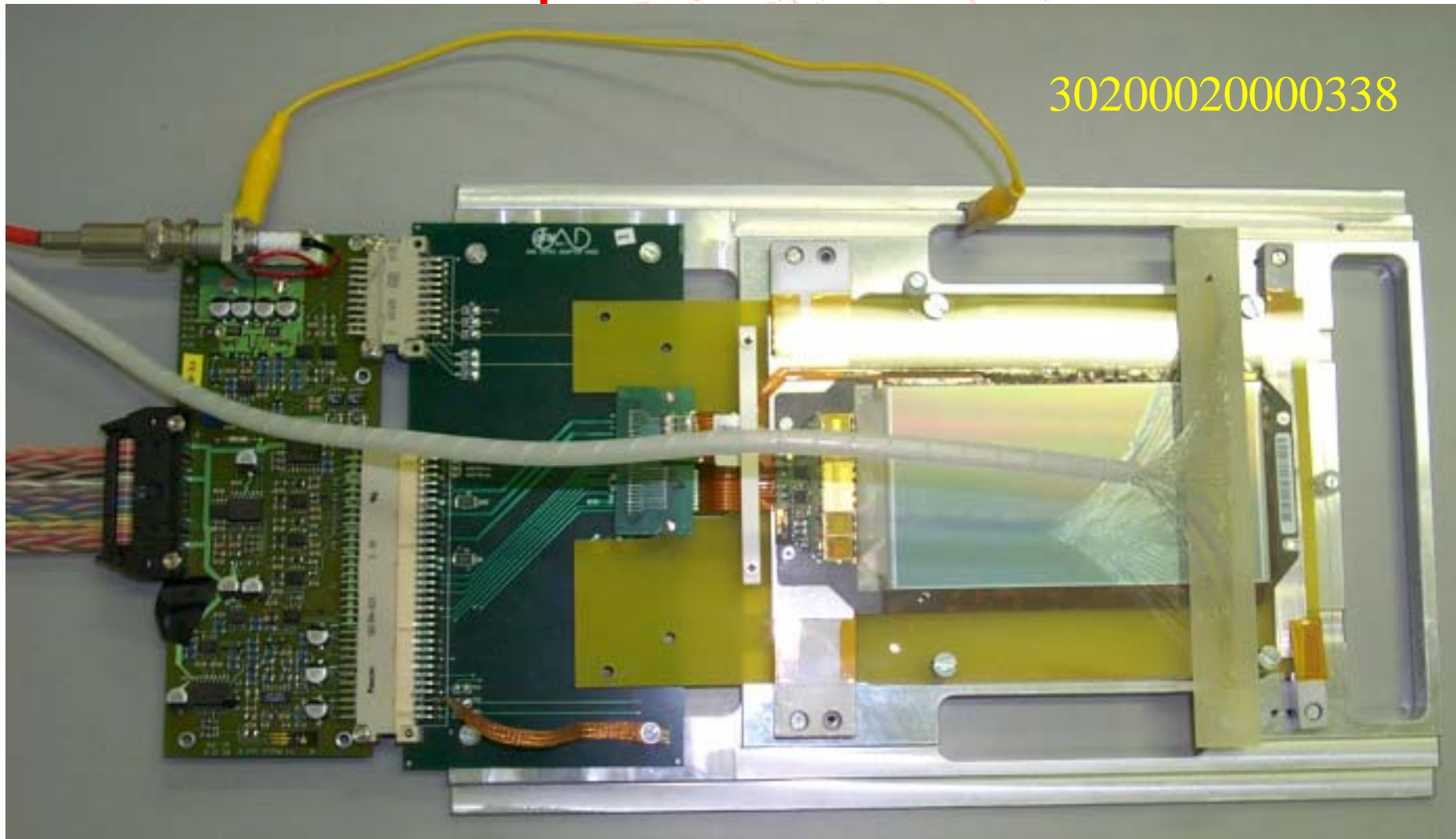


# Tests on TIB final version module in Firenze

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# TI B module of the final production



30200020000338



# TIB module of the final production



- Received two weeks ago from Perugia
- Bonded and tested in Florence
- Tests done:
  - Before bonding: ARC test, I V curve
  - After bonding: ARC test, I V curve
  - After cooling: ARC test, LT test, I V curve



# Tests setup

- ARCS:
  - Clamshell grounded
  - Support plate grounded
  - Cold ledge electrically insulated with kapton
  - Measurements done at 300 V and 500 V bias
  - Full tests with ARCS versions 6.0 and 6.1 (after cooling)
- LT (single module):
  - cold ledge electrically insulated
  - only the support plate grounded
  - Measurements done at 300 V bias
  - LT version 1.0



# Cuts used

- For these tests, we used the freshly defined cuts decided during the task force meeting of the last week in Torino
- Those cuts are implemented in Tony's macro
- The root output of the ARC is already compatible with these macros
- The root output of the LT should still be adapted. Now cuts are applied "by hand"

