

WBS Dictionary as of 4/8/02
Run 2b Silicon Schedule
Executive Summary

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

		# Sensors in z	# Sensors Total	Sensor Width (mm)	Readout Pitch (μm)	# Readout in z	# Chips per Readout Total Chips	# Hybrids Total			
Layer	Nphi	R (mm) Axial	R (mm) 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.

82	1.1.2	Readout System	\$4,240,515.04	\$1,589,309.50	\$5,829,824.54
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Notes

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.

328	1.1.3	Mechanical Design and Fabrication	\$1,348,696.00	\$2,175,875.30	\$3,524,571.30
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Notes

WBS Definition-

This summary element includes the development and fabrication of assembly fixtures, tooling, and support structures for sensors, readout components, and the fully assembled detector. Also included are mechanical and electrical infrastructure items such as mounting hardware, a detector cooling system, a dry-gas purge system, equipment protection interlocks and detector status monitoring equipment, alignment monitoring hardware, and the beryllium beam tube.

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627	1.1.4	Detector Production and Testing	\$275,950.00	\$810,927.90	\$1,086,877.90
	<i>Notes</i> 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.				
803	1.1.5	Monitoring	\$55,000.00	\$86,939.20	\$141,939.20
	<i>Notes</i> WBS Definition- This summary element includes design, production and testing of radiation and temperature monitoring systems independent of DAQ readout chain				
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				
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.				

WBS Dictionary as of 4/8/02
Run2b_Trigger_Schedule_4-7-02
Executive Summary

ID	WBS	Name	M&S Cost	Labor Cost	Total Cost
1	1.2	Run 2b Level 1 Trigger	\$2,300,070.42	\$986,721.68	\$3,286,792.10
	<p><i>Notes</i></p> <p>WBS Definition- The Level 1 trigger upgrade is designed to allow us to maintain the peak output rate of 5 kHz at the higher luminosities of Run 2b. This will be accomplished by upgrades to three systems - the Level 1 calorimeter trigger, a calorimeter cluster track match at Level 1, and the Level 1 central track trigger. This summary WBS element includes all the effort required to develop, build, test, install, and initially commission these trigger elements.</p>				
2	1.2.1	Level 1 Calorimeter Trigger	\$1,343,925.01	\$645,203.30	\$1,989,128.31
	<p><i>Notes</i></p> <p>WBS Definition- This summary element covers the Level 1 calorimeter trigger modifications. It includes development and procurement of ADC/digital filter boards (ADF), development and procurement of trigger-algorithm boards (TAB), the provision of output signals to facilitate a match between calorimeter towers and tracks, and procurement and improvements in associated readout crates, power supplies, cabling, and controls hardware.</p>				
71	1.2.2	Level 1 Calorimeter Track Matching	\$176,245.40	\$88,407.28	\$264,652.68
	<p><i>Notes</i></p> <p>WBS Definition- This summary element provides for improvements in the Run2a track-matching trigger. It includes development and procurement of slightly modified versions of existing Level 1 muon cards, and procurement of related cabling, connectors, readout crates, processors, and power supplies.</p>				
114	1.2.3	Level 1 Tracking	\$779,900.00	\$253,111.10	\$1,033,011.10
	<p><i>Notes</i></p> <p>WBS Definition- This summary element provides for improvements in the existing track trigger. It includes design and development of algorithms that utilize larger FPGAs, and development and procurement of new Digital Front-End (DFE) boards that utilize these FPGAs.</p>				
138	1.3	Run 2b Level 2 Trigger	\$473,800.00	\$160,128.45	\$633,928.45
	<p><i>Notes</i></p> <p>WBS Definition- The Level 2 trigger upgrade has been designed to maintain a peak output rate of 1 kHz in the higher luminosity environment of Run 2b. It consists of an upgrade to the Level 2 Beta processors and, in order to maintain adequate b-tagging efficiency, an upgrade to the silicon track trigger. This summary WBS element includes all the effort to design, build, test, install, and initially commission the Run 2b Level 2 trigger system.</p>				
139	1.3.1	Level 2 Beta Processor	\$72,100.00	\$18,740.20	\$90,840.20
	<p><i>Notes</i></p> <p>WBS Definition- This summary element includes the procurement of additional single-board computers (Level 2 Beta processors), associated hardware, and firmware support.</p>				
164	1.3.2	Silicon Track Trigger Upgrade	\$401,700.00	\$141,388.25	\$543,088.25
	<p><i>Notes</i></p> <p>WBS Definition- This summary element includes upgrades to the Run 2a silicon track trigger to adapt it to the increased number of inputs from the Run 2b silicon detector. It consists of the procurement of additional electronics boards of the Run 2a type, together with the development and production of a new board type (the Link Echo Board). Also included are firmware changes, procurement of additional, slightly modified backplanes, and additional cabling and connector hardware.</p>				
249	1.5	Online Systems	\$397,000.00	\$143,488.00	\$540,488.00
	<p><i>Notes</i></p> <p>WBS Definition-</p>				

ID	WBS	Name	M&S Cost	Labor Cost	Total Cost
"Online Systems" continued					
<i>Notes</i>					
This summary WBS element includes upgrades associated with data-taking and detector monitoring and controls systems. We have set a goal for data-logging of 50 Hz in the higher luminosity environment of Run 2b. This element describes the resources needed to develop an online system that will meet the physics needs of the experiment.					