

# IST report, plans and schedule

**Sensors**

**Readout chips**

**Wire bonding**

**Hybrid/cable**

**Readout systems**

**Mechanical support**

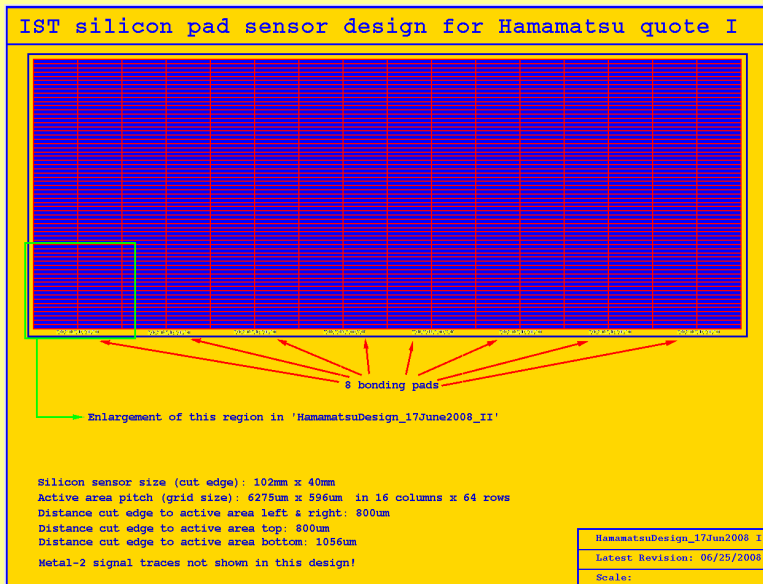
**Cooling system**

**Short Term Schedules**

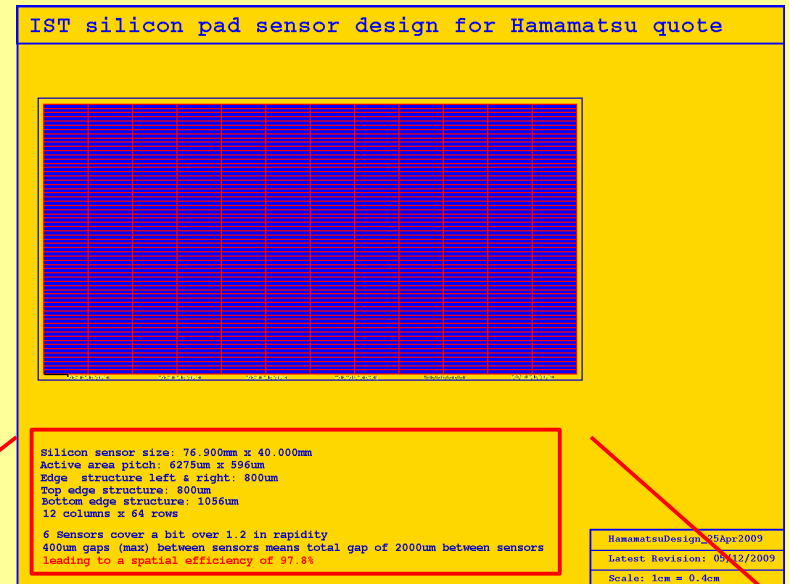
**HFT bi-monthly meeting  
BNL, March 9, 2010**

**Gerrit van Nieuwenhuizen**

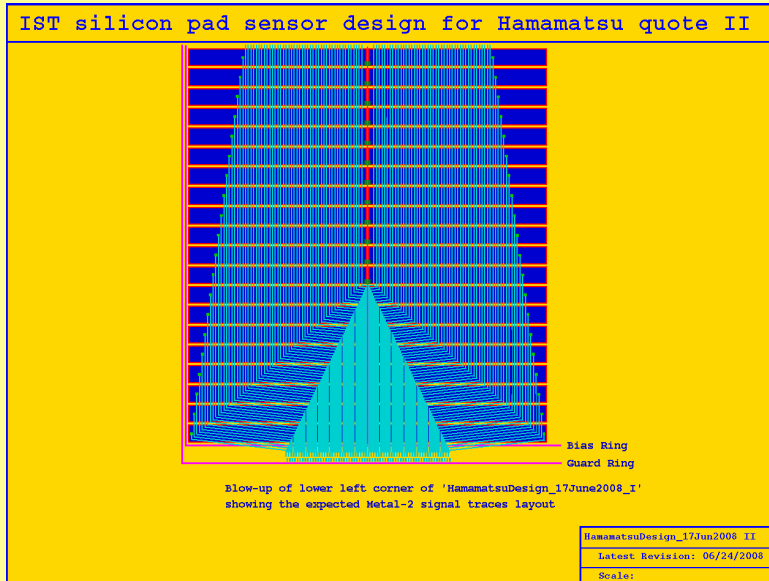
# Sensors



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%

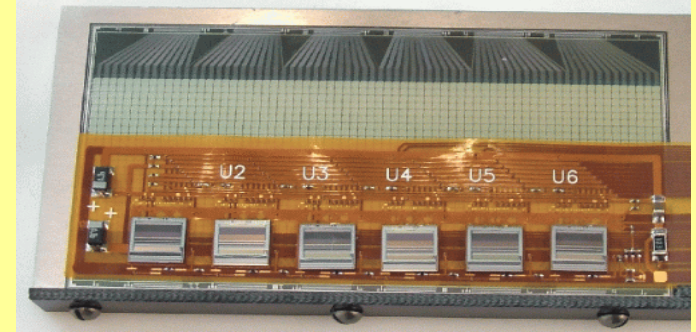
**Request for prototype quotation will go out as soon as funding schedule available**

