INTERNAL NOTE -- DISTRIBUTION AUTHORIZATION REQUIRED

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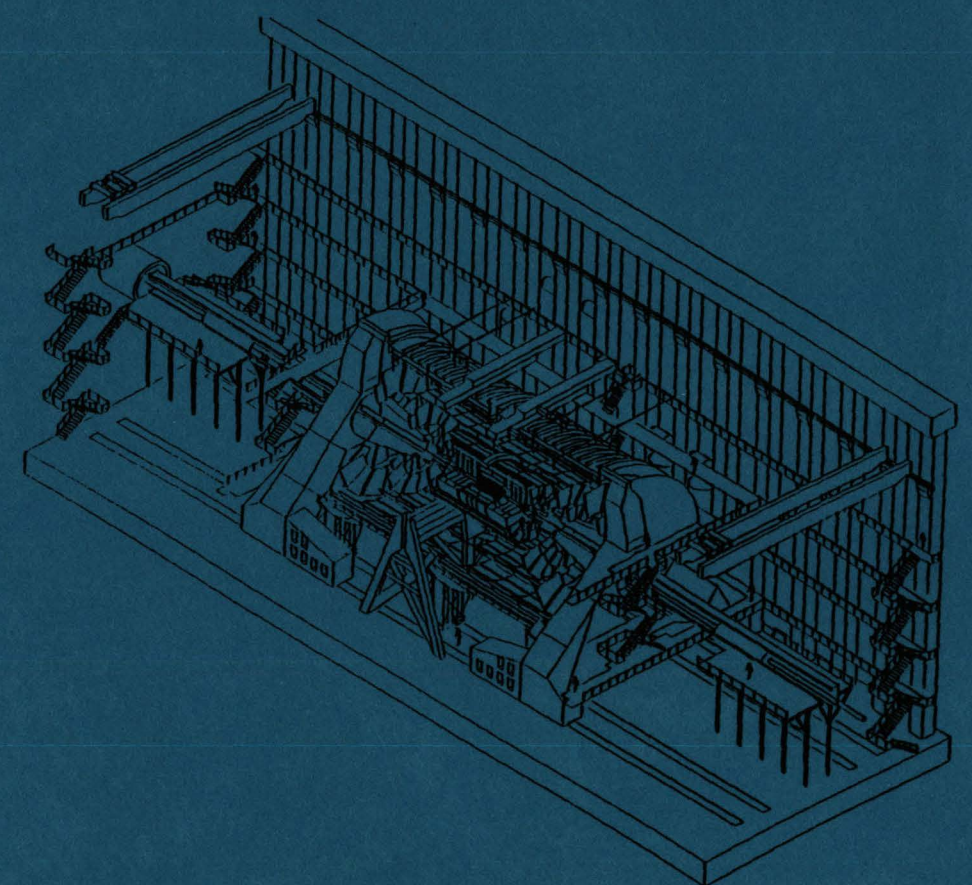
GEM Cost and Schedule Executive Summary

TDR Submittal



April 30, 1993

GEM-IN-93-31

INTERNAL NOTE -- DISTRIBUTION AUTHORIZATION REQUIRED

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522. GEM

- **522.5010 Tracker**
  - 10.01 R & D
  - 10.02 Silicon Tracker
  - 10.03 IPC Tracker
  - 10.04 Reserved
  - 10.05 Reserved
  - 10.06 STS/IPC Assembly
  - 10.07 Installation andFinal Test
  - 10.08 Project Management
  - 10.09 Conceptual/ Preliminary Design
- **522.5020 Calorimeter**
  - 20.01 R & D
  - 20.02 Inner Barrel Calorimetry
  - 20.03 Scintillating Barrel Hadronic Sections
  - 20.04 Endcap Calorimetry
  - 20.05 Forward Hadronic Calorimetry
  - 20.06 Passive Absorber
  - 20.07 Vacuum
  - 20.08 Cryogenics
  - 20.09 Instr., Power & Operational Control
  - 20.10 Final Assembly
  - 20.11 Hall Installation
  - 20.12 Calibration and Test Beam Program
  - 20.13 Subsystem Management
  - 20.14 Conceptual/ Preliminary Design
- **522.5030 Muon**
  - 30.01 R & D
  - 30.02 Barrel Region - CSC
  - 30.03 Endcap Region - CSC
  - 30.04 Installation - CSC
  - 30.05 Project Management - CSC
  - 30.06 Conceptual/ Preliminary Design
- **522.5040 Magnet**
  - 40.01 R & D
  - 40.02 Design Completion
  - 40.03 Fabrication & Assembly
  - 40.04 Installation and System Testing
  - 40.05 Project Management
  - 40.06 Conceptual/ Preliminary Design
- **522.5050 Electronics**
  - 50.01 R & D
  - 50.02 Front End
  - 50.03 Data Acquisition
  - 50.04 Trigger
  - 50.05 Integration
  - 50.06 Project Management
  - 50.07 Conceptual/ Preliminary Design
- **522.5060 Computing**
  - 60.01 R & D
  - 60.02 Global Control System
  - 60.03 On-line Computing
  - 60.04 Network and Communications
- **522.5070 Interface**
  - 70.01 CDS Support
  - 70.02 Beam Pipe
  - 70.03 Detector Access Equipment
  - 70.04 Detector Safety Systems
  - 70.05 Utility Services
  - 70.06 Cranes
  - 70.07 Auxillary Equipment
  - 70.08 Gas Services
  - 70.09 Survey Systems
  - 70.10 Magnetic Shielding
  - 70.11 Test Beam/Calibration Hall
  - 70.12 Cable & Plumbing Routing
- **522.5090 Project Management**
  - 90.01 Planning & Controls
  - 90.02 Engineering & Integration
  - 90.03 ES&H & QA
  - 90.04 Administration

gem DETECTOR PROJECT

GEM COST ESTIMATE SUMMARY

4/26/93

FY93 U.S. Dollars

GEM DETECTOR SYSTEM

WBS Code	Description	WBS Level	Material, k$	ManHours	Labor, k$	M + L, k$	Markup, k$	%	Contingency, k$	%	TOTAL, k$
	-GEM DETECTOR SYSTEM	00	274,531	3,657,544	167,306	441,837	6,029	1%	103,362	23%	551,228
10	-CENTRAL TRACKER	01	12,168	190,275	9,786	21,954	0	0%	5,369	25%	27,324
20	-CALORIMETER	01	68,570	1,012,430	37,976	106,546	0	0%	28,870	27%	135,415
30	-MUON	01	40,631	891,791	36,819	77,449	0	0%	20,897	27%	98,347
40	-MAGNET	01	64,787	348,234	33,232	98,019	6,029	6%	21,277	21%	125,325
50	-ELECTRONICS	01	52,619	465,971	22,552	75,171	0	0%	17,100	23%	92,272
60	-COMPUTER & CONTROLS	01	10,390	168,299	5,478	15,869	0	0%	3,591	23%	19,460
70	-INTERFACE SYSTEMS	01	21,814	122,305	3,567	25,381	0	0%	4,433	18%	29,813
90	-PROJECT MANAGEMENT	01	3,551	458,239	17,897	21,448	0	0%	1,825	9%	23,274

GEM COST ESTIMATE SUMMARY

4/26/93

FY93 U.S. Dollars

GEM DETECTOR SYSTEM

WBS Code	Description	WBS Level	Material, k$	ManHours	Labor, k$	M + L, k$	Markup, k$	%	Contingency, k$	%	TOTAL, k$
	-GEM DETECTOR SYSTEM	00	274,531	3,657,544	167,306	441,837	6,029	1%	103,362	23%	551,228
10	-CENTRAL TRACKER	01	12,168	190,275	9,786	21,954	0	0%	5,369	25%	27,324
10.01	-RESEARCH & DEVELOPMENT	02	1,286	29,236	1,797	3,083	0	0%	0	0%	3,083
10.02	-SILICON TRACKER SYSTEM (STS)	02	7,116	59,628	3,344	10,461	0	0%	3,003	29%	13,463
10.03	-INTERPOLATING PAD TRACKER (IPC)	02	3,032	44,140	1,870	4,902	0	0%	1,360	28%	6,262
10.04	RESERVED	02	0	0	0	0	0	0%	0	0%	0
10.05	RESERVED	02	0	0	0	0	0	0%	0	0%	0
10.06	-STS / IPC ASSEMBLY (uphole)	02	455	29,840	1,108	1,563	0	0%	444	28%	2,007
10.07	-INSTALLATION AND FINAL TEST (downhole)	02	115	7,611	340	455	0	0%	164	36%	619
10.08	-PROJECT MANAGEMENT	02	68	15,710	984	1,052	0	0%	400	38%	1,452
10.09	-CONCEPTUAL/PRELIMINARY DESIGN	02	96	4,111	343	439	0	0%	0	0%	439
20	-CALORIMETER	01	68,570	1,012,430	37,976	106,546	0	0%	28,870	27%	135,415
20.01	-RESEARCH & DEVELOPMENT	02	4,634	69,375	2,092	6,726	0	0%	1,883	28%	8,609
20.02	-INNER BARREL CALORIMETRY	02	13,586	168,510	5,890	19,476	0	0%	5,412	28%	24,888
20.03	-SCINTILLATING BARREL CALORIMETRY	02	8,731	120,758	5,159	13,889	0	0%	4,128	30%	18,017
20.04	-ENDCAP CALORIMETRY	02	15,447	320,285	11,961	27,408	0	0%	7,642	28%	35,050
20.05	-FORWARD HADRONIC CALORIMETRY	02	7,310	32,607	1,266	8,577	0	0%	2,466	29%	11,042
20.06	-PASSIVE ABSORBER	02	779	32,640	1,331	2,111	0	0%	752	36%	2,862
20.07	-VACUUM	02	76	17,082	583	659	0	0%	224	34%	883
20.08	-CRYOGENICS	02	11,954	19,800	499	12,453	0	0%	2,565	21%	15,018
20.09	-INSTR. POWER & OPERATIONAL CONTROL	02	215	1,735	52	266	0	0%	73	27%	339
20.10	-FINAL ASSEMBLY	02	509	17,361	511	1,020	0	0%	429	42%	1,449
20.11	-HALL INSTALLATION	02	1,532	67,381	2,092	3,624	0	0%	1,383	38%	5,007
20.12	-CALIBRATION AND TEST BEAM PROGRAM	02	3,618	25,267	701	4,319	0	0%	1,143	27%	5,462
20.13	-SUBSYSTEM MANAGEMENT	02	62	89,947	3,975	4,038	0	0%	565	14%	4,603

