

DETECTOR COST, SCHEDULE, MANPOWER

W. E. Althouse

9/20/94

DETECTOR COST, SCHEDULE, MANPOWER

- **DETECTOR DESIGN AND FABRICATION ACTIVITIES INCLUDED**
- **DETECTOR INTEGRATION ACTIVITIES SEPARATELY ESTIMATED AND INCLUDED IN PRE-OPS PHASE**
- **PRELIMINARY DESIGN & FABRICATION PLAN ENTERED INTO AUTOPLAN II DATA BASE**
- **BOTTOMS-UP MATERIAL AND MANPOWER ESTIMATES FOR EACH ACTIVITY MADE BY LIGO STAFF, THEN REVIEWED BY DETECTOR AND R&D MANAGEMENT AND ITERATED TO REACH CONSENSUS**
- **COSTS IN PRELIMINARY PLAN CONSISTENT WITH U.S. COST DATA BASE (MINOR DIFFERENCES RESOLVED WHEN DATA BASE INTEGRATION COMPLETED)**
- **PLAN WILL BE FURTHER ITERATED DURING FALL 1994, FINAL PLAN ADOPTED BY 1/95**
- **FACILITY MILESTONES USED TO CONSTRAIN SCHEDULE SO THAT NO PATH IS CRITICAL DURING DESIGN/CONSTRUCTION PHASE**

**DETECTOR COST,
SCHEDULE, MANPOWER
DETECTOR MILESTONES**

MILESTONE

**PREFERRED
DATE**

EXTERNAL (PROJECT) MILESTONES:

Alignment Sensing/Control Preliminary Design Review	12/95
BSC/TMC Seismic Isolation Preliminary Design Review	1/96
HAM Seismic Isolation Preliminary Design Review	4/96
Core Optics Support Preliminary Design Review	6/96
Length Sensing/Control Preliminary Design Review	10/96
Prestabilized Laser Preliminary Design Review	11/96
WA Buildings Joint Occupancy	9/97
WA Begin Facility Shakedown	3/98
LA Buildings Joint Occupancy	3/98
WA Facility Ready for Init. IFO Installation	7/98
LA Begin Facility Shakedown	9/98
LA Facility Ready for Init. IFO Installation	2/99

**DETECTOR COST,
SCHEDULE, MANPOWER
DETECTOR INTERNAL MILESTONES**

MILESTONE	DATE
Detector Implementation Plan Approved	1/95
CDS Preliminary Design Requirements Review	9/95
CDS Vacuum Controls Final Design Review	7/96
BSC/TMC Seismic Isolation Final Design Review*	7/96
Core Optics Support Final Design Review*	10/96
HAM Seismic Isolation Final Design Review*	10/96
Core Optics Components Vendors Qualified	11/96
Input/Output Optics Final Design Review*	1/97
BSC/TMC Seismic Isolation First Article Test Review	2/97
CDS WA Site Vacuum/Control Area & Networking Systems Ready for Installation	4/97
HAM Seismic Isolation First Article Test Review	6/97
Prestabilized Laser First Article Test Review	8/97
CDS Data Acquisition Final Design Review*	10/97
Begin WA IFO Installation*	7/98
Begin LA IFO Installation	2/99
Begin Coincidence Tests*	7/00

