

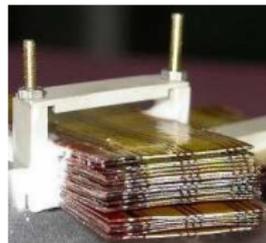
# My summer at CERN 2007

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# LMT connection and testing

- ★ **Low Mass Tapes (LMT's)** are flexible circuits used to bring power, sensing and control signals to the silicon modules in the SCT
  - ★ made by photolithography of aluminum on a kapton substrate
  - ★ 1 LMT per module



## Testing

- ★ Agilent Data Acquisition/Switch
  - ★ Measure resistance between lines
    - \* High reading: an open circuit
    - \* Low reading: a short
- ★ Keithley Source Meter
  - ★ Measure the High voltage (HV) resistance under forward bias

# LMT connection and testing

Diagram illustrating the LMT connection and testing process. A laptop is connected to a mobile phone (P1e10:12), which is in turn connected to a rack of modules (P0e10:12). The rack contains modules labeled C1, C2, and C3, and is connected to a larger system (O1-O13) via a cable labeled P0e10:12. The system is divided into sections labeled M1 through M10, and P0e10:12 through P0e10:13. A table below shows the connection details for the modules.

Disc	Connector	Part No.	Part Name	Serial No.	Y	Z	C	J
2	C1	2A-TL-O13	2032000	Y 27-15 S2/C=2 J=19				
	C2	2A-TL-M10	2031996	Y 27-15 S2/C=2 J=26				
	C3	2A-TL-I10	2031991	Y 27-15 S2/C=2 J=31				

Configuration window showing:

Cavern/Rack/Grate: US15:27-15.S2 / 2  
 Channel: 19  
 Filename: T:\users\surname\_J-R\Phillips\_Peter\

Parameter table:

Parameter	Level	Data	Upper	Unit	PASS
Chel-VddPst	0E+0	99E+00	10CE+0	-hars	●
vAIFe-VrrRst	0E+0	99F+0F	10TF+0	chrs	●
vvrFte-VrrRst	0E+0	99F+0F	10TF+0	chrs	●
vdd_ssr_vddtot	0F+0	1A1F3E	10L1U	chrs	●
lcomp_vddtot	5F+0	1A1F3E	10L1U	chrs	●
lcomp2_vddtot	7E+0	09E13E	10E13	lms	●
vP0-VddRst	2Lut :	1.9732E	1 25-C	wlks	●
vVCE-VddFe:	0E+0	99E+9E	10CE+3	lms	●
EELECT-vddRv:	0E+0	99E+9E	20E+3	-hars	●
HVsv-VddRst	0E+0	99E+9E	10CE+0	-hars	●
RESET-vdd	0E+3	99E+9E	20E+3	-hars	●
vdd-vddRst	0E+0	99F+0F	10TF+0	chrs	●
vvr-VddRst	0E+0	99F+0F	10TF+0	chrs	●
VV_vddRst	11E+3	1.1111E	40E+3	chrs	●
VVtot_VddRst	0F+0	13E1U	13E1U	chrs	●

Diagram showing a rack layout with modules M1-M10 and P0e10:12-P0e10:13. A red arrow points from the parameter table to the text "Fail/Pass".

## ★ If **NOT PASS**:

- ★ check known anomalies from earlier testing
- ★ tell an expert, which will try to fix it
- ★ in fact the most exciting part of the work !!

## ★ If **PASS**:

- ★ continue with next channel

## Security (mainly for the Detector)

## ★ The one that is connecting needs to wear:

- ★ ESD shoes
- ★ ESD bractlet, connected to ground
- ★ ESD polo shirt



## ★ The SemiConductor Tracking Detector Control System (SCT-DCS)

- ★ provide the detector with power, cooling and control
- ★ alert and protect against error conditions
- ★ divided into several subsystems:
  1. power supply (PS) system
  2. enviromental monitoring and interlock system
  3. cooling system
  4. thermal enclosure

### 1. PS system

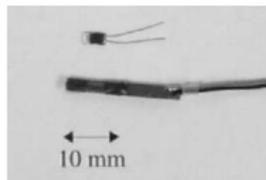
- ★ each module have 2 independent PS (high and low voltage)
- ★ several other connections, in total 16 readout values to tune and control the PS

# Detector Control System (DCS)

## 2. The environmental monitoring and interlock system

- 2.1 temperature of C fiber structure of the detector (113)
- 2.2 temperature of the air inside the detector (257)
- 2.3 temperature of the cooling system (658)
- 2.4 the relative humidity (51)

- ★ **dew point:** Humidity + temperature of air inside the detector.
- ★ **interlock system:** protect the silicon detector modules from overheating if the cooling stops.



Case	Action
$T_{module} > T_{alarm}$	Switch off LV and HV
$I_{bias} > I_{alarm}$	Switch off HV
Off state: $V_{bias} > 10\text{ V}$	Switch off HV
Off state: LV output on	Switch off LV
CC < - > HV/LV communication lost	Send emergency message to MoPS
CC < - > MoPS communication lost	Reset Communication
$T_{cool} < T_{dewpoint} + 10^{\circ}\text{C}$	Pop up messages
$T_{cool} < T_{dewpoint} + 5^{\circ}\text{C}$	Switch off LV/HV
$T_{cool} > 22^{\circ}\text{C}$	Switch off LV/HV
$T_{air} > 30^{\circ}\text{C}$	Switch off LV/HV
$T_{mech} > 30^{\circ}\text{C}$	Switch off LV/HV
Bad status for cooling	Switch off LV/HV
Communication loss between projects	Pop up messages, operator to reestablish communication. Interlock to ensure safety.

## 3. Cooling

- ★ Operational temperature:  $-7^{\circ}$
- ★ Stability better than  $\pm 2^{\circ}C$
- ★  $C_3F_8$  running in thin wall CuNi cooling tubes

### Chron job

- ★ runs daily to check that the SCT is not running under bad conditions
- ★ up till now: just sent an e-mail to the SCT commissioning
- ★ **Gunn and I** have made a script that generates a webpage presenting summaries and anomalies of the day
  - ★ based on Saverio's perlscripts and uses ROOT for plotting

## Great things

- ★ I really enjoyed being down there
- ★ Nice to just be around and see how things are done and how people are working
- ★ Great lectures, gave a good repetition on a lot of forgotten physics
- ★ Interesting project, especially that it is in fact used! We have contributed!
- ★ Great to have the opportunity to work down in the ATLAS pit

## Not so great things

- ★ Would have been nice (and cheaper) to rent an apartment

## Thanks to...

- ▶ Ole M. Røhne (for always answering (extremely detailed) on every question we had)
- ▶ Heidi Sandaker (for using time and effort to let us have some interesting things to do)
- ▶ Yuriy Pylypchenko (for helping (force) us, especially the first days)
- ▶ Farid Ould-Saada and the EPF group for spending money to make it possible to be down there for so long time!