GEM COST ESTIMATE SUMMARY

FY93 U.S. Dollars

GEM DETECTOR SYSTEM

WBS Code	Description	WBS Level	Material, k$	ManHours	Labor, k$	M + L, k$	Markup, k$	%	Contingency, k$	%	TOTAL, k$
20.14	-CONCEPTUAL/PRELIMINARY DESIGN	02	117	29,683	1,864	1,981	0	0%	205	10%	2,186
30	-MUON	01	40,631	891,791	36,819	77,449	0	0%	20,897	27%	98,347
30.01	-RESEARCH & DEVELOPMENT	02	1,958	62,977	4,550	6,508	0	0%	0	0%	6,508
30.02	-BARREL REGION	02	27,914	470,928	15,728	43,642	0	0%	13,174	30%	56,817
30.03	-END CAP REGION	02	9,336	225,218	7,975	17,312	0	0%	5,216	30%	22,528
30.04	-INSTALLATION	02	779	70,223	3,557	4,336	0	0%	1,308	30%	5,644
30.05	-PROJECT MANAGEMENT	02	435	37,921	3,297	3,732	0	0%	373	10%	4,105
30.06	CONCEPTUAL/PRELIMINARY DESIGN	02	208	24,525	1,712	1,920	0	0%	826	43%	2,746
40	-MAGNET	01	64,787	348,234	33,232	98,019	6,029	6%	21,277	21%	125,325
40.01	-RESEARCH & DEVELOPMENT	02	1,563	0	1,641	3,204	0	0%	64	2%	3,268
40.02	-DESIGN COMPLETION	02	922	58,575	3,796	4,718	374	8%	1,136	22%	6,227
40.03	-FABRICATION AND ASSEMBLY	02	60,749	159,177	4,883	65,632	5,059	8%	17,940	25%	88,631
40.04	-INSTALLATION AND SYSTEM TESTING FAB/ASSY	02	987	58,302	1,784	2,770	214	8%	673	23%	3,656
40.05	-PROJECT MANAGEMENT	02	121	72,180	5,877	5,997	383	6%	1,160	18%	7,540
40.06	-MAGNET CONC/PRELIM DESIGN	02	446	0	15,252	15,698	0	0%	305	2%	16,002
50	-ELECTRONICS	01	52,619	465,971	22,552	75,171	0	0%	17,100	23%	92,272
50.01	-RESEARCH AND DEVELOPMENT	02	1,433	57,809	4,051	5,484	0	0%	462	8%	5,946
50.02	-FRONT END	02	39,856	219,208	9,991	49,846	0	0%	12,155	24%	62,002
50.03	-DATA ACQUISITION SYSTEM	02	6,940	83,096	3,717	10,657	0	0%	2,317	22%	12,974
50.04	-TRIGGER	02	3,996	65,724	2,698	6,694	0	0%	1,740	26%	8,434
50.05	-INTEGRATION	02	31	17,098	732	763	0	0%	63	8%	826
50.06	-PROJECT MANAGEMENT	02	363	23,036	1,364	1,727	0	0%	363	21%	2,090
60	-COMPUTER & CONTROLS	01	10,390	168,299	5,478	15,869	0	0%	3,591	23%	19,460
60.01	-RESEARCH AND DEVELOPMENT	02	2,176	47,640	1,487	3,662	0	0%	666	18%	4,328
60.02	-GLOBAL CONTROL SYSTEM	02	1,150	48,702	1,454	2,603	0	0%	444	17%	3,047

GEM COST ESTIMATE SUMMARY

FY93 U.S. Dollars

GEM DETECTOR SYSTEM

WBS Code	Description	WBS Level	Material, k$	ManHours	Labor, k$	M + L, k$	Markup, k$	%	Contingency, k$	%	TOTAL, k$
60.03	-ONLINE COMPUTING SYSTEM	02	6,381	47,944	1,424	7,804	0	0%	2,222	29%	10,026
60.04	-NETWORK AND COMMUNICATIONS	02	658	15,476	429	1,086	0	0%	188	17%	1,274
60.05	PROJECT MANAGEMENT	02	27	8,537	686	713	0	0%	71	10%	785
70	-INTERFACE SYSTEMS	01	21,814	122,305	3,567	25,381	0	0%	4,433	18%	29,813
70.01	-CENTRAL DETECTOR SUPPORT (CDS)	02	3,414	14,500	665	4,079	0	0%	701	17%	4,780
70.02	-BEAM PIPE	02	1,958	3,101	114	2,072	0	0%	331	16%	2,403
70.03	-DETECTOR ACCESS EQUIPMENT	02	1,622	2,578	39	1,661	0	0%	332	20%	1,993
70.04	-DETECTOR SAFETY SYSTEMS	02	968	11,784	358	1,325	0	0%	159	12%	1,484
70.05	-UTILITY SERVICES	02	2,833	7,749	271	3,104	0	0%	661	21%	3,765
70.06	-CRANES	02	5,439	0	0	5,439	0	0%	544	10%	5,983
70.07	-AUXILIARY EQUIPMENT	02	1,437	9,480	340	1,777	0	0%	462	26%	2,239
70.08	-GAS SERVICES	02	1,478	7,726	205	1,683	0	0%	311	19%	1,995
70.09	-SURVEY ALIGNMENT SYSTEMS	02	467	17,392	438	906	0	0%	91	10%	996
70.10	-MAGNETIC SHIELDING SYSTEMS	02	268	0	0	268	0	0%	64	24%	332
70.11	-TEST BEAM / CALIBRATION HALL	02	1,632	16,831	294	1,927	0	0%	531	28%	2,457
70.12	-DETECTOR CABLE AND PLUMBING ROUTING, DESIG	02	299	31,163	841	1,141	0	0%	246	22%	1,387
70.13	RESERVED	02	0	0	0	0	0	0%	0	0%	0
90	-PROJECT MANAGEMENT	01	3,551	458,239	17,897	21,448	0	0%	1,825	9%	23,274
90.01	PROJECT MANAGEMENT, PLANNING, & CONTROLS	02	1,163	152,392	5,956	7,119	0	0%	641	9%	7,760
90.02	ENGINEERING & INTEGRATION	02	2,077	185,706	8,751	10,828	0	0%	975	9%	11,803
90.03	ENVIRONMENTAL SAFETY & HEALTH / QA	02	0	38,630	1,777	1,777	0	0%	107	6%	1,884
90.04	ADMINISTRATION	02	312	81,512	1,413	1,724	0	0%	104	6%	1,828

GEM DETECTOR SYSTEM COST ESTIMATE SUMMARY

22-Apr-93

(Costs in millions of FY93 dollars)

Procurements/Fabrication	252	
Installation/Assembly	56	
Subtotal (Procurements and Labor)	308	
EDIA	111	(36%)*
Direct Costs	419	
Contingency	103	(25%)
Subtotal	522	
R&D	29	(9%)*
TOTAL GEM DETECTOR SYSTEM FY93 $M	551	

* % of subtotal (Procurements and Labor)

GEM DETECTOR SYSTEM COST ESTIMATE SUMMARY

22-Apr-93

(Costs in millions of FY90 dollars)

Procurements/Fabrication	228	
Installation/Assembly	51	
Subtotal (Procurements and Labor)	279	
EDIA	101	(36%)*
Direct Costs	380	
Contingency	93	(24%)
Subtotal	473	
R&D	26	(9%)*
TOTAL GEM DETECTOR SYSTEM FY90 $M	499	

* % of subtotal (Procurements and Labor)

