# 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 | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**WBS Number:** 1.1.1 **Description:** Pixels

**Institution :** **Contact:** Not available

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 6370 | 3219 | 51 | 9589 | 1850 | 1134 | 781 | 2605 | 53.4 | 36.7 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 440 | 0 | 0 | 4982 | 5574 | 0 | 0 | 6345 | 6819 | 180 | 13529 | 1134.366 |
| **MFG MC** | 0 | 0 | 0 | 0 | 1793 | 441 | 0 | 0 | 4373 | 60 | 0 | 4912 | 258.554 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 1540 | 24082 | 0 | 0 | 0 | 0 | 0 | 0 | 1135.403 |
| **EDIA P** | 0 | 14710 | 5720 | 5720 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3080 | 1849.988 |
| **EDIA MC** | 0 | 1100 | 4400 | 2200 | 0 | 0 | 0 | 0 | 2640 | 0 | 0 | 4748 | 730.936 |
| **EDIA B/I** | 0 | 17464 | 15620 | 4520 | 0 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 3020.251 |
| | 0 | 33714 | 25740 | 12440 | 8315 | 31417 | 0 | 0 | 13358 | 6879 | 180 | 26269 | 8129.498 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 1509 | 13 | 0 | 273 | 0 | 630.3 | 2604.516 |
| **MFG MC** | 240 | 0 | 0 | 127 | 0 | 981.6 | 1406.653 |
| **MFG B/I** | 35 | 0 | 0 | 0 | 0 | 30.7 | 65.724 |
| **EDIA P** | 457 | 0 | 223 | 0 | 0 | 0.0 | 780.975 |
| **EDIA MC** | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |
| | 2240 | 13 | 239 | 400 | 0 | 1642.7 | 4877.068 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | 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 | 3118 | 4149 | 4105 | 1272 | 359 | 13007 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 3067 | 1441 | 47 | 4508 | 693 | 471 | 652 | 1251 | 16.8 | 18.7 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 1898 | 2622 | 0 | 0 | 0 | 5426 | 0 | 0 | 471.244 |
| **MFG MC** | 0 | 0 | 0 | 0 | 738 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33.591 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 18052 | 0 | 0 | 0 | 0 | 0 | 0 | 842.362 |
| **EDIA P** | 0 | 2200 | 5720 | 4400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 693.089 |
| **EDIA MC** | 0 | 0 | 4400 | 2200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 572.185 |
| **EDIA B/I** | 0 | 0 | 12100 | 1320 | 0 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 1159.332 |
| | 0 | 2200 | 22220 | 7920 | 2636 | 21994 | 0 | 0 | 0 | 5426 | 0 | 0 | 3771.803 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 840 | 4 | 0 | 0 | 0 | 295.0 | 1250.690 |
| **MFG MC** | 132 | 0 | 0 | 0 | 0 | 0.0 | 147.136 |
| **EDIA P** | 442 | 0 | 133 | 0 | 0 | 0.0 | 652.110 |
| **EDIA MC** | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |
| | 1414 | 4 | 149 | 0 | 0 | 295.0 | 2069.136 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1320 | 1427 | 1841 | 905 | 349 | 5841 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 1375 | 660 | 48 | 2036 | 693 | 0 | 652 | 30 | 10.8 | 8.4 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EDIA P** | 0 | 2200 | 5720 | 4400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 693.089 |
| **EDIA MC** | 0 | 0 | 4400 | 2200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 572.185 |
| **EDIA B/I** | 0 | 0 | 12100 | 1320 | 0 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 1159.332 |
| | 0 | 2200 | 22220 | 7920 | 0 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 2424.606 |

**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 |
| **EDIA P** | 442 | 0 | 133 | 0 | 0 | 0.0 | 652.110 |
| **EDIA MC** | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |
| | 469 | 0 | 149 | 0 | 0 | 0.0 | 701.361 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 862 | 867 | 733 | 510 | 154 | 3126 |

**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 | 178 | 76 | 0 | 30 | 30 | 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$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 27 | 0 | 0 | 0 | 0 | 0.0 | 30.051 |
| **EDIA P** | 0 | 0 | 25 | 0 | 0 | 0.0 | 30.000 |
| | 27 | 0 | 25 | 0 | 0 | 0.0 | 60.051 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 199 | 0 | 0 | 0 | 0 | 199 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** 1.1.1.1.1.2 **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 |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 7 | 24 | 37 | 0 | 0 | 0 | 30 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 27 | 0 | 0 | 0 | 0 | 0.0 | 30.051 |
| | 27 | 0 | 0 | 0 | 0 | 0.0 | 30.051 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 30 | 0 | 0 | 0 | 0 | 30 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 1239 | 619 | 50 | 1858 | 617 | 0 | 622 | 0 | 10.0 | 7.9 |

**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 | 2200 | 4840 | 3960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 616.783 |
| **EDIA MC** | 0 | 0 | 4400 | 2200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 572.185 |
| **EDIA B/I** | 0 | 0 | 11220 | 1320 | 0 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 1096.897 |
| | 0 | 2200 | 20460 | 7480 | 0 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 2285.865 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **EDIA P** | 442 | 0 | 108 | 0 | 0 | 0.0 | 622.110 |
| **EDIA MC** | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |
| | 442 | 0 | 124 | 0 | 0 | 0.0 | 641.310 |

**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 | 663 | 867 | 733 | 510 | 154 | 2927 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 130 | 26 | 20 | 156 | 0 | 0 | 130 | 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 | 117 | 0 | 0 | 0 | 0 | 0.0 | 130.331 |
| | 117 | 0 | 0 | 0 | 0 | 0.0 | 130.331 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 85 | 45 | 0 | 0 | 0 | 130 |

**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 $325K 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 |
|---|---|---|---|---|---|---|---|---|---|
| 362 | 72 | 20 | 434 | 0 | 0 | 362 | 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** | 325 | 0 | 0 | 0 | 0 | 0.0 | 361.939 |
| | 325 | 0 | 0 | 0 | 0 | 0.0 | 361.939 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 196 | 143 | 23 | 0 | 0 | 362 |

**WBS Number:** 1.1.1.1.1.2.4 **Description:** Support Tube

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

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

**Basis of Estimate:** Engineering judgement

**Details of Estimate:** The initial design is covered under prototype design for the first half of 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 |
|---|---|---|---|---|---|---|---|---|---|
| 308 | 154 | 50 | 462 | 260 | 0 | 48 | 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 P | 0 | 0 | 3080 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 260.134 |
| EDIA B/I | 0 | 0 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 124.869 |
| | 0 | 0 | 4840 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 385.003 |

**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 | 40 | 0 | 0 | 0.0 | 48.000 |
| | 0 | 0 | 40 | 0 | 0 | 0.0 | 48.000 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 139 | 120 | 120 | 55 | 0 | 433 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 373 | 142 | 38 | 514 | 313 | 0 | 60 | 0 | 3.3 | 1.8 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EDIA P** | 0 | 2200 | 1760 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 312.680 |
| **EDIA B/I** | 0 | 0 | 3080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 218.521 |
| | 0 | 2200 | 4840 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 531.201 |

**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 | 50 | 0 | 0 | 0.0 | 60.240 |
| | 0 | 0 | 50 | 0 | 0 | 0.0 | 60.240 |

**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 | 89 | 218 | 187 | 98 | 0 | 591 |

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

**Institution :** U. of New Mexico **Contact:** E. Anderssen

Support of EE Martin Hoeferkamp.

