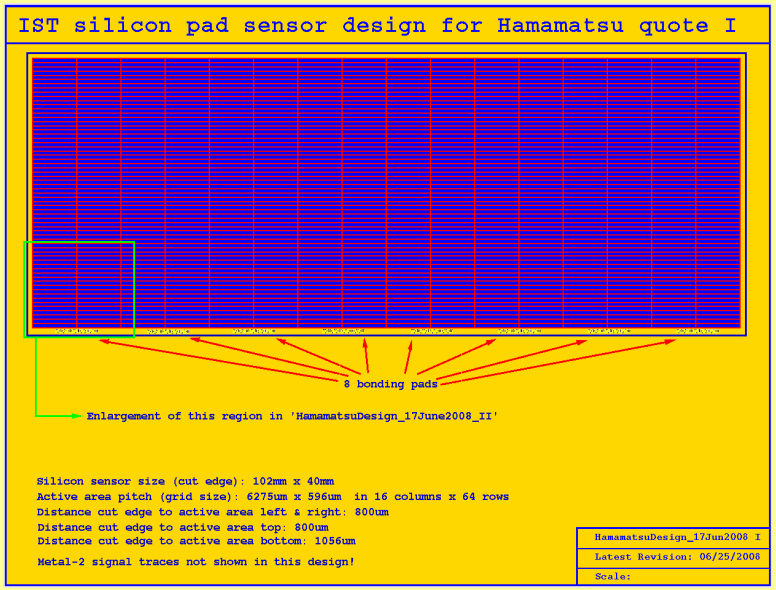
IST report, plans and schedule

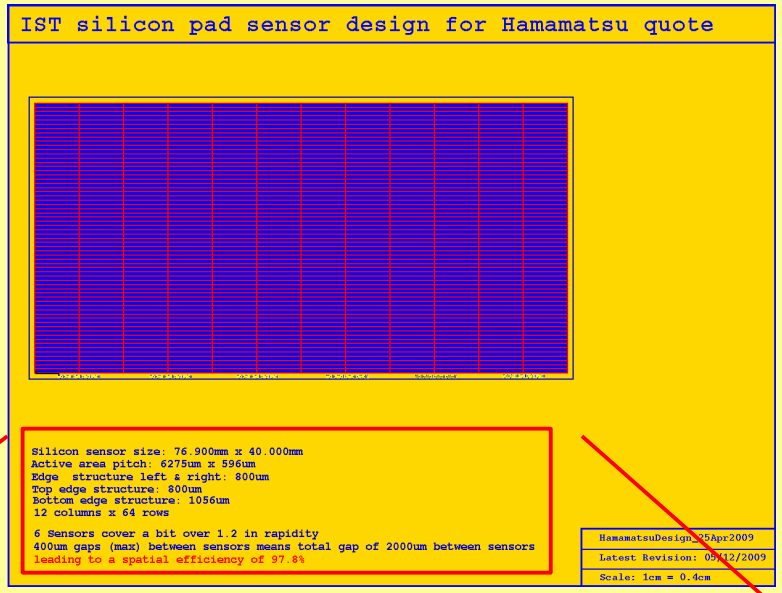
Sensors
Readout chips
Hybrid/cable
Readout systems
Mechanical support
Cooling system
Wire bonding
IST prototype module
CDR & Schedules

HFT monthly meeting
MIT, June 9, 2009
Gerrit van Nieuwenhuizen

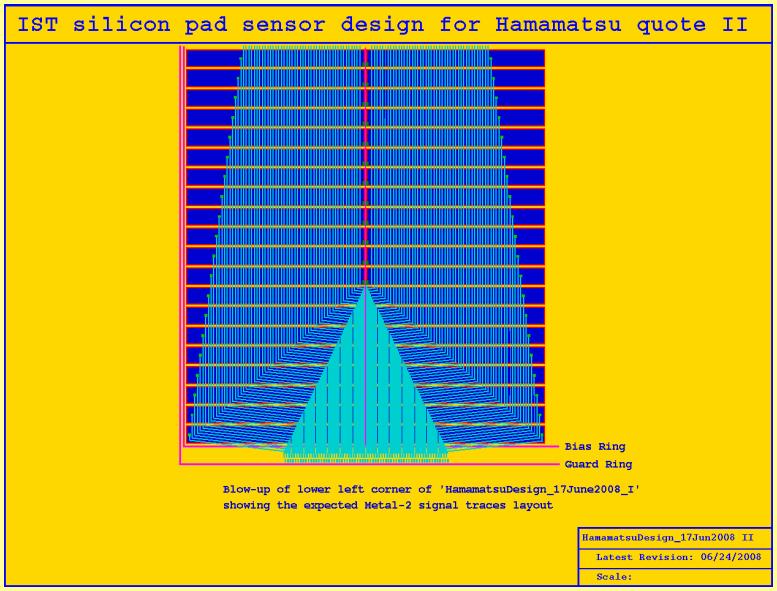
Sensors



2008



2009



Silicon sensor size: 76.900mm x 40.000mm
Active area pitch: 6275um x 596um
Edge structure left & right: 800um
Top edge structure: 800um
Bottom edge structure: 1056um
12 columns x 64 rows

6 Sensors cover a bit over 1.2 in rapidity
400um gaps (max) between sensors means total gap of 2000um between sensors
leading to a spatial efficiency of 97.8%

Request for prototype quotation will go out as soon as funding schedule available