* Milestones designated significant by Project

LIGO PROJECT

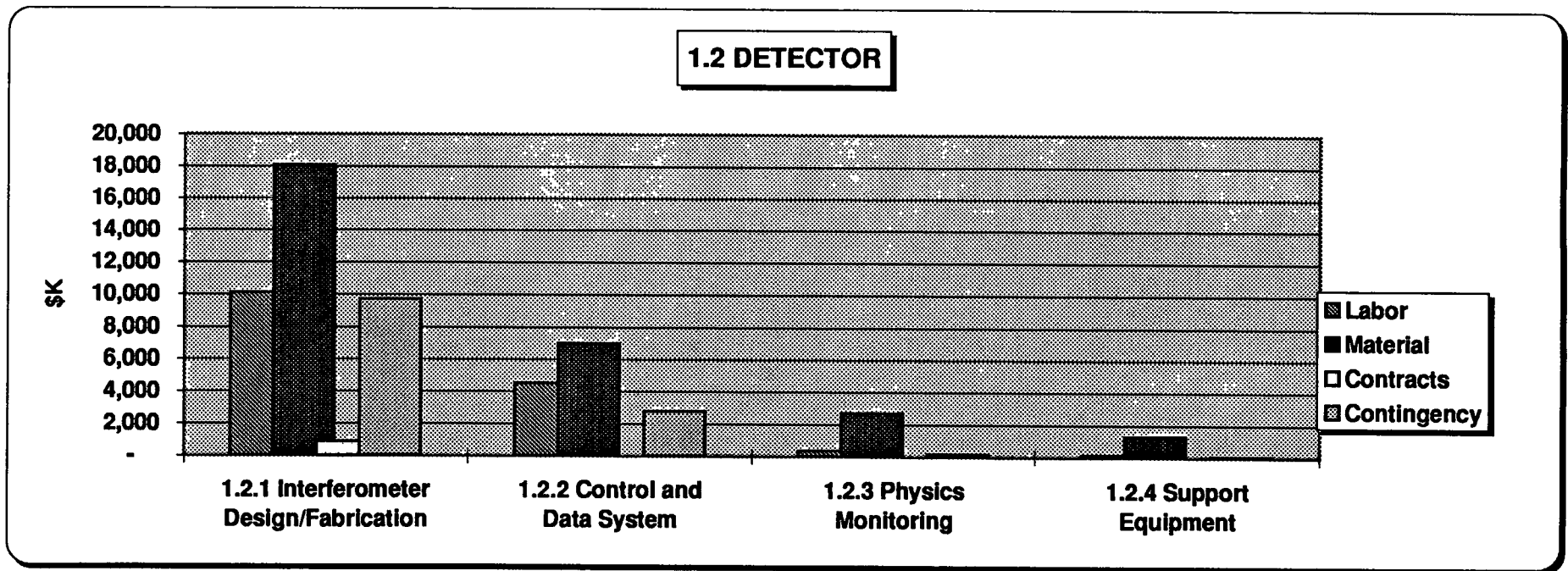
ESTIMATE WBS SUMMARY
(1994 \$K)

WBS No.	WBS TITLE	SUBTOT EST.	CONTINGENCY ALLOCATION		TOTAL COST
			%	(\$K)	
1.2	-Detector	45,094	28.20%	12,718	57,812
1.2.1	-Interferometer Design/Fabrication	29,098	33.37%	9,710	38,808
1.2.1.1	+Interferometers Design/Non-recurring Items/Systems Engineering	7,446	34.33%	2,556	10,002
1.2.1.2	+Interferometer Fabrication-WA Site	14,706	32.98%	4,851	19,557
1.2.1.3	+Interferometer Fabrication -LA Site	6,946	33.15%	2,303	9,249
1.2.2	-Control and Data System	11,456	24.28%	2,782	14,238
1.2.2.1	+CDS Design and Systems Engineering	4,144	23.26%	964	5,107
1.2.2.2	+CDS Procurement/Fabrication - WA Site	4,528	25.30%	1,145	5,674
1.2.2.3	+CDS Procurement/Fabrication - LA Site	2,784	24.16%	673	3,457
1.2.3	-Physics Monitoring	3,093	5.00%	155	3,248
1.2.3.1	Physics Monitor Design	338	5.00%	17	355
1.2.3.2	WA Physics Monitors Fabrication	1,642	5.00%	82	1,724
1.2.3.3	LA Physics Monitors Fabrication	1,114	5.00%	56	1,169
1.2.4	-Support Equipment	1,446	5.00%	72	1,518
1.2.4.1	Design/Fabrication Support Equipment	23	5.00%	1	25
1.2.4.2	WA Site Support Equipment	764	5.00%	38	802
1.2.4.3	LA Site Support Equipment	659	5.00%	33	692

