

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
	6753	3012	45	9765	1700	1252	736	3065	52.5	35.4

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	1320	0	0	6199	4932	0	0	11625	6071	180	14073	1252.140
MFG MC	0	0	0	0	1016	2319	0	0	4373	1102	0	2608	345.860
MFG B/I	0	0	0	0	1540	22390	0	0	0	0	0	0	1061.780
EDIA P	0	15150	1295	8360	0	0	0	0	0	0	0	3080	1699.803
EDIA MC	0	220	3080	1320	0	0	0	0	2640	0	0	1228	470.938
EDIA B/I	0	17464	15620	3880	0	1320	0	0	0	0	0	0	3060.111
	0	34154	19995	13560	8755	30961	0	0	18638	7173	180	20989	7890.632

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	1474	13	0	364	0	1008.5	3065.443
MFG MC	337	0	0	44	0	634.2	1080.294
EDIA P	25	0	159	0	486	0.0	735.832
EDIA MC	0	0	40	0	0	0.0	48.000
	1836	13	199	408	486	1642.7	4929.569

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	4	3387	3863	3961	1251	354	12820

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
	2586	1352	52	3938	530	342	601	1113	14.6	17.7

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Shops	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	1898	1980	0	0	0	3566	0	0	341.630
MFG MC	0	0	0	0	738	1878	0	0	0	1102	0	0	185.212
MFG B/I	0	0	0	0	0	16360	0	0	0	0	0	0	768.739
EDIA P	0	2640	1295	6160	0	0	0	0	0	0	0	0	530.171
EDIA MC	0	0	3080	1320	0	0	0	0	0	0	0	0	389.537
EDIA B/I	0	0	12100	1320	0	1320	0	0	0	0	0	0	1219.368
	0	2640	16475	8800	2636	21538	0	0	0	4668	0	0	3434.657

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	716	4	0	0	0	295.0	1113.196
MFG MC	252	0	0	0	0	0.0	280.503
EDIA P	0	0	73	0	486	0.0	600.637
EDIA MC	0	0	40	0	0	0.0	48.000
	968	4	113	0	486	295.0	2042.336

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	1472	1162	1636	864	344	5477

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
	1131	539	48	1670	530	0	601	0	8.2	8.4

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Shops	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
EDIA P	0	2640	1295	6160	0	0	0	0	0	0	0	0	530.171
EDIA MC	0	0	3080	1320	0	0	0	0	0	0	0	0	389.537
EDIA B/I	0	0	12100	1320	0	1320	0	0	0	0	0	0	1219.368
	0	2640	16475	8800	0	1320	0	0	0	0	0	0	2139.076

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	73	0	486	0.0	600.637
EDIA MC	0	0	40	0	0	0.0	48.000
	0	0	113	0	486	0.0	648.637

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	1043	604	522	469	150	2788

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
	136	41	30	177	106	0	30	0	1.0	0.5

MANPOWER SUMMARY:	S.W.		ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin.	Other	Contract	Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)					Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)		Student (hrs)
EDIA P	0	0	1295	440	0	0	0	0	0	0	0	0	105.750
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	62.435
	0	0	2175	440	0	0	0	0	0	0	0	0	168.185

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	25	0	0	0.0	30.000
	0	0	25	0	0	0.0	30.000

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	198	0	0	0	0	198

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: On project funds assumes one ME for first half of FY01 and 50% of designer(0.25FTE) for same period for all prototype design effort. Another 0.5FTE ME is supported by base funds. Substantial travel costs will be incurred in the first half of FY01, resulting from multiple trips and long stays at RAL and CERN by the 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
	106	34	32	140	76	0	30	0	0.8	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	440	0	0	0	0	0	0	0	0	76.306
EDIA B/I	0	0	880	0	0	0	0	0	0	0	0	0	62.435
	0	0	1760	440	0	0	0	0	0	0	0	0	138.741

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	25	0	0	0.0	30.000
	0	0	25	0	0	0.0	30.000

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	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	169	0	0	0	0	169

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: Completion of ongoing prototype tasks and documentation of same in the first half of FY01. Extrapolated from effort in FY00.

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	7	24	37	29	0	0	0	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\$)
EDIA P	0	0	415	0	0	0	0	0	0	0	0	0	29.444
	0	0	415	0	0	0	0	0	0	0	0	0	29.444

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

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	29	0	0	0	0	29

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
	995	498	50	1493	424	0	571	0	7.3	7.9

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Shops	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
EDIA P	0	2640	0	5720	0	0	0	0	0	0	0	0	424.421
EDIA MC	0	0	3080	1320	0	0	0	0	0	0	0	0	389.537
EDIA B/I	0	0	11220	1320	0	1320	0	0	0	0	0	0	1156.933
	0	2640	14300	8360	0	1320	0	0	0	0	0	0	1970.891

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	48	0	486	0.0	570.637
EDIA MC	0	0	40	0	0	0.0	48.000
	0	0	88	0	486	0.0	618.637

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	845	604	522	469	150	2590

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: This includes final production drawings for sectors and related attachment parts. We assume here that the design has been largely finalized during the prototype phase (by first half of FY01 and before) and that only 220 hours of designer time is needed for possible drawing revisions, updates.

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	11	0	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\$)
EDIA P	0	0	0	220	0	0	0	0	0	0	0	0	10.992
	0	0	0	220	0	0	0	0	0	0	0	0	10.992

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	11	0	0	0	0	11

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: The engineering design will be provided by Hytec, Inc under subcontract. A detailed estimate of effort is summarized in the supporting material. A total of \$117.1K of design funding 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
	124	25	20	148	0	0	124	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	0	0	0	0	117	0.0	123.539
	0	0	0	0	117	0.0	123.539

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	80	43	0	0	0	124

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. A detailed estimate is provided in the supporting documentation. A total of \$369,100 is costed.

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
	389	78	20	467	0	0	389	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	0	0	0	0	369	0.0	389.498
	0	0	0	0	369	0.0	389.498

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	296	72	22	0	0	389

WBS Number: 1.1.1.1.1.2.4 **Description:** Thermal barriers

Institution : LBNL/UC- Senior

Contact: E. Anderssen

Design of the the thermal/EMI barriers that support the pixel system.

Basis of Estimate: Engineering judgement

Details of Estimate: The initial design is covered under prototype design for the first half of FY01. Design effort after a decision point in mid-FY01 is contingent upon obtaining management contingency funding to proceed towards design and production of this item. All design effort and travel for second half of FY01 and beyond is put into management contingency or on 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	219	0	219	0	0	0	0	2.5	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\$)
EDIA MC	0	0	3080	1320	0	0	0	0	0	0	0	0	389.537
EDIA B/I	0	0	1760	0	0	0	0	0	0	0	0	0	184.905
	0	0	4840	1320	0	0	0	0	0	0	0	0	574.442

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	40	0	0	0.0	48.000
	0	0	40	0	0	0.0	48.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	6	15	8	15	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	207	173	173	70	0	622

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: The work will be done by LBNL and New Mexico engineers and designers supported by ATLAS and the base program. The division of labor between LBL and New Mexico is not yet known, so all work is currently costed at LBL rates. Some LBL support from 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
	307	113	37	420	271	0	36	0	3.0	1.8

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
EDIA P	0	2640	0	2640	0	0	0	0	0	0	0	0	270.530
EDIA B/I	0	0	3080	0	0	0	0	0	0	0	0	0	218.521
	0	2640	3080	2640	0	0	0	0	0	0	0	0	489.051

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	30	0	0	0.0	36.000
	0	0	30	0	0	0.0	36.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	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	108	160	160	98	0	525

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.

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	12	37	45	33	0	0	0	0.4	0.8

MANPOWER SUMMARY:	S.W.		Risk				Weight			Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Admin. Super. (hrs)	Other Admin. (hrs)	Contract Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
EDIA P	0	0	0	660	0	0	0	0	0	0	0	0	32.977
EDIA B/I	0	0	1320	0	0	0	0	0	0	0	0	0	138.679
	0	0	1320	660	0	0	0	0	0	0	0	0	171.656

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	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	46	57	68	0	0	172

WBS Number: 1.1.1.1.1.2.7 **Description:** Final Assembly/Installation

Institution : LBNL/UC- Senior **Contact:** F. Goozen

Design of disk/support frame final assembly and installation tooling and procedures at CERN.

Basis of Estimate: Physicist estimate

Details of Estimate: Engineer supported by base program aided by part time designer supported by project.