GEM DETECTOR COST SUMMARY

4/25/93

WBS	Item	Eng/Des k$	M&S k$	Inspection Admin k$	Proc/Fab Material k$	Assembly k$	Installation k$	Subtotal Labor k$	Subtotal Material k$	Subtotal Lab & Mat'l k$	Conting. k$	Total k$
	GEM DETECTOR SUMMARY	**85,377**	**12,173**	**29,464**	**263,418**	**48,686**	**8,747**	**168,496**	**279,370**	**447,866**	**103,362**	**551,228**
10	**CENTRAL TRACKER**	**6,073**	**1,404**	**1,109**	**10,346**	**2,723**	**300**	**9,786**	**12,168**	**21,954**	**5,369**	**27,323**
20	**CALORIMETER**	**12,899**	**1,015**	**4,339**	**67,550**	**18,149**	**2,593**	**37,976**	**68,570**	**106,546**	**28,869**	**135,415**
30	**MUON**	**10,805**	**1,379**	**6,712**	**37,358**	**20,229**	**966**	**36,819**	**40,631**	**77,449**	**20,897**	**98,347**
40	**MAGNET**	**21,793**	**3,461**	**7,311**	**64,208**	**4,803**	**2,472**	**34,422**	**69,626**	**104,048**	**21,277**	**125,325**
50	**ELECTRONICS**	**17,112**	**943**	**2,356**	**52,326**	**1,125**	**1,309**	**22,552**	**52,619**	**75,171**	**17,100**	**92,272**
60	**COMPUTING**	**5,034**	**202**	**21**	**10,190**	**421**	**0**	**5,478**	**10,390**	**15,869**	**3,591**	**19,460**
70	**INTERFACE**	**1,132**	**218**	**245**	**21,441**	**1,237**	**1,107**	**3,566**	**21,814**	**25,380**	**4,433**	**29,813**
90	**PROJECT MANAGEMENT**	**10,528**	**3,551**	**7,369**	**0**	**0**	**0**	**17,897**	**3,551**	**21,448**	**1,825**	**23,274**
	GEM DETECTOR CONSTRUCTION	52,892	8,559	28,835	252,627	47,619	8,629	133,707	265,453	399,160	98,952	498,113
10	CENTRAL TRACKER	4,130	731	1,109	9,439	2,723	300	7,646	10,786	18,433	5,369	23,802
20	CALORIMETER	10,333	827	4,135	62,987	17,082	2,475	34,020	63,819	97,838	26,781	124,620
30	MUON	4,687	943	6,569	35,628	20,229	966	30,557	38,465	69,021	20,072	89,093
40	MAGNET	4,900	1,452	7,311	64,208	4,803	2,472	17,529	67,617	85,146	20,909	106,055
50	ELECTRONICS	13,634	694	2,075	50,850	1,125	1,309	18,501	51,186	69,687	16,638	86,325
60	COMPUTING	3,548	143	21	8,074	421	0	3,992	8,215	12,206	2,925	15,132
70	INTERFACE	1,132	218	245	21,441	1,237	1,107	3,566	21,814	25,380	4,433	29,813
90	PROJECT MANAGEMENT	10,528	3,551	7,369	0	0	0	17,897	3,551	21,448	1,825	23,274
	GEM DETECTOR R&D	13,458	2,748	485	10,792	1,067	118	15,618	13,050	28,668	3,075	31,743
10	CENTRAL TRACKER	1,599	577	0	907	0	0	1,797	1,286	3,083	0	3,083
20	CALORIMETER	702	71	205	4,563	1,067	118	2,092	4,634	6,726	1,883	8,609
30	MUON	4,550	228	0	1,730	0	0	4,550	1,958	6,508	0	6,508
40	MAGNET	1,641	1,563	0	0	0	0	1,641	1,563	3,204	64	3,268
50	ELECTRONICS	3,479	249	281	1,476	0	0	4,051	1,433	5,484	462	5,946
60	COMPUTING	1,487	59	0	2,116	0	0	1,487	2,175	3,662	666	4,328
70	INTERFACE	0	0	0	0	0	0	0	0	0	0	0
90	PROJECT MANAGEMENT	0	0	0	0	0	0	0	0	0	0	0
	GEM DETECTOR C&P/D	19,027	866	144	0	0	0	19,171	866	20,037	1,335	21,373
10	CENTRAL TRACKER	343	96	0	0	0	0	343	96	439	0	439
20	CALORIMETER	1,864	117	0	0	0	0	1,864	117	1,981	205	2,186
30	MUON	1,568	208	144	0	0	0	1,712	208	1,920	826	2,745
40	MAGNET	15,252	446	0	0	0	0	15,252	446	15,698	304	16,002
50	ELECTRONICS	0	0	0	0	0	0	0	0	0	0	0
60	COMPUTING	0	0	0	0	0	0	0	0	0	0	0
70	INTERFACE	0	0	0	0	0	0	0	0	0	0	0
90	PROJECT MANAGEMENT	0	0	0	0	0	0	0	0	0	0	0

5.2.2.505.1 GEM DETECTOR COST SUMMARY FY93

4/25/93

	Engineering/design			M&S	Inspection/Admin			Proc/Fab	Assembly					Installation					Totals				
	Labor	Rate	Total	Material	Labor	Rate	Total	Material	Labor	Rate	Subtotal	Material	Total	Labor	Rate	Subtotal	Material	Total	Labor	Material	Subtotal	Conting.	Total
Item	my	k$/my	k$	k$	my	k$/my	k$	k$	my	k$/my	k$	k$	k$	my	k$/my	k$	k$	k$	k$	k$	k$	k$	k$
Central Tracker Const	37	111	4,130	731	11	97	1,109	9,439	34	63	2,106	616	2,723	4	82	300	0	300	7,646	10,786	18,433	5,369	23,802
Central Tracker R&D	15	109	1,599	577	0	0	0	907	0	0	0	0	0	0	0	0	0	0	1,797	1,286	3,083	0	3,083
Central Tracker C&P/D	2	148	343	96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	343	96	439	0	439
Calorimeter Const	105	99	10,333	827	63	65	4,135	62,987	283	60	17,077	5	17,082	41	61	2,475	0	2,475	34,020	63,819	97,838	26,781	124,620
Calorimeter R&D	8	87	702	71	5	45	205	4,563	22	48	1,067	0	1,067	2	48	118	0	118	2,092	4,634	6,726	1,883	8,609
Calorimeter C&P/D	17	111	1,864	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,864	117	1,981	205	2,186
Muon Const	42	112	4,687	943	54	123	6,569	35,628	318	58	18,403	1,826	20,229	16	56	899	67	966	30,557	38,465	69,021	20,072	89,093
Muon R&D	36	128	4,550	228	0	0	0	1,730	0	0	0	0	0	0	0	0	0	0	4,550	1,958	6,508	0	6,508
Muon C&P/D	13	121	1,568	208	1	159	144	0	0	0	0	0	0	0	0	0	0	0	1,712	208	1,920	826	2,745
Magnet Const	37	133	4,900	1,452	53	138	7,311	64,208	69	52	3,578	1,225	4,803	30	57	1,740	733	2,472	17,529	67,617	85,146	20,909	106,055
Magnet R&D	0	0	1,641	1,563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,641	1,563	3,204	64	3,268
Magnet C&P/D	0	0	15,252	446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,252	446	15,698	304	16,002
Electronics Const	147	93	13,634	694	23	91	2,075	50,850	4	51	184	941	1,125	26	48	1,261	49	1,309	18,501	51,186	69,687	16,638	86,325
Electronics R&D	28	124	3,479	249	2	127	281	1,476	0	0	0	0	0	0	0	0	0	0	4,051	1,433	5,484	462	5,946
Electronics C&P/D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Computing Const	57	62	3,548	143	1	40	21	8,074	10	42	421	0	421	0	0	0	0	0	3,992	8,215	12,206	2,925	15,132
Computing R&D	27	55	1,487	59	0	0	0	2,116	0	0	0	0	0	0	0	0	0	0	1,487	2,175	3,662	666	4,328
Computing C&P/D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interface Sys Const	16	72	1,132	218	3	75	245	21,441	25	46	1,162	75	1,237	21	48	1,027	80	1,107	3,566	21,814	25,380	4,433	29,813
Interface Sys R&D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interface Sys C&P/D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Project Mgmt Const	127	83	10,528	3,551	132	56	7,369	0	0	0	0	0	0	0	0	0	0	0	17,897	3,551	21,448	1,825	23,274
Project Mgmt R&D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Project Mgmt C&P/D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBSYSTEMS SUMMARY																							
CENTRAL TRACKER	54	112	6,073	1,404	11	97	1,109	10,346	34	63	2,106	616	2,723	4	82	300	0	300	9,786	12,168	21,954	5,369	27,323
CALORIMETER	129	100	12,899	1,015	68	64	4,339	67,550	306	59	18,144	5	18,149	43	60	2,593	0	2,593	37,976	68,570	106,546	28,869	135,415
MUON	90	120	10,805	1,379	55	123	6,712	37,358	318	58	18,403	1,826	20,229	16	56	899	67	966	36,819	40,631	77,449	20,897	98,347
MAGNET	37	591	21,793	3,461	53	138	7,311	64,208	69	52	3,578	1,225	4,803	30	57	1,740	733	2,472	34,422	69,626	104,048	21,277	125,325
ELECTRONICS	175	98	17,112	943	25	94	2,356	52,326	4	51	184	941	1,125	26	48	1,261	49	1,309	22,552	52,619	75,171	17,100	92,272
COMPUTING	84	60	5,034	202	1	40	21	10,190	10	42	421	0	421	0	---	0	0	0	5,478	10,390	15,869	3,591	19,460
INTERFACE	16	72	1,132	218	3	75	245	21,441	25	46	1,162	75	1,237	21	48	1,027	80	1,107	3,566	21,814	25,380	4,433	29,813
PROJECT MGMT	127	83	10,528	3,551	132	56	7,369	0	0	---	0	0	0	0	---	0	0	0	17,897	3,551	21,448	1,825	23,274
GEM DETECTOR SYSTEM	712	120	85,377	12,173	348	85	29,484	263,418	765	58	43,998	4,688	48,686	141	56	7,818	928	8,747	168,496	279,370	447,866	103,362	551,228