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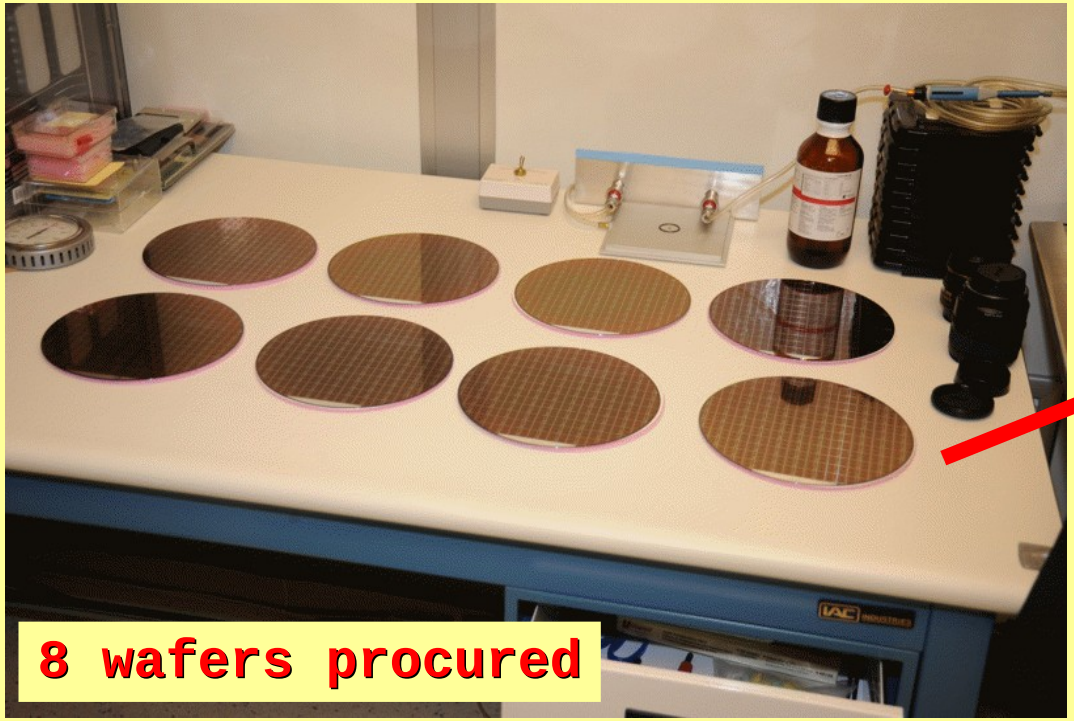
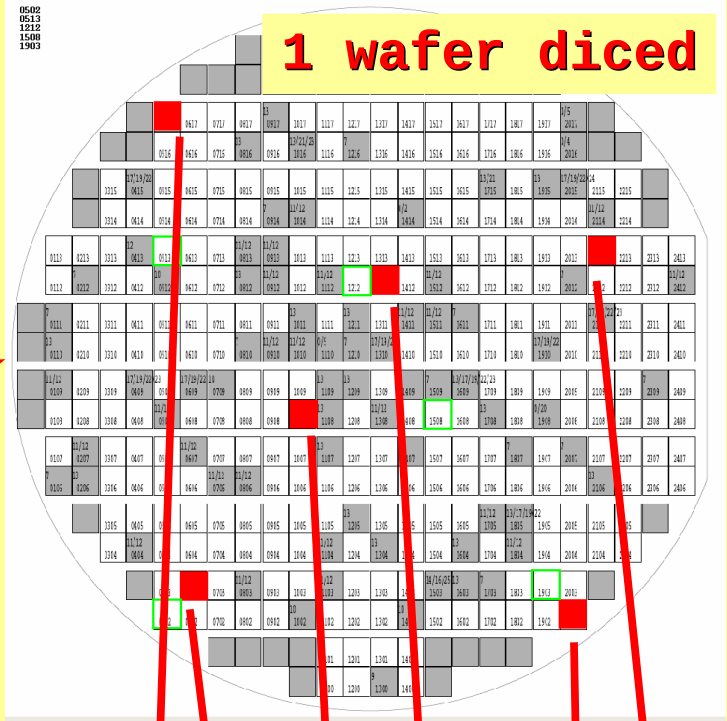
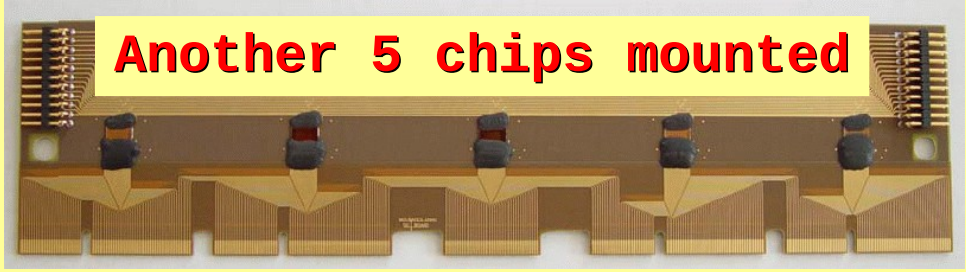
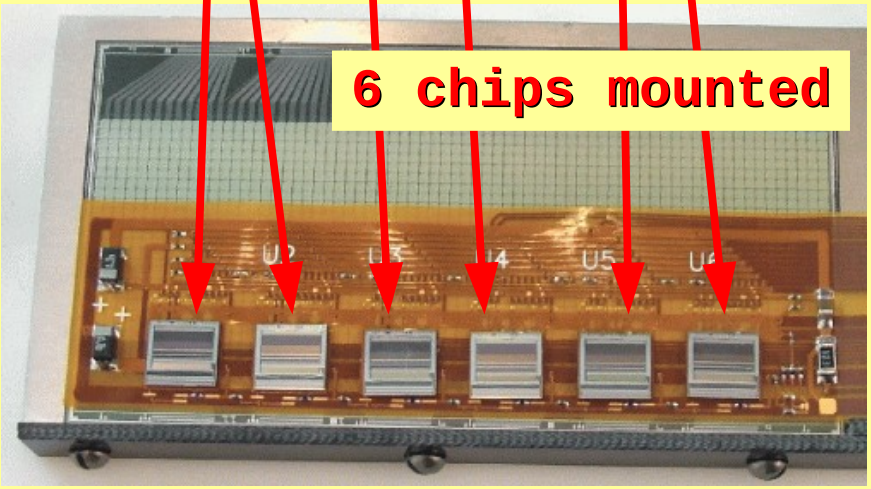
APV25-S1 readout chips









Dicing : 5-10 working days
The 6 chips are working except for I2C
Another test with 5 chips on APV module
First one more single wafer dice before all

