Installation progress

Antonino Sergi

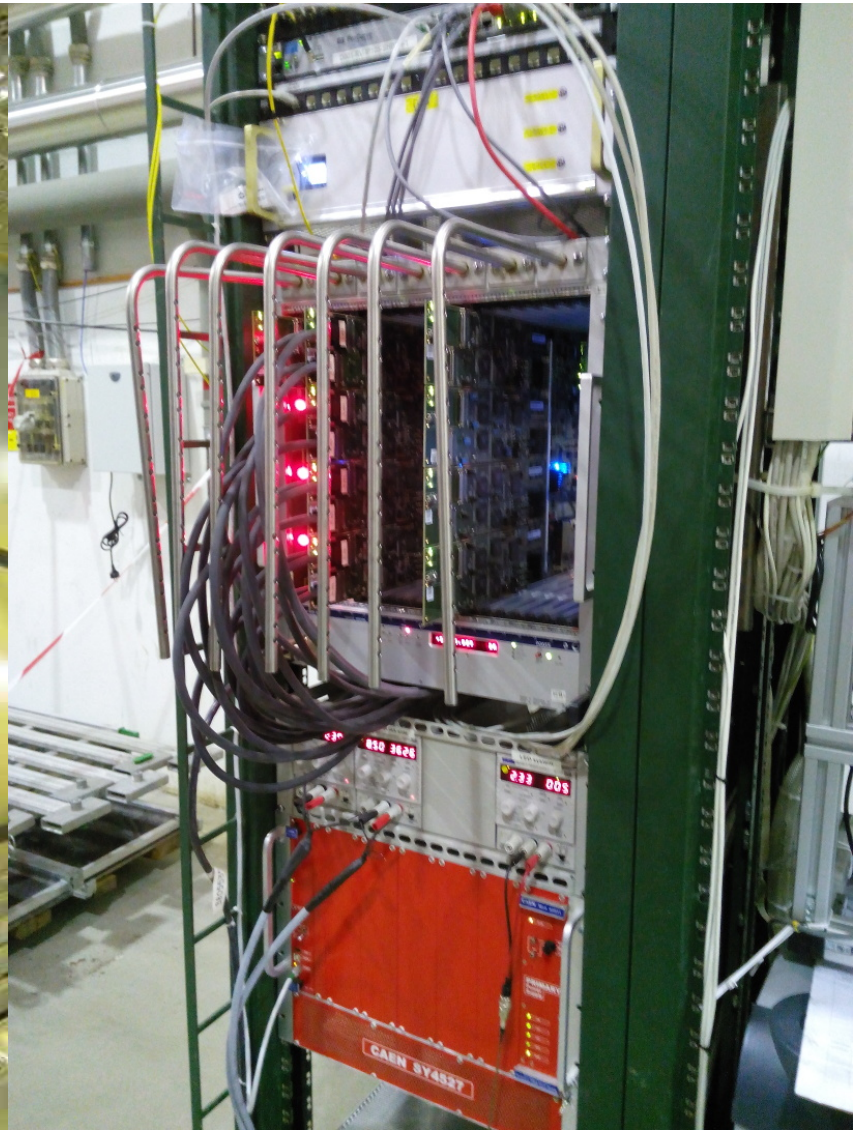
University of Birmingham

September 2014

Installation: 3.5 days

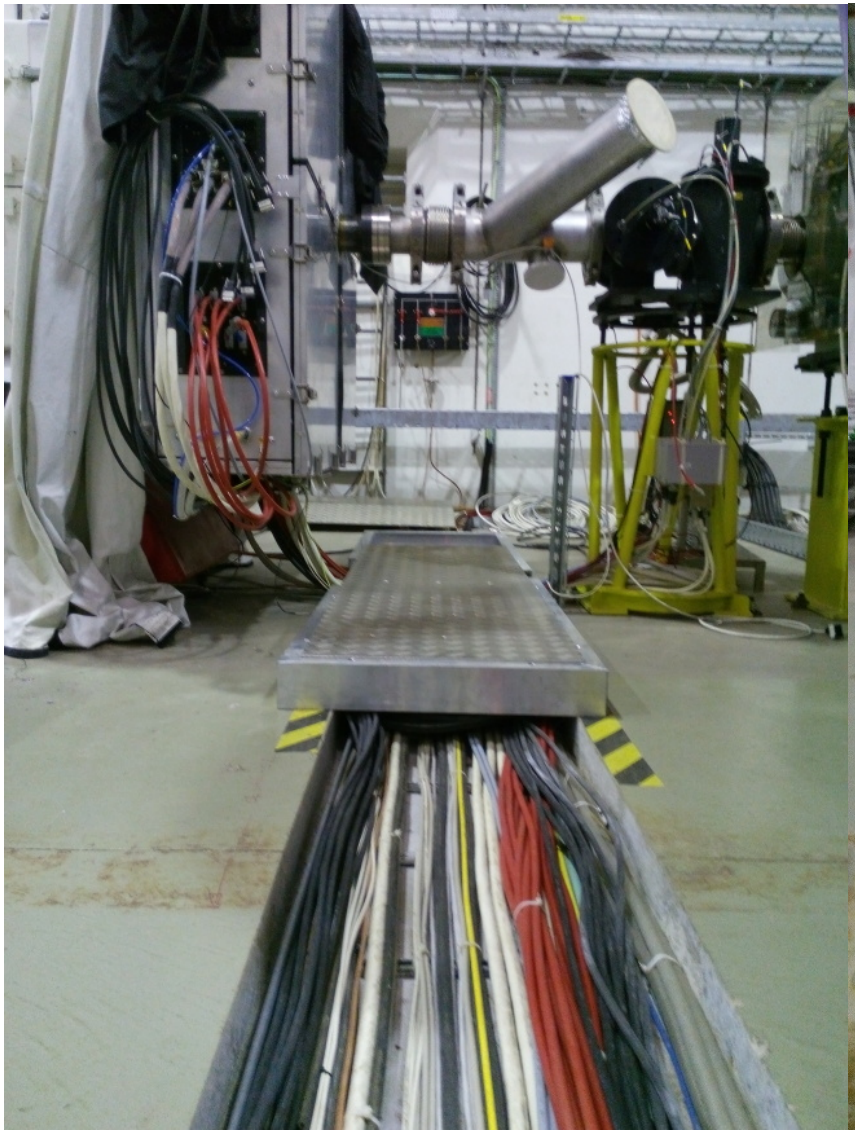
- All HV cables: 1 damaged on 4 channels $\rightarrow$ replaced
- All LV cables: significant drop between PS and KTAG; sense wires?
- All DCS cables: improved robustness (2 full sets)
- DCS software: operational
- New signal PP: repaired and tested to be 100% fine