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
	132	49	37	180	110	0	22	0	1.3	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\$)
EDIA P	0	0	0	2200	0	0	0	0	0	0	0	0	109.922
EDIA B/I	0	0	3960	0	0	0	0	0	0	0	0	0	416.036
	0	0	3960	2200	0	0	0	0	0	0	0	0	525.958

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	18	0	0	0.0	21.600
	0	0	18	0	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	
	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	46	49	49	278	126	548

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	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	0	1320	0	1320	0	0	0	0	0	0	83.226
	0	0	0	1320	0	1320	0	0	0	0	0	0	83.226

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	28	28	28	0	0	83

WBS Number: 1.1.1.1.1.2.9 **Description:** Integration/Project Supervision

Institution : LBNL/UC- Senior **Contact:** E. Anderssen

Costs associated with overall systems integration, management and supervision.

Basis of Estimate: Physicist estimate

Details of Estimate: This will be done by LBNL engineers and supported by the 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	115.566
	0	0	1100	0	0	0	0	0	0	0	0	0	115.566

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	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	23	23	23	23	23	116

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: (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
	197	119	60	316	0	59	0	138	0.9	1.0

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	182	220	0	0	0	742	0	0	58.995
MFG MC	0	0	0	0	0	0	0	0	0	422	0	0	22.129
MFG B/I	0	0	0	0	0	1822	0	0	0	0	0	0	91.036
	0	0	0	0	182	2042	0	0	0	1164	0	0	172.160

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	124	0	0	0	0	0.0	138.062
MFG MC	32	0	0	0	0	0.0	35.705
	156	0	0	0	0	0.0	173.767

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	188	158	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: Extrapolation of current rate up to PRR date in Feb. 01.

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	2	14	19	0	11	0	6	0.1	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	220	0	0	0	0	0	0	10.992
MFG B/I	0	0	0	0	0	600	0	0	0	0	0	0	29.979
	0	0	0	0	0	820	0	0	0	0	0	0	40.971

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	5	0	0	0	0	0.0	5.565
	5	0	0	0	0	0.0	5.565

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

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	47	0	0	0	0	47

WBS Number: 1.1.1.1.2.2 **Description:** Disk Support Rings

Institution : LBNL/UC- Senior

Contact: W. Miller

Prototype fabrication of disk support rings and mounts.

Details of Estimate: Remainder of work is 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 gn	Technical	C o s t	Schedule	
	0	0	0	0	0	0	0	0

WBS Number: 1.1.1.1.2.3

Description: Support Frame

Institution : LBNL/UC- Senior

Contact: E. Anderssen

Prototype fabrication of support frame and associated elements.

Basis of Estimate: Engineering judgement

Details of Estimate: Prototype fabrication related to support frame is completed. B-layer support prototype is not and is costed here. Production procedures overlap with thermal barrier. If thermal barrier is released from management contingency, would not build B-layer support prototype - methods covered under thermal barrier prototype. B-layer support prototype estimated at 10665 in materials and 156 hours of shop time in FY01(on project) and 166 hours of mechanical tech(on 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
	20	5	24	25	0	8	0	12	0.1	0.1

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	0	0	156	0	0	8.180
MFG B/I	0	0	0	0	0	0	166	0	0	0	0	0	0	8.294
	0	0	0	0	0	0	166	0	0	0	156	0	0	16.474

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	11.870
	11	0	0	0	0	0.0	11.870

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

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	20	8	0	0	0	28

WBS Number: 1.1.1.1.2.4

Description: Thermal Barriers

Institution : LBNL/UC- Senior

Contact: E. Anderssen

Prototype fabrication of thermal barriers/EMI barriers.

Basis of Estimate: Engineering judgement

Details of Estimate: This includes both mockups and prototype using proposed materials and construction techniques. Prototype is put under management contingency. Mockup is costed here. Mockup is 1558 materials, 208 hours shop and 68 hours mech tech(base). Prototype is 32080 materials and 422 shop hours(both under management contingency) and 476 hours mech tech(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
	13	47	368	59	0	11	0	2	0.4	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	208	0	0	10.907
MFG MC	0	0	0	0	0	0	0	0	0	0	422	0	0	22.129
MFG B/I	0	0	0	0	0	0	544	0	0	0	0	0	0	27.181
	0	0	0	0	0	0	544	0	0	0	630	0	0	60.217

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	2	0	0	0	0	0.0	1.734
MFG MC	32	0	0	0	0	0.0	35.705
	34	0	0	0	0	0.0	37.439

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	52	46	0	0	0	98

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)	148	65	44	213	0	29	0	119	0.3	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	182	0	0	0	0	378	0	0	28.916
MFG B/I	0	0	0	0	0	512	0	0	0	0	0	0	25.582
	0	0	0	0	182	512	0	0	0	378	0	0	54.498

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	107	0	0	0	0	0.0	118.893
	107	0	0	0	0	0.0	118.893

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	70	104	0	0	0	173

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: We assume four iterations of cable prototypes not including PP0.

Cable prototypes are in FY01: materials=23398 and 120 hours of mech tech. In FY02 materials = 31568 and 120 hours of mech tech.

Also include three rounds of PP0 prototypes at \$4800k per round(verbal quote) + loading of PP0(150 hours of elec. Tech).

Prototype of mechanical support occurs in FY02. 7456 M&S, 178 hours of shop time, 272 hours of mechanical tech time(assumed to be base program) and 32 hours of elec. tech time.

Materials in FY01: 23398+9600=32998
in FY02:31568+4800+7456=43824

Mech tech in FY01: 120
in FY02: 120+272=392

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
	104	46	44	150	0	18	0	86	0.2	0.3

MANPOWER SUMMARY:	S.W.							Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)		
MFG P	0	0	0	0	182	0	0	0	0	178	0	0	18.428	
MFG B/I	0	0	0	0	0	512	0	0	0	0	0	0	25.582	
	0	0	0	0	182	512	0	0	0	178	0	0	44.010	

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	77	0	0	0	0	0.0	85.503
	77	0	0	0	0	0.0	85.503

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	48	82	0	0	0	130

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: Extrapolation of current rate of expenditure on similar items into FY01 and 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
	44	19	44	63	0	10	0	33	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	10.488
	0	0	0	0	0	0	0	0	0	200	0	0	10.488

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	33.390
	30	0	0	0	0	0.0	33.390

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	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	22	22	0	0	0	44

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 gn	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: (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: 1.1.1.1.2.8

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 gn	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)	1258	694	55	1952	0	283	0	975	5.5	8.3

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Shops	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	1716	1760	0	0	0	2824	0	0	282.635
MFG MC	0	0	0	0	738	1878	0	0	0	680	0	0	163.083
MFG B/I	0	0	0	0	0	14538	0	0	0	0	0	0	677.703
	0	0	0	0	2454	18176	0	0	0	3504	0	0	1123.421

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	592	4	0	0	0	295.0	975.134
MFG MC	220	0	0	0	0	0.0	244.798
	812	4	0	0	0	295.0	1219.932

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	241	399	1114	395	194	2343

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. See supporting notes for detailed fabrication costs.

Thermal QA uses IR thermography(equipment covered under Test Equipment) and labor is mechanical technician at 25% time for one year 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
	145	41	28	185	0	82	0	63	1.3	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	0	0	1760	0	0	0	501	0	0	81.756
MFG B/I	0	0	0	0	0	0	2640	0	0	0	0	0	0	83.226
	0	0	0	0	0	0	4400	0	0	0	501	0	0	164.982

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	57	0	0	0	0	0.0	63.140
	57	0	0	0	0	0.0	63.140

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	159	69	0	0	0	228

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: Engineering judgement

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
	126	40	32	167	0	0	0	126	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	113	0	0	0	0	0.0	126.156
	113	0	0	0	0	0.0	126.156

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	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	126	0	0	0	126

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 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
	243	78	32	321	0	0	0	243	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	243.377
	0	0	0	0	0	230.0	243.377

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	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	122	122	0	0	243

WBS Number: 1.1.1.1.3.4

Description: B-layer Support

Institution : LBNL/UC- Senior

Contact: E. Anderssen

Support shell and other structures for the B-layer that are attached to the support frame.