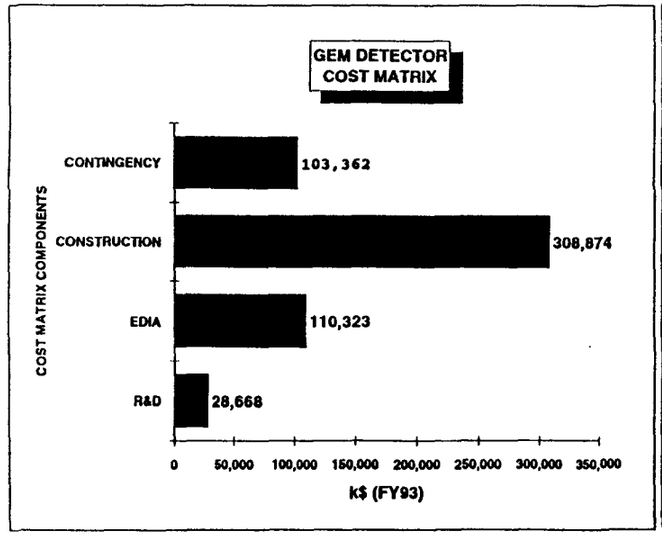
COST MATRIX COMPONENTS

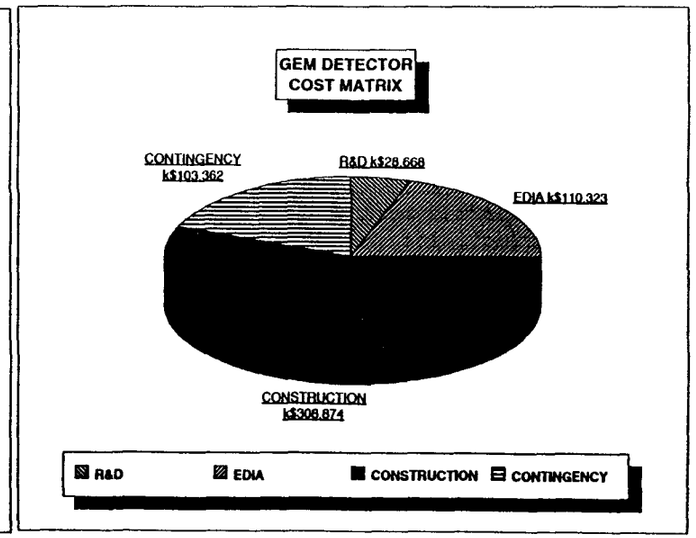
GEM DETECTOR SYSTEM

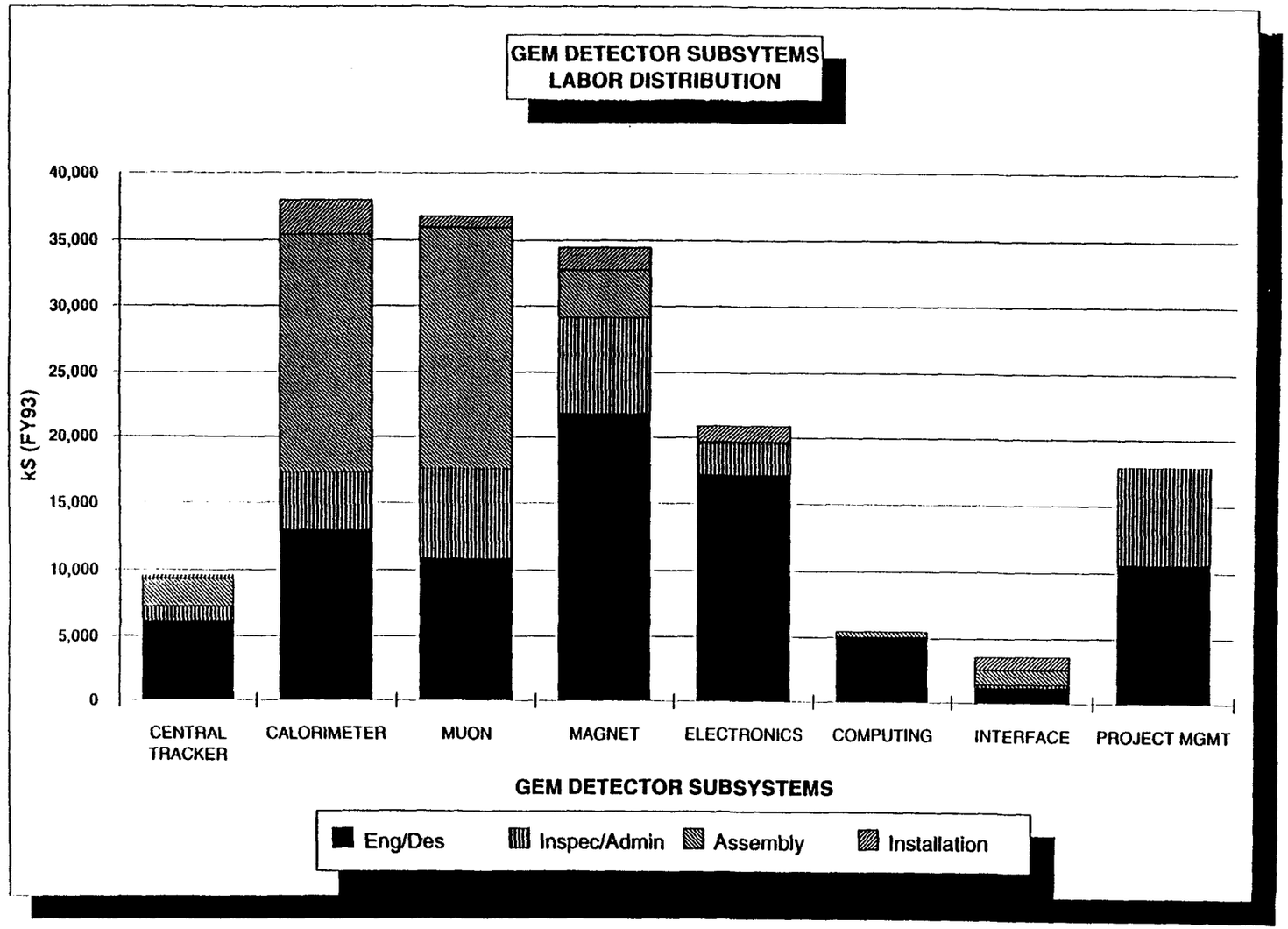
	85,377 Eng/Des	12,173 M&S	29,464 Inspec/Admin	263,418 Pr/Fab	57,433 Inst/Assy	103,362 Conting	551,228 Total
R&D	13,458	2,748	485	10,792	1,185	3,075	31,743
Concep/Pre Design	19,027	866	144	0	0	1,335	21,373
Construction	52,892	8,559	26,835	252,627	56,248	98,952	498,113

R&D %= 9.28% EDIA %= 35.72% Contingency %: 24.66%

R&D %= R&D / Construction EDIA %= EDIA / Construction Contingency %: Contingency / Construction + EDIA