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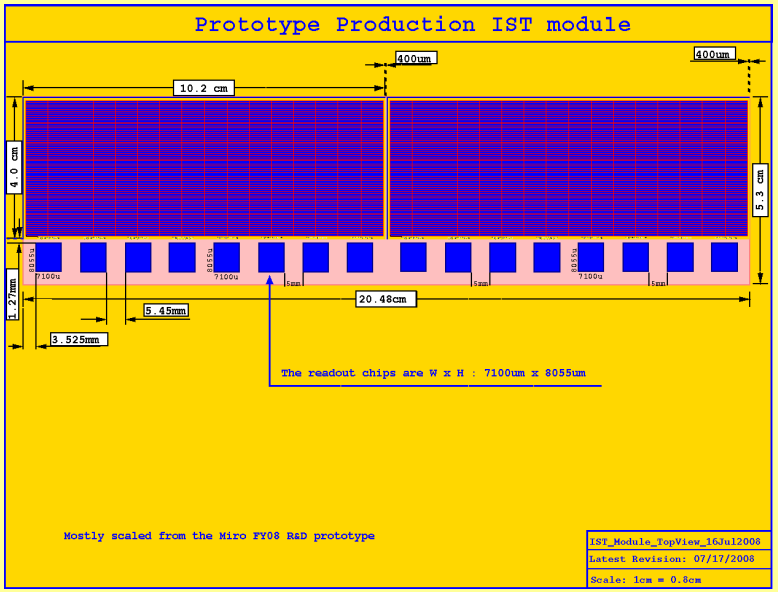
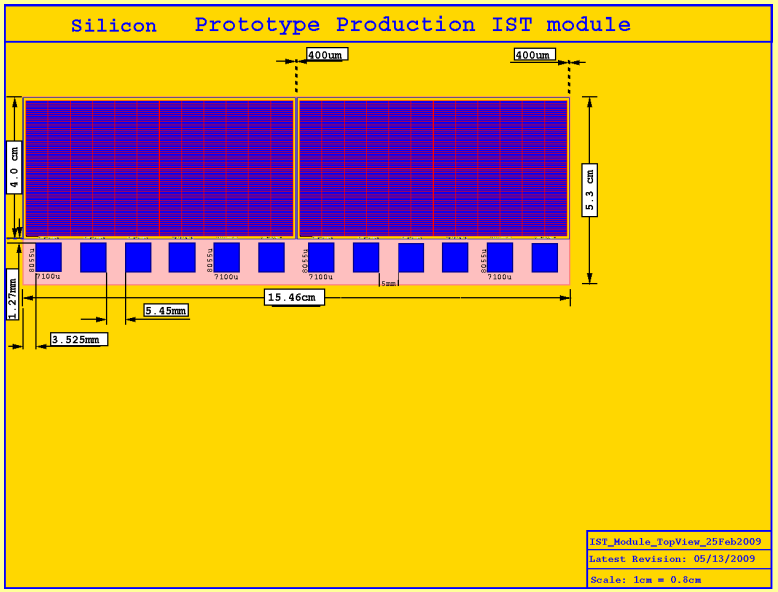
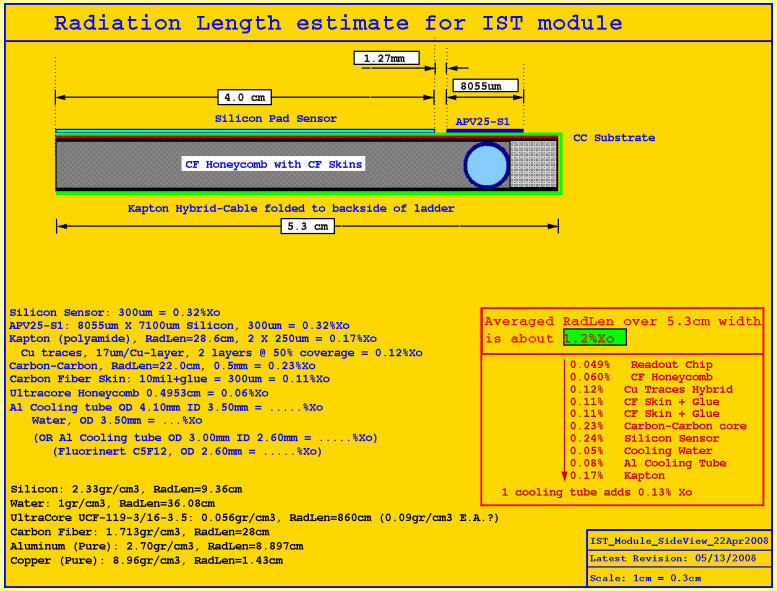
Kapton hybrids



2008



2009



Shorter sensors → shorter hybrids
12 chips → less dissipation (~ 4 Watt)
→ better matched to readout

Redesign will start as soon as the dust around the electrical engineering transition has settled → Aug./Sept.

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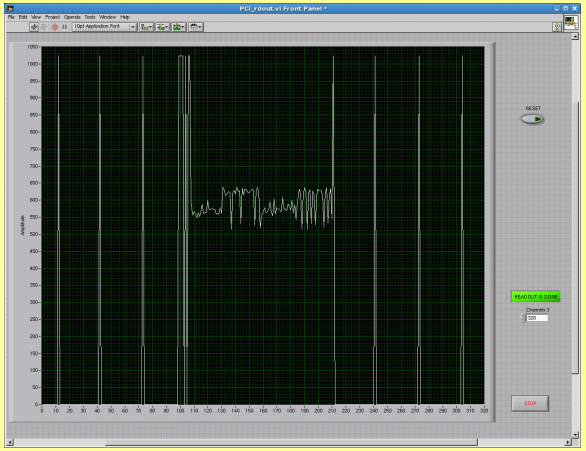
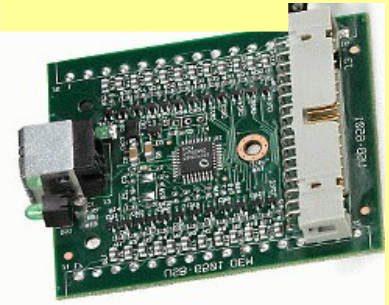
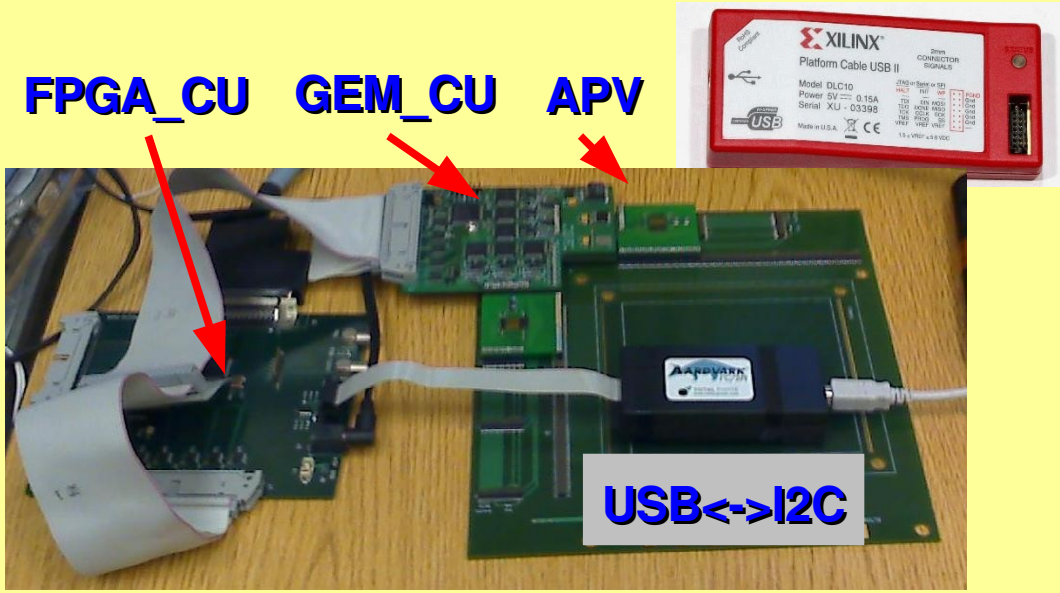
Test readout system