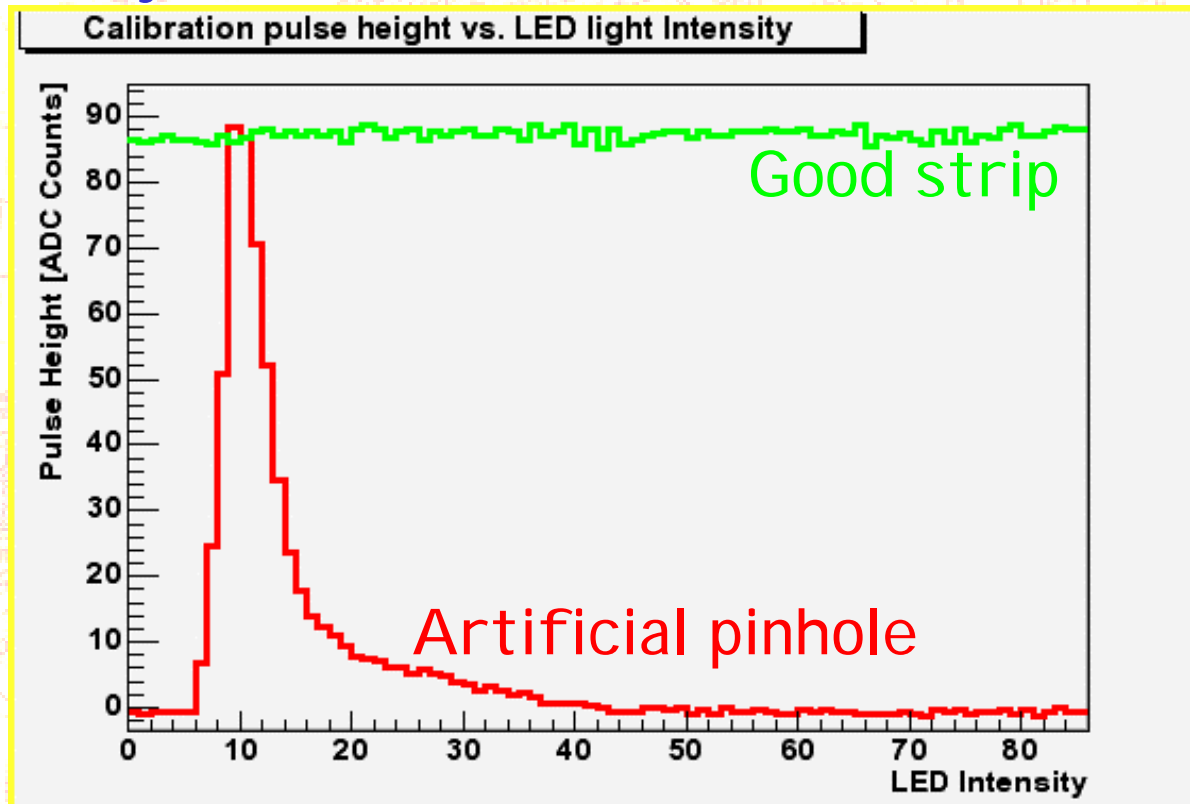


# TIB cuts

- The cuts decided for the TIB are:
- Noise (absolute cut in ADC channels):
  - Peak mode:  $0.95 < N < 1.45$
  - Dec mode:  $1.3 < N < 2.0$
- Peaking time (absolute cut wrt mean):
  - Peak mode:  $-5 \dots +5$
  - Dec mode:  $-3 \dots +5$
- Pulse height (percentage cut):
  - Peak mode:  $\pm 15\%$
  - Dec mode:  $\pm 20\%$
- $I @ 500V < 1.5 \times$  expected  $I$  on bare sensor

# TIB cuts

- Pinhole (absolute cut):
  - Peak and dec mode: difference between maximum and minimum calibration signal with varying light intensity  $< 40$  ADC channels





# Setup requirements for TIB

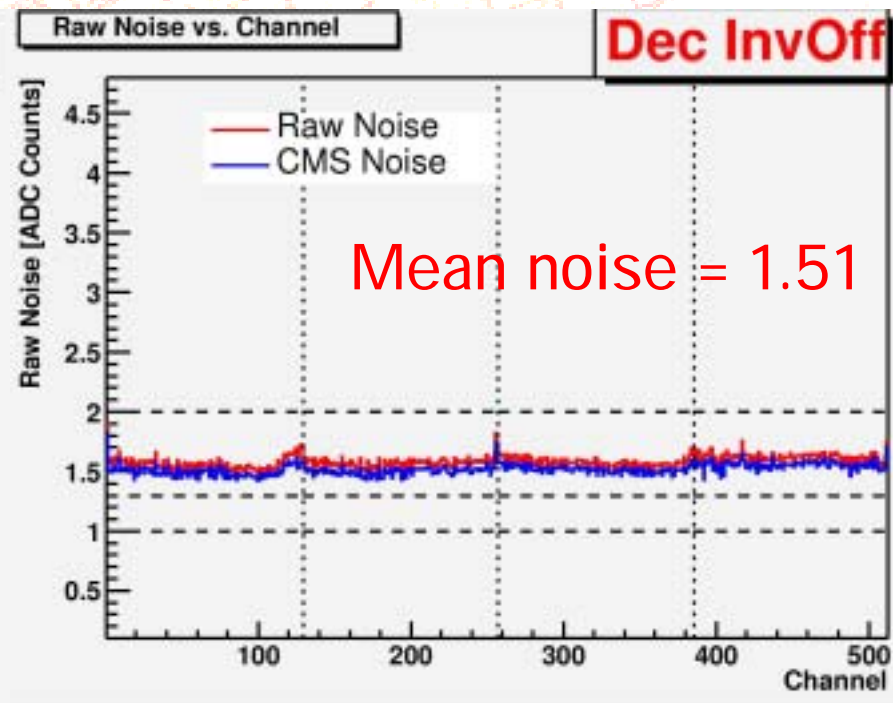
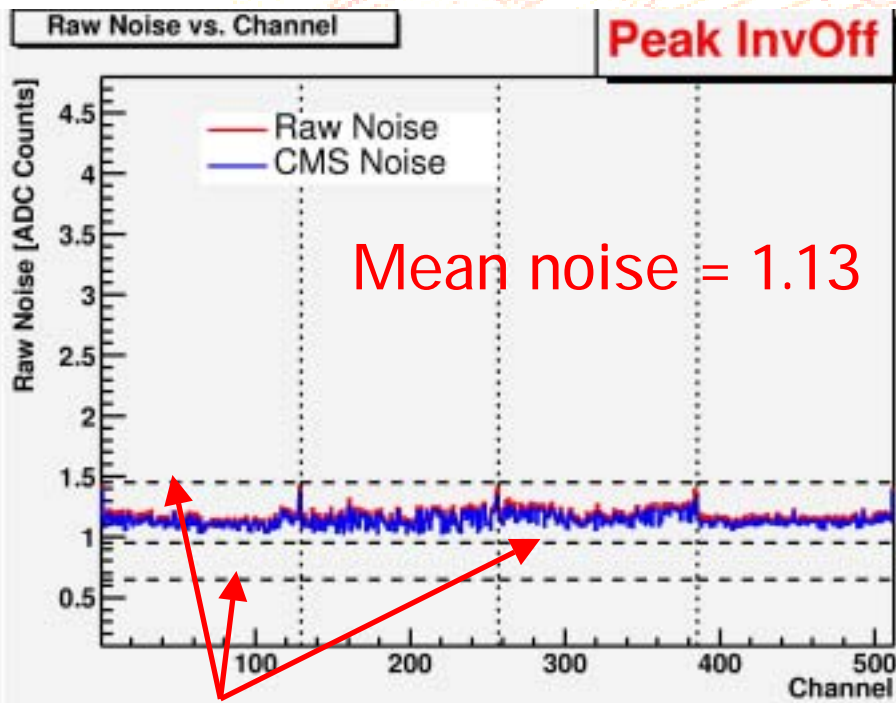


- CMN < 0.4 ADC channels in peak inv off
- All measurements should be done at 500 V
- Tests are taken in all four APV modes
- If a strip fails in **any** of these tests it's marked as **bad**