Basis of Estimate: Engineering judgement

Details of Estimate: In FY03: materials estimated at 14656 and 186 shop hours and 193 hours mech tech(base)
In FY04: materials estimated at 24905 and 186 shop hours and 193 hours mech tech(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
	64	30	47	93	0	20	0	44	0.2	0.2

MANPOWER SUMMARY:	S.W.		Admin.					Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)		
MFG P	0	0	0	0	0	0	0	0	0	372	0	0	19.507	
MFG B/I	0	0	0	0	0	386	0	0	0	0	0	0	19.286	
	0	0	0	0	0	386	0	0	0	372	0	0	38.793	

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	44.025
	40	0	0	0	0	0.0	44.025

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	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	36	47	0	83

WBS Number: 1.1.1.1.3.5

Description: Thermal Barriers

Institution : LBNL/UC- Senior

Contact: E. Anderssen

Thermal barrier for SCT system and integrated rails that support the pixel system. This is all in management contingency.

Basis of Estimate: Engineering judgement

Details of Estimate: FY02: 21060 materials, 248 hours shop and 24 hours mech tech
 FY03: 141687 materials, 432 hours shop and 1854 mech tech.

All mech tech put in management contingency. Some would be base supported if moved to 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
	0	189	0	189	0	0	0	0	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 MC	0	0	0	0	0	1878	0	0	0	680	0	0	129.492
	0	0	0	0	0	1878	0	0	0	680	0	0	129.492

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG MC	163	0	0	0	0	0.0	181.137
	163	0	0	0	0	0.0	181.137

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			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	38	273	0	0	311

WBS Number: 1.1.1.1.3.6

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
	311	177	57	487	0	124	0	186	1.9	0.5

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	Shops (hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	1716	0	0	0	0	861	0	0	124.214
MFG MC	0	0	0	0	738	0	0	0	0	0	0	0	33.591
MFG B/I	0	0	0	0	0	952	0	0	0	0	0	0	47.566
	0	0	0	0	2454	952	0	0	0	861	0	0	205.371

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	167	0	0	0	0	0.0	186.293
MFG MC	57	0	0	0	0	0.0	63.661
	225	0	0	0	0	0.0	249.954

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	31	424	0	0	455

WBS Number: 1.1.1.1.3.6.1 **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
	84	36	43	120	0	39	0	45	0.4	0.4

MANPOWER SUMMARY:	S.W.		Admin.					Other Contract		Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	224	0	0	0	0	528	0	0	38.880
MFG B/I	0	0	0	0	0	736	0	0	0	0	0	0	36.774
	0	0	0	0	224	736	0	0	0	528	0	0	75.654

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	44.989
	40	0	0	0	0	0.0	44.989

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	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	121	0	0	121

WBS Number: 1.1.1.1.3.6.2 **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: Goals

FY02: 86 electech hours, 24057 materials

FY03: 1604 elec tech hours, 69629 materials

Baseline scope

FY02: 57 elec tech,

Mechanical tech time in services mechanical support.

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
	126	64	51	190	0	56	0	70	1.0	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	1130	0	0	0	0	0	0	0	56.460
MFG MC	0	0	0	0	560	0	0	0	0	0	0	0	27.980
	0	0	0	0	1690	0	0	0	0	0	0	0	84.440

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	63	0	0	0	0	0.0	69.749
MFG MC	31	0	0	0	0	0.0	34.523
	94	0	0	0	0	0.0	104.272

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	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	31	158	0	0	189

WBS Number: 1.1.1.1.3.6.3

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	Cont Cost	Cont %	Total Cost	EDIA Labor	Mfg Labor	EDIA Matls	Mfg Matls	FTEs Project	FTEs Other
	(k\$)	(k\$)		(k\$)	(k\$)	(k\$)	(k\$)	(k\$)		
	29	12	41	40	0	17	0	11	0.2	0.1

MANPOWER SUMMARY:	S.W.		ME	Design	ET	MT	Admin.	Other	Contract	Tech.	Student	Total w/ overhead	
	Prof	EE					Super.	Admin.	Labor				Shops
MFG P	0	0	0	0	0	0	0	0	0	333	0	0	17.462
MFG B/I	0	0	0	0	0	216	0	0	0	0	0	0	10.792
	0	0	0	0	0	216	0	0	0	333	0	0	28.254

MATERIAL SUMMARY:	Pur. Mat.	Stores	Travel	Low Level	R + D	High Level	Total w/ overhead
MFG P	10	0	0	0	0	0.0	11.152
	10	0	0	0	0	0.0	11.152

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	4	6	4	15	4	1	1	

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

WBS Number: 1.1.1.1.3.6.4 **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 +220 per part. Load time is estimated to be 1.5 hrs each.

Baseline scope is taken to be 241 PP0s. Fab costs are 1250+241x220=54270
Load is 362 hours.

Management contingency is 26180 for fab and 178 hours for load.

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	65	91	137	0	11	0	60	0.3	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	362	0	0	0	0	0	0	0	11.412
MFG MC	0	0	0	0	178	0	0	0	0	0	0	0	5.611
	0	0	0	0	540	0	0	0	0	0	0	0	17.023

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	54	0	0	0	0	0.0	60.403
MFG MC	26	0	0	0	0	0.0	29.138
	80	0	0	0	0	0.0	89.541

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	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	107	0	0	107

WBS Number: 1.1.1.1.3.7

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 note for tooling and shop labor.

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

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
	94	51	54	145	0	50	0	44	0.5	1.5

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	0	950	0	0	49.817
MFG B/I	0	0	0	0	0	2640	0	0	0	0	0	0	131.906
	0	0	0	0	0	2640	0	0	0	950	0	0	181.723

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	44.075
	40	0	0	0	0	0.0	44.075

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	11	127	88	0	226

WBS Number: 1.1.1.1.3.8

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:	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)	92	50	54	142	0	7	0	85	0.1	2.0

MANPOWER SUMMARY:	S.W.						Admin. Other Contract			Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	0	140	0	0	7.341
MFG B/I	0	0	0	0	0	3520	0	0	0	0	0	0	175.875
	0	0	0	0	0	3520	0	0	0	140	0	0	183.216

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	4	0	0	0	0.0	84.659
	72	4	0	0	0	0.0	84.659

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	130	138	0	268

WBS Number: 1.1.1.1.3.9

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.

IR camera for production sector QA	65000
SmartScope maintenance	2,000
Chiller maintenance	2,000
Environmental chamber	10,000

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
	100	39	39	139	0	0	0	100	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	28	0	0	0	0	65.0	99.934
	28	0	0	0	0	65.0	99.934

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	

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	82	2	2	7	7	100

WBS Number: 1.1.1.1.3.10 **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.

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
	83	0	0	83	0	0	0	83	0.0	2.5

MANPOWER SUMMARY:	S.W.		Admin.				Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG B/I	0	0	0	0	0	4400	0	0	0	0	0	0	219.844
	0	0	0	0	0	4400	0	0	0	0	0	0	219.844

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	75	0	0	0	0	0.0	83.475
	75	0	0	0	0	0.0	83.475

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	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	116	188	303

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 reproduction order launched.

Details of Estimate: The number of sensor wafers to be procured in 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)	303	109	36	412	70	116	0	117	5.3	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract	Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	1320	0	0	0	0	0	0	0	0	0	5280	116.025
EDIA P	0	1598	0	0	0	0	0	0	0	0	0	0	70.230
EDIA MC	0	220	0	0	0	0	0	0	0	0	0	880	19.337
	0	3138	0	0	0	0	0	0	0	0	0	6160	205.592

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	22	0	0	0	0	92.9	116.571
MFG MC	0	0	0	0	0	58.0	57.994
	22	0	0	0	0	150.9	174.565

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	97	167	116	0	0	380

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
	70	7	10	77	70	0	0	0	0.9	0.0

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Shops	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
EDIA P	0	1598	0	0	0	0	0	0	0	0	0	0	70.230
	0	1598	0	0	0	0	0	0	0	0	0	0	70.230

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	35	35	0	0	0	70

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
	70	7	10	77	70	0	0	0	0.9	0.0

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	Shops (hrs)	(hrs)	(hrs)	
EDIA P	0	1598	0	0	0	0	0	0	0	0	0	0	70.230
	0	1598	0	0	0	0	0	0	0	0	0	0	70.230

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	35	35	0	0	0	70

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 Hoferkamp and additional time from physicists at UNM.

