E.O. Lawrence Berkeley National Laboratory
GRETINA MONTHLY PROGRESS REPORT
January, 2005

I. DEPUTY CONTRACT PROJ. MGR. ASSESSMENT

1. TECHNICAL AND PROGRAMMATIC PROGRESS AND ACCOMPLISHMENTS

On Jan. 25 and 26 we had the GRETINA Annual Review. We will have a follow up meeting at DOE to review additional aspects of the MIE. We have generated a list of the recommendations and a path forward for this follow up review.

The document "GRETINA Detector Module, Test Procedures and Apparatus," was completed. With this achievement we completed the Level 2 milestone "Complete Detector Test Procedures and Apparatus".

We have received a quotation from Canberra/Eurisys for the detector module design and fabrication. The quotation is being reviewed foreseen the order of the detector design.

Both, the Risk Management Plan and the Safety Plan were completed and reviewed. The Risk Register was partially completed and we gave emphasis on the risks associated with the detector module. The Activity Hazard Analysis for activities associated with the detector testing was generated and is pending review.

The Memorandum of Understanding between GRETINA and Argonne National Laboratory was signed.

The data from the test beam is been analyzed.

2. ACTIONS

N/A

3. COST AND SCHEDULE STATUS

3.1 VARIANCE ANALYSIS AND PROJECT COST PERFORMANCE REPORTS

		k$	
	Sched	**Act**	**Variance**
MIE	883.8	587.8	296.0
OPC	932.1	802.9	129.2

Variance Statement:

The mechanical design effort continues to lag plan. We need the results of the detector design to fully design the support structure.

Project Impact:

The design of the mechanical structure is not in the critical path.

Corrective Action:

To increase the scheduled expenditure we have to advance the mechanical design. The Detector Design contract with Eurisys is being pursued. The mechanical design requires key detector module dimensions that will be provided under this contract.

3.2 MILESTONE STATUS

We completed the Level 2 milestone "Complete Detector Test Procedures and Apparatus".

We are now pursuing the Level 1 milestone, CD2/3A. This milestone is associated with the preliminary review of the detector design. To achieve this milestone the procurement of the detector design has to be place soon.

3.3 PROJECT CRITICAL PATH ANALYSIS

The critical path continues to be the production and delivery of the Detector Modules. Canberra/Eurisys has provided an official quotation that will be analyzed for its impact on both cost and schedule.

II. DETAIL SUBSYSTEM STATUS

A. WBS 1.1. Mechanical

WBS 1.1.2 Mechanical Design

Technical Progress/Accomplishments

The concept design of the mechanical support is well advanced. There are some space constraints with the site at Michigan State University, which is being reviewed.

Significant Issues/Actions

N/A

WBS 1.1 Variance Analysis (Cumulative To-date) ($k)

Sched	Act	Variance
304.7	108.2	196.5

Variance Discussion

The progress on Mechanical design still depends on the detector design. We have received the quotation from Canberra/Eurisys for this work. The contract for detector design was not signed yet.

B. WBS 1.2 Detector Module

WBS 1.2.1 Procurement

Technical Progress/Accomplishments

We have received the price of the detector design and fabrication from Canberra/Eurisys.

Significant Issues/Actions

N/A

WBS 1.2.2 Test/Characterize Module 1

Technical Progress/Accomplishments

The document "GRETINA Detector Module, Test Procedures and Apparatus," was completed. With this achievement we completed the Level 2 milestone "Complete Detector Test Procedures and Apparatus".

Significant Issues/Actions

N/A

WBS 1.2 Variance Analysis (Cumulative To-date) ($k)

Sched	Act	Variance
128.0	101.2	26.8

Variance Discussion

We are using freeware software for the database, which saved money in this WBS item.

C. WBS 1.3 Electronics

WBS 1.3.1 Requirement Document

Technical Progress/Accomplishments

We have finished the first draft of the requirement document and we had one meeting to review the document with I-Yang Lee and David Radford.

Significant Issues/Actions

N/A

WBS 1.3 Variance Analysis (Cumulative To-date) ($k)

Sched	Act	Variance
9.2	6.9	3.3

Variance Discussion

Delay on this item does not impact the rest of the MIE.

D. WBS 1.4 Computing Systems

WBS 1.4.1 Requirement document

Technical Progress/Accomplishments

The first draft of the requirement document is done. It is pending review and more input from the community.

Significant Issues/Actions

N/A

WBS 1.4 Variance Analysis (Cumulative To-date) ($k)

Sched	Act	Variance
9.1	5.5	3.6

Variance Discussion

Delay on this item does not impact the rest of the MIE.

E. WBS 1.6 Project Management

WBS 1.6.1 Management

Technical Progress/Accomplishments

During this month we had the GRETINA Annual Review. Substantial effort was spent on placing together the presentations. Based on the meeting results, we have generated a list of the recommendations and a path forward for the follow up review at DOE.

