My summer at CERN 2007

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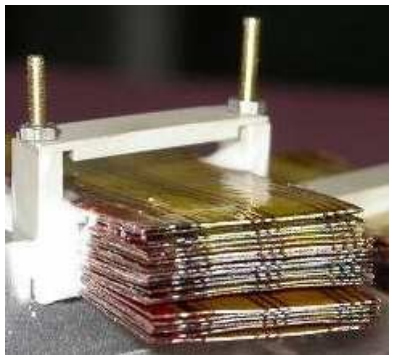
LMT connection and testing

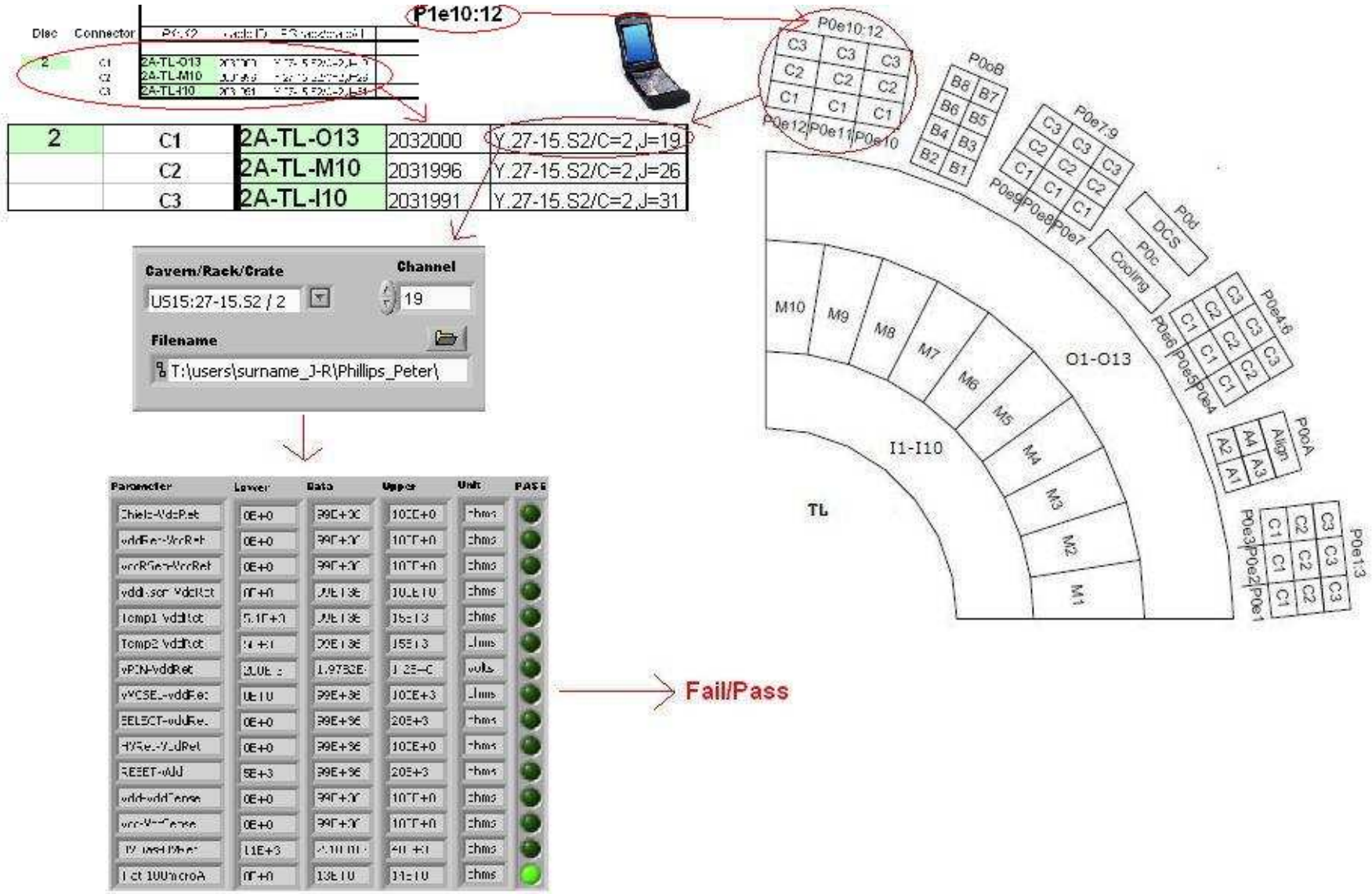
- **Low Mass Tapes (LMT's)** are flexible circuits used to bring power, sensing and control signals to the silicon modules in the SCT
  - made by photolithography of aluminum on a kapton substrate
  - 1 LMT per module



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



LMT connection and testing

- 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 braclet, connected to ground
  - ESD polo shirt

Detector Control System (DCS)

- 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

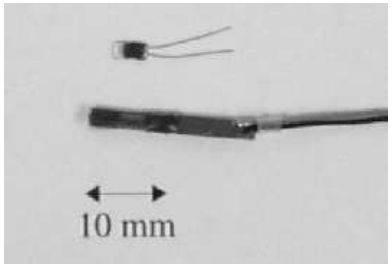
1. PS system
   - each module have 2 independent PS (high and low voltage)
   - several other connections, in total 16 readout values to tune and control the PS

Detector Control System (DCS)

2. The enviromental monitoring and interlock system
   - 2.1 temperature of C fiber stucture 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: $V_{bias} > 10$ 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
$T_{cool} < T_{dewpoint} + 10°C$	Pop up messages
$T_{cool} < T_{dewpoint} + 5°C$	Switch off LV/HV
$T_{cool} > 22°C$	Switch off LV/HV
$T_{air} > 30°C$	Switch off LV/HV
$T_{mech} > 30°C$	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.

Detector Control System (DCS)

3. Cooling
   - ⋆ Operational temperature: -7^o
   - ⋆ Stability better than $\pm 2^o C$
   - ⋆ 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

My own experience

Great things

- ★ I really enjoyed beeing 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 appartment

Acknowledgment

Thanks to...

- Ole M. Røhne (for always answering (extremly 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!