Details of Estimate: The engineering design from Martin Hoferkamp. Additional time from physicists at UNM. This is estimated to be 35 in FY01. Another 35K 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
	70	7	10	77	70	0	0	0	0.9	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	1598	0	0	0	0	0	0	0	0	0	0	0	70.230
	0	1598	0	0	0	0	0	0	0	0	0	0	0	70.230

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	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	35	35	0	0	0	70

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
	233	102	44	334	0	116	0	117	4.4	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	1320	0	0	0	0	0	0	0	0	0	5280	116.025
EDIA MC	0	220	0	0	0	0	0	0	0	0	0	880	19.337
	0	1540	0	0	0	0	0	0	0	0	0	6160	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 P	22	0	0	0	0	92.9	116.571
MFG MC	0	0	0	0	0	58.0	57.994
	22	0	0	0	0	150.9	174.565

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	62	132	116	0	0	310

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: (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
	233	102	44	334	0	116	0	117	4.4	0.0

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	1320	0	0	0	0	0	0	0	0	0	5280	116.025
EDIA MC	0	220	0	0	0	0	0	0	0	0	0	880	19.337
	0	1540	0	0	0	0	0	0	0	0	0	6160	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 P	22	0	0	0	0	92.9	116.571
MFG MC	0	0	0	0	0	58.0	57.994
	22	0	0	0	0	150.9	174.565

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	62	132	116	0	0	310

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
	16	16	100	32	0	0	0	16	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	16.138
	16	0	0	0	0	0.0	16.138

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	16	0	0	0	0	16

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
	16	16	100	32	0	0	0	16	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	16.138
	16	0	0	0	0	0.0	16.138

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

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	16	0	0	0	0	16

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
	93	51	55	144	0	0	0	93	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	92.9	92.873
MFG MC	0	0	0	0	0	58.0	57.994
	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	

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 SVXII) 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
	124	34	28	158	0	116	0	8	4.4	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\$)
MFG P	0	1320	0	0	0	0	0	0	0	0	0	5280	116.025
EDIA MC	0	220	0	0	0	0	0	0	0	0	0	880	19.337
	0	1540	0	0	0	0	0	0	0	0	0	6160	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 P	6	0	0	0	0	0.0	7.560
	6	0	0	0	0	0.0	7.560

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	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	46	39	58	0	0	143

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
	1830	656	36	2486	861	62	81	826	8.4	6.9

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	2640	0	0	300	61.722
EDIA P	0	9152	0	0	0	0	0	0	0	0	0	0	861.409
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
EDIA B/I	0	12144	0	0	0	0	0	0	0	0	0	0	1091.639
	0	21296	0	0	0	0	0	0	5280	0	0	300	2073.010

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	314	0	0	56	0	380.4	825.878
MFG MC	0	0	0	0	0	459.6	486.212
EDIA P	0	0	68	0	0	0.0	81.000
	314	0	68	56	0	840.0	1393.090

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	1173	1439	829	26	0	3466

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)	942	269	28	1211	861	0	81	0	5.2	6.9

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	9152	0	0	0	0	0	0	0	0	0	0	861.409
EDIA B/I	0	12144	0	0	0	0	0	0	0	0	0	0	1091.639
	0	21296	0	0	0	0	0	0	0	0	0	0	1953.048

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	68	0	0	0.0	81.000
	0	0	68	0	0	0.0	81.000

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	798	798	438	0	0	2034

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:	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)	469	117	25	586	415	0	54	0	2.6	6.9

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
EDIA P	0	4576	0	0	0	0	0	0	0	0	0	414.714
EDIA B/I	0	12144	0	0	0	0	0	0	0	0	0	1091.639
	0	16720	0	0	0	0	0	0	0	0	0	1506.353

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	45	0	0	0.0	54.000
	0	0	45	0	0	0.0	54.000

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	606	667	287	0	0	1560

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.

FY01 1.25 FTE junior designers, 2.0 senior designers

FY02 1.0 junior designers, 2.5 senior designers

FY03 0.5 junior designers, 1 senior 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
	469	117	25	586	415	0	54	0	2.6	5.7

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
EDIA P	0	4576	0	0	0	0	0	0	0	0	0	0	414.714
EDIA B/I	0	9944	0	0	0	0	0	0	0	0	0	0	945.654
	0	14520	0	0	0	0	0	0	0	0	0	0	1360.368

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	45	0	0	0.0	54.000
	0	0	45	0	0	0.0	54.000

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	547	609	258	0	0	1414

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.

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
	313	78	25	392	277	0	36	0	1.5	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	2640	0	0	0	0	0	0	0	0	0	0	277.358
EDIA B/I	0	7040	0	0	0	0	0	0	0	0	0	0	739.620
	0	9680	0	0	0	0	0	0	0	0	0	0	1016.978

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	30	0	0	0.0	36.000
	0	0	30	0	0	0.0	36.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	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	384	477	192	0	0	1053

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
	155	39	25	194	137	0	18	0	1.1	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\$)
EDIA P	0	1936	0	0	0	0	0	0	0	0	0	0	137.356
EDIA B/I	0	2904	0	0	0	0	0	0	0	0	0	0	206.034
	0	4840	0	0	0	0	0	0	0	0	0	0	343.390

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	15	0	0	0.0	18.000
	0	0	15	0	0	0.0	18.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	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	163	132	66	0	0	361

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	1.3

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 B/I	0	2200	0	0	0	0	0	0	0	0	0	0	145.985
	0	2200	0	0	0	0	0	0	0	0	0	0	145.985

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	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	58	58	29	0	0	146

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:	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)	169	54	32	223	169	0	0	0	1.1	0.0

MANPOWER SUMMARY:	S.W.						Admin.	Other	Contract	Tech.		Total w/	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	overhead (k\$)
EDIA P	0	1936	0	0	0	0	0	0	0	0	0	0	169.337
	0	1936	0	0	0	0	0	0	0	0	0	0	169.337

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	140	29	0	0	0	169

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

Details of Estimate: FY01 50% of V. Risk, and 10% of J. Joseph. Other 50% of Risk in FY01 is under 1.1.1.5.1.3.2

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
	111	40	36	151	111	0	0	0	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\$)
EDIA P	0	1056	0	0	0	0	0	0	0	0	0	0	110.943
	0	1056	0	0	0	0	0	0	0	0	0	0	110.943

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	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	111	0	0	0	0	111

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 880 hrs of junior 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
	58	14	24	72	58	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	58.394
	0	880	0	0	0	0	0	0	0	0	0	0	58.394

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	29	29	0	0	0	58

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

Details of Estimate: Assumes following fractions of senior engineer(limited by availability of suitable manpower).

FY01 25%
 FY02 50%
 FY03 75%

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
	304	97	32	402	277	0	27	0	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\$)
EDIA P	0	2640	0	0	0	0	0	0	0	0	0	0	0	277.358
	0	2640	0	0	0	0	0	0	0	0	0	0	0	277.358

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	23	0	0	0.0	27.000
	0	0	23	0	0	0.0	27.000

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	6	4	8	8	2	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	52	101	151	0	0	304

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: (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
	512	80	16	592	0	0	0	512	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	280	0	0	10	0	159.5	511.528
	280	0	0	10	0	159.5	511.528

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	374	137	0	0	0	512

WBS Number: 1.1.1.3.2.1

Description: Atmel/DMILL prototypes

Institution :

Contact: K. Einsweiler

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

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
	160	0	0	160	0	0	0	160	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	120	0	0	0	0	0.0	160.476
	120	0	0	0	0	0.0	160.476

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	160	0	0	0	0	160

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
	33	0	0	33	0	0	0	33	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	33	0	0	0	0	0.0	33.440
	33	0	0	0	0	0.0	33.440

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

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	33	0	0	0	0	33

WBS Number: 1.1.1.3.2.1.2

Description: FE-D3

Institution : Ohio State U.

Contact: K. Einsweiler

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

Basis of Estimate: In Contract

Details of Estimate: Assumes two full lot runs(2 x 20 wafers minimum). Cost is based on Temic Frame contract with CERN and US fraction of total 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
	127	0	0	127	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	87	0	0	0	0	0.0	127.036
	87	0	0	0	0	0.0	127.036

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

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	127	0	0	0	0	127

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: Penalty payment of \$10,000 for cancellation of FE-H1

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	0	0	10	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	10	0	0.0	10.000
	0	0	0	10	0	0.0	10.000

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	0	0	0	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	10	0	0	0	0	10

WBS Number: 1.1.1.3.2.3

Description: 0.25 Micron

Institution :

Contact: K. Einsweiler

Prototypes in 0.25 micron technology

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
	84	19	22	103	0	0	0	84	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	84.5	84.457
	0	0	0	0	0	84.5	84.457

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	31	54	0	0	0	84

WBS Number: 1.1.1.3.2.3.1 **Description:** 1st prototype

Institution : Ohio State U.

Contact: K. Einsweiler

6 wafer run with IBM. Funds may go through other institutions.