We have completed the Risk Management Plan document and also we have started the Risk Registry document. We reviewed the risk analysis associated with detector module and have generated the preliminary risk analysis for mechanics, electronics, computing systems, management and safety.

The MOU with Argonne National Laboratory has been signed.

Significant Issues/Actions

Timely placement of the contract with Eurisys is necessary to provide data for the upcoming reviews.

WBS 1.6.2 General Project Expenses

Technical Progress/Accomplishments

N/A

Significant Issues/Actions

N/A

WBS 1.6 Variance Analysis (Cumulative To-date) ($k)

Sched	Act	Variance
397.9	365.7	32.2

Variance Discussion

N/A

E. WBS 1.7 Environment, Safety and Health

WBS 1.7.1

Technical Progress/Accomplishments

The GRETINA Safety Plan document was completed and reviewed. The Activity Hazard Document (AHD) for detector work was generated and is under review.

Significant Issues/Actions

N/A

WBS 1.7 Variance Analysis (Cumulative To-date) ($k)

Sched	Act	Variance
34.8	.3	34.5

Variance Discussion

We charged the management account for the work of generating the Safety Plan and AHD. Also, the reviewers, up to now, didn't charge GRETINA for their help. We intend to transfer money between the management account and the ES&H account.

III. Research and Development Status

Technical Progress/Accomplishments

Tests with the Prototype II refurbished detector started. The central channel was oscillating and this was corrected by slightly decreasing the bandwidth of the pre-amp. We are trying to confirm the noise measurements Eurisys did at the factory to compare the performance of cold and warm FETs.

The data collected during the test beam is been analyzed.

Regarding computing systems, work on EPICS version of DAQ code and on the run control (both GUI and data preservation aspects) is going ahead.

After careful evaluation about the cable tested to transmit the analog signals between the pre-amplifiers and the digitizer modules we have concluded that it is to rigid and has a big diameter. We will try to find some other possible candidate, even considering procuring a custom made cable. We have performed several simulations with the pre-amplifier circuit from Eurisys, which is increasing our confidence that the circuit is sound. Also, we have finished the design, coding and bench testing of the pole-zero cancellation algorithm inside the FPGA and we plan to test now with the detector.

Significant Issues/Actions

N/A

R&D Variance Analysis (Cumulative To-date) ($k)