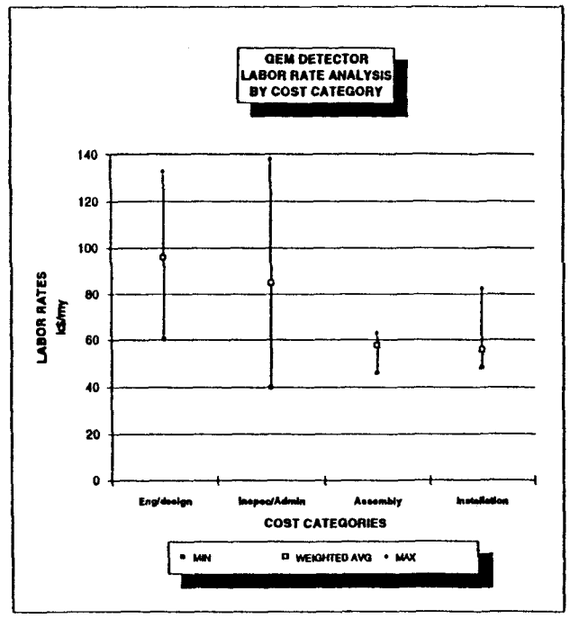


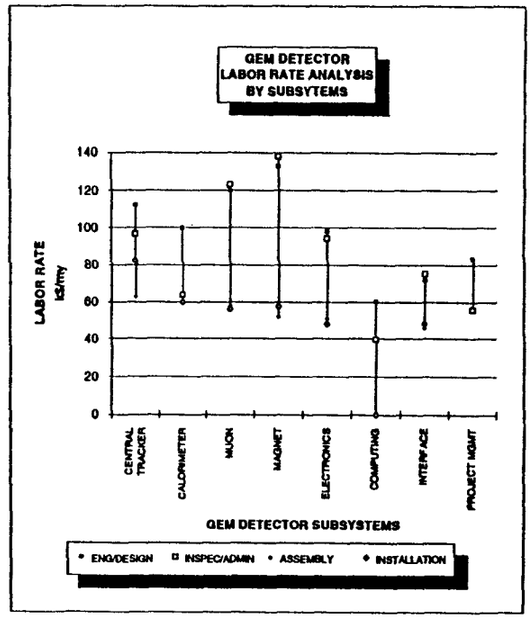


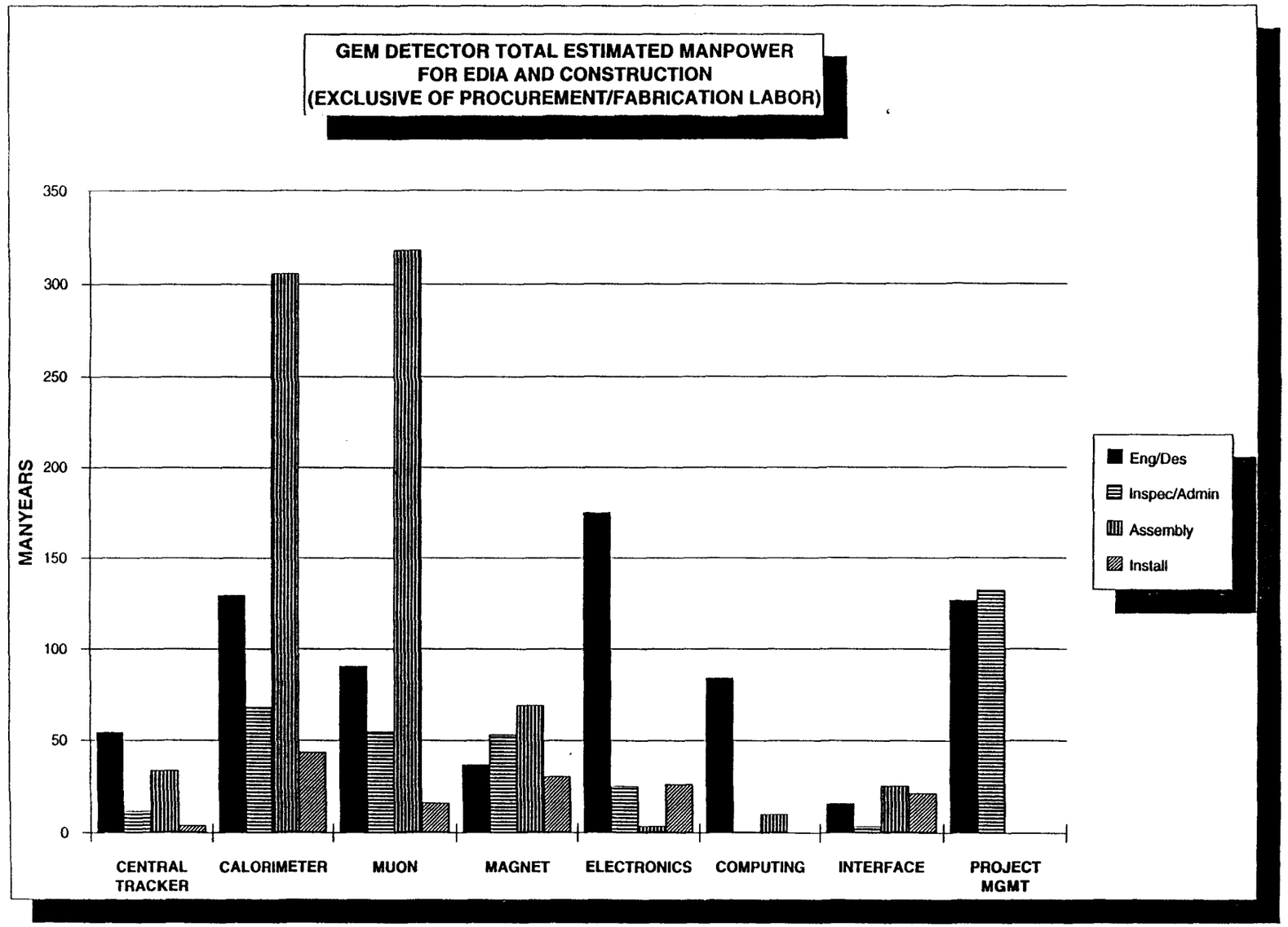

GEM DETECTOR SUBSYTEMS
LABOR DISTRIBUTION
kS (FY93)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
CENTRAL TRACKER
CALORIMETER
MUON
MAGNET
ELECTRONICS
COMPUTING
INTERFACE
PROJECT MGMT
GEM DETECTOR SUBSYSTEMS
Eng/Des
Inspec/Admin
Assembly
Installation

GEM DETECTOR LABOR RATE ANALYSIS

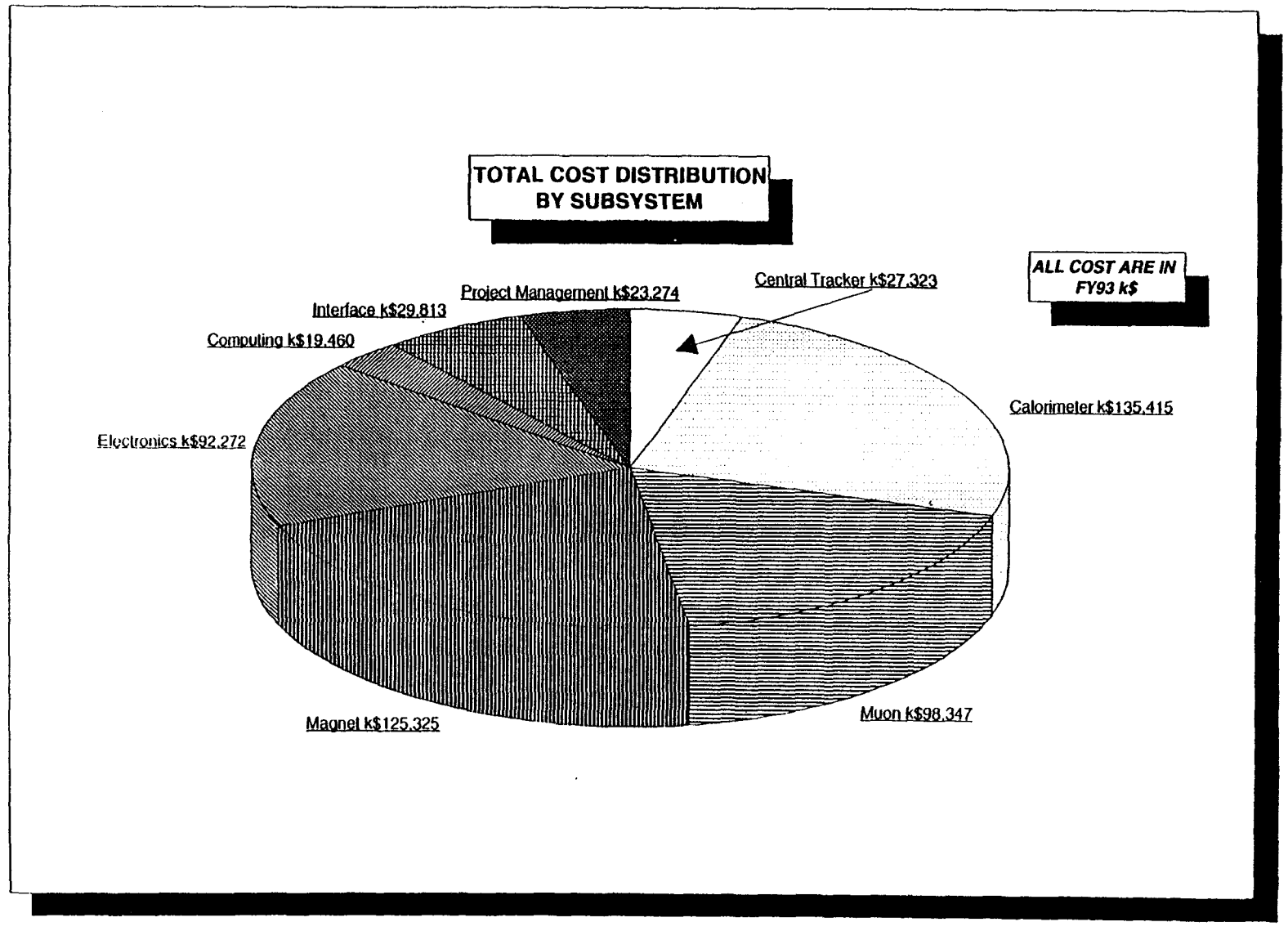
	COST CATEGORIES							
	Eng/design		Inspec/Admin		Assembly		Installation	
	Labor	Rate	Labor	Rate	Labor	Rate	Labor	Rate
SUBSYSTEMS	my	k$/my	my	k$/my	my	k$/my	my	k$/my
CENTRAL TRACKER	54	112	11	97	34	63	4	82
CALORIMETER	129	100	68	64	306	59	43	60
MUON	90	120	55	123	318	58	16	56
MAGNET	37	133	53	138	69	52	30	57
ELECTRONICS	175	98	25	94	4	51	26	48
COMPUTING	84	60	1	40	10		0	---
INTERFACE	18	72	3	75	25	46	21	48
PROJECT MGMT	127	83	132	56	0		0	
MIN		60		40		46		48
WEIGHTED AVG		96		85		57		56
MAX		133		138		63		82