Basis of Estimate: In Contract

Details of Estimate: Cost based on Frame Contract between IBM and CERN and US fraction(22%) of total cost.. Contingency is for additional 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
	31	7	22	37	0	0	0	31	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	30.7	30.724
	0	0	0	0	0	30.7	30.724

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	31	0	0	0	0	31

WBS Number: 1.1.1.3.2.3.2 **Description:** 2nd prototype

Institution : Ohio State U.

Contact: K. Einsweiler

2nd prototype run with 0.25 micron IBM

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
	54	12	22	66	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	0	0	0	0	0	53.7	53.733
	0	0	0	0	0	53.7	53.733

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	54	0	0	0	54

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 and 8" probe station for 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
	257	62	24	318	0	0	0	257	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	159	0	0	0	0	75.0	256.595
	159	0	0	0	0	75.0	256.595

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	173	83	0	0	0	257

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: 8" probe station: \$75K.

VME test boards -PLLs. Components for 10 PLLs funded in FY00 but not board fabrication or loading. Additional 10 boards to be fabricated for total of 20 to support all of pixel collaboration. Costs(components + board + loading) are estimated at
 $10*(500+500) + 10(2275+500+500)=42750.$

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

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

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

Probe cards are assumed to be produced in Europe and provided to collaboration.

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

Total materials costs $84,250 + 75000=159250$

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	62	24	318	0	0	0	257	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	159	0	0	0	0	75.0	256.595
	159	0	0	0	0	75.0	256.595

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	173	83	0	0	0	257

WBS Number: 1.1.1.3.3

Description: Production

Institution :

Contact: K. Einsweiler

Front-end IC and optoelectronics production and associated 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
	376	307	82	683	0	62	0	314	3.2	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	2640	0	0	300	61.722
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
	0	0	0	0	0	0	0	0	5280	0	0	300	119.962

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	221.0	314.350
MFG MC	0	0	0	0	0	459.6	486.212
	34	0	0	46	0	680.5	800.562

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	504	391	26	0	921

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)	274	236	86	510	0	58	0	216	3.0	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
	0	0	0	0	0	0	0	0	5280	0	0	0	116.480

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	168.0	215.630
MFG MC	0	0	0	0	0	459.6	486.212
	34	0	0	0	0	627.6	701.842

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	481	311	26	0	818

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 Atmel/DMILL for barrel Layer 1 and one of the three disks on each end. The remainder of the system is assumed to use IBM 0.25 micron. Costs are based on yields given in the module yield model table and from Frame Contract prices with each vendor. Minimum contractual yield(17%) from Atmel/DMILL is assumed. 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
	121	170	140	291	0	0	0	121	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	114.5	121.098
MFG MC	0	0	0	0	0	459.6	486.212
	0	0	0	0	0	574.0	607.310

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	423	184	0	0	607

WBS Number: 1.1.1.3.3.1.1.1 **Description:** Atmel(DMILL)

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: 497 DMILL wafers are required. Costs are based on Frame Contract for 500 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	107	0	107	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	459.6	486.212
	0	0	0	0	0	459.6	486.212

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	423	63	0	0	486

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: 170 wafers 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
	121	63	52	184	0	0	0	121	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	114.5	121.098
	0	0	0	0	0	114.5	121.098

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	121	0	0	121

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. 54 wafers 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
	57	29	52	86	0	0	0	57	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	53.6	56.690
	0	0	0	0	0	53.6	56.690

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	57	0	0	57

WBS Number: 1.1.1.3.3.1.3 **Description:** FE Testing

Institution : LBNL/UC- Senior

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.

DMILL testing is assumed to take 18 FTE months including a 6 month training period.

IBM testing is assumed to take 18 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
	96	37	39	133	0	58	0	38	3.0	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)	Mfg Shops (hrs)	Tech. Serv. (hrs)	Student (hrs)	Total w/ overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
EDIA MC	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
	0	0	0	0	0	0	0	0	5280	0	0	0	116.480

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	37.842
	34	0	0	0	0	0.0	37.842

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	58	70	26	0	154

WBS Number: 1.1.1.3.3.2

Description: Optoelectronics

Institution :

Contact: KK Gan

Production and associated testing of ICs for optoelectronics

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
	102	71	69	173	0	3	0	99	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	52.9	98.720
	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: Costs are based on minimum DMILL engineering run, Frame Contract and US fraction(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
	53	53	100	106	0	0	0	53	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	52.9	52.920
	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)

This assumes DMILL. If IBM is used instead, need 8" probe stations(50K project from contingency + 25K base support) is assumed.

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	18	36	67	0	3	0	46	0.2	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
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 gn	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	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
	790	325	41	1115	51	132	26	581	5.8	3.5

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	2321	0	0	0	472	20	0	3088	131.636
MFG MC	0	0	0	0	278	0	0	0	128	0	0	444	18.421
EDIA P	0	0	0	440	0	0	0	0	0	0	0	2640	50.991
EDIA MC	0	0	0	0	0	0	0	0	0	0	0	348	3.824
EDIA B/I	0	5280	0	800	0	0	0	0	0	0	0	0	287.154
	0	5280	0	1240	2599	0	0	0	600	20	0	6520	492.026

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	51	0	0	285	0	240.1	581.208
MFG MC	11	0	0	44	0	116.7	173.440
EDIA P	0	0	18	0	0	0.0	26.370
	63	0	18	329	0	356.8	781.018

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	212	351	710	0	0	1273

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 pigtails 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
	77	18	23	95	51	0	26	0	1.8	3.5

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	440	0	0	0	0	0	0	0	2640	50.991
EDIA B/I	0	5280	0	800	0	0	0	0	0	0	0	0	287.154
	0	5280	0	1240	0	0	0	0	0	0	0	2640	338.145

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	18	0	0	0.0	26.370
	0	0	18	0	0	0.0	26.370

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	121	142	101	0	0	365

WBS Number: 1.1.1.4.1.1

Description: Prototype design

Institution :

Contact: Rusty Boyd/KK Gan

Engineering design associated with prototype flex hybrids, pigtails 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
	18	4	20	22	10	0	9	0	0.5	1.3

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	0	0	0	0	0	0	0	0	0	0	880	9.669
EDIA B/I	0	1760	0	600	0	0	0	0	0	0	0	0	109.680
	0	1760	0	600	0	0	0	0	0	0	0	880	119.349

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	8.790
	0	0	6	0	0	0.0	8.790

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	121	7	0	0	0	128

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 infrastructure funding 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
	18	4	20	22	10	0	9	0	0.5	1.0

MANPOWER SUMMARY:	S.W.		Admin.				Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
EDIA P	0	0	0	0	0	0	0	0	0	0	0	880	9.669
EDIA B/I	0	1760	0	0	0	0	0	0	0	0	0	0	85.087
	0	1760	0	0	0	0	0	0	0	0	0	880	94.756

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	8.790
	0	0	6	0	0	0.0	8.790

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	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	104	0	0	0	0	104

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 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	0.1

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\$)
EDIA B/I	0	0	0	200	0	0	0	0	0	0	0	0	9.993
	0	0	0	200	0	0	0	0	0	0	0	0	9.993

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	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	10	0	0	0	0	10

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 FY01 and 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 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	7	7	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
	59	14	24	73	41	0	18	0	1.3	2.1

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\$)
EDIA P	0	0	0	440	0	0	0	0	0	0	0	1760	41.322
EDIA B/I	0	3520	0	200	0	0	0	0	0	0	0	0	177.474
	0	3520	0	640	0	0	0	0	0	0	0	1760	218.796

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	135	101	0	0	236

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: Level of Effort

Details of Estimate: R. Boyd supported by infrastructure or base funds. 2 1/2 time 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
	37	7	20	44	19	0	18	0	1.0	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\$)
EDIA P	0	0	0	0	0	0	0	0	0	0	0	1760	19.338
EDIA B/I	0	3520	0	0	0	0	0	0	0	0	0	0	170.174
	0	3520	0	0	0	0	0	0	0	0	0	1760	189.512

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

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	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	113	94	0	0	207

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
	22	7	31	29	22	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)	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	21.984
	0	0	0	440	0	0	0	0	0	0	0	0	21.984

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	22	0	0	0	22

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	0.1

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\$)
EDIA B/I	0	0	0	200	0	0	0	0	0	0	0	0	7.300
	0	0	0	200	0	0	0	0	0	0	0	0	7.300

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	7	0	0	7

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)	154	74	48	228	0	17	0	136	0.7	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	200	20	0	1080	17.451
	0	0	0	0	0	0	0	0	200	20	0	1080	17.451

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	115	0	0.0	136.170
	19	0	0	115	0	0.0	136.170

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	92	62	0	0	0	154

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 version 3.x.