- All TDC cables: mostly tested
- HV boards: replaced those with broken channels
- Channel mapping: indubitably correct!
- Splitter boards: all tested (1 noisy channel)
- Heat sink: tested external NINO plate
- False floor: finished
- Noise: foreseen instability due to cables and connectors

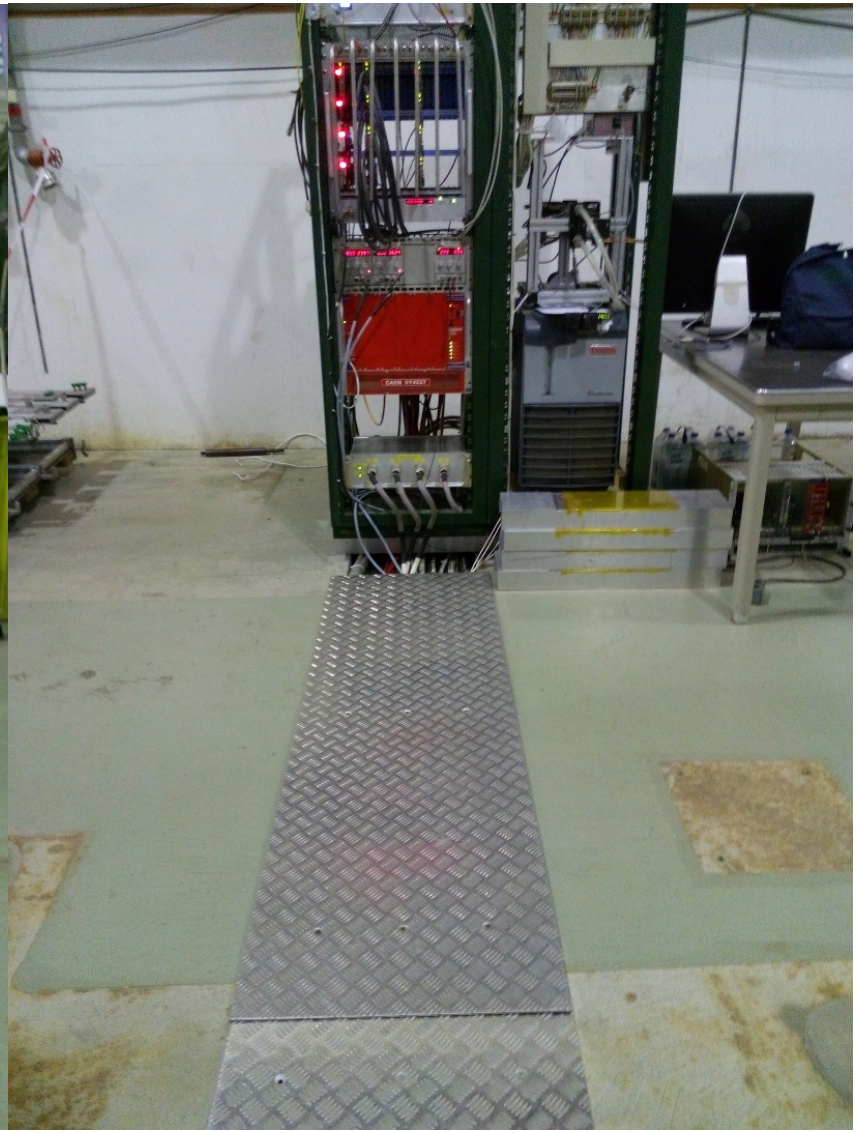
Splitter board



Just a bit flexible: we gave up for the stiffener

False floor





HV accident

Prologue (June):