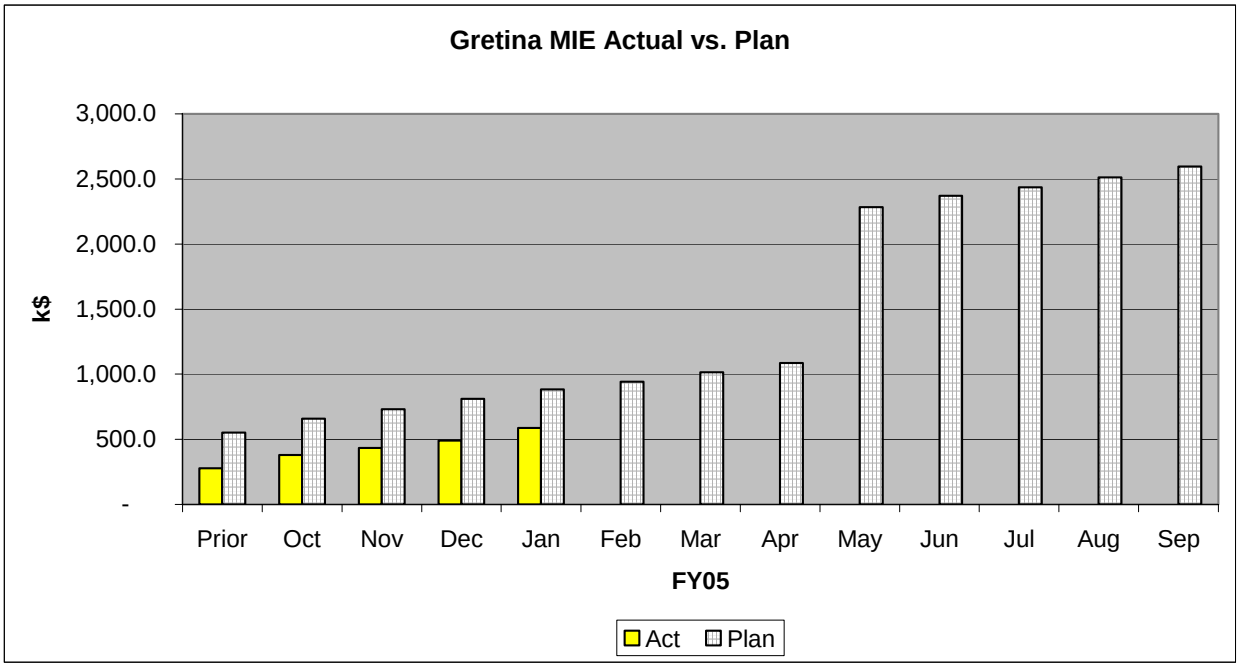
Sched	Act	Variance
932.1	802.9	129.2

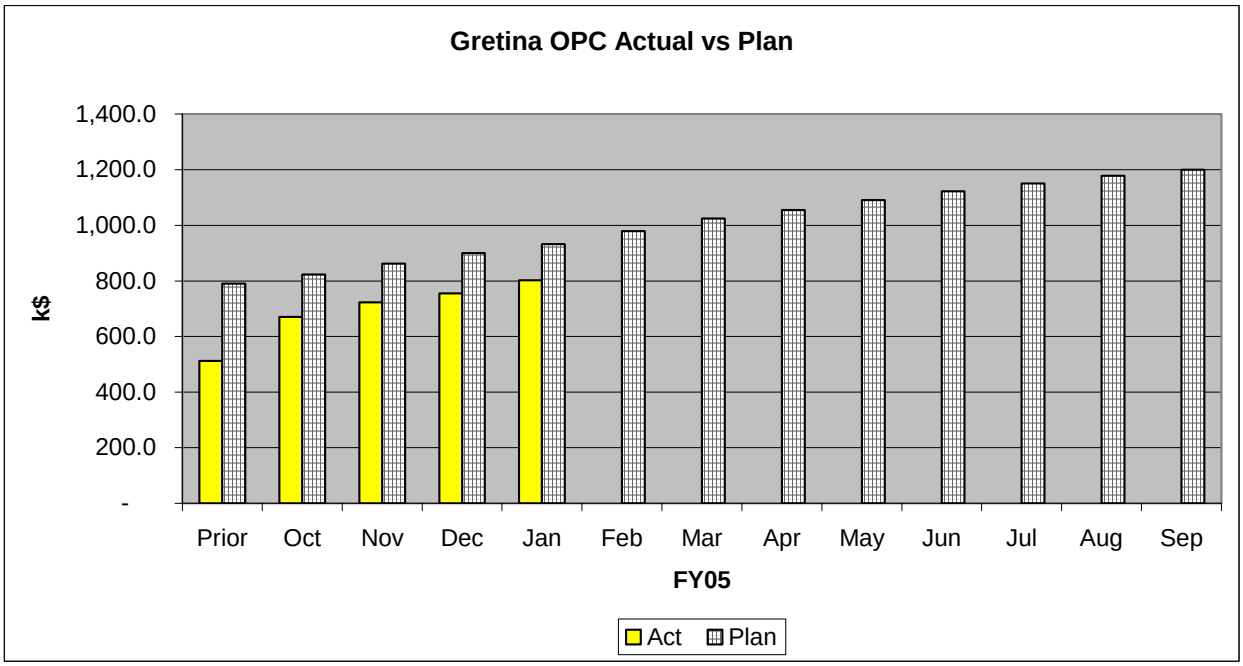
Variance Discussion

N/A

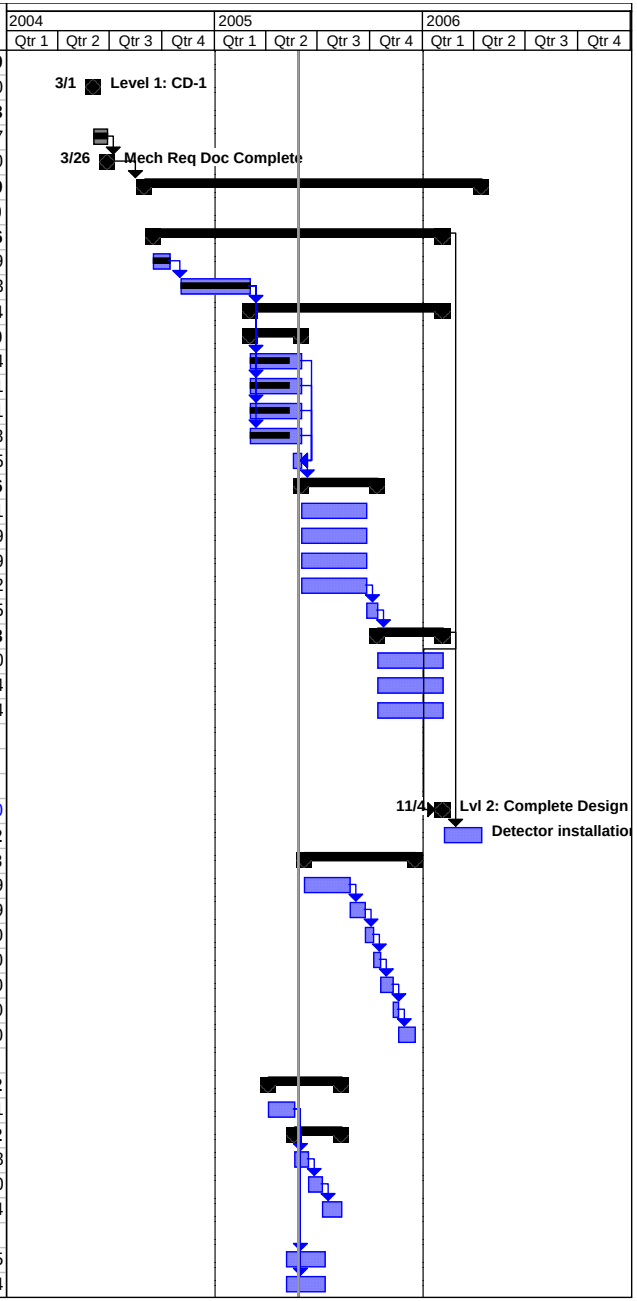
IV. Cost Chart

The above charts compare project-to-date budgeted cost with actual for the FY05 time period.