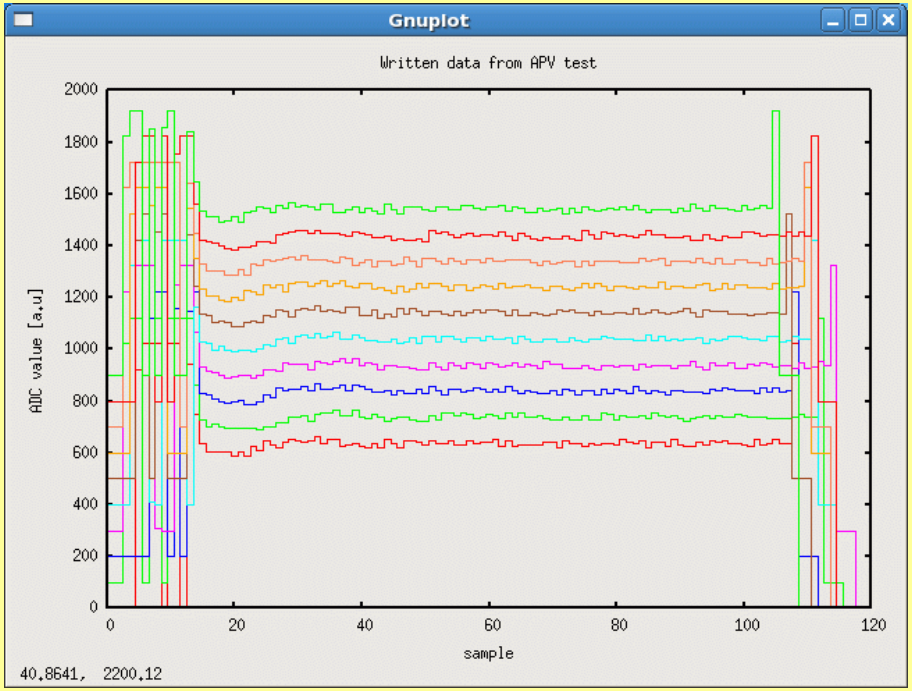
NATIONAL INSTRUMENTS LabVIEW 8.6





USB<->DIO





Have all components for the test readout
- APV test boards, transition board
- GEM_CU, FPGA_CU, programmer
- USB<=>DI/O, USB<=>I2C
- LabView 8.6 program
- Standalone C program

GEM_CU worked in FGT test beam exp.

Problem: channels are being dropped
Will discuss solution today.....

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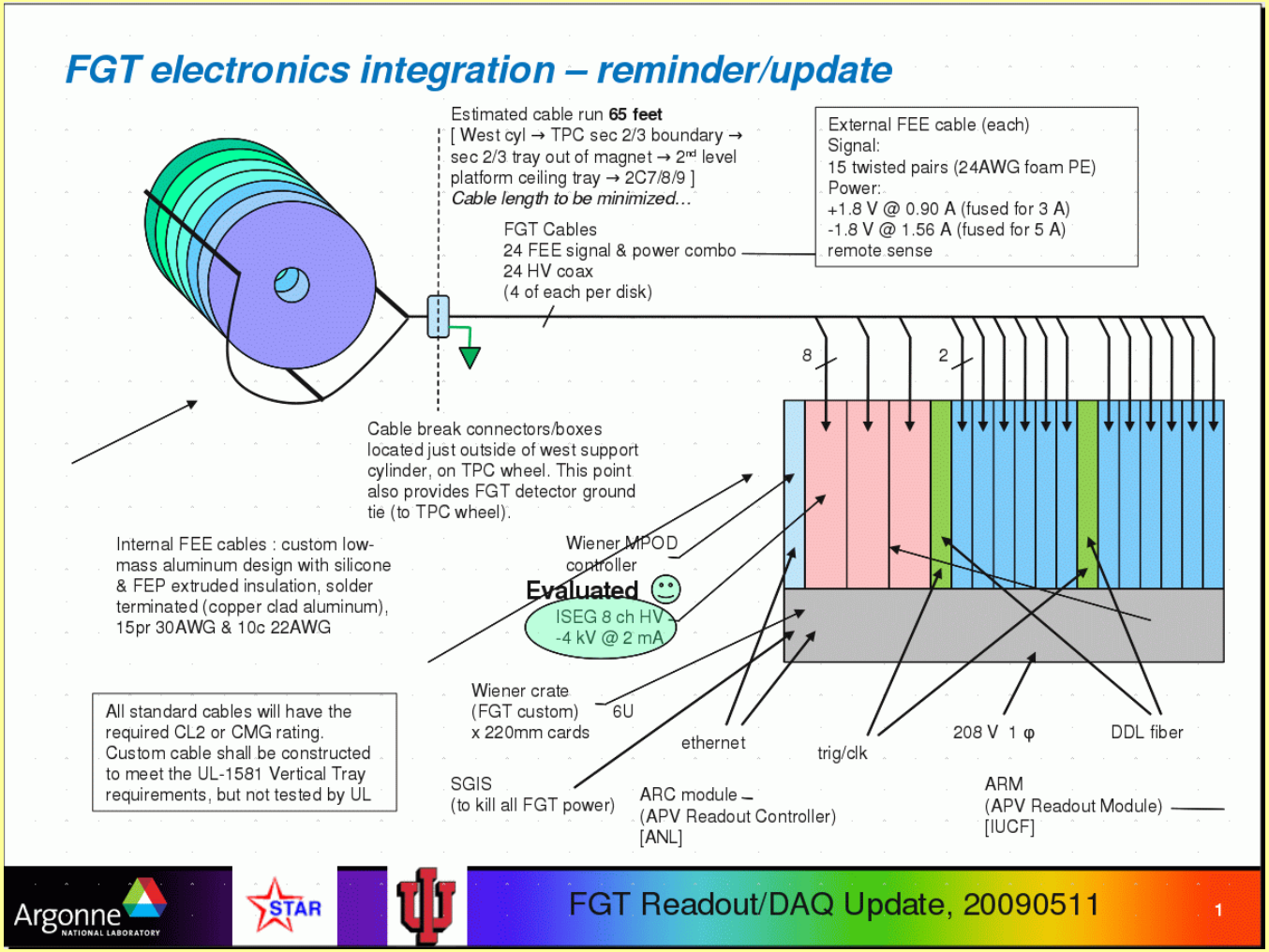
Production readout system