LIGO PROJECT

SEPTEMBER 1994

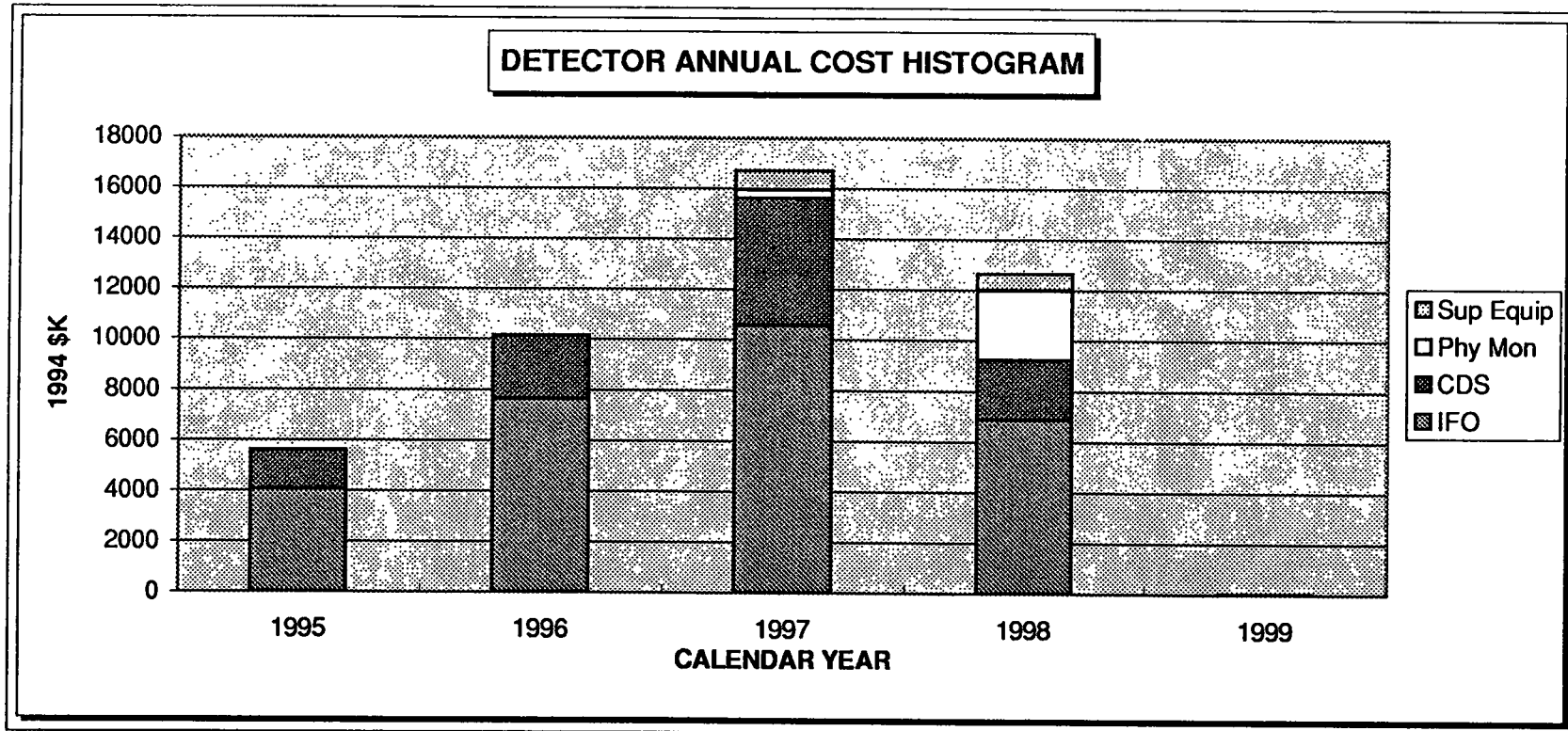
1.2 Detector		<--\$K-->			
Subsystem	Labor	Material	Contracts	Contingency	TOTAL
1.2.1 Interferometer Design/Fabrication	10,133	18,071	894	9,710	38,808
1.2.2 Control and Data System	4,492	6,965	-	2,782	14,238
1.2.3 Physics Monitoring	383	2,710	-	155	3,248
1.2.4 Support Equipment	138	1,308	-	72	1,518
TOTAL	15,146	29,054	894	12,718	57,812



LIGO DETECTOR SYSTEMS ANNUAL COSTS

SEPTEMBER 1994

	FY 94 \$K					
	1995	1996	1997	1998	1999	TOTALS
IFO	4034	7642	10545	6877	0	29098
CDS	1543	2501	5042	2354	18	11458
Phy Mon	0	0	338	2755	0	3093
Sup Equip	23	0	764	659	0	1446
TOTALS	5600	10143	16689	12645	18	45095