# ARC results (version 6.0)

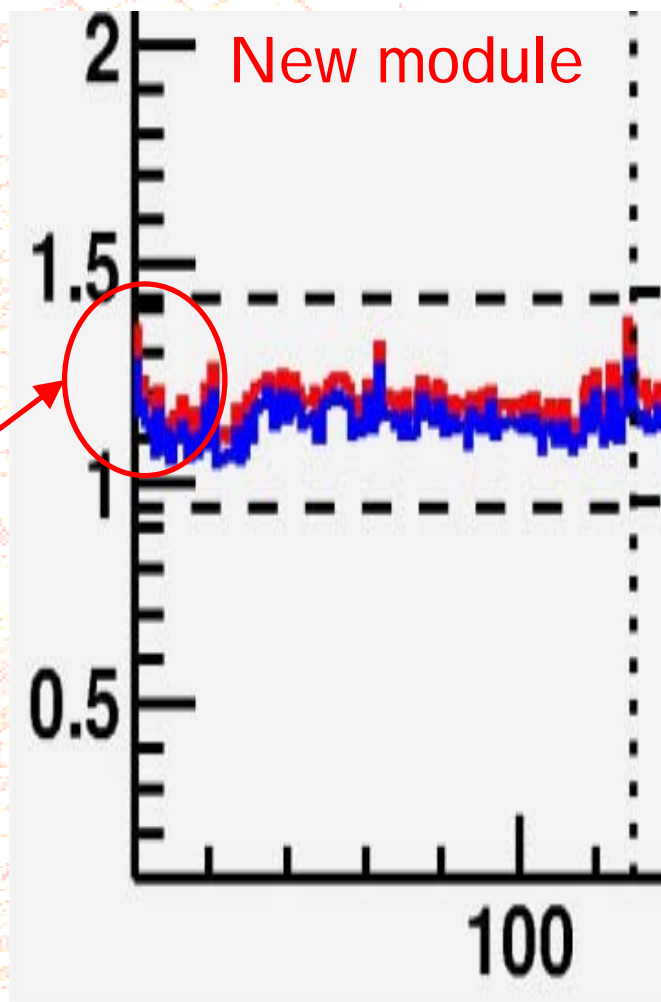
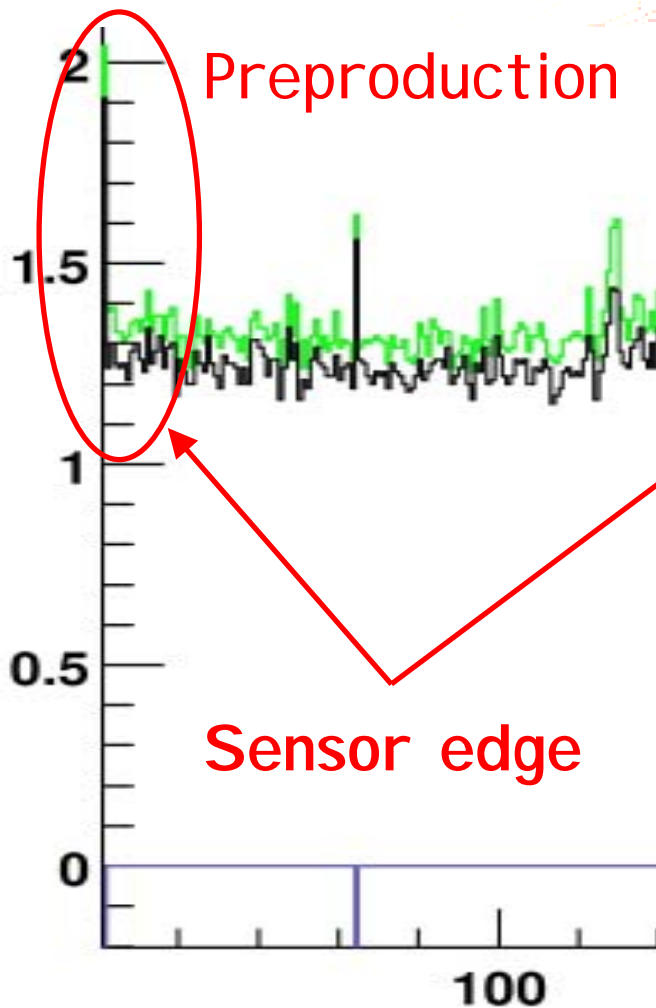
- Noise after bonding at 300 V
- No more high noise strips at the edges of the detector (filtering capacitor on hybrid)