For the IST we would need 3 crates plus 1 spare crate.
Breakdown:
- 24 IST ladders with 3 modules each => 72 cables with 12 APV/cable
- 72 'HV' (+200V, 500uA) channels
  (looks like Wiener also makes on-demand modules)

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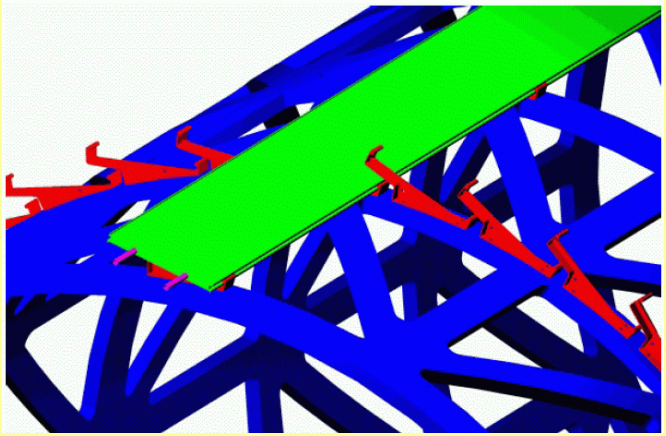
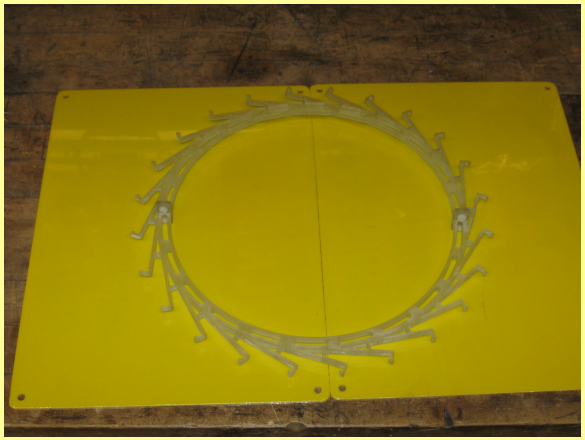
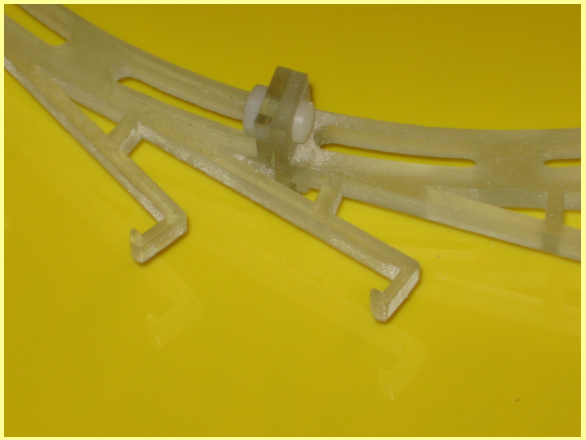
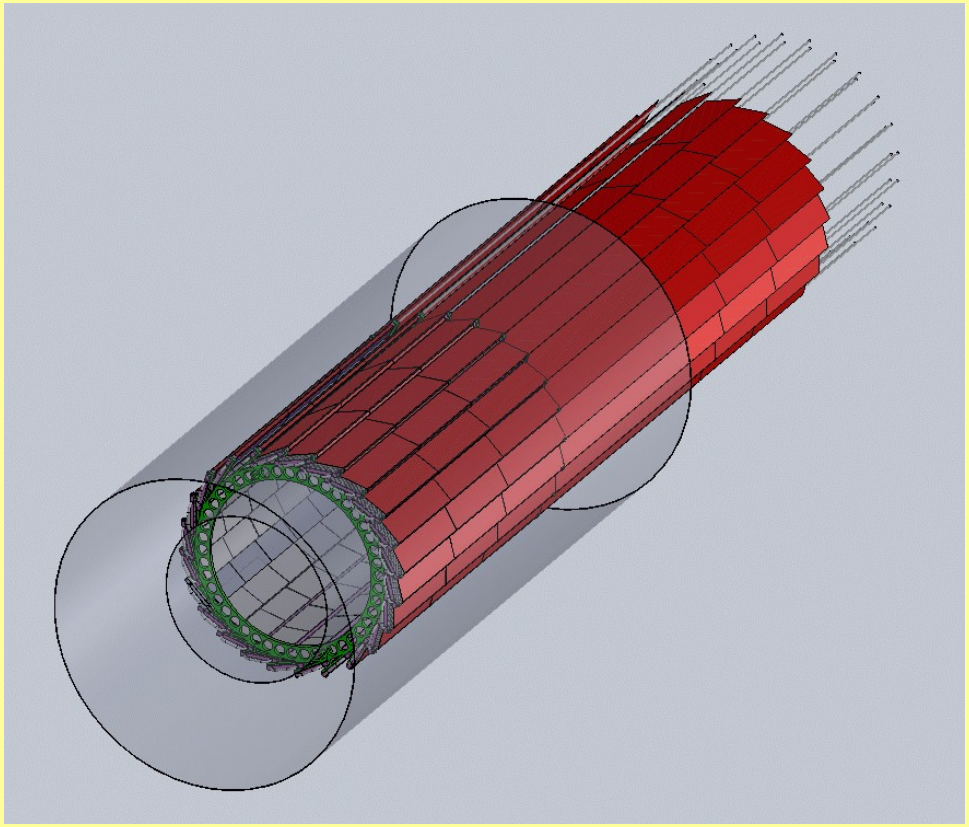
Mechanical support system