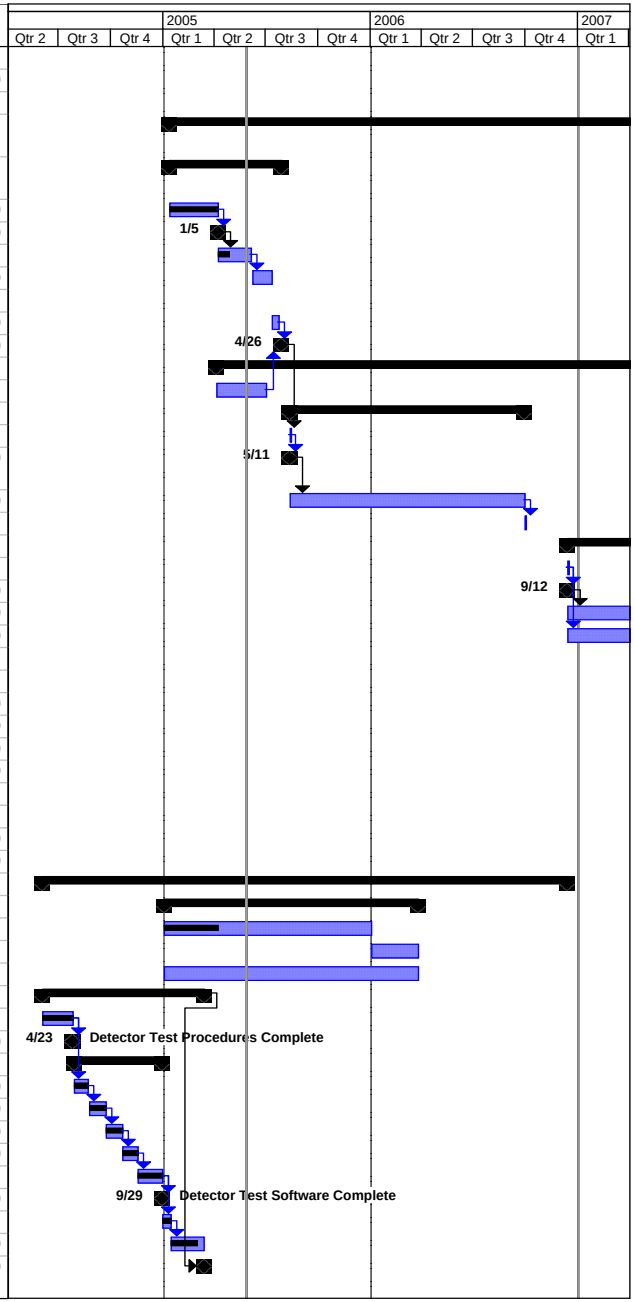




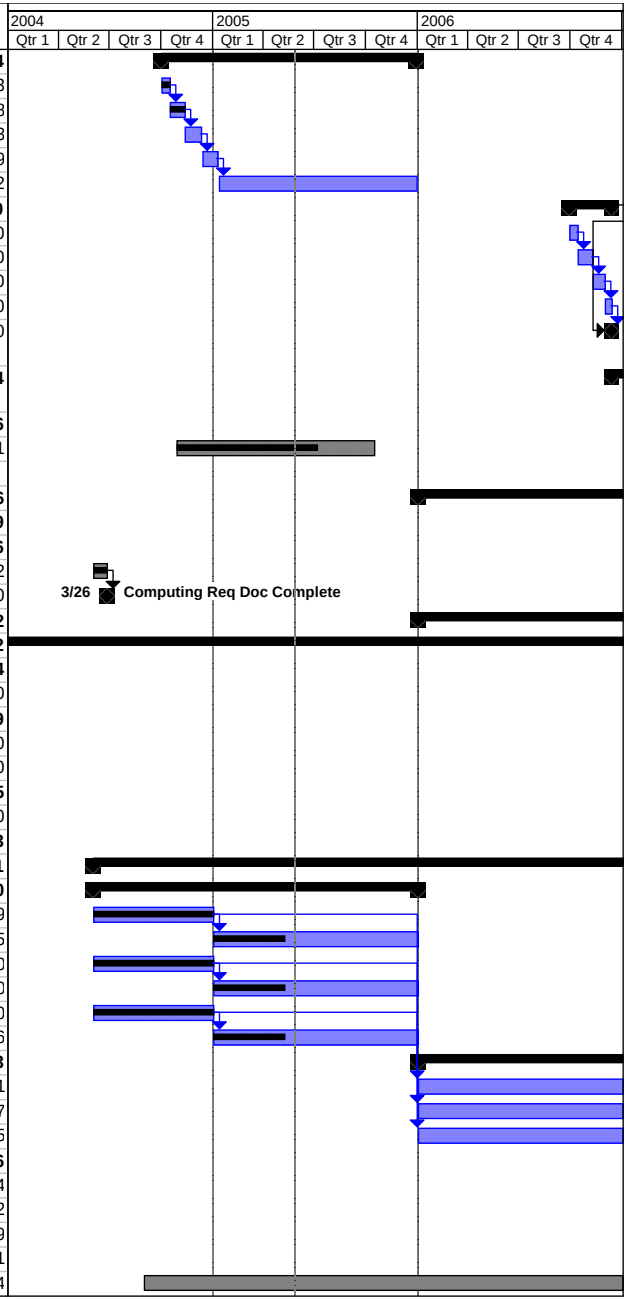
ID	Work reakdow	Task Name	% Complete	Start	Finish	Cost
1	**1**	**GRETINA**	**10%**	**Wed 10/1/03**	**Mon 5/17/10**	**$13,564,660.49**
2		**Level 1: CD-1**	0%	Mon 3/1/04	Mon 3/1/04	$0.00
3	**1.1**	**Mechanical**	**12%**	**Mon 3/1/04**	**Fri 5/30/08**	**$995,514.13**
4	**1.1.1**	Requirement document	100%	Mon 3/1/04	Fri 3/26/04	$9,065.97
5		Mech Req Doc Complete	100%	Fri 3/26/04	Fri 3/26/04	$0.00
6	**1.1.2**	**Design**	**21%**	**Tue 6/1/04**	**Wed 1/11/06**	**$458,437.49**
7		**Start Mech design**				**$0.00**
8	**1.1.2.1**	**Support structure**	**29%**	**Tue 6/15/04**	**Fri 11/4/05**	**$351,873.76**
9		Define requirements/spec	100%	Tue 6/15/04	Tue 7/13/04	$9,690.19
10		Conceptual design to Nov	100%	Mon 8/2/04	Tue 11/30/04	$50,390.13
11		**New Design Schedule**	**20%**	**Wed 12/1/04**	**Fri 11/4/05**	**$291,793.44**
12		**Conceptual Design**	**72%**	**Wed 12/1/04**	**Mon 2/28/05**	**$74,350.40**
13		Split Hemisphere	75%	Wed 12/1/04	Mon 2/28/05	$23,670.74
14		Rotation System	75%	Wed 12/1/04	Mon 2/28/05	$14,794.21
15		Translating Structure	75%	Wed 12/1/04	Mon 2/28/05	$14,794.21
16		Site Interface	75%	Wed 12/1/04	Mon 2/28/05	$5,917.68
17		Conceptual design review	0%	Tue 2/15/05	Mon 2/28/05	$15,173.55
18		**Final design**	**0%**	**Tue 3/1/05**	**Tue 7/12/05**	**$114,180.96**
19		Split Hemisphere	0%	Tue 3/1/05	Thu 6/23/05	$33,381.81
20		Rotation System	0%	Tue 3/1/05	Thu 6/23/05	$27,312.39
21		Translating Structure	0%	Tue 3/1/05	Thu 6/23/05	$27,312.39