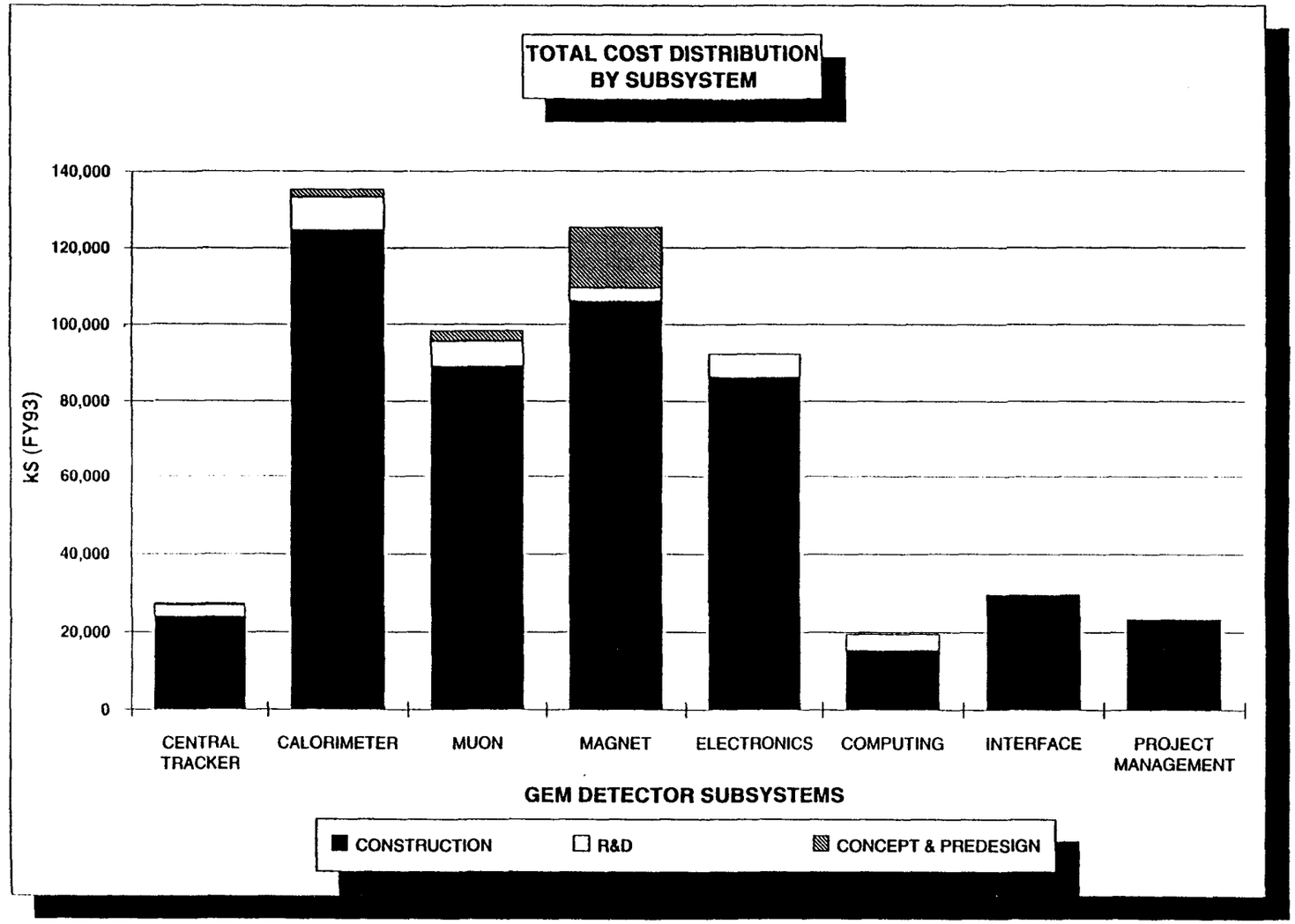


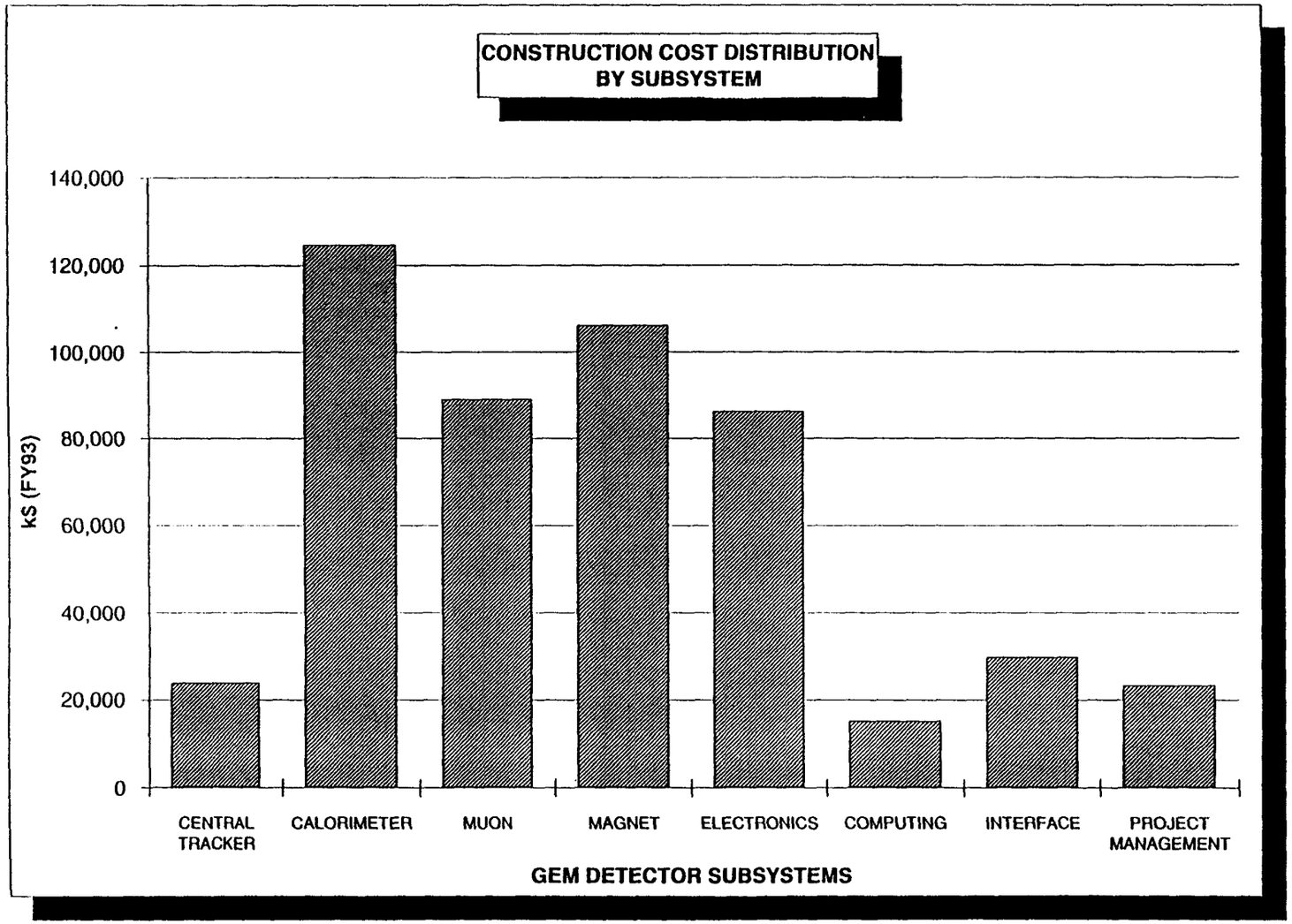


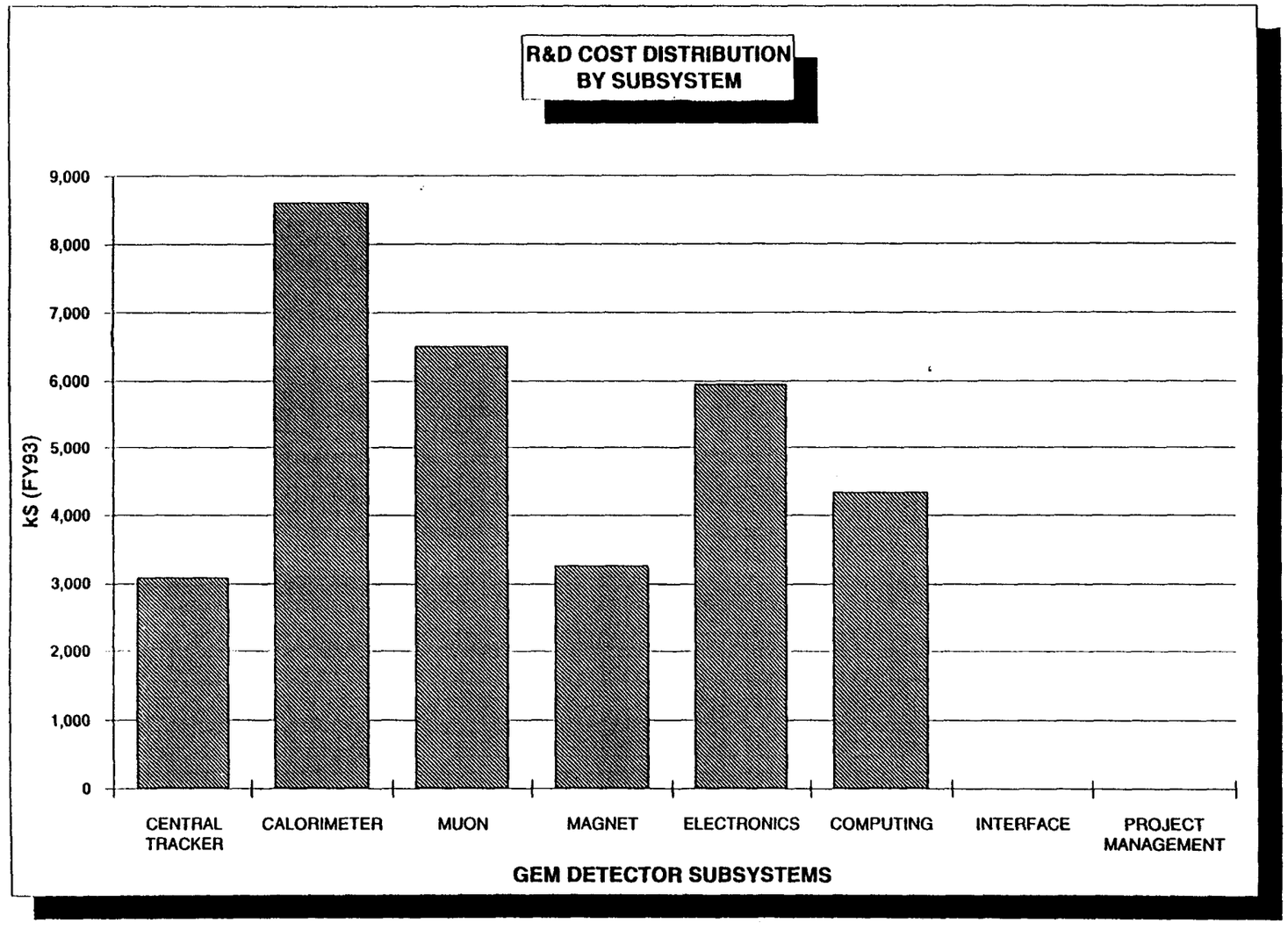
GEM DETECTOR PROJECT

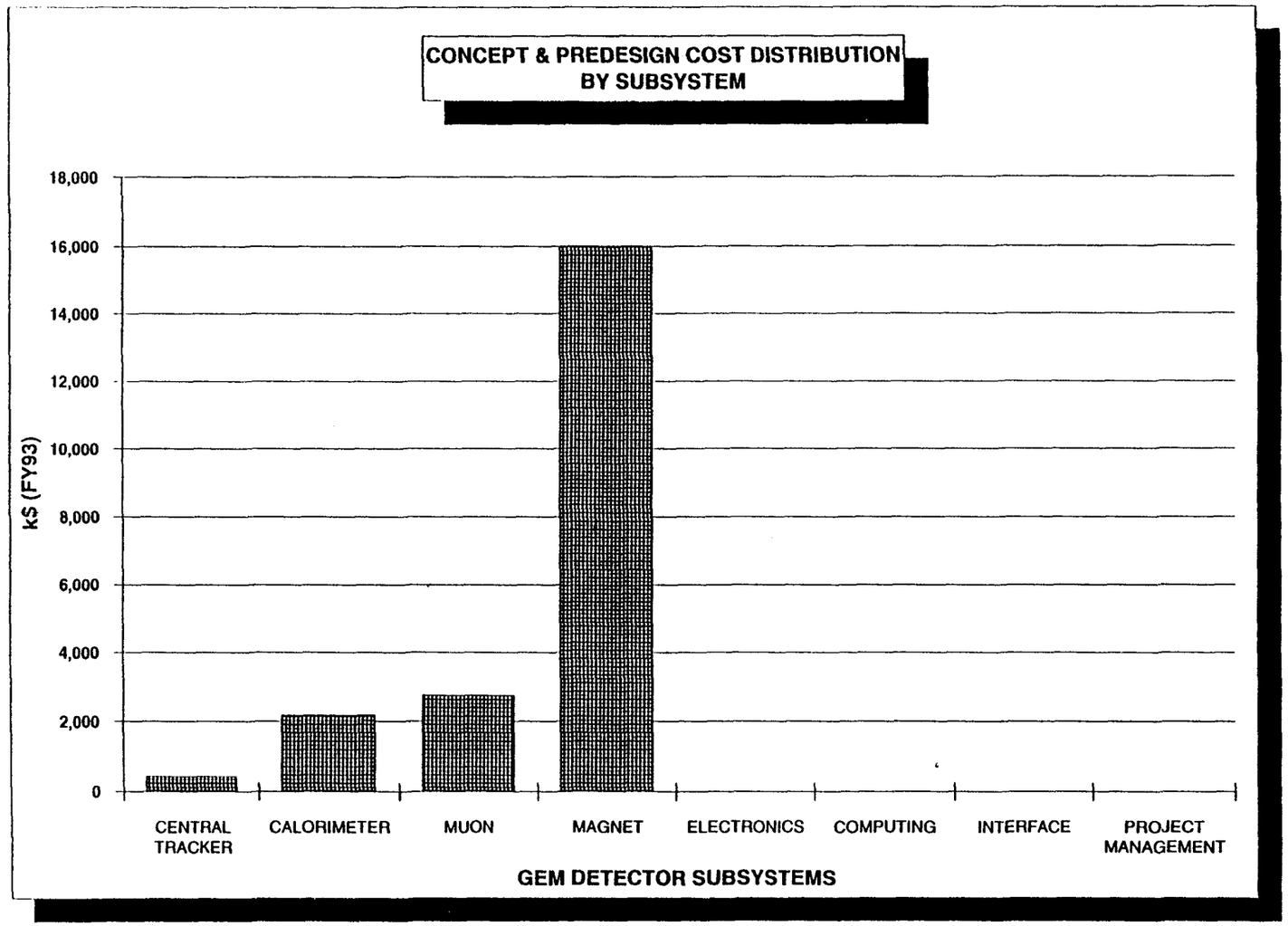


GEM DETECTOR PROJECT


TOTAL COST DISTRIBUTION
BY SUBSYSTEM
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
kS (FY93)
CENTRAL TRACKER
CALORIMETER
MUON
MAGNET
ELECTRONICS
COMPUTING
INTERFACE
PROJECT MANAGEMENT
GEM DETECTOR SUBSYSTEMS
CONSTRUCTION
R&D
CONCEPT & PREDESIGN

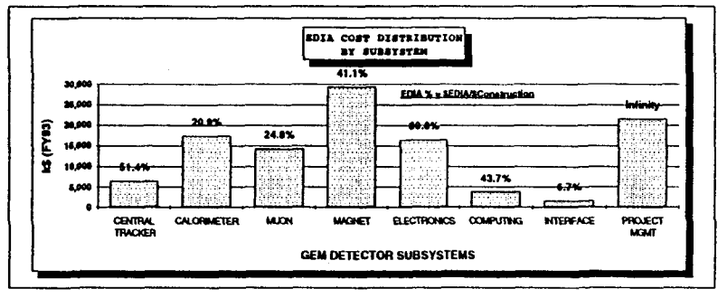

CONSTRUCTION COST DISTRIBUTION
BY SUBSYSTEM
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
kS (FY93)
CENTRAL TRACKER
CALORIMETER
MUON
MAGNET
ELECTRONICS
COMPUTING
INTERFACE
PROJECT MANAGEMENT
GEM DETECTOR SUBSYSTEMS

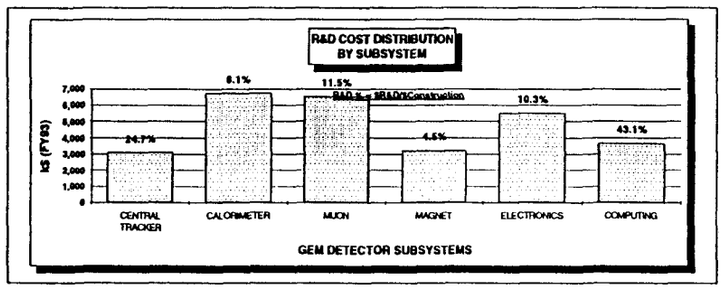

R&D COST DISTRIBUTION
BY SUBSYSTEM
kS (FY93)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
CENTRAL TRACKER
CALORIMETER
MUON
MAGNET
ELECTRONICS
COMPUTING
INTERFACE
PROJECT MANAGEMENT
GEM DETECTOR SUBSYSTEMS

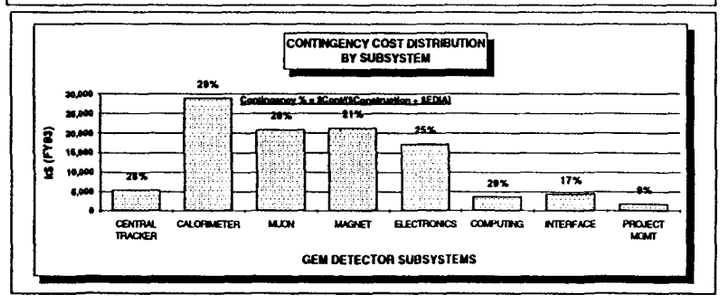

CONCEPT & PREDESIGN COST DISTRIBUTION
BY SUBSYSTEM
kS (FY93)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
CENTRAL TRACKER
