											
553	1.1.3.4.5.4	Install staves in north support cylinder	\$0.00	\$6,777.00	\$6,777.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.05	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Install staves in north support cylinder" continued											
<i>Notes</i>											
WBS Definition- Install staves and attach to outer stave positioning bulkhead, connect staves to coolant distribution manifolds, strain relieve cables											
Labor BOE- Assumes 5 staves per day taking 4 hours each of CMMT, MT time, Assumes 1 full time PHYS and 0.25 of another with consultation of ME and DESF											
554	1.1.3.4.5.5	Verify stave alignment	\$0.00	\$1,149.00	\$1,149.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	10 h	0 h	0 h	0 h	10 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
25	CMMT	0.5	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Perform and analyze CMM measurements of stave positions											
Labor BOE- Run2a experience assumes 4 hours of 2 techs time and the rest is supervisory											
555	1.1.3.4.5.6	Final electrical test of north layers 2-5	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Perform electrical tests of layer 2-5 staves (temporary cooling connections may be required)											
Labor BOE- 2 full time phys testing 6 staves per day											
556	1.1.3.4.6	Layer 2-5 North Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
557	1.1.3.4.7	Mate L0-L1 with L2-L5, north	\$0.00	\$12,588.00	\$12,588.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
8	MTSF	1.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	1.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
25	CMMT	1.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
30	CMML	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Install layer 0-1 assembly into layer 2-5 assembly, complete mechanical connections at outer end, verify alignment, connect layers 0-1 to coolant distribution manifolds											
Labor BOE- Run2a experience, with 3 full time techs, 3 full time supervisors (1.5 PHYS, 1.5 ME) on large CMM											
558	1.1.3.4.8	Install purge gas system, north	\$0.00	\$1,828.20	\$1,828.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
8	MTSF	1	\$689.40	\$0.00	\$0.00	\$689.40	24 h	0 h	0 h	0 h	24 h
<i>Notes</i>											
WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Install purge gas system, north" continued											
<i>Notes</i> Install lines / manifolds to supply purge gas to south assembly											
Labor BOE- full time ME and MT based on Run2a experience											
559	1.1.3.4.9	Install dew point sensors, north	\$0.00	\$609.40	\$609.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$379.60	\$0.00	\$0.00	\$379.60	8 h	0 h	0 h	0 h	8 h
8	MTSF	1	\$229.80	\$0.00	\$0.00	\$229.80	8 h	0 h	0 h	0 h	8 h
<i>Notes</i> WBS Definition- Install gas sample lines on south assembly											
Labor BOE- full time ME and MT based on Run2a experience											
560	1.1.3.4.10	Install and check cooling system, north	\$0.00	\$6,094.00	\$6,094.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i> WBS Definition- Make connections from coolant distribution bulkheads to the outside world, perform coolant system pressure and vacuum leak checks											
Labor BOE- full time work based on Run2a experience											
561	1.1.3.4.11	Final electrical test of north silicon	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i> WBS Definition- Perform electrical tests of south silicon, temporary local cooling system may be required											
Labor BOE- 2 full time phys testing 6 staves per day											
562	1.1.3.5	North Silicon Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
563	1.1.3.6	Prepare for shipment	\$0.00	\$37,764.00	\$37,764.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$17,082.00	\$0.00	\$0.00	\$17,082.00	360 h	0 h	0 h	0 h	360 h
8	MTSF	2	\$20,682.00	\$0.00	\$0.00	\$20,682.00	720 h	0 h	0 h	0 h	720 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	360 h	0 h	0 h	0 h	360 h
<i>Notes</i> WBS Definition- Move silicon to its shipping fixture, enclose with protective covers, provide any necessary purge gas connections and supplies											
Labor BOE- Run2a experience											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																																																				
564	1.1.3.7	Silicon Ready To Move To DAB	\$0.00	\$0.00	\$0.00																																																																																				
	<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																																								
565	1.1.3.8	Cylinders	\$99,940.00	\$416,940.15	\$516,880.15																																																																																				
	<p><i>Notes</i></p> <p>WBS Definition- Summary task that includes both the south and north support cylinders and extension cylinder design, assembly, and testing</p>																																																																																								
566	1.1.3.8.1	South support cylinder assembly	\$80,340.00	\$206,351.00	\$286,691.00																																																																																				
	<p><i>Notes</i></p> <p>WBS Definition- Summary task that includes the south support cylinder design, assembly, and testing</p>																																																																																								
567	1.1.3.8.1.1	Prototype cylinder	\$3,940.00	\$13,086.00	\$17,026.00																																																																																				
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>0.5</td> <td>\$11,388.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$11,388.00</td> <td>240 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>240 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>480 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>480 h</td> </tr> <tr> <td>21</td> <td>DESF</td> <td>0.1</td> <td>\$1,698.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,698.00</td> <td>48 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>48 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Design and fabricate prototype outer cylindrical portions of the silicon support cylinder assembly</p> <p>Labor BOE- Based on other design and prototyping experiences</p>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h	21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h																																				
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																														
1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h																																																																														
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h																																																																														
21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h																																																																														
568	1.1.3.8.1.2	Prototype stave positioning bulkhead	\$6,048.00	\$16,035.00	\$22,083.00																																																																																				
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																														
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8	MTSF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h																																																																														
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h																																																																														
25	CMMT	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h																																																																														
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35	OGP	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h																																																																														
569	1.1.3.8.1.3	Prototype z = 0 membrane	\$0.00	\$10,690.00	\$10,690.00																																																																																				
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>0.5</td> <td>\$3,796.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$3,796.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>8</td> <td>MTSF</td> <td>1</td> <td>\$4,596.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$4,596.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>160 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>160 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>0.25</td> <td>\$1,149.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,149.00</td> <td>40 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>40 h</td> </tr> <tr> <td>26</td> <td>CMMP</td> <td>0.25</td> <td>\$1,149.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$1,149.00</td> <td>40 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>40 h</td> </tr> <tr> <td>35</td> <td>OGP</td> <td>0.25</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>40 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>40 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- Design and fabricate prototype z = 0 membranes</p> <p>Labor BOE- Assume measurements are needed with CMMT, full time MT to fabricate, ME and DESF make drawings, PHYS supervises</p>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h	8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h	25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h	26	CMMP	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h	35	OGP	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																														
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h																																																																														
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h																																																																														
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																																														
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h																																																																														
26	CMMP	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h																																																																														
35	OGP	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h																																																																														

WBS Dictionary and Labor BOE as of 4/8/02
Run 2b Silicon Schedule

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
570	1.1.3.8.1.4	Prototype reproducible ball connections	\$1,000.00	\$21,729.00	\$22,729.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	8	MTSF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	25	CMMT	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	26	CMMP	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	<i>Notes</i>											
	WBS Definition- Design and fabricate prototype reproducible ball connections											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
571	1.1.3.8.1.5	Fabricate prototype south support cylinder assembly	\$0.00	\$16,035.00	\$16,035.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	8	MTSF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	25	CMMT	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	26	CMMP	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	<i>Notes</i>											
	WBS Definition- Mate prototype outer cylindrical portion, outer stave positioning bulkhead, z = 0 membrane, and reproducible ball mounts											
	Labor BOE- Assume measurements are needed with CMMT, full time MT to fabricate, ME and DESF make drawings, PHYS supervises											
572	1.1.3.8.1.6	Measure cylinder deflections under load	\$0.00	\$11,839.00	\$11,839.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	25	CMMT	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	26	CMMP	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	36	LK	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Perform and analyze CMM or other measurements of deflections of the support cylinder assembly under load											
	Labor BOE- Full time CMMT with help from the rest											
573	1.1.3.8.1.7	Finalize design of support cylinders	\$0.00	\$9,939.00	\$9,939.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	1.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Evaluate prototype results, modify designs and procedures if needed, complete drawings of support cylinder components, the support cylinder assembly, and fabrication and assembly fixturing											
	Labor BOE- Based on other design and prototyping experiences											
574	1.1.3.8.1.8	Fabricate cylinder	\$35,460.00	\$33,768.00	\$69,228.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost
"Fabricate cylinder" continued					
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		8 MTSF 1.5 \$20,682.00 \$0.00 \$0.00 \$20,682.00 720 h 0 h 0 h 0 h 720 h			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 480 h 0 h 0 h 0 h 480 h			
		21 DESF 0.1 \$1,698.00 \$0.00 \$0.00 \$1,698.00 48 h 0 h 0 h 0 h 48 h			
<i>Notes</i>					
WBS Definition- Fabricate the outer cylindrical portions of the silicon support cylinder assembly, QC the culinder					
Labor BOE- 1.5 MTs fabricate supervised by ME with consultation with PHYS and DESF					
575	1.1.3.8.1.9	Fabricate stave positioning bulkhead	\$24,192.00	\$14,311.50	\$38,503.50
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		1 MEF 0.5 \$5,694.00 \$0.00 \$0.00 \$5,694.00 120 h 0 h 0 h 0 h 120 h			
		8 MTSF 1 \$6,894.00 \$0.00 \$0.00 \$6,894.00 240 h 0 h 0 h 0 h 240 h			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 240 h 0 h 0 h 0 h 240 h			
		25 CMMT 0.25 \$1,723.50 \$0.00 \$0.00 \$1,723.50 60 h 0 h 0 h 0 h 60 h			
		29 CMMM 0.25 \$0.00 \$0.00 \$0.00 \$0.00 60 h 0 h 0 h 0 h 60 h			
<i>Notes</i>					
WBS Definition- Fabricate the outer stave positioning bulkhead					
Labor BOE- Full time MT with supervision from PHYS and ME, need a few measurements on CMM					
576	1.1.3.8.1.10	Fabricate z = 0 membrane	\$0.00	\$9,541.00	\$9,541.00
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		1 MEF 0.5 \$3,796.00 \$0.00 \$0.00 \$3,796.00 80 h 0 h 0 h 0 h 80 h			
		8 MTSF 1 \$4,596.00 \$0.00 \$0.00 \$4,596.00 160 h 0 h 0 h 0 h 160 h			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 160 h 0 h 0 h 0 h 160 h			
		25 CMMT 0.25 \$1,149.00 \$0.00 \$0.00 \$1,149.00 40 h 0 h 0 h 0 h 40 h			
		35 OGP 0.25 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
<i>Notes</i>					
WBS Definition- Fabricate z = 0 membrane, QC the membrane					
Labor BOE- Full time MT with supervision from PHYS and ME, need a few measurements on CMM					
577	1.1.3.8.1.11	Fabricate reproducible ball connections	\$1,000.00	\$13,337.00	\$14,337.00
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		1 MEF 1 \$7,592.00 \$0.00 \$0.00 \$7,592.00 160 h 0 h 0 h 0 h 160 h			
		8 MTSF 1 \$4,596.00 \$0.00 \$0.00 \$4,596.00 160 h 0 h 0 h 0 h 160 h			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 160 h 0 h 0 h 0 h 160 h			
		25 CMMT 0.25 \$1,149.00 \$0.00 \$0.00 \$1,149.00 40 h 0 h 0 h 0 h 40 h			
		29 CMMM 0.25 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
<i>Notes</i>					
WBS Definition- Fabricate and QC reproducible ball connections					
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises					
578	1.1.3.8.1.12	Install z = 0 ball mount	\$0.00	\$3,334.25	\$3,334.25
		<i>ID Resource Name Units Cost Baseline Cost Act. Cost Rem. Cost Work Ovt. Work Baseline Work Act. Work Rem. Work</i>			
		1 MEF 1 \$1,898.00 \$0.00 \$0.00 \$1,898.00 40 h 0 h 0 h 0 h 40 h			
		8 MTSF 1 \$1,149.00 \$0.00 \$0.00 \$1,149.00 40 h 0 h 0 h 0 h 40 h			
		15 PHYSF 1 \$0.00 \$0.00 \$0.00 \$0.00 40 h 0 h 0 h 0 h 40 h			
		25 CMMT 0.25 \$287.25 \$0.00 \$0.00 \$287.25 10 h 0 h 0 h 0 h 10 h			

