

U.S. ATLAS E.T.C. Cost Book

Funding Source: All

Funding Type: All

Institutions: All

U.S. Atlas Cost Book

11/12/01 4:02:03 PM

WBS Number:

Description:

Institution :

Contact:

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
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CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1**Description:** Pixels**Institution :****Contact:** Not available

This estimate covers the cost of US deliverables for the Pixel System.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	5249	2751	52	8001	1219	1257	540	2233	46.7	27.3

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	5229	5284	0	0	6183	4105	50	14499	1256.523
MFG MC	0	0	0	0	1512	441	0	0	4265	60	0	4612	310.327
MFG B/I	0	0	0	0	1540	23190	0	0	0	0	0	0	1427.018
EDIA P	0	6400	4400	3415	300	0	0	0	0	0	0	5720	1219.415
EDIA MC	0	1100	4400	2200	400	0	0	0	2640	0	0	4808	814.024
EDIA B/I	0	10060	9240	1820	0	880	0	0	0	0	0	1200	1888.964
	0	17560	18040	7435	8981	29795	0	0	13088	4165	50	30839	6916.271

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	1151	10	0	287	0	639.9	2233.135
MFG MC	170	0	0	76	0	609.6	886.869
MFG B/I	0	0	0	30	0	0.0	32.400
EDIA P	267	19	131	0	0	65.0	540.420
EDIA MC	0	0	16	0	0	0.0	19.040
	1588	29	147	393	0	1314.5	3711.864

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	3831	4677	1697	424	10628

WBS Number: 1.1.1.1**Description:** Mechanics and Final Assembly**Institution :****Contact:** G. Gilchriese

This estimate covers the US contribution to ATLAS pixel mechanics, services and final pixel system assembly.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	2387	1207	51	3594	519	468	319	1082	14.4	15.8

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	864	3520	0	0	810	3113	0	0	467.639
MFG MC	0	0	0	0	428	0	0	0	0	0	0	0	24.571
MFG B/I	0	0	0	0	0	19800	0	0	0	0	0	0	1142.658
EDIA P	0	220	4400	1760	0	0	0	0	0	0	0	3520	518.793
EDIA MC	0	0	4400	2200	0	0	0	0	0	0	0	0	622.050
EDIA B/I	0	0	7040	0	0	880	0	0	0	0	0	0	717.112
	0	220	15840	3960	1292	24200	0	0	810	3113	0	3520	3492.823

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	757	4	0	0	0	230.0	1081.825
MFG MC	110	0	0	0	0	0.0	119.272
EDIA P	241	15	36	0	0	0.0	318.540
EDIA MC	0	0	16	0	0	0.0	19.040
	1109	19	52	0	0	230.0	1538.677

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	1593	1863	1189	386	5032

WBS Number: 1.1.1.1.1**Description:** Design**Institution :****Contact:** G. Gilchriese

This includes the cost of mechanical engineering labor for prototype and production design. The engineering labor is provided by Hytec, Inc under contract to LBNL and by LBNL.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	837	500	60	1337	519	0	319	0	9.4	4.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	220	4400	1760	0	0	0	0	0	0	0	3520	518.793
EDIA MC	0	0	4400	2200	0	0	0	0	0	0	0	0	622.050
EDIA B/I	0	0	7040	0	0	880	0	0	0	0	0	0	717.112
	0	220	15840	3960	0	880	0	0	0	0	0	3520	1857.955

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	241	15	36	0	0	0.0	318.540
EDIA MC	0	0	16	0	0	0.0	19.040
	241	15	52	0	0	0.0	337.580

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	775	733	534	153	2196

WBS Number: 1.1.1.1.1.1**Description:** Prototype Design**Institution :****Contact:** G. Gilchriese

This includes the conceptual and prototype design of both the barrel and disk regions. System conceptual design is also included.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	82	26	32	108	70	0	12	0	0.5	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	880	0	0	0	0	0	0	0	0	0	70.180
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	70.180
	0	0	1760	0	0	0	0	0	0	0	0	0	140.360

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	10	0	0	0.0	11.900
	0	0	10	0	0	0.0	11.900

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	152	0	0	0	152

WBS Number: 1.1.1.1.1.1.1**Description:** Design - LBNL**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Engineering design at LBNL supported by internal funds and ATLAS project funds.

Basis of Estimate: Engineering judgement**Details of Estimate:** We estimate 2x0.5 FTE ME year remaining for prototype design items related to the pixel support tube. This is Neal Hartman(project) and Eric Anderssen(base).

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	82	26	32	108	70	0	12	0	0.5	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	880	0	0	0	0	0	0	0	0	0	70.180
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	70.180
	0	0	1760	0	0	0	0	0	0	0	0	0	140.360

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	10	0	0	0.0	11.900
	0	0	10	0	0	0.0	11.900

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	4	8	4	1	1	32

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	152	0	0	0	152

WBS Number: 1.1.1.1.1.1.2**Description:** Design - HYTEC, Inc.**Institution :** LBNL/UC-Junior**Contact:** W. Miller

The engineering design at HYTEC, Inc.

Basis of Estimate: Engineering judgement**Details of Estimate:** Complete

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	4	8	2	1	1	24

WBS Number: 1.1.1.1.1.2**Description:** Production Design**Institution :****Contact:** G. Gilchriese

This includes production design of all US mechanical and services deliverables and of final assembly and installation at CERN. Design labor is provided by Hytec, Inc under contract to LBNL and by LBNL.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	755	474	63	1229	449	0	307	0	8.9	4.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	220	3520	1760	0	0	0	0	0	0	0	3520	448.613
EDIA MC	0	0	4400	2200	0	0	0	0	0	0	0	0	622.050
EDIA B/I	0	0	6160	0	0	880	0	0	0	0	0	0	646.932
	0	220	14080	3960	0	880	0	0	0	0	0	3520	1717.595

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	241	15	26	0	0	0.0	306.640
EDIA MC	0	0	16	0	0	0.0	19.040
	241	15	42	0	0	0.0	325.680

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	623	733	534	153	2043

WBS Number: 1.1.1.1.1.2.1**Description:** Sectors**Institution :** LBNL/UC- Senior**Contact:** G. Gilchriese

Production design of disk sectors.

Basis of Estimate: Engineering judgement**Details of Estimate:** Complete

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	4	8	4	2	1	1	20

WBS Number: 1.1.1.1.1.2.2**Description:** Disk Support Rings and Mounts**Institution :** LBNL/UC- Senior**Contact:** W. Miller

Production design of disk support rings and the associated mounts to the support frame.

Basis of Estimate: Engineering judgement**Details of Estimate:** Design is complete. Engineering for production followup is included. This is a procurement to Hytec from LBNL

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	55	11	20	66	0	0	55	0	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	51	0	0	0	0	0.0	55.080
	51	0	0	0	0	0.0	55.080

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	4	8	4	2	1	1	20

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	55	0	0	0	55

WBS Number: 1.1.1.1.1.2.3**Description:** Support Frame**Institution :** LBNL/UC- Senior**Contact:** W. Miller

Production design of support frame and mounts to the SCT.

Basis of Estimate: Engineering judgement

Details of Estimate: This work will be performed by Hytec, Inc under subcontract to LBNL. Design engineering is 71.9K Production engineering followup is 118.1K. Total is 190K. FY02 is 71.9+59.1K=131K. FY03 is 59K.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	205	41	20	246	0	0	205	0	0.0	0.0

MATERIAL SUMMARY:		Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
	EDIA P	190	0	0	0	0	0.0	205.200
		190	0	0	0	0	0.0	205.200

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	4	8	4	2	1	1	20

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	141	64	0	0	205

WBS Number: 1.1.1.1.1.2.4**Description:** Support Tube**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Design of the support tube and related structures that support the pixel system within the Inner Detector

Basis of Estimate: Engineering judgement**Details of Estimate:** The initial design is covered under prototype design for the first half of FY02. Beam pipe support design is not currently included here.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	478	191	40	669	439	0	39	0	5.0	0.8

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	3520	1760	0	0	0	0	0	0	0	3520	438.944
EDIA B/I	0	0	1320	0	0	0	0	0	0	0	0	0	105.270
	0	0	4840	1760	0	0	0	0	0	0	0	3520	544.214

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	15	20	0	0	0.0	38.800
	0	15	20	0	0	0.0	38.800

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	10	8	10	2	1	1	40

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	166	307	110	0	583

WBS Number: 1.1.1.1.1.2.5**Description:** Services**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Design of power cables, coolant tubing and integration of same into pxiel structure, external routing and interfaces to other systems.

Basis of Estimate: Engineering judgement

Details of Estimate: This work will be done by physicists and base-program supported engineering at LBNL. Some initial work will be done at UNM in FY02.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	17	7	42	24	10	0	8	0	0.1	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	220	0	0	0	0	0	0	0	0	0	0	9.669
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	70.180
	0	220	880	0	0	0	0	0	0	0	0	0	79.849

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	6	0	0	0.0	7.560
	0	0	6	0	0	0.0	7.560

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	49	39	0	0	87

WBS Number: 1.1.1.1.1.2.5.1 **Description:** Services Design - New Mexico

Institution : U. of New Mexico

Contact: E. Anderssen

Support of EE Martin Hoeferkamp.

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	17	7	42	24	10	0	8	0	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	220	0	0	0	0	0	0	0	0	0	0	9.669
	0	220	0	0	0	0	0	0	0	0	0	0	9.669

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	6	0	0	0.0	7.560
	0	0	6	0	0	0.0	7.560

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	15	4	15	2	1	1	42

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	13	4	0	0	17

WBS Number: 1.1.1.1.1.2.5.2**Description:** Services Design - LBNL**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

LBNL design

Basis of Estimate: Physicist estimate**Details of Estimate:** Mechanical design included under support tube and related design. Single design team.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	70.180
	0	0	880	0	0	0	0	0	0	0	0	0	70.180

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>				Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule		
	4	15	4	15	2	1	1		42

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	35	35	0	0	70

WBS Number: 1.1.1.1.1.2.6**Description:** Disk Assembly**Institution :** LBNL/UC- Senior**Contact:** F. Goozen

Design of disk assembly tooling and procedures. Disk assembly is placing sectors on disk rings.

Basis of Estimate: Engineering judgement**Details of Estimate:** This work will be done by LBNL engineers supported by the base program and designers supported by ATLAS(included under support tube design)

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Mfg Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	95.700
	0	0	880	0	0	0	0	0	0	0	0	0	95.700

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	6	4	15	2	1	1	37

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	48	48	0	96

WBS Number: 1.1.1.1.1.2.7**Description:** Final Assembly**Institution :** LBNL/UC- Senior**Contact:** F. Goozen

Design of disk/support frame final assembly tooling and procedures for use at LBL and CERN.

Basis of Estimate: Physicist estimate**Details of Estimate:** Engineer supported by base program.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	1.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	2640	0	0	0	0	0	0	0	0	0	287.100
	0	0	2640	0	0	0	0	0	0	0	0	0	287.100

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>				Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule		
	6	6	4	15	2	1	1		37

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	0	191	96	287

WBS Number: 1.1.1.1.1.2.8**Description:** Test Equipment**Institution :** LBNL/UC-Junior**Contact:** G. Gilchriese

Design of test equipment and supplies need for mechanical assembly.

Basis of Estimate: Physicist estimate**Details of Estimate:** Technical staff supported by base program

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	0	0	0	880	0	0	0	0	0	0	40.832
	0	0	0	0	0	880	0	0	0	0	0	0	40.832

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	6	4	15	2	1	1	37

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	20	20	0	0	41

WBS Number: 1.1.1.1.1.2.9**Description:** Integration/Project Engineering**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Costs associated with overall systems integration, management and supervision.

Basis of Estimate: Physicist estimate**Details of Estimate:** Assumption is about 10% time of engineer for project management and related items supported by base program.

Overall systems integration with the Inner Detector is desired by the Inner Detector management but is included here as engineering labor in management contingency. This engineering would largely be resident at CERN.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	148	0	148	0	0	0	0	2.5	0.3

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Mfg Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA MC	0	0	4400	0	0	0	0	0	0	0	0	0	478.500
EDIA B/I	0	0	440	0	0	0	0	0	0	0	0	0	47.850
	0	0	4840	0	0	0	0	0	0	0	0	0	526.350

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	6	4	15	1	1	1	
								31

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	191	191	120	24	526

WBS Number: 1.1.1.1.1.2.10 **Description:** Installation**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Design of pixel installation(insertion) tooling and procedures.

Basis of Estimate: Physicist estimate**Details of Estimate:** Designer manpower for design of installation(insertion) tooling and procedures. Most effort is assumed to come from non-US.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	75	0	75	0	0	0	0	1.3	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA MC	0	0	0	2200	0	0	0	0	0	0	0	0	143.550
	0	0	0	2200	0	0	0	0	0	0	0	0	143.550

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA MC	0	0	16	0	0	0.0	19.040
	0	0	16	0	0	0.0	19.040

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	6	15	4	15	2	1	1	46

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	65	65	33	163

WBS Number: 1.1.1.1.2**Description:** Development and Prototypes**Institution :****Contact:** G. Gilchriese

This includes the procurement of prototype materials, testing equipment and fixtures, fabrication of prototypes, and technical labor needed for assembly and testing.

Details of Estimate: This includes the procurement of prototype materials, testing equipment and fixtures, fabrication of prototypes, and technical labor needed for assembly and testing.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	191	106	55	296	0	53	0	138	0.5	1.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	200	0	0	0	180	451	0	0	52.534
MFG B/I	0	0	0	0	0	2640	0	0	0	0	0	0	155.672
	0	0	0	0	200	2640	0	0	180	451	0	0	208.206

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	128	0	0	0	0	0.0	138.240
	128	0	0	0	0	0.0	138.240

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	346	0	0	0	346

WBS Number: 1.1.1.1.2.1**Description:** Disk Sectors**Institution :** LBNL/UC- Senior**Contact:** G. Gilchriese

Prototype disk sector development.