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** Support beyond FY01 is to be determined.

**COST SUMMARY: (Project)**

| Base Cost (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 | 18 | 42 | 62 | 39 | 0 | 5 | 0 | 0.5 | 0.0 |

**MANPOWER SUMMARY:**

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

**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 | 4 | 0 | 0 | 0.0 | 5.040 |
| | 0 | 0 | 4 | 0 | 0 | 0.0 | 5.040 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 4 | 15 | 4 | 15 | 2 | 1 | 1 | 42 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 44 | 0 | 0 | 0 | 0 | 44 |

**WBS Number:** 1.1.1.1.1.2.5.2 **Description:** Services Design - LBNL

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

Design engineering for services at LBNL

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 293 | 123 | 42 | 416 | 274 | 0 | 19 | 0 | 2.8 | 1.8 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EDIA P** | 0 | 1320 | 1760 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 274.005 |
| **EDIA B/I** | 0 | 0 | 3080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 218.521 |
| | 0 | 1320 | 4840 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 492.526 |

**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 | 16 | 0 | 0 | 0.0 | 19.200 |
| | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 4 | 15 | 4 | 15 | 2 | 1 | 1 | 42 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 45 | 211 | 180 | 76 | 0 | 512 |

**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. 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 | 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* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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

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

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

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** Engineer supported by base program.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 22 | 8 | 37 | 30 | 0 | 0 | 22 | 0 | 0.0 | 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 B/I | 0 | 0 | 3960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 416.036 |
| | 0 | 0 | 3960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 416.036 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 190 | 104 | 438 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 Engineering

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

Costs associated with overall systems integration, management and supervision.

**Basis of Estimate:** Physicist estimate

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

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 143 | 0 | 143 | 0 | 0 | 0 | 0 | 2.5 | 0.6 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EDIA MC | 0 | 0 | 4400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 462.263 |
| EDIA B/I | 0 | 0 | 1100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 115.566 |
| | 0 | 0 | 5500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 577.829 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 208 | 208 | 116 | 23 | 578 |

**WBS Number:** 1.1.1.1.1.2.10 **Description:** Installation

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

Design of pixel installation(insertion) tooling and procedures.

**Basis of Estimate:** Physicist estimate

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 59 | 0 | 59 | 0 | 0 | 0 | 0 | 1.3 | 0.0 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EDIA MC** | 0 | 0 | 0 | 2200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 109.922 |
| | 0 | 0 | 0 | 2200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 109.922 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **EDIA MC** | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |
| | 0 | 0 | 16 | 0 | 0 | 0.0 | 19.200 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 6 | 15 | 4 | 15 | 2 | 1 | 1 | 46 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 51 | 27 | 129 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 257 | 117 | 46 | 374 | 0 | 89 | 0 | 168 | 1.0 | 1.2 |

**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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 182 | 220 | 0 | 0 | 0 | 1311 | 0 | 0 | 88.833 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 2142 | 0 | 0 | 0 | 0 | 0 | 0 | 102.967 |
| | 0 | 0 | 0 | 0 | 182 | 2362 | 0 | 0 | 0 | 1311 | 0 | 0 | 191.800 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 151 | 0 | 0 | 0 | 0 | 0.0 | 168.132 |
| | 151 | 0 | 0 | 0 | 0 | 0.0 | 168.132 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 218 | 142 | 0 | 0 | 0 | 360 |

**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 of development into 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 |
|---|---|---|---|---|---|---|---|---|---|
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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-Junior **Contact:** F. Goozen

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

**Basis of Estimate:** Engineering judgement

**Details of Estimate:** Estimate based on similar tooling costs used for prototype frame construction and from design concept sketches

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 29 | 10 | 0 | 6 | 0 | 2 | 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 | 113 | 0 | 0 | 5.926 |
| MFG B/I | 0 | 0 | 0 | 0 | 0 | 220 | 0 | 0 | 0 | 0 | 0 | 0 | 6.935 |
| | 0 | 0 | 0 | 0 | 0 | 220 | 0 | 0 | 0 | 113 | 0 | 0 | 12.861 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 2 | 4 | 2 | 15 | 4 | 1 | 1 | 29 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 15 |

**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. 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 | 156 | 0 | 0 | 8.180 |
| MFG B/I | 0 | 0 | 0 | 0 | 0 | 166 | 0 | 0 | 0 | 0 | 0 | 0 | 8.294 |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** Support Tube

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

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

**Basis of Estimate:** Engineering judgement

**Details of Estimate:** Mockup, prototype mounts, rails and assembly and test of same See supporting estimate. 548 hrs of shop time, 458 hours of mech tech and $13648 of materials.

Prototype of endplug thermal barrier(1/2 of production estimate). 116 hrs of shop time, 186 hrs of mech. Tech time and 13,027 of materials.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 43 | 66 | 107 | 0 | 35 | 0 | 30 | 0.4 | 0.4 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 664 | 0 | 0 | 34.819 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 644 | 0 | 0 | 0 | 0 | 0 | 0 | 32.177 |
| | 0 | 0 | 0 | 0 | 0 | 644 | 0 | 0 | 0 | 664 | 0 | 0 | 66.996 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 27 | 0 | 0 | 0 | 0 | 0.0 | 29.689 |
| | 27 | 0 | 0 | 0 | 0 | 0.0 | 29.689 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 67 | 30 | 0 | 0 | 0 | 97 |

**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: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 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. 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:**

| | *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|---|
| | Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 1435 | 663 | 46 | 2098 | 0 | 382 | 0 | 1053 | 5.1 | 9.1 |

**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 | 1716 | 2402 | 0 | 0 | 0 | 4115 | 0 | 0 | 382.411 |
| **MFG MC** | 0 | 0 | 0 | 0 | 738 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33.591 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 15910 | 0 | 0 | 0 | 0 | 0 | 0 | 739.395 |
| | 0 | 0 | 0 | 0 | 2454 | 18312 | 0 | 0 | 0 | 4115 | 0 | 0 | 1155.397 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 662 | 4 | 0 | 0 | 0 | 295.0 | 1052.507 |
| **MFG MC** | 132 | 0 | 0 | 0 | 0 | 0.0 | 147.136 |
| | 794 | 4 | 0 | 0 | 0 | 295.0 | 1199.643 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 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 | 417 | 1108 | 395 | 194 | 2355 |

**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 | 1760 | 0 | 0 | 0 | 501 | 0 | 0 | 81.756 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 2640 | 0 | 0 | 0 | 0 | 0 | 0 | 83.226 |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 for the frame and cones are provided in the accompanying supporting documentation.

