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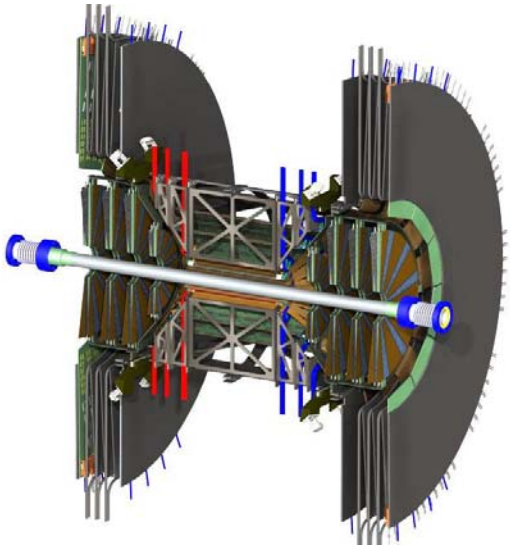


Cost Book
for the
Forward Silicon Vertex Trackers (FVTX)
for PHENIX

at
Brookhaven National Laboratory

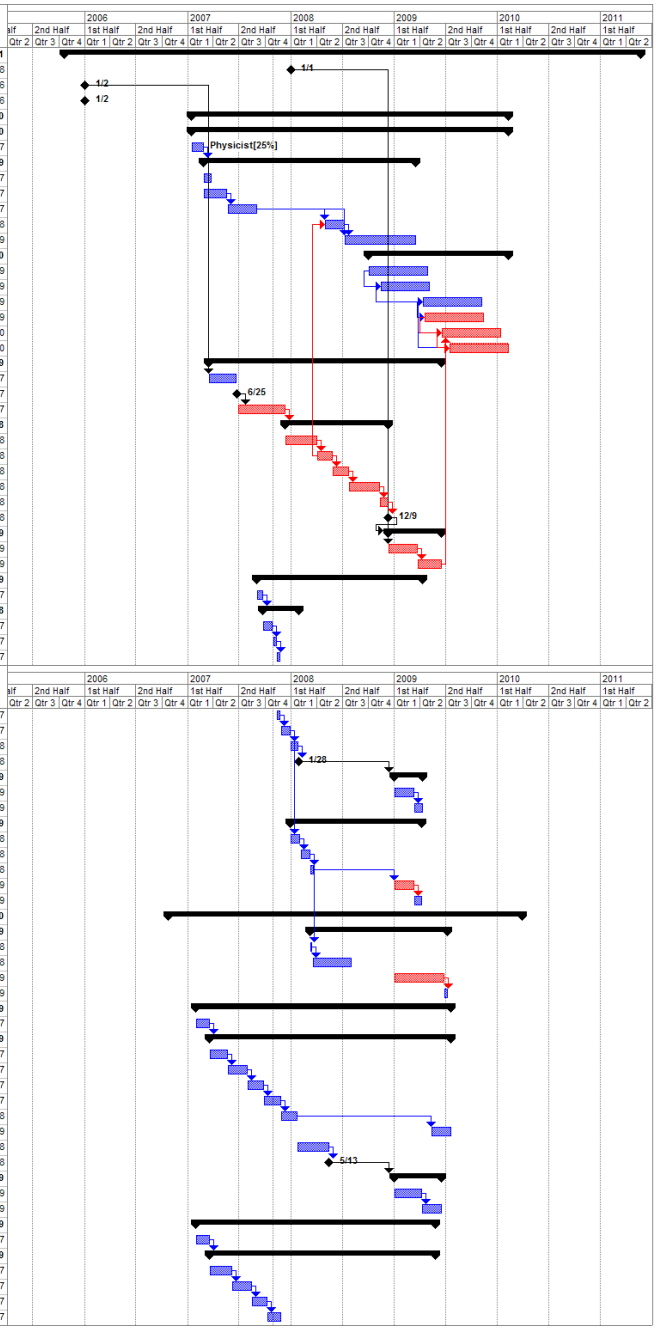
For the U.S. Department of Energy
Office of Science
Office of Nuclear Physics

November 11, 2007

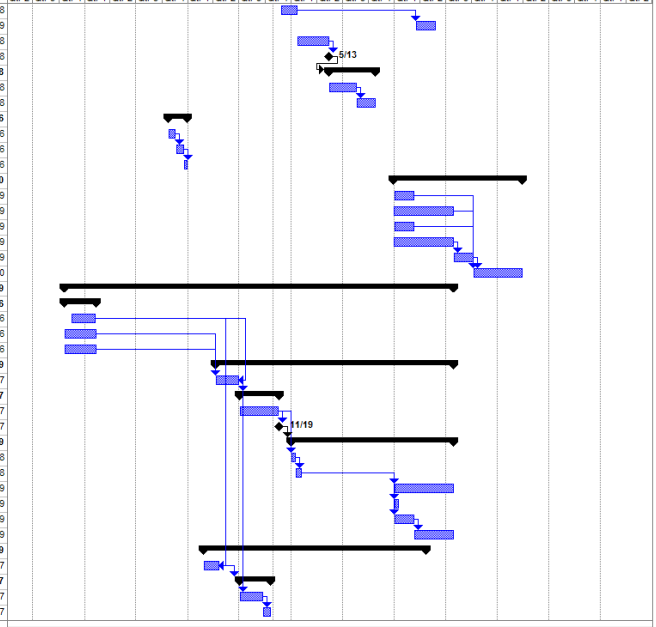
1. Project Schedule

ID	WBS	Task Name	Start	Finish
1	1	**FVTX Project**	**Fri 10/21/05**	**Tue 5/24/11**
2	1.1	**Start Construction**	Tue 1/1/08	Tue 1/1/08
3	1.2	**Start R&D BNL**	Mon 1/2/06	Mon 1/2/06
4	1.3	**Start R&D LANL**	Mon 1/2/06	Mon 1/2/06
5	1.4	**Wedge Components**	**Mon 1/15/07**	**Tue 2/9/10**
6	1.4.1	**Wedge sensors**	**Mon 1/15/07**	**Tue 2/9/10**
7	1.4.1.1	design sensors	Mon 1/15/07	Fri 2/23/07
8	1.4.1.2	**procure prototype sensor**	**Mon 2/26/07**	**Mon 3/16/09**
9	1.4.1.2.1	mask set	Mon 2/26/07	Fri 3/23/07
10	1.4.1.2.2	sensor manufacture	Mon 2/26/07	Fri 5/18/07
11	1.4.1.2.3	test prototype sensor	Mon 5/21/07	Fri 8/31/07
12	1.4.1.2.4	wire bond FPHX	Tue 4/29/08	Mon 7/7/08
13	1.4.1.2.5	test wedge assembly(system test)	Tue 7/8/08	Mon 3/16/09
14	1.4.1.3	**procure sensors**	**Wed 10/1/08**	**Tue 2/9/10**
15	1.4.1.3.1	procure sensor	Wed 10/1/08	Tue 4/28/09
16	1.4.1.3.2	Sensor Q/A	Wed 11/12/08	Tue 5/5/09
17	1.4.1.3.3	Attach flex cable	Fri 4/10/09	Thu 11/5/09
18	1.4.1.3.4	Attach sensor	Fri 4/17/09	Thu 11/12/09
19	1.4.1.3.5	wire bond assembly	Wed 6/17/09	Tue 1/12/10
20	1.4.1.3.6	test chip,sensor + cable assemblies	Wed 7/15/09	Tue 2/9/10
21	1.4.2	**FPHX Chip**	**Thu 3/15/07**	**Tue 6/16/09**
22	1.4.2.1	design(FNAL)	Thu 3/15/07	Wed 6/20/07
23	1.4.2.2	Review design	Mon 6/25/07	Mon 6/25/07
24	1.4.2.3	layout	Tue 6/26/07	Mon 12/10/07
25	1.4.2.4	**procure prototype chip**	**Tue 12/11/07**	**Tue 12/9/08**
26	1.4.2.4.1	First MOSIS run	Tue 12/11/07	Mon 3/31/08
27	1.4.2.4.2	test prototype(FNAL)	Tue 4/1/08	Mon 5/26/08
28	1.4.2.4.3	redesign	Tue 5/27/08	Mon 7/21/08
29	1.4.2.4.4	submit 2nd MOSIS run	Tue 7/22/08	Mon 11/10/08
30	1.4.2.4.5	test 2nd proto	Tue 11/11/08	Mon 12/8/08
31	1.4.2.4.6	review and approve	Tue 12/9/08	Tue 12/9/08
32	1.4.2.5	**procure production chips**	**Wed 12/10/08**	**Tue 6/16/09**
33	1.4.2.5.1	engineering run	Wed 12/10/08	Tue 3/24/09
34	1.4.2.5.2	test chips(FNAL)	Wed 3/25/09	Tue 6/16/09
35	1.4.3	**Kapton flex cables HDI**	**Mon 9/3/07**	**Thu 4/9/09**
36	1.4.3.1	design	Mon 9/3/07	Fri 9/21/07
37	1.4.3.2	**procure prototype HDI**	**Mon 9/24/07**	**Mon 1/28/08**
38	1.4.3.2.1	prototype	Mon 9/24/07	Fri 10/26/07
39	1.4.3.2.2	test	Mon 10/29/07	Fri 11/9/07
40	1.4.3.2.3	redesign	Mon 11/12/07	Fri 11/23/07