Basis of Estimate: Parametric estimate**Details of Estimate:** Complete

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	4	2	0	4	1	1	14

WBS Number: 1.1.1.1.2.2**Description:** Disk Support Rings**Institution :** LBNL/UC-Junior**Contact:** F. Goozen

Prototype fabrication of disk support rings and mounts. Most of this work is complete except for trial assembly of disk ring and prototype mounts into frame. This requires tooling to be manufactured and labor.

Basis of Estimate: Engineering judgement**Details of Estimate:** Complete

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	D e s i g n	Technical	C o s t	Schedule	
	2	4	2	15	4	1	1	29

WBS Number: 1.1.1.1.2.3**Description:** Support Frame**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Prototype fabrication and mockup of support frame and associated elements.

Basis of Estimate: Engineering judgement

Details of Estimate: Prototype fabrication related to support frame is completed. Mockup of support frame is included here. 92 hours shop time, 56 mech tech, and \$406 materials.

Prototype pixel mounts (pixel to PST): 64 hours shop, 40 mech tech, \$2320 materials.

Revised mockup rails estimated at 5K. Total materials then is 8K.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	20	5	24	25	0	11	0	9	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	156	0	0	11.310
	0	0	0	0	0	0	0	0	0	156	0	0	11.310

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	8	0	0	0	0	0.0	8.640
	8	0	0	0	0	0.0	8.640

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	4	8	2	1	1	

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	20	0	0	0	20

WBS Number: 1.1.1.1.2.4**Description:** Support Tube**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Prototype fabrication support tube mockup, elements of the support tube and a prototype of the endplug thermal barrier

Basis of Estimate: Engineering judgement

Details of Estimate: PST mockup completed. Pixel frame mockup is not, and is not costed here. Prototype forward tube, mounts, rails and assembly and test of same. Preliminary estimate is

2 foot long mandrels 15K
 Panels for friction and other tests 6K
 Materials for foot long prototypes 10K
 Autoclave time at LLNL including training 25K
 Miscellaneous materials and supplies 5K
 Subtotal of 61K
 Misc shop time of 100 hrs
 0.5 FTE of Mech Tech covered by base program and includes endplug

Prototype of endplug thermal barrier (1/2 of production estimate). 116 hrs of shop time, 187 hrs of mech. Tech time and 13,027 of materials.

PST mount prototypes 10K

Total materials is 84K

Total shop is 220 hrs

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	116	77	66	193	0	26	0	91	0.2	1.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	150	0	0	0	0	220	0	0	25.738
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	114.840
	0	0	0	0	150	1760	0	0	0	220	0	0	140.578

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	84	0	0	0	0	0.0	90.720
	84	0	0	0	0	0.0	90.720

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	15	4	15	4	1	1	66

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	231	0	0	0	231

WBS Number: 1.1.1.1.2.5**Description:** Services**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Prototype fabrication of cables and coolant connections.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	54	24	44	78	0	15	0	39	0.2	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	50	0	0	0	180	75	0	0	15.486
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	40.832
	0	0	0	0	50	880	0	0	180	75	0	0	56.318

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	36	0	0	0	0	0.0	38.880
	36	0	0	0	0	0.0	38.880

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	95	0	0	0	95

WBS Number: 1.1.1.1.2.5.1**Description:** Cables and Connections**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Fabrication of prototype cables and connections, PP0 and mechanical support.

Basis of Estimate: Engineering judgement**Details of Estimate:**

PP0 prototype in FY02 8K plus 120 hours of contract labor.

Prototype of service panel and PP1 occurs in FY02. 17K materials. 50 hours shop, 60 hours of contract labor, 40 hours of etech and mech tech supported by base.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	41	18	44	59	0	14	0	27	0.2	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	50	0	0	0	180	50	0	0	13.674
	0	0	0	0	50	0	0	0	180	50	0	0	13.674

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	25	0	0	0	0	0.0	27.000
	25	0	0	0	0	0.0	27.000

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	8	4	8	4	1	1	44

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	41	0	0	0	41

WBS Number: 1.1.1.1.2.5.2**Description:** Coolant Connections**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Prototype fabrication of coolant connections.

Basis of Estimate: Physicist estimate**Details of Estimate:** 11K materials, 25 hours shop and tech support from base program covered under sector production or elsewhere.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	14	6	44	20	0	2	0	12	0.0	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	25	0	0	1.812
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	40.832
	0	0	0	0	0	880	0	0	0	25	0	0	42.644

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	11	0	0	0	0	0.0	11.880
	11	0	0	0	0	0.0	11.880

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	8	4	8	4	1	1	44

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	55	0	0	0	55

WBS Number: 1.1.1.1.2.6**Description:** Disk Assembly**Institution :** LBNL/UC-Junior**Contact:** F. Goozen

Prototype fabrication associated with disk assembly

Details of Estimate: Covered under production.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.1.2.7**Description:** Final Assembly and Installation**Institution :** LBNL/UC-Junior**Contact:** F. Goozen

Prototype fabrication associated with final assembly and installation

Details of Estimate: Covered under production

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	D e s i g n	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.1.2.8**Description:** Test Equipment**Institution :** LBNL/UC-Junior**Contact:** G. Gilchriese

Prototype test equipment

Details of Estimate: Covered under production

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.1.3**Description:** Production**Institution :****Contact:** G. Gilchriese

Production of pixel mechanics and related services items, final assembly and installation.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	1359	602	44	1961	0	415	0	944	4.5	9.8

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	664	3520	0	0	630	2662	0	0	415.105
MFG MC	0	0	0	0	428	0	0	0	0	0	0	0	24.571
MFG B/I	0	0	0	0	0	17160	0	0	0	0	0	0	986.986
	0	0	0	0	1092	20680	0	0	630	2662	0	0	1426.662

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	629	4	0	0	0	230.0	943.585
MFG MC	110	0	0	0	0	0.0	119.272
	740	4	0	0	0	230.0	1062.857

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	472	1130	655	233	2490

WBS Number: 1.1.1.1.3.1**Description:** Disk Sectors**Institution :** LBNL/UC-Junior**Contact:** G. Gilchriese

Local supports - disk sectors - for the disk regions of the pixel system. All sectors are part of baseline scope.

Basis of Estimate: Engineering judgement**Details of Estimate:** We assume production of 60 sectors to deliver 2*9+4*8=50 to the detector.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	133	37	28	170	0	118	0	15	1.3	1.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	1760	0	0	0	501	0	0	117.986
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	81.664
	0	0	0	0	0	3520	0	0	0	501	0	0	199.650

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	12	2	0	0	0	0.0	14.960
	12	2	0	0	0	0.0	14.960

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	4	8	4	4	2	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	215	0	0	0	215

WBS Number: 1.1.1.1.3.2**Description:** Disk Support Rings**Institution :** LBNL/UC- Senior**Contact:** W. Miller

Support rings for disk sectors and mounts to attach to support frame. All disk rings/mounts are in baseline scope.

Basis of Estimate: Vendor quotation**Details of Estimate:** The details of the estimate are provided in the accompanying supporting documentation.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	127	14	11	141	0	0	0	127	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	118	0	0	0	0	0.0	127.008
	118	0	0	0	0	0.0	127.008

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	2	2	1	2	2	1	11

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	127	0	0	0	127

WBS Number: 1.1.1.1.3.3**Description:** Support Frame**Institution :** LBNL/UC- Senior**Contact:** W. Miller

Central support frame and end cones, disk region support frame, and external mounts.

Basis of Estimate: Engineering judgement**Details of Estimate:** The details of the estimate for the frame and cones are provided in the accompanying supporting documentation.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	260	83	32	343	0	0	0	260	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	230.0	259.940
	0	0	0	0	0	230.0	259.940

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	D e s i g n	Technical	C o s t	Schedule	
	2	4	8	8	4	2	1	32

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	130	130	0	0	260

WBS Number: 1.1.1.1.3.4**Description:** End Plate Stiffener and Pixel Mounts**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Support Frame endplate and pixel to PST support mounts.

Basis of Estimate: Engineering judgement**Details of Estimate:** Endplate included in frame. Rough estimate of 4K for materials and 200 hrs shop time

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	19	9	47	28	0	15	0	4	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	200	0	0	14.500
	0	0	0	0	0	0	0	0	0	200	0	0	14.500

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	4	0	0	0	0	0.0	4.320
	4	0	0	0	0	0.0	4.320

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	8	8	15	4	2	1	47

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	19	0	0	19

WBS Number: 1.1.1.1.3.5**Description:** Support Tube**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Support tube and integrated rails that support the pixel system.

Basis of Estimate: Engineering judgement**Details of Estimate:**

Preliminary estimate. Baseline was to use prototype forward as production. This was estimated at 387 shop, 715 Mech Tech and 94572 materials.

Previous FY03: 121 hours shop, 822 hours mech tech, \$107332 materials.

Current preliminary is

Shop 508 total 340 in FY03, 168 in FY04

Mech tech we take to be 2 people, 0.5 FTE from base 0.5 FTE from project(shared with other aspects of project)

Materials is 202K which is put all in FY03

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	357	218	61	575	0	139	0	218	1.5	2.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	440	1760	0	0	0	508	0	0	138.910
MFG B/I	0	0	0	0	0	3520	0	0	0	0	0	0	163.328
	0	0	0	0	440	5280	0	0	0	508	0	0	302.238

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	202	0	0	0	0	0.0	218.160
	202	0	0	0	0	0.0	218.160

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	8	10	4	15	4	1	1	
								61

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	427	94	0	520

WBS Number: 1.1.1.1.3.6**Description:** Endplug Thermal Barrier**Institution :** LBNL/UC-Junior**Contact:** E. Anderssen

Endplug thermal barrier at end of pixel support tube

Basis of Estimate: Engineering judgement**Details of Estimate:** See supporting estimate. 232 hrs of shop time. 372 hrs of mech tech time and 26,054 of materials.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	45	27	61	72	0	17	0	28	0.1	1.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	232	0	0	16.820
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	81.664
	0	0	0	0	0	1760	0	0	0	232	0	0	98.484

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	26	0	0	0	0	0.0	28.138
	26	0	0	0	0	0.0	28.138

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	8	10	4	15	4	1	1	61

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	86	41	0	127

WBS Number: 1.1.1.1.3.7**Description:** Services**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Power and signal cables and connections. Cooling piping and connections. Mechanical supports for same.

Basis of Estimate: Engineering judgement

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	260	131	50	391	0	101	0	159	1.2	2.3

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	224	0	0	0	630	861	0	0	100.789
MFG MC	0	0	0	0	428	0	0	0	0	0	0	0	24.571
MFG B/I	0	0	0	0	0	3960	0	0	0	0	0	0	258.390
	0	0	0	0	652	3960	0	0	630	861	0	0	383.750

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	148	0	0	0	0	0.0	159.491
MFG MC	35	0	0	0	0	0.0	38.272
	183	0	0	0	0	0.0	197.763

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	467	115	0	582

WBS Number: 1.1.1.1.3.7.1**Description:** Mechanical support**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Mechanical support of services within the ID volume.

Basis of Estimate: Engineering judgement**Details of Estimate:** FY03: materials 40421, shop is 528 hours, mech tech 736(base). Includes mechanical integration of cables and shipping.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	97	42	43	138	0	53	0	44	0.4	1.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	224	0	0	0	0	528	0	0	52.896
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	114.840
	0	0	0	0	224	1760	0	0	0	528	0	0	167.736

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	40	0	0	0	0	0.0	43.655
	40	0	0	0	0	0.0	43.655

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	8	4	15	4	1	1	43

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	154	57	0	211

WBS Number: 1.1.1.1.3.7.2**Description:** Cables and Connections**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Production materials and labor for low mass cables.

Basis of Estimate: Engineering judgement**Details of Estimate:**

PP0 to PP1 cable bundles in FY03: \$25 per PP0 for materials and \$175 per PP0 for cable termination in PP1 connectors (vendor quote)

Assembly labor at LBL is 30 minutes per PP0 (300 including spares in baseline) for microwelding type 1 signal wires before laminating on service panel.

Assembly labor at LBL is 20 hours of mechanical technician per service panel

Total number of service panels in goals is 32, in baseline is 24.

Goals: 12*32*\$275=105,600 and 880 hours

Baseline is 12*24*275=79,200 and 630 hours.

MC= 26,400 and 250 hours.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	109	52	48	162	0	24	0	86	0.5	1.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	630	0	0	0	23.751
MFG MC	0	0	0	0	250	0	0	0	0	0	0	0	16.312
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	114.840
	0	0	0	0	250	1760	0	0	630	0	0	0	154.903

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	79	0	0	0	0	0.0	85.536
MFG MC	26	0	0	0	0	0.0	28.512
	106	0	0	0	0	0.0	114.048

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	4	6	4	8	4	1	1	
								34

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	212	57	0	269

WBS Number: 1.1.1.1.3.7.3**Description:** Coolant pipes and connectors**Institution :** LBNL/UC- Senior**Contact:** E. Anderssen

Costs of coolant pipes and connectors for complete system up to PP2. Fittings not included for PP2. Items beyond PP2 are non-US responsibility.

Basis of Estimate: Engineering judgement

Details of Estimate: Materials 10020, shop time 333 hours, mech tech 216 hours. This assumes 80% yield of fittings to tubes.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	35	14	41	49	0	24	0	11	0.2	0.3

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	333	0	0	24.142
MFG B/I	0	0	0	0	0	440	0	0	0	0	0	0	28.710
	0	0	0	0	0	440	0	0	0	333	0	0	52.852

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	10	0	0	0	0	0.0	10.822
	10	0	0	0	0	0.0	10.822

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	6	4	15	4	1	1	41

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	64	0	0	64

WBS Number: 1.1.1.1.3.7.4**Description:** Patch Panel 0**Institution :** LBNL/UC-Junior**Contact:** M. Garcia-Sciveres

Patch panel 0(PP0) located at the end of the pixel detector.