**Expect FY10 funds in July???**

# APV25-S1 readout chips

8 wafers procured = enuf chips  
1 wafer diced (5-10 working days)

6 chips mounted, chips work but I2C is  
not working, so very useful for tests

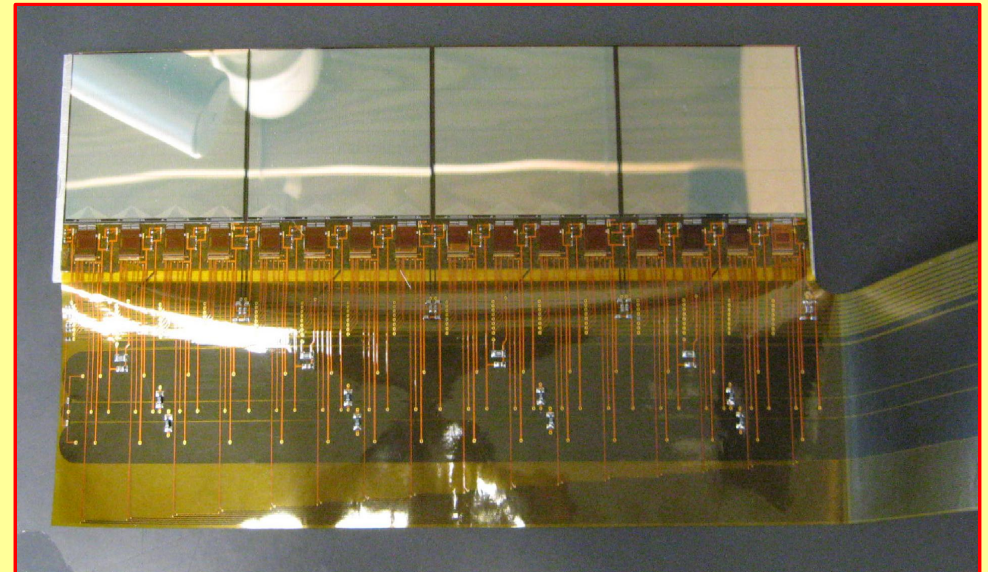


2 x 16 chips mounted on 2, more than fullscale, prototypes

1 prototype partially bonded

Testing hampered by reluctant  
readout system

I'd like to wait with further  
dicing until more test  
result are available



# Wire bonding

Instrumentation Division

**BROOKHAVEN**  
NATIONAL LABORATORY  
Home

**Bonding of prototypes is taking place at BNL**

**Production bonding will take place at BNL**

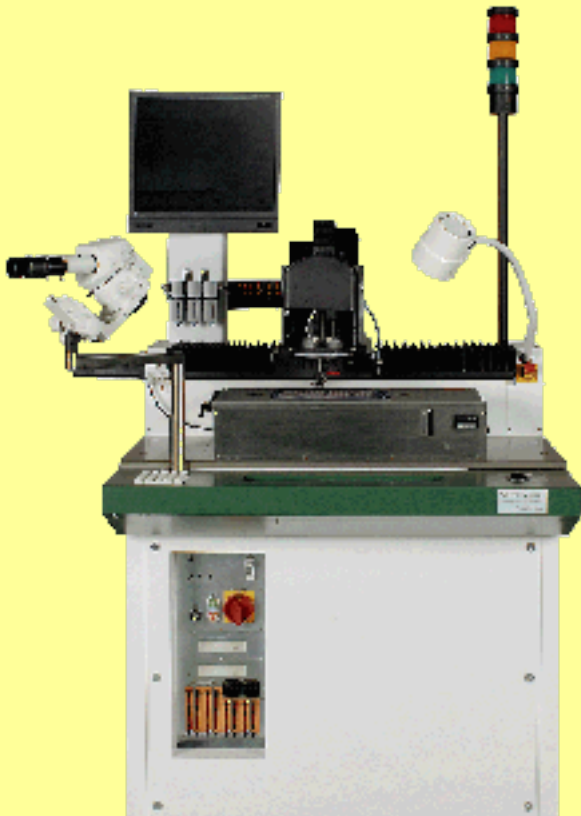
- needs to be scheduled carefully
- will be supervised by Don Pinelli
- we will supply a person to do the bonding

