Fermilab Library
0 1160 0052479 7

SDC-90-00065

VI
T

SDC
SOLENOIDAL DETECTOR NOTES

TWO SCENARIOS FOR REDUCTION IN SCOPE AND COST OF THE SDC DETECTOR

M. Gilchriese

August 3, 1990

M. Gilchriese
August 3, 1990
SDC-NOTE- 65

Two Scenarios for Reduction in Scope and Cost of the SDC Detector

I have looked at two simple means to reduce the scope and cost of the detector. Estimates of cost impact are approximate and derived from scaling. Everything is referenced to the EoI estimate.

Scenario (1)

Tracking volume

Reduce half length from 4.5 to 3.75 m. Keep radius the same as EoI.

Coil: Assume scales like stored energy. Reduction factor is 3.75/4.5=.83

Barrel calorimeter: Tonnage is decreased by factor 3.75/4.5 = .83

Shielding steel tonnage is reduced by factor of .92

Muon steel is reduced by .95

Assume muon area and channel count can also be reduced by 10% - factor is 0.9

Reduce steel thickness to 1.3 m. Factor is 1.3/1.5 = 0.87 in tonnage. So total factor is .95*.87= .83

Reduce silicon system by 20%

Reduce outer tracker channel count by 20%

Use steel toroids in place of air-core toroids

Approximate tonnage of steel beyond design with air core is

$\pi[(6)^{**}2 - (2)^{**}2]*4*7.87*2$ =6329 tonnes

Scenario (2)

Same as (1) except retain most of muon system.

Keep steel thickness at 1.5 m so reduction factor is only .95

Reduce area and channel count by same factor of 0.95

The results for both are given in the spreadsheets.

SDC Detector Cost Estimate Scenario (1)

SYSTEM	UNIT	NO. OF UNITS	CODE	UNIT COST (000's)	SUBTOTAL	SUBSYSTEM SUBTOTAL	TOTAL	SUBSYS/TOTAL %
SPECIAL PURPOSE DETECTOR								
Si VERTEX(INCLUDES PIXEL DETECTOR)	METER**2	26	SVD2	1,000	26,400			
CONTINGENCY ON Si VERTEX (30%)					7,920			
						34,320		6.8%
TRACKING								
CENTRAL TRACKING - BARREL	KWIRES	200	TC1	100	20,000			
CENTRAL TRACKING - INTERMEDIATE	KWIRES	48	TC1	100	4,800			
CONTINGENCY ON TRACKING (30%)					7,440			
						32,240		6.4%
CALORIMETRY								
BARREL CALORIMETER	TONNES	2,834	C4	17	48,178			
END CALORIMETER (2)	TONNES	1,836	C4	17	31,212			
FORWARD CALORIMETER (2)	TONNES	75	C4	17	1,300			
RETURN YOKE STEEL	TONNES	1,981	MS1	2	3,308			
CONTINGENCY ON CALORIMETRY (30-40%)					25,329			
						109,328		21.7%
MUON DETECTORS								
MUON TRACKING, BARREL	METER**2	5,638	MS3	3	15,053			
MUON TRACKING, ENDS (2)	METER**2	1,204	MS4	5	6,417			
MUON SCINTILLATOR COUNTERS (3-LAYERS)	METER**2	6,235	TS1	1	4,988			
MUON MAGNETIZED Fe BARREL TOROID	TONNES	17,119	MS2	2	30,129			
MUON INTERMEDIATE IRON TOROIDS (2)	SYSTEM	6,329	MS2	2	11,139			
CONTINGENCY ON MUON DET. (30-40%)					21,432			
						89,159		17.7%
MAGNETS								
SUPERCONDUCTING SOLENOID	SYSTEM	1	AM2	25,000	20,750			
IRON TOROID POWER SUPPLIES (1)	SYSTEM	2	AM6	2,600	5,200			
He CRYO SUPPORT SYSTEM	SYSTEM	1	AM6	2,600	2,600			
CONTINGENCY ON MAGNETS (25%)					7,138			
						35,688		7.1%
ELECTRONICS								
CALORIMETRY 1 (EM & HADR. TOWERS)	KCHAN	90	E2	250	22,500			
CALORIMETRY 2 (PRE-RADIATOR)	KCHAN	10	E1	125	1,250			
MUON TRACKING	KCHAN	90	E1	125	11,250			
MUON SCINTILLATOR TRIGGER	KCHAN	13	E2	250	3,150			
CENTRAL TRACKING - BARREL	KCHAN	200	E1	125	25,000			
CENTRAL TRACKING - INTERMEDIATE	KCHAN	48	E1	125	6,000			
FORWARD CALORIMETRY	KCHAN	7	E2	250	1,750			
CONTINGENCY ON ELECTRONICS (50%)					35,450			
						106,350		21.1%
ON-LINE COMPUTING	SYSTEM	1	E7	10,000	10,000			
CONTINGENCY ON COMPUTING (25%)					2,500			
						12,500		2.5%
EDIA								
(20% OF ABOVE)						83,917		16.7%
				GRAND TOTAL(FY90 K$)			503,502	