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Install z = 0 ball mount" continued											
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	10 h	0 h	0 h	0 h	10 h
<u>Notes</u>											
WBS Definition- Install the z = 0 ball mount ring within the outer cylinder											
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
579	1.1.3.8.1.13	Install and align z = 0 membrane	\$0.00	\$3,334.25	\$3,334.25						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
25	CMMT	0.25	\$287.25	\$0.00	\$0.00	\$287.25	10 h	0 h	0 h	0 h	10 h
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	10 h	0 h	0 h	0 h	10 h
<u>Notes</u>											
WBS Definition- Install and align the z = 0 membrane within the outer cylinder											
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
580	1.1.3.8.1.14	Install and align z = 600 ball mount	\$0.00	\$6,668.50	\$6,668.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
<u>Notes</u>											
WBS Definition- Install and align the z = 600 ball mount ring within the outer cylinder											
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
581	1.1.3.8.1.15	Install and align stave positioning bulkhead	\$8,700.00	\$6,668.50	\$15,368.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
<u>Notes</u>											
WBS Definition- Install and align the outer stave positioning bulkhead within the outer cylinder											
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
582	1.1.3.8.1.16	Measure cylinder deflections under load	\$0.00	\$16,035.00	\$16,035.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
8	MTSF	0.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
25	CMMT	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
36	LK	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Measure cylinder deflections under load" continued											
<i>Notes</i>											
WBS Definition- Measure cylinder deflections under load and verify that they are consistent with results from the prototype											
Labor BOE- Full time CMMT with help from the rest											
583	1.1.3.8.2	South extension cylinder	\$7,808.00	\$66,627.70	\$74,435.70						
<i>Notes</i>											
WBS Definition- Summary task that includes the south extension cylinder design, assembly, and testing											
584	1.1.3.8.2.1	Prototype z = 830 membrane	\$0.00	\$8,175.00	\$8,175.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Design, fabricate, and QC prototype z = 830 membranes											
Labor BOE- Based on other design and prototyping experiences											
585	1.1.3.8.2.2	Prototype mounts to CFT barrel 1	\$0.00	\$12,262.50	\$12,262.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.25	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
8	MTSF	0.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
21	DESF	0.5	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
25	CMMT	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
<i>Notes</i>											
WBS Definition- Design, fabricate, and QC prototype mechanical connections from the silicon extension cylinder to the outer end of CFT barrel 1											
Labor BOE- Based on other design and prototyping experiences											
586	1.1.3.8.2.3	Prototype reproducible ball connections	\$1,000.00	\$5,502.50	\$6,502.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.25	\$949.00	\$0.00	\$0.00	\$949.00	20 h	0 h	0 h	0 h	20 h
8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
21	DESF	1	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
<i>Notes</i>											
WBS Definition- Design, fabricate, and QC prototype reproducible ball connections from the silicon extension cylinder to the outer end of CFT barrel 2											
Labor BOE- Based on other design and prototyping experiences											

ID	WBS	Name	M&S Cost		Labor Cost		Cost				
587	1.1.3.8.2.4	Assemble and evaluate prototype	\$5,808.00	\$8,175.00	\$13,983.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Mate prototype extension cylinder, z = 830 membrane, mounts to CFT, and reproducible ball mounts to CFT											
Labor BOE- Based on other design and prototyping experiences											
588	1.1.3.8.2.5	Fabricate z = 830 membrane	\$0.00	\$8,375.00	\$8,375.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.2	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Design, fabricate, and QC z = 830 membrane											
Labor BOE- half time MT and ME to fabricate with measurements needed from CMMT, PHYS supervises											
589	1.1.3.8.2.6	Fabricate mounts to CFT barrel 1	\$0.00	\$8,375.00	\$8,375.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
21	DESF	0.2	\$1,132.00	\$0.00	\$0.00	\$1,132.00	32 h	0 h	0 h	0 h	32 h
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Design, fabricate, and QC mechanical connections from the silicon extension cylinder to the outer end of CFT barrel 1											
Labor BOE- half time MT and ME to fabricate with measurements needed from CMMT, PHYS supervises											
590	1.1.3.8.2.7	Fabricate reproducible ball connections	\$1,000.00	\$4,187.50	\$5,187.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
21	DESF	0.2	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
<i>Notes</i>											
WBS Definition- Design, fabricate, and QC reproducible ball connections from the silicon extension cylinder to the outer end of CFT barrel 2											
Labor BOE- half time MT and ME to fabricate with measurements needed from CMMT, PHYS supervises											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
591	1.1.3.8.2.8	Install z = 600 ball mount	\$0.00	\$3,617.25	\$3,617.25							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	21	DESF	0.2	\$283.00	\$0.00	\$0.00	\$283.00	8 h	0 h	0 h	0 h	8 h
	25	CMMT	0.25	\$287.25	\$0.00	\$0.00	\$287.25	10 h	0 h	0 h	0 h	10 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	10 h	0 h	0 h	0 h	10 h
	<i>Notes</i>											
	WBS Definition- Install and align the z = 600 ball mount ring within the south extension cylinder											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
592	1.1.3.8.2.9	Mate with south support cylinder assembly	\$0.00	\$723.45	\$723.45							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$379.60	\$0.00	\$0.00	\$379.60	8 h	0 h	0 h	0 h	8 h
	8	MTSF	1	\$229.80	\$0.00	\$0.00	\$229.80	8 h	0 h	0 h	0 h	8 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	8 h	0 h	0 h	0 h	8 h
	21	DESF	0.2	\$56.60	\$0.00	\$0.00	\$56.60	1.6 h	0 h	0 h	0 h	1.6 h
	25	CMMT	0.25	\$57.45	\$0.00	\$0.00	\$57.45	2 h	0 h	0 h	0 h	2 h
	36	LK	1	\$0.00	\$0.00	\$0.00	\$0.00	8 h	0 h	0 h	0 h	8 h
	<i>Notes</i>											
	WBS Definition- Mate the south support cylinder assembly with the south extension cylinder											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
593	1.1.3.8.2.10	Install and align mounts for CFT barrel 1	\$0.00	\$7,234.50	\$7,234.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	21	DESF	0.2	\$566.00	\$0.00	\$0.00	\$566.00	16 h	0 h	0 h	0 h	16 h
	25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
	36	LK	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Install and align the mounts to connect silicon to CFT barrel 1 within the south extension cylinder, verify alignment											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
594	1.1.3.8.3	North support cylinder assembly	\$0.00	\$103,227.50	\$103,227.50							
	<i>Notes</i>											
	WBS Definition- Summary task that includes the north support cylinder assembly, and testing											
595	1.1.3.8.3.1	Fabricate cylinder	\$0.00	\$28,074.00	\$28,074.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.25	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	8	MTSF	1.5	\$20,682.00	\$0.00	\$0.00	\$20,682.00	720 h	0 h	0 h	0 h	720 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	21	DESF	0.1	\$1,698.00	\$0.00	\$0.00	\$1,698.00	48 h	0 h	0 h	0 h	48 h
	<i>Notes</i>											
	WBS Definition- Fabricate the outer cylindrical portions of the silicon support cylinder assembly, QC the culinder											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate cylinder" continued											
<u>Notes</u>											
Labor BOE- 1.5 MTs fabricate supervised by ME with consultation with PHYS and DESF											
596	1.1.3.8.3.2	Fabricate stave positioning bulkhead	\$0.00	\$11,464.50	\$11,464.50						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	0.25	\$2,847.00	\$0.00	\$0.00	\$2,847.00	60 h	0 h	0 h	0 h	60 h
8	MTSF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
25	CMMT	0.25	\$1,723.50	\$0.00	\$0.00	\$1,723.50	60 h	0 h	0 h	0 h	60 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
<u>Notes</u>											
WBS Definition- Fabricate the outer stave positioning bulkhead											
Labor BOE- Full time MT with supervision from PHYS and ME, need a few measurements on CMM											
597	1.1.3.8.3.3	Fabricate z = 0 membrane	\$0.00	\$7,643.00	\$7,643.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
35	OGP	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<u>Notes</u>											
WBS Definition- Fabricate z = 0 membrane, QC the membrane											
Labor BOE- Full time MT with supervision from PHYS and ME, need a few measurements on CMM											
598	1.1.3.8.3.4	Fabricate reproducible ball connections	\$0.00	\$13,337.00	\$13,337.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<u>Notes</u>											
WBS Definition- Fabricate and QC reproducible ball connections											
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
599	1.1.3.8.3.5	Install z = 0 ball mount	\$0.00	\$6,668.50	\$6,668.50						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
<u>Notes</u>											
WBS Definition- Install the z = 0 ball mount ring within the outer cylinder											
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
600	1.1.3.8.3.6	Install and align z = 0 membrane	\$0.00	\$6,668.50	\$6,668.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
	30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
	<i>Notes</i>											
	WBS Definition- Install and align the z = 0 membrane within the outer cylinder											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
601	1.1.3.8.3.7	Install and align z = 600 ball mount	\$0.00	\$6,668.50	\$6,668.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
	30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
	<i>Notes</i>											
	WBS Definition- Install and align the z = 600 ball mount ring within the outer cylinder											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
602	1.1.3.8.3.8	Install and align stave positioning bulkhead	\$0.00	\$6,668.50	\$6,668.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
	30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
	<i>Notes</i>											
	WBS Definition- Install and align the outer stave positioning bulkhead within the outer cylinder											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
603	1.1.3.8.3.9	Measure cylinder deflections under load	\$0.00	\$16,035.00	\$16,035.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	8	MTSF	0.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h
	25	CMMT	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	36	LK	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Measure cylinder deflections under load and verify that they are consistent with results from the prototype											
	Labor BOE- Full time CMMT with help from the rest											
604	1.1.3.8.4	North extension cylinder	\$11,792.00	\$40,733.95	\$52,525.95							
	<i>Notes</i>											
	WBS Definition- Summary task that includes the north extension cylinder assembly, and testing											