22		Site Interface	0%	Tue 3/1/05	Thu 6/23/05	$11,000.82
23		Final design review	0%	Fri 6/24/05	Tue 7/12/05	$15,173.55
24		**Detail Dwgs**	**0%**	**Wed 7/13/05**	**Fri 11/4/05**	**$103,262.08**
25		Split Hemisphere	0%	Wed 7/13/05	Fri 11/4/05	$41,605.60
26		Rotation System	0%	Wed 7/13/05	Fri 11/4/05	$30,828.24
27		Translating Structure	0%	Wed 7/13/05	Fri 11/4/05	$30,828.24
28						
29						
30						
31		**Lvl 2: Complete Design and Drawings of Me**	0%	Fri 11/4/05	Fri 11/4/05	$0.00
32	**1.1.2.2**	**Detector installation tool**	0%	**Mon 11/7/05**	**Wed 1/11/06**	**$45,293.32**
33	**1.1.2.3**	**Target chamber Washington Univ.**	**0%**	**Mon 3/7/05**	**Fri 9/16/05**	**$9,857.18**
34		Define requirements	0%	Mon 3/7/05	Wed 5/25/05	$4,928.59
35		Design Specifications	0%	Thu 5/26/05	Tue 6/21/05	$4,928.59
36		Conceptual design	0%	Wed 6/22/05	Wed 7/6/05	$0.00
37		Conceptual design review	0%	Thu 7/7/05	Mon 7/18/05	$0.00
38		Final design	0%	Tue 7/19/05	Mon 8/8/05	$0.00
39		Final design review	0%	Tue 8/9/05	Thu 8/18/05	$0.00
40		Detail Dwgs	0%	Fri 8/19/05	Fri 9/16/05	$0.00
41						
42	**1.1.2.4**	**LN system**	**0%**	**Mon 1/3/05**	**Wed 5/11/05**	**$51,413.22**
43		Define requirements/specifications	0%	Mon 1/3/05	Thu 2/17/05	$10,289.41
44		**Mechanical**	**0%**	**Fri 2/18/05**	**Wed 5/11/05**	**$34,061.52**
45		Conceptual design	0%	Fri 2/18/05	Mon 3/14/05	$16,780.18
46		Final design	0%	Tue 3/15/05	Wed 4/6/05	$12,266.00
47		Detail Dwgs	0%	Thu 4/7/05	Wed 5/11/05	$5,015.34
48						
49		Electrical	0%	Thu 2/3/05	Mon 4/11/05	$3,260.25
50		Computer control	0%	Thu 2/3/05	Mon 4/11/05	$3,802.04