Basis of Estimate: Parametric estimate

Details of Estimate: Based on scaling costs from 2.x prototypes. 200 pieces at \$125 each for flex fab + 200 pieces at \$50 each for components and assembly. Testing is 0.5 FTE student. Half of loading and testing in FY01 and half 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
	45	11	24	55	0	10	0	35	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	0	0	0	0	880	9.669
	0	0	0	0	0	0	0	0	0	0	0	0	880	9.669

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	35	0	0.0	35.000
	0	0	0	35	0	0.0	35.000

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	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	35	10	0	0	0	45

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 three rounds for optical hybrid prototypes. First round in PCB, 2nd and third rounds in ceramic hybrids.

Also include here test equipment and test boards for optical components and hybrids.

- Optical equipment 10K
- Test boards(6x1200) 7.2K
- Boards for beam tests and irradiations 8K
- Supplies, cables, etc 4K
- Optical package prototypes 3K
- First prototype 3.6K
- 2nd prototype 24K
- 3rd prototype 24K

Total materials 83800

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	48	58	130	0	2	0	80	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	0	0	200	2.321
	0	0	0	0	0	0	0	0	0	0	0	200	2.321

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	80	0	0.0	79.800
	0	0	0	80	0	0.0	79.800

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	10	6	8	4	4	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	41	41	0	0	0	82

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. Connectors are 3K minimum order. Labor to mount connectors and solder flex to pigtail is estimated at 200 hours. Fixture for this is estimated at \$200 for materials and 20 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
	27	16	58	42	0	5	0	21	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	200	20	0	0	5.461
	0	0	0	0	0	0	0	0	200	20	0	0	5.461

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	21.370
	19	0	0	0	0	0.0	21.370

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	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	16	11	0	0	0	27

WBS Number: 1.1.1.4.3

Description: Production

Institution :

Contact: Rusty Boyd/KK Gan

Production of flex hybrids. Two vendors are assumed.

Production of disk pigtailed. 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
	559	233	42	792	0	114	0	445	3.3	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	2321	0	0	0	272	0	0	2008	114.185
MFG MC	0	0	0	0	278	0	0	0	128	0	0	444	18.421
EDIA MC	0	0	0	0	0	0	0	0	0	0	0	348	3.824
	0	0	0	0	2599	0	0	0	400	0	0	2800	136.430

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	170	0	240.1	445.038
MFG MC	11	0	0	44	0	116.7	173.440
	44	0	0	214	0	356.8	618.478

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	146	609	0	0	755

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:	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)	387	163	42	550	0	37	0	350	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	561	0	0	0	0	0	0	1404	36.935
MFG MC	0	0	0	0	278	0	0	0	0	0	0	348	14.483
EDIA MC	0	0	0	0	0	0	0	0	0	0	0	348	3.824
	0	0	0	0	839	0	0	0	0	0	0	2100	55.242

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	102	0	240.1	349.700
MFG MC	0	0	0	39	0	116.7	155.540
	8	0	0	140	0	356.8	505.240

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	136	424	0	0	560

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 preliminary quotations from CERN and Compunetics. We assume 50% from each. Take CERN fab/testing costs + cutting to be \$85 per flex. Compunetics cost(including cutting) is taken to be \$125 per flex for an average cost of \$105 per hybrid. NRE for CERN is 2K. Shipping costs are taken to be 2.4K

Number of flex started is taken from module yield table. For goals is 3356. For baseline scope is 2245.

Baseline scope cost is $2245 * 105 = 235725 + 2000 + 2400 = 240,125$. We divide this equally between FY02 and FY03.

Goals cost would be 356,780 so management contingency is 116,655.

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)	240	100	42	340	0	0	0	240	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	240.1	240.125
MFG MC	0	0	0	0	0	116.7	116.655
	0	0	0	0	0	356.8	356.780

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	120	237	0	0	357

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/connectors are estimated at \$15 per flex.

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.

Baseline scope costs are $2245 \times (15+20) = 78575 + 15000 = 93575$ for materials. Labor is $2245 \times 0.5 \times 0.5 \text{ hrs} = 561$ hours.

Goals costs are $3356 \times (15+20) = 117460 + 15000 = 132460$ for materials. Labor is $3356 \times 0.5 \times 0.5 = 839$ hours.

So management contingency is 38885 for materials and 278 hours of labor.

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
	112	45	40	157	0	19	0	94	0.5	0.0

MANPOWER SUMMARY:	S.W.							Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)		
MFG P	0	0	0	0	561	0	0	0	0	0	0	0	0	18.903
MFG MC	0	0	0	0	278	0	0	0	0	0	0	0	0	9.367
	0	0	0	0	839	0	0	0	0	0	0	0	0	28.270

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	94	0	0.0	93.575
MFG MC	0	0	0	39	0	0.0	38.885
	0	0	0	132	0	0.0	132.460

CONTINGENCY FACTORS:	Risk				Weight			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	6	4	8	4	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	0	161	0	0	161

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.

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
	34	18	53	52	0	18	0	16	1.2	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	0	0	0	1404	18.032
MFG MC	0	0	0	0	0	0	0	0	0	0	0	348	5.116
EDIA MC	0	0	0	0	0	0	0	0	0	0	0	348	3.824
	0	0	0	0	0	0	0	0	0	0	0	2100	26.972

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	16	27	0	0	43

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 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	8	15	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

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
	16	8	52	24	0	8	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	7.713
EDIA MC	0	0	0	0	0	0	0	0	0	0	0	348	3.824
	0	0	0	0	0	0	0	0	0	0	0	1050	11.537

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	8	12	0	0	20

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 pieces including vendor testing. 6 different designs. 100 pieces per design. NRE 6*750=4500. Testing NRE 6*500=3000.

Connectors(\$3K minimum order).

Attach connectors and connect to flex at 2/hour=300 hours. Continuity testing includes fixture(1K) and labor at 10 mins each(contract labor rate).

Goals: Materials 35500. Labor is 400 hours.

Baseline scope: Materials 24140. Labor is 272 hours

Management contingency: Materials 11360. Labor is 128 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
	33	15	44	47	0	6	0	27	0.2	0.0

MANPOWER SUMMARY:	S.W.		Design				Admin. Other		Contract	Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	272	0	0	0	6.000
MFG MC	0	0	0	0	0	0	0	0	128	0	0	0	2.824
	0	0	0	0	0	0	0	0	400	0	0	0	8.824

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	24	0	0	0	0	0.0	26.868
MFG MC	11	0	0	0	0	0.0	12.644
	36	0	0	0	0	0.0	39.512

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	48	0	0	48

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
	140	56	40	195	0	71	0	68	1.4	0.0

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	Shops (hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	1760	0	0	0	0	0	0	604	71.250
MFG MC	0	0	0	0	0	0	0	0	0	0	0	96	1.114
	0	0	0	0	1760	0	0	0	0	0	0	700	72.364

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	68	0	0.0	68.470
MFG MC	0	0	0	5	0	0.0	5.256
	0	0	0	74	0	0.0	73.726

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	136	0	0	146

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: Estimate is based on optical package developed at OSU. Use of alternative package would make this cost zero if supplied by other collaborators(Taiwan). These are packages only for disk region.

Bases	2860
ULTEM	200
Jig material	500
Cap machining	2000
Base machining	2000
VCSEL	7150
PIN	1716

Material total 16426

Labor is 300 hour at student rate.

These numbers are for goals. Baseline scope is 11,170 and 204 hours. Management contingency is 5256 and 96 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
	14	8	56	21	0	2	0	11	0.2	0.0

MANPOWER SUMMARY:	S.W.							Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)		
MFG P	0	0	0	0	0	0	0	0	0	0	0	204	2.368	
MFG MC	0	0	0	0	0	0	0	0	0	0	0	96	1.114	
	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	11	0	0.0	11.170
MFG MC	0	0	0	5	0	0.0	5.256
	0	0	0	16	0	0.0	16.426

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	
	10	6	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	0	20	0	0	20

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, so management contingency is too small to bother with.

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	25	38	90	0	34	0	31	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	880	0	0	0	0	0	0	200	34.441
	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	31	0	0.0	30.800
	0	0	0	31	0	0.0	30.800

CONTINGENCY FACTORS:	<i>Risk</i>				<i>Weight</i>			Cont %
	Technical	C o s t	Schedule	Des i gn	Technical	C o s t	Schedule	
	10	6	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	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 both optical packages and optical hybrids.