ID	WBS	Name	M&S Cost		Labor Cost		Cost					
605	1.1.3.8.4.1	Fabricate z = 830 membrane	\$11,792.00	\$5,345.00	\$17,137.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Design, fabricate, and QC z = 830 membrane											
	Labor BOE- half time MT and ME to fabricate with measurements needed from CMMT, PHYS supervises											
606	1.1.3.8.4.2	Fabricate mounts to CFT barrel 1	\$0.00	\$5,345.00	\$5,345.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.25	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	25	CMMT	0.25	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Design, fabricate, and QC mechanical connections from the silicon extension cylinder to the outer end of CFT barrel 1											
	Labor BOE- half time MT and ME to fabricate with measurements needed from CMMT, PHYS supervises											
607	1.1.3.8.4.3	Fabricate reproducible ball connections	\$0.00	\$2,672.50	\$2,672.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.25	\$949.00	\$0.00	\$0.00	\$949.00	20 h	0 h	0 h	0 h	20 h
	8	MTSF	0.5	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h
	<i>Notes</i>											
	WBS Definition- Design, fabricate, and QC reproducible ball connections from the silicon extension cylinder to the outer end of CFT barrel 2											
	Labor BOE- half time MT and ME to fabricate with measurements needed from CMMT, PHYS supervises											
608	1.1.3.8.4.4	Install z = 600 ball mount	\$0.00	\$3,334.25	\$3,334.25							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	8	MTSF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	25	CMMT	0.25	\$287.25	\$0.00	\$0.00	\$287.25	10 h	0 h	0 h	0 h	10 h
	29	CMMM	0.25	\$0.00	\$0.00	\$0.00	\$0.00	10 h	0 h	0 h	0 h	10 h
	<i>Notes</i>											
	WBS Definition- Install and align the z = 600 ball mount ring within the north extension cylinder											
	Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises											
609	1.1.3.8.4.5	Mate all support and extension cylinders	\$0.00	\$1,333.70	\$1,333.70							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
	8	MTSF	1	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																																								
"Mate all support and extension cylinders" continued																																																																													
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																		
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h																																																																		
25	CMMT	0.25	\$114.90	\$0.00	\$0.00	\$114.90	4 h	0 h	0 h	0 h	4 h																																																																		
30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	4 h	0 h	0 h	0 h	4 h																																																																		
<i>Notes</i>																																																																													
WBS Definition- Mate north and south support cylinder assemblies and north and south extension cylinders																																																																													
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises																																																																													
610	1.1.3.8.4.6	Install and align mounts to CFT barrel 1 in north extension cylinder	\$0.00	\$6,668.50	\$6,668.50																																																																								
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>1</td> <td>\$3,796.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$3,796.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>8</td> <td>MTSF</td> <td>1</td> <td>\$2,298.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$2,298.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>80 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>80 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>0.25</td> <td>\$574.50</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$574.50</td> <td>20 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>20 h</td> </tr> <tr> <td>30</td> <td>CMML</td> <td>0.25</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>20 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>20 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h	8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h	25	CMMT	0.25	\$574.50	\$0.00	\$0.00	\$574.50	20 h	0 h	0 h	0 h	20 h	30	CMML	0.25	\$0.00	\$0.00	\$0.00	\$0.00	20 h	0 h	0 h	0 h	20 h			
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																																		
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h																																																																		
8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h																																																																		
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h																																																																		
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WBS Definition- Install and align the mounts to connect silicon to CFT barrel 1 within the north extension cylinder, verify alignment																																																																													
Labor BOE- Full time ME and MT and then CMMT needed for a few measurements, PHYS supervises																																																																													
611	1.1.3.8.4.7	Measure cylinder deflections under load	\$0.00	\$16,035.00	\$16,035.00																																																																								
		<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEF</td> <td>0.5</td> <td>\$5,694.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$5,694.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> <tr> <td>8</td> <td>MTSF</td> <td>0.5</td> <td>\$3,447.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$3,447.00</td> <td>120 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>120 h</td> </tr> <tr> <td>15</td> <td>PHYSF</td> <td>0.25</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>60 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>60 h</td> </tr> <tr> <td>25</td> <td>CMMT</td> <td>1</td> <td>\$6,894.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$6,894.00</td> <td>240 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>240 h</td> </tr> <tr> <td>36</td> <td>LK</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>240 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>240 h</td> </tr> </tbody> </table>	ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	1	MEF	0.5	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h	8	MTSF	0.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	60 h	0 h	0 h	0 h	60 h	25	CMMT	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h	36	LK	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h			
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<i>Notes</i>																																																																													
WBS Definition- Perform and analyze deflection measurements of the complete, mated assembly under load																																																																													
Labor BOE- Full time CMMT with help from the rest																																																																													
612	1.1.3.9	Support Structures Within CFT Barrel 3	\$6,000.00	\$8,866.00	\$14,866.00																																																																								
<i>Notes</i>																																																																													
WBS Definition- This summary task includes design and fabrication of support structures and development of a cable routing plan																																																																													
613	1.1.3.9.1	Design support structures	\$0.00	\$6,602.00	\$6,602.00																																																																								
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<i>Notes</i>																																																																													
WBS Definition- Design structures to support junction cards, cabling, and services within CFT barrel 3																																																																													
Labor BOE- Run2a experience																																																																													

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
614	1.1.3.9.2	Fabricate support structures	\$6,000.00	\$2,264.00	\$8,264.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
	21	DESF	0.2	\$2,264.00	\$0.00	\$0.00	\$2,264.00	64 h	0 h	0 h	0 h	64 h
	<i>Notes</i>											
	WBS Definition- Fabricate the structures support junction cards, cabling, and services within CFT barrel 3											
	Labor BOE- Run2a experience											
615	1.1.3.10	Develop cable routing plan	\$0.00	\$9,939.00	\$9,939.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.25	\$5,694.00	\$0.00	\$0.00	\$5,694.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
	16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
	21	DESF	0.25	\$4,245.00	\$0.00	\$0.00	\$4,245.00	120 h	0 h	0 h	0 h	120 h
	<i>Notes</i>											
	WBS Definition- Determine the paths of cables and services from the inner surface of CFT barrel 3 to locations on the face of the central calorimeter											
	Labor BOE- Run2a experience											
616	1.1.3.11	Coolant distribution system	\$144,700.00	\$196,498.00	\$341,198.00							
	<i>Notes</i>											
	WBS Definition- This summary task includes design and fabrication of a coolant distribution system											
617	1.1.3.11.1	Design and fabricate additional system to provide -20 C coolant	\$88,600.00	\$70,260.00	\$158,860.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$18,980.00	\$0.00	\$0.00	\$18,980.00	400 h	0 h	0 h	0 h	400 h
	7	MTF	1	\$22,980.00	\$0.00	\$0.00	\$22,980.00	800 h	0 h	0 h	0 h	800 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	21	DESF	1	\$28,300.00	\$0.00	\$0.00	\$28,300.00	800 h	0 h	0 h	0 h	800 h
	<i>Notes</i>											
	WBS Definition- Design and fabricate an additional chiller, heat exchangers, storage vessels, gas purge and removal systems, and piping to provide -20 C cooling											
	Labor BOE- Full time tech with 0.5 time of PHYS and ME based on Run2a experience, need lots of drawings so full time DESF											
618	1.1.3.11.2	Verify flow and delivery capabilities	\$0.00	\$18,282.00	\$18,282.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	7	MTF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Verify the flow and delivery capabilities of the -20 C system at operating temperature											
	Labor BOE- Full time testing with PHYS, ME, MT											
619	1.1.3.11.3	Design and fabricate coolant distribution bulkheads	\$56,100.00	\$71,392.00	\$127,492.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$30,368.00	\$0.00	\$0.00	\$30,368.00	640 h	0 h	0 h	0 h	640 h
	7	MTF	1	\$18,384.00	\$0.00	\$0.00	\$18,384.00	640 h	0 h	0 h	0 h	640 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Design and fabricate coolant distribution bulkheads" continued											
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
21	DESF	1	\$22,640.00	\$0.00	\$0.00	\$22,640.00	640 h	0 h	0 h	0 h	640 h
<u>Notes</u>											
WBS Definition- Design and fabricate the bulkheads to distribute coolant to the ends of silicon layers 0-5											
Labor BOE- full time work based on Run2a experience											
620	1.1.3.11.4	Measure pressure drops versus flows of flow elements	\$0.00	\$12,188.00	\$12,188.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
7	MTF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Measure pressure drop versus flow for each stove type, each layer 0-1 structure, coolant distribution bulkheads, piping elements, heat exchangers, and other individual cooling system components											
Labor BOE- full time work based on Run2a experience											
621	1.1.3.11.5	Balance flows	\$0.00	\$24,376.00	\$24,376.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$15,184.00	\$0.00	\$0.00	\$15,184.00	320 h	0 h	0 h	0 h	320 h
7	MTF	1	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<u>Notes</u>											
WBS Definition- Select and custom machine any flow control devices needed to provide the required flow rate to each parallel path of the cooling system											
Labor BOE- full time work based on Run2a experience											
622	1.1.3.12	Dry gas distribution system	\$86,000.00	\$26,772.00	\$112,772.00						
<u>Notes</u>											
WBS Definition- This summary task includes the design and fabrication of the dry gas distribution system											
623	1.1.3.12.1	Design and fabricate dry gas system	\$86,000.00	\$26,772.00	\$112,772.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
7	MTF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
21	DESF	1	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u>											
WBS Definition- Design and fabricate all components, lines, instrumentation, controls, and equipment needed to provide high-reliability purge gas flow to the silicon region and to nearby detector regions											
Labor BOE- Based on Run2a experience and number of drawings needed											
624	1.1.3.13	Prepare controls, monitoring, and interlocks	\$160,000.00	\$18,282.00	\$178,282.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
7	MTF	1	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Prepare controls, monitoring, and interlocks" continued											
<u>Notes</u> WBS Definition- Prepare and test those controls, monitoring, and interlocks specific to silicon purge operation Labor BOE- Run2a experience											
625	1.1.3.14	Cooling And Dry Gas Systems Ready For Installation	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
626	1.1.3.15	Review mechanical systems for pORC	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Prepare, review, and submit documentation to demonstrate that silicon mechanical infrastructure is sufficient to safely install and operate silicon Labor BOE- Run2a experience											
627	1.1.4	Detector Production and Testing	\$275,950.00	\$810,927.90	\$1,086,877.90						
<u>Notes</u> WBS Definition- This summary element includes the hardware and software used in testing and quality assurance activities associated with silicon sensor, hybrid, and detector module production. It includes test stands/stations, storage boxes, commercial diagnostic and database software for recording test results.											
628	1.1.4.1	Develop module burn-in stands(UIC)	\$113,487.00	\$0.00	\$113,487.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	64 h	0 h	0 h	0 h	64 h
<u>Notes</u> WBS Definition- Designing and procuring parts necessary to build 2 module burn-in stands Labor BOE- Per UIC estimate											
629	1.1.4.2	Develop module burn-in stands (Fermilab)	\$71,463.00	\$39,540.00	\$111,003.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
8	MTSF	1	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
12	ETF	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
21	DESF	0.5	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- Designing and procuring parts necessary to build 2 module burn-in stands Labor BOE- Estimated by UIC based on Run2a experience											
630	1.1.4.3	L0 Modules	\$6,030.00	\$98,226.50	\$104,256.50						
<u>Notes</u> WBS Definition- The summary task that includes the prototyping and construction of all L0 modules											

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
631	1.1.4.3.1	Develop module prototype			\$6,030.00	\$33,666.00	\$39,696.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	8	MTSF	1	\$13,788.00	\$0.00	\$0.00	\$13,788.00	480 h	0 h	0 h	0 h	480 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	21	DESF	0.5	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
	<u>Notes</u>											
	WBS Definition- Design and prototyping of L0 module including how to build it											
	Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
632	1.1.4.3.2	L0 Module Production Begun			\$0.00	\$0.00	\$0.00					
	<u>Notes</u>											
	WBS Definition- Milestone											
633	1.1.4.3.3	Align and glue sensor to flex cable			\$0.00	\$3,676.80	\$3,676.80					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.2	\$3,676.80	\$0.00	\$0.00	\$3,676.80	128 h	0 h	0 h	0 h	128 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<u>Notes</u>											
	WBS Definition- Aligning sensor to flex cable and gluing it											
	Labor BOE- 144 modules with 15 per week, 3 per day, assume 1/2 hour per module with 1/2 hour slack											
634	1.1.4.3.4	Perform sensor-to-flex cable wirebonds			\$0.00	\$9,192.00	\$9,192.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	24	WBNDRT	0.5	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
	27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	<u>Notes</u>											
	WBS Definition- wirebonding sensor to flex cable											
	Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
635	1.1.4.3.5	Attach end hybrids to flex cable			\$0.00	\$0.00	\$0.00					
	<u>Notes</u>											
	WBS Definition- Gluing the hybrid to the flex cable											
	Labor BOE- work assumed in 1.1.4.3.3											
636	1.1.4.3.6	Wirebond end hybrid to flex cable			\$0.00	\$9,192.00	\$9,192.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	24	WBNDRT	0.5	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
	27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	<u>Notes</u>											
	WBS Definition- wirebonding hybrid to flex cable											
	Labor BOE-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Wirebond end hybrid to flex cable" continued											
<i>Notes</i> Assume 10 units/week or 2/day, each taking 1-2 hours											
637	1.1.4.3.7	L0 Module Production Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
638	1.1.4.3.8	Develop sensor module burn-in tests	\$0.00	\$754.40	\$754.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
38	ModuleBurnInStand	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i> WBS Definition- Design and try out module burn-in test including software analysis											
Labor BOE- Assume 4 days of EE and fulltime PHYS											
639	1.1.4.3.9	Debug sensor modules	\$0.00	\$9,192.00	\$9,192.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i> WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage											
Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
640	1.1.4.3.10	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	128 h	0 h	0 h	0 h	128 h
38	ModuleBurnInStand	0.2	\$0.00	\$0.00	\$0.00	\$0.00	128 h	0 h	0 h	0 h	128 h
<i>Notes</i> WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
641	1.1.4.3.11	Evaluate and repair sensor modules	\$0.00	\$22,353.30	\$22,353.30						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	1	\$20,400.00	\$0.00	\$0.00	\$20,400.00	680 h	0 h	0 h	0 h	680 h
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	1,360 h	0 h	0 h	0 h	1,360 h
24	WBNDRT	0.1	\$1,953.30	\$0.00	\$0.00	\$1,953.30	68 h	0 h	0 h	0 h	68 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	68 h	0 h	0 h	0 h	68 h
32	SASEQTestStandF	2	\$0.00	\$0.00	\$0.00	\$0.00	1,360 h	0 h	0 h	0 h	1,360 h
<i>Notes</i> WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
Labor BOE- 2 physicists and 1 tech working 2 days on each module											