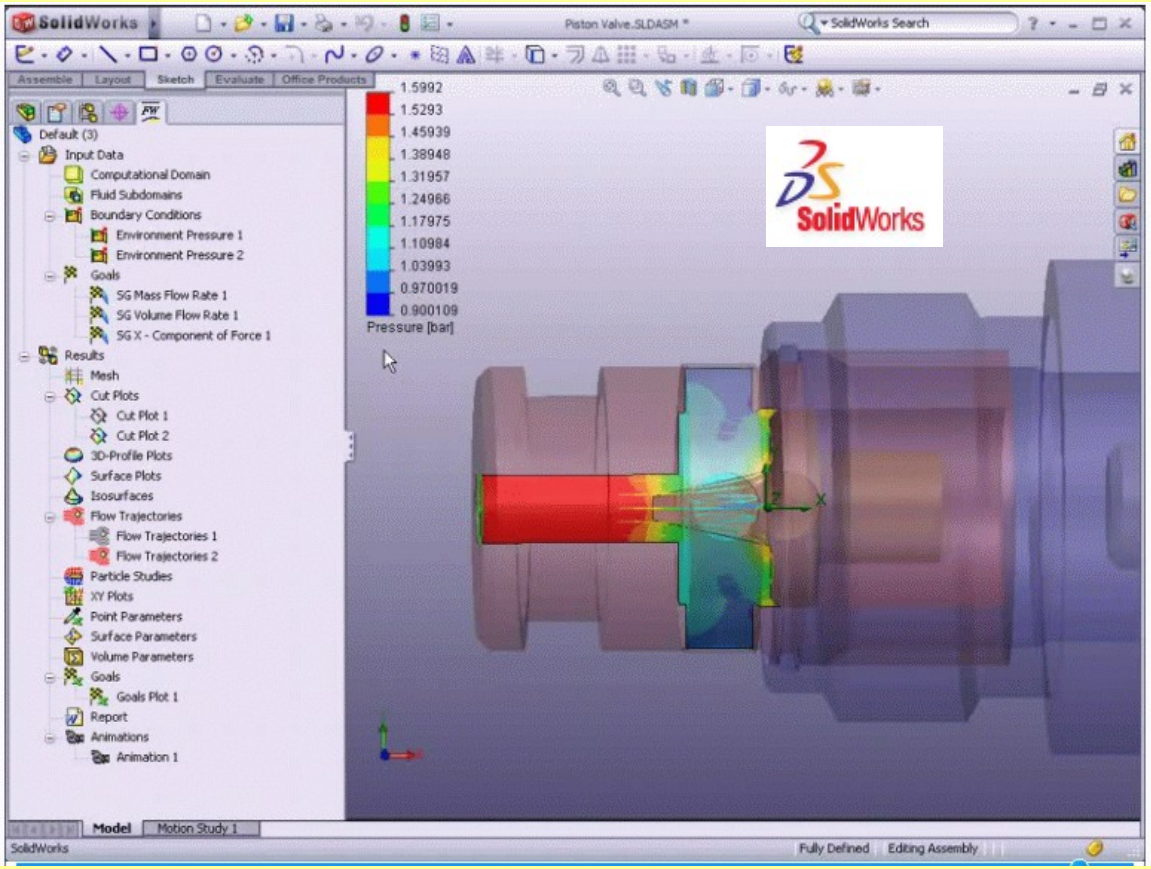






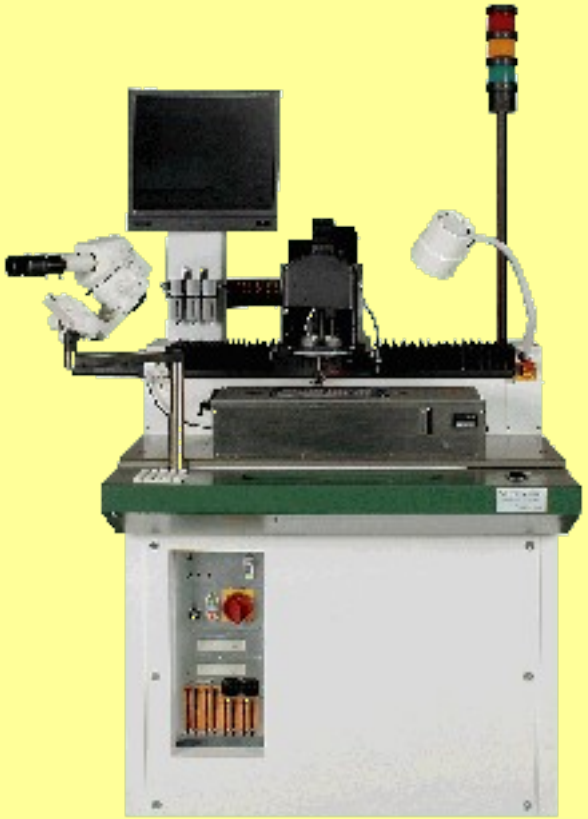
50 cm IST in SolidWorks
Clamping 'Crown' rapid prototype
85 cm prototype ladder

Cooling system



License for FloWorks
Jim Kelsey is simulating IST liquid cooling system
Soon to decide on under-pressure water cooling (old SVT)
or fluorocarbon based system