CALORIMETER
MUON
MAGNET
ELECTRONICS
COMPUTING
INTERFACE
PROJECT MANAGEMENT
GEM DETECTOR SUBSYSTEMS

EDIA, R&D and Contingency Analysis (FY93)

	Total Cost - K$ (w/contingency)	Total Cost - K$ (w/o contingency)	Construction Cost - K$ (Pr/Fab/Inst/Assy)	EDIA - K$ (no R&D)	EDIA% (% of construction)	R&D - K$	R&D % (% of Const)	Contingency - K$	Contingency % %(Total-R&D)
GEM DETECTOR SYSTEM	**551,228**	**447,866**	**308,874**	**110,323**	**35.7%**	**28,668**	**9.3%**	**103,362**	**25%**
CENTRAL TRACKER	27,323	21,954	12,461	6,410	51.4%	3,083	24.7%	5,369	28%
CALORIMETER	135,415	106,546	82,544	17,276	20.9%	6,726	8.1%	28,869	29%
MUON	98,347	77,449	56,823	14,119	24.8%	6,508	11.5%	20,897	29%
MAGNET	125,325	104,048	71,483	29,361	41.1%	3,204	4.5%	21,277	21%
ELECTIONICS	92,272	75,171	53,285	16,402	30.8%	5,484	10.3%	17,100	25%
COMPUTING	19,460	15,869	8,495	3,711	43.7%	3,662	43.1%	3,591	29%
INTERFACE	29,813	25,380	23,784	1,596	6.7%	0	0.0%	4,433	17%
PROJECT MGMT	23,274	21,448	0	21,448	0.0%	0	0.0%	1,825	9%







OPEN PLAN

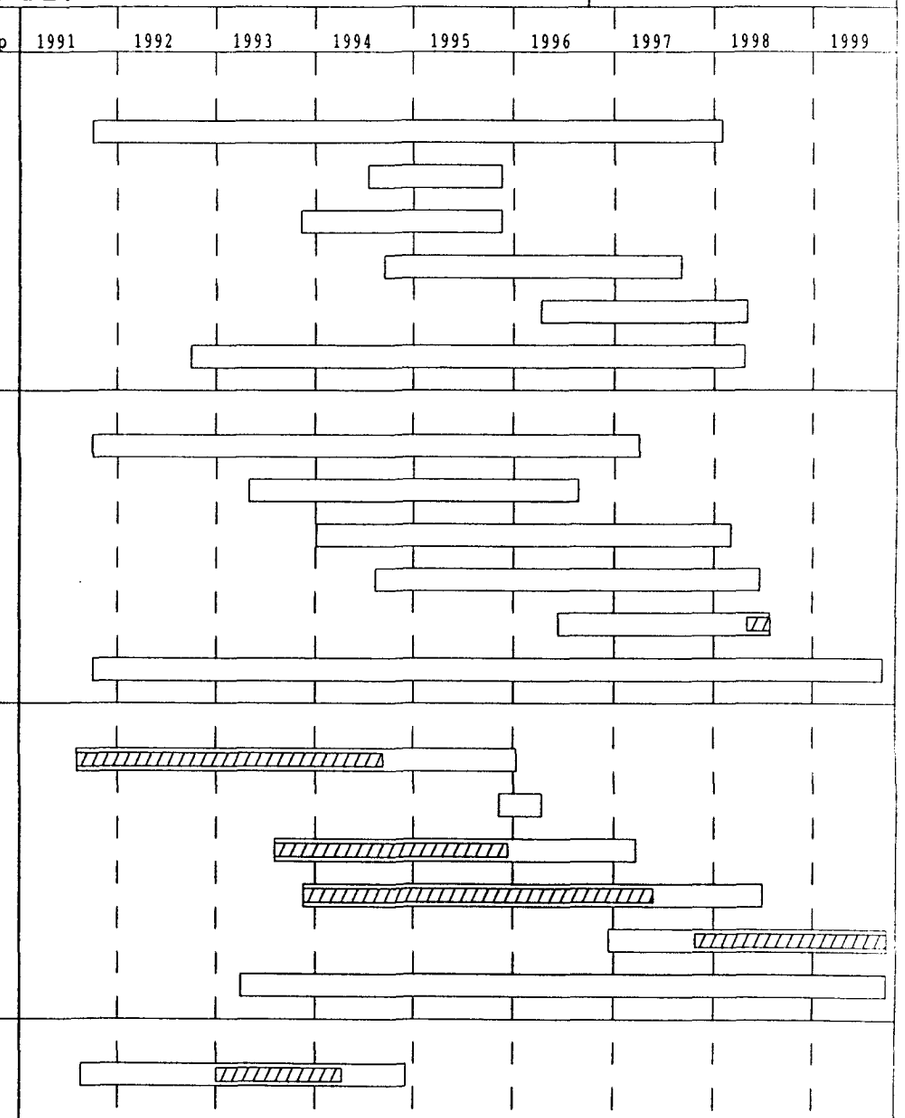
Project: GEM_0426
Report: TDR_SUM1
Status as of: 15AUG91
Current Date: 27APR93
Page: 1