ID	WBS	Name	M&S Cost				Labor Cost			Cost		
642	1.1.4.3.12	Perform quality assurance tests	\$0.00				\$10,200.00			\$10,200.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	0.5	\$10,200.00	\$0.00	\$0.00	\$10,200.00	340 h	0 h	0 h	0 h	340 h
	16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	1,360 h	0 h	0 h	0 h	1,360 h
	32	SASEQTestStandF	2	\$0.00	\$0.00	\$0.00	\$0.00	1,360 h	0 h	0 h	0 h	1,360 h
	<i>Notes</i>											
	WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
	Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
643	1.1.4.3.13	L0 Module Testing Complete	\$0.00				\$0.00			\$0.00		
	<i>Notes</i>											
	WBS Definition- Milestone											
644	1.1.4.4	L1 Modules	\$10,970.00				\$100,295.00			\$111,265.00		
	<i>Notes</i>											
	WBS Definition- The summary task that includes the prototyping and construction of all L1 modules											
645	1.1.4.4.1	Develop module prototype	\$10,970.00				\$33,666.00			\$44,636.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
	8	MTSF	1	\$13,788.00	\$0.00	\$0.00	\$13,788.00	480 h	0 h	0 h	0 h	480 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	21	DESF	0.5	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
	<i>Notes</i>											
	WBS Definition- Design and prototyping of L1 module including how to build it											
	Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
646	1.1.4.4.2	L1 Module Production Begun	\$0.00				\$0.00			\$0.00		
	<i>Notes</i>											
	WBS Definition- Milestone											
647	1.1.4.4.3	Align and glue sensors to hybrid	\$0.00				\$7,468.50			\$7,468.50		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$3,734.25	\$0.00	\$0.00	\$3,734.25	130 h	0 h	0 h	0 h	130 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	130 h	0 h	0 h	0 h	130 h
	25	CMMT	0.25	\$3,734.25	\$0.00	\$0.00	\$3,734.25	130 h	0 h	0 h	0 h	130 h
	29	CMMM	1	\$0.00	\$0.00	\$0.00	\$0.00	520 h	0 h	0 h	0 h	520 h
	<i>Notes</i>											
	WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
	Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time											
648	1.1.4.4.4	Wirebond sensors to hybrid	\$0.00				\$22,405.50			\$22,405.50		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$7,468.50	\$0.00	\$0.00	\$7,468.50	260 h	0 h	0 h	0 h	260 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	260 h	0 h	0 h	0 h	260 h
	24	WBNDRT	1	\$14,937.00	\$0.00	\$0.00	\$14,937.00	520 h	0 h	0 h	0 h	520 h
	27	WBNDR	1	\$0.00	\$0.00	\$0.00	\$0.00	520 h	0 h	0 h	0 h	520 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Wirebond sensors to hybrid" continued											
<i>Notes</i>											
WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											
649	1.1.4.4.5	L1 Module Production Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
650	1.1.4.4.6	Develop sensor module burn-in tests	\$0.00	\$754.40	\$754.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
38	ModuleBurnInStand	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Design and try out module burn-in test including software analysis											
Labor BOE- Assume 4 days of EE and fulltime PHYS											
651	1.1.4.4.7	Debug sensor modules	\$0.00	\$9,192.00	\$9,192.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
<i>Notes</i>											
WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage											
Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
652	1.1.4.4.8	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	260 h	0 h	0 h	0 h	260 h
38	ModuleBurnInStand	0.3	\$0.00	\$0.00	\$0.00	\$0.00	156 h	0 h	0 h	0 h	156 h
<i>Notes</i>											
WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
653	1.1.4.4.9	Evaluate and repair sensor modules	\$0.00	\$18,408.60	\$18,408.60						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	1	\$16,800.00	\$0.00	\$0.00	\$16,800.00	560 h	0 h	0 h	0 h	560 h
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	1,120 h	0 h	0 h	0 h	1,120 h
24	WBNDRT	0.1	\$1,608.60	\$0.00	\$0.00	\$1,608.60	56 h	0 h	0 h	0 h	56 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	56 h	0 h	0 h	0 h	56 h
32	SASEQTestStandF	2	\$0.00	\$0.00	\$0.00	\$0.00	1,120 h	0 h	0 h	0 h	1,120 h
<i>Notes</i>											
WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Evaluate and repair sensor modules" continued											
<i>Notes</i>											
Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
654	1.1.4.4.10	Perform quality assurance tests	\$0.00	\$8,400.00	\$8,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.5	\$8,400.00	\$0.00	\$0.00	\$8,400.00	280 h	0 h	0 h	0 h	280 h
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	1,120 h	0 h	0 h	0 h	1,120 h
32	SASEQTestStandF	2	\$0.00	\$0.00	\$0.00	\$0.00	1,120 h	0 h	0 h	0 h	1,120 h
<i>Notes</i>											
WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
655	1.1.4.4.11	L1 Module Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
656	1.1.4.5	Fabricate mechanical module prototypes	\$0.00	\$9,807.00	\$9,807.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.25	\$1,415.00	\$0.00	\$0.00	\$1,415.00	40 h	0 h	0 h	0 h	40 h
28	CMMS	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Use CMMs and fixtures to glue mechanical parts together and test tolerances for all module types											
Labor BOE- Using CMMS, 1 full time PHYS and MT will be testing procedures MEF, DESF for consulting											
657	1.1.4.6	Fabricate south axial 20 cm sensor gangs	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
25	CMMT	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
28	CMMS	6	\$0.00	\$0.00	\$0.00	\$0.00	1,200 h	0 h	0 h	0 h	1,200 h
<i>Notes</i>											
WBS Definition- Align 2 sensors and glue on CMM for 20 cm gangs											
Labor BOE- Use 3 small CMMs, 2 sets of gangs per CMM per day, each set takes CMMT, MT 1 hour with consultation by PHYS											
658	1.1.4.7	Fabricate south stereo 20 cm sensor gangs	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
25	CMMT	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
28	CMMS	6	\$0.00	\$0.00	\$0.00	\$0.00	1,200 h	0 h	0 h	0 h	1,200 h
<i>Notes</i>											
WBS Definition- Align 2 sensors and glue on CMM for 20 cm gangs											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate south stereo 20 cm sensor gangs" continued											
<u>Notes</u>											
Labor BOE- Use 3 small CMMs, 2 sets of gangs per CMM per day, each set takes CMMT, MT 1 hour with consultation by PHYS											
659	1.1.4.8	Fabricate north axial 20 cm sensor gangs	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
25	CMMT	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
28	CMMS	6	\$0.00	\$0.00	\$0.00	\$0.00	1,200 h	0 h	0 h	0 h	1,200 h
<u>Notes</u>											
WBS Definition- Align 2 sensors and glue on CMM for 20 cm gangs											
Labor BOE- Use 3 small CMMs, 2 sets of gangs per CMM per day, each set takes CMMT, MT 1 hour with consultation by PHYS											
660	1.1.4.9	Fabricate north stereo 20 cm sensor gangs	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
25	CMMT	0.6	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
28	CMMS	6	\$0.00	\$0.00	\$0.00	\$0.00	1,200 h	0 h	0 h	0 h	1,200 h
<u>Notes</u>											
WBS Definition- Align 2 sensors and glue on CMM for 20 cm gangs											
Labor BOE- Use 3 small CMMs, 2 sets of gangs per CMM per day, each set takes CMMT, MT 1 hour with consultation by PHYS											
661	1.1.4.10	10/10 Axial Modules	\$9,000.00	\$84,248.00	\$93,248.00						
<u>Notes</u>											
WBS Definition- The summary task that includes the prototyping and construction of all 10/10 Axial modules											
662	1.1.4.10.1	Develop electrical module prototype	\$9,000.00	\$33,666.00	\$42,666.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
8	MTSF	1	\$13,788.00	\$0.00	\$0.00	\$13,788.00	480 h	0 h	0 h	0 h	480 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
21	DESF	0.5	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
<u>Notes</u>											
WBS Definition- Design and prototyping of 10/10 Axial module including how to build it											
Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
663	1.1.4.10.2	Develop sensor module burn-in tests	\$0.00	\$754.40	\$754.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
38	ModuleBurnInStand	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Design and try out module burn-in test including software analysis											
Labor BOE-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Develop sensor module burn-in tests" continued												
<i>Notes</i> Assume 4 days of EE and fulltime PHYS												
664	1.1.4.10.3	South	\$0.00	\$24,913.80	\$24,913.80							
<i>Notes</i> WBS Definition- Summary task including all South 10/10 Axial module production												
665	1.1.4.10.3.1	10/10 South Axial Module Production Begun	\$0.00	\$0.00	\$0.00							
<i>Notes</i> WBS Definition- Milestone												
666	1.1.4.10.3.2	Align and glue sensors to hybrid	\$0.00	\$4,596.00	\$4,596.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	25	CMMT	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
<i>Notes</i> WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises												
667	1.1.4.10.3.3	Wirebond sensors to hybrid	\$0.00	\$6,894.00	\$6,894.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	24	WBNDRT	0.5	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i> WBS Definition- wirebond all necessary connections Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules												
668	1.1.4.10.3.4	10/10 South Axial Module Production Complete	\$0.00	\$0.00	\$0.00							
<i>Notes</i> WBS Definition- Milestone												
669	1.1.4.10.3.5	Debug sensor module	\$0.00	\$2,298.00	\$2,298.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i> WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module												