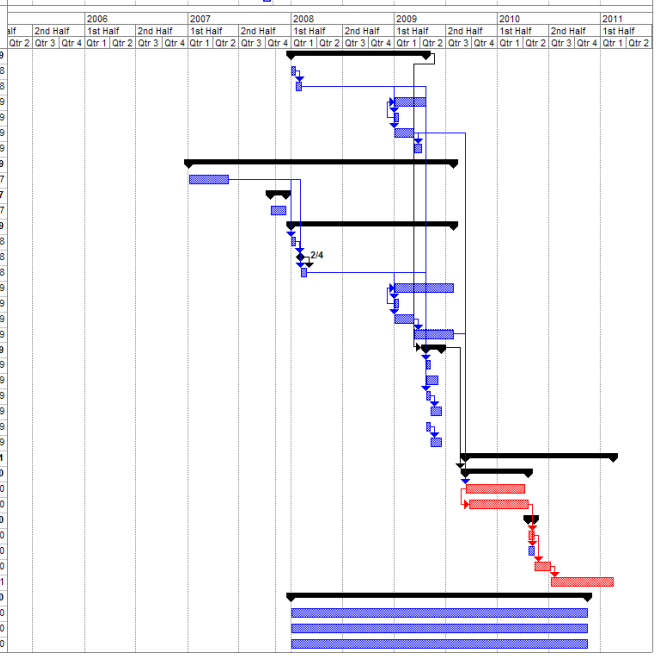
ID	WBS	Task Name	Start	Finish
40	1.4.3.2.3	redesign	Mon 11/12/07	Fri 11/23/07
41	1.4.3.2.4	prototype	Mon 11/26/07	Fri 12/28/07
42	1.4.3.2.5	test 2nd prototype	Mon 12/31/07	Fri 1/25/08
43	1.4.3.2.6	review and approve HDI	Mon 1/28/08	Mon 1/28/08
44	1.4.3.3	**procure production HDI**	**Fri 1/2/09**	**Thu 4/9/09**
45	1.4.3.3.1	procure	Fri 1/2/09	Thu 3/12/09
46	1.4.3.3.2	test cable	Fri 3/13/09	Thu 4/9/09
47	1.4.4	**Kapton HDI to ROC interconnect**	**Mon 12/31/07**	**Wed 4/8/09**
48	1.4.4.1	design	Mon 12/31/07	Fri 2/1/08
49	1.4.4.2	prototype	Mon 2/4/08	Fri 3/7/08
50	1.4.4.3	test prototype	Mon 3/10/08	Fri 3/21/08
51	1.4.4.4	procure	Thu 1/1/09	Wed 3/11/09
52	1.4.4.5	test cable	Thu 3/12/09	Wed 4/8/09
53	1.5	**DAQ**	**Mon 10/23/06**	**Mon 3/29/10**
54	1.5.1	**Fiber output ROC-FEM**	**Mon 3/10/08**	**Wed 7/8/09**
55	1.5.1.1	design	Mon 3/10/08	Fri 3/14/08
56	1.5.1.2	prototype	Mon 3/17/08	Fri 8/1/08
57	1.5.1.3	procure	Thu 1/1/09	Wed 6/24/09
58	1.5.1.4	test cable	Thu 6/25/09	Wed 7/8/09
59	1.5.2	**ROC Electronics**	**Tue 1/30/07**	**Mon 7/20/09**
60	1.5.2.1	design	Tue 1/30/07	Mon 3/19/07
61	1.5.2.2	**procure prototype**	**Tue 3/20/07**	**Mon 7/20/09**
62	1.5.2.2.1	prototype	Tue 3/20/07	Mon 5/21/07
63	1.5.2.2.2	test prototype	Tue 5/22/07	Mon 7/30/07
64	1.5.2.2.3	redesign	Tue 7/31/07	Mon 9/24/07
65	1.5.2.2.4	2nd prototype	Tue 9/25/07	Mon 11/26/07
66	1.5.2.2.5	test second proto	Tue 11/27/07	Mon 1/21/08
67	1.5.2.2.6	PHENIX system test	Tue 5/12/09	Mon 7/20/09
68	1.5.2.2.7	preproduction prototype	Tue 1/22/08	Mon 5/12/08
69	1.5.2.2.8	review and approve ROC	Tue 5/13/08	Tue 5/13/08
70	1.5.2.3	**procure production ROC**	**Thu 1/1/09**	**Mon 6/15/09**
71	1.5.2.3.1	production	Thu 1/1/09	Wed 4/8/09
72	1.5.2.3.2	Q/A - 28 units	Thu 4/9/09	Mon 6/15/09
73	1.5.3	**FEM Electronics**	**Tue 1/30/07**	**Mon 5/25/09**
74	1.5.3.1	design	Tue 1/30/07	Mon 3/19/07
75	1.5.3.2	**procure prototype FEM**	**Tue 3/20/07**	**Mon 5/25/09**
76	1.5.3.2.1	prototype	Tue 3/20/07	Mon 6/4/07
77	1.5.3.2.2	test prototype	Tue 6/5/07	Mon 8/13/07
78	1.5.3.2.3	redesign	Tue 8/14/07	Mon 10/8/07
79	1.5.3.2.4	2nd prototype	Tue 10/9/07	Mon 11/26/07



ID	WBS	Task Name	Start	Finish
80	1.5.3.2.5	test second proto	Tue 11/27/07	Mon 1/21/08
81	1.5.3.2.6	PHENIX system test	Tue 3/17/09	Mon 5/25/09
82	1.5.3.2.7	preproduction prototype	Tue 1/22/08	Mon 5/12/08
83	1.5.3.2.8	review and approve FEM	Tue 5/13/08	Tue 5/13/08
84	**1.5.3.3**	**procure production FEM**	**Wed 5/14/08**	**Fri 10/24/08**
85	1.5.3.3.1	production	Wed 5/14/08	Tue 8/19/08
86	1.5.3.3.2	Q/A - 28	Wed 8/20/08	Fri 10/24/08
87	**1.5.4**	**Calibration**	**Mon 10/23/06**	**Fri 12/29/06**
88	1.5.4.1	Design Pulse injection	Mon 10/23/06	Fri 11/17/06
89	1.5.4.2	prototype	Mon 11/20/06	Fri 12/15/06
90	1.5.4.3	test prototype	Mon 12/18/06	Fri 12/29/06
91	**1.5.5**	**Ancillary**	**Tue 12/30/08**	**Mon 3/29/10**
92	1.5.5.1	Racks	Thu 1/1/09	Wed 3/11/09
93	1.5.5.2	LV,HV,crates,etc	Tue 12/30/08	Mon 7/27/09
94	1.5.5.3	DCM-24	Thu 1/1/09	Wed 3/11/09
95	1.5.5.4	Slow controls	Tue 12/30/08	Mon 7/27/09
96	1.5.5.5	Misc lab equip	Tue 7/28/09	Mon 10/5/09
97	1.5.5.6	install	Tue 10/6/09	Mon 3/29/10
98	**1.6**	**Mechanics**	**Fri 10/21/05**	**Wed 7/29/09**
99	**1.6.1**	**specifications**	**Fri 10/21/05**	**Thu 2/9/06**
100	1.6.1.1	endcaps - specify heat load	Tue 11/15/05	Mon 2/6/06
101	1.6.1.2	specify mechanical tolerances/distortions	Fri 10/21/05	Thu 2/9/06
102	1.6.1.3	specify disassembly/configuration options	Fri 10/21/05	Thu 2/9/06
103	**1.6.2**	**Support structure cage**	**Mon 4/9/07**	**Wed 7/29/09**
104	1.6.2.1	design	Mon 4/9/07	Fri 6/29/07
105	**1.6.2.2**	**procure prototype cage**	**Mon 7/2/07**	**Mon 11/19/07**
106	1.6.2.2.1	prototype	Mon 7/2/07	Fri 11/16/07
107	1.6.2.2.2	Review and approve cage design	Mon 11/19/07	Mon 11/19/07
108	**1.6.2.3**	**procure**	**Wed 1/2/08**	**Wed 7/29/09**
109	1.6.2.3.1	final design	Wed 1/2/08	Tue 1/15/08
110	1.6.2.3.2	detail drawings	Wed 1/16/08	Tue 2/5/08
111	1.6.2.3.3	laison	Thu 1/1/09	Wed 7/29/09
112	1.6.2.3.4	tooling	Thu 1/1/09	Wed 1/14/09
113	1.6.2.3.5	material	Thu 1/1/09	Wed 3/11/09
114	1.6.2.3.6	Fabrication	Thu 3/12/09	Wed 7/29/09
115	**1.6.3**	**wedge backplane**	**Mon 2/26/07**	**Wed 4/22/09**
116	1.6.3.1	design	Mon 2/26/07	Fri 4/20/07
117	**1.6.3.2**	**procure prototype wedge backplane**	**Mon 7/2/07**	**Fri 10/19/07**
118	1.6.3.2.1	prototype	Mon 7/2/07	Fri 9/21/07
119	1.6.3.2.2	test	Mon 9/24/07	Fri 10/19/07