Project Cost Curve : DETECTOR CUM. COSTS

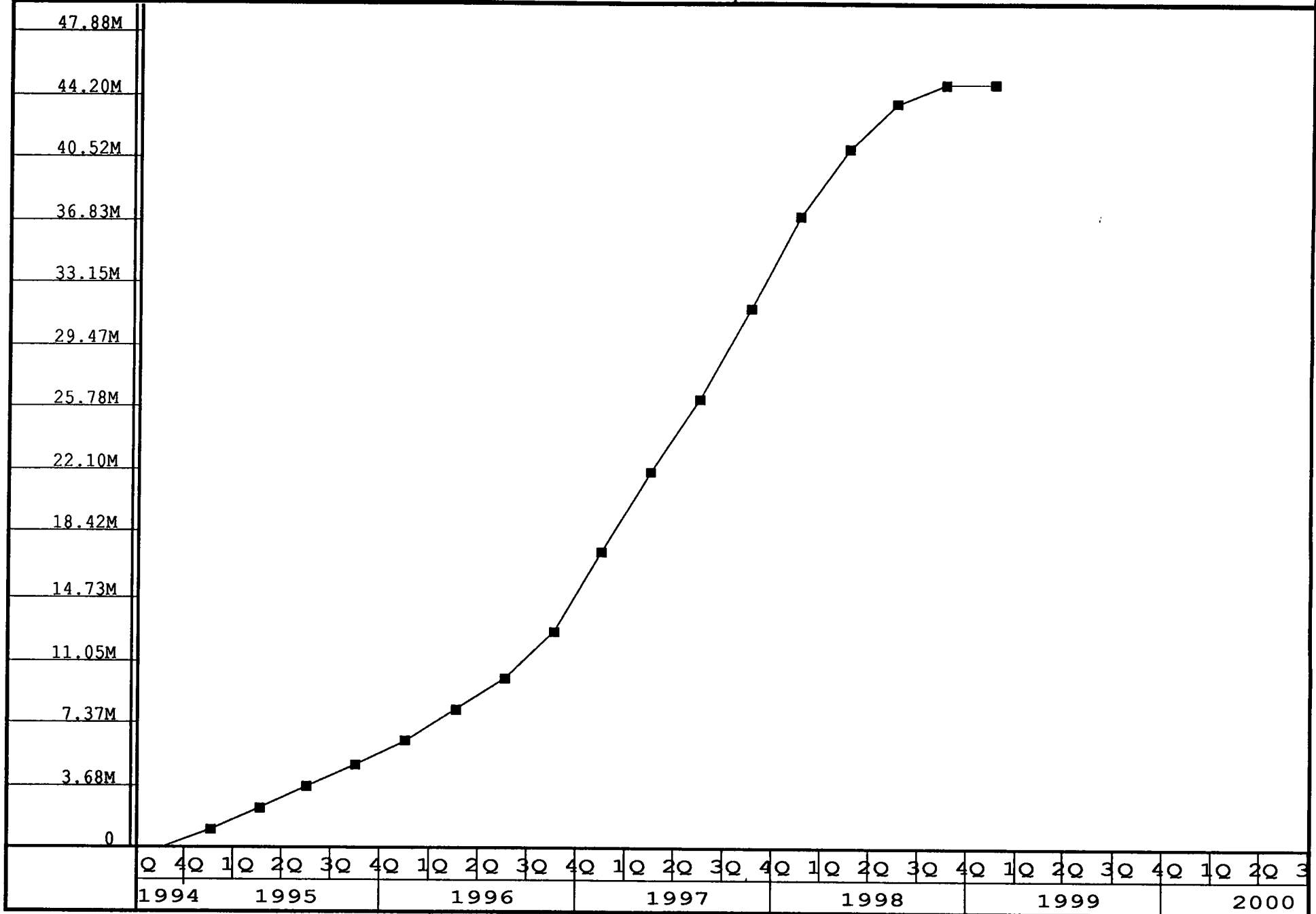
Activity: DET1:DET1

Report span: 10/01/94To 10/01/0

Preferred Dates in Unit(s)

Project span: 10/03/94To 07/04/0, 68.23 Month(s)