**COST SUMMARY: (Project)**

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

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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. 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 | 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:**

| | *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|---|
| | Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| | 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:** Support Tube

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

Support tube and integrated rails that support the pixel system.

**Basis of Estimate:** Engineering judgement

**Details of Estimate:** FY02: 29370 materials, 380 hours shop and 60 hours mech tech
FY03: 87193 materials, 566 hours shop and 1582 mech tech.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 211 | 129 | 61 | 340 | 0 | 82 | 0 | 130 | 0.9 | 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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 0 | 642 | 0 | 0 | 0 | 946 | 0 | 0 | 81.684 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 1000 | 0 | 0 | 0 | 0 | 0 | 0 | 49.965 |
| | 0 | 0 | 0 | 0 | 0 | 1642 | 0 | 0 | 0 | 946 | 0 | 0 | 131.649 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 117 | 0 | 0 | 0 | 0 | 0.0 | 129.735 |
| | 117 | 0 | 0 | 0 | 0 | 0.0 | 129.735 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 56 | 206 | 0 | 0 | 261 |

**WBS Number:** 1.1.1.1.3.6 **Description:** Endplug Thermal Barrier

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

Endplug thermal barrier at end of pixel support tube

**Basis of Estimate:** Engineering judgement

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 25 | 61 | 66 | 0 | 12 | 0 | 29 | 0.1 | 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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 232 | 0 | 0 | 12.166 |
| MFG B/I | 0 | 0 | 0 | 0 | 0 | 372 | 0 | 0 | 0 | 0 | 0 | 0 | 11.727 |
| | 0 | 0 | 0 | 0 | 0 | 372 | 0 | 0 | 0 | 232 | 0 | 0 | 23.893 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 26 | 0 | 0 | 0 | 0 | 0.0 | 28.998 |
| | 26 | 0 | 0 | 0 | 0 | 0.0 | 28.998 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 8 | 10 | 4 | 15 | 4 | 1 | 1 | 61 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 | 0 | 0 | 53 |

**WBS Number:** 1.1.1.1.3.7 **Description:** Services

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

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

**Basis of Estimate:** Engineering judgement

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 311 | 177 | 57 | 487 | 0 | 124 | 0 | 186 | 1.9 | 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 | 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:** 1.1.1.1.3.7.1 **Description:** Mechanical support

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

Mechanical support of services within the ID volume.

**Basis of Estimate:** Engineering judgement

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 84 | 36 | 43 | 120 | 0 | 39 | 0 | 45 | 0.4 | 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** 1.1.1.1.3.7.2 **Description:** Cables and Connections

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

Production materials and labor for low mass cables.

**Basis of Estimate:** Engineering judgement

**Details of Estimate:** 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. 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:** 1.1.1.1.3.7.3 **Description:** Coolant pipes and connectors

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

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

**Basis of Estimate:** Engineering judgement

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 29 | 12 | 41 | 40 | 0 | 17 | 0 | 11 | 0.2 | 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 | 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. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 10 | 0 | 0 | 0 | 0 | 0.0 | 11.152 |
| | 10 | 0 | 0 | 0 | 0 | 0.0 | 11.152 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 4 | 6 | 4 | 15 | 4 | 1 | 1 | 41 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 39 |

**WBS Number:** 1.1.1.1.3.7.4 **Description:** Patch Panel 0

**Institution :** LBNL/UC-Junior **Contact:** M. Garcia-Sciveres

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

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** Verbal quote of $1250 NRE +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. 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 | 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* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:** 1.1.1.1.3.8 **Description:** Disk Assembly

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

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

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

**Basis of Estimate:** Engineering judgement

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

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

**COST SUMMARY: (Project)**

| Base Cost (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 | 55 | 54 | 157 | 0 | 56 | 0 | 46 | 0.6 | 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 | 0 | 0 | 0 | 1063 | 0 | 0 | 55.743 |
| 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 | 1063 | 0 | 0 | 187.649 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 42 | 0 | 0 | 0 | 0 | 0.0 | 46.190 |
| | 42 | 0 | 0 | 0 | 0 | 0.0 | 46.190 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 135 | 88 | 0 | 234 |

**WBS Number:** 1.1.1.1.3.9 **Description:** Disk Region Final Assembly

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

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

**Basis of Estimate:** Physicist estimate

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

Testing

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

Shipping

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

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

Assembly equipment at CERN

The US will provide support for assembly equipment at CERN and for shipment of equipment used at LBNL for trial assembly to CERN.
These estimates are at a very early stage

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

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

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

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

| **COST SUMMARY: (Project)** | **Base Cost (k$)** | **Cont Cost (k$)** | **Cont %** | **Total Cost (k$)** | **EDIA Labor (k$)** | **Mfg Labor (k$)** | **EDIA Matls (k$)** | **Mfg Matls (k$)** | **FTEs Project** | **FTEs Other** |
|---|---|---|---|---|---|---|---|---|---|---|
| | 92 | 50 | 54 | 142 | 0 | 7 | 0 | 85 | 0.1 | 2.0 |

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

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:** 1.1.1.1.3.10 **Description:** Test Equipment

**Institution :** LBNL/UC- Senior **Contact:** G. Gilchriese

Test equipment and supplies.

**Basis of Estimate:** Physicist estimate

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

| | |
|---|---|
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 4 | 4 | 4 | 15 | 4 | 1 | 1 | 39 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 82 | 2 | 2 | 7 | 7 | 100 |

**WBS Number:** 1.1.1.1.3.11 **Description:** Installation

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

Tooling and fixtures for installation into ID at CERN.