ID	WBS	Task Name	Start	Finish
121	**1.6.3.3**	**procure**	**Wed 1/2/08**	**Wed 4/22/09**
122	1.6.3.3.1	final design	Wed 1/2/08	Tue 1/15/08
123	1.6.3.3.2	constr drawings	Wed 1/16/08	Tue 2/5/08
124	1.6.3.3.3	liason	Thu 1/1/09	Wed 4/22/09
125	1.6.3.3.4	tooling	Thu 1/1/09	Wed 1/14/09
126	1.6.3.3.5	material	Thu 1/1/09	Wed 3/11/09
127	1.6.3.3.6	fabrication	Thu 3/12/09	Wed 4/8/09
128	**1.6.4**	**support disk**	**Thu 1/4/07**	**Wed 7/29/09**
129	1.6.4.1	R&D design	Thu 1/4/07	Wed 5/23/07
130	**1.6.4.2**	**procure prototype disk**	**Mon 10/22/07**	**Fri 12/14/07**
131	1.6.4.2.1	prototype	Mon 10/22/07	Fri 12/14/07
132	**1.6.4.3**	**Procure**	**Wed 1/2/08**	**Wed 7/29/09**
133	1.6.4.3.1	final design	Wed 1/2/08	Tue 1/15/08
134	1.6.4.3.2	Review wedge,disk,cage	Mon 2/4/08	Mon 2/4/08
135	1.6.4.3.3	construction drawings	Tue 2/5/08	Mon 2/25/08
136	1.6.4.3.4	liason	Thu 1/1/09	Wed 7/29/09
137	1.6.4.3.5	tooling	Thu 1/1/09	Wed 1/14/09
138	1.6.4.3.6	material	Thu 1/1/09	Wed 3/11/09
139	1.6.4.3.7	fabrication	Thu 3/12/09	Wed 7/29/09
140	**1.6.5**	**Alignment and assembly jigs**	**Thu 4/23/09**	**Wed 6/17/09**
141	1.6.5.1	design wedge jig	Thu 4/23/09	Wed 5/6/09
142	1.6.5.2	procure wedge jig	Thu 4/23/09	Wed 6/3/09
143	1.6.5.3	design cool plate jig	Thu 4/23/09	Wed 5/6/09
144	1.6.5.4	procure cool plate ass jig	Thu 5/7/09	Wed 6/17/09
145	1.6.5.5	design cage ass jig	Thu 4/23/09	Wed 5/6/09
146	1.6.5.6	procure cage ass jig	Thu 5/7/09	Wed 6/17/09
147	**1.7**	**Endcap Assembly**	**Wed 9/9/09**	**Tue 2/15/11**
148	**1.7.1**	**Assemble ladders onto cooling plate**	**Wed 9/9/09**	**Tue 4/20/10**
149	1.7.1.1	place wedges on cooling plate	Wed 9/9/09	Tue 4/6/10
150	1.7.1.2	optically survey wedges	Wed 9/23/09	Tue 4/20/10
151	**1.7.2**	**Install into cage enclosure**	**Wed 4/21/10**	**Tue 5/11/10**
152	1.7.2.1	place cooling plates in cage	Wed 4/21/10	Tue 5/11/10
153	1.7.2.2	optically survey	Wed 4/21/10	Tue 5/11/10
154	1.7.3	Test and Install into VTX enclosure	Wed 5/12/10	Tue 7/6/10
155	1.7.4	COMMISION	Wed 7/7/10	Tue 2/15/11
156	**1.8**	**System Integration**	**Wed 1/2/08**	**Tue 11/16/10**
157	1.8.1	Mechanical egineer	Wed 1/2/08	Tue 11/16/10
158	1.8.2	Electrical Engineer	Wed 1/2/08	Tue 11/16/10
159	1.9	FVTX Management	Wed 1/2/08	Tue 11/16/10



2. Cost Summary

Forward Endcap Cost Estimate - FVTX

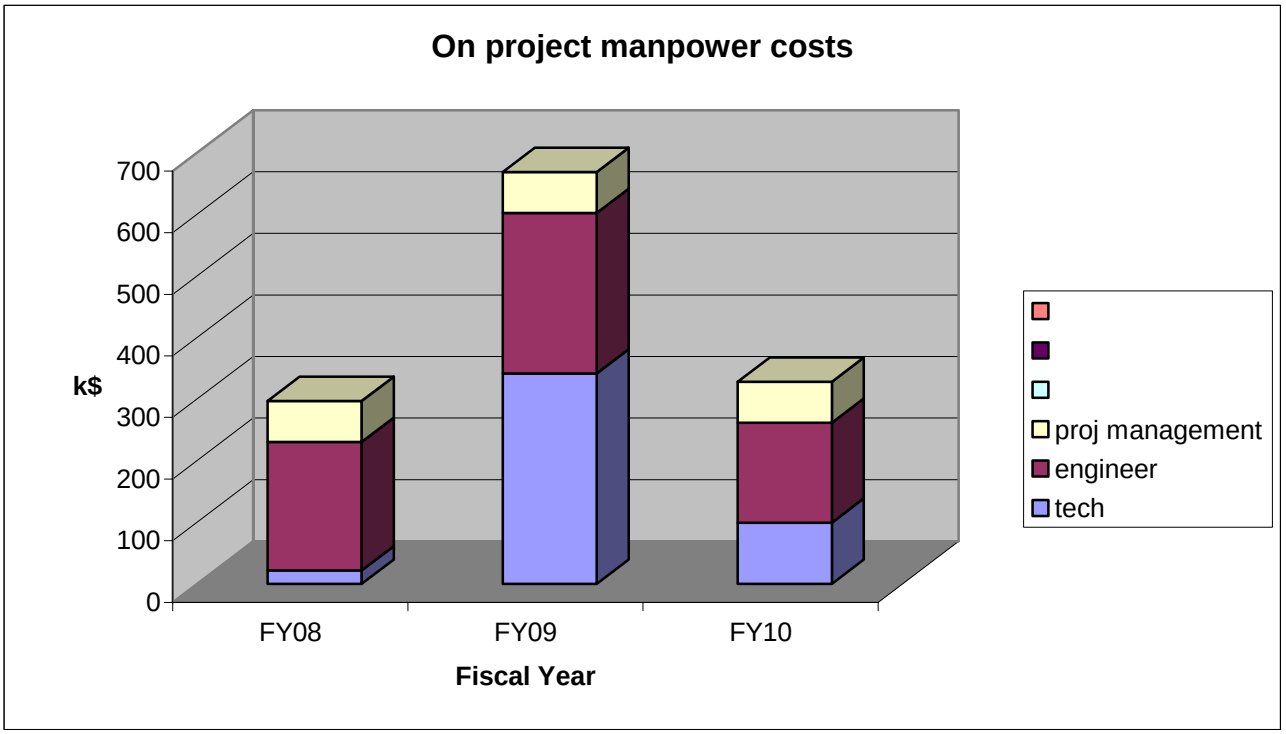
FY2007 dollars

2 endcaps	WBS	Base Cost Total	M&S	Workforce	comments	total contingency	Cost with Contingency	2008	2009	2010
Mechanics	1.6									
Mechanical ladder and support structure	1.6.2-1.6.4	352	275	77	HYTEC Estimate	0.27	446		446	
Alignment and Assembly jigs	1.6.5	60	30	30	engineering estimate	0.25	75		75	
	totals	412	305	107			521		521	
Sensor										
Silicon Sensor	1.4.1									
prototype sensor and test	1.4.1.2	85	85		mask,prototype,wire bond,te	0.22	104	104		
purchase	1.4.1.3	410	410		Vendor quotes	0.26	517	100	417	
sensor Q/A and testing	1.4.1.3.2	50		50	University students + engine	0.16	58		58	
	totals	545	495	50			678	204	475	
Readout Chip	1.4.2									
PHX chip, tested	1.4.2									
2 nd Mosis run and test	1.4.2.4.4	95	50	45	FNAL esimate	0.29	122	122		
engineering run	1.4.2.5.1	240	240		FNAL estimate	0.48	355		355	
testing	1.4.2.5.2	50		50		0.16	58		58	
attach HDI to backplane	1.4.1.3.3	30		30	engineering estimate	0.22	37		37	
attach sensor	1.4.1.3.4	30		30	engineering estimate	0.22	37		37	
wire bond assembly	1.4.1.3.5	188	188		Promex quote	0.26	237		237	
test wedge assembly	1.4.1.3.6	40		40	engineering estimate	0.22	49		49	
HDI bus	1.4.3	98	80	18	440 HDI, 10% spares, $250	0.24	122		122	
flex cables, sensor to ROC	1.4.4	56	38	18	784 flex, 10% spares, $42 e	0.16	65		65	
	totals	827	596	231			1081	122	959	
Readout Electronics										
ROC electronics	1.5.2									
preproduction proto	1.5.5.2	71	14	57	engineering estimate	0.36	97	97		
production	1.5.5.3.1	337	282	55	engineering estimate	0.33	449		449	
Q/A	1.5.5.3.2	14		14	engineering estimate	0.14	16		16	
	totals	422	296	126			561	97	465	
FEM electronics	1.5.3									
preproduction	1.5.3.2	80	22	57	engineering estimate	0.36	108	108		
production	1.5.3.3.1	301	260	42	engineering estimate	0.33	401			401
Q/A	1.5.3.3.2	14		14	engineering estimate	0.14	16			16
fibercables, ROC-FEM	1.5.1	17	11	6	440 ea. 54 units	0.16	20		20	
lab equipment	1.5.5.5	100	100		probe, test equipment	0.10	110	110		
	totals	512	393	119			655	218	20	417
Ancillary Systems	1.5.5									
Racks,LV,HV,DCM,crates,install	1.5.5.1-1.5.5.6	99	84	15	existing designs	0.12	111			111
slow controls	1.5.5.4	5		5	existing designs	0.18	6			6
calibration system	1.5.4									
	totals	104	84	20			117	0	0	117
Assembly										
Assemble endcap	1.7	30		30	techs and students	0.26	38			38
Integration										
Electronics Integration	1.8.2	165		165	Engineer	0.14	188	63	63	63
Mechanical Integration	1.8.1	250		250	Engineer	0.14	285	95	95	95
	totals	415		415			473	158	158	158
Management										
Management	1.9	200		200		0.14	228	76	76	76
total		3468	2169	1298		0.26	4353	874	2673	805
					Inflation adjusted(.035 per year)		**4661**	**905**	**2863**	**893**
BNL overhead 18%					DOE Guidence		4950	900	3000	1050
LANL overhead and GRT 19.5%										
All labor fully burdened										