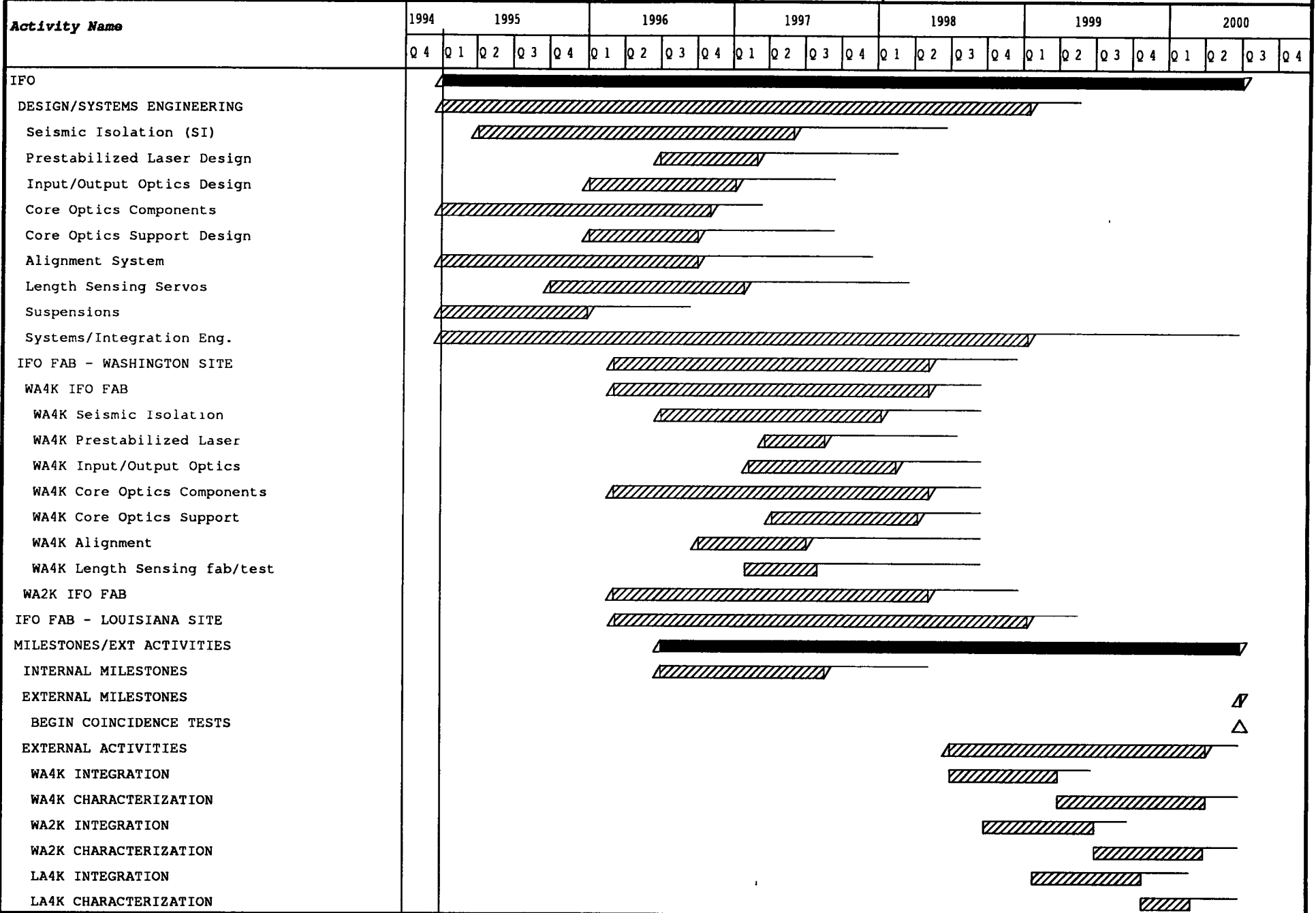
Run Date: 09/15/94



Gantt Chart : IFO SUMMARY

Project span: 01/02/95 To 07/04/ 0, 65.27 Month(s)