ID	Work reakdown	Task Name	% Complete	Start	Finish	Cost
51	**1.1.3**	**Production**	**0%**	**Thu 9/6/07**	**Fri 5/30/08**	**$528,010.67**
85		**Level 2: Mechanical Production Complete**	0%	Fri 5/30/08	Fri 5/30/08	$0.00
86	**1.2**	**Detector Module**	**10%**	**Mon 3/1/04**	**Thu 7/23/09**	**$6,963,220.30**
87	**1.2.1**	**Purchasing**	**4%**	**Mon 10/11/04**	**Mon 2/2/09**	**$6,537,301.43**
88	**1.2.1.1**	**Write detector requirements and specs and procurement specs**	**52%**	**Mon 10/11/04**	**Tue 4/26/05**	**$5,059.43**
89		Write Detector requirements	100%	Mon 10/11/04	Wed 1/5/05	$0.00
90		Detector Req Doc Complete	100%	Wed 1/5/05	Wed 1/5/05	$0.00
91		Define interfaces	30%	Thu 1/6/05	Fri 3/4/05	$5,059.43
92		Write procurement specification	0%	Mon 3/7/05	Fri 4/8/05	$0.00
93						
94		Receive bids	0%	Mon 4/11/05	Fri 4/22/05	$0.00
95		**LVL 1: CD 2/3A**	0%	Tue 4/26/05	Tue 4/26/05	$0.00
96	**1.2.1.2**	**Detector Procurement**	**0%**	**Mon 1/3/05**	**Mon 2/2/09**	**$6,532,242.00**
97		Detector Design Contract	0%	Mon 1/3/05	Tue 3/29/05	$164,272.00
98		**FY05: Detector Module 1**	**0%**	**Wed 5/11/05**	**Wed 6/28/06**	**$1,170,970.00**
99		Procure dectector module 1	0%	Wed 5/11/05	Wed 5/11/05	$1,143,000.00
100		**LVL 2: Award Detector Module Contract**	0%	Wed 5/11/05	Wed 5/11/05	$0.00
101		Delivery of module 1	0%	Thu 5/12/05	Tue 6/27/06	$0.00
102		Flat Procurement Burden	0%	Wed 6/28/06	Wed 6/28/06	$27,970.00
103		**FY06: Dectector Module 2 thru 3**	**0%**	**Tue 9/12/06**	**Wed 8/29/07**	**$1,765,000.00**
104		Procure Mod 2 & 3	0%	Tue 9/12/06	Tue 9/12/06	$1,765,000.00
105		**Lvl 3: Exercise Option for Mod 2 & 3**	0%	Tue 9/12/06	Tue 9/12/06	$0.00
106		Deliver module 2	0%	Wed 9/13/06	Wed 8/29/07	$0.00
107		Deliver module 3	0%	Wed 9/13/06	Wed 8/29/07	$0.00
108		**FY07: Dectector Module 4 thru 6**	**0%**	**Thu 8/30/07**	**Tue 8/19/08**	**$2,574,000.00**
109		Procure	0%	Thu 8/30/07	Fri 8/31/07	$2,574,000.00
110		**Lvl 3: Exercise Option for Mod 4 - 6**	0%	Fri 8/31/07	Fri 8/31/07	$0.00
111		Deliver module 4	0%	Tue 9/4/07	Tue 8/19/08	$0.00
112		Deliver module 5	0%	Tue 9/4/07	Tue 8/19/08	$0.00
113		Deliver module 6	0%	Tue 9/4/07	Tue 8/19/08	$0.00
114		**FY08: Dectector Module 7**	**0%**	**Wed 2/13/08**	**Mon 2/2/09**	**$858,000.00**
115		Procure Mod 7	0%	Wed 2/13/08	Wed 2/13/08	$858,000.00
116		**Lvl 2: Exercise Option for Last Detector**	0%	Wed 2/13/08	Wed 2/13/08	$0.00
117		Deliver module 7	0%	Thu 2/14/08	Mon 2/2/09	$0.00
118	**1.2.2**	**Test/Characterize Module 1**	**24%**	**Mon 3/1/04**	**Mon 9/11/06**	**$333,506.03**
119	**1.2.2.1**	**Detector Engineering and Test**	**10%**	**Fri 10/1/04**	**Thu 12/22/05**	**$250,130.22**
120		Detector Engineer (FY05)	24%	Fri 10/1/04	Fri 9/30/05	$67,704.89
121		Detector Engineer (FY06)	0%	Mon 10/3/05	Thu 12/22/05	$43,156.55
122		Detector Testing	0%	Fri 10/1/04	Thu 12/22/05	$139,268.78
123	**1.2.2.2**	**Develop test procedures and apparatus**	**95%**	**Mon 3/1/04**	**Fri 12/10/04**	**$35,448.17**
124		Develop test procedures	100%	Mon 3/1/04	Fri 4/23/04	$11,779.45
125		Detector Test Procedures Complete	100%	Fri 4/23/04	Fri 4/23/04	$0.00
126		**Develop test software**	**100%**	**Mon 4/26/04**	**Wed 9/29/04**	**$15,994.16**
127		Determine energy and time resolution	100%	Mon 4/26/04	Fri 5/21/04	$0.00
128		Noise analysis	100%	Mon 5/24/04	Mon 6/21/04	$0.00
129		Pulse shape analysis	100%	Tue 6/22/04	Tue 7/20/04	$0.00
130		Compare with simulation	100%	Wed 7/21/04	Tue 8/17/04	$0.00
131		Interfaces	100%	Wed 8/18/04	Wed 9/29/04	$15,994.16
132		Detector Test Software Complete	100%	Wed 9/29/04	Wed 9/29/04	$0.00
133		Assemble test apparatus	100%	Thu 9/30/04	Wed 10/13/04	$7,674.56
134		Tests and performance characterization	75%	Thu 10/14/04	Fri 12/10/04	$0.00
135		**Level 2: Detector Test Procedures and Apparatus Complete**	0%	Fri 12/10/04	Fri 12/10/04	$0.00