SDC Detector Cost Estimate - Scenario(2)

SYSTEM	UNIT	NO. OF UNITS	CODE	UNIT COST (000's)	SUBTOTAL	SUBSYSTEM SUBTOTAL	TOTAL	SUBSYS/TOTAL %
SPECIAL PURPOSE DETECTOR								
Si VERTEX(INCLUDES PIXEL DETECTOR)	METER**2	26	SVD2	1,000	26,400			
CONTINGENCY ON Si VERTEX (30%)					7,920			
						34,320		6.7%
TRACKING								
CENTRAL TRACKING - BARREL	KWIRES	200	TC1	100	20,000			
CENTRAL TRACKING - INTERMEDIATE	KWIRES	48	TC1	100	4,800			
CONTINGENCY ON TRACKING (30%)					7,440			
						32,240		6.3%
CALORIMETRY								
BARREL CALORIMETER	TONNES	2,834	C4	17	48,178			
END CALORIMETER (2)	TONNES	1,836	C4	17	31,212			
FORWARD CALORIMETER (2)	TONNES	75	C4	17	1,300			
RETURN YOKE STEEL	TONNES	1,981	MS1	2	3,308			
CONTINGENCY ON CALORIMETRY (30-40%)					25,329			
						109,328		21.3%
MUON DETECTORS								
MUON TRACKING, BARREL	METER**2	5,951	MS3	3	15,889			
MUON TRACKING, ENDS (2)	METER**2	1,271	MS4	5	6,774			
MUON SCINTILLATOR COUNTERS (3-LAYERS)	METER**2	6,581	TS1	1	5,265			
MUON MAGNETIZED Fe BARREL TOROID	TONNES	19,594	MS2	2	34,485			
MUON INTERMEDIATE IRON TOROIDS (2)	SYSTEM	6,329	MS2	2	11,139			
CONTINGENCY ON MUON DET. (30-40%)					23,180			
						96,733		18.8%
MAGNETS								
SUPERCONDUCTING SOLENOID	SYSTEM	1	AM2	25,000	20,750			
IRON TOROID POWER SUPPLIES (1)	SYSTEM	2	AM6	2,600	5,200			
He CRYO SUPPORT SYSTEM	SYSTEM	1	AM6	2,600	2,600			
CONTINGENCY ON MAGNETS (25%)					7,138			
						35,688		6.9%
ELECTRONICS								
CALORIMETRY 1 (EM & HADR. TOWERS)	KCHAN	90	E2	250	22,500			
CALORIMETRY 2 (PRE-RADIATOR)	KCHAN	10	E1	125	1,250			
MUON TRACKING	KCHAN	95	E1	125	11,875			
MUON SCINTILLATOR TRIGGER	KCHAN	13	E2	250	3,325			
CENTRAL TRACKING - BARREL	KCHAN	200	E1	125	25,000			
CENTRAL TRACKING - INTERMEDIATE	KCHAN	48	E1	125	6,000			
FORWARD CALORIMETRY	KCHAN	7	E2	250	1,750			
CONTINGENCY ON ELECTRONICS (50%)					35,850			
						107,550		20.9%
ON-LINE COMPUTING	SYSTEM	1	E7	10,000	10,000			
CONTINGENCY ON COMPUTING (25%)					2,500			
						12,500		2.4%
EDIA								
(20% OF ABOVE)						85,672		16.7%
				GRAND TOTAL(FY90 K$)			514,029	