- Fibers 10K
- Optical equipment 2K
- Burn-in equipment 4K
- Test equipment 2K
- Supplies 6K
- Storage and boxes 65*20=1.3K
- Shipping 1.2

Materials total 25500

Labor is 0.5 FTE tech(other 0.5 in module assembly and test) and 200 hours student. Again this is not scaled to obtain 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
	61	23	38	84	0	34	0	27	0.6	0.0

MANPOWER SUMMARY:	S.W.		Design				Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	880	0	0	0	0	0	0	200	34.441
	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	27	0	0.0	26.500
	0	0	0	27	0	0.0	26.500

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	
	10	6	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	10	51	0	0	61

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
	1102	520	47	1623	187	601	28	286	18.4	7.3

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	1980	2952	0	0	8513	2485	180	5405	601.127
MFG MC	0	0	0	0	0	441	0	0	4245	0	0	2164	142.227
MFG B/I	0	0	0	0	1540	6030	0	0	0	0	0	0	293.041
EDIA P	0	1760	0	1760	0	0	0	0	0	0	0	440	187.002
EDIA B/I	0	40	3520	1760	0	0	0	0	0	0	0	0	461.950
	0	1800	3520	3520	3520	9423	0	0	12758	2485	180	8009	1685.347

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	228	9	0	23	0	0.0	286.090
MFG MC	74	0	0	0	0	0.0	82.145
EDIA P	25	0	0	0	0	0.0	27.825
	327	9	0	23	0	0.0	396.060

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	4	393	706	635	343	0	2081

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: (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
	191	67	35	259	180	0	11	0	2.0	3.0

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.	Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
EDIA P	0	1760	0	1760	0	0	0	0	0	0	0	180.353
EDIA B/I	0	40	3520	1760	0	0	0	0	0	0	0	461.950
	0	1800	3520	3520	0	0	0	0	0	0	0	642.303

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	11.130
	10	0	0	0	0	0.0	11.130

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	4	196	439	14	0	0	653

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	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	277.358
	0	0	2640	0	0	0	0	0	0	0	0	0	277.358

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	92	185	0	0	0	277

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 and designer 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	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\$)
EDIA B/I	0	0	880	880	0	0	0	0	0	0	0	0	136.421
	0	0	880	880	0	0	0	0	0	0	0	0	136.421

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	136	0	0	0	136

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
	191	67	35	259	180	0	11	0	2.0	0.5

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
EDIA P	0	1760	0	1760	0	0	0	0	0	0	0	0	180.353
EDIA B/I	0	40	0	880	0	0	0	0	0	0	0	0	48.171
	0	1800	0	2640	0	0	0	0	0	0	0	0	228.524

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	11.130
	10	0	0	0	0	0.0	11.130

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	4	104	118	14	0	0	240

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	0.5

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	40	0	880	0	0	0	0	0	0	0	0	48.172
	0	40	0	880	0	0	0	0	0	0	0	0	48.171

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	4	22	22	0	0	0	48

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 0.5 FTE in FY01 and 0.25FTE in FY02 electrical engineer for dedicated module burn-in and test system. An additional 0.5FTE of designer time for probe cards, test cards - design, debugging and use.

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
	191	67	35	259	180	0	11	0	2.0	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	1760	0	1760	0	0	0	0	0	0	0	0	0	180.353
	0	1760	0	1760	0	0	0	0	0	0	0	0	0	180.353

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	11.130
	10	0	0	0	0	0.0	11.130

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	15	2	1	1	35	

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	82	96	14	0	0	191

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)	280	74	26	354	0	209	17	54	3.2	2.6

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\$)
MFG P	0	0	0	0	1100	1188	0	0	0	2124	180	1056	208.907
MFG B/I	0	0	0	0	0	4620	0	0	0	0	0	0	145.645
	0	0	0	0	1100	5808	0	0	0	2124	180	1056	354.552

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	9	0	0	0	0.0	53.988
EDIA P	15	0	0	0	0	0.0	16.695
	55	9	0	0	0	0.0	70.683

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	174	191	60	0	0	425

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 FY01, 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
	17	1	7	18	0	0	17	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	15	0	0	0	0	0.0	16.695
	15	0	0	0	0	0.0	16.695

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	6	6	6	0	0	17

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 minimum lot charge(\$120) from Okamoto. We assume 3 lots in each of FY01, 02 and 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
	1	0	16	1	0	0	0	1	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	1	0	0	0	0	0.0	1.202
	1	0	0	0	0	0.0	1.202

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	0	0	0	0	1

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: Dicing costs are based on minimum lot charge of \$100 and 5 lots per year.

Die sort assumes method used for SVXIII 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
	6	1	16	7	0	4	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	0	0	20	0	176	3.709
	0	0	0	0	0	0	0	0	0	0	20	0	176	3.709

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	2	0	0	0	0	0.0	2.115
	2	0	0	0	0	0.0	2.115

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	1	3	2	0	0	6

WBS Number: 1.1.1.5.2.4

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: (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
	196	55	28	251	0	150	0	46	2.4	2.1

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	1100	660	0	0	0	1464	80	880	149.748
MFG B/I	0	0	0	0	0	3740	0	0	0	0	0	0	117.903
	0	0	0	0	1100	4400	0	0	0	1464	80	880	267.651

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	37	5	0	0	0	0.0	46.226
	37	5	0	0	0	0.0	46.226

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	132	138	43	0	0	314

WBS Number: 1.1.1.5.2.4.1 **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 two more design cycles.

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
	79	22	28	101	0	77	0	2	0.8	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	1464	0	0	76.771
MFG B/I	0	0	0	0	0	1760	0	0	0	0	0	0	55.484
	0	0	0	0	0	1760	0	0	0	1464	0	0	132.255

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	2	0	0	0	0	0.0	2.271
	2	0	0	0	0	0.0	2.271

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	67	67	0	0	0	135

WBS Number: 1.1.1.5.2.4.2 **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 80 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
	23	7	28	30	0	21	0	3	0.4	0.6

MANPOWER SUMMARY:	S.W.		Admin.				Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	660	0	0	0	0	0	0	20.806
MFG B/I	0	0	0	0	0	1100	0	0	0	0	0	0	34.677
	0	0	0	0	0	1760	0	0	0	0	0	0	55.483

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	2.500
	0	3	0	0	0	0.0	2.500

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	12	23	23	0	0	58

WBS Number: 1.1.1.5.2.4.3 **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 0.25 FTE electrical technician from project funds. 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. Bare module probing is estimated at....

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
	94	26	28	120	0	52	0	41	1.2	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	1100	0	0	0	0	0	0	80	880	52.171
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	0	27.742
	0	0	0	0	1100	880	0	0	0	0	0	80	880	79.913

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	35	3	0	0	0	0.0	41.455
	35	3	0	0	0	0.0	41.455

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	53	48	21	0	0	121

WBS Number: 1.1.1.5.2.5

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: (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
	60	17	28	77	0	55	0	4	0.7	0.5

MANPOWER SUMMARY:	S.W.						Admin. Super.	Other Admin.	Contract Labor	Tech. Serv.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	0	528	0	0	0	640	100	0	55.450
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	27.742
	0	0	0	0	0	1408	0	0	0	640	100	0	83.192

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	4	0	0	0	0.0	4.445
	0	4	0	0	0	0.0	4.445

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	35	44	8	0	0	88

WBS Number: 1.1.1.5.2.5.1 **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 assume two more complete design cycles

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
	34	10	28	44	0	34	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\$)
MFG P	0	0	0	0	0	0	0	0	0	640	0	0	33.561
	0	0	0	0	0	0	0	0	0	640	0	0	33.561

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	0.445
	0	0	0	0	0	0.0	0.445

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	17	17	0	0	0	34

WBS Number: 1.1.1.5.2.5.2 **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 0.15 FTE per year 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
	19	5	28	24	0	17	0	2	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	528	0	0	0	0	0	0	16.645
	0	0	0	0	0	528	0	0	0	0	0	0	16.645

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:	<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	1	9	8	0	0	19

WBS Number: 1.1.1.5.2.5.3 **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
	7	2	28	9	0	5	0	2	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	0	100	0	5.244
MFG B/I	0	0	0	0	0	880	0	0	0	0	0	0	27.742
	0	0	0	0	0	880	0	0	0	0	100	0	32.986

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:	<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	17	17	0	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
	631	380	60	1011	7	392	0	232	13.2	1.7

MANPOWER SUMMARY:	S.W.		ME	Design	ET	MT	Admin.	Other	Contract	Tech.		Total w/ overhead (k\$)	
	Prof	EE					Super.	Admin.	Labor	Shops	Serv.		Student
	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	880	1764	0	0	8513	361	0	4349	392.220
MFG MC	0	0	0	0	0	441	0	0	4245	0	0	2164	142.227
MFG B/I	0	0	0	0	1540	1410	0	0	0	0	0	0	147.396
EDIA P	0	0	0	0	0	0	0	0	0	0	0	440	6.649
	0	0	0	0	2420	3615	0	0	12758	361	0	6953	688.492

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	188	0	0	23	0	0.0	232.102
MFG MC	74	0	0	0	0	0.0	82.145
	262	0	0	23	0	0.0	314.247

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	22	76	562	343	0	1003

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 Okamoto. 500 6" wafers at \$13 each(management contingency) and 224 8" wafers at \$14 each. Contingency is taken to be 100% to account for possible need for minimum lot charges, which cannot be specified 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
	3	12	357	16	0	0	0	3	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	3	0	0	0	0	0.0	3.490
MFG MC	8	0	0	0	0	0.0	8.980
	11	0	0	0	0	0.0	12.470

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	9	3	0	12

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.