Macro's cuts limits



# Comparison with preproduction

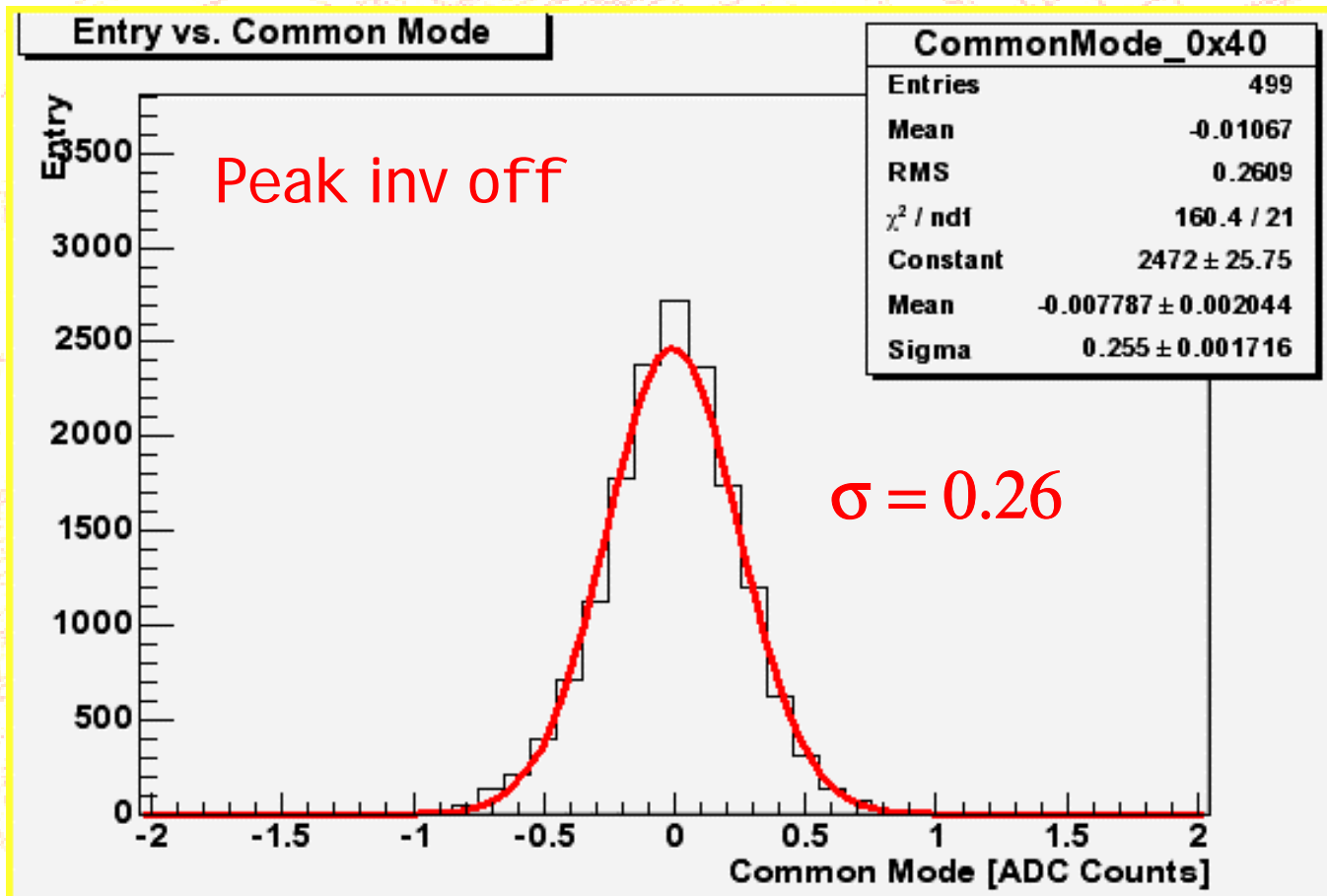


First chip - peak inv off



# Common Mode Noise

- The CMN meets the specifications
- Below 0.4 ADC channels in peak inv off



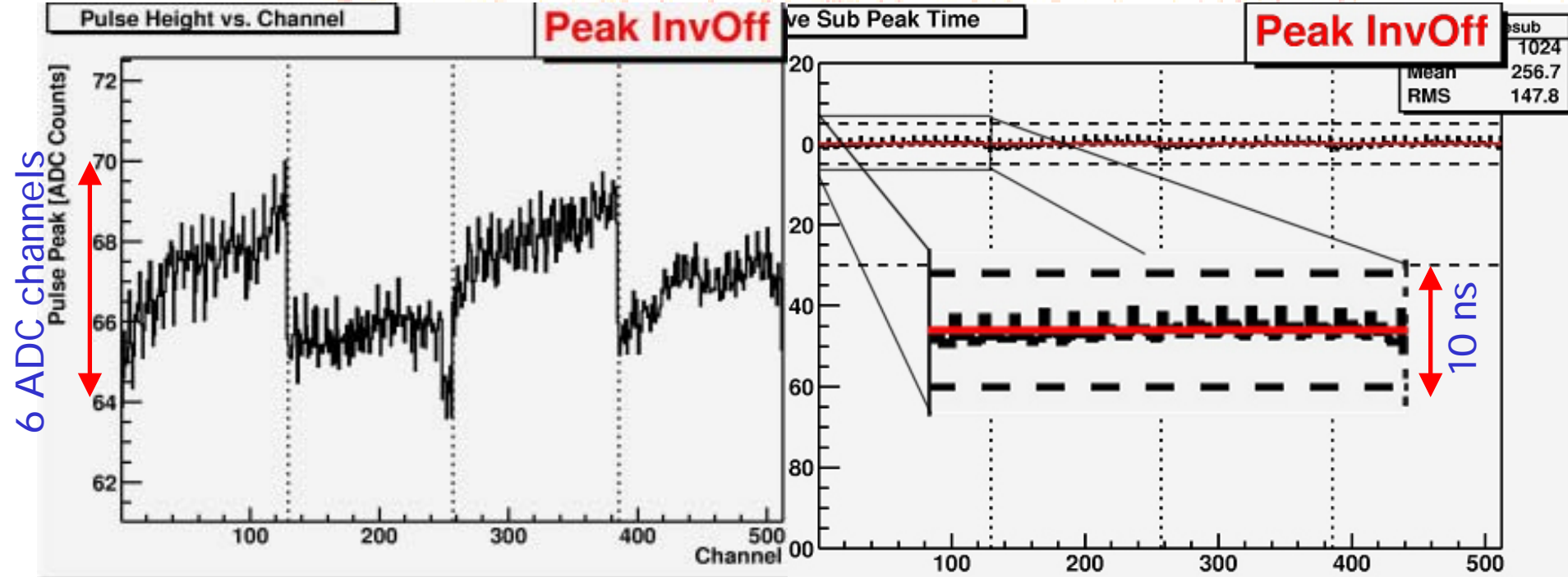


# Calibration tests

- We use 2 values from calibration tests:

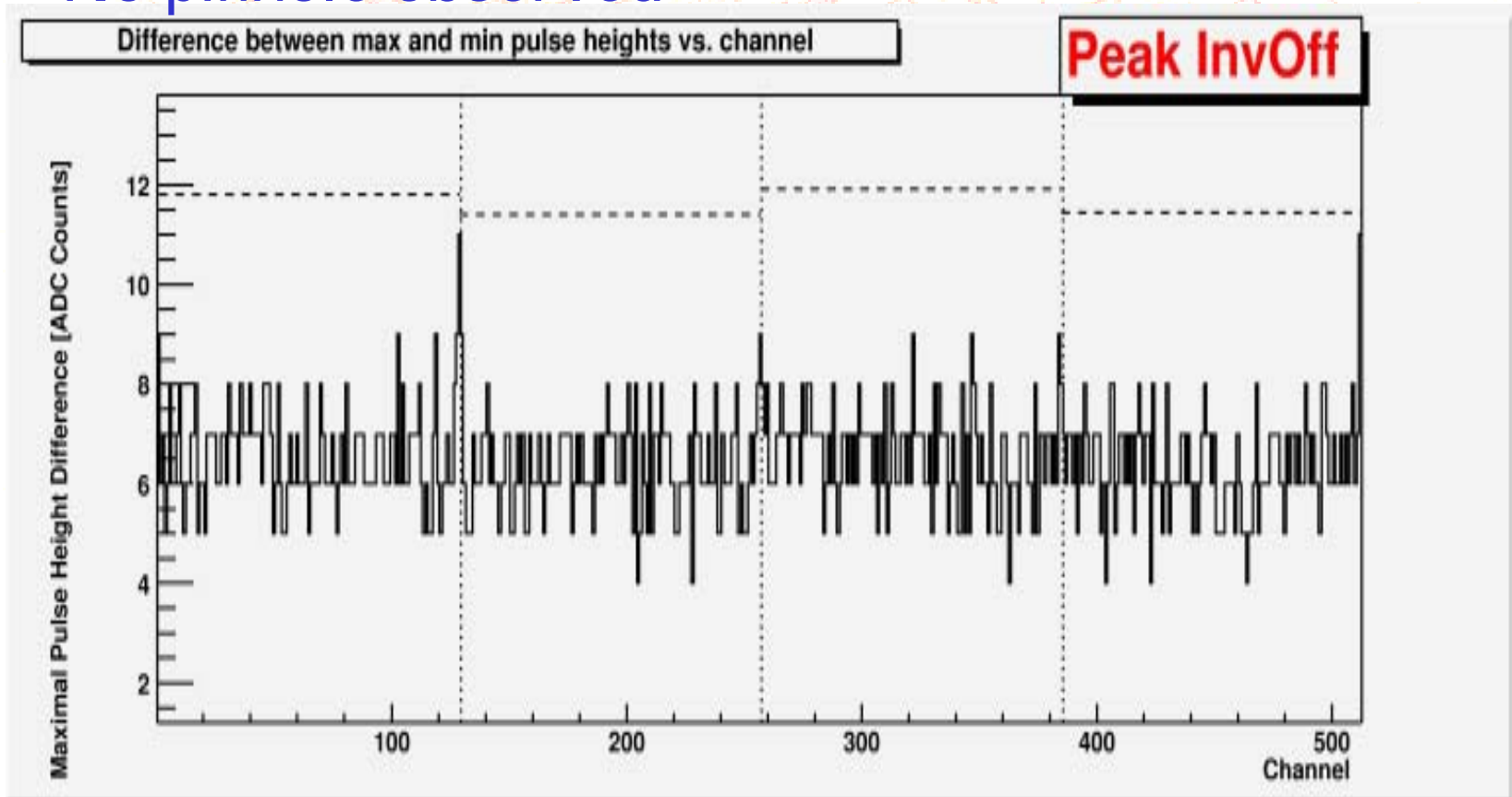
The maximum calibration value ( $\pm 15\%$ )