**Basis of Estimate:** Level of Effort

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2.5 |

**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 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 MC** | 75 | 0 | 0 | 0 | 0 | 0.0 | 83.475 |
| | 75 | 0 | 0 | 0 | 0 | 0.0 | 83.475 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 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 |
|---|---|---|---|---|---|---|---|---|---|
| 133 | 109 | 82 | 241 | 70 | 39 | 0 | 24 | 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 | 440 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1760 | 38.675 |
| EDIA P | 0 | 1598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70.230 |
| EDIA MC | 0 | 1100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4400 | 96.687 |
| | 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 | 0.0 | 23.698 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 150.9 | 150.867 |
| | 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. 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:** 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. 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:** S. Seidel

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

**Details of Estimate:** The engineering design from Martin Hoeferkamp. Additional time from physicists at UNM. 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:** 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 |
|---|---|---|---|---|---|---|---|---|---|
| 62 | 102 | 163 | 164 | 0 | 39 | 0 | 24 | 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 | 440 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1760 | 38.675 |
| **EDIA MC** | 0 | 1100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4400 | 96.687 |
| | 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 | 0.0 | 23.698 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 150.9 | 150.867 |
| | 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. 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 |
|---|---|---|---|---|---|---|---|---|---|
| 62 | 102 | 163 | 164 | 0 | 39 | 0 | 24 | 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 | 440 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1760 | 38.675 |
| EDIA MC | 0 | 1100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4400 | 96.687 |
| | 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 | 0.0 | 23.698 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 150.9 | 150.867 |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | 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:** 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | 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:** 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:**

| *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:** 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 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 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 51 | 0 | 51 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

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

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | 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:** 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
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 |
|---|---|---|---|---|---|---|---|---|---|
| 46 | 34 | 74 | 81 | 0 | 39 | 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 | 440 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1760 | 38.675 |
| EDIA MC | 0 | 1100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4400 | 96.688 |
| | 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 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 1616 | 868 | 54 | 2485 | 908 | 62 | 81 | 566 | 8.6 | 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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2640 | 0 | 0 | 300 | 61.722 |
| **EDIA P** | 0 | 9592 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 907.635 |
| **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 | 21736 | 0 | 0 | 0 | 0 | 0 | 0 | 5280 | 0 | 0 | 300 | 2119.236 |

## MATERIAL SUMMARY:

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 239 | 0 | 0 | 56 | 0 | 239.2 | 566.132 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 570.0 | 601.566 |
| **MFG B/I** | 35 | 0 | 0 | 0 | 0 | 30.7 | 65.724 |
| **EDIA P** | 0 | 0 | 68 | 0 | 0 | 0.0 | 81.000 |
| | 274 | 0 | 68 | 56 | 0 | 840.0 | 1314.422 |

## PROFILE SUMMARY:

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1098 | 1481 | 829 | 26 | 0 | 3434 |

**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: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 989 | 476 | 48 | 1465 | 908 | 0 | 81 | 0 | 5.5 | 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 | 9592 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 907.635 |
| **EDIA B/I** | 0 | 12144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1091.639 |
| | 0 | 21736 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1999.274 |

**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 | 844 | 438 | 0 | 0 | 2080 |

**WBS Number:** 1.1.1.3.1.1 **Description:** IC design

**Institution :** **Contact:** K. Einsweiler

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 469 | 253 | 54 | 722 | 415 | 0 | 54 | 0 | 2.6 | 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 | 4576 | 0 | 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 | 0 | 1091.639 |
| | 0 | 16720 | 0 | 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 | 253 | 54 | 722 | 415 | 0 | 54 | 0 | 2.6 | 5.7 |

**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 | 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 | 169 | 54 | 483 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 6 | 15 | 8 | 4 | 2 | 2 | 1 | 54 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 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 | 84 | 54 | 239 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 6 | 15 | 8 | 4 | 2 | 2 | 1 | 54 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 216 | 71 | 33 | 286 | 216 | 0 | 0 | 0 | 1.4 | 0.0 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EDIA P | 0 | 2376 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 215.563 |
| | 0 | 2376 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 215.563 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 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 | 75 | 0 | 0 | 0 | 216 |

**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. 25% FTE 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 |
|---|---|---|---|---|---|---|---|---|---|
| 157 | 57 | 36 | 214 | 157 | 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 | 1496 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 157.169 |
| | 0 | 1496 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 157.169 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 46 | 0 | 0 | 0 | 157 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 152 | 50 | 457 | 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 | 277.358 |
| | 0 | 2640 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 6 | 15 | 15 | 8 | 2 | 1 | 1 | 50 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 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 |
|---|---|---|---|---|---|---|---|---|---|
| 367 | 53 | 15 | 421 | 0 | 0 | 0 | 367 | 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** | 205 | 0 | 0 | 10 | 0 | 128.7 | 367.136 |
| **MFG B/I** | 35 | 0 | 0 | 0 | 0 | 30.7 | 65.724 |
| | 240 | 0 | 0 | 10 | 0 | 159.5 | 432.860 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 300 | 133 | 0 | 0 | 0 | 433 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 130 | 0 | 0 | 130 | 0 | 0 | 0 | 130 | 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 | 130.283 |
| | 120 | 0 | 0 | 0 | 0 | 0.0 | 130.283 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 130 | 0 | 0 | 0 | 0 | 130 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 :** LBNL/UC-Junior **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 |
|---|---|---|---|---|---|---|---|---|---|
| 97 | 0 | 0 | 97 | 0 | 0 | 0 | 97 | 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 | 96.843 |
| | 87 | 0 | 0 | 0 | 0 | 0.0 | 96.843 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 97 | 0 | 0 | 0 | 0 | 97 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 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 |
| **MFG B/I** | 35 | 0 | 0 | 0 | 0 | 30.7 | 65.724 |
| | 35 | 0 | 0 | 0 | 0 | 84.5 | 119.457 |

**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 | 66 | 54 | 0 | 0 | 0 | 119 |

**WBS Number:** 1.1.1.3.2.3.1 **Description:** TSMC prototypes

**Institution :** U. of California, Santa Cruz-Jr **Contact:** K. Einsweiler

Test chips in TSMC via MOSIS

**Basis of Estimate:** Parametric estimate

**Details of Estimate:** Estimate based on die size and MOSIS cost. Estimate is 15K for digitial test chip. And 20K for analog test chip. Covered by base program funds.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG B/I** | 35 | 0 | 0 | 0 | 0 | 0.0 | 35.000 |
| | 35 | 0 | 0 | 0 | 0 | 0.0 | 35.000 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 10 | 4 | 8 | 8 | 2 | 1 | 1 | 40 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 35 |

**WBS Number:** 1.1.1.3.2.3.2 **Description:** 1st prototype

**Institution :** U. of California, Santa Cruz-Jr **Contact:** K. Einsweiler

6 wafer run with IBM.