Run Date: 09/12/94



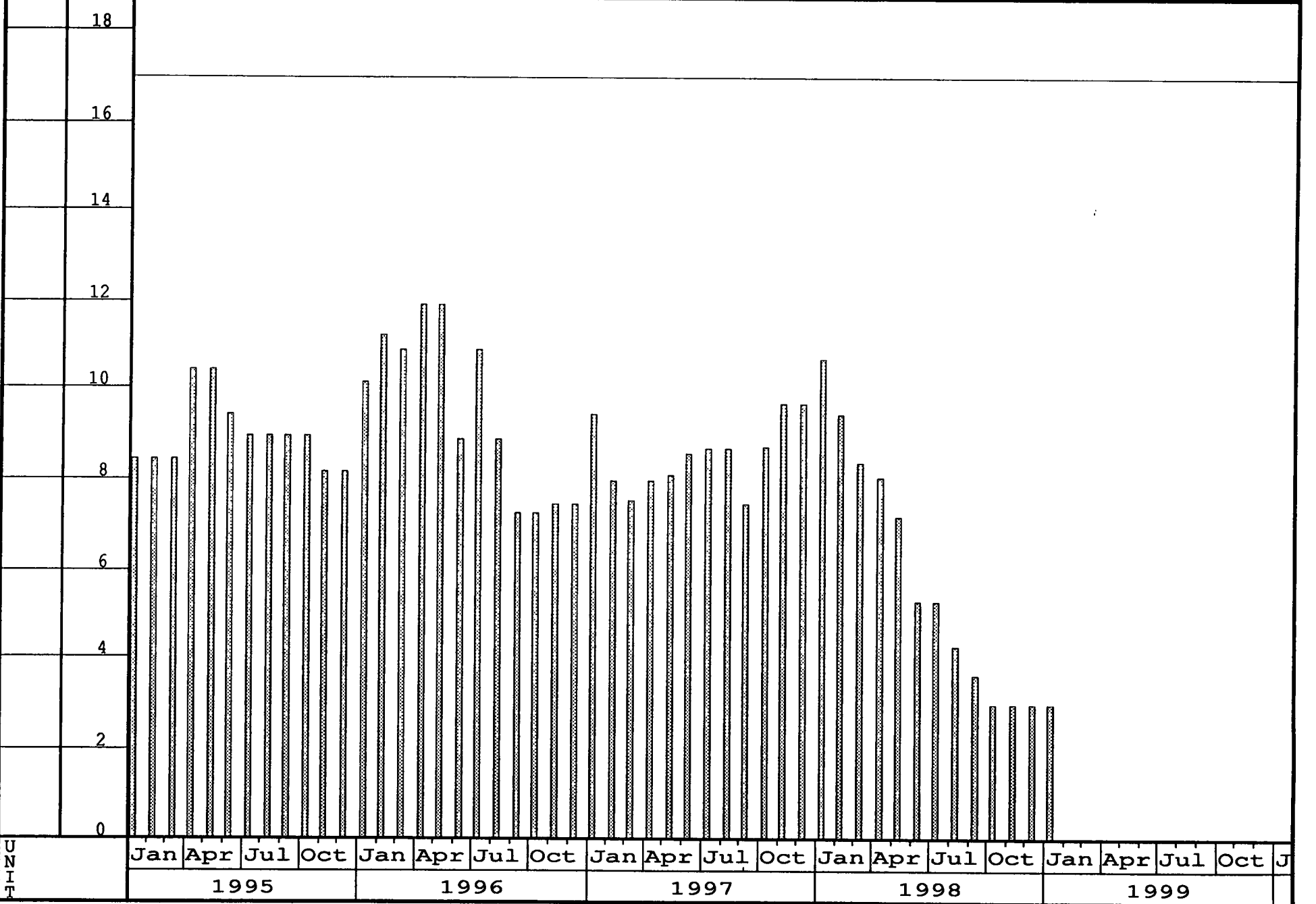
Gantt Chart : SUPPORT EQUIPMENT SUMMARY

Project span: 01/02/95 To 07/04/ 0, 65.27 Month(s)

Run Date: 09/15/94

Activity Name	1994				1995				1996				1997				1998				1999				2000															
	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4											
SUPPORT EQUIPMENT																																								
Design/Fab																																								
WA Support Equipment																																								
LA Support Equipment																																								
MILESTONES																																								
WA Facility Ready																									△															
LA Facility Ready																													△											
BEGIN COINCIDENCE TESTS																																					△			

Histogram : DETECTOR SCIENTISTS		Activity: DET1:DET1
Project span: 10/03/94To 07/04/0, 68.23 Month(s)		Report span: 01/02/95To 01/31/0 Preferred Dates in Unit(s)
Run Date: 09/15/94		Resource: SCIENCE



UNIT	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	J
	1995				1996				1997				1998				1999				