Basis of Estimate: Physicist estimate**Details of Estimate:** Verbal quote of \$1250 NRE +50 per part. Loading cost is estimated at \$25 each plus 3000 for materials.Baseline scope is taken to be 241 PP0s. Fab costs are $4250 + 241 \times 75 = 18075$

Management contingency is 9037

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	19	23	117	42	0	0	0	19	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG MC	0	0	0	0	178	0	0	0	0	0	0	0	8.259
	0	0	0	0	178	0	0	0	0	0	0	0	8.259

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	18	0	0	0	0	0.0	19.478
MFG MC	9	0	0	0	0	0.0	9.760
	27	0	0	0	0	0.0	29.238

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	6	8	15	4	1	1	61

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	37	0	0	37

WBS Number: 1.1.1.1.3.8**Description:** Disk Assembly**Institution :** LBNL/UC- Senior**Contact:** F. Goozen

Tooling and labor needed for disk assembly, placement of sectors on disk support rings and associated attachment of services and testing.

We also include here strain relief items that must be added to support services. These are not yet designed.

Basis of Estimate: Engineering judgement

Details of Estimate: See supporting notes for tooling and shop labor. We assume another round of tooling needed for drilling precision holes in frame, included here also

We estimate the cost of composite strain relief pieces for services at \$200 per octant per disk or \$9600

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	50	27	54	77	0	16	0	34	0.1	1.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	220	0	0	15.950
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	114.840
	0	0	0	0	0	1760	0	0	0	220	0	0	130.790

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	32	0	0	0	0	0.0	34.020
	32	0	0	0	0	0.0	34.020

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	4	15	8	15	4	1	1	
								54

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	0	165	0	165

WBS Number: 1.1.1.1.3.9**Description:** Disk Region Final Assembly**Institution :** LBNL/UC- Senior**Contact:** F. Goozen

Tooling, fixtures, materials and supplies for disk and frame final assembly and test of system at LBNL and CERN.

Basis of Estimate: Physicist estimate**Details of Estimate:** We assume tooling from disk assembly is reused. Additional costs are documented in the notes and are 140 hours of shop time and 2350 for materials.**Testing**

Cable trays and labor for cable installation	5,000
Racks(refurbished)	1,000
Patch panels/supports	2,000
Large environmental box	5,000
Subtotal	13,000

Shipping

This is at a very early stage. We assume we will ship each disk end as a unit

Shipping boxes(2)	3,000
Shipping disks	10,000
Subtotal	13,000

Assembly equipment at CERN

The US will provide support for assembly equipment at CERN and for shipment of equipment used at LBNL for trial assembly to CERN.

These estimates are at a very early stage

Assembly equipment at CERN	30,000
Ship equipment to CERN	5,000
Subtotal	35,000

Travel and stores costs are also included for the technical staff that will have to be resident at CERN during final assembly and installation.

Assembly labor is assumed to be covered by the base program.

There is currently a significant uncertainty in the assembly sequence and support at CERN

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	90	49	54	139	0	10	0	80	0.1	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	140	0	0	10.150
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	57.420
	0	0	0	0	0	880	0	0	0	140	0	0	67.570

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	72	2	0	0	0	0.0	80.268
	72	2	0	0	0	0.0	80.268

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	15	8	15	4	1	1	54

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	0	148	0	148

WBS Number: 1.1.1.1.3.10**Description:** Test Equipment**Institution :** LBNL/UC- Senior**Contact:** G. Gilchriese

Test equipment and supplies.

Basis of Estimate: Physicist estimate

Details of Estimate: This covers equipment and supplies that will be needed for testing during construction and during testing. It does not include electronics or cables but items for mechanical and thermal testing and clean room and misc. supplies.

SmartScope maintenance 2,000
Chiller maintenance 2,000

Consumables(not covered by base program) at \$500 per month, \$6000 per year for two years.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	17	7	39	24	0	0	0	17	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	16	0	0	0	0	0.0	17.280
	16	0	0	0	0	0.0	17.280

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	4	15	4	1	1	39

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	2	9	6	17

WBS Number: 1.1.1.1.3.11**Description:** Installation**Institution :** LBNL/UC- Senior**Contact:** F. Goozen

Tooling and fixtures for installation into ID at CERN.

Basis of Estimate: Level of Effort**Details of Estimate:** This is currently set at a fixed level of effort in materials and manpower related to final insertion of pixel detector into ID. And its all in management contingency.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	2.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG B/I	0	0	0	0	0	3520	0	0	0	0	0	0	229.680
	0	0	0	0	0	3520	0	0	0	0	0	0	229.680

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG MC	75	0	0	0	0	0.0	81.000
	75	0	0	0	0	0.0	81.000

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	0	0	0	0	4	1	1	0

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	0	84	226	311

WBS Number: 1.1.1.2**Description:** Sensors**Institution :****Contact:** S. Seidel

This estimate covers the US contribution to the ATLAS pixel detectors/sensors. We assume that detector procurement will be shared among the collaborating institutions via a common procurement or procurements, with the US providing about 20% of the total cost. In addition, the US will participate in the design and testing of the detectors, as described below. The prototype phase of sensor development is completed and the preproduction order launched.

Details of Estimate: The number of sensor wafers to be procured is determined from the "module yield model" spreadsheet. Testing time is based on prototype experience.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	39	78	203	117	39	0	0	0	3.6	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	38.675
EDIA MC	0	1100	0	0	0	0	0	0	0	0	0	4400	96.687
	0	1980	0	0	0	0	0	0	0	0	0	4400	135.362

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG MC	0	0	0	0	0	150.9	150.867
	0	0	0	0	0	150.9	150.867

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	170	116	0	0	286

WBS Number: 1.1.1.2.1**Description:** Design/Engineering**Institution :****Contact:** S. Seidel

Design of silicon pixel sensors.

Details of Estimate: Preproduction design is complete. Any additional design activity will be done by physicists or non-US personnel.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	39	4	10	43	39	0	0	0	0.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	38.675
	0	880	0	0	0	0	0	0	0	0	0	0	38.675

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	39	0	0	0	39

WBS Number: 1.1.1.2.1.1**Description:** Test design**Institution :****Contact:** S. Seidel

This includes the engineering design needed for test fixtures, equipment procurement and assembly of test stations.

Details of Estimate: This includes the engineering design needed for test fixtures, equipment procurement and assembly of test stations.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	39	4	10	43	39	0	0	0	0.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	38.675
	0	880	0	0	0	0	0	0	0	0	0	0	38.675

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	39	0	0	0	39

WBS Number: 1.1.1.2.1.1.1**Description:** Design - New Mexico**Institution :** U. of New Mexico**Contact:** S. Seidel

The engineering design at UNM from Martin Hoeferkamp and additional time from physicists at UNM.

Details of Estimate: The engineering design from Martin Hoeferkamp. Additional time from physicists at UNM. Another 39K is included in FY02 to complete all testing design and implement procedures on production.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	39	4	10	43	39	0	0	0	0.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	38.675
	0	880	0	0	0	0	0	0	0	0	0	0	38.675

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	2	2	2	1	1	1	10

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	39	0	0	0	39

WBS Number: 1.1.1.2.3**Description:** Production**Institution :****Contact:** S. Seidel

Preproduction and production fabrication and testing

Details of Estimate: The number of production wafers follows from the yield spreadsheet.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other			
	0	75	0	75	0	0	0	0	3.1	0.0			
MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Tech. Shops (hrs)	Serv. Student (hrs)	Total w/ overhead (k\$)	
	EDIA MC	0	1100	0	0	0	0	0	0	0	0	4400	96.687
	0	1100	0	0	0	0	0	0	0	0	0	4400	96.687
MATERIAL SUMMARY:				Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)			
	MFG MC				0	0	0	0	0	150.9	150.867		
				0	0	0	0	0	150.9	150.867			
PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)		
	0	0	0	0	0	0	132	116	0	0	248		

WBS Number: 1.1.1.2.3.1**Description:** Barrels, Disks and B-layer(s)**Institution :****Contact:** S. Seidel

Preproduction and production for barrel layers 1 and 2 and for disks and B-layer.

Details of Estimate: Two companies have been selected by CERN to provide pixel sensors. These companies have provided firm price quotations and are under contract.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	0	75	0	75	0	0	0	0	3.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA MC	0	1100	0	0	0	0	0	0	0	0	0	4400	96.687
	0	1100	0	0	0	0	0	0	0	0	0	4400	96.687

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG MC	0	0	0	0	0	150.9	150.867
	0	0	0	0	0	150.9	150.867

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	132	116	0	0	248

WBS Number: 1.1.1.2.3.1.1**Description:** Preproduction**Institution :****Contact:** S. Seidel

Preproduction fabrication costs. These are split among institutions as shown at lower levels.

Basis of Estimate: In Contract

Details of Estimate: This order has been started and will be delivered in FY01. Costs based on contract values. Costs have been assigned to Albany, although funds were granted to Albany, OSU and UOK based on higher estimates before a contract was completed. Contingency is given as 100% in case a 2nd round is required.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

WBS Number: 1.1.1.2.3.1.1.1**Description:** Preproduction costs - Albany**Institution :** SUNY at Albany**Contact:** S. Seidel

Albany funded fabrication

Basis of Estimate: In Contract**Details of Estimate:** See higher level. Contingency is set at 100% to account for possible 2nd preproduction run.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	15	10	8	12	4	2	1	100

WBS Number: 1.1.1.2.3.1.1.2**Description:** Preproduction - Ohio State**Institution :** Ohio State U.**Contact:** S. Seidel

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.2.3.1.1.3**Description:** Preproduction - Oklahoma**Institution :** U. of Oklahoma**Contact:** S. Seidel

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.2.3.1.2**Description:** Production**Institution :** U. of Oklahoma**Contact:** S. Seidel

Production fabrication costs.

Basis of Estimate: Vendor quotation

Details of Estimate: Costs are based on firm prices from contract with two vendors with CERN. Order is assumed to be split equally between two vendors. Contingency is estimated assuming purchase from higher price vendor. Yield is assumed to be lowest allowed by contract ie. 50% of wafers have 2 good tiles and 50% have 3 good tiles.

Goals are based on purchase to yield 1782 tiles in the experiment. Baseline scope is for 1192 in detector.

12K is added for mask changes that may be needed for B-layer sensor(in management contingency)

Funds are ascribed to Oklahoma but may be granted to other institutions. Division of production costs among institutions not known at this time.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	51	0	51	0	0	0	0	0.0	0.0

MATERIAL SUMMARY:		Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG MC		0	0	0	0	0	150.9	150.867
		0	0	0	0	0	150.9	150.867

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	6	2	2	4	4	2	1	34

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	93	58	0	0	151

WBS Number: 1.1.1.2.3.1.3**Description:** Testing**Institution :** U. of New Mexico**Contact:** S. Seidel

Preproduction and production testing equipment and labor. All testing is currently ascribed to UNM but UOK is also developing this capability.

Basis of Estimate: Physicist estimate

Details of Estimate: We assume that the US will test 25% of wafers for Layers 1 and 2, the disks, and the B Layer. The cost of equipment and materials and supplies is based on experience from testing production quantities of wafers for similar experiments (e.g., CDF SVXI) and from prototype experience. Specific equipment, material, and supply needs at each institution at which testing will occur are listed below:

wafer storage: \$2000

probation maintenance: \$2000

miscellaneous supplies: \$2000

Consequently the total cost per institution (excluding overhead charges) is about \$6000.

Testing labor amounts to 1FTE(student rates) for FY01, 02 and 03.

Oversight is provided by 25% of engineer for the same time period.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	23	0	23	0	0	0	0	3.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA MC	0	1100	0	0	0	0	0	0	0	0	0	4400	96.688
	0	1100	0	0	0	0	0	0	0	0	0	4400	96.687

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	2	4	8	4	4	1	1	24

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	39	58	0	0	97

WBS Number: 1.1.1.3**Description:** Electronics**Institution :****Contact:** K. Einsweiler

This covers the US activities associated with pixel integrated circuit electronics. The US will contribute to the design and fabrication of the front-end IC(FE) and the optical driver/receiver ICs. The European groups have the responsibility for the design and fabrication of the Module Control Chip(MCC). The US will provide test systems for IC wafer probing(and other testing of modules that uses some of the same equipment).

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	1227	629	51	1856	533	48	191	455	6.0	4.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	880	0	0	1180	48.142
EDIA P	0	4420	0	1190	300	0	0	0	0	0	0	0	532.518
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	76.560
EDIA B/I	0	6540	0	0	0	0	0	0	0	0	0	1200	672.666
	0	10960	0	1190	300	0	0	0	3520	0	0	2380	1329.886

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	87	0	0	91	0	252.5	455.254
MFG MC	0	0	0	0	0	149.5	165.474
EDIA P	16	4	81	0	0	65.0	191.120
	103	4	81	91	0	467.0	811.848

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	1138	888	78	38	2142

WBS Number: 1.1.1.3.1**Description:** Design/Engineering**Institution :****Contact:** K. Einsweiler

This covers the design engineering of the FE chip and the optical ICs.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	724	318	44	1042	533	0	191	0	3.4	4.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	4420	0	1190	300	0	0	0	0	0	0	0	532.518
EDIA B/I	0	6540	0	0	0	0	0	0	0	0	0	1200	672.666
	0	10960	0	1190	300	0	0	0	0	0	0	1200	1205.184

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	16	4	81	0	0	65.0	191.120
	16	4	81	0	0	65.0	191.120

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	794	515	49	38	1396

WBS Number: 1.1.1.3.1.1**Description:** IC design**Institution :****Contact:** K. Einsweiler

Design of prototypes of the FE and optical ICs. FE design is done at LBL and optical IC design at OSU. In both cases this is a collaborative effort with European groups.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	323	175	54	498	183	0	141	0	1.0	3.6

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	1840	0	0	0	0	0	0	0	0	0	0	182.700
EDIA B/I	0	5140	0	0	0	0	0	0	0	0	0	1200	520.416
	0	6980	0	0	0	0	0	0	0	0	0	1200	703.116

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	16	0	42	0	0	65.0	140.710
	16	0	42	0	0	65.0	140.710

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	505	339	0	0	844

WBS Number: 1.1.1.3.1.1.1**Description:** Design - LBNL**Institution :****Contact:** K. Einsweiler

The FE design activity is supported by both internal LBL funding and ATLAS project funding.

