IAPP WP6

High voltage teststand at CAEN to power Silicon detectors

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FTK IAPP
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Goal of the measurements at CAEN

First part of secondment (2013)

Prepare a setup to power and read out ATLAS pixel sensors and characterize planar sensors by using a CAEN power supply board under development

Setup

Mainframe Crate: **CAEN SY4527**

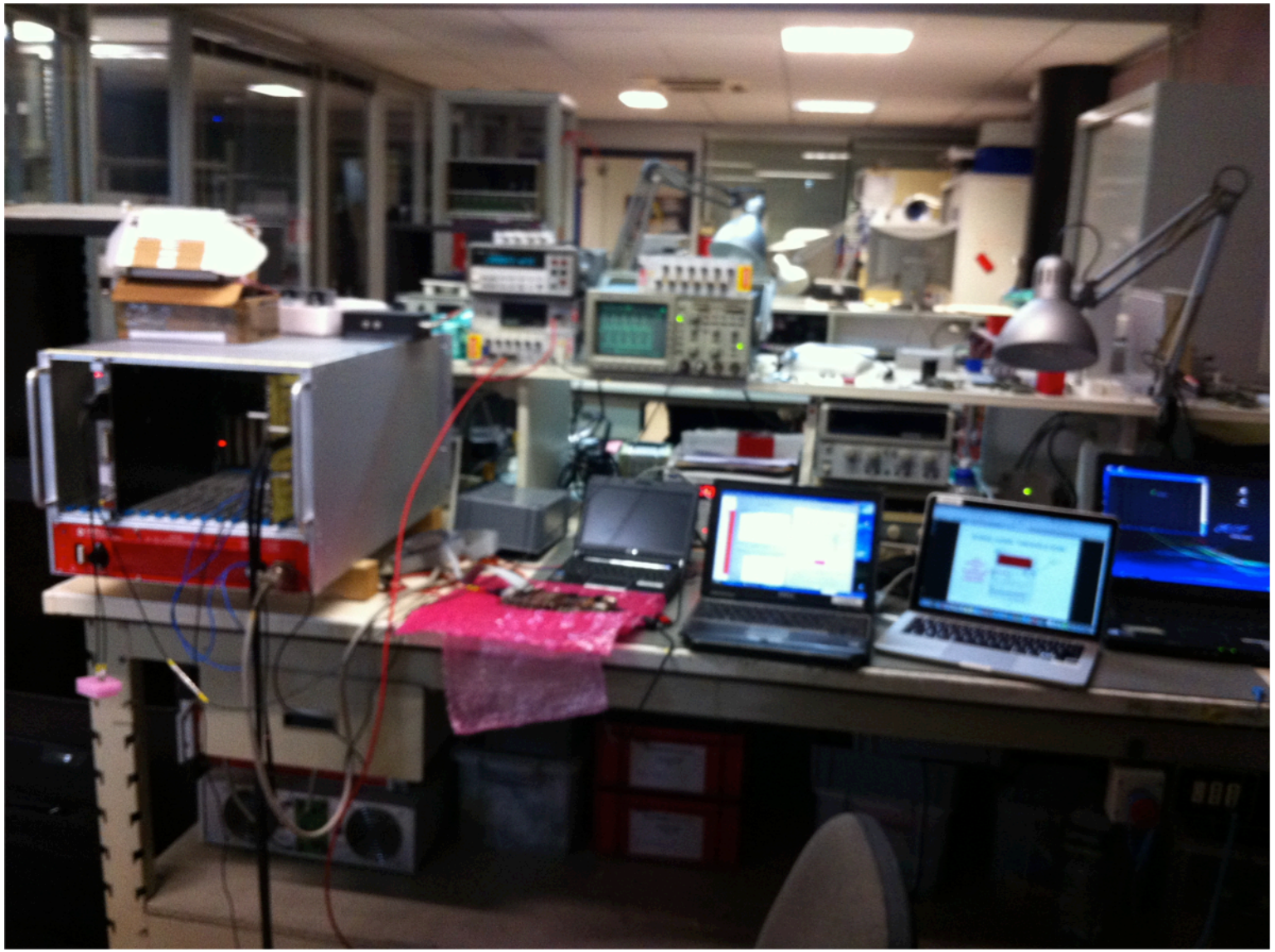
16-boards capacitance, controlled by A4528 CPU Full