**Basis of Estimate:** Vendor quotation

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 30.7 | 30.724 |
| | 0 | 0 | 0 | 0 | 0 | 30.7 | 30.724 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:** 1.1.1.3.2.3.3 **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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 173 | 42 | 24 | 215 | 0 | 0 | 0 | 173 | 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** | 84 | 0 | 0 | 0 | 0 | 75.0 | 173.120 |
| | 84 | 0 | 0 | 0 | 0 | 75.0 | 173.120 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 94 | 79 | 0 | 0 | 0 | 173 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 173 | 42 | 24 | 215 | 0 | 0 | 0 | 173 | 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** | 84 | 0 | 0 | 0 | 0 | 75.0 | 173.120 |
| | 84 | 0 | 0 | 0 | 0 | 75.0 | 173.120 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 94 | 79 | 0 | 0 | 0 | 173 |

**WBS Number:** 1.1.1.3 **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 |
|---|---|---|---|---|---|---|---|---|---|
| 261 | 339 | 130 | 600 | 0 | 62 | 0 | 199 | 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 | 110.5 | 198.996 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 570.0 | 601.566 |
| | 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: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 185 | 236 | 128 | 421 | 0 | 58 | 0 | 127 | 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) | 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 | 84.0 | 126.736 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 543.6 | 575.106 |
| | 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 |
|---|---|---|---|---|---|---|---|---|---|
| 61 | 170 | 281 | 230 | 0 | 0 | 0 | 61 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 57.2 | 60.549 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 516.8 | 546.761 |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** 37 wafers(baselinescope) from US are required assuming yields given in module yield table(50% native yield). Costs are based on Frame Contract with CERN.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 61 | 63 | 104 | 124 | 0 | 0 | 0 | 61 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 57.2 | 60.549 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 57.2 | 60.549 |
| | 0 | 0 | 0 | 0 | 0 | 114.5 | 121.098 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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. 12 wafers(baseline scope) required. Costs based on Frame Contract. Contingency should cover uncertainty in yield. 50% yield is assumed for base cost.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 29 | 104 | 58 | 0 | 0 | 0 | 28 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 26.8 | 28.345 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 26.8 | 28.345 |
| | 0 | 0 | 0 | 0 | 0 | 53.6 | 56.690 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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) | 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: | Risk | | | | Weight | | | Cont % |
|---|---|---|---|---|---|---|---|---|
| | Technical | Cost | Schedule | Design | Technical | Cost | 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 |
|---|---|---|---|---|---|---|---|---|---|
| 76 | 103 | 136 | 178 | 0 | 3 | 0 | 72 | 0.2 | 0.0 |

**MANPOWER SUMMARY:**

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

**MATERIAL SUMMARY:**

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

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 23 | 79 | 0 | 0 | 102 |

**WBS Number:** 1.1.1.3.3.2.1 **Description:** Production

**Institution :** Ohio State U. **Contact:** KK Gan

Optical ICs production

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** 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 |
|---|---|---|---|---|---|---|---|---|---|
| 26 | 53 | 200 | 79 | 0 | 0 | 0 | 26 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

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

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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. Thus contingency is set at 100%.

**COST SUMMARY: (Project)**

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

**MANPOWER SUMMARY:**

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

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 46 | 0 | 0.0 | 45.800 |
| | 0 | 0 | 0 | 46 | 0 | 0.0 | 45.800 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 12 | 15 | 8 | 15 | 4 | 2 | 1 | 101 |

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

**WBS Number:** 1.1.1.4 **Description:** Flex Hybrids/Optical Hybrids

**Institution :** **Contact:** Rusty Boyd/KK Gan

Flex hybrids mounted on each pixel module and "pigtails" 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 |
|---|---|---|---|---|---|---|---|---|---|
| 525 | 323 | 62 | 848 | 51 | 101 | 26 | 347 | 5.8 | 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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 1544 | 0 | 0 | 0 | 472 | 20 | 0 | 2784 | 100.693 |
| **MFG MC** | 0 | 0 | 0 | 0 | 1055 | 0 | 0 | 0 | 128 | 0 | 0 | 748 | 49.365 |
| **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 | 492.027 |

## 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 | 195 | 0 | 96.0 | 346.918 |
| **MFG MC** | 11 | 0 | 0 | 127 | 0 | 260.7 | 400.230 |
| **EDIA P** | 0 | 0 | 18 | 0 | 0 | 0.0 | 26.370 |
| | 63 | 0 | 18 | 321 | 0 | 356.8 | 773.518 |

## PROFILE SUMMARY:

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 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 | 375 | 679 | 0 | 0 | 1266 |

**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 | 19 | 25 | 97 | 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. 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 | 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:**

| | *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|---|
| | Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 16 | 27 | 75 | 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:** Engineering judgement

**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 | 9 | 24 | 46 | 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:**

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

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 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 approximately0 .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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 pigtails and 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 |
|---|---|---|---|---|---|---|---|---|---|
| 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 | 880 | 9.669 |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 pigtails. One vendor assumed.

Production of disk optical hybrids.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 294 | 230 | 78 | 524 | 0 | 83 | 0 | 211 | 3.3 | 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 | 1544 | 0 | 0 | 0 | 272 | 0 | 0 | 1704 | 83.242 |
| **MFG MC** | 0 | 0 | 0 | 0 | 1055 | 0 | 0 | 0 | 128 | 0 | 0 | 748 | 49.365 |
| **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 | 136.431 |

**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 | 80 | 0 | 96.0 | 210.748 |
| **MFG MC** | 11 | 0 | 0 | 127 | 0 | 260.7 | 400.230 |
| | 44 | 0 | 0 | 207 | 0 | 356.8 | 610.978 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 170 | 577 | 0 | 0 | 747 |

**WBS Number:** 1.1.1.4.3.1 **Description:** Flex hybrid

**Institution :** **Contact:** Rusty Boyd

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 175 | 163 | 93 | 338 | 0 | 26 | 0 | 149 | 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 | 224 | 0 | 0 | 0 | 0 | 0 | 0 | 1404 | 25.580 |
| **MFG MC** | 0 | 0 | 0 | 0 | 615 | 0 | 0 | 0 | 0 | 0 | 0 | 348 | 25.838 |
| **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 | 45 | 0 | 96.0 | 149.480 |
| **MFG MC** | 0 | 0 | 0 | 95 | 0 | 260.7 | 355.760 |
| | 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 | 160 | 400 | 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: (Project)**

| Base Cost (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 | 100 | 104 | 196 | 0 | 0 | 0 | 96 | 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 | 96.0 | 96.050 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 260.7 | 260.730 |
| | 0 | 0 | 0 | 0 | 0 | 356.8 | 356.780 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 144 | 213 | 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*(15+20)=78575+15000=93575 for materials. Labor is 2245*0.5*0.5 hrs=561 hours.