Details of Estimate: The FE design activity is supported by both internal LBL funding and ATLAS project funding.

Times in months/hours

FY02

Blanquart 12/1760, all on base

Gerrit 5/733 all on project

Emanuele 4/587 all on project

FY03

Blanquart 12/1760 all on base

Gerrit 3/440 all on project

Emanuele 2/293 all on base

All hours rounded up in general.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	323	175	54	498	183	0	141	0	1.0	2.9

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	1840	0	0	0	0	0	0	0	0	0	0	182.700
EDIA B/I	0	3820	0	0	0	0	0	0	0	0	0	1200	432.825
	0	5660	0	0	0	0	0	0	0	0	0	1200	615.525

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	16	0	42	0	0	65.0	140.710
	16	0	42	0	0	65.0	140.710

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	446	310	0	0	756

WBS Number: 1.1.1.3.1.1.1.1 **Description:** Senior Engineering**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

See higher level.

Basis of Estimate: Physicist estimate**Details of Estimate:** See higher level. Also included here are 65K for Cadence licenses

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	253	136	54	389	135	0	118	0	0.7	2.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	1240	0	0	0	0	0	0	0	0	0	0	134.850
EDIA B/I	0	3520	0	0	0	0	0	0	0	0	0	0	382.800
	0	4760	0	0	0	0	0	0	0	0	0	0	517.650

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	8	0	30	0	0	65.0	117.790
	8	0	30	0	0	65.0	117.790

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	6	15	8	4	2	2	1	54

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	374	261	0	0	635

WBS Number: 1.1.1.3.1.1.1.2 **Description:** Junior Engineering**Institution :** LBNL/UC-Junior**Contact:** K. Einsweiler

See higher level.

Basis of Estimate: Physicist estimate**Details of Estimate:** See higher level.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	71	38	54	109	48	0	23	0	0.3	0.9

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	600	0	0	0	0	0	0	0	0	0	0	47.850
EDIA B/I	0	300	0	0	0	0	0	0	0	0	0	1200	50.025
	0	900	0	0	0	0	0	0	0	0	0	1200	97.875

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	8	0	12	0	0	0.0	22.920
	8	0	12	0	0	0.0	22.920

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	15	8	4	2	2	1	54

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	72	48	0	0	121

WBS Number: 1.1.1.3.1.1.2**Description:** Design-OSU**Institution :** Ohio State U.**Contact:** KK Gan

Design of optoelectronics ICs

Basis of Estimate: Physicist estimate**Details of Estimate:** Work is supported by base program.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.8

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	1320	0	0	0	0	0	0	0	0	0	0	87.591
	0	1320	0	0	0	0	0	0	0	0	0	0	87.591

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>				Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule		
	6	1	8	4	2	1	1		25

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	58	29	0	0	88

WBS Number: 1.1.1.3.1.2**Description:** Test design**Institution :****Contact:** K. Einsweiler

This covers the engineering design of test boards and the development of test procedures.

Details of Estimate: This covers the engineering design of test boards and the development of test procedures.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other		
	368	127	35	495	350	0	18	0	2.3	0.0		
MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Tech. Shops (hrs)	Serv. Student (hrs)	Total w/ overhead (k\$)
	EDIA P	0	2580	0	1190	300	0	0	0	0	0	0
	0	2580	0	1190	300	0	0	0	0	0	0	349.818
MATERIAL SUMMARY:				Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)		
	EDIA P				0	4	12	0	0	0.0	18.280	
				0	4	12	0	0	0.0	18.280		
PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)	
	0	0	0	0	0	0	241	127	0	0	368	

WBS Number: 1.1.1.3.1.2.1**Description:** LBL Engineering**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

Engineering will be needed for test design. This includes design of test boards

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	324	117	36	441	306	0	18	0	1.9	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	1920	0	1190	300	0	0	0	0	0	0	0	306.022
	0	1920	0	1190	300	0	0	0	0	0	0	0	306.022

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	4	12	0	0	0.0	18.280
	0	4	12	0	0	0.0	18.280

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	8	4	8	8	2	1	1	36

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	211	113	0	0	324

WBS Number: 1.1.1.3.1.2.2**Description:** OSU Engineering**Institution :** Ohio State U.**Contact:** KK Gan

Engineering will be needed for test design of optical ICs.

Basis of Estimate: Physicist estimate**Details of Estimate:** We estimate that 660 hrs of engineering will be needed.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	44	11	24	54	44	0	0	0	0.4	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	660	0	0	0	0	0	0	0	0	0	0	43.796
	0	660	0	0	0	0	0	0	0	0	0	0	43.796

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>				Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule		
	8	4	8	4	1	1	1		24

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	29	15	0	0	44

WBS Number: 1.1.1.3.1.3**Description:** Systems Engineering**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

Systems engineering of pixel electronics system

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	32	16	50	48	0	0	32	0	0.0	0.8

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	1400	0	0	0	0	0	0	0	0	0	0	152.250
	0	1400	0	0	0	0	0	0	0	0	0	0	152.250

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	27	0	0	0.0	32.130
	0	0	27	0	0	0.0	32.130

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	15	15	8	2	1	1	50

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	49	49	49	38	184

WBS Number: 1.1.1.3.2**Description:** Development and Prototypes**Institution :****Contact:** K. Einsweiler

This covers the procurement of prototype chips and the technical labor needed for test board layout, assembly and testing.

Details of Estimate: This covers the procurement of prototype chips and the technical labor needed for test board layout, assembly and testing.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	251	62	24	313	0	0	0	251	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	53	0	0	45	0	142.0	251.330
	53	0	0	45	0	142.0	251.330

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	251	0	0	0	251

WBS Number: 1.1.1.3.2.1**Description:** Atmel/DMILL prototypes**Institution :****Contact:** K. Einsweiler

Prototypes with Temic. FE-D2 and FE-D3.

Details of Estimate: No longer relevant

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

WBS Number: 1.1.1.3.2.1.1**Description:** FE-D2**Institution :** SUNY at Albany**Contact:** K. Einsweiler

2nd DMILL prototype run

Basis of Estimate: Actual price**Details of Estimate:** Committed in FY00 and costed in FY01.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	

WBS Number: 1.1.1.3.2.1.2**Description:** FE-D3**Institution :** LBNL/UC-Junior**Contact:** K. Einsweiler

Pre-series DMILL run. Funds may flow through different institutions.

Basis of Estimate: In Contract**Details of Estimate:** No longer to be done.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.3.2.2**Description:** Honeywell**Institution :** Ohio State U.**Contact:** K. Einsweiler

Costs of FE-H1 now cancelled.

Basis of Estimate: Actual price**Details of Estimate:** No longer relevant

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.3.2.3**Description:** 0.25 Micron**Institution :****Contact:** K. Einsweiler

Prototypes in 0.25 micron technology

Details of Estimate: Estimate extrapolated from costs of existing test chips. Includes also optoelectronics test chips.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	133	33	25	166	0	0	0	133	0.0	0.0

MATERIAL SUMMARY:		Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
	MFG P	0	0	0	20	0	111.0	132.600
		0	0	0	20	0	111.0	132.600

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	133	0	0	0	133

WBS Number: 1.1.1.3.2.3.1**Description:** TSMC and IBM prototypes**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

Test chips in TSMC via MOSIS and IBM via CERN

Basis of Estimate: Parametric estimate

Details of Estimate: Analog test chips in TSMC and/or IBM. Optoelectronics test chips will be funded through OSU. Relative costs between LBL and OSU not precisely known at this time.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	22	9	40	30	0	0	0	22	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	20	0	0.0	21.600
	0	0	0	20	0	0.0	21.600

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	10	4	8	8	2	1	1	40

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	22	0	0	0	22

WBS Number: 1.1.1.3.2.3.2**Description:** 1st prototype**Institution :** SUNY at Albany**Contact:** K. Einsweiler

12 wafer run with IBM.

Basis of Estimate: Vendor quotation

Details of Estimate: 12 wafer run at 200K. US fraction is 22% or 44K. This will be split among different universities but is ascribed to Albany for convenience Also Albany contribution to second run of 3K. 47K total.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	47	10	22	57	0	0	0	47	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	47.0	47.000
	0	0	0	0	0	47.0	47.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	2	8	4	2	1	1	22

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	47	0	0	0	47

WBS Number: 1.1.1.3.2.3.3**Description:** 2nd prototype**Institution :** Ohio State U.**Contact:** K. Einsweiler

2nd prototype run with 0.25 micron IBM and optical chips.

Basis of Estimate: In Contract**Details of Estimate:** Assumes 48 wafer run. Cost based on Frame Contract and US fraction of total cost. Contingency costs cover possible penalty payments explained in Frame Contract.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	64	14	22	78	0	0	0	64	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	64.0	64.000
	0	0	0	0	0	64.0	64.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	2	8	4	2	1	1	22

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	64	0	0	0	64

WBS Number: 1.1.1.3.2.4**Description:** Test Equipment/Hardware/Software**Institution :****Contact:** K. Einsweiler

This covers test equipment during the prototype phase. Funds are needed for test board fabrication, probe cards, misc. hardware and misc. software. Funds are needed for a probe station for the 8" 0.25 micron wafers.

Details of Estimate: This covers test equipment during the prototype and preproduction phase. Logic analyzers, manual probe stations, automated probe stations and other standard laboratory test equipment already exists or will be provided by LBNL. Funds are needed for test board fabrication, probe cards, misc. hardware and misc. software.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	119	28	24	147	0	0	0	119	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	53	0	0	25	0	31.0	118.730
	53	0	0	25	0	31.0	118.730

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	119	0	0	0	119

WBS Number: 1.1.1.3.2.4.1**Description:** Equipment/Test Boards**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

Testing equipment and test boards. We assume these boards will be used also in production.

Basis of Estimate: Physicist estimate**Details of Estimate:**

Load 7 PLL boards @\$500 = \$3,500

PICT boards are estimated at $5 \times (1500 + 500 + 500) = 12,500$

PCC boards are estimated at $15 \times (500 + 300 + 300) = 16,500$

Board debugging(engineering labor) covered under design and supplemented by physicists.

Probe cards @\$1,500

Single chip and module support card costs are extrapolated from existing cards and are $50 \times 250 = 12,500$

Parameter analyzer(4155) from Agilent \$25,000

Impedance meter(4294) from Agilent at \$31,000

Simple BOC cards \$6,000

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	119	28	24	147	0	0	0	119	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	53	0	0	25	0	31.0	118.730
	53	0	0	25	0	31.0	118.730

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	S c h e d u l e	D e s i g n	Technical	C o s t	S c h e d u l e	
	4	4	8	4	2	1	1	24

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	119	0	0	0	119

WBS Number: 1.1.1.3.3**Description:** Production**Institution :****Contact:** K. Einsweiler

Front-end IC and optoelectronics production and associated testing.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	252	249	99	501	0	48	0	204	2.7	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	880	0	0	1180	48.142
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	76.560
	0	0	0	0	0	0	0	0	3520	0	0	1180	124.702

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	34	0	0	46	0	110.5	203.924
MFG MC	0	0	0	0	0	149.5	165.474
	34	0	0	46	0	260.0	369.398

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	92	373	29	0	494

WBS Number: 1.1.1.3.3.1**Description:** Front-end ICs**Institution :****Contact:** K. Einsweiler

Production and associated testing of front-end ICs

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	176	146	83	323	0	45	0	132	2.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	880	0	0	880	44.660
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	76.560
	0	0	0	0	0	0	0	0	3520	0	0	880	121.220

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	34	0	0	0	0	84.0	131.664
MFG MC	0	0	0	0	0	123.0	139.014
	34	0	0	0	0	207.0	270.678

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	69	294	29	0	392

WBS Number: 1.1.1.3.3.1.1**Description:** Outer system**Institution :****Contact:** K. Einsweiler

Production costs of barrel and disk front-end ICs(outer system, not B-layer).

Details of Estimate: The cost estimate is based on using IBM 0.25 micron. Costs are based on yields given in the module yield model table and from Frame Contract prices with each vendor. IBM yield is assumed to be 50%.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	65	77	119	142	0	0	0	65	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	57.2	64.670
MFG MC	0	0	0	0	0	96.2	108.740
	0	0	0	0	0	153.5	173.410

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	173	0	0	173

WBS Number: 1.1.1.3.3.1.1.1 **Description:** Layer1/2x1 disk

Institution : LBNL/UC- Senior

Contact: K. Einsweiler

FE IC production for barrel Layer 1 and 2x1 disks. This is all in management contingency.

Basis of Estimate: Vendor quotation

Details of Estimate: 25 wafers

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	10	0	10	0	0	0	0	0.0	0.0

MATERIAL SUMMARY:		Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
	MFG MC	0	0	0	0	0	39.0	44.070
		0	0	0	0	0	39.0	44.070

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	2	8	4	2	1	1	22

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	44	0	0	44

WBS Number: 1.1.1.3.3.1.1.2**Description:** IBM**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

IBM FE ICs

Basis of Estimate: Vendor quotation

Details of Estimate: 37 wafers(baselinescope) from US are required assuming yields given in module yield table(50% native yield). Costs are based on Frame Contract with CERN.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	65	67	104	132	0	0	0	65	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	57.2	64.670
MFG MC	0	0	0	0	0	57.2	64.670
	0	0	0	0	0	114.5	129.340

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	2	8	8	4	2	1	52

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	129	0	0	129

WBS Number: 1.1.1.3.3.1.2**Description:** B-layer**Institution :** LBNL/UC- Senior**Contact:** K. Einsweiler

B-layer FE ICs

Basis of Estimate: Vendor quotation

Details of Estimate: Assumes IBM. 12 wafers(baseline scope) required. Costs based on Frame Contract. Contingency should cover uncertainty in yield. 50% yield is assumed for base cost.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	30	31	104	62	0	0	0	30	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	26.8	30.274
MFG MC	0	0	0	0	0	26.8	30.274
	0	0	0	0	0	53.6	60.548

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	2	8	8	4	2	1	52

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	61	0	0	61

WBS Number: 1.1.1.3.3.1.3**Description:** FE Testing**Institution :** LBNL/UC-Junior**Contact:** K. Einsweiler

Equipment and labor for testing all front-end ICs.