ID	WBS	Name			M&S Cost	Labor Cost	Cost					
670	1.1.4.10.3.6	Burn-in sensor modules			\$0.00	\$0.00	\$0.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
	Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
671	1.1.4.10.3.7	Evaluate and repair sensor modules			\$0.00	\$9,025.80	\$9,025.80					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$4,021.50	\$0.00	\$0.00	\$4,021.50	140 h	0 h	0 h	0 h	140 h
	11	ETSF	0.5	\$4,200.00	\$0.00	\$0.00	\$4,200.00	140 h	0 h	0 h	0 h	140 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
	24	WBNDRT	0.1	\$804.30	\$0.00	\$0.00	\$804.30	28 h	0 h	0 h	0 h	28 h
	27	WBNDRT	0.1	\$0.00	\$0.00	\$0.00	\$0.00	28 h	0 h	0 h	0 h	28 h
	32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
	<i>Notes</i>											
	WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
	Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
672	1.1.4.10.3.8	Perform quality assurance tests			\$0.00	\$2,100.00	\$2,100.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	0.25	\$2,100.00	\$0.00	\$0.00	\$2,100.00	70 h	0 h	0 h	0 h	70 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
	32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
	<i>Notes</i>											
	WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
	Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
673	1.1.4.10.3.9	10/10 South Axial Module Testing Complete			\$0.00	\$0.00	\$0.00					
	<i>Notes</i>											
	WBS Definition- Milestone											
674	1.1.4.10.4	North			\$0.00	\$24,913.80	\$24,913.80					
	<i>Notes</i>											
	WBS Definition- Summary task including all North 10/10 Axial module production											
675	1.1.4.10.4.1	10/10 North Axial Module Production Begun			\$0.00	\$0.00	\$0.00					
	<i>Notes</i>											
	WBS Definition- Milestone											
676	1.1.4.10.4.2	Align and glue sensors to hybrid			\$0.00	\$4,596.00	\$4,596.00					
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	25	CMMT	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Align and glue sensors to hybrid" continued											
<i>Notes</i>											
WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
677	1.1.4.10.4.3	Wirebond sensors to hybrid	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
24	WBNDRT	0.5	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											
678	1.1.4.10.4.4	10/10 North Axial Module Production Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
679	1.1.4.10.4.5	Debug sensor modules	\$0.00	\$2,298.00	\$2,298.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage											
Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
680	1.1.4.10.4.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
681	1.1.4.10.4.7	Evaluate and repair sensor modules	\$0.00	\$9,025.80	\$9,025.80						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$4,021.50	\$0.00	\$0.00	\$4,021.50	140 h	0 h	0 h	0 h	140 h
11	ETSF	0.5	\$4,200.00	\$0.00	\$0.00	\$4,200.00	140 h	0 h	0 h	0 h	140 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
24	WBNDRT	0.1	\$804.30	\$0.00	\$0.00	\$804.30	28 h	0 h	0 h	0 h	28 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	28 h	0 h	0 h	0 h	28 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
<i>Notes</i>											
WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Evaluate and repair sensor modules" continued											
<i>Notes</i> Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDR works 1 hour per module											
682	1.1.4.10.4.8	Perform quality assurance tests	\$0.00	\$2,100.00	\$2,100.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.25	\$2,100.00	\$0.00	\$0.00	\$2,100.00	70 h	0 h	0 h	0 h	70 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
<i>Notes</i> WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
683	1.1.4.10.4.9	10/10 North Axial Module Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
684	1.1.4.11	10/20 Axial Modules	\$0.00	\$41,926.60	\$41,926.60						
<i>Notes</i> WBS Definition- The summary task that includes the prototyping and construction of all 10/20 Axial modules											
685	1.1.4.11.1	Develop electrical module prototype	\$0.00	\$11,222.00	\$11,222.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i> WBS Definition- Design and prototyping of 10/20 Axial module including how to build it											
Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
686	1.1.4.11.2	Develop sensor module burn-in tests	\$0.00	\$754.40	\$754.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i> WBS Definition- Design and try out module burn-in test including software analysis											
Labor BOE- Assume 4 days of EE and fulltime PHYS											
687	1.1.4.11.3	South	\$0.00	\$14,975.10	\$14,975.10						
<i>Notes</i> WBS Definition- Summary task including all South 10/20 Axial module production											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
688	1.1.4.11.3.1	10/20 South Axial Module Production Begun	\$0.00	\$0.00	\$0.00																																																												
	<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																
689	1.1.4.11.3.2	Align and glue sensors to hybrid	\$0.00	\$2,872.50	\$2,872.50																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
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25	CMMT	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h																																																						
28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h																																																						
690	1.1.4.11.3.3	Wirebond sensors to hybrid	\$0.00	\$4,308.75	\$4,308.75																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
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27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																																																						
691	1.1.4.11.3.4	10/20 South Axial Module Production Complete	\$0.00	\$0.00	\$0.00																																																												
	<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																
692	1.1.4.11.3.5	Debug sensor module	\$0.00	\$1,436.25	\$1,436.25																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
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32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																																																						
693	1.1.4.11.3.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00																																																												
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> <th>Work</th> <th>Ovt. Work</th> <th>Baseline Work</th> <th>Act. Work</th> <th>Rem. Work</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>PHYSU</td> <td>1</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>200 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>200 h</td> </tr> <tr> <td>38</td> <td>ModuleBurnInStand</td> <td>0.5</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>100 h</td> <td>0 h</td> <td>0 h</td> <td>0 h</td> <td>100 h</td> </tr> </tbody> </table> <p><i>Notes</i></p> <p>WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels</p> <p>Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation</p>					ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h	38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																								
ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h																																																						
38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																																																						

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
694	1.1.4.11.3.7	Evaluate and repair sensor modules	\$0.00	\$5,157.60	\$5,157.60							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	24	WBNDRT	0.1	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
	27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
	32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
	Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
695	1.1.4.11.3.8	Perform quality assurance tests	\$0.00	\$1,200.00	\$1,200.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	0.25	\$1,200.00	\$0.00	\$0.00	\$1,200.00	40 h	0 h	0 h	0 h	40 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
	Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
696	1.1.4.11.3.9	10/20 South Axial Module Testing Complete	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											
697	1.1.4.11.4	North	\$0.00	\$14,975.10	\$14,975.10							
	<i>Notes</i>											
	WBS Definition- Summary task including all North 10/20 Axial module production											
698	1.1.4.11.4.1	10/20 North Axial Module Production Begun	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											
699	1.1.4.11.4.2	Align and glue sensors to hybrid	\$0.00	\$2,872.50	\$2,872.50							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
	15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
	25	CMMT	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
	28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	<i>Notes</i>											
	WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
	Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
700	1.1.4.11.4.3	Wirebond sensors to hybrid	\$0.00	\$4,308.75	\$4,308.75							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	50 h	0 h	0 h	0 h	50 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Perform quality assurance tests" continued											
<i>Notes</i>											
WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
706	1.1.4.11.4.9	10/20 North Axial Module Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
707	1.1.4.12	20/20 Axial Modules	\$15,000.00	\$70,298.40	\$85,298.40						
<i>Notes</i>											
WBS Definition- The summary task that includes the prototyping and construction of all 20/20 Axial modules											
708	1.1.4.12.1	Develop electrical module prototype	\$15,000.00	\$11,222.00	\$26,222.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Design and prototyping of 20/20 Axial module including how to build it											
Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
709	1.1.4.12.2	Develop sensor module burn-in tests	\$0.00	\$6,070.00	\$6,070.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	1	\$3,772.00	\$0.00	\$0.00	\$3,772.00	80 h	0 h	0 h	0 h	80 h
9	MTU	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Design and try out module burn-in test including software analysis											
Labor BOE- Assume 4 days of EE and fulltime PHYS											
710	1.1.4.12.3	South	\$0.00	\$26,503.20	\$26,503.20						
<i>Notes</i>											
WBS Definition- Summary task including all South 20/20 Axial module production											
711	1.1.4.12.3.1	20/20 South Axial Module Production Begun	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
712	1.1.4.12.3.2	Align and glue sensors to hybrid	\$0.00	\$4,596.00	\$4,596.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
28	CMMS	4	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Align and glue sensors to hybrid" continued											
<u>Notes</u>											
WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
713	1.1.4.12.3.3	Wirebond sensors to hybrid	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
24	WBNDRT	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
27	WBNDR	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											
714	1.1.4.12.3.4	20/20 South Axial Module Production Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
715	1.1.4.12.3.5	Debug sensor modules	\$0.00	\$2,298.00	\$2,298.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage											
Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
716	1.1.4.12.3.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
38	ModuleBurnInStand	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
717	1.1.4.12.3.7	Evaluate and repair sensor modules	\$0.00	\$10,315.20	\$10,315.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
11	ETSF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
24	WBNDRT	0.2	\$919.20	\$0.00	\$0.00	\$919.20	32 h	0 h	0 h	0 h	32 h
27	WBNDR	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Evaluate and repair sensor modules" continued											
<i>Notes</i> Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDR works 1 hour per module											
718	1.1.4.12.3.8	Perform quality assurance tests	\$0.00	\$2,400.00	\$2,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i> WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
719	1.1.4.12.3.9	20/20 South Axial Module Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
720	1.1.4.12.4	North	\$0.00	\$26,503.20	\$26,503.20						
<i>Notes</i> WBS Definition- Summary task including all North 20/20 Axial module production											
721	1.1.4.12.4.1	20/20 North Axial Module Production Begun	\$0.00	\$0.00	\$0.00						
<i>Notes</i> WBS Definition- Milestone											
722	1.1.4.12.4.2	Align and glue sensors to hybrid	\$0.00	\$4,596.00	\$4,596.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
28	CMMS	4	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
<i>Notes</i> WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
723	1.1.4.12.4.3	Wirebond sensors to hybrid	\$0.00	\$6,894.00	\$6,894.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
24	WBNDR	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
27	WBNDR	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i> WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
724	1.1.4.12.4.4	20/20 North Axial Module Production Complete	\$0.00	\$0.00	\$0.00						
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>											
725	1.1.4.12.4.5	Debug sensor modules	\$0.00	\$2,298.00	\$2,298.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage</p> <p>Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module</p>											
726	1.1.4.12.4.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
38	ModuleBurnInStand	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels</p> <p>Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation</p>											
727	1.1.4.12.4.7	Evaluate and repair sensor modules	\$0.00	\$10,315.20	\$10,315.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
11	ETSF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
24	WBNDRT	0.2	\$919.20	\$0.00	\$0.00	\$919.20	32 h	0 h	0 h	0 h	32 h
27	WBNDR	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections</p> <p>Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module</p>											
728	1.1.4.12.4.8	Perform quality assurance tests	\$0.00	\$2,400.00	\$2,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary</p> <p>Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work</p>											
729	1.1.4.12.4.9	20/20 North Axial Module Testing Complete	\$0.00	\$0.00	\$0.00						
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
730	1.1.4.13	10/10 Stereo Modules	\$0.00	\$66,859.80	\$66,859.80						
<p><i>Notes</i></p> <p>WBS Definition- The summary task that includes the prototyping and construction of all 10/10 Stereo modules</p>											
731	1.1.4.13.1	Develop electrical module prototype	\$0.00	\$22,444.00	\$22,444.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
8	MTSF	1	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
21	DESF	0.5	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
<p><i>Notes</i></p> <p>WBS Definition- Design and prototyping of 10/10 Stereo module including how to build it</p> <p>Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time</p>											
732	1.1.4.13.2	Develop sensor module burn-in tests	\$0.00	\$1,214.00	\$1,214.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
10	MTO	0.2	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Design and try out module burn-in test including software analysis</p> <p>Labor BOE- Assume 4 days of EE and fulltime PHYS</p>											
733	1.1.4.13.3	South	\$0.00	\$21,600.90	\$21,600.90						
<p><i>Notes</i></p> <p>WBS Definition- Summary task including all South 10/10 Stereo module production</p>											
734	1.1.4.13.3.1	10/10 South Stereo Module Production Begun	\$0.00	\$0.00	\$0.00						
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>											
735	1.1.4.13.3.2	Align and glue sensors to hybrid	\$0.00	\$4,021.50	\$4,021.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
25	CMMT	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	560 h	0 h	0 h	0 h	560 h
<p><i>Notes</i></p> <p>WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together</p> <p>Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises</p>											
736	1.1.4.13.3.3	Wirebond sensors to hybrid	\$0.00	\$6,032.25	\$6,032.25						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	70 h	0 h	0 h	0 h	70 h
24	WBNDRT	0.5	\$4,021.50	\$0.00	\$0.00	\$4,021.50	140 h	0 h	0 h	0 h	140 h
27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Wirebond sensors to hybrid" continued											
<i>Notes</i>											
WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											
737	1.1.4.13.3.4	10/10 South Stereo Production Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
738	1.1.4.13.3.5	Debug sensor modules	\$0.00	\$2,010.75	\$2,010.75						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
<i>Notes</i>											
WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage											
Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
739	1.1.4.13.3.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	280 h	0 h	0 h	0 h	280 h
38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
<i>Notes</i>											
WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
740	1.1.4.13.3.7	Evaluate and repair sensor modules	\$0.00	\$7,736.40	\$7,736.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
11	ETSF	0.5	\$3,600.00	\$0.00	\$0.00	\$3,600.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
24	WBNDRT	0.1	\$689.40	\$0.00	\$0.00	\$689.40	24 h	0 h	0 h	0 h	24 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
741	1.1.4.13.3.8	Perform quality assurance tests	\$0.00	\$1,800.00	\$1,800.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.25	\$1,800.00	\$0.00	\$0.00	\$1,800.00	60 h	0 h	0 h	0 h	60 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Perform quality assurance tests" continued											
<u>Notes</u>											
Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
742	1.1.4.13.3.9	10/10 South Stereo Module Testing Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
743	1.1.4.13.4	North	\$0.00	\$21,600.90	\$21,600.90						
<u>Notes</u>											
WBS Definition- Summary task including all North 10/10 Stereo module production											
744	1.1.4.13.4.1	10/10 North Stereo Module Production Begun	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
745	1.1.4.13.4.2	Align and glue sensors to hybrid	\$0.00	\$4,021.50	\$4,021.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
25	CMMT	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	560 h	0 h	0 h	0 h	560 h
<u>Notes</u>											
WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
746	1.1.4.13.4.3	Wirebond sensors to hybrid	\$0.00	\$6,032.25	\$6,032.25						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	70 h	0 h	0 h	0 h	70 h
24	WBNDRT	0.5	\$4,021.50	\$0.00	\$0.00	\$4,021.50	140 h	0 h	0 h	0 h	140 h
27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
<u>Notes</u>											
WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											
747	1.1.4.13.4.4	10/10 North Stereo Production Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
748	1.1.4.13.4.5	Debug sensor modules	\$0.00	\$2,010.75	\$2,010.75						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$2,010.75	\$0.00	\$0.00	\$2,010.75	70 h	0 h	0 h	0 h	70 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Debug sensor modules" continued											
<i>Notes</i>											
WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage											
Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
749	1.1.4.13.4.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	280 h	0 h	0 h	0 h	280 h
38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	140 h	0 h	0 h	0 h	140 h
<i>Notes</i>											
WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
750	1.1.4.13.4.7	Evaluate and repair sensor modules	\$0.00	\$7,736.40	\$7,736.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
11	ETSF	0.5	\$3,600.00	\$0.00	\$0.00	\$3,600.00	120 h	0 h	0 h	0 h	120 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
24	WBNDRT	0.1	\$689.40	\$0.00	\$0.00	\$689.40	24 h	0 h	0 h	0 h	24 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
751	1.1.4.13.4.8	Perform quality assurance tests	\$0.00	\$1,800.00	\$1,800.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.25	\$1,800.00	\$0.00	\$0.00	\$1,800.00	60 h	0 h	0 h	0 h	60 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	120 h	0 h	0 h	0 h	120 h
<i>Notes</i>											
WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
752	1.1.4.13.4.9	10/10 North Stereo Module Testing Complete	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
753	1.1.4.14	10/20 Stereo Modules	\$0.00	\$53,608.20	\$53,608.20						
<i>Notes</i>											
WBS Definition- The summary task that includes the prototyping and construction of all 10/20 Stereo modules											
754	1.1.4.14.1	Develop electrical module prototype	\$0.00	\$22,444.00	\$22,444.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Develop electrical module prototype" continued											
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
21	DESF	0.5	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
<i>Notes</i>											
WBS Definition- Design and prototyping of 10/20 Stereo module including how to build it											
Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											
755	1.1.4.14.2	Develop sensor module burn-in tests	\$0.00	\$1,214.00	\$1,214.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
10	MTO	0.2	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<i>Notes</i>											
WBS Definition- Design and try out module burn-in test including software analysis											
Labor BOE- Assume 4 days of EE and fulltime PHYS											
756	1.1.4.14.3	South	\$0.00	\$14,975.10	\$14,975.10						
<i>Notes</i>											
WBS Definition- Summary task including all South 10/20 Stereo module production											
757	1.1.4.14.3.1	10/20 South Stereo Module Production Begun	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
758	1.1.4.14.3.2	Align and glue sensors to hybrid	\$0.00	\$2,872.50	\$2,872.50						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
25	CMMT	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
<i>Notes</i>											
WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
759	1.1.4.14.3.3	Wirebond sensors to hybrid	\$0.00	\$4,308.75	\$4,308.75						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	50 h	0 h	0 h	0 h	50 h
24	WBNDRT	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h
27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
<i>Notes</i>											
WBS Definition- wirebond all necessary connections											
Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
760	1.1.4.14.3.4	10/20 South Module Production Complete	\$0.00	\$0.00	\$0.00						
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>											
761	1.1.4.14.3.5	Debug sensor modules	\$0.00	\$1,436.25	\$1,436.25						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.25	\$1,436.25	\$0.00	\$0.00	\$1,436.25	50 h	0 h	0 h	0 h	50 h
15	PHYSF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
<p><i>Notes</i></p> <p>WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage</p> <p>Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module</p>											
762	1.1.4.14.3.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	200 h	0 h	0 h	0 h	200 h
38	ModuleBurnInStand	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h
<p><i>Notes</i></p> <p>WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels</p> <p>Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation</p>											
763	1.1.4.14.3.7	Evaluate and repair sensor modules	\$0.00	\$5,157.60	\$5,157.60						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
24	WBNDRT	0.1	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections</p> <p>Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module</p>											
764	1.1.4.14.3.8	Perform quality assurance tests	\$0.00	\$1,200.00	\$1,200.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.25	\$1,200.00	\$0.00	\$0.00	\$1,200.00	40 h	0 h	0 h	0 h	40 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<p><i>Notes</i></p> <p>WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary</p> <p>Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work</p>											
765	1.1.4.14.3.9	10/20 South Module Testing Complete	\$0.00	\$0.00	\$0.00						
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
766	1.1.4.14.4	North	\$0.00	\$14,975.10	\$14,975.10																																																												
<p><i>Notes</i></p> <p>WBS Definition- Summary task including all North 10/20 Stereo module production</p>																																																																	
767	1.1.4.14.4.1	10/20 North Stereo Module Production Begun	\$0.00	\$0.00	\$0.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																	
768	1.1.4.14.4.2	Align and glue sensors to hybrid	\$0.00	\$2,872.50	\$2,872.50																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
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28	CMMS	2	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h																																																						
769	1.1.4.14.4.3	Wirebond sensors to hybrid	\$0.00	\$4,308.75	\$4,308.75																																																												
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ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost	Work	Ovt. Work	Baseline Work	Act. Work	Rem. Work																																																						
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24	WBNDRT	0.5	\$2,872.50	\$0.00	\$0.00	\$2,872.50	100 h	0 h	0 h	0 h	100 h																																																						
27	WBNDR	0.5	\$0.00	\$0.00	\$0.00	\$0.00	100 h	0 h	0 h	0 h	100 h																																																						
770	1.1.4.14.4.4	10/20 North Module Production Complete	\$0.00	\$0.00	\$0.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																	
771	1.1.4.14.4.5	Debug sensor modules	\$0.00	\$1,436.25	\$1,436.25																																																												
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772	1.1.4.14.4.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00																																																												
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ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Burn-in sensor modules" continued											
<u>Notes</u>											
WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels											
Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
773	1.1.4.14.4.7	Evaluate and repair sensor modules	\$0.00	\$5,157.60	\$5,157.60						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
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16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
24	WBNDRT	0.1	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
27	WBNDR	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
774	1.1.4.14.4.8	Perform quality assurance tests	\$0.00	\$1,200.00	\$1,200.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.25	\$1,200.00	\$0.00	\$0.00	\$1,200.00	40 h	0 h	0 h	0 h	40 h
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32	SASEQTestStandF	0.5	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
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775	1.1.4.14.4.9	10/20 North Module Testing Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
776	1.1.4.15	20/20 Stereo Modules	\$0.00	\$65,442.40	\$65,442.40						
<u>Notes</u>											
WBS Definition- The summary task that includes the prototyping and construction of all 20/20 Stereo modules											
777	1.1.4.15.1	Develop electrical module prototype	\$0.00	\$11,222.00	\$11,222.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.5	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
21	DESF	0.5	\$2,830.00	\$0.00	\$0.00	\$2,830.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>											
WBS Definition- Design and prototyping of 20/20 Stereo module including how to build it											
Labor BOE- Assume full time technician and PHYSF with designs by DESF and MEF 1/2 time											