**1 IST prototype was partially bonded ( $\frac{1}{4}$ ) in a few hours with 25 mil wire**

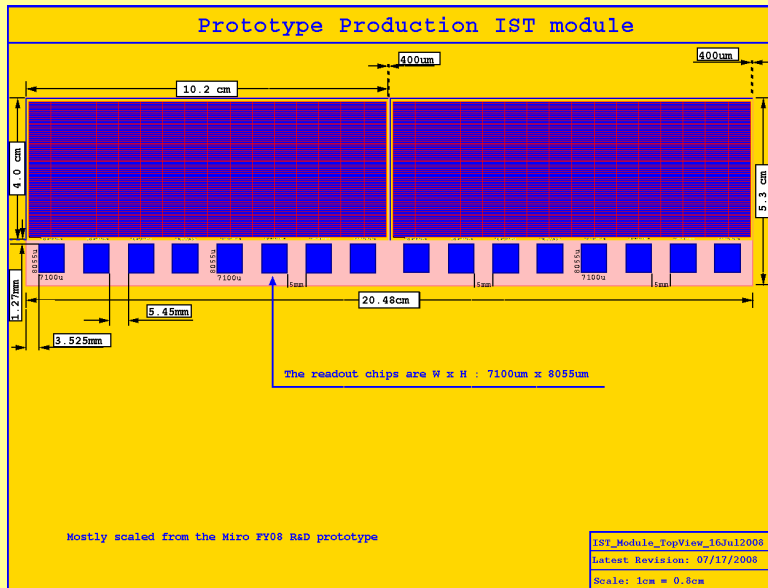
**25 mil is too thick and current tools are too wide to comfortably bond the APV chip**

**In the process of ordering new tools and wire**

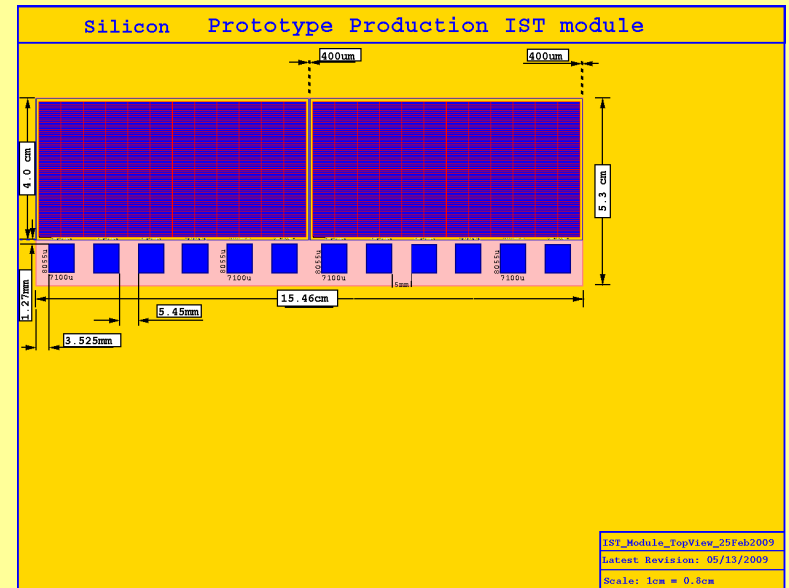
**Sensor bonding pad design will be vetted by Don Pinelli**



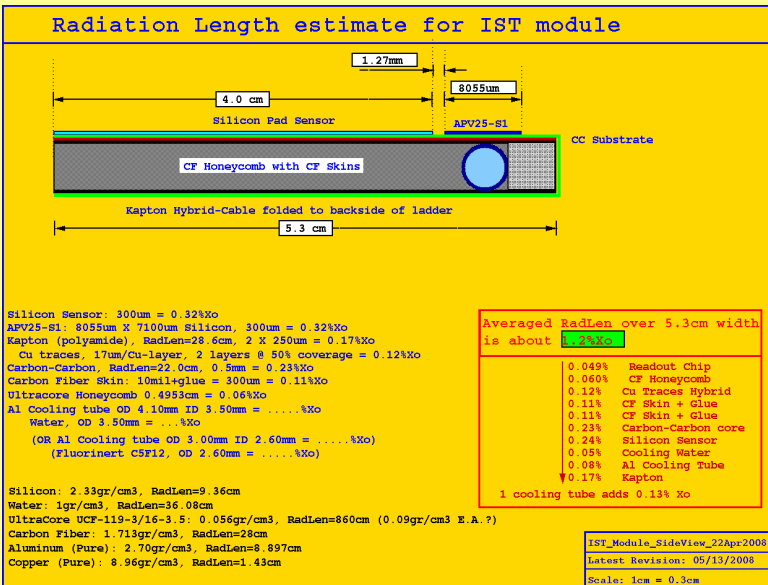
# Kapton hybrids



2008



2009



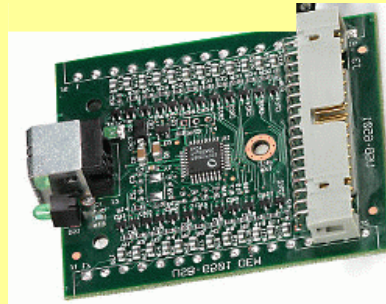
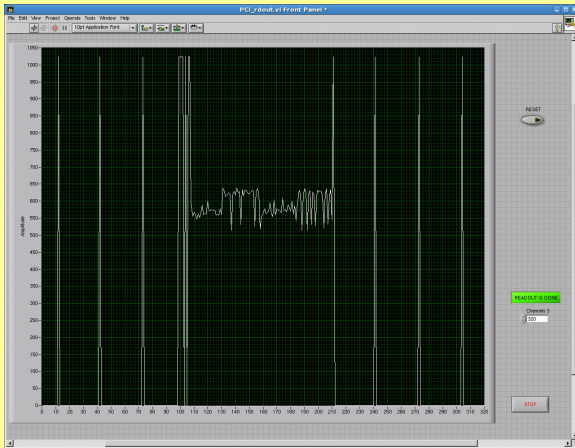
Shorter sensors → shorter hybrids  
12 chips → less dissipation (~ 4 Watt)  
→ better matched to readout