3 Workforce Detail

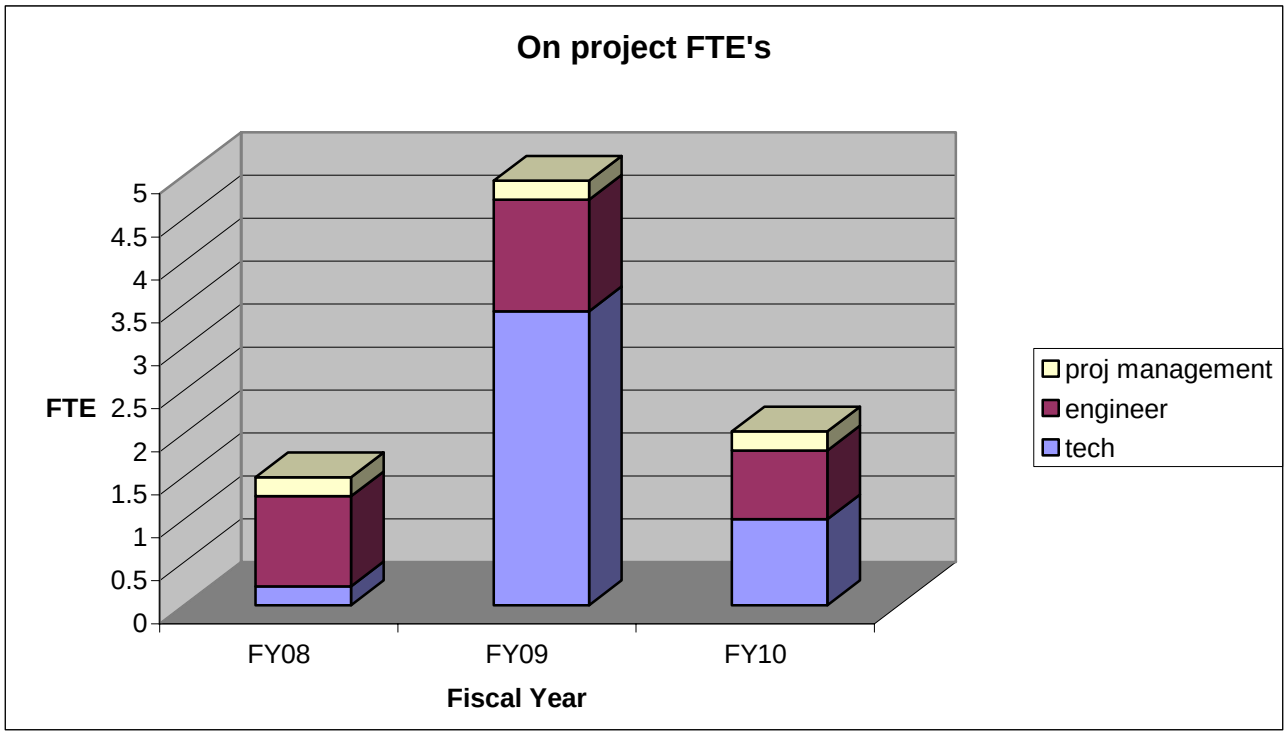
WBS		tech $	Eng $	tech08	tech09	tech10	eng08	eng09	eng10
1.4.1.3.2	unm	50			50				
1.4.1.3.3	cu	30			26	4			
1.4.1.3.4	cu	30			26	4			
1.4.1.3.6	cu	40			15.4	24.6			
1.4.2.4.3	fnal		30				30		
1.4.2.4.5	fnal		15					15	
1.4.2.5.2	fnal	50			50				
1.4.3.3.2	unm	18.2			18.2				
1.4.4.5	unm	18.2			18.2				
1.5.1.4	unm	6			6				
1.5.2.2.7	lanl	26.6	30.7		26.6			30.7	
1.5.2.3.1	lanl	26.6	30.7		26.6			30.7	
1.5.2.3.2	lanl	14			14				
1.5.3.2.7	lanl	24.8	30.7		24.8			30.7	
1.5.3.3.1	lanl	17.9	23.7			17.9			23.7
1.5.3.3.2	lanl	14				14			
1.5.5.2	bnl	5			5				
1.5.5.4	bnl	5			5				
1.5.5.6	bnl	5				5			
1.6.2.3.1	hytec		20				20		
1.6.2.3.2	hytec	10		10					
1.6.2.3.3	hytec		5					5	
1.6.3.2.2	hytec	5		5					
1.6.3.3.1	hytec		10				10		
1.6.3.3.2	hytec	2		2					
1.6.3.3.3	hytec		5					5	
1.6.4.3.1	hytec		10				10		
1.6.4.3.3	hytec	5		5					
1.6.4.3.4	hytec		5					5	
1.6.5.1	hytec	10			10				
1.6.5.3	hytec	10			10				
1.6.5.5	hytec	10			10				
1.7.1.1	bnl	10				10			
1.7.1.2	bnl	5				5			
1.7.2.1	bnl	5				5			
1.7.2.2	bnl	5				5			
1.7.3	bnl	5				5			
1.8.1	lanl		250				83.3	83.3	83.3
1.8.2	cu		165				55	55	55
1.8.3	lanl	200					66.6	66.6	66.6
		663.3	630.8	22	341.8	99.5	274.9	327	228.6

	tech	engineer	proj management
FY08	22	208.3	66.6
FY09	341.8	260.4	66.6
FY10	99.5	162	66.6



	tech	engineer	proj management
FY08	0.22	1.05	0.22
FY09	3.42	1.3	0.22
FY10	1	0.8	0.22

Average FTE
Tech $100k
Eng $200k



3. WBS 1.4 Wedge Components
The wedge components consist of the silicon sensor, the high density interconnect (HDI), and the FPHX chips. The carbon back plane that supports these components is listed in section WBS 1.6.

3.1 WBS 1.4.1 Wedge Sensors

3.1.1 Hamamatsu Quote

Jon Kaputinsky
Los Alamos National Lab
MS H846
LOS ALAMOS, NM 87545
505-665-2800
505-665-7920

Date: 11/8/2007 8:58:54 AM
Number: yXn07-26917199

Type: Price Quotation
Terms: Net 30 Days
Ship Via: Best Method
F.O.B.: Middlesex, NJ
Delivery: TBD

:: FVTV Detectors

Product Name	QTY	Unit Price	Lead Time
NRE for DC-TYPE [NRE for DC-TYPE RoHS:U]	1	$32,586.00	-
DC-TYPE [DC-TYPE RoHS:U]	17	$1,100.00	-
DC-TYPE [DC-TYPE RoHS:U]	50	$585.00	-
DC-TYPE [DC-TYPE RoHS:U]	84	$484.00	-
DC-TYPE [DC-TYPE RoHS:U]	550	$428.00	-
NRE for AC-TYPE [NRE for AC-TYPE RoHS:U]	1	$50,000.00	-
AC-TYPE [AC-TYPE RoHS:U]	17	$1,425.00	-
AC-TYPE [AC-TYPE RoHS:U]	50	$773.00	-
AC-TYPE	84	$632.00	-

3.1.2 Czech correspondence and ON Semi

Subject: RE: Sensors for FVTX project

From: "Miroslav Finger" <Miroslav.Finger@cern.ch>
To: "Melynda Brooks" <mbrooks@lanl.gov>
Cc: "Vaclav Vrba" <vrba@fzu.cz>, <dlee@lanl.gov>, <jonk@lanl.gov>

Dear Melynda,

At the moment we do not have price quotation for the Si sensor production in ON Semiconductor for FVTX. But we estimate that we could pay up to 50% of the cost of Si strip sensors for PHENIX FVTX providing that the production order is placed to ON Semiconductor.