Histogram : DETECTOR TECH/DESIGNERS

Activity: DET1:DET1

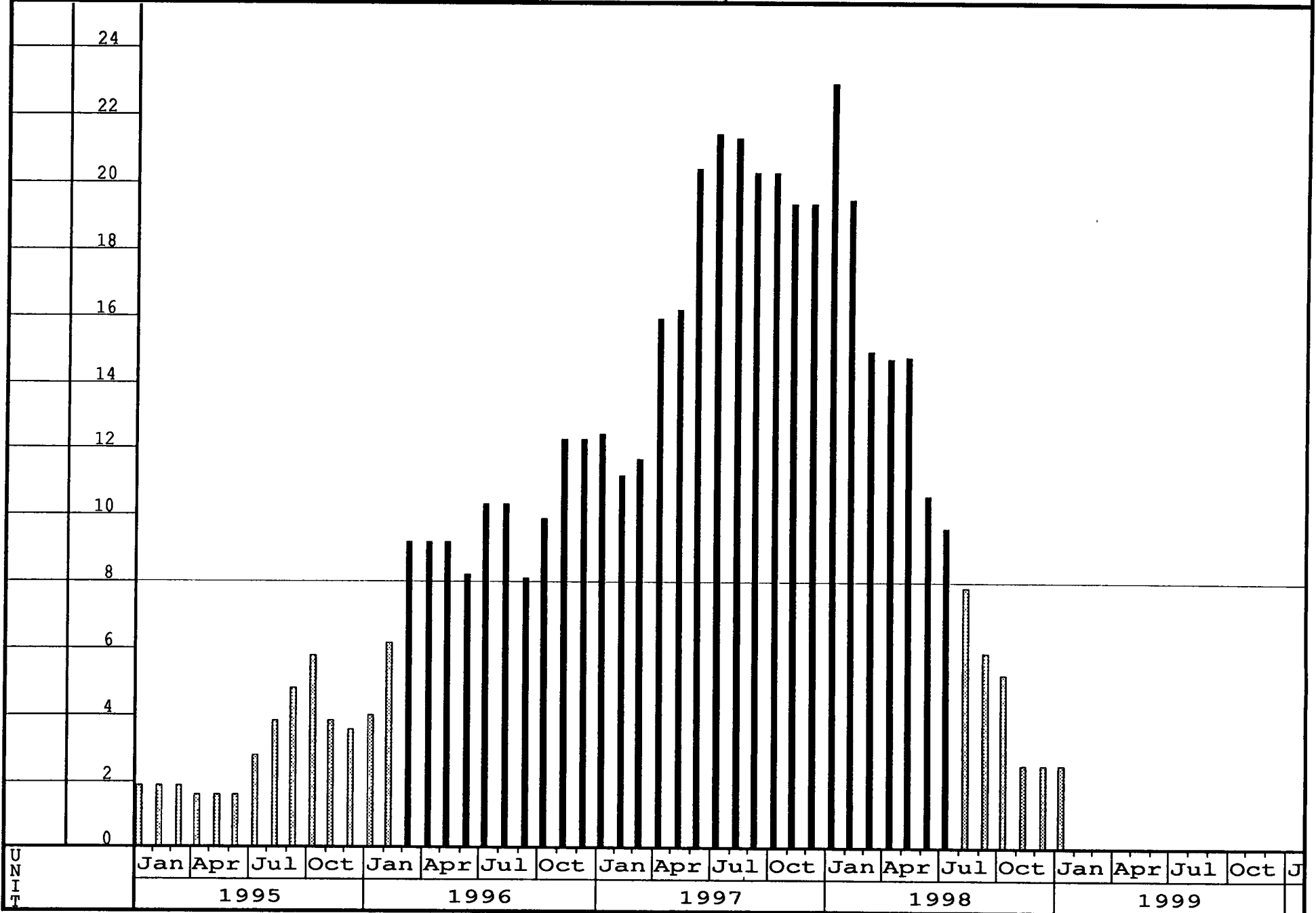
Report span: 01/02/95To 01/31/0

Preferred Dates in Unit(s)

Project span: 10/03/94To 07/04/0, 68.23 Month(s)