ID	Work reakdow	Task Name	% Complete	Start	Finish	Cost
136	**1.2.2.3**	**Develop database**	**10%**	**Thu 7/1/04**	**Wed 9/28/05**	**$47,927.64**
137		Define database requirements	100%	Thu 7/1/04	Thu 7/15/04	$1,370.93
138		Define backup and recovery	100%	Fri 7/16/04	Thu 8/12/04	$13,709.28
139		Select and procure package	0%	Fri 8/13/04	Fri 9/10/04	$12,795.33
140		Customize System	0%	Mon 9/13/04	Fri 10/8/04	$13,873.79
141		Contine support	0%	Mon 10/11/04	Wed 9/28/05	$6,178.32
142	**1.2.2.4**	**Test/characterize Module 1**	**0%**	**Wed 6/28/06**	**Mon 9/11/06**	**$0.00**
143		Detector acceptance test	0%	Wed 6/28/06	Wed 7/12/06	$0.00
144		Test/characterize detectors with source	0%	Thu 7/13/06	Wed 8/9/06	$0.00
145		Test/characterize detectors with beam	0%	Thu 8/10/06	Wed 8/30/06	$0.00
146		Review test results	0%	Thu 8/31/06	Mon 9/11/06	$0.00
147		**Lvl 2: Test/Char. of Mod 1 Complete**	0%	Mon 9/11/06	Mon 9/11/06	$0.00
148	**1.2.3**	**Test/Char Mod 2 thru 7**	**0%**	**Tue 9/12/06**	**Thu 7/23/09**	**$92,412.84**
190	**1.3**	**Electronics**	**11%**	**Wed 7/28/04**	**Tue 4/28/09**	**$1,707,738.56**
191	**1.3.1**	Requirement document	70%	Wed 7/28/04	Fri 7/15/05	$9,177.21
192						
193	**1.3.2**	**Electronics Prototype**	**0%**	**Mon 10/3/05**	**Thu 6/21/07**	**$677,918.76**
278	**1.3.3**	**Electronics Production**	**0%**	**Thu 9/6/07**	**Tue 4/28/09**	**$1,020,642.59**
348	**1.4**	**Computing Systems**	**1%**	**Wed 10/1/03**	**Thu 3/26/09**	**$1,340,291.26**
349	1.4.1	Requirement document	80%	Mon 3/1/04	Fri 3/26/04	$9,139.52
350		Computing Req Doc Complete	0%	Fri 3/26/04	Fri 3/26/04	$0.00
351	**1.4.2**	**Prototype**	**0%**	**Mon 10/3/05**	**Thu 6/28/07**	**$327,707.72**
425	**1.4.3**	**CS Production**	**0%**	**Wed 10/1/03**	**Thu 3/26/09**	**$1,003,444.02**
525	**1.5**	**System Assembly**	**0%**	**Thu 6/28/07**	**Thu 4/15/10**	**$221,515.04**
526		**Lvl 2: Elec & Computing Subsys Ready for Pro**	0%	Thu 6/28/07	Thu 6/28/07	$0.00
527	**1.5.1**	**Prototype**	**0%**	**Fri 6/29/07**	**Wed 9/5/07**	**$12,594.09**
539		**Level 1: CD-2B/CD-3B**	0%	Wed 9/5/07	Wed 9/5/07	$0.00
540		**Lvl 2: Prod Elec and Comp Subsys. Ready for F**	0%	Tue 4/28/09	Tue 4/28/09	$0.00
541	**1.5.2**	**Production**	**0%**	**Wed 4/29/09**	**Mon 11/30/09**	**$208,920.95**
577		Level 1: CD-4: Approve Start of Operations	0%	Thu 4/15/10	Thu 4/15/10	$0.00
578	**1.6**	**Project Management**	**11%**	**Mon 3/1/04**	**Mon 5/17/10**	**$2,197,754.53**
579	**1.6.1**	**Management**	**11%**	**Mon 3/1/04**	**Mon 5/17/10**	**$1,977,914.71**
580	**1.6.1.1**	**Initial phase (FY04-FY05)**	**58%**	**Mon 3/1/04**	**Fri 9/30/05**	**$475,344.90**
581		Contractor Project Manager - FY04	100%	Mon 3/1/04	Thu 9/30/04	$40,653.79
582		CPM - FY05	33%	Fri 10/1/04	Fri 9/30/05	$68,438.55
583		Project Engineer - FY04	100%	Mon 3/1/04	Thu 9/30/04	$129,423.80
584		Proj Engineer - FY05	33%	Fri 10/1/04	Fri 9/30/05	$157,532.20
585		Project Control Analyst - FY04	100%	Mon 3/1/04	Thu 9/30/04	$29,713.10
586		Project Controls Analyst - FY05	33%	Fri 10/1/04	Fri 9/30/05	$49,583.46
587	**1.6.1.2**	**Long term**	**0%**	**Mon 10/3/05**	**Wed 9/30/09**	**$1,020,651.03**
588		Contractor Project Manager	0%	Mon 10/3/05	Wed 9/30/09	$151,834.81
589		Project Engineer	0%	Mon 10/3/05	Wed 9/30/09	$685,279.47
590		Project Control Analyst	0%	Mon 10/3/05	Wed 9/30/09	$183,536.75
591	**1.6.1.3**	**Final phase (~0.5 of FY10)**	**0%**	**Thu 10/1/09**	**Mon 5/17/10**	**$132,533.36**
592		Contractor Project Manager	0%	Thu 10/1/09	Mon 5/17/10	$17,011.44
593		Project Engineer	0%	Thu 10/1/09	Mon 5/17/10	$67,700.12
594		Project Control Analyst	0%	Thu 10/1/09	Mon 5/17/10	$24,866.69
595		Prepare for CD4	0%	Mon 4/5/10	Fri 4/16/10	$22,955.11
596	**1.6.1.4**	Quality Assurance Manager	0%	Tue 6/1/04	Tue 12/22/09	$35,417.84



