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

Funding Source: All **Funding Type:** All

Institutions: All

WBS Number: **Description:**

Institution : **Contact:**

COST SUMMARY: (Project)

Base Cost (k$)	Cont Cost (k$)	Cont %	Total Cost (k$)	EDIA Labor (k$)	Mfg Labor (k$)	EDIA Matls (k$)	Mfg Matls (k$)	FTEs Project	FTEs Other

CONTINGENCY FACTORS:

Risk				*Weight*			
Technical	Cost	Schedule	Design	Technical	Cost	Schedule	Cont %
0	0	0	0	0	0	0	0

WBS Number: 1.1.1.2 **Description:** Sensors

Institution : **Contact:**

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

Details of Estimate: The number of sensor wafers to be procured in determined from the "module yield model" spreadsheet. Testing time is based on prototype 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
	303	109	36	412	70	116	0	117	5.3	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	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:**

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. 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	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:**

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. 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	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:**

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

Details of Estimate: The engineering design from Martin Hoeferkamp. Additional time from physicists at UNM. 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	70.230
	0	1598	0	0	0	0	0	0	0	0	0	0	70.230

CONTINGENCY FACTORS:	*Risk*				*Weight*			
	Technical	Cost	Schedule	Design	Technical	Cost	Schedule	Cont %
	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:** Not available

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. 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	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:** Not available

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. Thes 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. 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	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:** Not available

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:** Not available

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:

Risk				Weight			
Technical	Cost	Schedule	Design	Technical	Cost	Schedule	Cont %
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:** Not available

COST SUMMARY: (Project)

Base Cost (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:

Risk				*Weight*			
Technical	Cost	Schedule	Design	Technical	Cost	Schedule	Cont %
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:** Not available

COST SUMMARY: (Project)

Base Cost (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:

Risk				*Weight*			
Technical	**Cost**	**Schedule**	**Design**	**Technical**	**Cost**	**Schedule**	**Cont %**
0	0	0	0	0	0	0	0

WBS Number: 1.1.1.2.3.1.2 **Description:** Production

Institution : U. of Oklahoma **Contact:** Not available

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 contigency)

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:

Risk: Technical	Risk: Cost	Risk: Schedule	Risk: Design	Weight: Technical	Weight: Cost	Weight: Schedule	Cont %
6	2	2	4	4	2	1	34

PROFILE SUMMARY:

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

WBS Number: 1.1.1.2.3.1.3 **Description:** Testing

Institution : U. of New Mexico **Contact:** Not available

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
probestation 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:

Risk				*Weight*			
Technical	Cost	Schedule	Design	Technical	Cost	Schedule	Cont %
2	4	8	4	4	1	1	24

PROFILE SUMMARY:

FY 96 (k$)	FY 97 (k$)	FY 98 (k$)	FY 99 (k$)	FY 00 (k$)	FY 01 (k$)	FY 02 (k$)	FY 03 (k$)	FY 04 (k$)	FY 05 (k$)	Total (k$)
0	0	0	0	0	46	39	58	0	0	143