Goals costs are 3356*(15+20)=117460+15000=132460 for materials. Labor is 3356*0.5*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 |
|---|---|---|---|---|---|---|---|---|---|
| 45 | 45 | 100 | 90 | 0 | 8 | 0 | 37 | 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 | 224 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.548 |
| **MFG MC** | 0 | 0 | 0 | 0 | 615 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20.723 |
| | 0 | 0 | 0 | 0 | 839 | 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 | 37 | 0 | 0.0 | 37.430 |
| **MFG MC** | 0 | 0 | 0 | 95 | 0 | 0.0 | 95.030 |
| | 0 | 0 | 0 | 132 | 0 | 0.0 | 132.460 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 6 | 4 | 8 | 4 | 2 | 1 | 1 | 28 |

| PROFILE SUMMARY: | FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 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. 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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. 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 | 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* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 86 | 53 | 61 | 139 | 0 | 52 | 0 | 34 | 1.4 | 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 | 1320 | 0 | 0 | 0 | 0 | 0 | 0 | 300 | 51.662 |
| MFG MC | 0 | 0 | 0 | 0 | 440 | 0 | 0 | 0 | 0 | 0 | 0 | 400 | 20.703 |
| | 0 | 0 | 0 | 0 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 700 | 72.365 |

**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 | 34 | 0 | 0.0 | 34.400 |
| MFG MC | 0 | 0 | 0 | 32 | 0 | 0.0 | 31.826 |
| | 0 | 0 | 0 | 66 | 0 | 0.0 | 66.226 |

**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 | 0 | 10 | 129 | 0 | 0 | 139 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 8 | 0 | 8 | 0 | 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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 300 | 3.483 |
| | 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 MC** | 0 | 0 | 0 | 16 | 0 | 0.0 | 16.426 |
| | 0 | 0 | 0 | 16 | 0 | 0.0 | 16.426 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 10 | 6 | 4 | 8 | 2 | 1 | 1 | 38 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
|---|---|---|---|---|---|---|---|---|---|
| 33 | 25 | 76 | 57 | 0 | 17 | 0 | 15 | 0.6 | 0.0 |

**MANPOWER SUMMARY:**

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

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 15 | 0 | 0.0 | 15.400 |
| MFG MC | 0 | 0 | 0 | 15 | 0 | 0.0 | 15.400 |
| | 0 | 0 | 0 | 31 | 0 | 0.0 | 30.800 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 10 | 6 | 4 | 8 | 2 | 1 | 1 | 38 |

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

**WBS Number:** 1.1.1.4.3.3.3 **Description:** Testing

**Institution :** Ohio State U. **Contact:** KK Gan

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

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** This includes testing of both optical packages and optical hybrids.

Environmental chamber 2.5K
Optical equipment 2K
Burn-in equipment 4K
Test equipment 2K
Supplies 6K
Storage and boxes 65*20=1.3K
Shipping 1.2

Materials total 19000

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 |
|---|---|---|---|---|---|---|---|---|---|
| 53 | 20 | 38 | 74 | 0 | 34 | 0 | 19 | 0.6 | 0.0 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 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 | 19 | 0 | 0.0 | 19.000 |
| | 0 | 0 | 0 | 19 | 0 | 0.0 | 19.000 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 10 | 6 | 4 | 8 | 2 | 1 | 1 | 38 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 10 | 43 | 0 | 0 | 53 |

**WBS Number:** 1.1.1.5 **Description:** Module Assembly/Test

**Institution :** **Contact:** Maurice Garcia-Sciveres

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

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 924 | 478 | 52 | 1401 | 128 | 462 | 21 | 312 | 16.8 | 7.7 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 1540 | 2952 | 0 | 0 | 3233 | 1373 | 180 | 8685 | 462.032 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 441 | 0 | 0 | 4245 | 60 | 0 | 4164 | 175.598 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 1540 | 6030 | 0 | 0 | 0 | 0 | 0 | 0 | 293.041 |
| **EDIA P** | 0 | 1320 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 440 | 128.043 |
| **EDIA B/I** | 0 | 40 | 3520 | 2400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 482.126 |
| | 0 | 1360 | 3520 | 3280 | 3080 | 9423 | 0 | 0 | 7478 | 1433 | 180 | 13289 | 1540.840 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 252 | 9 | 0 | 23 | 0 | 0.0 | 312.078 |
| **MFG MC** | 96 | 0 | 0 | 0 | 0 | 0.0 | 106.854 |
| **EDIA P** | 15 | 0 | 4 | 0 | 0 | 0.0 | 21.495 |
| | 363 | 9 | 4 | 23 | 0 | 0.0 | 440.427 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | 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 | 364 | 671 | 611 | 331 | 0 | 1981 |

**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 |
|---|---|---|---|---|---|---|---|---|---|
| 126 | 44 | 35 | 170 | 121 | 0 | 5 | 0 | 1.3 | 3.4 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EDIA P** | 0 | 1320 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 121.394 |
| **EDIA B/I** | 0 | 40 | 3520 | 2400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 482.126 |
| | 0 | 1360 | 3520 | 3280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 603.520 |

**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 | 4 | 0 | 0 | 0.0 | 4.800 |
| | 0 | 0 | 4 | 0 | 0 | 0.0 | 4.800 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 4 | 199 | 391 | 14 | 0 | 0 | 608 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 126 | 44 | 35 | 170 | 121 | 0 | 5 | 0 | 1.3 | 0.9 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EDIA P** | 0 | 1320 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 121.394 |
| **EDIA B/I** | 0 | 40 | 0 | 1520 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.347 |
| | 0 | 1360 | 0 | 2400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 189.741 |

**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 | 4 | 0 | 0 | 0.0 | 4.800 |
| | 0 | 0 | 4 | 0 | 0 | 0.0 | 4.800 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 4 | 107 | 69 | 14 | 0 | 0 | 195 |

**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) | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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..25FTE of designer time in FY01 and similarly in FY02 for probe cards, test cards - design, debugging and use. Additional designer time in FY01 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 |
|---|---|---|---|---|---|---|---|---|---|
| 126 | 44 | 35 | 170 | 121 | 0 | 5 | 0 | 1.3 | 0.4 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EDIA P | 0 | 1320 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 121.394 |
| EDIA B/I | 0 | 0 | 0 | 640 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20.176 |
| | 0 | 1320 | 0 | 1520 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 141.570 |

**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 | 4 | 0 | 0 | 0.0 | 4.800 |
| | 0 | 0 | 4 | 0 | 0 | 0.0 | 4.800 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 85 | 47 | 14 | 0 | 0 | 146 |

**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: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 261 | 71 | 27 | 332 | 0 | 140 | 17 | 105 | 2.4 | 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 | 660 | 1188 | 0 | 0 | 0 | 1072 | 180 | 1056 | 139.869 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 4620 | 0 | 0 | 0 | 0 | 0 | 0 | 145.645 |
| | 0 | 0 | 0 | 0 | 660 | 5808 | 0 | 0 | 0 | 1072 | 180 | 1056 | 285.514 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 86 | 9 | 0 | 0 | 0 | 0.0 | 104.685 |
| **EDIA P** | 15 | 0 | 0 | 0 | 0 | 0.0 | 16.695 |
| | 101 | 9 | 0 | 0 | 0 | 0.0 | 121.380 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 143 | 204 | 60 | 0 | 0 | 407 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 20 | 0 | 176 | 3.709 |
| | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** Dummy wafers

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Dummy wafers manufactured in US for use by bump bonding vendors to develop their processes and make dummy modules.