Ben Buck and Gerard Visser will check if the current design needs improving before cutting it down to proper size

Production expected in July 2010

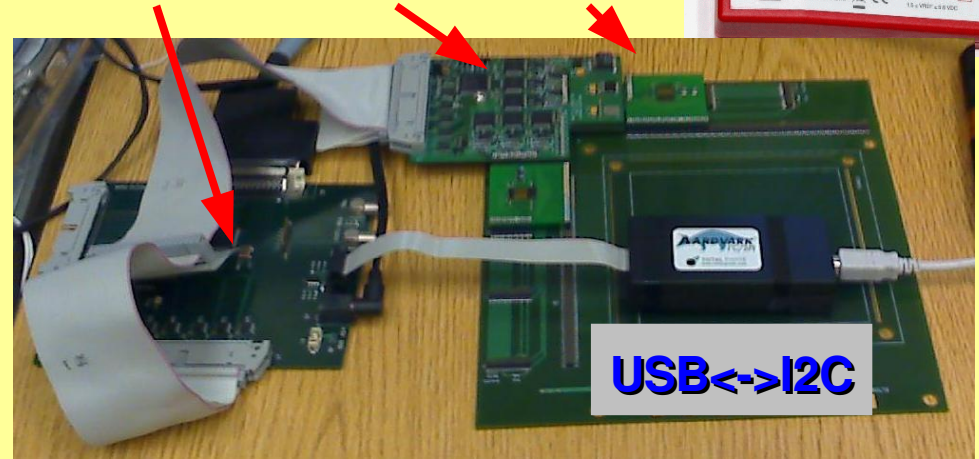


# Test readout system



USB<->DIO

FPGA\_CU GEM\_CU APV



Old readout firmware dropped channels in a random way

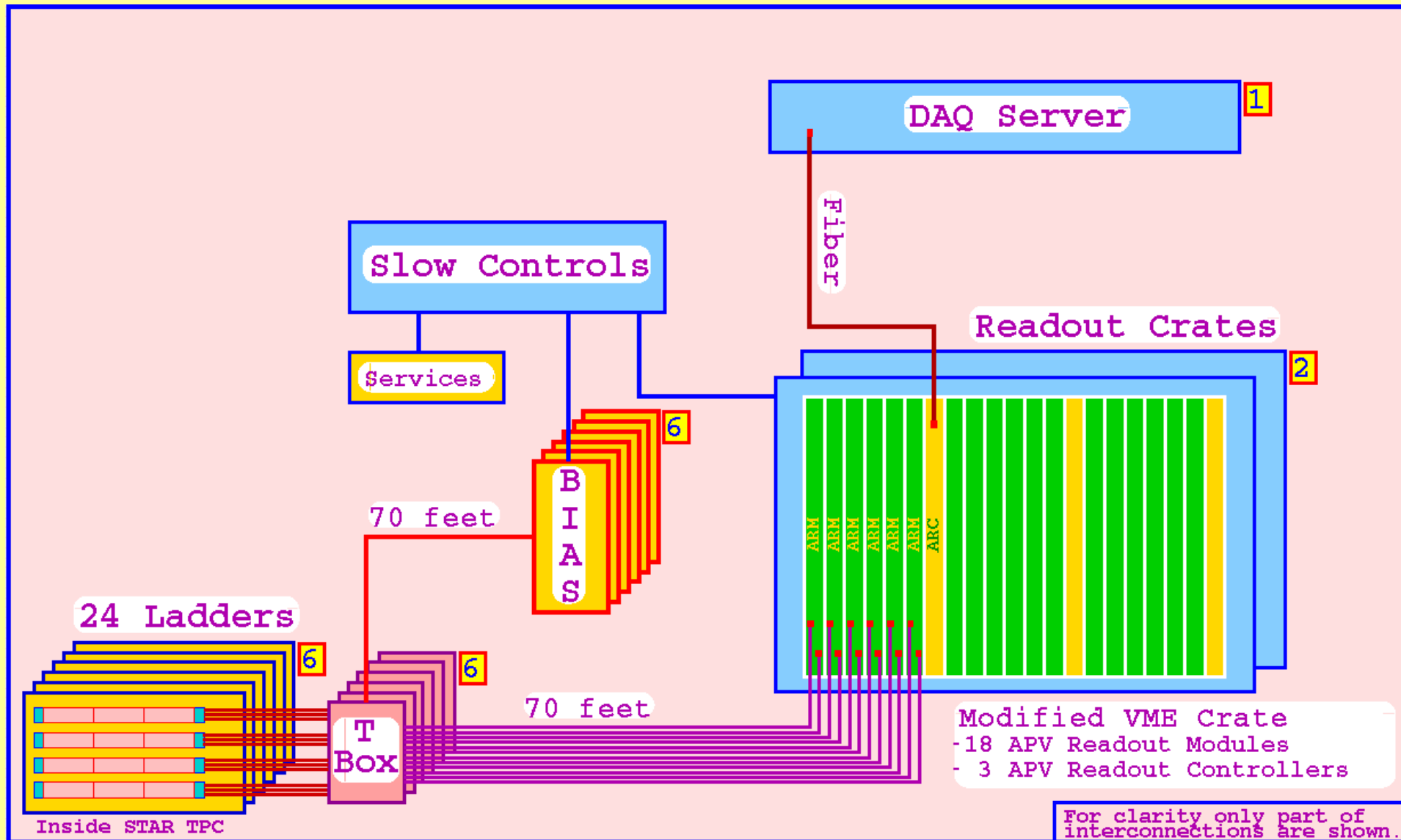
Miro Plesko left before fixing this problem, Ben Buck had to rewrite the firmware from scratch

Testing was slowed down by CD-1 efforts

Currently using a DaqMxBase C program to talk to readout system, handshaking seems to be working but no data readout (although visible at APV level)

Did I just blow up the FPGA\_CU board?