ID	WBS	Name	M&S Cost					Labor Cost			Cost	
778	1.1.4.15.2	Develop sensor module burn-in tests	\$0.00					\$1,214.00			\$1,214.00	
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	5	EEU	0.2	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
	10	MTO	0.2	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Design and try out module burn-in test including software analysis											
	Labor BOE- Assume 4 days of EE and fulltime PHYS											
779	1.1.4.15.3	South	\$0.00					\$26,503.20			\$26,503.20	
	<i>Notes</i>											
	WBS Definition- Summary task including all South 20/20 Stereo module production											
780	1.1.4.15.3.1	20/20 South Stereo Module Production Begun	\$0.00					\$0.00			\$0.00	
	<i>Notes</i>											
	WBS Definition- Milestone											
781	1.1.4.15.3.2	Align and glue sensors to hybrid	\$0.00					\$4,596.00			\$4,596.00	
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	25	CMMT	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	28	CMMS	4	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
	<i>Notes</i>											
	WBS Definition- On CMM, using fixtures align sensors and hybrid and glue all together											
	Labor BOE- 2 modules glued per day per CMM, each takes 1 hour of time for each of MT and CMMT, MT helps document, PHYS supervises											
782	1.1.4.15.3.3	Wirebond sensors to hybrid	\$0.00					\$6,894.00			\$6,894.00	
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	24	WBNDRT	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	27	WBNDR	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- wirebond all necessary connections											
	Labor BOE- Assume use of 1 full time wirebonding machine for entire project, having each module take 1 hour plus extra time for problem modules											
783	1.1.4.15.3.4	20/20 South Stereo Module Production Complete	\$0.00					\$0.00			\$0.00	
	<i>Notes</i>											
	WBS Definition- Milestone											
784	1.1.4.15.3.5	Debug sensor modules	\$0.00					\$2,298.00			\$2,298.00	
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	0.5	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Debug sensor modules" continued											
<u>Notes</u> WBS Definition- Pull wirebonds on all bad channels so that module will take bias voltage Labor BOE- Based on Run2a experience, assume 2/day at 1-2 hours per module											
785	1.1.4.15.3.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
38	ModuleBurnInStand	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels Labor BOE- Assume a burn-in cycle of 3 days for a total of 64 modules allowed, each takes 1/2 hour of documentation											
786	1.1.4.15.3.7	Evaluate and repair sensor modules	\$0.00	\$10,315.20	\$10,315.20						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
11	ETSF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
24	WBNDRT	0.2	\$919.20	\$0.00	\$0.00	\$919.20	32 h	0 h	0 h	0 h	32 h
27	WBNDR	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
787	1.1.4.15.3.8	Perform quality assurance tests	\$0.00	\$2,400.00	\$2,400.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u> WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
788	1.1.4.15.3.9	20/20 South Stereo Module Testing Complete	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
789	1.1.4.15.4	North	\$0.00	\$26,503.20	\$26,503.20						
<u>Notes</u> WBS Definition- Summary task including all North 20/20 Stereo module production											