I would like to note, that the money we have at our disposal can be dedicated and used for (mainly) R&D with domestic partners. This will be the case of Si sensors development an production for PHENIX FVTX in ON Semiconductor. Each sensor will be tested before sending to US.

To be more specific about our share, would you be so kind and ask ON Semiconductor for price quotation (and send us CC). We assume that for number of reasons it is more practical, that request for price quote goes from you - particularly that the wording sent to different companies being asked for price quotation is the same.

Looking forward to hear from you,
Sincerely,

Miroslav

3.1.3 CIS Quote

```
X-Sieve: CMU Sieve 2.2
X-Mailer: Novell GroupWise Internet Agent 6.0.4
Date: Fri, 16 Feb 2007 15:10:55 +0100
From: "Roeder Ralf" <rroeder@cismst.de>
To: <jonk@lanl.gov>
Cc: "Laser Hans-Joachim" <hjlaser@cismst.de>
Subject: new offer
X-Proofpoint-Virus-Version: vendor=fsecure
engine=4.65.5502:2.3.11,1.2.37,4.0.164 definitions=2007-02-16_05:2007-
02-14,2007-02-16,2007-02-16 signatures=0
X-Proofpoint-Spam: 0
X-PMX-Version: 4.7.1.128075


Dear Jon,


do You have got the email with the new order sent on 24th January ?
```

ps: estimation:

(1) DC n-type detectors: p on n silicon diode
(i) mask set:
J (adjustment marks)
A (Boron implantation)
C (contact opening)
D (metal structuring)
E (passivation opening)

(ii) Optional:
*Chip and Wafer Layout chip design Top and Bottom Sensor
10,600 USD

(iii) NRE Pre-Production (Prototyping)

- masks
* based on gds2 data base from LANL
*top sensor wafers with 3 top sensor chips (TOPS) per wafer
* bottom sensor wafers with 5 bottom sensor chips (BOS) per wafer
* mask set for 4inch top sensor wafer DCTS_OAS
  1 mask finer writing grid + 4 masks standard 6,200 USD
* mask set for 4inch bottom sensor wafe DCBS_OAS
  1 mask finer writing grid + 4 masks standard 6,200 USD

- wafer processing
* 1 batch = 18 wafer top sensor prototyping
10,200 USD
* 1 batch = 12 wafer bottom sensor prototyping
7,600 USD

- test
* prototyp test set up
3,550 USD
* prototyp testing 3,420 USD

prototyping amount: 37,170 USD (without layout work package)
(iv) Production

- TOP SENSOR WAFERS DC

* 350 pcs top sensor chips: 80 wafer with 3 TOPS chips meeting spec and 70 wafer with 2 TOPS chips meeting spec

* 80 wafer with 3 TOPS chips meeting spec
* wafer 635 USD each wafer
* chip test 112 USD each wafer

offer: 80 pcs wafers 747 USD each wafer = 59,760 USD

* 70 wafer with 2 TOPS chips meeting spec
* each wafer 423 USD each wafer
* chip test 112 USD each wafer
offer: 70 pcs wafers 535 USD each wafer = 37,450 USD

processing of 8 batches dc top sensor
97,210 USD

- TOP BOTTOM WAFERS DC
* 350 pcs bottom sensor chips:
34 wafer with 5 BOS chips meeting spec
+ 30 wafer with 4 BOS chips meeting spec
+ 20 wafer with 3 BOS chips meeting spec

* 34 wafer with 5 BOS chips meeting spec
* wafer 635 USD each wafer
* chip test 112 USD each wafer
offer: 34 pcs wafers 747 USD each wafer = 25,398 USD

* 30 wafer with 4 BOS chips meeting spec
* wafer 529 USD each wafer
* chip test 112 USD each wafer
offer 30 pcs wafers: 641 USD each wafer = 19,230 USD

* 20 wafer with 3 BOS chips meeting spec
* wafer 423 USD each wafer
* chip test 112 USD each wafer
offer 20 pcs wafers: 535 USD each wafer = 10,700 USD

processing of 4 batches dc bottom sensor
55,328 USD

---

(2) AC n-type detectors: p strips on n silicon + oxid+intrid

(v) mask set:
J (adjustment marks)
A (Boron implantation)
B (nitrid structuring, + option moderated pspray)
C (contact opening)
D (metal structuring)

E (passivation opening)

(vi) Optional:
* Chip and Wafer Layout chip design Top and Bottom Sensor
12,900 USD

(vii) NRE Pre-Production (Prototyping)

- masks
* based on gds2 data base from LANL
* top sensor wafers with 3 top sensor chips (TOPS) per wafer
* bottom sensor wafers with 5 bottom sensor chips (BOS) per wafer
* mask set for 4inch top sensor wafer ACTS_OAS
  2 mask finer writing grid + 4 masks standard 7,500 USD
* mask set for 4inch bottom sensor wafer ACBS_OAS
  2 mask finer writing grid + 4 masks standard 7,500 USD

- wafer processing
* 1 batch = 18 wafer top sensor prototyping
13,280 USD
* 1 batch = 12 wafer bottom sensor prototyping
9,920 USD

- test
* prototyp test set up 3,550 USD
* prototyp testing 3,420 USD

prototyping amount: 45,170 USD (without layout work package)

(viii) Production

* TOP SENSOR WAFERS AC
* 350 pcs top sensor chips: 80 wafer with 3 TOPS chips meeting spec +
70 wafer with 2 TOPS chips meeting spec

* 80 wafer with 3 TOPS chips meeting spec
* wafer 668 USD each wafer
* chip test 112 USD each wafer
offer: 80 pcs wafers 780 USD each wafer = 62,400 USD

* 70 wafer with 2 TOPS chips meeting spec
* wafer 446 USD each wafer
* chip test 112 USD each wafer
offer: 70 pcs wafers 558 USD each wafer = 39,060 USD

processing of 8 batches 101,460 USD

* TOP BOTTOM WAFERS AC

* 350 pcs bottom sensor chips: 34 wafer with 5 BOS chips meeting spec
+ 30 wafer with 4 BOS chips meeting spec
+ 20 wafer with 3 BOS chips meeting spec

* 34 wafer with 5 BOS chips meeting spec
* wafer 668 USD each wafer
* chip test 112 USD each wafer
offer: 34 pcs wafers 780 USD each wafer = 26,520 USD

* 30 wafer with 4 BOS chips meeting spec
* wafer 557 USD each wafer
* chip test 112 USD each wafer
offer: 30 pcs wafers 669 USD each wafer = 20,070 USD

* 20 wafer with 3 BOS chips meeting spec
* wafer 446 USD each wafer
* chip test 112 USD each wafer
offer: 20 pcs wafers 558 USD each wafer = 11,160 USD

processing of 4 batches 57,750 USD

- Delivery of tested wafers
* FOB LANL
* Option dicing: aditional offer

(3) delivery schedule
* mask set 2 ... 3 weeks
* prototyping * DC detectors 8 ... 10 week after confirmed order
* AC detectors
10 .... 12 weeks after confirmed order
attention ! 3 weeks service time at wafer processing line !

* production * DC detectors 8 ... 12 week after confirmed order
* AC detectors 10 ... 14 weeks after confirmed order
- first two batches after 8 ... 10 weeks; each week two following batches

Best regards / Mit freundlichen Grüßen

R. Röder
Manager MEMS, Radiation Detectors

CiS Institut f. Mikrosensorik gGmbH
Konrad-Zuse-Straße 14
D-99099 Erfurt

Tel.: +49 361 66314 61
Tel.: +49 361 66314 13
mobil: +49 171 5510794

Jon S Kapustinsky
Deputy Group Leader
P-25 Subatomic Physics
Mailstop - H846
phone: 665-2800
fax: 665-7920

3.1.4 Micron Quote

Los Alamos National Laboratory
P-25 Subatomic Physics
Los Alamos
NM 87545
USA

5th February 2007

Quotation number

5812

VAT NO. GB 376-

8710-14
Fax No. 505-665-7920
Attention: Jon S. Kapustinsky / David M. Lee
e-mail: dlee@lanl.gov
Tel: 505-665-2800

Experiment: PHENIX FVTX (Forward Vertex) UPGRADE
Change : Height reduction to permit more devices/ wafer

1) TECHNICAL
Technology: 6 inch single sided
Substrate: N-silicon 5000 – 8000 ohm-cm
Design: P-N silicon DC wedge subtending 7.5°
Electronics: Fermi lab design (Roy Yarena)

DC Design: a) With Polysilicon bias resistors b) Without resistors
Polysilicon resistor version has common 'DRAIN' easy to monitor QUALITY
Detector Thickness: 300 ± 15 microns
Detector Base: 23.27mm
Detector Apex: 5.60mm
Detector Height: 126.50mm
Bias Resistors: 5M ± 2.5 Megohms or 10M ± 5M (Optional)
Full Depletion (FD) 50V typical, 100V maximum
Operating Voltage: FD to FD+30V
Total Current 20°C (FD+30V): 1uA typical, 2uA maximum
Strip Leakage Current: 1nA typical, 10nA maximum
Metallising Aluminium: 1500Å
Strip (Ring) Pitch: 75 microns
No. of Strips: 1792 (14 x 128) to verify. With centre 3584
Detector Edge: 1mm (500 microns minimum)
Minimum Acceptance Level; 99%
Radiation Exposure 500 Kilorads equivalent 1MeV protons

ΔI damage $1nA/cm^2$/ 100RADS
Note: Resistor inclusive version whilst more complex to manufacture would be much

simpler to test and evaluate as total current would be an instant quality factor by

measuring leakage current between the drain and the ohmic side.