ID	Work reakdow	Task Name	% Complete	Start	Finish	Cost
597	**1.6.1.5**	**Subsystem Managers**	**10%**	**Mon 3/1/04**	**Fri 9/18/09**	**$313,967.58**
598		Mechanical (Design)	36%	Tue 6/1/04	Mon 3/27/06	$38,685.78
599		Mechanical (Production)	0%	Tue 8/14/07	Thu 9/4/08	$25,235.38
600		Detector	18%	Mon 3/1/04	Thu 9/3/09	$0.00
601		Electronics	0%	Mon 8/1/05	Thu 8/13/09	$114,777.50
602		Computing Systems	0%	Mon 8/1/05	Thu 8/13/09	$125,241.52
603		Systems assembly	0%	Wed 4/29/09	Fri 9/18/09	$10,027.40
604	**1.6.2**	**General Project Expenses**	**12%**	**Mon 3/1/04**	**Wed 1/20/10**	**$219,839.81**
605	**1.6.2.1**	Network security & remote access	12%	Thu 5/20/04	Wed 1/20/10	$25,728.10
606	**1.6.2.2**	System Support	12%	Thu 5/20/04	Wed 1/20/10	$51,238.49
607	**1.6.2.3**	Misc. Expenses	12%	Thu 5/20/04	Wed 1/20/10	$56,333.85
608	**1.6.2.4**	**Travel**	**9%**	**Mon 3/1/04**	**Thu 10/2/08**	**$86,539.37**
619	**1.7**	**Environment and Safety**	**24%**	**Mon 3/1/04**	**Wed 9/16/09**	**$138,626.67**