The normalized time needed to reach that maximum ( $\pm 5$ )



# Pinhole test

- Difference between maximum and minimum value
- Test done only in peak inv off
- No pinhole observed

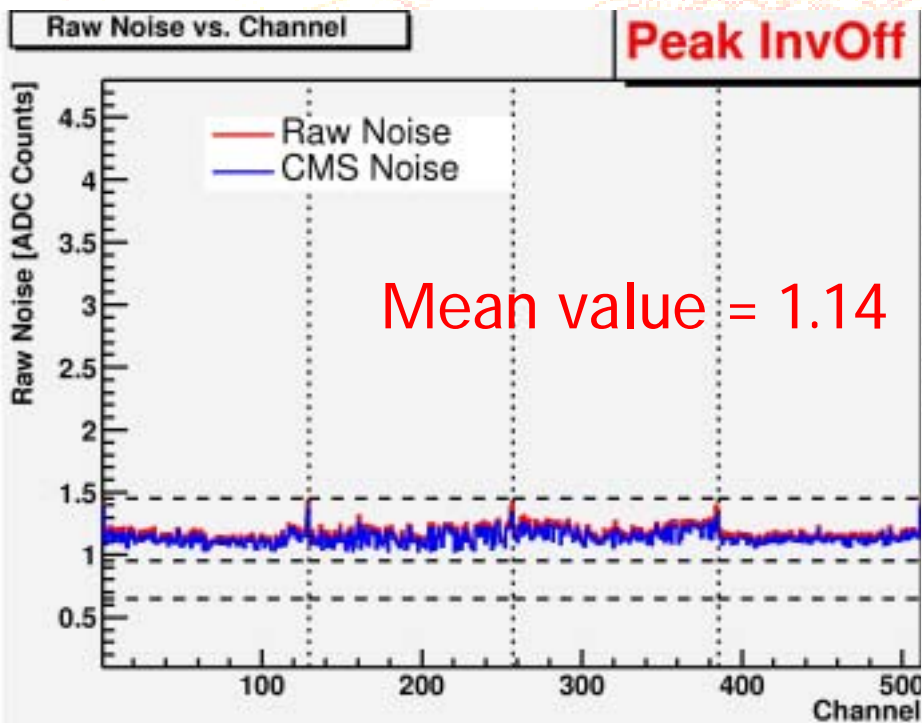




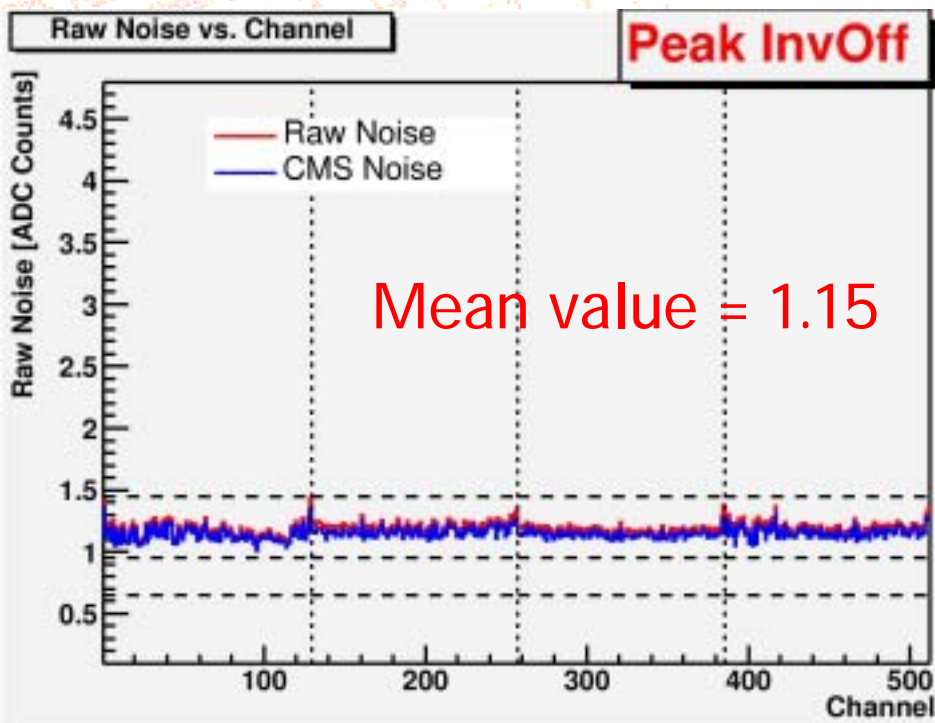
# Differences between 300 V and 500 V bias



- Measurements taken at different voltages don't show any significant difference in the strip behaviour



300 V bias



500 V bias



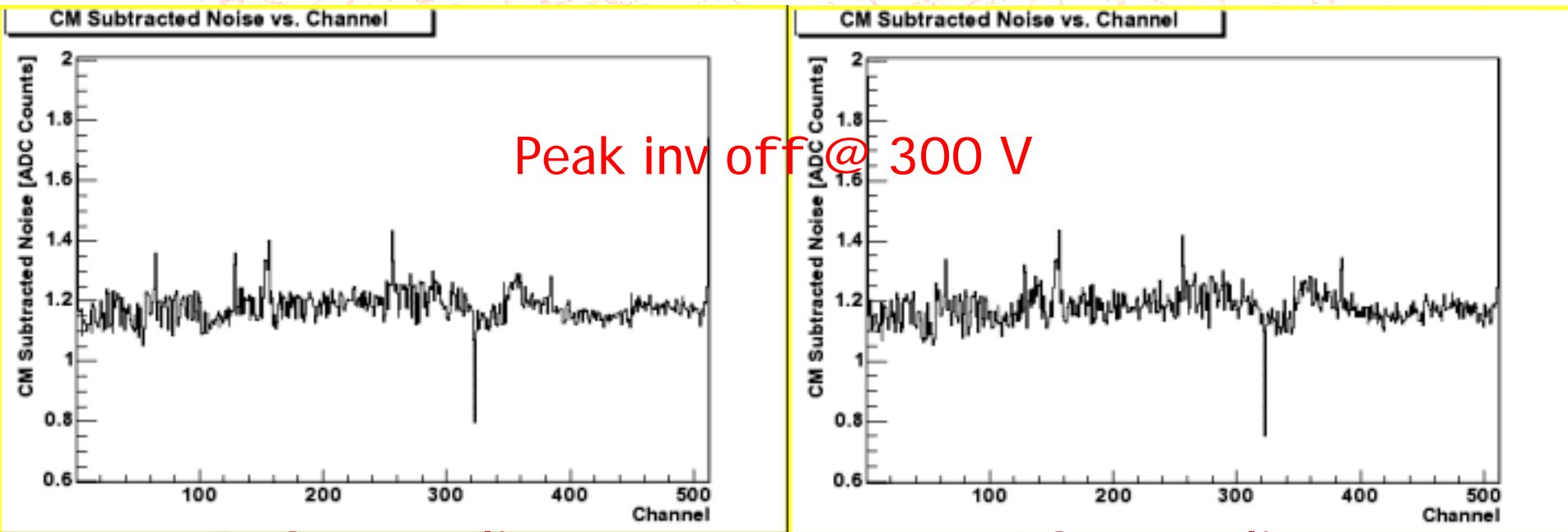
# Cooling cycle

- The module was cooled down to  $-15\text{ }^{\circ}\text{C}$ 
  - dry nitrogen atmosphere ( $\text{RH} < 2\%$ )
  - Catania single module passive box
  - climatic chamber
- Kept at that temperature for about half an hour
- Then brought back to room temperature
- A new full test was done with
  - ARCS version 6.1
  - Long Term software version 1.0