Lower value resistor may be referable as tolerance is better and gives less voltage drop after radiation damage. Previous PHENIX pixel wedge was AC Coupled with capacitors and resistors.

2) REQUIREMENT
Supply 20 Pre-Series Prototype Detectors 2007
Supply 350 Series Production Detectors 2008
Detector is supplied as CHIP ONLY with probe-tested documentation and Q.A. (ISO9001) release in chip corner package suitable for handling and transit by FEDEX.

3) Financial
NRE (Non recurring engineering)
Detector Design

3.1)	Simple DC Single Sided Wedge 3 masks # $5000	$15000
3.2)	Resistor Biased DC Wedge (optional) 6 masks # $7000	$30000
3.3)	Silicon (NRE) Pre series	$13000
3.4)	Probe card for customer testing	$1000

3.5)	Packing boxes for wedge	$1000

Total NRE (subject to design options) $30,000 or $45,000

Pre Series detectors 2007

Supply 20 pre series (prototype) PHENIX FVTX 6 inch technology silicon detectors to specification.

DC # $1750	**$35,000**
DC with resistor # $2000	**$40,000**

Total DC proposal	**$65,000**
Total DC poly R proposal	**$70,000**

Production Series 2008

Price 350 detectors to specification with probe test documentation
NRE Silicon 6 " # $50,000
PHENIX FVTX DC # $1500
PHENIX FVTX DC with Poly R # $1750

Budget total $575,000 or $662,500

Base Price January 2007 for prices labour and materials
Final Price subject to pre series acceptance and yields

Prices: US dollars FOB Los Alamos
Payment terms: LANL net 30 days
Delivery: 4 months contingency +/- 1 month
Warranty: 12 months manufacturing defects/ specification attributed to Micron Semiconductor Ltd from Invoice date.
Origin: UK/ EEC
Quotation validity: 31st March 2007

Colin Wilburn
Director

NOTE On MICRON QUOTE: This quote was for a single working sensor on a 6-inch wafer. We expect to get 3 large sensors and 4 small sensors on a 6-inch wafer. The quote would be $220,000 for 350 large sensors.

3.2 WBS 1.4.2 FPHX Chips

3.2.1 MOSIS Quote

MOSIS QUOTATION

To: Ray Yarema
Fermilab
P. O. Box
Batavia,, IL 60510

yarema@fnal.gov

Quote ID: 145535-A
Date: 24-OCT-2007
Expires: 23-NOV-2007
Payment Terms: See below
MOSIS Account: 573-COM-RLAB/FERMI

Issue Purchase Order to: University of Southern California **Tax ID:** 95-1642394

Item	QTY	Unit	Part No	Description	Unit Price	Extended Price
1	1	LOT	10502	Initial lot of 40 TSMC 0.25 Mixed Mode Process (CM025) ICs, up to 25 mm^2. Price based on area of 22.5 mm^2.	38,588	38,588
						======
						38,588

These prices include Federal Express 2 day shipping; delivery is best effort.

Terms and conditions are defined in the customer agreement signed by your organization on 28-MAR-1990.

Projects on MOSIS scheduled fabrication runs will be invoiced (net 30 days) for 80% of the total charges when MOSIS sends customer design data to the mask vendor (tapeout). Parts will not be shipped until this first invoice is paid. The balance will be invoiced (net 30 days) when fabricated parts are shipped to the customer.

For more information please contact MOSIS customer support.

Approved By:

MOSIS
Automated Quote Generator

CONFIDENTIAL

The MOSIS Service
USC Information Sciences Institute
4676 Admiralty Way
Marina del Rey, CA 90292-6695

MOSIS

Telephone (310) 448-9400
Facsimile (310) 823-5624
support@mosis.com
http://www.mosis.com

3.2.2 FNAL Quote

More thoughts on Cost Estimate for 128 Channel PHX
12/7/06
Revised 10/24/07
R. Yarema

The chip will have 128 channels designed to mate with a detector that has a 75 micron pitch. The estimated size of the chip is 9 mm x 2.5 mm. The prototype cost of this device in the TSMC 0.25 um process is approximately $38,588K.

The wafer frame size is nominally 21 x 21 mm. For the estimated size I would put 2 rows of 8 chips in the frame plus a PCM that might be about 1 x 10 mm. The overall frame size would then be about 21 x 18 mm.

I expect about 68 full frames with 16 chips/ frame for a total of 1088 chips per wafer. Typically we get about an 80% yield on this type of design.

One lot starts with 12 wafers. TSMC guarantees 6 wafers but MOSIS expects to ship a minimum of 10 wafers. (We get all the good wafers from a lot). We have never gotten less than 10 wafers in a lot.

In one lot I would estimate 1088 x .8 yield x 10 wafers = 8704 good parts.

The number needed for the experiment given by Jon is 11290. Therefore I believe you will need 1 ½ lots for 13000 good parts. Masks cost are $150K and a full lot of wafers is $50K. Thus the production processing should cost about $225K.

3.4 WBS 1.4.1.3.5 Promex and FNAL Wire Bonding Quote

PROMEX INDUSTRIES INC.
3075 Oakmead Village Drive, Santa Clara, CA 95051 USA

FM52005
ISO 9001: 2000

David M. Lee
Los Alamos National Laboratory
P-25 MS H846
Los Alamos, NM 87545

Quote#: 7617
January 19, 2007

Dear David,

Promex is pleased to offer you the following quotation for the assembly of your FVTX Sensor wedge.

I. **NRE Price:**
   - A. **Solder stencil: $1,000**
   - B. **Engineering: $2,500**
   - C. **Machine Programming: $500**

II. **P/N, Quantity & Price:**

A. Large wedge, 350@$425 per board
B. Small wedge, 120@$135 per board

III. **Leadtime: 15-20 working days**

IV. **Assumptions:**
   - A. **Los Alamos National Laboratory**, to provide all materials, and bond fixture.
   - B. **Promex** will perform wirebond and SMT assembly only, no electrical testing.
   - C. Revision changes to the current revision levels will be charged $250 per revision implementation if machine reprogramming is required.

Quote#: 7617 , page 1 of 2

Quote#: 7617 , page 2 of 2

Promex Industries, Inc. 3075 Oakmead Village Drive Santa Clara CA 95051 USA Phone: 408-496-0222 Fax: 408-496-0117
www.promex-ind.com