- LightBox 4 was tested and installed in June
- On the last day few HV boards were replaced for broken channels
- They were supposed to be tested at 100V to check for further broken channels

Event (August):

- Installed boxes 7 and 8
- After solving DAQ issues we started looking for bad readout channels:
  - No noisy (digital) channels
  - Moved to DCS and switched on HV for box 6 $\rightarrow$ all ok
  - Switched on HV for boxes 1, 3, 4, 7, 8 $\rightarrow$ box 4 ramped up to 2500V
  - It took about 1 minute to realize it and switch it off

HV accident: forensics

Causal sequence:

- On the last day few HV boards were replaced for broken channels
- They were supposed to be tested at 100V to check for further broken channels
- One was somehow missed
- DCS doesn't show the actual setting from HV hardware, but the last setting transmitted
- DCS doesn't transmit settings for switch on command
- The last setting is actually stored on the HV board, rather than on the crate
- The HV board came back from the pool with a random setting
- This random setting (including all limits) was used when switched on

HV accident: remarks

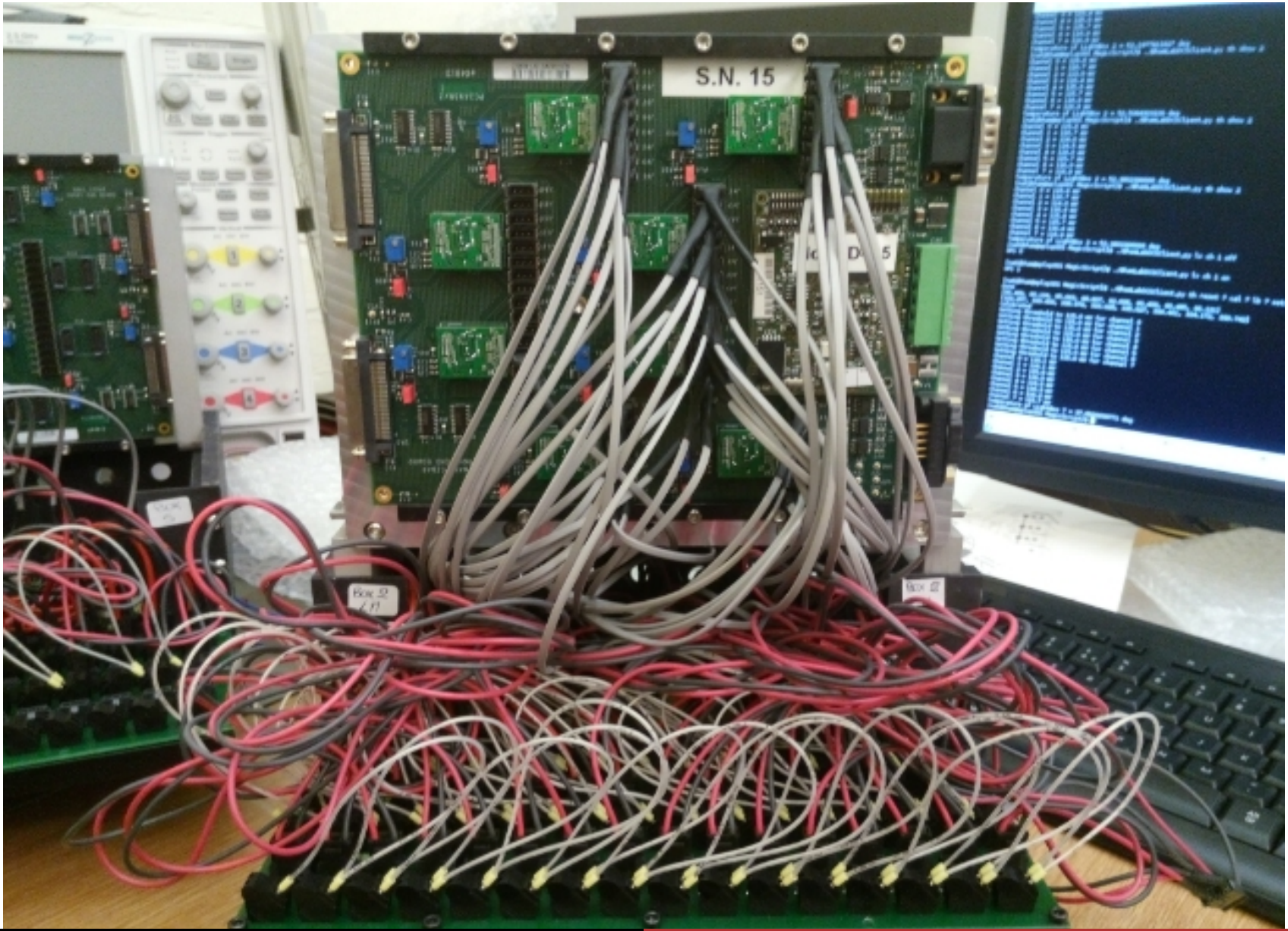
Prevention:

- DCS should provide a "reset button" to set all parameters to reasonable values
- Every time a board is replaced it should be reset by pressing this button

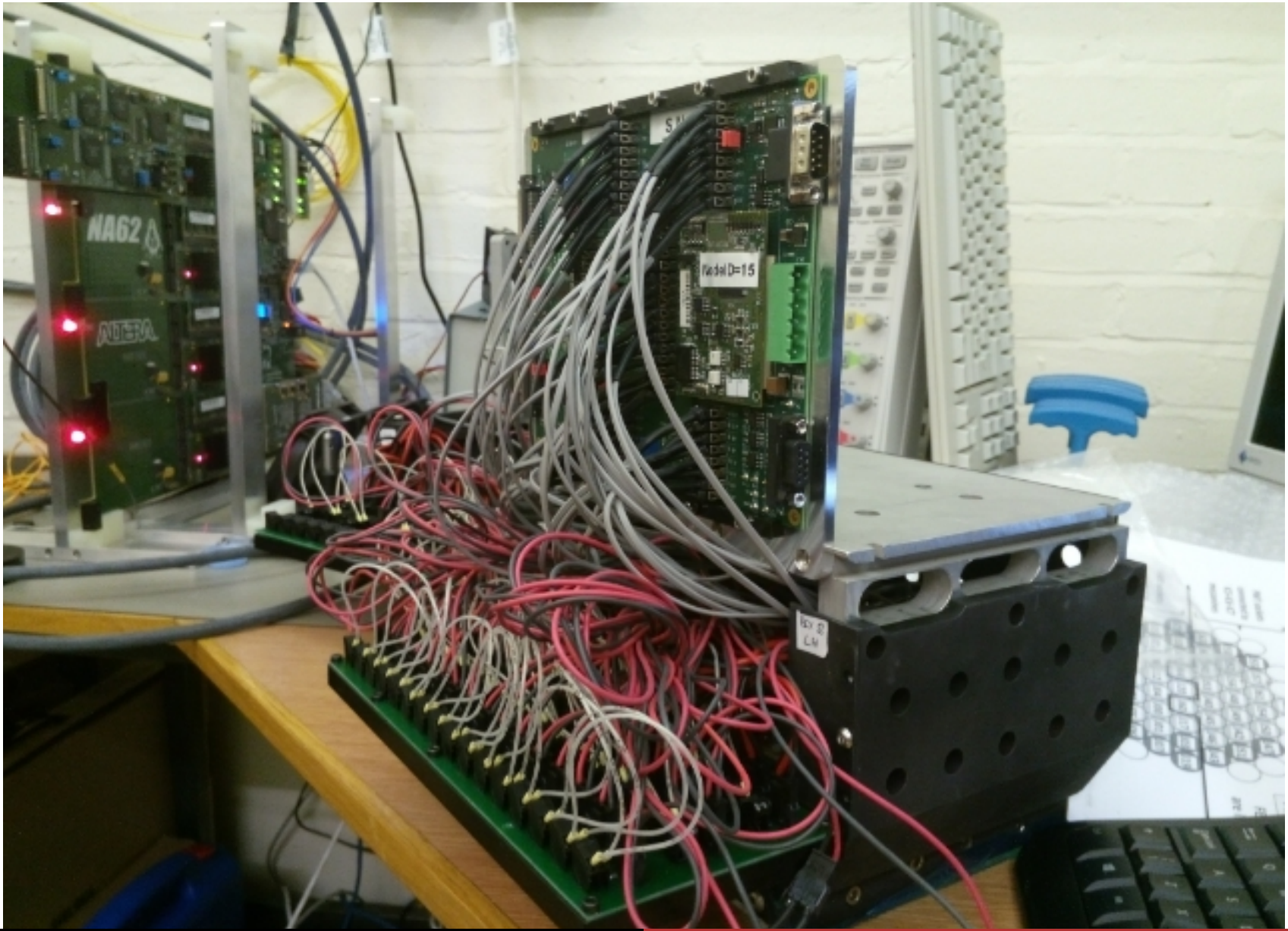
General:

- This DCS "feature" is common to all NA62 HV systems
- If any board is moved from a large HV detector to a small HV detector this kind of accident can happen again

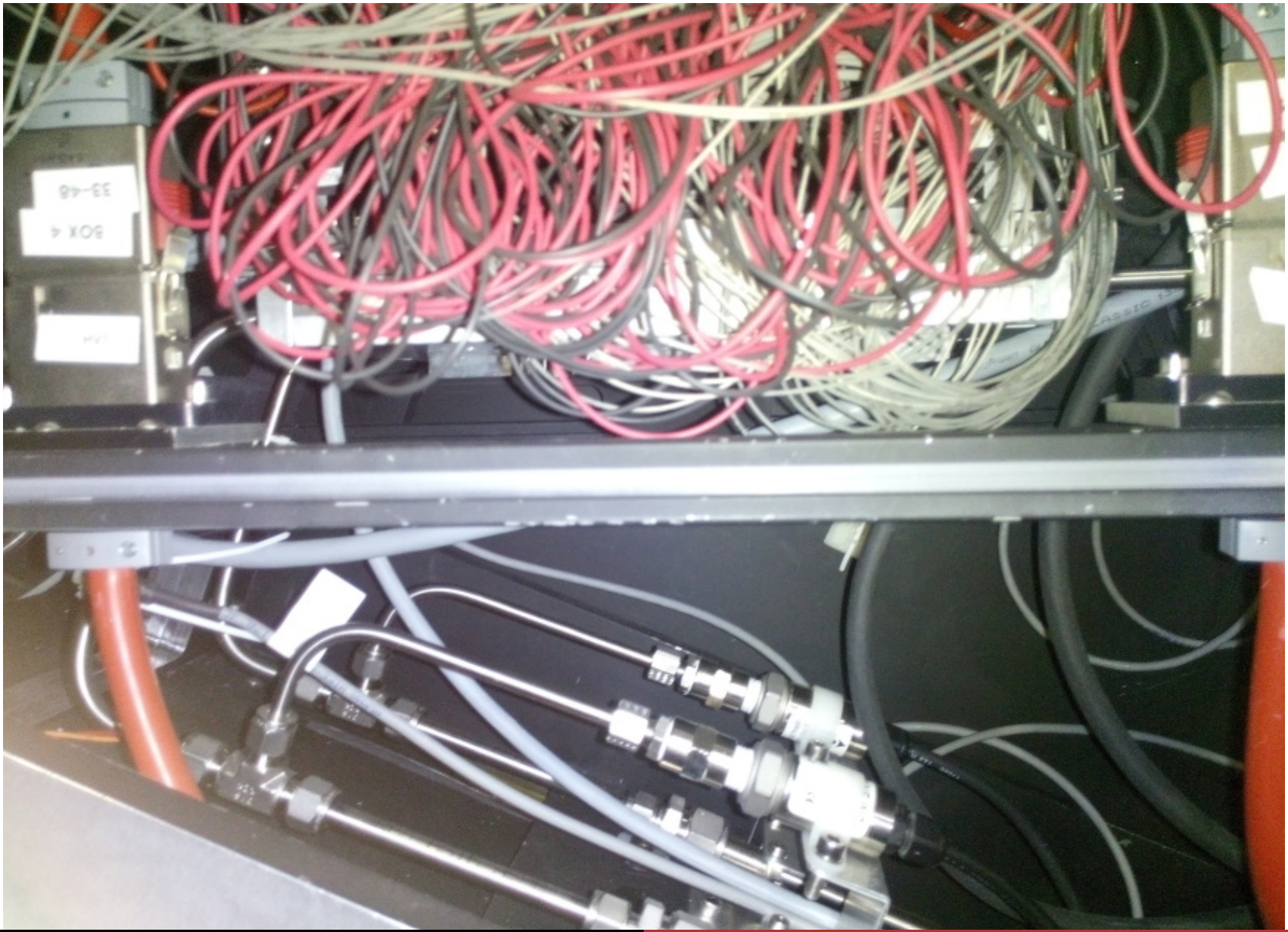
NINO plate