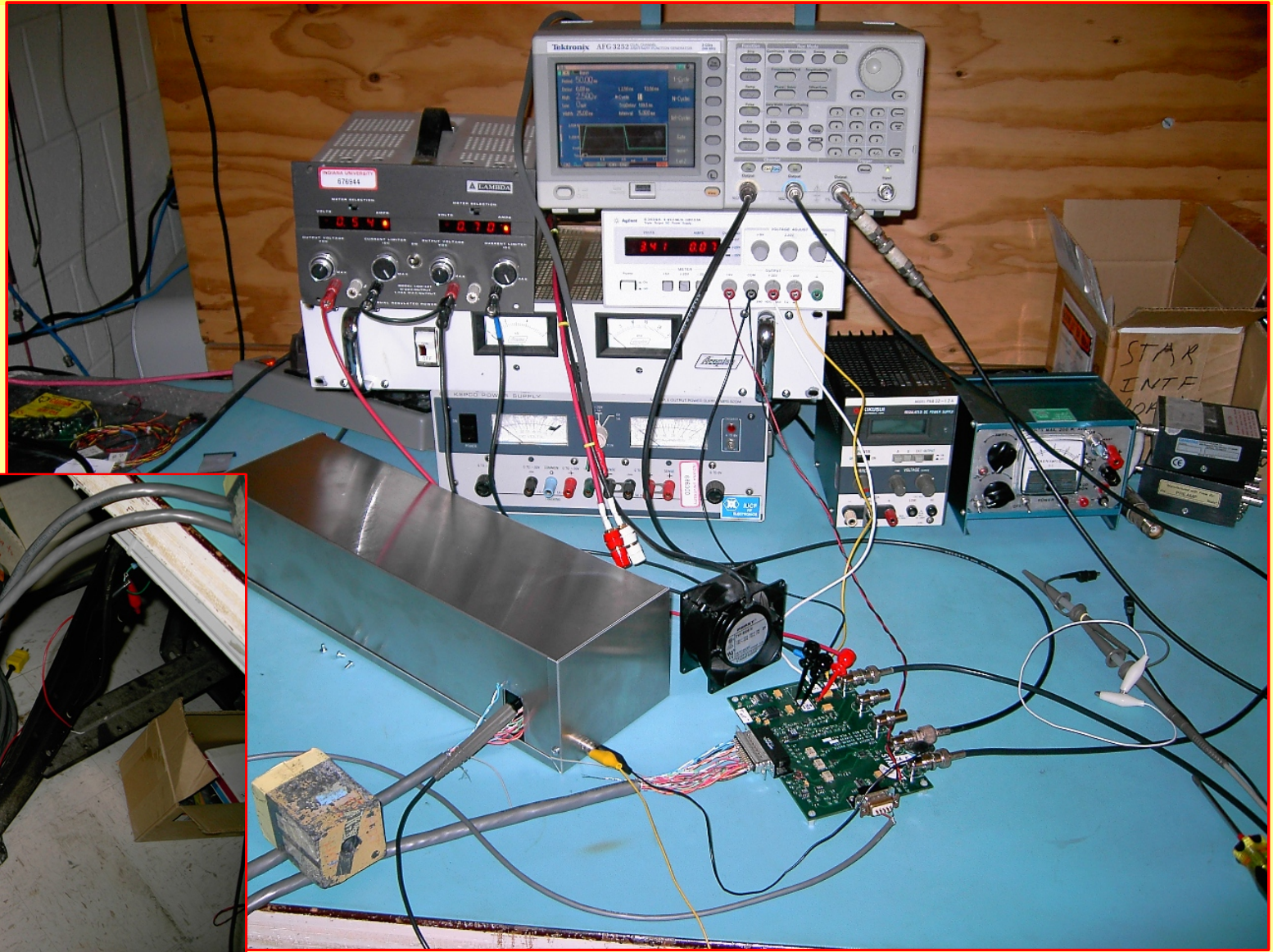
# Production readout system



First prototypes of ARM/ARC system ready May/June 2010.