Preliminary Cost Estimate for the LANL-Phenix Forward Vertex Detector Pro

Material Cost For Wire Bonding

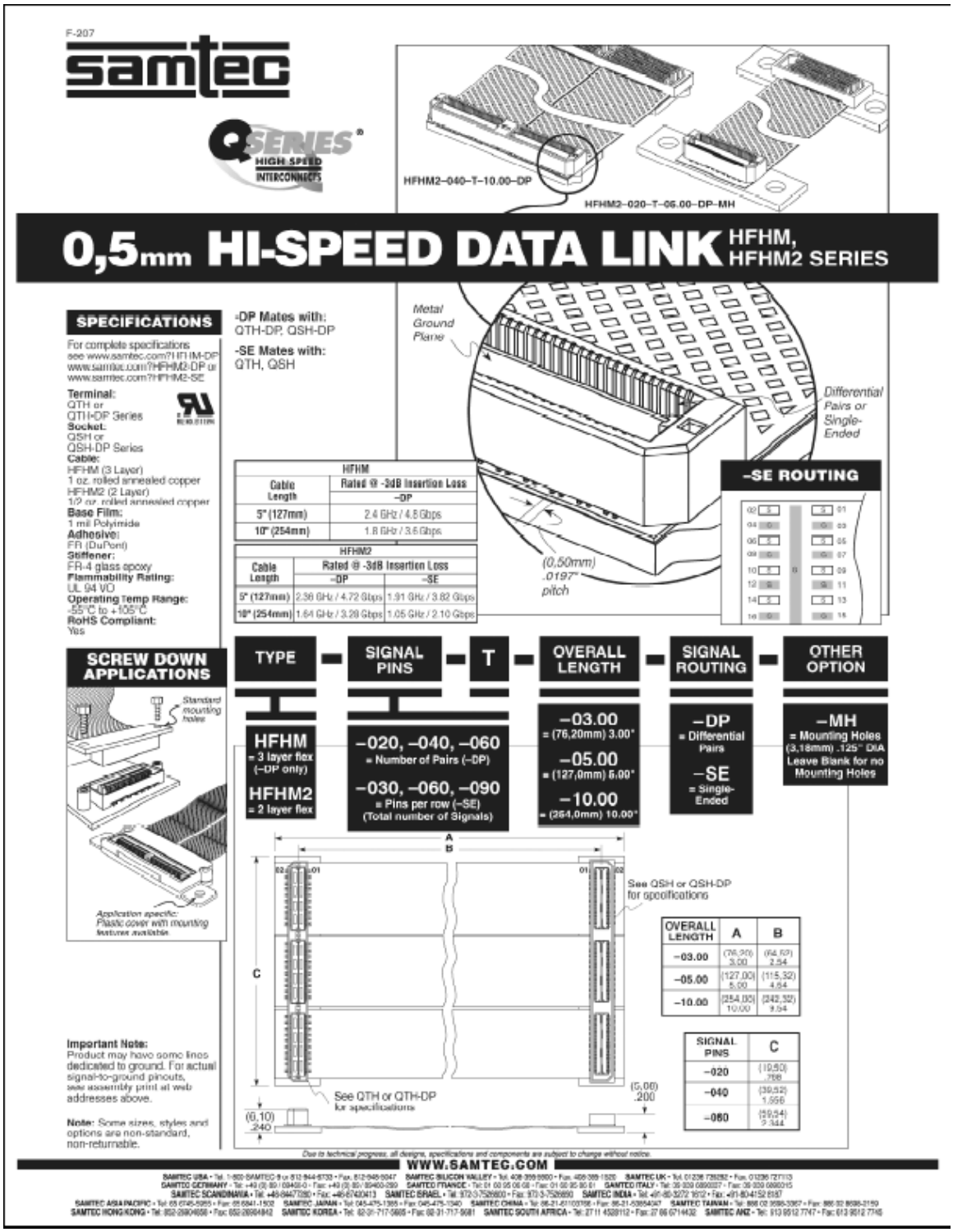
Item	Unit Cost	Amount	Extended Cost
Spool of 25 micron Aluminum Wire	$25	22	$550
Tooling	$28	150	$4,200
Total Material Cost			$4,750
Indirect Cost on Materials (16.03%)			$761.43
Fully Burdened Material Cost			$5,511.43

Labor Cost for Wire Bonding Item	Unit Cost	Amount	Extended Cost
Wirebonding and Inpection	$57.03/wedge (see note)	400	$22,812.00
Estimated Fully Burdened Total cost			$28,323.43

Note: Estimate 1 hour of labor per wedge. Includes inspection. This number is alre

3.3 WBS 1.4.3 Kapton Flex Cables HDI
3.4 WBS 1.4.4 Kapton HDI to ROC Interconnect

3.4.1 Samtec Cable



4 WBS 1.5 DAQ
4.1 WBS 1.5.1 Fiber Output ROC-FEM
4.2 WBS 1.5.2 ROC
4.3.WBS 1.5.3 FEM
4.3.1Combined Quote for Fiber, ROC, FEM,

FVTX

Task		Duration	TSM	ECAD		M&S	M&S	M&S	M&S	Notes	Manpower	Manpower	M&S
		Weeks	Hours	Hours	# units	NRE	Unit Cost	Parts	Total		TSM	ECAD	with G&A
ROC Pre-production										2 ROC FPGA with all associated circuitry for both sensor and FEM. Mechanical configuration for system installation.			
Design		3	40	80									
PCB Design		4	40	120									
PCB Fabrication		4	8	16	2	$ 1,000.00	$ 1,000.00		$ 3,000.00	3 week turn			
Assembly		3	8	16	2	$ 2,000.00	$ 1,000.00	$ 1,530.72	$ 7,061.44	2 week turn			
Test		2	80					$ 1,530.00	$ 1,530.00				
									$ 11,591.44		$ 30,652.16	$ 26,610.40	$ 13,851.77
FEM Pre-production										3 FEM FPGAs on VME format card with all associated circuitry for FVTX system operation. VME interface. Same as R&D FEM with the addition of FVTX specific features.			
Design		3	40	80									
PCB Design		4	40	120									
PCB Fabrication		4	8	16	2	$ 1,000.00	$ 800.00		$ 2,600.00	3 week turn			
Assembly		3	8	16	2	$ 2,000.00	$ 800.00	$ 2,893.76	$ 9,387.52	2 week turn			
Test		2	80					$ 6,730.00	$ 6,730.00				
									$ 18,717.52		$ 30,652.16	$ 26,610.40	$ 22,367.44
ROC Production										7 ROC FPGA and all associated circuitry for FVTX system operation.			
Design		2	40	80									
PCB Design		3	40	120									
PCB Fabrication		4	8	8	28	$ 2,000.00	$ 2,000.00		$ 58,000.00	3 week turn			
Assembly		3	8	8	28	$ 2,500.00	$ 1,500.00	$ 3,136.44	$ 132,320.32	2 week turn			
Test		2	80					$ 45,530.00	$ 45,530.00				
									$ 235,850.32		$ 30,652.16	$ 24,775.20	$ 281,841.13
FEM Production										3 FEM FPGAs on VME format card with all associated circuitry for FVTX system operation. VME interface.			
Design		2	20	60									
PCB Design		3	20	80									
PCB Fabrication		4	8	8	54	$ 1,000.00	$ 600.00		$ 33,400.00	3 week turn			
Assembly		3	8	8	54	$ 2,000.00	$ 600.00	$ 2,390.76	$ 163,501.04	2 week turn			
Test		2	80					$ 20,514.00	$ 20,514.00				
									$ 217,415.04		$ 23,685.76	$ 17,893.20	$ 259,610.97
System													
Integration		4	20										
Test		4	20										
Specification			40										
Contingency			0	0							$ 13,932.80		
Total			744	836					$ 483,574.32				
Rate (Construction)			$ 174.16	$ 114.70					1.195	G&A =14% per Melynda			
Loaded Cost			$ 129,575.04	$ 95,889.20					$ 577,871.31				
									$ 803,335.55		$ 129,575.04	$ 95,889.20	$ 577,871.31

Part Number	Manufacturer	Description	Cost	FVTX ROC Pr	FVTX FEM Pr
A3PE1500-FG676	Actel	IC, FPGA, Flash	$ 123.30		
A3PE3000-FG896	Actel	IC, FPGA, Flash	$ 261.50	4	
TLK2711JRZQE	Texas Instruments	IC, Transceiver, 1.6 to 2.7 GBPS	$ 10.50	17	10
LT3021EDH-1.5	Linear Technology	IC, Regulator, Linear, 1.5V, 500mA	$ 3.21	4	
LT1118CST-2.5	Linear Technology	IC, Regulator, Linear, 2.5V, 800mA	$ 3.45	4	1
LT1529CQ-3.3	Linear Technology	IC, Regulator, Linear, 3.3V, 3A	$ 4.73	4	1
HFBR-772BEZ	Avago Technology	IC, Fiber Optic Transmitter, 12 channel	$ 540.00	2	
HFBR-782BEZ	Avago Technology	IC, Fiber Optic Receiver, 12 channel	$ 380.00		1
HFBR-7924E	Avago Technology	IC, Fiber Optic Transceiver	$ 100.00	1	1
84512-102	fci	Connector, array, 10x10, 1.27mm pitch	$ 9.00	2	1
XC4VSX55-10FF1148C	Xilinx	IC, FPGA, SRAM	$ 1,000.00		1
XCF32PFSG48	Xilinx	IC, Flash Memory	$ 29.00		1
25LC1024	Atmel	IC, EEPROM,	$ 3.00		1
LT1963AEQ	Linear Technology	IC, Regulator, Linear, 1.2V, 1500mA	$ 5.25		3
REG103F-5	Texas Instruments	IC, Regulator, Linear, 5V, 500mA	$ 4.50	4	
TLV5617ACD	Texas Instruments	IC, DAC, Dual, 10-bit	$ 4.05	4	
REF191ES	Analog Devices	IC, Reference, 2.048V	$ 1.94	4	
AD8044AR-14	Analog Devices	IC, Op Amp, Quad, Rail-to-rail,	$ 6.40	12	
ADG713BR	Analog Devices	IC, Analog Switch, Quad	$ 6.40	8	
DS2782E	Maxim	IC, IVT Sensor	$ 2.37	16	9
Passive Components			$ 50.00	4	3
RE96MSR-062	Vector Electronics	Connector, VME, 96 pin, R/A	$ 8.00		2
DF18C-100DF	HiRose	Connector, Data	$ 1.50	28	
		Connector, LV	$ 3.00	7	
G-Link Card	BNL	Glink Card	$ 200.00		1
		Crystal Oscillator 135 MHz	$ 6.00	28	54
XC3S200-4FT256C	Xilinx	IC, FPGA, SRAM	$ 25.00	1	1
XCF02SV02D	Xilinx	IC, Flash Memory	$ 4.50	1	1
Parts Cost				$ 3,136.44	$ 2,390.76
System Level Components					
VME Crates	SIP, Inc (quote)		$ 6,676.00		3
FO Cables, ROC to FEM, datax12, 50m	FIS, Inc.		$ 195.00	54	
FO Cables, ROC to FEM, Control, 50m			$ 25.00	28	
Data Cables, 10 inch	HIRose		$ 42.00	784	
LV Cables			$ 7.00	196	
FO Cables, FEM to DCM, 3m			$ 9.00		54
				$ 45,530.00	$ 20,514.00

4.4 WBS 1.5.5 Ancilliary

4.4.1 LV, HV, crates, etc. quotes

From: Eric Mannel <mannel@nevis.columbia.edu>
To: phenix-fvtx-l@bnl.gov
Subject: LV/Bias supplies for FVTX

Dear All-

In order to get a resonable cost estimate for power supplies, I need to have an idea of level of segmentation that we will want. Specifically, I would like feedback on the following:

Bias Voltage:
Expected Voltage Range
Number of channels (1 per wedge, 1/2 wedge, disk or faction thereof?)