# Cooling cycle

- This “cooling system” was tested using a preproduction module: 30200020000005 as guinea pig
- No difference observed



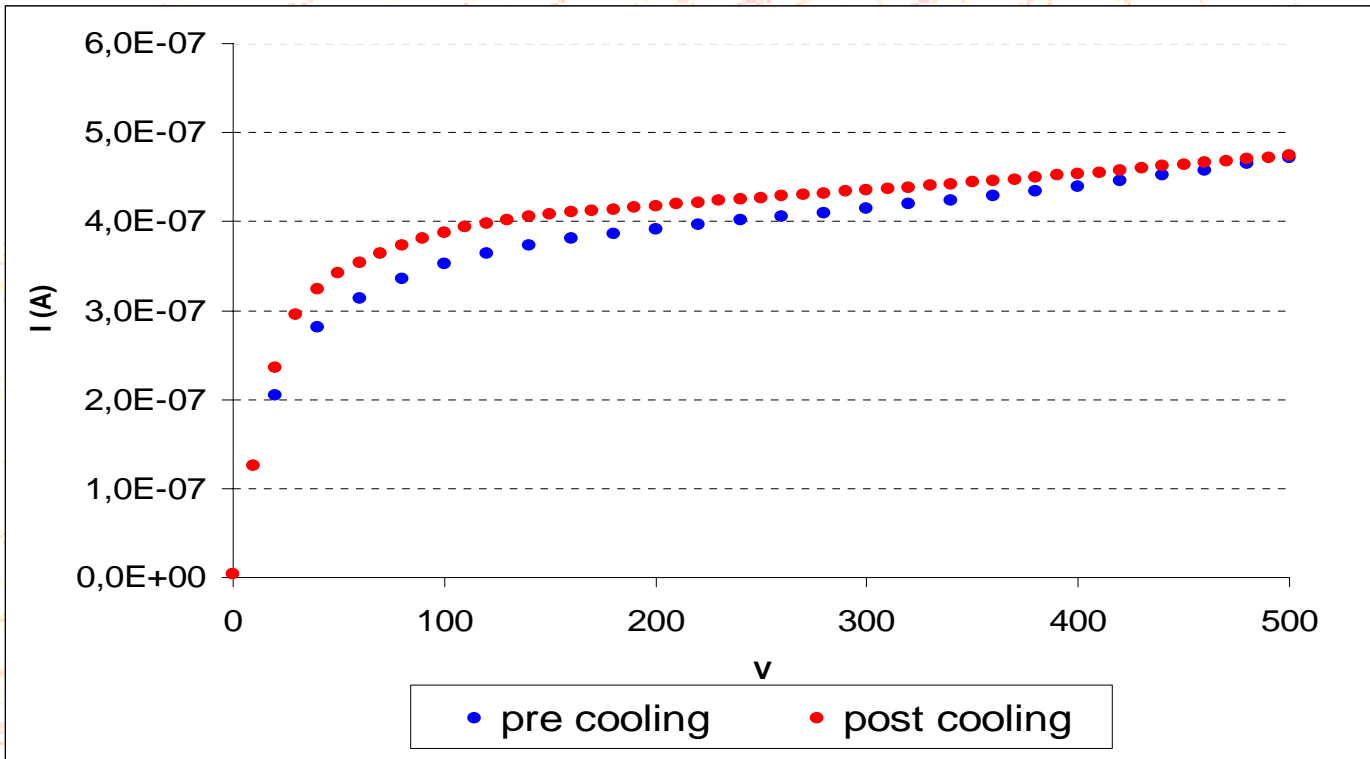
Before cooling

After cooling



# Cooling cycle

- There is no variation in the I V curves before and after the cooling cycle

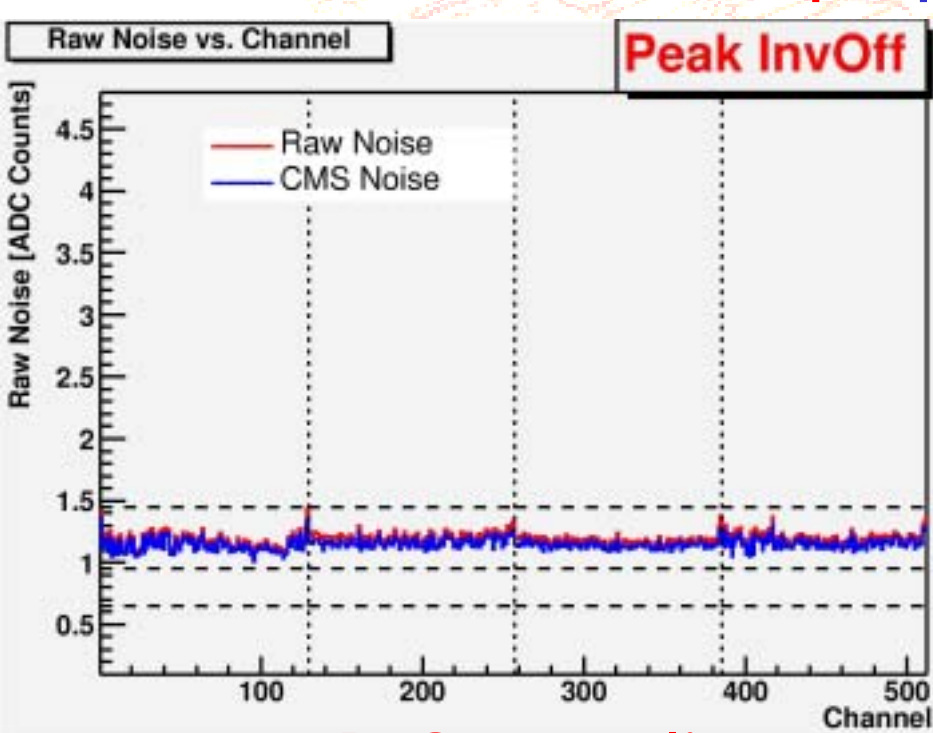


- So we passed to test the new module...