HV board: **A1541N**

No. of Channels 32 (Common Floating Return)
Output Voltage 0÷500 V
Max. Output Current 10 mA
Voltage Set Resolution 10 mV
Voltage Monitor Resolution 1 mV
Current Set Resolution 200 nA
Current Monitor Resolution 10 nA
VMAX hardware 0÷500 V common for all the board channels
VMAX hardware accuracy 1 V
VMAX software 0÷500 V settable for each channel
VMAX software resolution 1 V
Ramp Up/Down 1÷50 Volt/sec, 1 Volt/sec step
Voltage Ripple < 10 mVpp (Max) full load
Maximum output power 5 W per channel
Power consumption A1541: 320 W @ full power
A1541L, A1541S: 240 W @ full power
A1541D: 120 W @ full power

Readout: **ATLAS USBPix**

Setup at CAEN

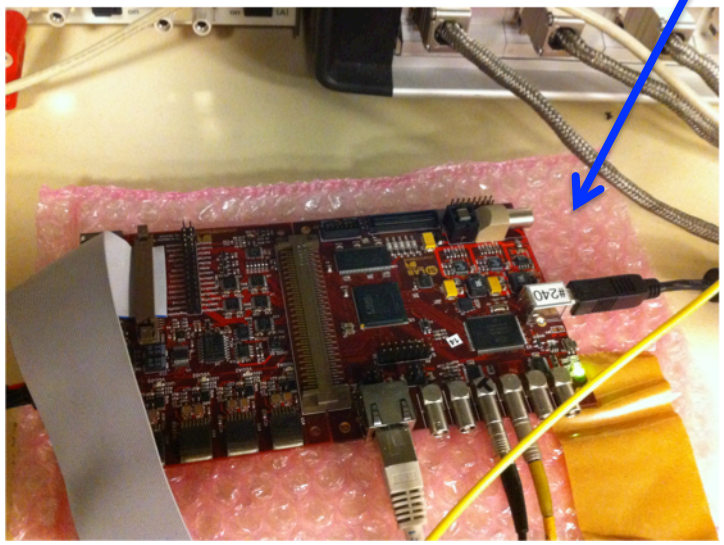


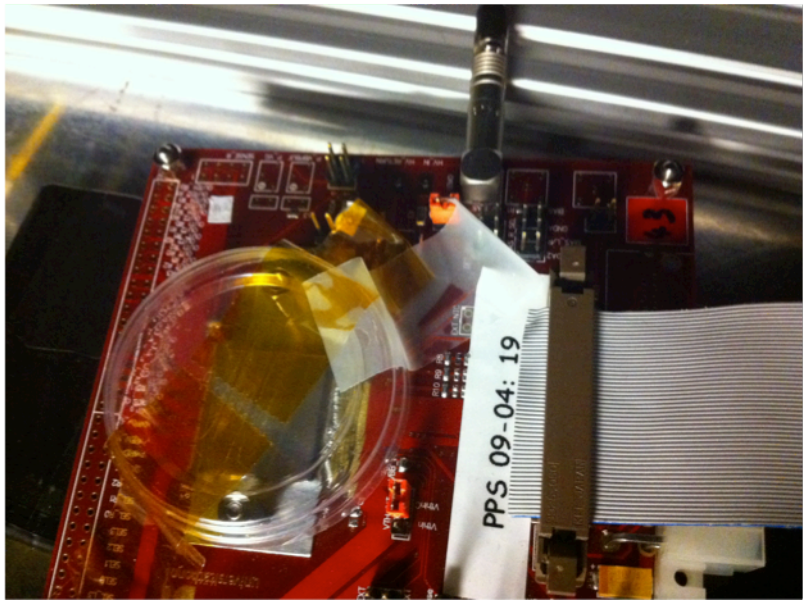
Setup

CAEN SY4527 with A1541N

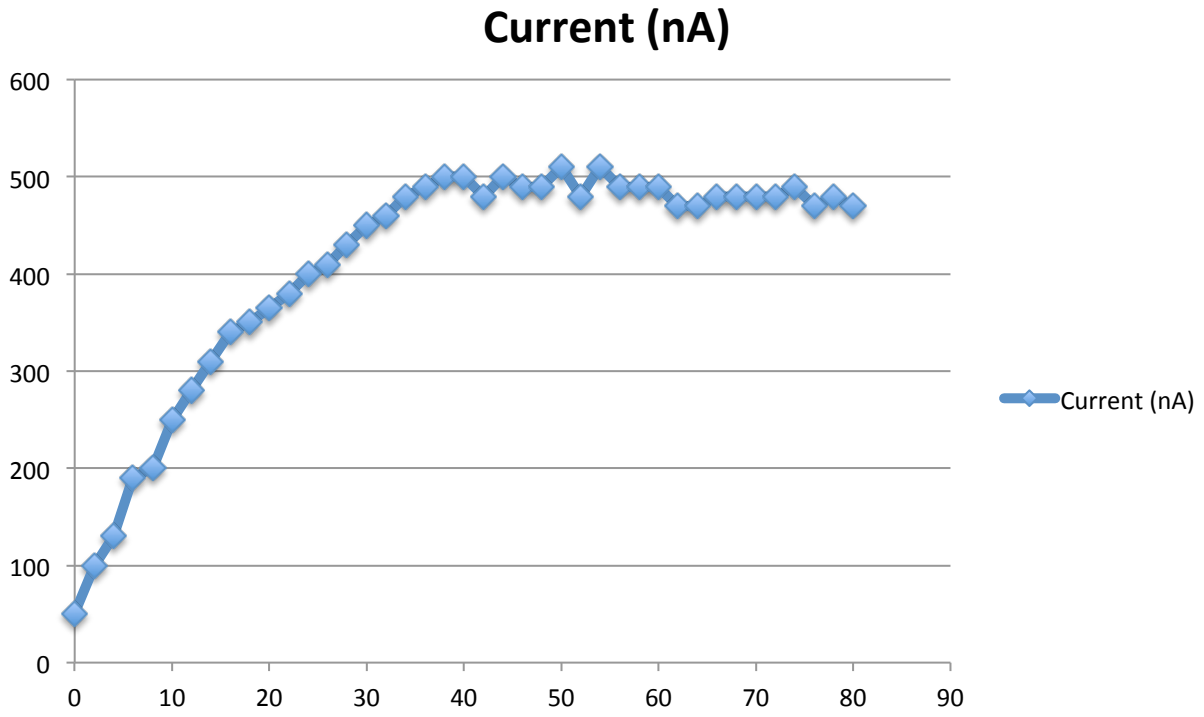
Readout card and mezzanine

Pixel sensor bump-bonded to FE-I4 readout chip



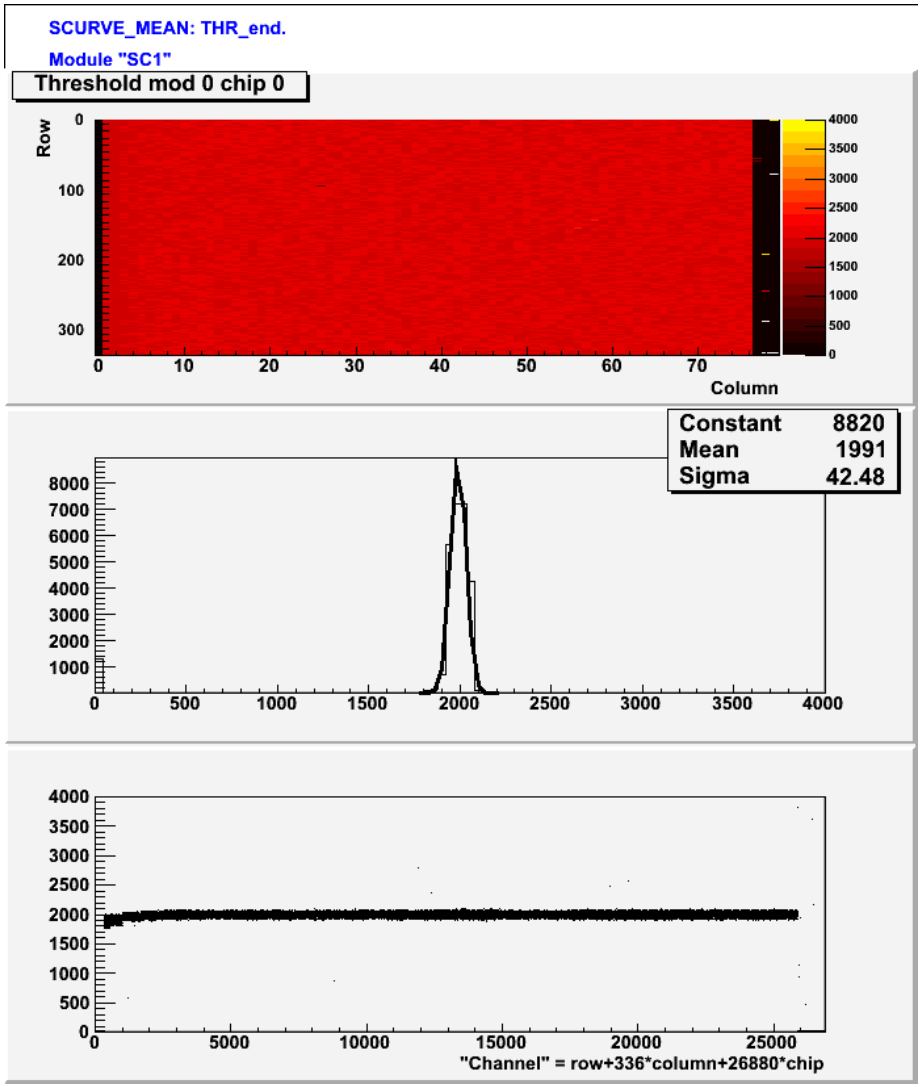


IV characterization with A1541N (room temperature)