Run Date: 09/15/94

Resource: TECH



Histogram : R&D / DETECTOR SCIENTISTS

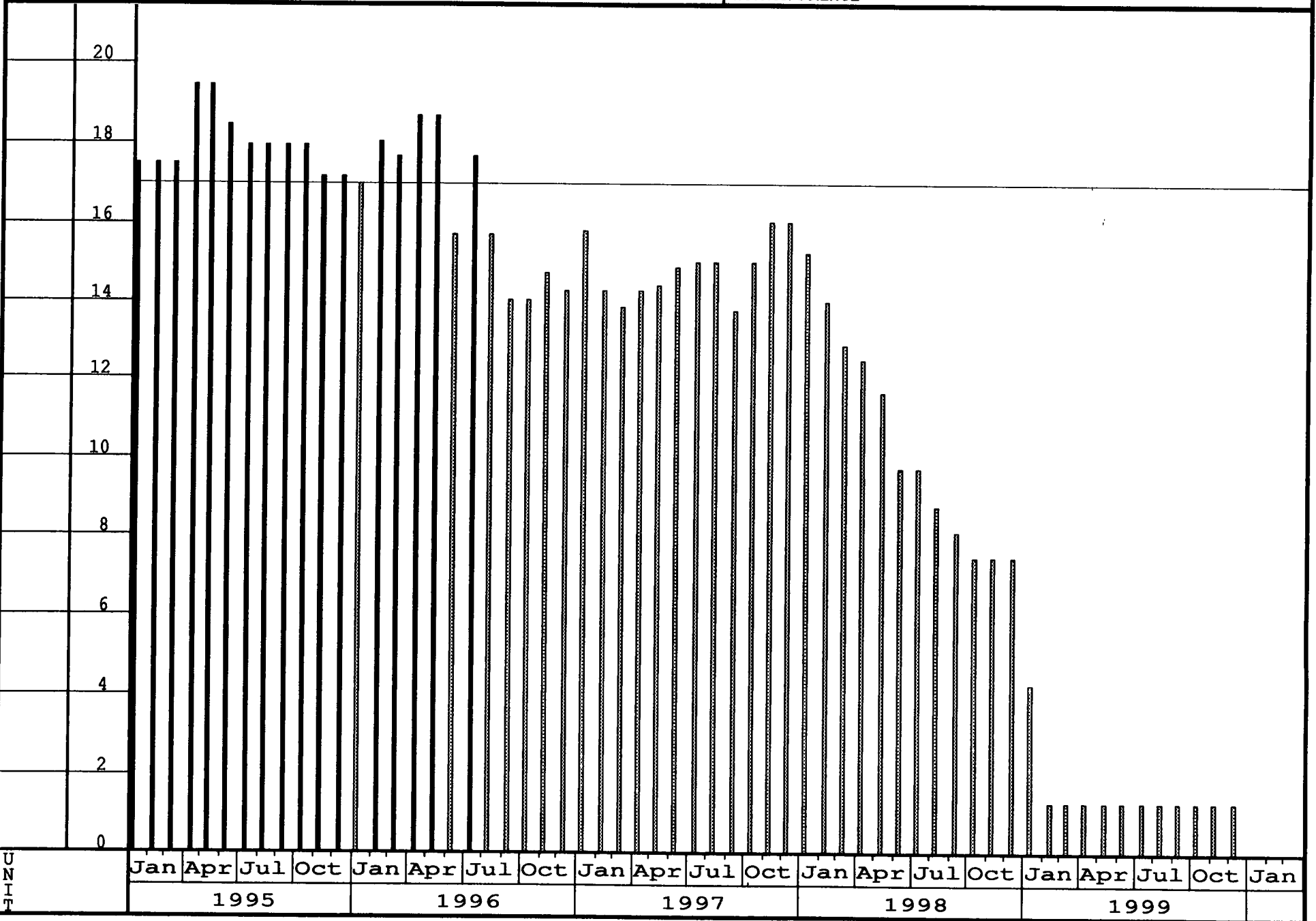
Activity: DET1:DET1

Report span: 01/01/95To 08/01/0

Preferred Dates in Unit(s)

Project span: 10/03/94To 07/04/0, 68.23 Month(s)

Run Date: 09/19/94 Resource: SCIENCE



UNIT

Jan Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Jan
 1995 1996 1997 1998 1999

Histogram : R&D / DETECTOR TECHNICIANS

Activity: DET1:DET1

Report span: 01/01/95 To 08/01/0

Preferred Dates in Unit(s)

Project span: 10/03/94 To 07/04/0, 68.23 Month(s)

Run Date: 09/19/94

Resource: TECH