Basis of Estimate: Physicist estimate**Details of Estimate:** Equipment, Materials and Supplies

Test equipment for production testing will largely be in hand at the end of the development period. However, some additional items will be required. Estimates are based on previous experience.

Wafer storage in production \$5000

Probe station shielding/environmental control \$3,000

Probe station maintenance \$2,000 per year starting in FY02 for three years

Active probe cards \$10,000

Miscellaneous supplies \$2,000 per year starting in FY03 for two years.

Database and other software licenses \$2,000 per year starting in FY02 for three years.

FY02 5+3+2+5+2=17

FY03 2+5+2+2=11

FY04 2+2+2=6

Labor

Testing labor will be provided by temporary personnel supervised by physicists and postdocs. We assume the US will test(probe) 50% of all wafers.

IBM testing is assumed to take 12 FTE months including a 6 month training period

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	81	38	47	119	0	45	0	37	2.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	880	0	0	880	44.660
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	76.560
	0	0	0	0	0	0	0	0	3520	0	0	880	121.220

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	34	0	0	0	0	0.0	36.720
	34	0	0	0	0	0.0	36.720

CONTINGENCY FACTORS:	<i>Risk</i>					<i>Weight</i>			Cont %		
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule				
	4	4	8	4	2	1	1				
										24	
PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	69	60	29	0	158

WBS Number: 1.1.1.3.3.2**Description:** Optoelectronics**Institution :****Contact:** KK Gan

Production and associated testing of ICs for optoelectronics

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	76	103	136	178	0	3	0	72	0.2	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	300	3.482
	0	0	0	0	0	0	0	0	0	0	0	300	3.482

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	46	0	26.5	72.260
MFG MC	0	0	0	0	0	26.5	26.460
	0	0	0	46	0	52.9	98.720

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	23	79	0	0	102

WBS Number: 1.1.1.3.3.2.1**Description:** Production**Institution :** Ohio State U.**Contact:** KK Gan

Optical ICs production

Basis of Estimate: Physicist estimate**Details of Estimate:** Currently estimated as fixed contribution.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	26	53	200	79	0	0	0	26	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	26.5	26.460
MFG MC	0	0	0	0	0	26.5	26.460
	0	0	0	0	0	52.9	52.920

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	10	15	15	15	4	2	1	100

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	53	0	0	53

WBS Number: 1.1.1.3.3.2.2**Description:** Testing, Dicing and Sorting**Institution :** Ohio State U.**Contact:** KK Gan

Testing, dicing and sorting of optical ICs. 50% done in US.

Basis of Estimate: Physicist estimate

Details of Estimate: Wafer storage 1K
 Probe station shielding/environmental control 3K
 Probe station maintenance 2K
 Probe cards 4K
 Test cards 1K
 Burn-in equipment 2K
 Supplies 2K
 Database licenses 2K
 Dicing 27K. Costs are large as result of dicing many small die.
 Die sort 1.6K
 Shipping 0.2K

Total materials 45.8K

Labor is 300 hours(student rate)

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	49	50	101	99	0	3	0	46	0.2	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	300	3.482
	0	0	0	0	0	0	0	0	0	0	0	300	3.482

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	46	0	0.0	45.800
	0	0	0	46	0	0.0	45.800

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	12	15	8	15	4	2	1	101

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	23	26	0	0	49

WBS Number: 1.1.1.4**Description:** Flex Hybrids/Optical Hybrids**Institution :****Contact:** Rusty Boyd/KK Gan

Flex hybrids mounted on each pixel module and "pigtailed" connecting disk module flex hybrids to power/optical signals(PP0 covered in another WBS element). We assume the US will procure all flex hybrids, all passive parts for them and load(passives) for all of them. MCC loading testing(after MCC and passive loading) will be split between the US and Europe 50:50.

Optical hybrids for the disk region are included in this WBS element.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	543	317	58	860	50	173	18	303	6.8	2.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	3485	0	0	0	140	40	0	3754	172.852
MFG MC	0	0	0	0	1084	0	0	0	20	0	0	448	44.790
EDIA P	0	0	0	465	0	0	0	0	0	0	0	1760	49.679
EDIA MC	0	0	0	0	400	0	0	0	0	0	0	408	18.727
EDIA B/I	0	3520	0	720	0	0	0	0	0	0	0	0	196.455
	0	3520	0	1185	4969	0	0	0	160	40	0	6370	482.503

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	44	0	0	99	0	157.4	302.956
MFG MC	12	0	0	50	0	309.2	372.200
EDIA P	0	0	12	0	0	0.0	17.580
	56	0	12	149	0	466.6	692.736

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	412	756	7	0	1175

WBS Number: 1.1.1.4.1**Description:** Design/Engineering**Institution :****Contact:** Rusty Boyd/KK Gan

This covers the engineering design manpower needed for the flex hybrids, disk pigtailed and optical components.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	67	18	26	85	50	0	18	0	1.3	2.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	465	0	0	0	0	0	0	0	1760	49.679
EDIA B/I	0	3520	0	720	0	0	0	0	0	0	0	0	196.455
	0	3520	0	1185	0	0	0	0	0	0	0	1760	246.134

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	12	0	0	0.0	17.580
	0	0	12	0	0	0.0	17.580

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	120	144	0	0	264

WBS Number: 1.1.1.4.1.1**Description:** Prototype design**Institution :****Contact:** Rusty Boyd/KK Gan

Engineering design associated with prototype flex hybrids, pigtailed and optical components.

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	11	2	20	13	6	0	4	0	0.3	0.7

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	25	0	0	0	0	0	0	0	440	6.465
EDIA B/I	0	880	0	400	0	0	0	0	0	0	0	0	57.144
	0	880	0	425	0	0	0	0	0	0	0	440	63.609

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	3	0	0	0.0	4.395
	0	0	3	0	0	0.0	4.395

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	68	0	0	0	68

WBS Number: 1.1.1.4.1.1.1**Description:** Flex hybrid**Institution :** U. of Oklahoma**Contact:** Rusty Boyd

Prototype engineering for flex hybrid

Basis of Estimate: Level of Effort**Details of Estimate:** R. Boyd at UOK + student support and travel. R. Boyd supported by base funding in FY02.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	9	2	20	11	5	0	4	0	0.3	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	0	0	0	0	0	0	0	0	440	4.834
EDIA B/I	0	880	0	0	0	0	0	0	0	0	0	0	42.544
	0	880	0	0	0	0	0	0	0	0	0	440	47.378

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	3	0	0	0.0	4.395
	0	0	3	0	0	0.0	4.395

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	4	4	2	1	1	20

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	52	0	0	0	52

WBS Number: 1.1.1.4.1.1.2**Description:** Pigtail**Institution :** LBNL/UC- Senior**Contact:** M. Garcia-Sciveres

Engineering design for pigtail prototypes.

Basis of Estimate: Physicist estimate**Details of Estimate:** Support of designer.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	2	0	20	2	2	0	0	0	0.0	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	25	0	0	0	0	0	0	0	0	1.631
	0	0	0	25	0	0	0	0	0	0	0	0	1.631

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	4	4	2	1	1	20

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	2	0	0	0	2

WBS Number: 1.1.1.4.1.1.3**Description:** Optical Hybrids**Institution :** Ohio State U.**Contact:** KK Gan

Engineering design for optical components.

Basis of Estimate: Level of Effort**Details of Estimate:** Designer time in FY02 for optical hybrids supported by base program.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.2

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	0	400	0	0	0	0	0	0	0	0	14.600
	0	0	0	400	0	0	0	0	0	0	0	0	14.600

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	10	4	4	4	4	1	1	52

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	15	0	0	0	15

WBS Number: 1.1.1.4.1.2**Description:** Production design**Institution :****Contact:** Rusty Boyd/KK Gan

Production design of the flex hybrid, disk pigtail and optical components. This includes test design and production oversight.

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	56	16	28	72	43	0	13	0	1.0	1.7

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	440	0	0	0	0	0	0	0	1320	43.214
EDIA B/I	0	2640	0	320	0	0	0	0	0	0	0	0	139.311
	0	2640	0	760	0	0	0	0	0	0	0	1320	182.525

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	9	0	0	0.0	13.185
	0	0	9	0	0	0.0	13.185

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	52	144	0	0	196

WBS Number: 1.1.1.4.1.2.1**Description:** Flex Hybrid**Institution :** U. of Oklahoma**Contact:** Rusty Boyd

This includes the electronic simulation, design and layout of flex hybrids. Simulations of the design performance will be carried out by students. Production oversight is included. Support of R. Boyd by infrastructure/base is assumed.

Basis of Estimate: Engineering judgement

Details of Estimate: R. Boyd supported by infrastructure or base funds. students to assist in final design, simulations and verification.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	28	7	24	34	15	0	13	0	0.8	1.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	0	0	0	0	0	0	0	0	1320	14.504
EDIA B/I	0	2640	0	0	0	0	0	0	0	0	0	0	127.631
	0	2640	0	0	0	0	0	0	0	0	0	1320	142.135

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	9	0	0	0.0	13.185
	0	0	9	0	0	0.0	13.185

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	4	8	2	1	1	24

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	52	104	0	0	155

WBS Number: 1.1.1.4.1.2.2**Description:** Pigtail**Institution :** LBNL/UC- Senior**Contact:** M. Garcia-Sciveres

Production engineering design of the pigtail

Basis of Estimate: Physicist estimate**Details of Estimate:** Estimate of approximately 0.25 FTE of electronics designer for layout and test followup

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	29	9	31	38	29	0	0	0	0.3	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Mfg Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	440	0	0	0	0	0	0	0	0	28.710
	0	0	0	440	0	0	0	0	0	0	0	0	28.710

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	4	15	2	1	1	31

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	29	0	0	29

WBS Number: 1.1.1.4.1.2.3**Description:** Optical components**Institution :** Ohio State U.**Contact:** KK Gan

Production engineering for optical component work done in US

Basis of Estimate: Physicist estimate**Details of Estimate:** Designer time for optical component and hybrid design supported by base program.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.2

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	0	320	0	0	0	0	0	0	0	0	11.680
	0	0	0	320	0	0	0	0	0	0	0	0	11.680

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	10	4	4	4	4	1	1	52

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	12	0	0	12

WBS Number: 1.1.1.4.2**Description:** Development and Prototypes**Institution :****Contact:** Rusty Boyd/KK Gan

This includes the procurement of prototype flex hybrids, disk pigtailed and optical hybrids.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	134	54	41	189	0	45	0	89	1.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	440	0	0	0	100	40	0	2110	44.952
	0	0	0	0	440	0	0	0	100	40	0	2110	44.952

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	16	0	0	72	0	0.0	89.496
	16	0	0	72	0	0.0	89.496

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	110	24	0	0	134

WBS Number: 1.1.1.4.2.1**Description:** Flex hybrids**Institution :** U. of Oklahoma**Contact:** Rusty Boyd

Prototype fabrication and test of flex hybrids. This is for versions 3.x. and 4.x

Basis of Estimate: Parametric estimate

Details of Estimate: Based on bids from vendors for 50 part each prototype orders
 Version 3 will be fabricated with compunetics only, version 4 with multiple vendors (assume 3)
 200 pieces x \$50 for components and assembly. 10K

Compunetics: 6K (x2 for v3 and v4)

Dyconex 10K

Speedy: 5K

Probe cards 5K

Total: 36K materials

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	69	17	24	86	0	33	0	36	1.2	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	440	0	0	0	0	0	0	1670	33.175
	0	0	0	0	440	0	0	0	0	0	0	1670	33.175

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	36	0	0.0	36.000
	0	0	0	36	0	0.0	36.000

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	4	0	4	1	1	24

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	69	0	0	0	69

WBS Number: 1.1.1.4.2.2**Description:** Optical prototypes**Institution :** Ohio State U.**Contact:** KK Gan

Fabrication and testing of optical package and optical hybrid prototypes.

Basis of Estimate: Physicist estimate

Details of Estimate: We assume multiple rounds for optical hybrid prototypes in ceramic hybrids.
Also include here test equipment and test boards for optical components and hybrids.

Boards for beam tests and irradiations 8K

Supplies, cables, etc 4K

2nd prototype 24K

Total materials 36K

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	41	24	58	65	0	5	0	36	0.3	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	440	5.107
	0	0	0	0	0	0	0	0	0	0	0	440	5.107

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	36	0	0.0	36.000
	0	0	0	36	0	0.0	36.000

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	10	6	8	4	4	1	1	
								58

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	17	24	0	0	41

WBS Number: 1.1.1.4.2.3**Description:** Pigtails prototypes**Institution :** LBNL/UC- Senior**Contact:** M. Garcia-Sciveres

Fabrication of pigtail prototypes

Basis of Estimate: Physicist estimate

Details of Estimate: Fab costs are estimated to be 16K to cover 3 small quantity lots and 100 piece lot for different disk pigtail types. Labor to mount connectors and solder flex to pigtail is estimated at 200 hours. Fixture for this is estimated at \$200 for materials and 40 hours shop time.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	24	14	58	38	0	7	0	17	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	100	40	0	0	6.670
	0	0	0	0	0	0	0	0	100	40	0	0	6.670

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	16	0	0	0	0	0.0	17.496
	16	0	0	0	0	0.0	17.496

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	10	6	8	4	4	1	1	58

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	24	0	0	0	24

WBS Number: 1.1.1.4.3**Description:** Production**Institution :****Contact:** Rusty Boyd/KK Gan

Production of flex hybrids. Two vendors are assumed but cost basis takes the bid from the only presently viable vendor that has produced prototypes in the past.

Production of disk pigtails. One vendor assumed.