ID	WBS	Name	M&S Cost	Labor Cost	Cost																																																												
790	1.1.4.15.4.1	20/20 North Stereo Module Production Begun	\$0.00	\$0.00	\$0.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																	
791	1.1.4.15.4.2	Align and glue sensors to hybrid	\$0.00	\$4,596.00	\$4,596.00																																																												
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792	1.1.4.15.4.3	Wirebond sensors to hybrid	\$0.00	\$6,894.00	\$6,894.00																																																												
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27	WBNDR	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h																																																						
793	1.1.4.15.4.4	20/20 North Stereo Module Production Complete	\$0.00	\$0.00	\$0.00																																																												
<p><i>Notes</i></p> <p>WBS Definition- Milestone</p>																																																																	
794	1.1.4.15.4.5	Debug sensor modules	\$0.00	\$2,298.00	\$2,298.00																																																												
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795	1.1.4.15.4.6	Burn-in sensor modules	\$0.00	\$0.00	\$0.00																																																												
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ID	WBS	Name	M&S Cost			Labor Cost			Cost			
796	1.1.4.15.4.7	Evaluate and repair sensor modules	\$0.00			\$10,315.20			\$10,315.20			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	1	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
	11	ETSF	1	\$4,800.00	\$0.00	\$0.00	\$4,800.00	160 h	0 h	0 h	0 h	160 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	24	WBNDRT	0.2	\$919.20	\$0.00	\$0.00	\$919.20	32 h	0 h	0 h	0 h	32 h
	27	WBNDR	0.2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections											
	Labor BOE- 2 physicists and 1 tech working 2 days on each module, also WBNDRT works 1 hour per module											
797	1.1.4.15.4.8	Perform quality assurance tests	\$0.00			\$2,400.00			\$2,400.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	11	ETSF	0.5	\$2,400.00	\$0.00	\$0.00	\$2,400.00	80 h	0 h	0 h	0 h	80 h
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	32	SASEQTestStandF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Performing paperwork to grade each module and test for charge collection, temperature cycle, or other tests if deemed necessary											
	Labor BOE- Assume all modules are laser tested with 2 physicists performing 2-3 laser tests per day, also assume that 4 hours each day is needed by technician to help document work											
798	1.1.4.15.4.9	20/20 North Stereo Module Testing Complete	\$0.00			\$0.00			\$0.00			
	<i>Notes</i>											
	WBS Definition- Milestone											
799	1.1.4.16	Design database (UIC)	\$0.00			\$0.00			\$0.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
	<i>Notes</i>											
	WBS Definition- Finding platform and designing datastructures needed in database											
	Labor BOE- Based on UIC estimate											
800	1.1.4.17	Design travelers(UIC)	\$0.00			\$0.00			\$0.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	640 h	0 h	0 h	0 h	640 h
	<i>Notes</i>											
	WBS Definition- Design system for individual travelers for each module type											
	Labor BOE- Based on UIC estimate											
801	1.1.4.18	Construct database(UIC)	\$50,000.00			\$0.00			\$50,000.00			
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	560 h	0 h	0 h	0 h	560 h
	<i>Notes</i>											
	WBS Definition- Implement the database design on chosen platform											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Construct database(UIC)" continued												
<u>Notes</u>												
Labor BOE- Based on UIC estimate												
802	1.1.4.19	Maintain database(Fermilab)	\$0.00	\$153,100.00	\$153,100.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	400 h	0 h	0 h	0 h	400 h
	18	COMPF	1	\$153,100.00	\$0.00	\$0.00	\$153,100.00	4,000 h	0 h	0 h	0 h	4,000 h
<u>Notes</u>												
WBS Definition- Day-to-day maintenance of database as well as implementation of new features as necessary												
Labor BOE- Run2a experience												
803	1.1.5	Monitoring	\$55,000.00	\$86,939.20	\$141,939.20							
<u>Notes</u>												
WBS Definition- This summary element includes design, production and testing of radiation and temperature monitoring systems independent of DAQ readout chain												
804	1.1.5.1	Radiation Monitors	\$15,000.00	\$75,449.20	\$90,449.20							
<u>Notes</u>												
WBS Definition- This summary element includes hardware and detectors for radiation monitors that measure the dose and dose rate delivered to the silicon detector. It includes silicon diodes, hybrids, cabling, and readout electronics.												
805	1.1.5.1.1	Design system	\$0.00	\$16,606.40	\$16,606.40							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	1	MEF	0.1	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
	5	EEU	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
	15	PHYSF	0.1	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	16	PHYSU	0.25	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>												
WBS Definition- Design system and develop procurement plan												
Labor BOE- Run2a experience												
806	1.1.5.1.2	Produce diodes	\$1,500.00	\$0.00	\$1,500.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u>												
WBS Definition- From vendor, buy diodes												
Labor BOE- Run2a experience												
807	1.1.5.1.3	Test diodes	\$0.00	\$9,600.00	\$9,600.00							
	<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
	13	ETU	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
	16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>												
WBS Definition- Make sure that diodes function as expected												

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Test diodes" continued											
<u>Notes</u>											
Labor BOE- Run2a experience											
808	1.1.5.1.4	Design sensor boards	\$0.00	\$13,204.00	\$13,204.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	0.5	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
22	DESU	0.5	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Design the boards to readout the diodes											
Labor BOE- Run2a experience											
809	1.1.5.1.5	Procure prototype parts	\$13,500.00	\$754.40	\$14,254.40						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	0.1	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<u>Notes</u>											
WBS Definition- Procure parts for all of the sensor boards and downstream readout											
Labor BOE- Run2a experience											
810	1.1.5.1.6	Fabriacte prototypes	\$0.00	\$9,600.00	\$9,600.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
13	ETU	1	\$9,600.00	\$0.00	\$0.00	\$9,600.00	320 h	0 h	0 h	0 h	320 h
<u>Notes</u>											
WBS Definition- Fabricate prototype sensor boards as well as downstream readout											
Labor BOE- Run2a experience											
811	1.1.5.1.7	Test prototypes	\$0.00	\$7,544.00	\$7,544.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
<u>Notes</u>											
WBS Definition- Verify operation of prototype system											
Labor BOE- Run2a experience											
812	1.1.5.1.8	Decide on final system	\$0.00	\$0.00	\$0.00						
<u>Notes</u>											
WBS Definition- Milestone											
813	1.1.5.1.9	Procure final system	\$0.00	\$754.40	\$754.40						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	0.1	\$754.40	\$0.00	\$0.00	\$754.40	16 h	0 h	0 h	0 h	16 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Procure final system" continued											
<u>Notes</u> WBS Definition- Procure parts including sensor boards, diodes, and components Labor BOE- Run2a experience											
814	1.1.5.1.10	Fabricate final system	\$0.00	\$0.00	\$0.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	48 h	0 h	0 h	0 h	48 h
<u>Notes</u> WBS Definition- Make all of the sensor boards and all other readout components Labor BOE- Run2a experience											
815	1.1.5.1.11	Test radiation monitoring system	\$0.00	\$15,088.00	\$15,088.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
5	EEU	1	\$15,088.00	\$0.00	\$0.00	\$15,088.00	320 h	0 h	0 h	0 h	320 h
16	PHYSU	0.1	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
<u>Notes</u> WBS Definition- Test full readout chain on the bench Labor BOE- Run2a experience											
816	1.1.5.1.12	Install radiation monitors	\$0.00	\$2,298.00	\$2,298.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
8	MTSF	1	\$2,298.00	\$0.00	\$0.00	\$2,298.00	80 h	0 h	0 h	0 h	80 h
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<u>Notes</u> WBS Definition- Install the radiation sensors onto the silicon detector assemblies Labor BOE- Run2a experience											
817	1.1.5.1.13	Radiation Monitoring System Installed	\$0.00	\$0.00	\$0.00						
<u>Notes</u> WBS Definition- Milestone											
818	1.1.5.2	Temperature Monitors	\$40,000.00	\$11,490.00	\$51,490.00						
<u>Notes</u> WBS Definition- The summary task includes the design, prototyping, production, and testing for an independent system to read the silicon temperatures on L0/L1											
819	1.1.5.2.1	Design and prototype system	\$20,000.00	\$0.00	\$20,000.00						
<u>Notes</u> WBS Definition- Design, draw, and prototype system by obtaining parts necessary and testing them Labor BOE- To be estimated by RICE											

ID	WBS	Name				M&S Cost	Labor Cost			Cost		
820	1.1.5.2.2	Procure parts and build final system				\$20,000.00	\$0.00			\$20,000.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	880 h	0 h	0 h	0 h	880 h
	<i>Notes</i>											
	WBS Definition- Procure parts for all of the sensors and downstream readout											
	Labor BOE- To be estimated by RICE											
821	1.1.5.2.3	Test temperature monitoring system				\$0.00	\$0.00			\$0.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	16	PHYSU	1	\$0.00	\$0.00	\$0.00	\$0.00	480 h	0 h	0 h	0 h	480 h
	<i>Notes</i>											
	WBS Definition- Full readout chain test on the bench											
	Labor BOE- To be estimated by RICE											
822	1.1.5.2.4	Install temperature monitors				\$0.00	\$11,490.00			\$11,490.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	8	MTSF	1	\$11,490.00	\$0.00	\$0.00	\$11,490.00	400 h	0 h	0 h	0 h	400 h
	16	PHYSU	0.2	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Install temperature sensors on the L0/L1 assembly											
	Labor BOE- To be estimated by RICE											
823	1.1.5.2.5	Temperature Monitoring System Installed				\$0.00	\$0.00			\$0.00		
	<i>Notes</i>											
	WBS Definition- Milestone											
824	1.1.6	Installation				\$90,000.00	\$296,678.20			\$386,678.20		
	<i>Notes</i>											
	WBS Definition- This summary element includes equipment used to transport and install the completed silicon detector at DØ. It includes transportation, installation, and alignment fixtures, as well as hardware associated with the cooling and dry gas systems that is used											
825	1.1.6.1	Design transport fixtures				\$10,000.00	\$13,252.00			\$23,252.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h
	21	DESF	1	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
	<i>Notes</i>											
	WBS Definition- Design the fixtures for transporting silicon from SiDet to D0											
	Labor BOE- Run2a experience											
826	1.1.6.2	Fabricate transportation fixtures				\$0.00	\$3,047.00			\$3,047.00		
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	7	MTF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Fabricate transportation fixtures" continued											
<i>Notes</i>											
WBS Definition- Fabricate the fixtures for transporting silicon from SiDet to D0											
Labor BOE- Run2a experience											
827	1.1.6.3	Test transportation fixtures	\$0.00	\$3,047.00	\$3,047.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
7	MTF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Measure gravitational loadings imparted to an object of the same size and weight as the silicon assemblies during a trial move to D0											
Labor BOE- Run2a experience											
828	1.1.6.4	Design installation fixtures	\$30,000.00	\$19,878.00	\$49,878.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$11,388.00	\$0.00	\$0.00	\$11,388.00	240 h	0 h	0 h	0 h	240 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	240 h	0 h	0 h	0 h	240 h
21	DESF	1	\$8,490.00	\$0.00	\$0.00	\$8,490.00	240 h	0 h	0 h	0 h	240 h
<i>Notes</i>											
WBS Definition- Design the fixtures for moving silicon from the D0 high bay into final position within the CFT											
Labor BOE- Run2a experience											
829	1.1.6.5	Fabricate installation fixtures	\$0.00	\$3,656.40	\$3,656.40						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	0.2	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
7	MTF	0.2	\$1,378.80	\$0.00	\$0.00	\$1,378.80	48 h	0 h	0 h	0 h	48 h
<i>Notes</i>											
WBS Definition- Fabricate the fixtures for moving silicon from the D0 high bay into final position within the CFT											
Labor BOE- Run2a experience											
830	1.1.6.6	Test installation fixtures	\$0.00	\$3,047.00	\$3,047.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
7	MTF	1	\$1,149.00	\$0.00	\$0.00	\$1,149.00	40 h	0 h	0 h	0 h	40 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- To the extent possible before shutdown begins, perform a trial run using the fixtures with dummy silicon assemblies											
Labor BOE- Run2a experience											
831	1.1.6.7	Design alignment fixtures	\$0.00	\$13,252.00	\$13,252.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	160 h	0 h	0 h	0 h	160 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
"Design alignment fixtures" continued												
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	21	DESF	1	\$5,660.00	\$0.00	\$0.00	\$5,660.00	160 h	0 h	0 h	0 h	160 h
	<u>Notes</u>											
	WBS Definition- Design the fixtures to aid in aligning silicon with CFT barrel 1											
	Labor BOE- Run2a experience											
832	1.1.6.8	Fabricate alignment fixtures	\$0.00	\$3,656.40	\$3,656.40							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	0.2	\$2,277.60	\$0.00	\$0.00	\$2,277.60	48 h	0 h	0 h	0 h	48 h
	7	MTF	0.2	\$1,378.80	\$0.00	\$0.00	\$1,378.80	48 h	0 h	0 h	0 h	48 h
	<u>Notes</u>											
	WBS Definition- Fabricate the fixtures to aid in aligning silicon with CFT barrel 2											
	Labor BOE- Run2a experience											
833	1.1.6.9	Shutdown for Installation Begins	\$0.00	\$0.00	\$0.00							
	<u>Notes</u>											
	WBS Definition- Milestone											
834	1.1.6.10	Install and check out chiller	\$50,000.00	\$18,670.00	\$68,670.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$7,592.00	\$0.00	\$0.00	\$7,592.00	160 h	0 h	0 h	0 h	160 h
	4	EEF	0.25	\$1,886.00	\$0.00	\$0.00	\$1,886.00	40 h	0 h	0 h	0 h	40 h
	7	MTF	2	\$9,192.00	\$0.00	\$0.00	\$9,192.00	320 h	0 h	0 h	0 h	320 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<u>Notes</u>											
	WBS Definition- Install and test chiller for -20 C system											
	Labor BOE- Includes time for welding as well as testing, based on Run2a experience											
835	1.1.6.11	Install and check out piping	\$0.00	\$37,764.00	\$37,764.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$17,082.00	\$0.00	\$0.00	\$17,082.00	360 h	0 h	0 h	0 h	360 h
	7	MTF	2	\$20,682.00	\$0.00	\$0.00	\$20,682.00	720 h	0 h	0 h	0 h	720 h
	15	PHYSF	0.25	\$0.00	\$0.00	\$0.00	\$0.00	90 h	0 h	0 h	0 h	90 h
	<u>Notes</u>											
	WBS Definition- Install and test piping, vessels, etc. for -20 C system											
	Labor BOE- Includes time for welding as well as testing, based on Run2a experience											
836	1.1.6.12	Uncable	\$0.00	\$18,384.00	\$18,384.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	7	MTF	4	\$18,384.00	\$0.00	\$0.00	\$18,384.00	640 h	0 h	0 h	0 h	640 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	<u>Notes</u>											
	WBS Definition-											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Uncable" continued											
<u>Notes</u> Remove the cabling from Run 2a silicon											
Labor BOE- Based on the number of people who can successfully work in the enclosed area											
837	1.1.6.13	Drain coolant and dry passages	\$0.00	\$8,392.00	\$8,392.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
7	MTF	2	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Drain the coolant from the present -10 C system and dry the cooling passages											
Labor BOE- Run2a experience											
838	1.1.6.14	Remove H-disks	\$0.00	\$8,392.00	\$8,392.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
7	MTF	2	\$4,596.00	\$0.00	\$0.00	\$4,596.00	160 h	0 h	0 h	0 h	160 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
<u>Notes</u> WBS Definition- Remove the H-disks from within CFT barrel 3											
Labor BOE- Based on Run2a installation experience											
839	1.1.6.15	Decouple beryllium beam pipe	\$0.00	\$839.20	\$839.20						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$379.60	\$0.00	\$0.00	\$379.60	8 h	0 h	0 h	0 h	8 h
7	MTF	2	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	2.4 h	0 h	0 h	0 h	2.4 h
<u>Notes</u> WBS Definition- Remove the screws at the beryllium beam pipe flanges and remove the couplings											
Labor BOE- Run2a experience											
840	1.1.6.16	Remove EC flanges and bellows	\$0.00	\$839.20	\$839.20						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$379.60	\$0.00	\$0.00	\$379.60	8 h	0 h	0 h	0 h	8 h
7	MTF	2	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
15	PHYSF	0.3	\$0.00	\$0.00	\$0.00	\$0.00	2.4 h	0 h	0 h	0 h	2.4 h
<u>Notes</u> WBS Definition- Cut the end calorimeter beam tube flange and bellows assemblies from the inboard ends of the beam tubes passing through each end calorimeter											
Labor BOE- Run2a experience											
841	1.1.6.17	Remove beryllium beam pipe	\$0.00	\$3,207.00	\$3,207.00						
<u>ID</u>	<u>Resource Name</u>	<u>Units</u>	<u>Cost</u>	<u>Baseline Cost</u>	<u>Act. Cost</u>	<u>Rem. Cost</u>	<u>Work</u>	<u>Ovt. Work</u>	<u>Baseline Work</u>	<u>Act. Work</u>	<u>Rem. Work</u>
1	MEF	1	\$1,138.80	\$0.00	\$0.00	\$1,138.80	24 h	0 h	0 h	0 h	24 h
7	MTF	3	\$2,068.20	\$0.00	\$0.00	\$2,068.20	72 h	0 h	0 h	0 h	72 h