**Basis of Estimate:** Vendor quotation

**Details of Estimate:** Based on vendor quotations and assumes two rounds of 25 wafer 6" lots and two rounds of 25 8" wafers lots.

First round is 13,775. Second round is 11775, assumes no mask changes. Total is 25,550.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 10 | 34 | 38 | 0 | 0 | 0 | 28 | 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 | 26 | 0 | 0 | 0 | 0 | 0.0 | 28.437 |
| | 26 | 0 | 0 | 0 | 0 | 0.0 | 28.437 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 8 | 10 | 4 | 4 | 2 | 1 | 1 | 34 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 15 | 13 | 0 | 0 | 0 | 28 |

**WBS Number:** 1.1.1.5.2.5 **Description:** Module Assembly and Testing

**Institution :** LBNL/UC- Senior **Contact:** Maurice Garcia-Sciveres

Tooling, labor, supplies and equipment for assembly and testing of prototype dummy and real modules.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 166 | 46 | 28 | 212 | 0 | 97 | 0 | 68 | 1.7 | 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 | 660 | 660 | 0 | 0 | 0 | 732 | 80 | 880 | 97.491 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 3740 | 0 | 0 | 0 | 0 | 0 | 0 | 117.903 |
| | 0 | 0 | 0 | 0 | 660 | 4400 | 0 | 0 | 0 | 732 | 80 | 880 | 215.394 |

**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 | 5 | 0 | 0 | 0 | 0.0 | 68.486 |
| | 57 | 5 | 0 | 0 | 0 | 0.0 | 68.486 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 102 | 138 | 43 | 0 | 0 | 284 |

**WBS Number:** 1.1.1.5.2.5.1 **Description:** Tooling

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Tooling for assembly of dummy and real prototype modules.

**Basis of Estimate:** Parametric estimate

**Details of Estimate:** Costs are based on parametric scaling from existing tooling assuming one more design cycle.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 11 | 28 | 52 | 0 | 38 | 0 | 2 | 0.4 | 1.0 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 732 | 0 | 0 | 38.385 |
| 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 | 732 | 0 | 0 | 93.869 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 29 | 67 | 0 | 0 | 0 | 96 |

**WBS Number:** 1.1.1.5.2.5.2 **Description:** Assembly

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Labor for assembly of dummy and real prototype modules.

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** We assume 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. 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** 1.1.1.5.2.5.3 **Description:** Testing

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

This includes mechanical and electrical testing of prototype modules

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** Mechanical testing includes use of coordinate measurement machine time(project funded) at 2 hours per module. Mechanical technician time for other testing is supported by base program. Electrical testing in FY01 will be done by physicists. Electrical testing assumes 0.25 FTE electrical technician from project funds in FY02 and 0.12 FTE in FY03. A prototype module burn-in system is assumed to be built during this phase. A rough estimate of this system is $20K, not including design. Test boards and special cables is estimated at 10K.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 80 | 22 | 28 | 102 | 0 | 38 | 0 | 41 | 0.9 | 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 | 660 | 0 | 0 | 0 | 0 | 0 | 80 | 880 | 38.300 |
| MFG B/I | 0 | 0 | 0 | 0 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 27.742 |
| | 0 | 0 | 0 | 0 | 660 | 880 | 0 | 0 | 0 | 0 | 80 | 880 | 66.042 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 39 | 48 | 21 | 0 | 0 | 107 |

**WBS Number:** 1.1.1.5.2.5.4 **Description:** Equipment

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Cost of special equipment used in preparing for module essembly in QA for module assembly.

**Basis of Estimate:** Vendor quotation

**Details of Estimate:** This includes the cost of plasma cleaner - verbal quotation of about 18K and wire bond pull tester 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 |
|---|---|---|---|---|---|---|---|---|---|
| 22 | 6 | 28 | 28 | 0 | 0 | 0 | 22 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 20 | 0 | 0 | 0 | 0 | 0.0 | 22.260 |
| | 20 | 0 | 0 | 0 | 0 | 0.0 | 22.260 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 22 | 0 | 0 | 0 | 0 | 22 |

**WBS Number:** 1.1.1.5.2.6 **Description:** Module Attachment

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Tooling, labor, materials and supplies for attachment of prototype dummy and real modules to disk sectors.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 43 | 12 | 28 | 55 | 0 | 39 | 0 | 4 | 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 | 0 | 528 | 0 | 0 | 0 | 320 | 100 | 0 | 38.669 |
| **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 | 320 | 100 | 0 | 66.411 |

**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 | 18 | 44 | 8 | 0 | 0 | 71 |

**WBS Number:** 1.1.1.5.2.6.1 **Description:** Tooling

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Prototype tooling for attachment of modules to disk sectors.

**Basis of Estimate:** Parametric estimate

**Details of Estimate:** Based on existing tooling and assuming one more complete design cycle.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 5 | 28 | 22 | 0 | 17 | 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$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 320 | 0 | 0 | 16.780 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 320 | 0 | 0 | 16.780 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 3 | 4 | 4 | 8 | 4 | 1 | 1 | 28 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 17 |

**WBS Number:** 1.1.1.5.2.6.2 **Description:** Assembly

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Assembly/attachment of prototype modules to disk sectors.

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** This is labor for assembly. It assumes 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:** 1.1.1.5.2.6.3 **Description:** Testing

**Institution :** LBNL/UC-Junior **Contact:** Maurice Garcia-Sciveres

Testing of prototypes after attachment to disk sectors.

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** This includes IR imaging for sector quality control. Cost of IR camera is covered under Testing in Mechanics. Labor for IR testing is provided by base program. This also includes labor for survey using optical CMM or other. Equipment for electrical testing is covered under module testing.