Production of disk optical hybrids.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	341	245	72	587	0	128	0	213	4.0	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	3045	0	0	0	40	0	0	1644	127.900
MFG MC	0	0	0	0	1084	0	0	0	20	0	0	448	44.790
EDIA MC	0	0	0	0	400	0	0	0	0	0	0	408	18.727
	0	0	0	0	4529	0	0	0	60	0	0	2500	191.417

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	28	0	0	27	0	157.4	213.460
MFG MC	12	0	0	50	0	309.2	372.200
	40	0	0	77	0	466.6	585.660

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	182	588	7	0	777

WBS Number: 1.1.1.4.3.1**Description:** Flex hybrid**Institution :****Contact:** Rusty Boyd

Production of flex hybrids, including bare hybrid, components, component loading and testing.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	243	189	78	432	0	85	0	158	2.8	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	1985	0	0	0	0	0	0	1404	84.916
MFG MC	0	0	0	0	644	0	0	0	0	0	0	348	26.815
EDIA MC	0	0	0	0	140	0	0	0	0	0	0	348	8.541
	0	0	0	0	2769	0	0	0	0	0	0	2100	120.272

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	8	0	0	8	0	142.0	158.000
MFG MC	0	0	0	50	0	293.8	343.840
	8	0	0	58	0	435.8	501.840

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	172	450	0	0	622

WBS Number: 1.1.1.4.3.1.1**Description:** Bare Flex Hybrids**Institution :** U. of Oklahoma**Contact:** Rusty Boyd

Fabrication of bare flex circuits.

Basis of Estimate: Engineering judgement

Details of Estimate: Based on quotation from Compunetics. Budgetary quotations from other vendors are lower, but these other vendors have not yet produced prototypes. We assume their production quotes will increase after they gain experience building prototypes.

Cost is \$85 per flex + \$10 each for cutting.

Number of flex that need to be started for baseline is 2245 and 3356 for goals, therefore cost of 1111 goes into management contingency.

Cost of an additional 1345 Hybrids is put into management contingency (separate page) leaving 900 Modules in the project.

Project=85,500, Management Contingency = 105,545 + 127,775

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	87	90	104	176	0	0	0	87	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	86.5	86.500
MFG MC	0	0	0	0	0	233.3	233.320
	0	0	0	0	0	319.8	319.820

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	4	4	4	2	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	117	203	0	0	320

WBS Number: 1.1.1.4.3.1.2**Description:** Components and Assembly**Institution :** U. of Oklahoma**Contact:** Rusty Boyd

Purchase of passive components, loading of passive components by vendors. Assumed all to be done in US. MCC attach and wire bond, assumed 50% in US.

Basis of Estimate: Parametric estimate

Details of Estimate: Components are estimated at \$5 per flex for capacitors and resistors and \$20 per flex for frame carrier printed circuit board.

Passive loading is estimated at \$20 per flex.

MCC attach, bonding and encapsulation(after testing - see following elements) done by elec. Tech at 30 min per die. We have assumed this is done in house. Scaling from previous experience with vendors for same task would give about \$20 per MCC, which is less than the in-house estimate but we take here the more conservative number. We assume the US does 50% of MCC attach/bond.

Materials(epoxy, misc,) taken to be 15K.

Costs are divided between project and management contingency as for bare hybrids.

Project costs are $900 \times (25+20) = 40,500 + 15,000 = 55,500$ for materials. Labor is $900 \times 0.5 \times 0.5 \text{ hrs} = 225$ hours.

Management Contingency A = $1111 \times (25+20) = 49,995$ for materials. Labor is $1111 \times 0.5 \times 0.5 = 278$ hours.

Management Contingency B = $1345 \times (25+20) = 60,525$ for materials. Labor is $1345 \times 0.5 \times 0.5 = 366$ hours.

Materials divided equally in FY02 and FY03, labor all in FY03.

Partial support for a technician is included in FY02 for training and ramp-up

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	63	55	87	118	0	8	0	56	0.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	225	0	0	0	0	0	0	0	7.581
MFG MC	0	0	0	0	644	0	0	0	0	0	0	0	21.700
	0	0	0	0	869	0	0	0	0	0	0	0	29.280

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	55.5	55.500
MFG MC	0	0	0	50	0	60.5	110.520
	0	0	0	50	0	116.0	166.020

CONTINGENCY FACTORS:	<i>Risk</i>					<i>Weight</i>			Cont %		
	Technical		C o s t	Schedule	Des i gn	Technical		C o s t		Schedule	
	6	4	8	4	2	1	1				
										28	
PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	55	140	0	0	195

WBS Number: 1.1.1.4.3.1.3**Description:** Testing**Institution :****Contact:** Rusty Boyd

Testing of flex hybrids.

Details of Estimate: HV test before MCC attach. Fixtures(4*1K) + probe cards(4*1K). Labor is estimated to be 0.25 hrs per flex at student rate.

Test after MCC attach. Fixtures(4*1K) + probe cards(4*1K). Labor per flex is 0.75 hrs per flex at student rate. Probe stations exist. 50% done in US.

Mechanical inspection is estimated at 0.25 hr per flex at student rates.

Baseline costs. Materials are 16K. Labor is 2245*1.25*0.5=1403 hrs

Goals costs. Materials are 16K. Labor is 3356*1.25*0.5=2098 hrs.

Management contingency is 695 hours.

Materials and labor are split equally between UOK and Albany.

Some electrical technician time included at OU for repairs and to help with testing.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	93	45	48	138	0	77	0	16	2.3	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	1760	0	0	0	0	0	0	1404	77.335
MFG MC	0	0	0	0	0	0	0	0	0	0	0	348	5.116
EDIA MC	0	0	0	0	140	0	0	0	0	0	0	348	8.541
	0	0	0	0	1900	0	0	0	0	0	0	2100	90.992

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	8	0	0	8	0	0.0	16.000
	8	0	0	8	0	0.0	16.000

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	107	0	0	107

WBS Number: 1.1.1.4.3.1.3.1 **Description:** Albany**Institution :** SUNY at Albany**Contact:** Rusty Boyd

Testing and QA of flex circuits and flex hybrids at Albany.

Basis of Estimate: Physicist estimate**Details of Estimate:** See higher level

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	18	10	54	28	0	10	0	8	0.6	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	702	10.319
MFG MC	0	0	0	0	0	0	0	0	0	0	0	348	5.116
	0	0	0	0	0	0	0	0	0	0	0	1050	15.435

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	8	0	0	0	0	0.0	8.000
	8	0	0	0	0	0.0	8.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	2	8	8	0	1	4	1	42

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	23	0	0	23

WBS Number: 1.1.1.4.3.1.3.2 **Description:** Oklahoma**Institution :** U. of Oklahoma**Contact:** Rusty Boyd

Testing and QA of flex circuits and flex hybrids at UOK.

Basis of Estimate: Engineering judgement**Details of Estimate:** Se higher level. Tech not in management contingency

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	75	35	47	110	0	67	0	8	1.7	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	1760	0	0	0	0	0	0	702	67.016
EDIA MC	0	0	0	0	140	0	0	0	0	0	0	348	8.541
	0	0	0	0	1900	0	0	0	0	0	0	1050	75.557

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	8	0	0.0	8.000
	0	0	0	8	0	0.0	8.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	2	8	8	0	1	4	1	42

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	84	0	0	84

WBS Number: 1.1.1.4.3.2**Description:** Pigtails**Institution :** LBNL/UC- Senior**Contact:** M. Garcia-Sciveres

Production of pigtails.

Basis of Estimate: Parametric estimate**Details of Estimate:** Based on previous experience.

\$40 per piece including vendor testing. 6 different designs. 100 pieces per design for goals and 50 for baseline scope.
NRE 6*750=4500. Testing NRE 6*500=3000.

Connectors and connector attachment are on type 0 cable

Attachment of type 0 cable to pigtail is after sector mounting.

Technician labor needed to train and supervise contract labor and to do some amount of large diameter wire wirebonding for
production of type-0 cable. Estimate is 200 hours for base and 80 for man. cont.

Goals: Materials 31,500. Labor to add pigtails to hybrids is 10 minutes per hybrid.

Baseline scope: Materials 19,500. Labor is 40 hours

Management contingency: Materials 12,000. Labor is 20 hours.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	23	11	48	33	0	2	0	21	0.0	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	40	0	0	0	1.508
MFG MC	0	0	0	0	0	0	0	0	20	0	0	0	0.754
	0	0	0	0	0	0	0	0	60	0	0	0	2.262

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	20	0	0	0	0	0.0	21.060
MFG MC	12	0	0	0	0	0.0	12.960
	32	0	0	0	0	0.0	34.020

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	6	6	4	8	2	1	1	30

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	36	0	0	36

WBS Number: 1.1.1.4.3.3**Description:** Optical hybrids**Institution :** Ohio State U.**Contact:** KK Gan

Costs for producing and testing optical hybrids for disk system.

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	76	45	59	121	0	41	0	34	1.2	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	1060	0	0	0	0	0	0	240	41.476
MFG MC	0	0	0	0	440	0	0	0	0	0	0	100	17.221
EDIA MC	0	0	0	0	260	0	0	0	0	0	0	60	10.186
	0	0	0	0	1760	0	0	0	0	0	0	400	68.883

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	19	0	15.4	34.400
MFG MC	0	0	0	0	0	15.4	15.400
	0	0	0	19	0	30.8	49.800

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	10	102	7	0	119

WBS Number: 1.1.1.4.3.3.1**Description:** Optical packages and components**Institution :** Ohio State U.**Contact:** Rusty Boyd/KK Gan

Costs of optical packages and components, other than integrated circuits.

Basis of Estimate: Physicist estimate**Details of Estimate:** Optical packages would be supplied by Taiwan collaborators at no cost to US program

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	10	6	4	8	2	1	1	38

WBS Number: 1.1.1.4.3.3.2**Description:** Optical hybrids**Institution :** Ohio State U.**Contact:** KK Gan

Costs for fabrication of optical hybrids that hold optical components, ICs, passive components, connectors.

Basis of Estimate: Physicist estimate

Details of Estimate: We assume ceramic for optical hybrids. Costs are estimated at minimum order of 24K. One optical board per sector. 50 sectors for goals and we assume optical boards are made for goals. We assume manufacture of 65 optical boards to account for losses.

Passive components are taken to be \$20/board or 1300. Connectors are minimum order of 3K. Fixtures for bonding etc are taken at 1200.

Loading is taken at \$20/board or 1300.

Materials total is 30800

Labor is 0.5 FTE tech(other 0.5 is under module assembly) and 200 hours of student.

Goals: 30,800 and 1760 hours

Baseline scope(34 boards in experiment): 29960 and still 1 FTE tech.

15,300 materials is moved into MC.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	33	25	76	57	0	17	0	15	0.6	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	440	0	0	0	0	0	0	100	17.221
MFG MC	0	0	0	0	440	0	0	0	0	0	0	100	17.221
	0	0	0	0	880	0	0	0	0	0	0	200	34.442

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	15.4	15.400
MFG MC	0	0	0	0	0	15.4	15.400
	0	0	0	0	0	30.8	30.800

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	10	6	4	8	2	1	1	38

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	65	0	0	65

WBS Number: 1.1.1.4.3.3.3**Description:** Testing**Institution :** Ohio State U.**Contact:** KK Gan

Testing labor and materials for testing optical components and optical hybrids.

Basis of Estimate: Physicist estimate**Details of Estimate:** This includes testing of optical hybrids only

Environmental chamber 3.5K
 Optical equipment 2K
 Burn-in equipment 10K
 Test equipment 2K
 Supplies 6K
 Storage and boxes 65*20=1.3K
 Shipping 1.2

Materials total 26000

Labor is 0.5 FTE tech(other 0.5 in module assembly and test) and 200 hours student.
 Only the labor scales with the number of hybrids. We take 70% base and 30% MC.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	43	20	47	64	0	24	0	19	0.6	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	620	0	0	0	0	0	0	140	24.255
EDIA MC	0	0	0	0	260	0	0	0	0	0	0	60	10.186
	0	0	0	0	880	0	0	0	0	0	0	200	34.441

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	19	0	0.0	19.000
	0	0	0	19	0	0.0	19.000

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	10	6	4	8	2	1	1	38

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	10	36	7	0	53

WBS Number: 1.1.1.5**Description:** Module Assembly/Test**Institution :****Contact:** Maurice Garcia-Sciveres

This covers the assembly and test of modules. The basic components of the modules(sensors, electronics, hybrids and cables) are described in other WBS elements. We include here electronics wafer thinning and dicing, die sort, module mechanical assembly, module testing. Attachment of modules to disk sectors and testing after this attachment.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	968	520	54	1487	80	568	13	307	15.8	4.7

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	880	1764	0	0	4353	952	50	9565	567.890
MFG MC	0	0	0	0	0	441	0	0	4245	60	0	4164	240.966
MFG B/I	0	0	0	0	1540	3390	0	0	0	0	0	0	284.360
EDIA P	0	880	0	0	0	0	0	0	0	0	0	440	79.750
EDIA B/I	0	0	2200	1100	0	0	0	0	0	0	0	0	302.731
	0	880	2200	1100	2420	5595	0	0	8598	1012	50	14169	1475.697

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	183	6	0	97	0	0.0	306.700
MFG MC	47	0	0	26	0	0.0	79.056
MFG B/I	0	0	0	30	0	0.0	32.400
EDIA P	10	0	2	0	0	0.0	13.180
	241	6	2	153	0	0.0	431.336

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	474	1010	423	0	1907

WBS Number: 1.1.1.5.1**Description:** Design/Engineering**Institution :****Contact:** Maurice Garcia-Sciveres

This covers the engineering design manpower needed for module prototypes, to establish production procedures, for oversight of industrial fabrication and in-house assembly and for the design of test procedures and equipment.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	73	25	35	98	70	0	2	0	0.5	1.9

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	70.180
EDIA B/I	0	0	2200	1100	0	0	0	0	0	0	0	0	302.731
	0	880	2200	1100	0	0	0	0	0	0	0	0	372.911

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	2	0	0	0.0	2.380
	0	0	2	0	0	0.0	2.380

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	186	189	0	0	375

WBS Number: 1.1.1.5.1.1**Description:** Prototype Design**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

This is the engineering time needed for the design of prototypes for module assembly.