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
	25	65	262	90	0	0	0	25	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	22	0	0	0	0	0.0	24.931
MFG MC	36	0	0	0	0	0.0	40.291
	59	0	0	0	0	0.0	65.222

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	40	25	0	65

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.

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, reprobng and packaging is estimated to be 5 minutes per die or 2,000 hours for baseline scope.

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

Laobr is 60 hours shop time and 2,000 hours student 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
	58	34	58	92	0	33	0	25	1.7	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	0	60	0	2000	33.371
MFG MC	0	0	0	0	0	0	0	0	0	0	0	1000	15.112
	0	0	0	0	0	0	0	0	0	60	0	3000	48.483

MATERIAL SUMMARY:	Pur. Mat. (k\$)	Stores (k\$)	Travel (k\$)	Low Level (k\$)	R + D (k\$)	High Level (k\$)	Total w/ overhead (k\$)
MFG P	22	0	0	0	0	0.0	24.709
MFG MC	10	0	0	0	0	0.0	10.614
	32	0	0	0	0	0.0	35.323

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	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	3	51	29	0	84

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
	173	66	38	239	0	119	0	54	3.7	0.4

MANPOWER SUMMARY:	S.W.							Admin. Super.	Other Admin.	Contract Labor	Tech.		Student	Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	
MFG P	0	0	0	0	0	884	0	0	3233	301	0	0	0	118.933
MFG MC	0	0	0	0	0	441	0	0	1605	0	0	0	0	51.284
MFG B/I	0	0	0	0	0	750	0	0	0	0	0	0	0	37.473
	0	0	0	0	0	2075	0	0	4838	301	0	0	0	207.690

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	54.093
	28	0	0	23	0	0.0	54.093

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	169	76	0	262

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 300 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
	17	8	46	25	0	16	0	1	0.2	0.0

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	overhead (k\$)
MFG P	0	0	0	0	0	0	0	0	0	301	0	0	15.784
	0	0	0	0	0	0	0	0	0	301	0	0	15.784

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	1.113
	1	0	0	0	0	0.0	1.113

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	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	17	0	0	0	17

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
	82	30	37	112	0	52	0	30	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	51.820
MFG MC	0	0	0	0	0	0	0	0	1164	0	0	0	25.678
MFG B/I	0	0	0	0	0	750	0	0	0	0	0	0	37.473
	0	0	0	0	0	750	0	0	3513	0	0	0	114.971

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	30.051
	27	0	0	0	0	0.0	30.051

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	0	103	42	0	145

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 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	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
	245	155	63	400	0	152	0	93	6.5	0.4

MANPOWER SUMMARY:	S.W.						Admin. Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	5280	0	0	2349	151.978
MFG MC	0	0	0	0	0	0	0	0	2640	0	0	1164	75.831
MFG B/I	0	0	0	0	660	0	0	0	0	0	0	0	32.977
	0	0	0	0	660	0	0	0	7920	0	0	3513	260.786

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	93.492
MFG MC	20	0	0	0	0	0.0	22.260
	104	0	0	0	0	0.0	115.752

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	45	234	98	0	377

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
	57	33	59	90	0	35	0	21	2.0	0.4

MANPOWER SUMMARY:	S.W.		Admin. Other Contract					Tech.		Total w/ overhead (k\$)			
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	0	0	0	2349	35.499
MFG MC	0	0	0	0	0	0	0	0	0	0	0	1164	17.591
MFG B/I	0	0	0	0	660	0	0	0	0	0	0	0	32.977
	0	0	0	0	660	0	0	0	0	0	0	3513	86.067

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	21.147
	19	0	0	0	0	0.0	21.147

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	0	78	29	0	107

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
	189	121	64	310	0	116	0	72	4.5	0.0

MANPOWER SUMMARY:	S.W.		Admin.					Other Contract		Tech.		Total w/ overhead (k\$)	
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
MFG P	0	0	0	0	0	0	0	0	5280	0	0	0	116.479
MFG MC	0	0	0	0	0	0	0	0	2640	0	0	0	58.240
	0	0	0	0	0	0	0	0	7920	0	0	0	174.719

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	72.345
MFG MC	20	0	0	0	0	0.0	22.260
	85	0	0	0	0	0.0	94.605

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	45	155	69	0	269

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	Cont Cost	Cont %	Total Cost	EDIA Labor	Mfg Labor	EDIA Matls	Mfg Matls	FTEs Project	FTEs Other
	(k\$)	(k\$)		(k\$)	(k\$)	(k\$)	(k\$)	(k\$)		
	51	19	38	70	0	44	0	7	0.5	0.4

MANPOWER SUMMARY:	S.W.		Design	ET	MT	Admin.		Contract Labor	Tech. Serv.	Student	Total w/ overhead
	Prof	EE				Super.	Admin.				
	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(k\$)
MFG P	0	0	0	0	880	0	0	0	0	0	43.969
MFG B/I	0	0	0	0	660	0	0	0	0	0	32.977
	0	0	0	0	1540	0	0	0	0	0	76.946

MATERIAL SUMMARY:	Pur. Mat.	Stores	Travel	Low Level	R + D	High Level	Total w/ overhead
MFG P	6	0	0	0	0	0.0	6.901
	6	0	0	0	0	0.0	6.901

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

PROFILE SUMMARY:	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	Total
	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)	(k\$)
	0	0	0	0	0	22	11	12	39	0	84

WBS Number: 1.1.1.5.3.7

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
	60	23	38	82	0	44	0	16	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	43.969
MFG B/I	0	0	0	0	880	0	0	0	0	0	0	0	43.969
	0	0	0	0	1760	0	0	0	0	0	0	0	87.938

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	15.582
	14	0	0	0	0	0.0	15.582

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	6	8	8	4	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	0	34	70	0	104

WBS Number: 1.1.1.5.3.8 **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
	16	6	38	21	7	0	0	9	0.3	0.0

MANPOWER SUMMARY:	S.W.		Admin.				Other		Contract		Tech.		Total w/ overhead (k\$)
	Prof (hrs)	EE (hrs)	ME (hrs)	Design (hrs)	ET (hrs)	MT (hrs)	Super. (hrs)	Admin. (hrs)	Labor (hrs)	Shops (hrs)	Serv. (hrs)	Student (hrs)	
EDIA P	0	0	0	0	0	0	0	0	0	0	0	440	6.649
	0	0	0	0	0	0	0	0	0	0	0	440	6.649

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	8.904
	8	0	0	0	0	0.0	8.904

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	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	12	3	0	16

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
	143	50	35	193	0	0	0	143	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	143	0	0	0	0	0.0	142.500
	143	0	0	0	0	0.0	142.500

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	40	40	35	18	10	143

WBS Number: 1.1.1.6.1

Description: Test Beam Support

Institution :

Contact:

Funding of test beam operations at CERN(or other locations if applicable)

Basis of Estimate: Physicist estimate

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
	63	21	33	83	0	0	0	63	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	63	0	0	0	0	0.0	62.500
	63	0	0	0	0	0.0	62.500

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	10	4	15	2	1	1	33

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	20	20	15	8	0	63

WBS Number: 1.1.1.6.2

Description: System test support

Institution :

Contact:

Costs associated with laboratory system tests at CERN and development of local testing infrastructure for use during final assembly.

Basis of Estimate: Physicist estimate

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
	80	30	37	110	0	0	0	80	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	80.000
	80	0	0	0	0	0.0	80.000

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	10	4	15	4	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	20	20	20	10	10	80