**COST SUMMARY: (Project)**

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

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 536 | 363 | 68 | 899 | 7 | 322 | 0 | 207 | 13.2 | 1.7 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 880 | 1764 | 0 | 0 | 3233 | 301 | 0 | 7629 | 322.163 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 441 | 0 | 0 | 4245 | 60 | 0 | 4164 | 175.598 |
| **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 | 7478 | 361 | 0 | 12233 | 651.806 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 166 | 0 | 0 | 23 | 0 | 0.0 | 207.393 |
| **MFG MC** | 96 | 0 | 0 | 0 | 0 | 0.0 | 106.854 |
| | 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 | 537 | 331 | 0 | 966 |

**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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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,reprobing 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 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 34 | 0 | 34 | 0 | 0 | 0 | 0 | 1.7 | 0.0 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 0 | 3000 | 48.484 |
| | 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 MC** | 32 | 0 | 0 | 0 | 0 | 0.0 | 35.323 |
| | 32 | 0 | 0 | 0 | 0 | 0.0 | 35.323 |

| CONTINGENCY FACTORS: | Risk | | | | Weight | | | Cont % |
|---|---|---|---|---|---|---|---|---|
| | Technical | Cost | Schedule | Design | Technical | Cost | 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. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 0 | 884 | 0 | 0 | 3233 | 301 | 0 | 0 | 118.933 |
| **MFG MC** | 0 | 0 | 0 | 0 | 0 | 441 | 0 | 0 | 1605 | 0 | 0 | 0 | 51.284 |
| **MFG B/I** | 0 | 0 | 0 | 0 | 0 | 750 | 0 | 0 | 0 | 0 | 0 | 0 | 37.473 |
| | 0 | 0 | 0 | 0 | 0 | 2075 | 0 | 0 | 4838 | 301 | 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. 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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:

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 209 | 138 | 66 | 347 | 0 | 115 | 0 | 93 | 6.5 | 0.4 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7629 | 115.292 |
| **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 | 2640 | 0 | 0 | 8793 | 224.100 |

**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 | 209 | 86 | 0 | 340 |

**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. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MFG P** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2349 | 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* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 152 | 105 | 69 | 257 | 0 | 80 | 0 | 72 | 4.5 | 0.0 |

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5280 | 79.793 |
| MFG MC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2640 | 0 | 0 | 0 | 58.240 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2640 | 0 | 0 | 5280 | 138.033 |

**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* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 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 | 131 | 57 | 0 | 233 |

**WBS Number:** 1.1.1.5.3.6 **Description:** Module Attachment

**Institution :** LBNL/UC- Senior **Contact:** Maurice Garcia-Sciveres

Attachment of assembled modules to disk sectors. This includes thermal and mechanical testing but not electrical testing. All of this work will be done at LBNL

**Basis of Estimate:** Physicist estimate

**Details of Estimate:** Goals assume attachment of (2*9*6+4*8*6)*1.1=330 modules. We assume attachment and QA of 3 modules(one-half sector) per day or 880 hours.

Baseline scope is (2*9*6+2*8*6)*1.1= 224 modules or 600 hours.

Materials include clean room supplies and miscellaneous tools at $1000 per month. $4000 baseline, $2000 management contingency.

Adhesives are taken to be $1000 for both cases

Storage boxes for each sector at $20 each = $1200.

**COST SUMMARY: (Project)**

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

**MANPOWER SUMMARY:**

| | S.W. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFG P | 0 | 0 | 0 | 0 | 0 | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 43.969 |
| MFG B/I | 0 | 0 | 0 | 0 | 0 | 660 | 0 | 0 | 0 | 0 | 0 | 0 | 32.977 |
| | 0 | 0 | 0 | 0 | 0 | 1540 | 0 | 0 | 0 | 0 | 0 | 0 | 76.946 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| MFG P | 6 | 0 | 0 | 0 | 0 | 0.0 | 6.901 |
| | 6 | 0 | 0 | 0 | 0 | 0.0 | 6.901 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 | 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. Prof (hrs) | EE (hrs) | ME (hrs) | Design (hrs) | ET (hrs) | MT (hrs) | Admin. Super. (hrs) | Other Admin. (hrs) | Contract Labor (hrs) | Shops (hrs) | Tech. Serv. (hrs) | Student (hrs) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EDIA P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 440 | 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:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | Cost | Schedule | Design | Technical | Cost | Schedule | Cont % |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 105 | 0 | 0 | 105 | 0 | 0 | 0 | 105 | 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** | 105 | 0 | 0 | 0 | 0 | 0.0 | 105.000 |
| | 105 | 0 | 0 | 0 | 0 | 0.0 | 105.000 |

**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 | 25 | 30 | 30 | 10 | 10 | 105 |

**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:** Level of Effort

**Details of Estimate:** Based on past year's experience

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 40 | 0 | 0 | 40 | 0 | 0 | 0 | 40 | 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** | 40 | 0 | 0 | 0 | 0 | 0.0 | 40.000 |
| | 40 | 0 | 0 | 0 | 0 | 0.0 | 40.000 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 10 | 15 | 15 | 0 | 0 | 40 |

**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:** Level of Effort

**Details of Estimate:** This is very rough estimate.

**COST SUMMARY: (Project)**

| Base Cost (k$) | Cont Cost (k$) | Cont % | Total Cost (k$) | EDIA Labor (k$) | Mfg Labor (k$) | EDIA Matls (k$) | Mfg Matls (k$) | FTEs Project | FTEs Other |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 0 | 0 | 65 | 0 | 0 | 0 | 65 | 0.0 | 0.0 |

**MATERIAL SUMMARY:**

| | Pur. Mat. (k$) | Stores (k$) | Travel (k$) | Low Level (k$) | R + D (k$) | High Level (k$) | Total w/ overhead (k$) |
|---|---|---|---|---|---|---|---|
| **MFG P** | 65 | 0 | 0 | 0 | 0 | 0.0 | 65.000 |
| | 65 | 0 | 0 | 0 | 0 | 0.0 | 65.000 |

**CONTINGENCY FACTORS:**

| *Risk* | | | | *Weight* | | | |
|---|---|---|---|---|---|---|---|
| Technical | C o s t | Schedule | Des i gn | Technical | C o s t | Schedule | Cont % |
| 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 |

**PROFILE SUMMARY:**

| FY 96 (k$) | FY 97 (k$) | FY 98 (k$) | FY 99 (k$) | FY 00 (k$) | FY 01 (k$) | FY 02 (k$) | FY 03 (k$) | FY 04 (k$) | FY 05 (k$) | Total (k$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 15 | 15 | 15 | 10 | 10 | 65 |