Some current fluctuation (readout? See comments below)

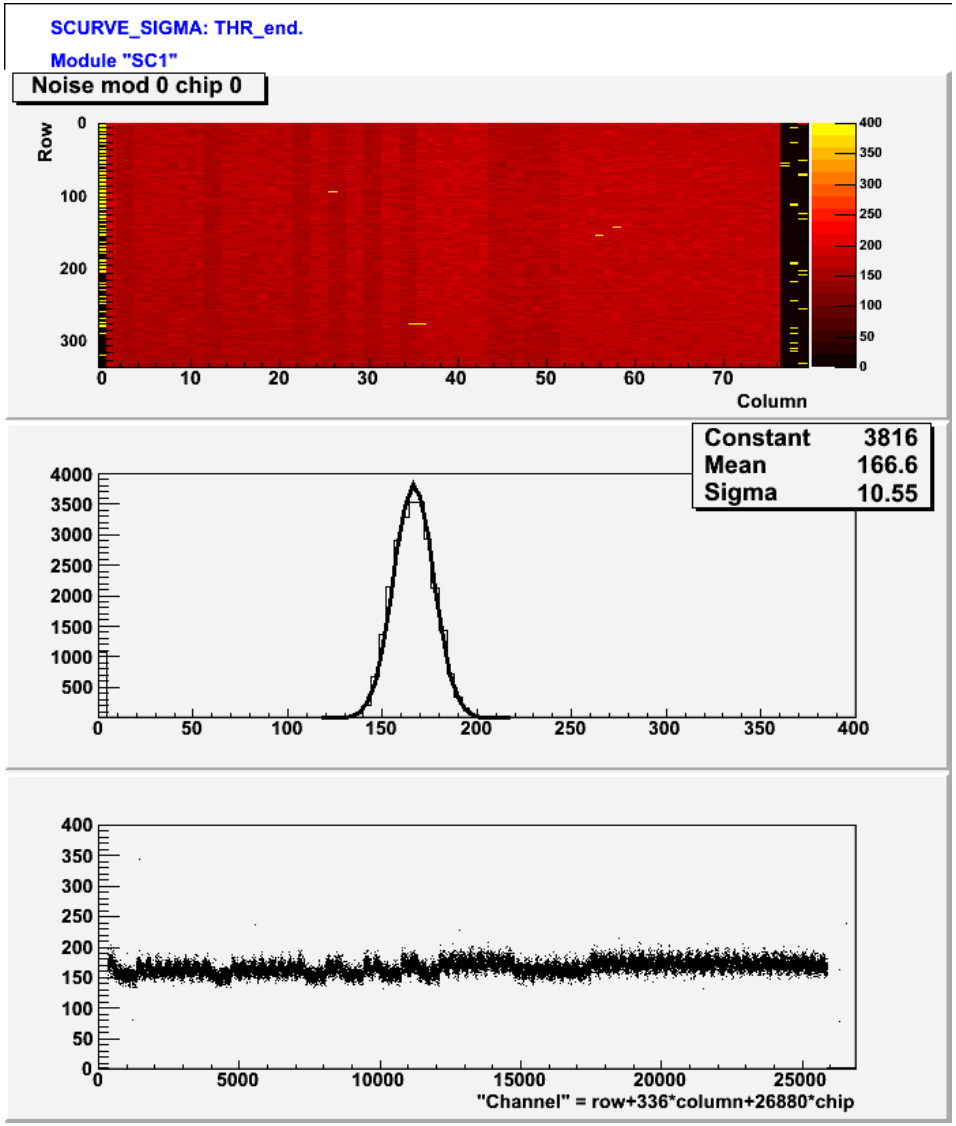
Calibrations (I) : threshold determination



Threshold scan performed.
Fitted with s-curves

Threshold ~2000 e (ok)
Threshold spread ~40e

Calibrations (II) : noise measurement



Noise ~160 e (ok)

Note: setup has been improved in a few ways

examples:

Better screening from light

Sensors inside grounded metal Faraday cage

Electrical connections to mezzanine and flat connector to sensor

More detailed description in the report

First impressions

- Very positive experience !
- Setup now working (and fairly optimized, even if still interesting options to try)
  - Better thermal stabilization of the sensor?
- First feedback on the HV board (for our applications)
  - Possibility to switch polarity (jumper?)
  - End-of-scale for monitoring
    -> presently 10 mA.
    Would it be possible to SW select scale (ex. 1mA)?
    Some fluctuations (due to the end-of-scale?)
  - Channels are floating and offsettable. Very good!