Basis of Estimate: Physicist estimate**Details of Estimate:** Engineering design is supported by base program

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.6

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	1100	0	0	0	0	0	0	0	0	0	119.625
	0	0	1100	0	0	0	0	0	0	0	0	0	119.625

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	8	8	2	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	96	24	0	0	120

WBS Number: 1.1.1.5.1.2**Description:** Production Design**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Production design for module assembly. This includes all mechanical aspects but not electrical testing.

Basis of Estimate: Physicist estimate**Details of Estimate:** Engineering time is supported by base program at LBNL.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.6

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	1100	0	0	0	0	0	0	0	0	0	119.625
	0	0	1100	0	0	0	0	0	0	0	0	0	119.625

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	8	8	2	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	24	96	0	0	120

WBS Number: 1.1.1.5.1.3**Description:** Testing Design**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Engineering design for testing.

Basis of Estimate: Physicist estimate

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	73	25	35	98	70	0	2	0	0.5	0.6

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	70.180
EDIA B/I	0	0	0	1100	0	0	0	0	0	0	0	0	63.481
	0	880	0	1100	0	0	0	0	0	0	0	0	133.661

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	2	0	0	0.0	2.380
	0	0	2	0	0	0.0	2.380

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	66	70	0	0	136

WBS Number: 1.1.1.5.1.3.1**Description:** Mechanical Prototypes**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Engineering time will be needed to develop test procedures for the mechanical prototypes and to design fixtures and probe cards.

Basis of Estimate: Physicist estimate**Details of Estimate:** Supported by base program

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA B/I	0	0	0	660	0	0	0	0	0	0	0	0	43.065
	0	0	0	660	0	0	0	0	0	0	0	0	43.065

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	8	8	2	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	29	14	0	0	43

WBS Number: 1.1.1.5.1.3.2**Description:** Functional Prototypes**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

An engineer will be needed to design test cards and related fixtures for functional module prototypes including burn in.

Basis of Estimate: Physicist estimate

Details of Estimate: We estimate 0.25 FTE in FY02 and 0.25 in FY03 electrical engineer for dedicated module burn-in and test system. This is supported under 1.1.1.3 in FY02.

An additional 0.25FTE of designer time in FY02 and FY03 for probe cards, test cards - design, debugging and use. Supported by project in 02 and base in 03.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	73	25	35	98	70	0	2	0	0.5	0.3

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	880	0	0	0	0	0	0	0	0	0	0	70.180
EDIA B/I	0	0	0	440	0	0	0	0	0	0	0	0	20.416
	0	880	0	440	0	0	0	0	0	0	0	0	90.596

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
EDIA P	0	0	2	0	0	0.0	2.380
	0	0	2	0	0	0.0	2.380

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	8	15	2	1	1	

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	37	56	0	0	93

WBS Number: 1.1.1.5.2**Description:** Development and Prototypes**Institution :****Contact:** Maurice Garcia-Sciveres

This covers prototype developments for all aspects of module assembly and test.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	227	64	28	291	0	140	11	76	2.3	1.1

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	1120	852	50	1936	139.983
MFG B/I	0	0	0	0	0	1980	0	0	0	0	0	0	91.872
	0	0	0	0	0	1980	0	0	1120	852	50	1936	231.855

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	43	6	0	22	0	0.0	76.195
MFG B/I	0	0	0	30	0	0.0	32.400
EDIA P	10	0	0	0	0	0.0	10.800
	53	6	0	52	0	0.0	119.395

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	241	110	0	0	351

WBS Number: 1.1.1.5.2.1**Description:** X-ray Inspection**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

X-ray inspection of modules and assemblies

Basis of Estimate: Parametric estimate

Details of Estimate: Costs are based on \$200 per hour contract with X-Tek for use of their X-ray inspection machine. We assume 25 hrs per year for FY02 and FY03.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	11	1	7	12	0	0	11	0	0.0	0.0

MATERIAL SUMMARY:		Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
	EDIA P	10	0	0	0	0	0.0	10.800
		10	0	0	0	0	0.0	10.800

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	1	1	4	0	2	1	1	7

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	5	5	0	0	11

WBS Number: 1.1.1.5.2.2**Description:** Wafer Thinning**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Thinning of prototype IC and dummy wafers

Basis of Estimate: Parametric estimate**Details of Estimate:** Costs are based on \$150 per 8" wafer price from Aptek. We assume 40 wafers in 02 and 20 in 03.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	10	2	16	11	0	0	0	10	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	9	0	0.0	9.720
	0	0	0	9	0	0.0	9.720

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	1	10	4	0	2	1	1	16

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	6	3	0	0	10

WBS Number: 1.1.1.5.2.3**Description:** Wafer Dicing and Die Sort**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Dicing of prototype IC and dummy wafers

Basis of Estimate: Parametric estimate

Details of Estimate: There will be approximately 30 dummy and 10 electrical prototype wafers to dice in FY02 at \$100 per wafer. We assume same for FY03.

Additionally, wafers may have to be coated with photoresist if thinning process is not compatible with resist coated wafers. We assume \$400 lot charge for this 5 times per year.

Die sort assumes method used for SVXII for CDF. \$400 for materials and 20 hours shop time.

Labor for die sort is student at 0.1 FTE

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	19	8	42	27	0	5	0	14	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	20	0	176	5.278
	0	0	0	0	0	0	0	0	0	20	0	176	5.278

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	13	0	0.0	13.824
	0	0	0	13	0	0.0	13.824

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	12	10	8	0	2	1	1	

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	10	9	0	0	19

WBS Number: 1.1.1.5.2.4**Description:** Dummy wafers**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Dummy wafers manufactured in US for use by bump bonding vendors to develop their processes and make dummy modules.

Basis of Estimate: Vendor quotation**Details of Estimate:** Based on cost of one lot of 8" wafers produced in FY01. Assume another lot made in FY02

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	13	4	34	17	0	0	0	13	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	12	0	0	0	0	0.0	12.717
	12	0	0	0	0	0.0	12.717

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	10	4	4	2	1	1	34

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	13	0	0	0	13

WBS Number: 1.1.1.5.2.5**Description:** Module Assembly and Testing**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Tooling, labor, supplies and equipment for assembly and testing of prototype dummy and real modules.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	153	43	28	196	0	117	0	37	1.9	0.8

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	880	732	0	1760	116.870
MFG B/I	0	0	0	0	0	1320	0	0	0	0	0	0	61.248
	0	0	0	0	0	1320	0	0	880	732	0	1760	178.118

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	31	3	0	0	0	0.0	36.502
MFG B/I	0	0	0	30	0	0.0	32.400
	31	3	0	30	0	0.0	68.902

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	166	82	0	0	247

WBS Number: 1.1.1.5.2.5.1**Description:** Tooling**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Tooling for assembly of dummy and real prototype modules.

Basis of Estimate: Parametric estimate**Details of Estimate:** Costs are based on parametric scaling from existing tooling assuming one more design cycle.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	54	15	28	69	0	53	0	1	0.4	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	732	0	0	53.070
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	40.832
	0	0	0	0	0	880	0	0	0	732	0	0	93.902

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	1	0	0	0	0	0.0	1.102
	1	0	0	0	0	0.0	1.102

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	95	0	0	0	95

WBS Number: 1.1.1.5.2.5.2**Description:** Assembly**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Labor for assembly of dummy and real prototype modules.

Basis of Estimate: Physicist estimate**Details of Estimate:** We assume 60 modules are assembled in this phase. Labor for mechanical assembly is supported by base program. Labor for wire bonding and related QC is project supported.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	27	8	28	35	0	26	0	2	0.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	880	0	0	0	25.520
	0	0	0	0	0	0	0	0	880	0	0	0	25.520

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	2	0	0	0	0.0	1.500
	0	2	0	0	0	0.0	1.500

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	14	13	0	0	27

WBS Number: 1.1.1.5.2.5.3**Description:** Testing**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

This includes mechanical and electrical testing of prototype modules

Basis of Estimate: Physicist estimate

Details of Estimate: Mechanical testing includes use of coordinate measurement machine time(project funded) at 2 hours per module. Mechanical technician time for other testing is supported by base program. Electrical testing assumes 0.5 FTE student from project funds in FY02 and 0.25 FTE in FY03. A prototype module burn-in system is assumed to be built during this phase. A rough estimate of this system is \$20K, not including design. Test boards and special cables is estimated at 10K.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	72	20	28	92	0	38	0	34	1.0	0.3

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	1760	38.280
MFG B/I	0	0	0	0	0	440	0	0	0	0	0	0	20.416
	0	0	0	0	0	440	0	0	0	0	0	1760	58.696

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	30	2	0	0	0	0.0	33.900
	30	2	0	0	0	0.0	33.900

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	41	52	0	0	93

WBS Number: 1.1.1.5.2.5.4**Description:** Equipment**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Cost of special equipment used in preparing for module essembly in QA for module assembly.

Basis of Estimate: Vendor quotation

Details of Estimate: This is based on equipment purchases made in FY01 that were needed to fulfill needs as they arose. Examples of such equipment are environmental chambers, wirebond pull testers, plasma cleaning equipment, assembly microscopes or video systems, etc.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	0	0	0	0	0	0	0	0	0.0	0.0

MATERIAL SUMMARY:		Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
	MFG B/I	0	0	0	30	0	0.0	32.400
		0	0	0	30	0	0.0	32.400

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	16	16	0	0	32

WBS Number: 1.1.1.5.2.6**Description:** Module Attachment**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Tooling, labor, materials and supplies for attachment of prototype dummy and real modules to disk sectors.

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	21	6	28	27	0	18	0	3	0.2	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	240	100	50	0	17.835
MFG B/I	0	0	0	0	0	660	0	0	0	0	0	0	30.624
	0	0	0	0	0	660	0	0	240	100	50	0	48.459

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	3	0	0	0	0.0	3.432
	0	3	0	0	0	0.0	3.432

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	41	11	0	0	52

WBS Number: 1.1.1.5.2.6.1**Description:** Tooling**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Prototype tooling for attachment of modules to disk sectors.

Basis of Estimate: Parametric estimate**Details of Estimate:** Based on existing tooling and assuming one more complete design cycle.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	8	2	28	10	0	7	0	0	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	100	0	0	7.250
	0	0	0	0	0	0	0	0	0	100	0	0	7.250

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0.0	0.432
	0	0	0	0	0	0.0	0.432

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	8	0	0	0	8

WBS Number: 1.1.1.5.2.6.2**Description:** Assembly**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Assembly/attachment of prototype modules to disk sectors.

Basis of Estimate: Physicist estimate**Details of Estimate:** This is labor for assembly. It assumes 240 hours to develop and use techniques.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	9	3	28	11	0	7	0	2	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	240	0	0	0	6.960
	0	0	0	0	0	0	0	0	240	0	0	0	6.960

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	2	0	0	0	0.0	2.000
	0	2	0	0	0	0.0	2.000

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	8	1	0	0	9

WBS Number: 1.1.1.5.2.6.3**Description:** Testing**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Testing of prototypes after attachment to disk sectors.

Basis of Estimate: Physicist estimate

Details of Estimate: This includes IR imaging for sector quality control. Cost of IR camera is covered under Testing in Mechanics. Labor for IR testing is provided by base program. This also includes labor for survey using optical CMM or other. Equipment for electrical testing is covered under module testing.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	5	1	28	6	0	4	0	1	0.0	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	50	0	3.625
MFG B/I	0	0	0	0	0	660	0	0	0	0	0	0	30.624
	0	0	0	0	0	660	0	0	0	0	50	0	34.249

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	1	0	0	0	0.0	1.000
	0	1	0	0	0	0.0	1.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	3	4	4	8	4	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	25	10	0	0	35

WBS Number: 1.1.1.5.3**Description:** Production**Institution :****Contact:** Maurice Garcia-Sciveres

Pixel module assembly, testing and attachment to disk sectors. See production model for assumptions. US is entirely responsible for bumped wafer thinning, dicing of these wafers, IC sort. US will assemble about one-quarter of modules and test them. US will attach all disk modules to sectors and test after attachment.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	668	431	64	1099	10	428	0	231	13.1	1.7

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	880	1764	0	0	3233	100	0	7629	427.907
MFG MC	0	0	0	0	0	441	0	0	4245	60	0	4164	240.966
MFG B/I	0	0	0	0	1540	1410	0	0	0	0	0	0	192.488
EDIA P	0	0	0	0	0	0	0	0	0	0	0	440	9.570
	0	0	0	0	2420	3615	0	0	7478	160	0	12233	870.931

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	140	0	0	75	0	0.0	230.505
MFG MC	47	0	0	26	0	0.0	79.056
	187	0	0	101	0	0.0	309.561

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	48	710	423	0	1180

WBS Number: 1.1.1.5.3.1**Description:** IC Wafer Thinning**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Thinning of IC wafers after bump deposition.

Basis of Estimate: Vendor quotation**Details of Estimate:** We assume that all IC wafers are to be thinned in US. Costs based on vendor price list from Aptek.

Baseline 200 8" wafers at \$150 each

Management contingency 100 8" wafers at \$150 each

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	32	49	150	81	0	0	0	32	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	30	0	0.0	32.400
MFG MC	0	0	0	15	0	0.0	16.200
	0	0	0	45	0	0.0	48.600

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	15	10	10	10	4	2	1	100

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	32	16	0	49

WBS Number: 1.1.1.5.3.2**Description:** Dicing of IC Wafers**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Dicing of thinned IC wafers.

Basis of Estimate: Vendor quotation

Details of Estimate: WE assume all FE IC wafers are diced in US. Costs are based on verbal estimate from Micro Dicing of \$50 per wafer for 6" wafer and our extrapolation to \$100 per wafer for 8" wafers. Contingency is fixed at 100% in case minimum lot charges are needed at some time.