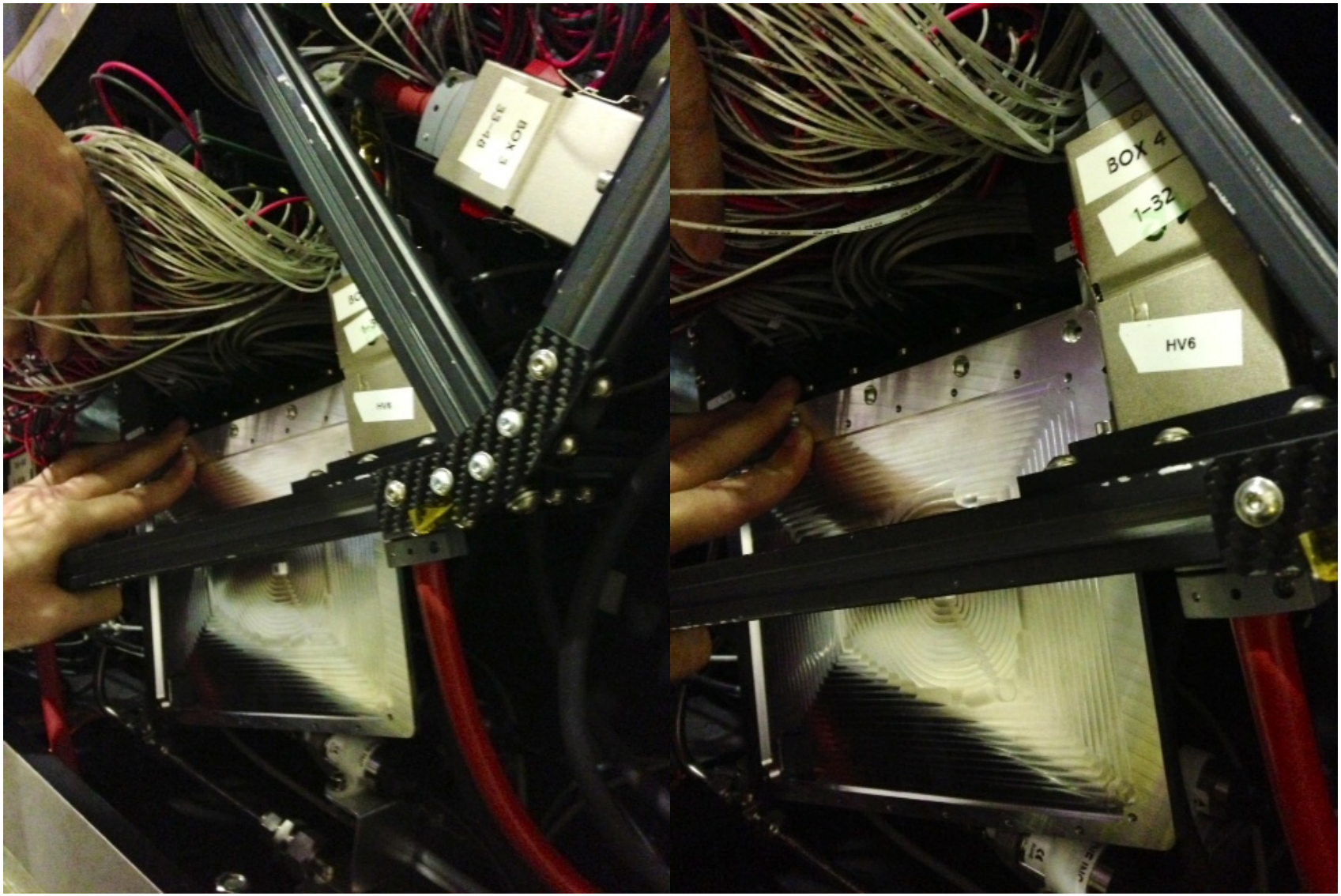
NINO plate



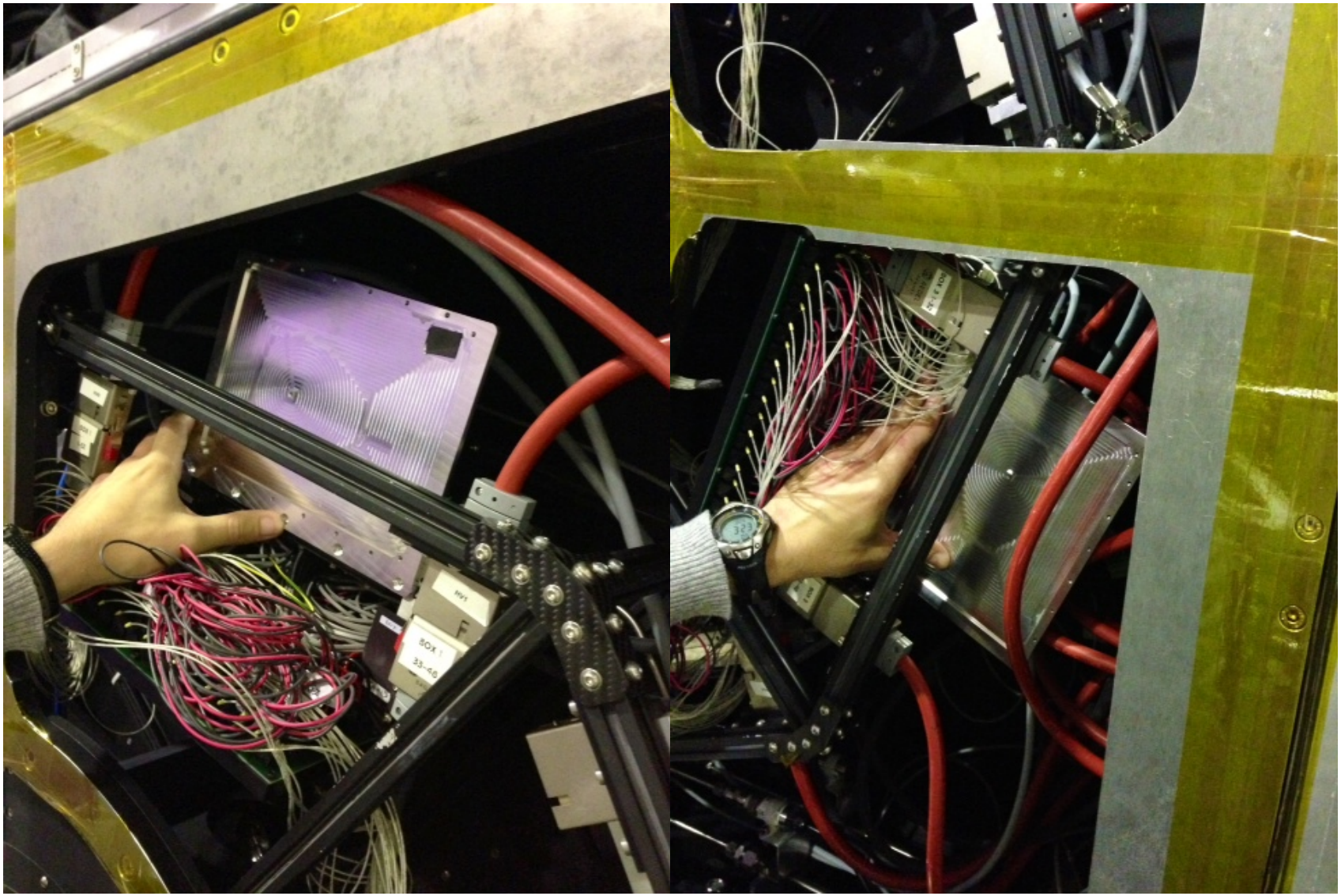
NINO plate