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Remove beryllium beam pipe" continued											
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	24 h	0 h	0 h	0 h	24 h
<i>Notes</i>											
WBS Definition- Install beam pipe handling fixturing, remove the Run 2a beryllium beam pipe from the Run 2a silicon											
Labor BOE- Run2a experience											
842	1.1.6.18	Remove SMT-North	\$0.00	\$2,138.00	\$2,138.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
7	MTF	3	\$1,378.80	\$0.00	\$0.00	\$1,378.80	48 h	0 h	0 h	0 h	48 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<i>Notes</i>											
WBS Definition- Remove SMT-North from the CFT											
Labor BOE- Run2a installation experience											
843	1.1.6.19	Remove SMT-South	\$0.00	\$2,138.00	\$2,138.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
7	MTF	3	\$1,378.80	\$0.00	\$0.00	\$1,378.80	48 h	0 h	0 h	0 h	48 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<i>Notes</i>											
WBS Definition- Remove SMT-South from the CFT											
Labor BOE- Run2a installation experience											
844	1.1.6.20	Verify mating of ball mount rings with those on the ends of CFT	\$0.00	\$1,218.80	\$1,218.80						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$759.20	\$0.00	\$0.00	\$759.20	16 h	0 h	0 h	0 h	16 h
7	MTF	1	\$459.60	\$0.00	\$0.00	\$459.60	16 h	0 h	0 h	0 h	16 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	16 h	0 h	0 h	0 h	16 h
<i>Notes</i>											
WBS Definition- Verify that the z = 830 ball mount rings mate properly with those on the ends of CFT barrel 1, modify as required											
Labor BOE- 2 days of measurements that need verification											
845	1.1.6.21	Install alignment fixtures	\$0.00	\$5,345.00	\$5,345.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
7	MTF	3	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Install the fixtures to aid in aligning silicon with CFT barrel 1											
Labor BOE- Run2a experience											

ID	WBS	Name	M&S Cost	Labor Cost	Cost							
846	1.1.6.22	Transport silicon detector to DAB	\$0.00	\$2,897.20	\$2,897.20							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	2	\$1,518.40	\$0.00	\$0.00	\$1,518.40	32 h	0 h	0 h	0 h	32 h
	7	MTF	3	\$1,378.80	\$0.00	\$0.00	\$1,378.80	48 h	0 h	0 h	0 h	48 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	32 h	0 h	0 h	0 h	32 h
	<i>Notes</i>											
	WBS Definition- Transport silicon from SiDet to D0											
	Labor BOE- Run2a experience											
847	1.1.6.23	Install silicon detector at DAB	\$0.00	\$10,690.00	\$10,690.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$3,796.00	\$0.00	\$0.00	\$3,796.00	80 h	0 h	0 h	0 h	80 h
	7	MTF	3	\$6,894.00	\$0.00	\$0.00	\$6,894.00	240 h	0 h	0 h	0 h	240 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	80 h	0 h	0 h	0 h	80 h
	<i>Notes</i>											
	WBS Definition- Move silicon from the D0 high bay into position within CFT barrel 1, make mechanical connections											
	Labor BOE- Run2a experience											
848	1.1.6.24	Detector Installed In Fiber Tracker	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Milestone											
849	1.1.6.25	Make and test cooling and dry gas connections	\$0.00	\$5,345.00	\$5,345.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
	7	MTF	3	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
	15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
	<i>Notes</i>											
	WBS Definition- Make and test the connections from the SW corner of the D0 platform to the ends of the silicon structure											
	Labor BOE- Run2a experience											
850	1.1.6.26	Install beam tube	\$0.00	\$0.00	\$0.00							
	<i>Notes</i>											
	WBS Definition- Install the Run 2b beryllium beam tube through the silicon region											
	Labor BOE- Estimates based on threading model											
851	1.1.6.27	Install and dress new twisted pair cables	\$0.00	\$25,928.00	\$25,928.00							
	<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
	4	EEF	1	\$7,544.00	\$0.00	\$0.00	\$7,544.00	160 h	0 h	0 h	0 h	160 h
	7	MTF	4	\$18,384.00	\$0.00	\$0.00	\$18,384.00	640 h	0 h	0 h	0 h	640 h
	15	PHYSF	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	16	PHYSU	2	\$0.00	\$0.00	\$0.00	\$0.00	320 h	0 h	0 h	0 h	320 h
	<i>Notes</i>											
	WBS Definition- Install and dress cables from the junction cards within CFT barrel 3 to the adapter cards on the face of the central calorimeter											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"Install and dress new twisted pair cables" continued											
<i>Notes</i>											
Labor BOE- Run2a experience											
852	1.1.6.28	Make beam tube connections	\$0.00	\$5,345.00	\$5,345.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
1	MEF	1	\$1,898.00	\$0.00	\$0.00	\$1,898.00	40 h	0 h	0 h	0 h	40 h
7	MTF	3	\$3,447.00	\$0.00	\$0.00	\$3,447.00	120 h	0 h	0 h	0 h	120 h
15	PHYSF	1	\$0.00	\$0.00	\$0.00	\$0.00	40 h	0 h	0 h	0 h	40 h
<i>Notes</i>											
WBS Definition- Make and leak chack connections from the beryllium beam tube to beam tubes passing through the end calorimeters											
Labor BOE- Run2a experience											
853	1.1.6.29	Ready To Begin Cabling And Commissioning Detector	\$0.00	\$0.00	\$0.00						
<i>Notes</i>											
WBS Definition- Milestone											
854	1.1.6.30	Connect cabling and commission detector	\$0.00	\$76,310.00	\$76,310.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
4	EEF	1	\$18,860.00	\$0.00	\$0.00	\$18,860.00	400 h	0 h	0 h	0 h	400 h
7	MTF	5	\$57,450.00	\$0.00	\$0.00	\$57,450.00	2,000 h	0 h	0 h	0 h	2,000 h
15	PHYSF	3	\$0.00	\$0.00	\$0.00	\$0.00	1,200 h	0 h	0 h	0 h	1,200 h
16	PHYSU	3	\$0.00	\$0.00	\$0.00	\$0.00	1,200 h	0 h	0 h	0 h	1,200 h
<i>Notes</i>											
WBS Definition- All of the electrical connections for the silicon detector are made and checked here											
Labor BOE- Run2a experience											
855	1.1.7	Readout Software	\$51,000.00	\$38,275.00	\$89,275.00						
<i>Notes</i>											
WBS Definition- This summary element includes procurement of CPU, and laptop computers, and associated commercial software packages for the purpose of aiding in the testing, debugging, readout, and status monitoring of the silicon detector.											
856	1.1.7.1	1553 Code	\$51,000.00	\$0.00	\$51,000.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	1,000 h	0 h	0 h	0 h	1,000 h
<i>Notes</i>											
WBS Definition- Programming all of the elements that use the 1553 EPICs interface for the system											
Labor BOE- Based on Run2a experience, estimate from Northwestern to modify code											
857	1.1.7.2	CPU Code	\$0.00	\$38,275.00	\$38,275.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	1,000 h	0 h	0 h	0 h	1,000 h
18	COMPF	0.5	\$38,275.00	\$0.00	\$0.00	\$38,275.00	1,000 h	0 h	0 h	0 h	1,000 h
<i>Notes</i>											
WBS Definition- Programming all of the VRBs, SEQUENCERs, and other DAQ CPUs											

ID	WBS	Name	M&S Cost	Labor Cost	Cost						
"CPU Code" continued											
<i>Notes</i>											
Labor BOE- Based on Run2a experience, estimate from Northwestern to modify code											
858	1.1.7.3	Level 3 Examine	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	1,000 h	0 h	0 h	0 h	1,000 h
<i>Notes</i>											
WBS Definition- Writing the examine process that allows L3 to monitor what is happening with silicon											
Labor BOE- Based on Run2a experience, estimate from Northwestern to modify code											
859	1.1.7.4	EPICS Code	\$0.00	\$0.00	\$0.00						
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	<i>Work</i>	<i>Ovt. Work</i>	<i>Baseline Work</i>	<i>Act. Work</i>	<i>Rem. Work</i>
16	PHYSU	0.5	\$0.00	\$0.00	\$0.00	\$0.00	1,000 h	0 h	0 h	0 h	1,000 h
<i>Notes</i>											
WBS Definition- Making sure that all databases are correct and the EPICs linked objects are functioning together											
Labor BOE- Based on Run2a experience, estimate from Northwestern to modify code											