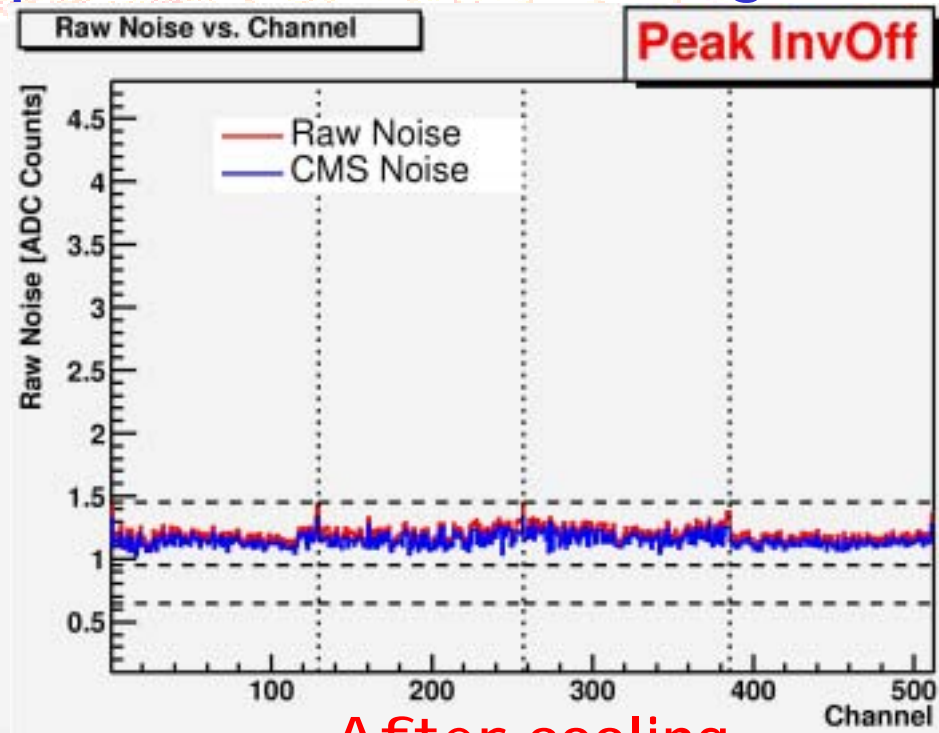


# ARCS test results

- Data taken at 500V bias
- Peak mode inv off
- **No new bad strip** appeared after cooling



Before cooling

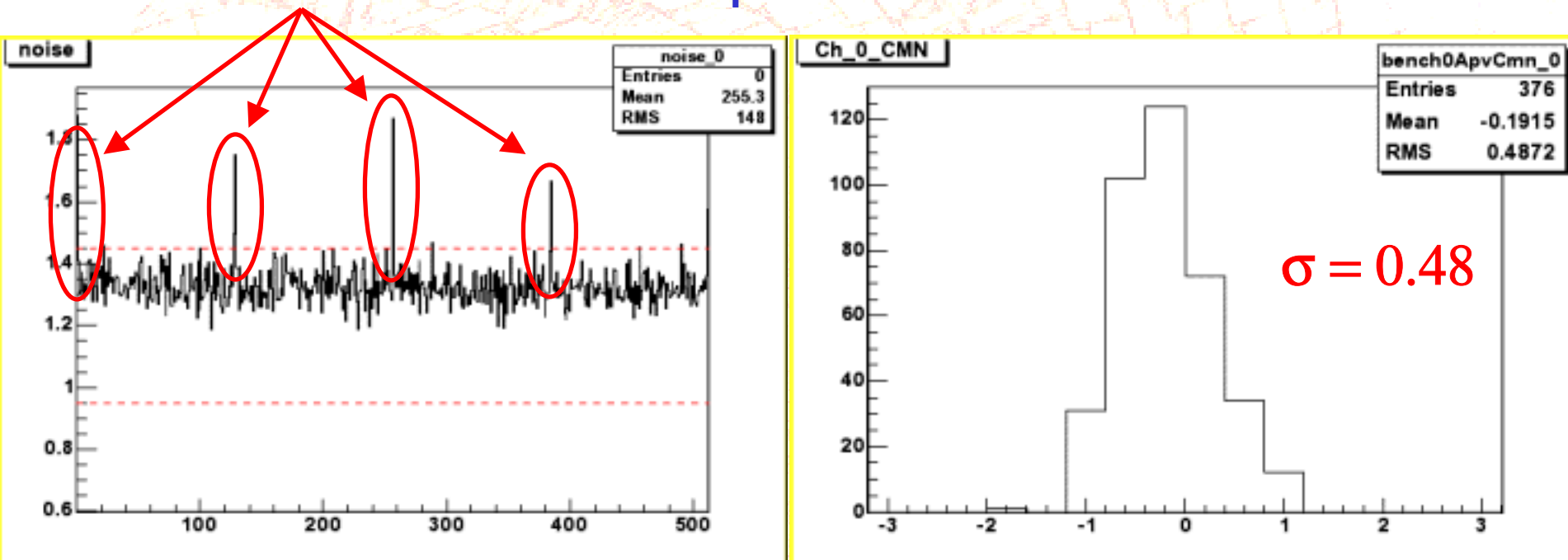


After cooling



# Long Term test results

- Noise and CMN in peak inv off after cooling
- 300 V bias
- There are a few problems on the first channel of each chip