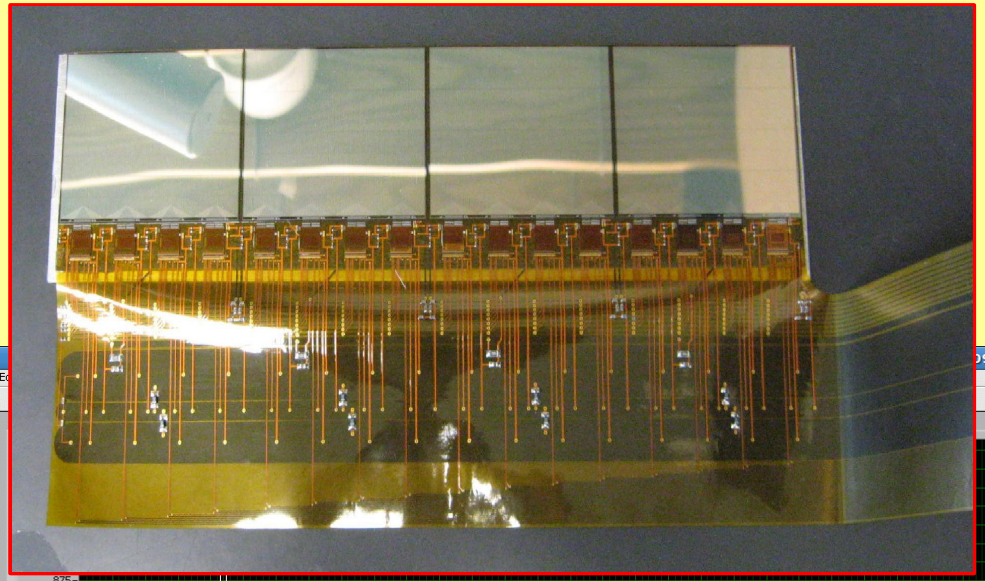
Wire bonding

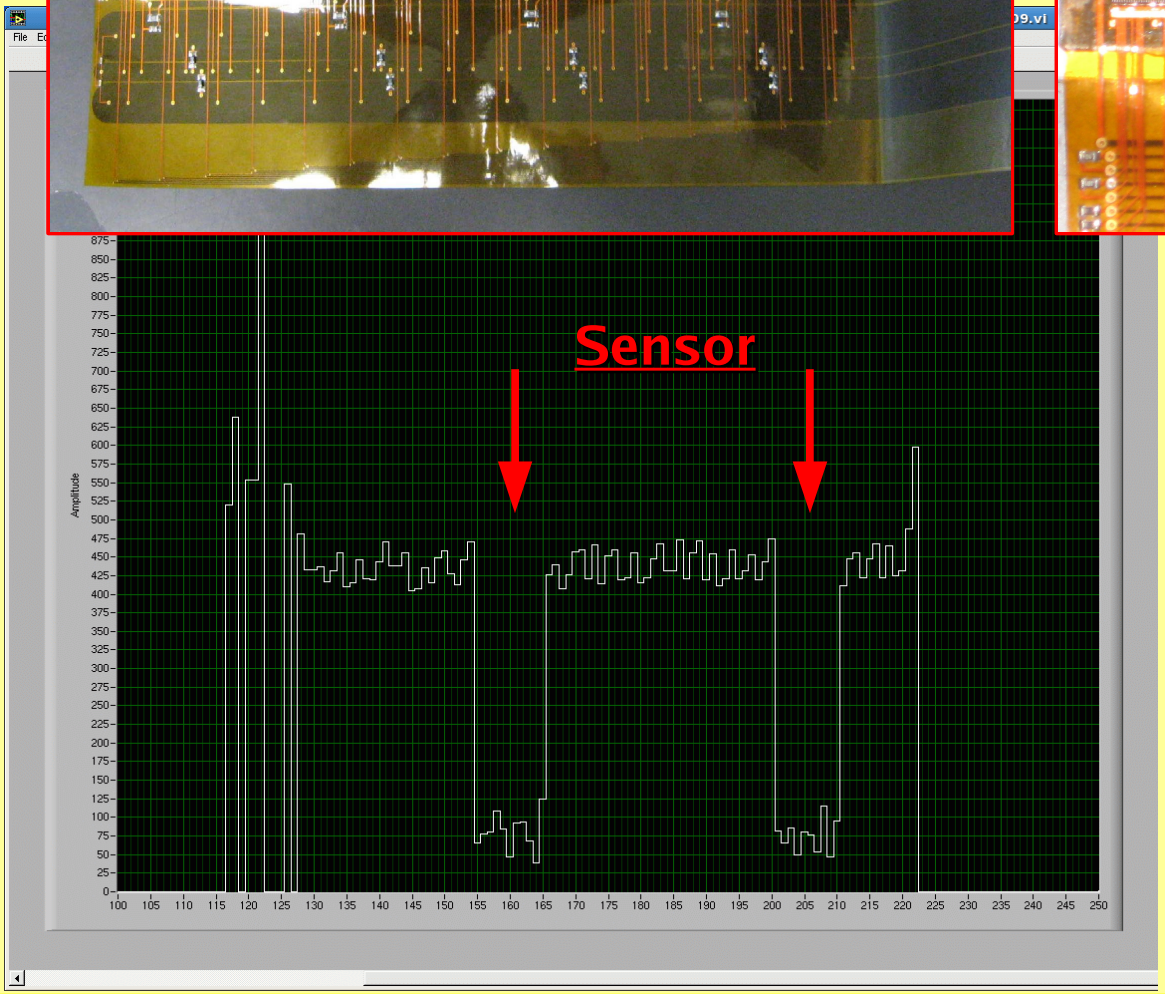


Giving up on LNS wire bonder
Service contract terminated

IST prototype bonded in 1 day
Discussion with Veljko Radeka next week

IST prototype





¼ of sensors bonded
- → 1 mil wire @ 44 um pitch!
- → probably can do all bondings

Readout chips operational
- → I2C works, can set parameters
- → chips are reading out

Sensors show up in the right place

Speed demon at 16ms/channel
- → ~25 seconds per sensor

Desperately need working readout

Gerrit van Nieuwenhuizen

CDR & Schedules

Reworking IST section CDR
→ Focusing on design choices

Schedules, WBS
Sorry.....