Low Voltage(s) in the IR
Voltage(s)
Power/Current estimates per channel
Number of channels (1 per ROC, Wedge, disk or fraction there of?)

I have a quote from Wiener/ISEG for both their low voltage and high voltage modules. The numbers are $6700 for crate and controller, $2400 for 8 channel, programmable 0-8V, 50W/channel floating ground LV module and $5300 for 32 channel 0-500V common ground High voltage module. Both LV and HV modules can share the same crate. For the VTX I have a requested an evaluation system which I hope to have by the end of this year or the first of next year.

Eric J. Mannel
Associate Research Scientist,
Dept of Physics/Nevis Labs
Columbia University
914/591-2816 (Nevis Office)
914/659-3235 (Cell)

Phenix-fvtx-l mailing list
Phenix-fvtx-l@lists.bnl.gov
https://lists.bnl.gov/mailman/listinfo/phenix-fvtx-l

5 WBS 1.6 Mechanics
5.1 WBS 1.6.2 Support structure cage
5.2 WBS 1.6.3 Wedge Back Plane

5.2.1 Across Quote

Dear Mr. Sondheim

Thank you very much for your e-mail.

AC100 unit price
(size 140*50*0.76T, without machining, 150 pieces, flatness ^about0.1)
2500yen($22)

AC100 unit price
(size 136*45.03*0.76T,
with machining the finish wedge shape, 150 pieces, flatness ^about0.1)
5000yen($44)

Best regards,

Mihoko Yamashita

Across Corporation
yamashita@across-cc.co.jp

5.2.2 Alliance Quote

Subject: FW: Test Coupons
From: "RJ Ponchione" <rj@hytecinc.com>
To: <dlee@lanl.gov>

Hi Dave, here is the email again. Please let me know as soon as you get it. If I don't hear from you today, I'll assume it didn't make it too you.

RJ PONCHIONE

MECHANICAL ENGINEER
:: FlashCT® Computed Tomography
:: Advanced Composites + Design Engineering Services

110 EASTGATE DRIVE LOS ALAMOS, NM 87544
Cell : **505-699-7329** Office : 505-661-3000
Email: rj@hytecinc.com

Note: HYTEC, Inc. has merged with IMTEC Corporation.
Merger Press Release

From: Rick Byrens [mailto:rbyrens@alliancespacesystems.com]
Sent: Tuesday, September 04, 2007 4:15 PM
To: RJ Ponchione
Subject: RE: Test Coupons

Hi RJ,

Here's our quotation for the subject test coupons (please reference Alliance quote # V07-246):

NRE = $3,000
Unit Price = $1,225 each
X 10 each coupons = $12,250

Grand Total = $15,250

Notes/Exceptions:

1) Material will be K13D2U/RS-3C, .063mm CPT
2) The small (0.79mm) holes will be located to .02mm true position on a best effort basis.

Delivery of all coupons would be 4 weeks after receipt of order, FOB Signal Hill, CA
Terms are net 30 days
Quote validity: 60 days

Please give me a call or e-mail if you have any questions

Rick Byrens

alliance spacesystems

Office: (626) 296-1373 x207
Mobile: (714) 325-0592
rbyrens@alliancespacesystems.com

From: RJ Ponchione [mailto:rj@hytecinc.com]
Sent: Friday, August 24, 2007 10:11 AM
To: Rick Byrens
Subject: RE: Test Coupons

I hate to do this to you, but the final parts have 2 high precision locating holes. I had originally removed them from the drawing to keeps the cost of the test parts down, but now the customer would like them in the test samples. I have attached an updated drawing.
Thanks.

IMTEC CORPORATION

RJ PONCHIONE

MECHANICAL ENGINEER
:: FlashCT® Computed Tomography
:: Advanced Composites + Design Engineering Services

110 EASTGATE DRIVE LOS ALAMOS, NM 87544
Cell : **505-699-7329** Office : 505-661-3000
Email: rj@hytecinc.com

Note: HYTEC, Inc. has merged with IMTEC Corporation.
Merger Press Release

From: Rick Byrens [mailto:rbyrens@alliancespacesystems.com]
Sent: Thursday, August 23, 2007 2:39 PM
To: RJ Ponchione
Subject: RE: Test Coupons

Well, considering the minimum buy on the K13C (which you won't have to pay for on the K13D), there is a huge favorable cost difference for K13D.

Per pound, K13C is about $1,200/lb, K13D $1,400

Regards,

Rick Byrens

alliance spacesystems

Office: (626) 296-1373 x207
Mobile: (714) 325-0592
rbyrens@alliancespacesystems.com

From: RJ Ponchione [mailto:rj@hytecinc.com]
Sent: Thursday, August 23, 2007 1:00 PM
To: Rick Byrens
Subject: RE: Test Coupons

I think that will be fine. The K13D is actually a better fiber for what we are doing. What is the relative cost difference between it and the K13C that we speced?

IMTEC CORPORATION

RJ PONCHIONE

MECHANICAL ENGINEER
:: FlashCT® Computed Tomography
:: Advanced Composites + Design Engineering Services

110 EASTGATE DRIVE LOS ALAMOS, NM 87544
Cell : **505-699-7329** Office : 505-661-3000
Email: rj@hytecinc.com

Note: HYTEC, Inc. has merged with IMTEC Corporation.
Merger Press Release

From: Rick Byrens [mailto:rbyrens@alliancespacesystems.com]
Sent: Thursday, August 23, 2007 12:52 PM
To: RJ Ponchione
Subject: RE: Test Coupons

RJ,

We have some K13D/RS-3 .0025" material in stock we could use for these. It's a higher thermal conductivity/stiffness, so it should work out great. I'll go ahead and quote this and we can go from there.

Ordering new K13C would likely be around $25K just for material…

Regards,

Rick Byrens

alliance spacesystems
Office: (626) 296-1373 x207
Mobile: (714) 325-0592
rbyrens@alliancespacesystems.com

From: RJ Ponchione [mailto:rj@hytecinc.com]
Sent: Thursday, August 23, 2007 10:49 AM
To: Rick Byrens
Subject: RE: Test Coupons

Rick -
I was afraid of that. Unfortunately the in-plane conductivity of these panels is fairly critical, and since these test samples will be used for thermal testing at some point I think it is important that we get them built out of the right fiber. How expensive is an expensive small order? In order to consider a substitution, I think the fiber would have to be very equivalent in stiffness and thermal conductivity. I am not terribly familiar with all of the types of fiber available so if you think you have something close I am willing to consider it.

IMTEC CORPORATION

RJ PONCHIONE

MECHANICAL ENGINEER
:: FlashCT® Computed Tomography
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110 EASTGATE DRIVE LOS ALAMOS, NM 87544
Cell : **505-699-7329** Office : 505-661-3000
Email: rj@hytecinc.com

Note: HYTEC, Inc. has merged with IMTEC Corporation.
Merger Press Release

From: Rick Byrens [mailto:rbyrens@alliancespacesystems.com]
Sent: Thursday, August 23, 2007 11:39 AM
To: RJ Ponchione
Subject: RE: Test Coupons

Hi RJ,

Do you think M55J will be an acceptable alternate for these coupons? We do not have K13C in stock, and it would be an expensive small order to make these coupons. We can also talk about other alternates based on what we have in inventory if you want.

Let me know what you think…

Regards,

Rick Byrens

alliance spacesystems

Office: (626) 296-1373 x207
Mobile: (714) 325-0592
rbyrens@alliancespacesystems.com

From: RJ Ponchione [mailto:rj@hytecinc.com]
Sent: Wednesday, August 22, 2007 9:49 AM
To: Rick Byrens
Cc: dlee@lanl.gov
Subject: Test Coupons

Hi Rick, We need to get some test blanks made up for a different portion of the same project as the pixel staves. They would like about 10 pieces. Please see the attached drawing. Could you give me a price and delivery time estimate? Thanks.

IMTEC CORPORATION

RJ PONCHIONE

MECHANICAL ENGINEER
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Merger Press Release

5.3 WBS 1.6.4 Support Disk
5.4 WBS 1.6.5 Alignment and Assembly Jigs