# Test pre-prototype readout system

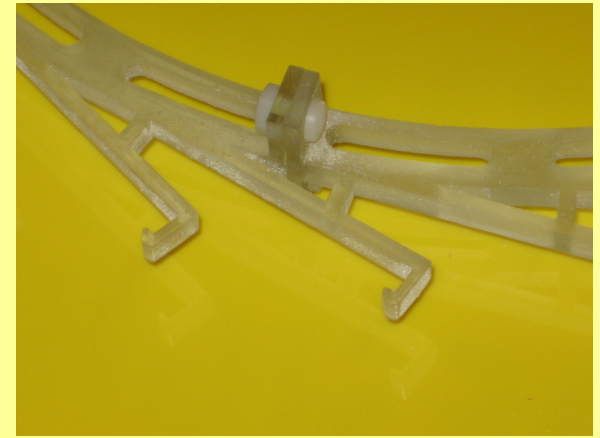
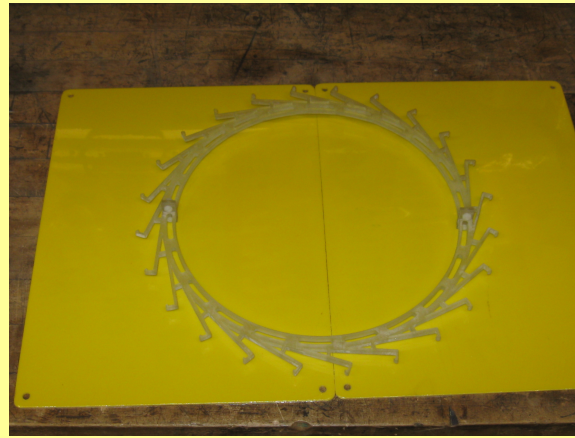
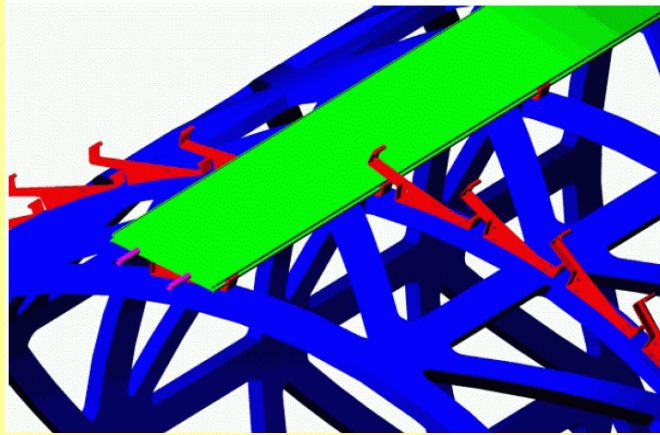


110 ft of cable!