LEVEL I SUMMARY BASELINE SCHEDULE

522 GEM DETECTOR

GEM DETECTOR

Summary Description	Baseline	Start/Finish	%Comp
522.5010 TRACKING SYSTEMS			
DESIGN	01OCT91	29JAN98	
PROCUREMENT	13JUL94	16NOV95	
FABRICATION	09NOV93	16NOV95	
ASSEMBLY	13SEP94	28AUG97	
INSTALLATION	09APR96	01MAY98	
LEVEL OF EFFORT (LOE)	01OCT92	22APR98	
522.5020 CALORIMETRY SYSTEMS			
DESIGN	01OCT91	31MAR97	
PROCUREMENT	30APR93	19AUG96	
FABRICATION	03JAN94	04MAR98	
ASSEMBLY	10AUG94	19JUN98	
INSTALLATION	10JUN96	27JUL98	
LEVEL OF EFFORT (LOE)	01OCT91	16SEP99	
522.5030 MUON SYSTEMS			
DESIGN	01AUG91	11JAN96	
PROCUREMENT	09NOV95	10APR96	
FABRICATION	03AUG93	18MAR97	
ASSEMBLY	18NOV93	29JUN98	
INSTALLATION	13DEC96	30SEP99	
LEVEL OF EFFORT (LOE)	01APR93	28SEP99	
522.5040 MAGNETS			
DESIGN	15AUG91	01DEC94	



Legend: Baseline, Critical, Float, Baseline, Projected, Actual

SUPERCONDUCTING SUPER COLLIDER PROJECT
GEM - PROJECT OFFICE

Signatures

Approved by: _____

OPEN PLAN

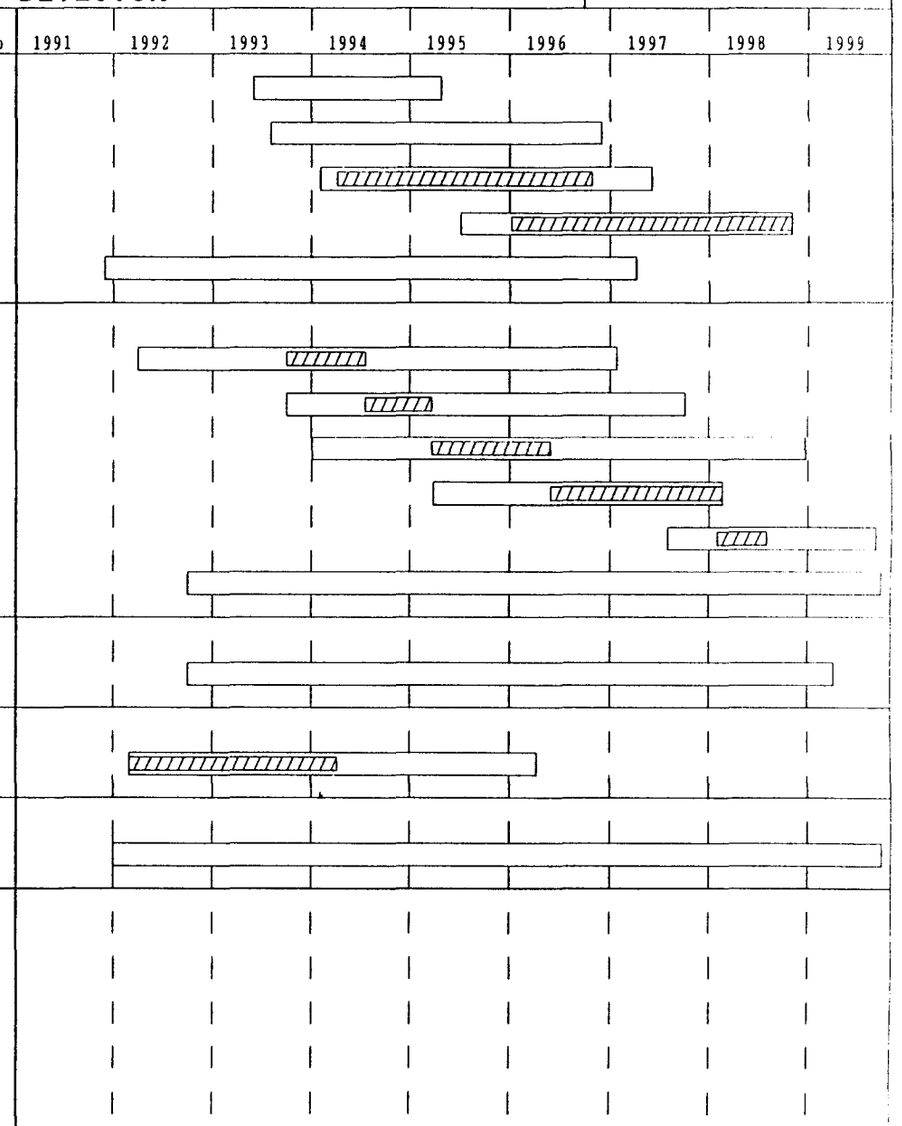
Project: GEM_0426
Report: TDR_SUM1
Status as of: 15AUG91
Current Date: 27APR93
Page: 2

LEVEL I SUMMARY BASELINE SCHEDULE

522 GEM DETECTOR

G E M DETECTOR

Summary Description	Baseline	Start/Finish	%Comp
PROCUREMENT	01JUN93	26APR95	
FABRICATION	02AUG93	27NOV96	
ASSEMBLY	02FEB94	30MAY97	
INSTALLATION	07JUL95	30OCT98	
LEVEL OF EFFORT (LOE)	02DEC91	03APR97	
522.5050 ELECTRONIC SYSTEMS			
DESIGN	01APR92	22JAN97	
PROCUREMENT	01OCT93	01OCT97	
FABRICATION	03JAN94	21DEC98	
ASSEMBLY	27MAR95	16FEB98	
INSTALLATION	28JUL97	06SEP99	
LEVEL OF EFFORT (LOE)	01OCT92	28SEP99	
522.5060 DETECTOR COMPUTING			
	01OCT92	05APR99	
522.5070 INTERFACE SYSTEMS			
CONSTRUCTION	02MAR92	08APR96	
522.5090 PROJECT MGT & DETECTOR INTEGT			
	01JAN92	30SEP99	



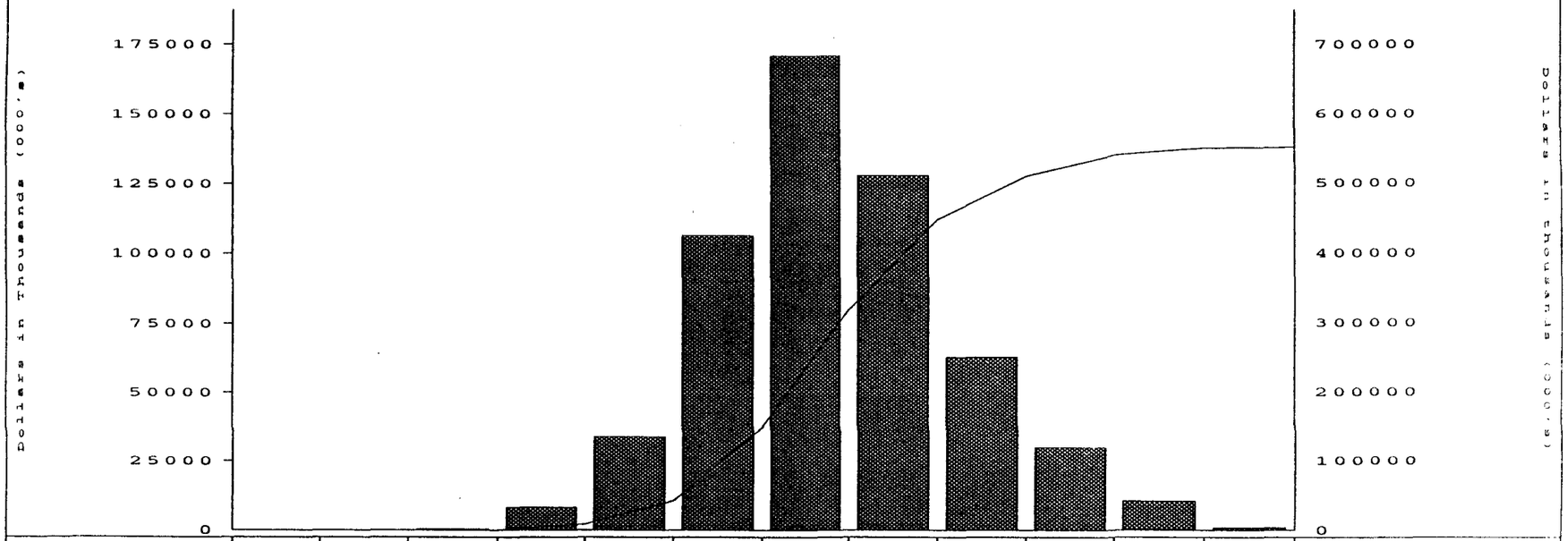
Legend: Baseline; Critical; Float; Baseline; Projected; Actual

SUPERCONDUCTING SUPER COLLIDER PROJECT
GEM - PROJECT OFFICE

Signatures

Approved by: _____

GEM Detector Report: GEM_FY	GEM DETECTOR WBS 522.50 - DETECTORS & EXPERIMENTALS SYS	Date: 27APR93 Project: GEM_0426



		FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
Incr Bud	$100k	4	83	339	1062	1708	1278	625	299	105	9
Cum Bud	$100k	4	87	426	1488	3196	4474	5099	5397	5502	5512

WBS	522.5010	$27,323,488	TRACKING SYSTEMS
WBS	522.5020	$135,415,178	CALORIMETRY SYSTEMS
WBS	522.5030	$98,346,729	MUON SYSTEMS
WBS	522.5040	$125,324,910	MAGNETS
WBS	522.5050	$92,271,560	ELECTRONIC SYSTEMS
WBS	522.5060	$19,415,423	DETECTOR COMPUTIN
WBS	522.5070	$29,813,084	INTERFACE SYSTEMS
WBS	522.5090	$23,273,612	PROJECT MGT & DETECT