Additionally we add a cost of \$10 per wafer for photoresist coating if that is necessary.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	24	36	150	59	0	0	0	24	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	22	0	0.0	23.760
MFG MC	0	0	0	11	0	0.0	11.880
	0	0	0	33	0	0.0	35.640

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	15	10	10	10	4	2	1	100

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	26	10	0	36

WBS Number: 1.1.1.5.3.3**Description:** IC Die Sort**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

We assume all FE die are sorted in US after dicing and packaged for shipment for bump bonding vendors.

Basis of Estimate: Parametric estimate

Details of Estimate: After dicing the die must be inspected, sorted and packaged in Gelpaks. We assume here that this will be done for all die at LBL.

Materials

We assume 4" Gelpaks can hold 48 good die and that 24,000 die are needed for baseline scope or about 500 Gelpaks at \$17 each gives \$8,500. Shipment is estimated at 25*\$100=\$2500. Management contingency adds 5,000.

Die sort is based on method used by CDF for SVXIII. We assume three special vacuum carriers at \$400 each for materials, and 20 shop time each.

Probe cards are covered under 1.1.1.3.3.

Labor for die removal, loading die into carrier, reprobing and packaging is estimated to be 5 minutes per die or 2,000 hours for baseline scope, 1000 more for goals

Die must be marked. We assume laser marking and include cost of this in estimate at \$10K for equipment.

Total equipment cost is 11,000+1200+10000=22200

Base Laobr is 60 hours shop time and 2,000 hours student time.
MC is 1000 student time

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	0	40	0	40	0	0	0	0	1.7	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG MC	0	0	0	0	0	0	0	0	0	60	0	3000	69.601
	0	0	0	0	0	0	0	0	0	60	0	3000	69.600

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG MC	27	0	0	0	0	0.0	29.376
	27	0	0	0	0	0.0	29.376

CONTINGENCY FACTORS:	Risk				Weight			Cont %			
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule				
	3	6	8	8	4	2	1				
										40	
PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	4	62	32	0	99

WBS Number: 1.1.1.5.3.4**Description:** Module Assembly**Institution :****Contact:** Maurice Garcia-Sciveres

Tooling, materials and labor for attachment of flex hybrids to bare modules and attachment of pigtails.

Details of Estimate: We assume the U.S. begins assembly 650(goals) -> 435(baseline scope modules).

Tooling costs are estimated from conceptual designs and some fabrication of prototype parts

Labor

The assembly steps are

Clean and inspect bare module
 Probe bare module
 Attach pigtail to flex hybrid
 Clean and inspect flex hybrid and test
 Apply glue
 Assemble flex hybrid to bare module
 Inspect
 Cure

Wire bond from FE pads to flex using automated bonder
 Inspect
 Repair, if necessary

Storage

Database logging

Wire bonding will be done at LBL and Ohio State, in equal proportion

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	200	77	38	277	0	147	0	53	3.6	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	884	0	0	3233	100	0	0	147.136
MFG MC	0	0	0	0	0	441	0	0	1605	0	0	0	69.489
MFG B/I	0	0	0	0	0	750	0	0	0	0	0	0	48.938
	0	0	0	0	0	2075	0	0	4838	100	0	0	265.563

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	28	0	0	23	0	0.0	53.169
	28	0	0	23	0	0.0	53.169

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	226	93	0	319

WBS Number: 1.1.1.5.3.4.1**Description:** Tooling**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Tooling costs for module assembly

Basis of Estimate: Engineering judgement**Details of Estimate:** \$1000 for materials and about 100 hours of shop time. This is final iteration of tools developed during prototype phase.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	8	4	46	12	0	7	0	1	0.1	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	100	0	0	7.250
	0	0	0	0	0	0	0	0	0	100	0	0	7.250

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	1	0	0	0	0	0.0	1.080
	1	0	0	0	0	0.0	1.080

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	6	6	8	8	4	1	1	46

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	8	0	0	8

WBS Number: 1.1.1.5.3.4.2**Description:** Assembly - LBNL**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

This includes labor and materials and supplies costs for assembly at LBNL.

Basis of Estimate: Engineering judgement

Details of Estimate: We assume 1FTE for the full period(including 6 month training period before full production start) at LBL split between physical assembly and wire bonding. And 0.25 FTE of supervision from a senior technician supported by base program. Miscellaneous materials and supplies, maintenance of wire bonder, etc are estimated to be 1,500 per month.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	118	45	38	163	0	89	0	29	2.0	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	2349	0	0	0	88.557
MFG MC	0	0	0	0	0	0	0	0	1164	0	0	0	43.883
MFG B/I	0	0	0	0	0	750	0	0	0	0	0	0	48.938
	0	0	0	0	0	750	0	0	3513	0	0	0	181.378

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	27	0	0	0	0	0.0	29.160
	27	0	0	0	0	0.0	29.160

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	4	4	8	8	2	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	151	59	0	211

WBS Number: 1.1.1.5.3.4.3**Description:** Assembly - Ohio State**Institution :** Ohio State U.**Contact:** Maurice Garcia-Sciveres

Wire bonding and inspection at OSU and related assembly tasks.

Basis of Estimate: Physicist estimate**Details of Estimate:** See attached notes

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	74	28	38	102	0	51	0	23	1.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	884	0	0	884	0	0	0	51.329
MFG MC	0	0	0	0	0	441	0	0	441	0	0	0	25.606
	0	0	0	0	0	1325	0	0	1325	0	0	0	76.935

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	0	0	0	23	0	0.0	22.929
	0	0	0	23	0	0.0	22.929

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	4	8	8	2	1	1	28

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	66	34	0	100

WBS Number: 1.1.1.5.3.5**Description:** Module Testing**Institution :****Contact:** Maurice Garcia-Sciveres

Electrical testing of bare and assembled modules. All U.S. bare module testing will be done at LBNL. Assembled module testing locations are TBD but are costed here at LBL rates. Assembled module testing is likely to be done at universities.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	257	171	67	428	0	166	0	91	6.5	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	7629	165.931
MFG MC	0	0	0	0	0	0	0	0	2640	0	0	1164	101.877
MFG B/I	0	0	0	0	660	0	0	0	0	0	0	0	43.065
	0	0	0	0	660	0	0	0	2640	0	0	8793	310.873

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	84	0	0	0	0	0.0	90.720
MFG MC	20	0	0	0	0	0.0	21.600
	104	0	0	0	0	0.0	112.320

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	43	268	112	0	423

WBS Number: 1.1.1.5.3.5.1**Description:** Bare Module Testing**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

A bare module is one after flip chip assembly and X-ray inspection but before attachment of the flex hybrid. We assume testing for one year with ramp up of 6 months.

Basis of Estimate: Physicist estimate**Details of Estimate:** Costs of bare module assembly are for probe cards, tooling, probe stations maintenance and labor.**Materials costs**

Probe cards 5,000
 Tooling 2,000
 Maintenance 2,000
 Shipping/customs 10000

Labor

We assume 1FTE student equivalent for 1.5 years + senior technician(base program supported) + physicist supervision.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	72	44	61	115	0	51	0	21	2.0	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	2349	51.091
MFG MC	0	0	0	0	0	0	0	0	0	0	0	1164	25.317
MFG B/I	0	0	0	0	660	0	0	0	0	0	0	0	43.065
	0	0	0	0	660	0	0	0	0	0	0	3513	119.473

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	19	0	0	0	0	0.0	20.520
	19	0	0	0	0	0.0	20.520

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	8	6	8	15	2	1	1	
								45

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	102	38	0	140

WBS Number: 1.1.1.5.3.5.2**Description:** Assembled Module Testing**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Modules after attachment of flex hybrids/pigtails and inspection are shipped to module testing sites for detailed testing and burn-in.

Basis of Estimate: Physicist estimate

Details of Estimate: Location of module testing is TBD. It is cost here at LBL rates. Assumption is 1.5 years duration. One module per day => 3 FTEs for goals or 2 FTEs for baseline scope. Equipment costs are taken to be 20K per site and 3 sites for goals, 2 for baseline. Shipment boxes and costs are taken to be 25K.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	185	127	69	312	0	115	0	70	4.5	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	0	0	5280	114.840
MFG MC	0	0	0	0	0	0	0	0	2640	0	0	0	76.560
	0	0	0	0	0	0	0	0	2640	0	0	5280	191.400

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	65	0	0	0	0	0.0	70.200
MFG MC	20	0	0	0	0	0.0	21.600
	85	0	0	0	0	0.0	91.800

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	8	6	8	15	2	1	1	45

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	43	165	75	0	283

WBS Number: 1.1.1.5.3.6**Description:** Module Attachment**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Attachment of assembled modules to disk sectors. This includes thermal and mechanical testing but not electrical testing. All of this work will be done at LBNL

Basis of Estimate: Physicist estimate

Details of Estimate: Goals assume attachment of $(2*9*6+4*8*6)*1.1=330$ modules. We assume attachment and QA of 3 modules(one-half sector) per day or 880 hours.

Baseline scope is $(2*9*6+2*8*6)*1.1=224$ modules or 600 hours.

Materials include clean room supplies and miscellaneous tools at \$1000 per month. \$4000 baseline, \$2000 management contingency.

Adhesives are taken to be \$1000 for both cases

Storage boxes for each sector at \$20 each = \$1200.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	64	24	38	88	0	57	0	7	0.5	0.4

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	880	0	0	0	0	0	0	57.420
MFG B/I	0	0	0	0	0	660	0	0	0	0	0	0	43.065
	0	0	0	0	0	1540	0	0	0	0	0	0	100.485

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	6	0	0	0	0	0.0	6.696
	6	0	0	0	0	0.0	6.696

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	6	8	8	4	1	1	38

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	44	64	0	107

WBS Number: 1.1.1.5.3.7**Description:** Attach Type 0 cable to Sector with modules**Institution :****Contact:** M. Garcia-Sciveres

After all modules are loaded on a sector a pre-assembled Type 0 cable bundle is attached to the pigtails

Details of Estimate: Technician labor to microweld type 0 cable conductors to module pigtails. Assume 2 hours per sector .

32 sectors for baseline and 16 additional sectors for goals

COST SUMMARY:	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
(Project)	0	0	0	0	0	0	0	0	0.0	0.0

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	6	8	8	4	1	1	38

WBS Number: 1.1.1.5.3.8**Description:** Sector Electrical Testing**Institution :** LBNL/UC- Senior**Contact:** Maurice Garcia-Sciveres

Electrical testing of sectors with modules attached.

Basis of Estimate: Physicist estimate**Details of Estimate:** Electrical testing of completed sectors requires mechanical and electrical tooling, DAQ systems and labor. Temperature cycling will also be done

Tooling costs can only be crudely estimated at this time and we take 5,000.

We take 3000 for a refurbished environmental chamber.

Storage is taken to be \$6000

DAQ systems are assumed to exist already at LBNL for this purpose for either IC testing or from ROD development.

Labor is taken to be one sector every two days(880 hours) + participation and supervision by postdocs and other physicists.

We do not separate here goals and baseline scope.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	73	28	38	100	0	57	0	15	0.5	0.5

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	880	0	0	0	0	0	0	0	57.420
MFG B/I	0	0	0	0	880	0	0	0	0	0	0	0	57.420
	0	0	0	0	1760	0	0	0	0	0	0	0	114.840

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	14	0	0	0	0	0.0	15.120
	14	0	0	0	0	0.0	15.120

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	6	8	8	4	1	1	38

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	39	91	0	130

WBS Number: 1.1.1.5.3.9**Description:** Production database**Institution :** LBNL/UC-Junior**Contact:** Maurice Garcia-Sciveres

Development and maintenance of module production database

Basis of Estimate: Physicist estimate**Details of Estimate:** We assume development is done by physicists. But we include costs of computers for data entry and student labor for report generation and global QA. We include bar code equipment for sectors at 2K

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	18	7	38	25	10	0	0	9	0.3	0.0

MANPOWER SUMMARY:	S.W. Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
EDIA P	0	0	0	0	0	0	0	0	0	0	0	440	9.570
	0	0	0	0	0	0	0	0	0	0	0	440	9.570

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	8	0	0	0	0	0.0	8.640
	8	0	0	0	0	0.0	8.640

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i g n	Technical	C o s t	Schedule	
	4	6	8	8	4	1	1	38

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	0	13	5	0	18

WBS Number: 1.1.1.6**Description:** Beam/System Test Support**Institution :****Contact:**

This includes costs for test equipment, test beam support and system test operations at CERN

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	86	0	0	86	0	0	0	86	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	80	0	0	0	0	0.0	86.400
	80	0	0	0	0	0.0	86.400

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	43	43	0	0	86

WBS Number: 1.1.1.6.1**Description:** Test Beam Support**Institution :** LBNL/UC-Junior**Contact:**

Funding of test beam operations at CERN(or other locations if applicable)

Basis of Estimate: Level of Effort**Details of Estimate:** Based on past year's experience

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	32	0	0	32	0	0	0	32	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	30	0	0	0	0	0.0	32.400
	30	0	0	0	0	0.0	32.400

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	2	1	1	0

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	16	16	0	0	32

WBS Number: 1.1.1.6.2**Description:** System test support**Institution :** LBNL/UC-Junior**Contact:**

Costs associated with laboratory system tests at CERN and development of local testing infrastructure for use during final assembly.

Basis of Estimate: Level of Effort**Details of Estimate:** This is very rough estimate.

COST SUMMARY: (Project)	Base Cost (k\$)	Cont Cost (k\$)	Cont %	Total Cost (k\$)	EDIA Labor (k\$)	Mfg Labor (k\$)	EDIA Matls (k\$)	Mfg Matls (k\$)	FTEs Project	FTEs Other
	54	0	0	54	0	0	0	54	0.0	0.0

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	50	0	0	0	0	0.0	54.000
	50	0	0	0	0	0.0	54.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	0	0	0	0	2	1	1	0

PROFILE SUMMARY:	FY 96 (k\$)	FY 97 (k\$)	FY 98 (k\$)	FY 99 (k\$)	FY 00 (k\$)	FY 01 (k\$)	FY 02 (k\$)	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	Total (k\$)
	0	0	0	0	0	0	27	27	0	0	54