CDR_IST_Outline_23Jun2009.txt

0 The Intermediate Silicon Tracker

0.1 Introduction
*** REFER TO CHAPTER 4 FOR REQUIREMENTS ***
*** IS RADIATION GOING TO BE ADDRESSED IN CHAPTER 4? ***
*** AND THIS ALL RESULTED IN..... ***

0.2 Design choices
1 IST radius and silicon sensor geometry
2 Readout chips
3 Hybrids, modules and ladders
4 Mechanical support structure and stability
5 Cooling
7 Readout system

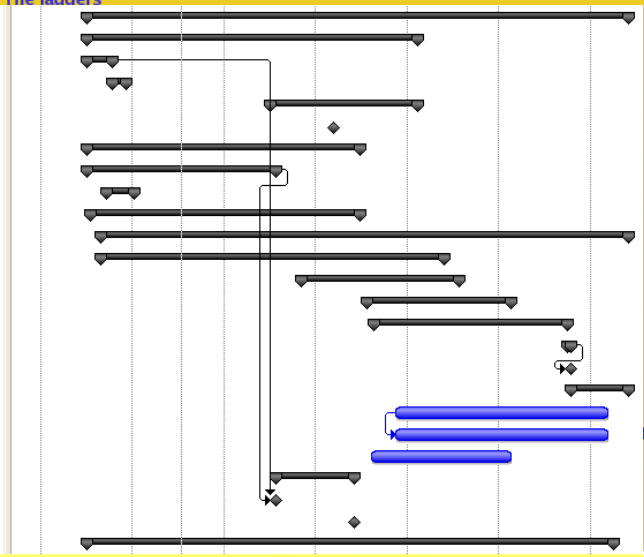
0.3 The Silicon Pad Sensors
1 Internal Layout
2 Required sensor characteristics
3 Quality control

0.4 The APV25-S1 readout chip
1 Description of functioning
2 etc

0.5 The Detector Modules
1 Layout
2 Module assembly
3 Cooling performance
4 Quality control

0.6 The Support Structure
1 IST barrel layout
2 The ladders

132	1.3	0%	Strip Detector	38.45 mons	Thu 1/1/09	Tue 12/13/11	$2,344,907.45	35.69	$878,241.58	$3,223,149.02		Surrow[30%]
133	1.3.1	0%	Mechanical	23.55 mons	Thu 1/1/09	Thu 10/21/10	$447,777.88	35.56	$179,111.15	$626,889.04		
134	1.3.1.1	0%	Design	1.8 mons	Thu 1/1/09	Thu 2/19/09	$61,956.00	40	$24,782.40	$86,738.40		
139	1.3.1.2	0%	Pre-production	1 mon	Fri 2/20/09	Thu 3/19/09	$2,500.00	40	$1,000.00	$3,500.00	138	
141	1.3.1.3	0%	Procurement/Fabrication	10.55 mons	Thu 12/31/09	Thu 10/21/10	$383,321.88	40	$153,328.75	$536,650.64		
145	1.3.1.4	0%	First IST ladder produced	0 mons	Wed 5/5/10	Wed 5/5/10	$0.00	0	$0.00	$0.00	144	
146	1.3.2	0%	Electrical	19.4 mons	Thu 1/1/09	Mon 6/28/10	$1,553,900.08	35.38	$561,838.63	$2,115,738.71		
147	1.3.2.1	0%	Design and Requirements	13.4 mons	Thu 1/1/09	Mon 1/11/10	$2,587.00	40	$1,034.80	$3,621.80		
159	1.3.2.2	0%	Pre-production	2 mons	Mon 2/9/09	Fri 4/3/09	$39,600.00	32.5	$14,280.00	$53,880.00		
164	1.3.2.3	0%	Procurement/Fabrication	19.15 mons	Thu 1/8/09	Mon 6/28/10	$1,511,713.08	31.82	$546,523.83	$2,058,236.91		
176	1.3.3	0%	Assembly Testing/QA	37.45 mons	Thu 1/29/09	Tue 12/13/11	$343,229.48	38.57	$137,291.79	$480,521.28		
177	1.3.3.1	0%	Component Testing	24.4 mons	Thu 1/29/09	Mon 12/13/10	$21,523.84	40	$8,609.54	$30,133.38		
193	1.3.3.2	0%	Assemble modules	11.25 mons	Thu 3/4/10	Wed 1/12/11	$0.00	40	$0.00	$0.00		
197	1.3.3.3	0%	Assemble ladders	10.25 mons	Tue 7/13/10	Mon 4/25/11	$0.00	40	$0.00	$0.00		
200	1.3.3.4	0%	Testing	13.75 mons	Tue 7/27/10	Mon 8/15/11	$0.00	40	$0.00	$0.00		
203	1.3.3.5	0%	Ship to BNL	0.25 mons	Tue 8/16/11	Mon 8/22/11	$0.00	40	$0.00	$0.00		
205	1.3.3.6	0%	IST ladders shipped to BNL	0 mons	Mon 8/22/11	Mon 8/22/11	$0.00	0	$0.00	$0.00	203	
206	1.3.3.7	0%	Layer Integration	4.05 mons	Tue 8/23/11	Tue 12/13/11	$0.00	40	$0.00	$0.00		
210	1.3.3.8	0%	Electrical assistance	61 wks	Mon 9/6/10	Fri 11/4/11	$68,333.89	40	$27,333.55	$95,667.44	192,208FF	IIT Elec Eng Project[20%]
211	1.3.3.9	0%	Mechanical assistance	61 wks	Mon 9/6/10	Fri 11/4/11	$84,203.62	40	$33,681.45	$117,885.07	210SS	T Mech Eng Project[20%]
212	1.3.3.10	0%	Technical assistance	40 wks	Tue 7/20/10	Mon 4/25/11	$169,168.14	40	$67,667.25	$236,835.39	34SS,199FF	MIT Tech Proj
213	1.3.4	0%	Milestones	5.6 mons	Mon 1/11/10	Wed 6/16/10	$0.00	0	$0.00	$0.00		
214	1.3.4.1	0%	IST Design finalized	0 mons	Mon 1/11/10	Mon 1/11/10	$0.00	0	$0.00	$0.00	147,134	
215	1.3.4.2	0%	IST Silicon sensors procured	0 mons	Wed 6/16/10	Wed 6/16/10	$0.00	0	$0.00	$0.00	165	
216	1.4	0%	Integration	37.5 mons	Wed 12/31/08	Tue 11/15/11	$1,665,410.91	40.59	$945,754.76	$2,611,165.67		Videbaek[30%]



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Concluding remarks

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