Prototype readout being tested with long cable by Gerard Visser

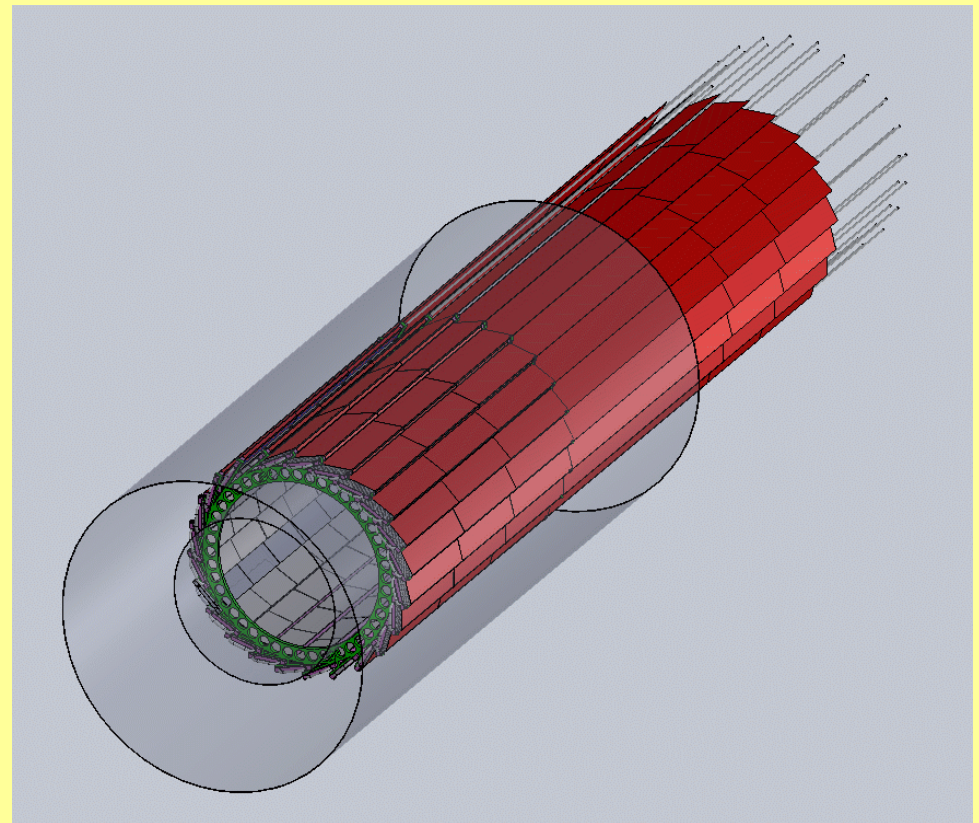


# Mechanical support system



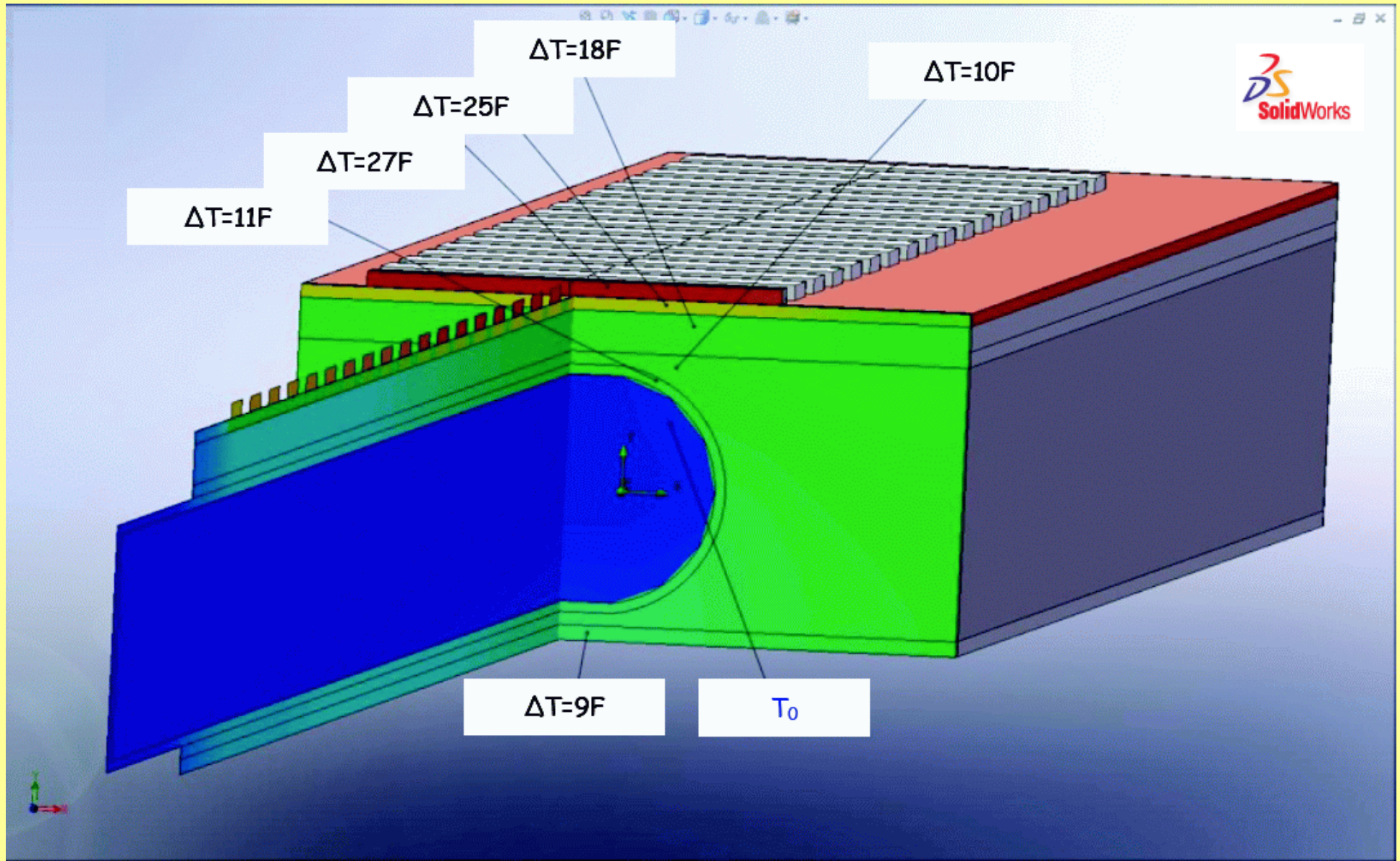
**50 cm IST in SolidWorks  
Clamping 'Crown' rapid prototype**