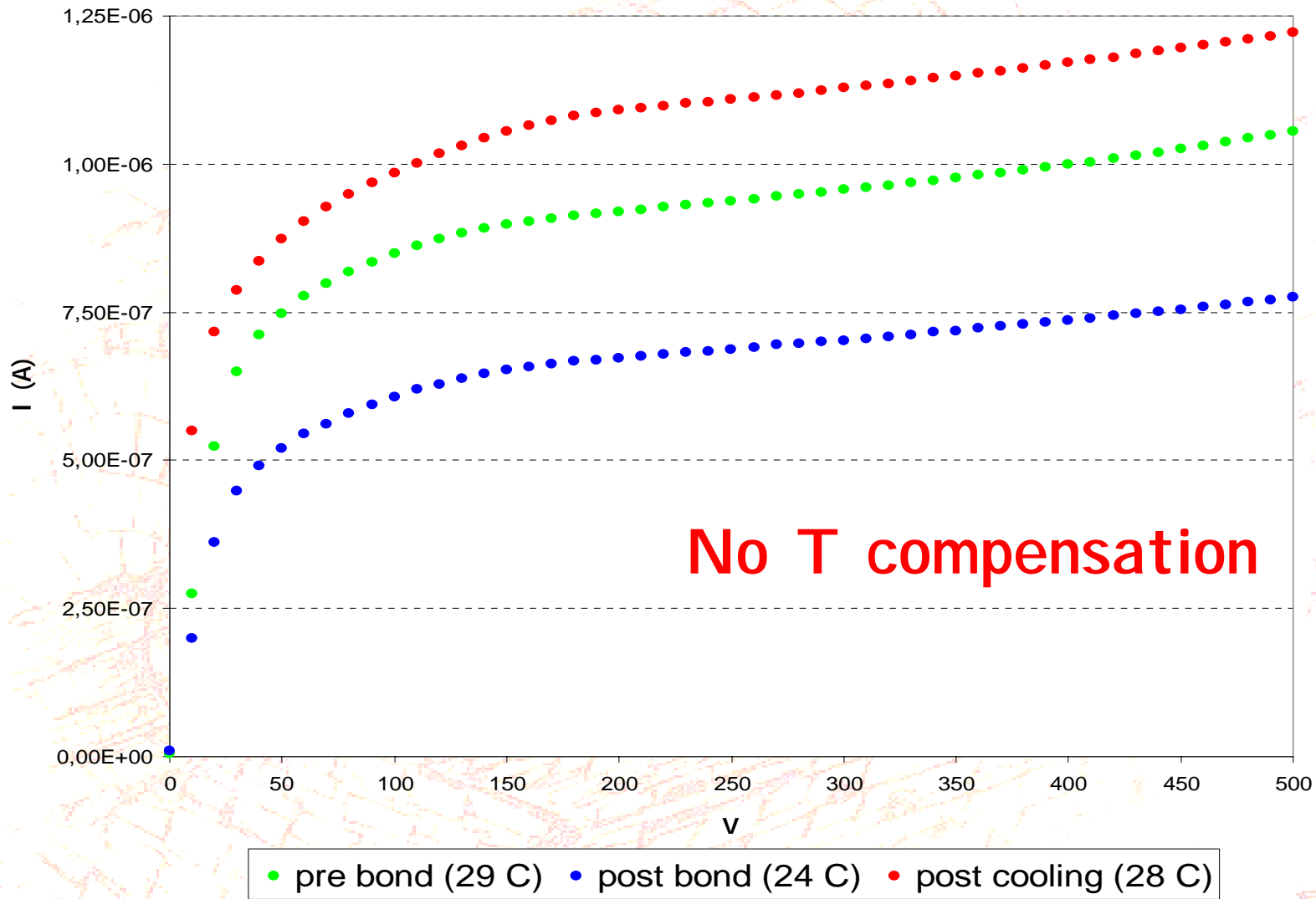


# ARC - LT scaling

- There is a different scale factor in our LT and ARCS setups
- The calibration height is
  - 73 ADC channels with LT
  - 66 ADC channels with ARCSin peak inv off, with ICAL 58 (thought to be 2 MIPS in thin detectors, but see R. Ranieri's talk in TB meeting)
- Also taking this scaling into account and modifying the cuts accordingly, the chips' edges are marked bad. **This should be studied**

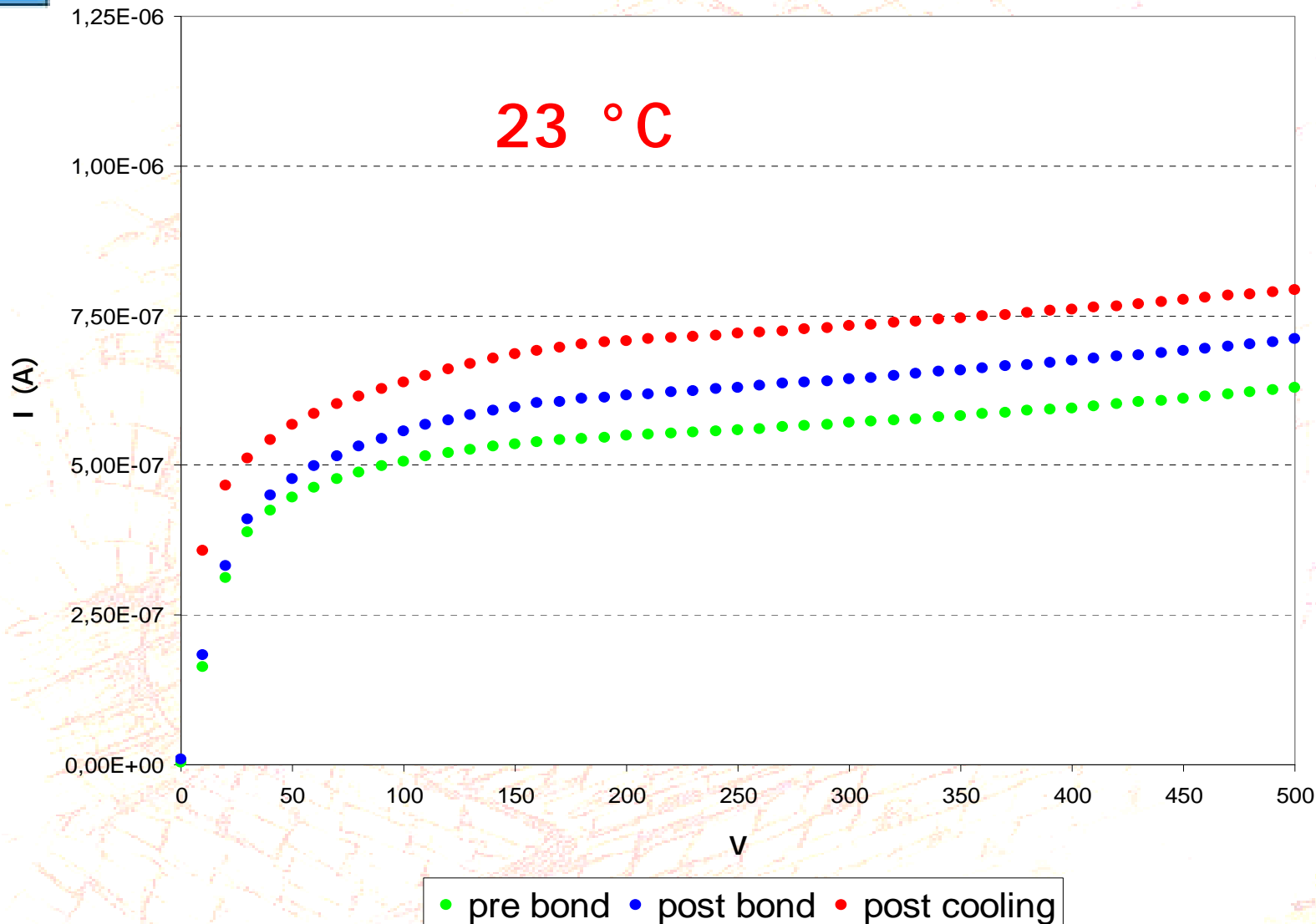


# I V plots





# I V plots with T compensation





# I V results

- If we consider the variation of the temperature, there is no significant difference in the 3 measurements
- Referring to 23 °C, at 500 V we have:
  - Pre bond: 630 nA
  - Post bond: 711 nA
  - After cooling: 793 nA
- The variation is below 15%
- The humidity was roughly controlled (RH ~ 40%) during the different tests



# Conclusions

- We tested a “real” module with the sw presently available.
- We used the cuts procedures defined in last week meeting in Torino
- The tests were successful and showed **no defects** in the module
- The ARCS is working well and our setup is compliant with the CMN requirements for the TIB ( $< 0.4$  ADC channels)