**Produce 50 cm ladder in August**



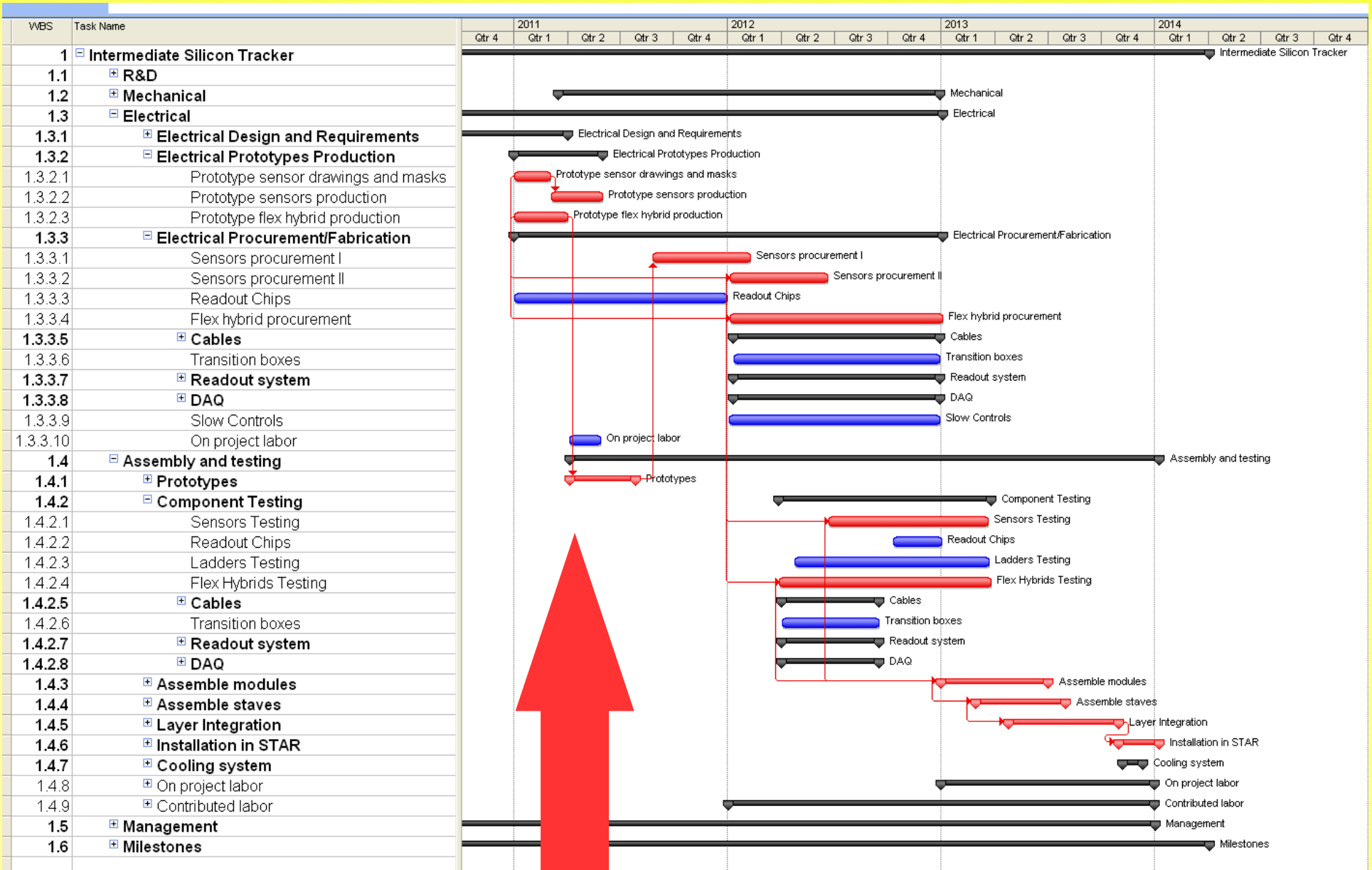


# Cooling system



FloWorks shows a  $\Delta T$  of 27 F for the ladder and 10 F for the ladder wrt the fluorocarbon based coolant

# Schedules



**Shortterm we are on track as long as the funding arrives as expected**



# CD-1 Homework

IST labor and capital was done per year for the duration of the project

MIT manpower tables were provided

Report about APV25-S1 dead time issue was produced

Report about replacing SSD by second IST layer was produced

Cost Type	Name	Function	Expertise	Cost (\$y project)	Cost 2010	Cost 2011	Cost 2012	Cost 2013	Cost 2014
	Ben Buck	Electronics Engineer	Front End Electronics, Readout	\$210,485.00	\$42,131.70	\$29,211.10	\$75,951.00	\$63,191.20	\$0.00
	Gerard Visser	Electronics Engineer	Readout, DAQ	\$70,219.50	\$70,219.50	\$0.00	\$0.00	\$0.00	\$0.00
	Bob Abruzio	Electronics Draft	Front End Electronics, Readout	\$19,385.99	\$19,385.99	\$0.00	\$0.00	\$0.00	\$0.00
	Jim Kelsey	Mechanical Engineer	Support Structure, Cooling	\$302,496.60	\$0.00	\$0.00	\$224,626.80	\$77,869.80	\$0.00
	Jason Besuille	Mechanical Engineer	Support Structure, Cooling	\$38,186.35	\$0.00	\$0.00	\$18,718.90	\$19,467.45	\$0.00
	TBD	Technician	Wire Bonding	\$81,475.50	\$0.00	\$0.00	\$0.00	\$81,475.50	\$0.00
	Don Pinelli	Technician	Wire Bonding	\$6,143.55	\$0.00	\$0.00	\$0.00	\$6,143.55	\$0.00
On project Labor									
	Bernd Sarrow	Physicist	S						
	Gerrit van Nieuwenhuizen	Physicist	D						
	TBD	Post-Doc	A						
	TBD	Grad Student	A						
	TBD	Grad Student	A						
Contributed Labor									
	Dale Ross	Technician	A						
Re-Directed Labor									
	Electrical Procurement								
	Mechanical Procurement								
Capital Equipment									
	MIT Fiscal Support								
Management									
Total									

APV HIP Dead Time

Response to issues raised

the HFT CD-1 review on

Evaluation SSD vs 2<sup>nd</sup> IST layer

Response to draft recommendation from

the HFT CD-1 review on Nov. 12, 2009

# Concluding remarks

**Sensor design will be finished before June**  
**RFQ will go out to Hamatsu, June-July**  
**Prototype production in Q1 FY2011**

**Waiting with dicing of more APV chips until test results are available**

**Wire bonding being set up at BNL**  
**Agreement with Instrumentation Div. for prototypes and production**

**Hybrid designs are being vetted**  
**Shortened design finished before July**  
**Prototype production July-August**

**Smoothing out problems with test readout system**  
**First prototypes of ARM/ARC in May**  
**On schedule for FGT, so IST should be OK**

**Have to schedule to mechanical engineering still**

**CD-1 done!(?).....Moving towards CD-2**