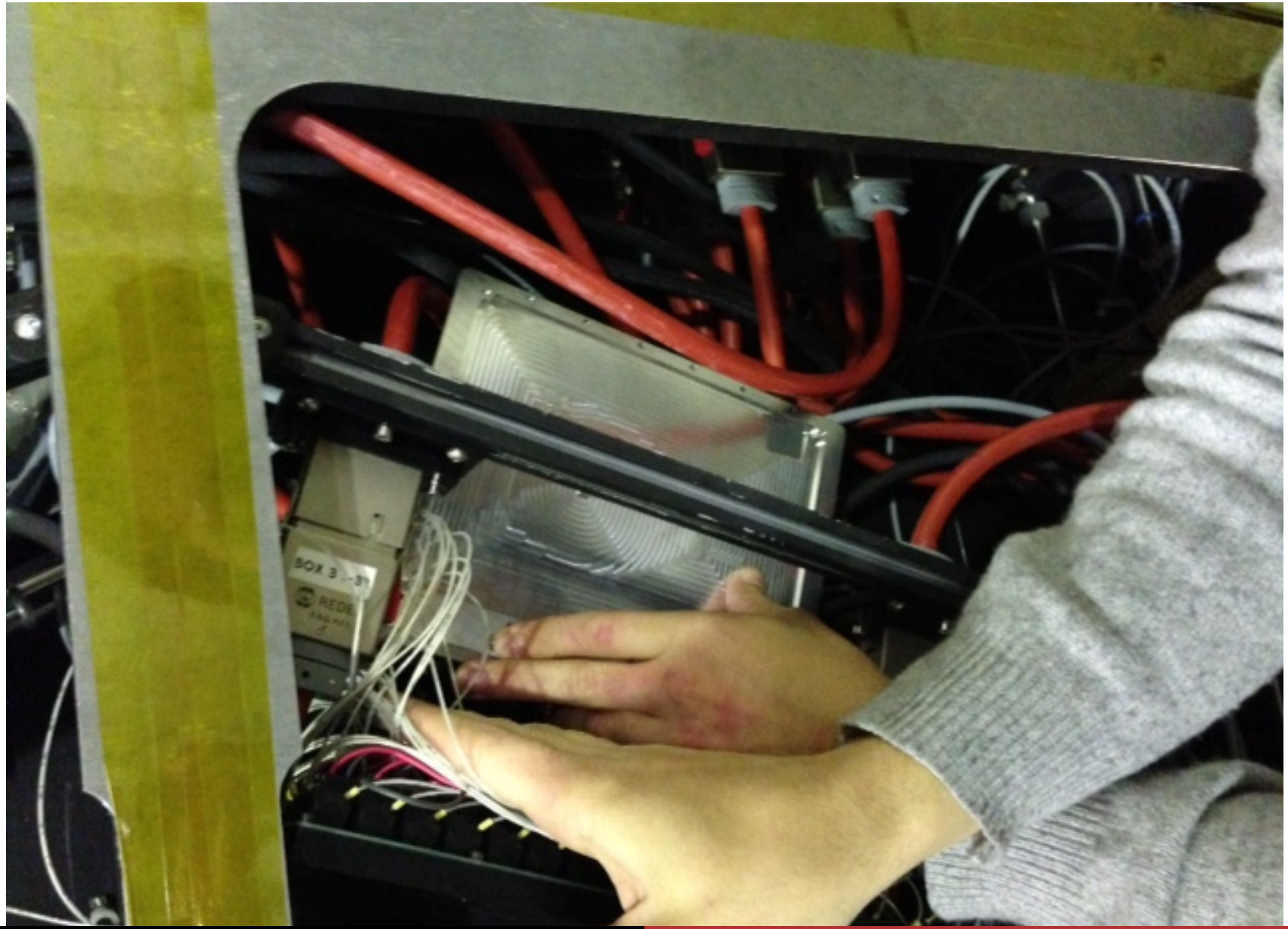
NINO plate



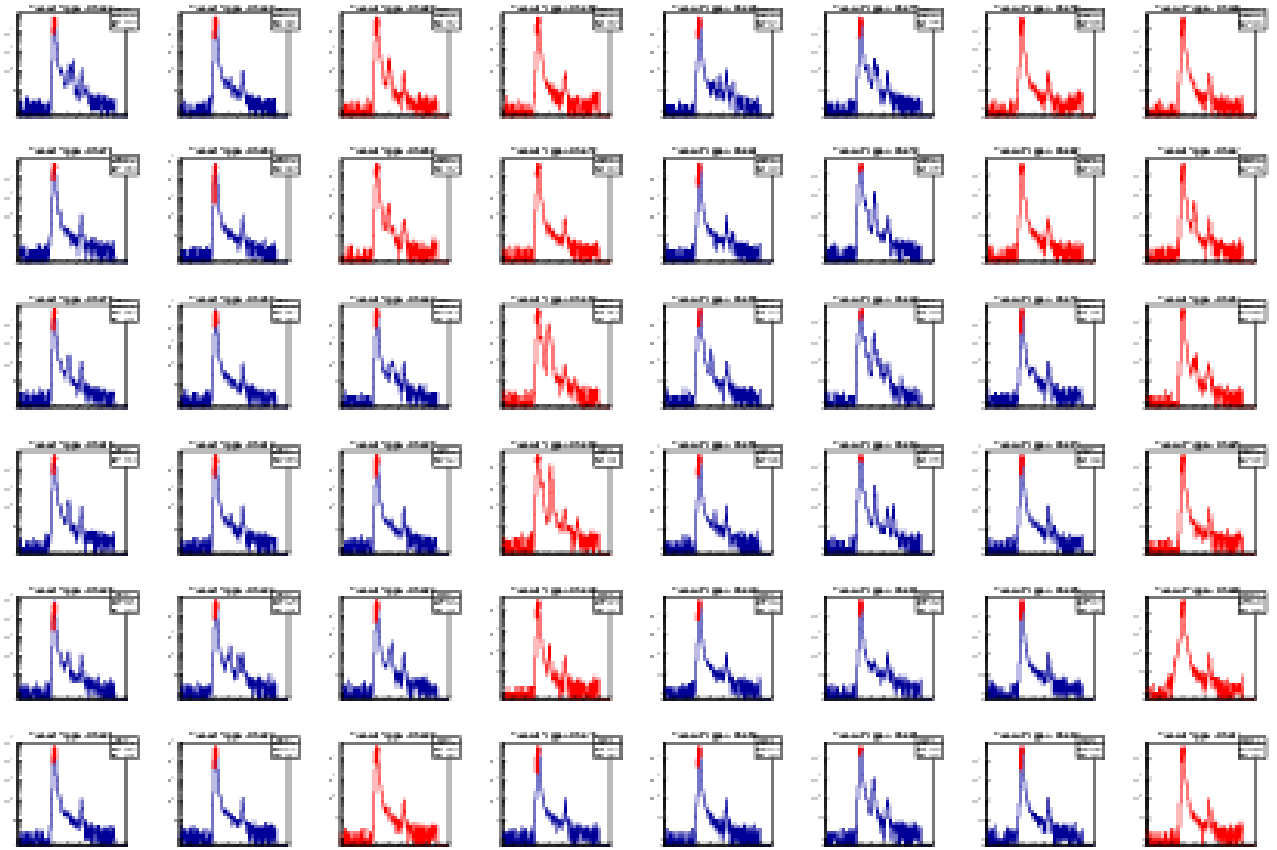
NINO plate



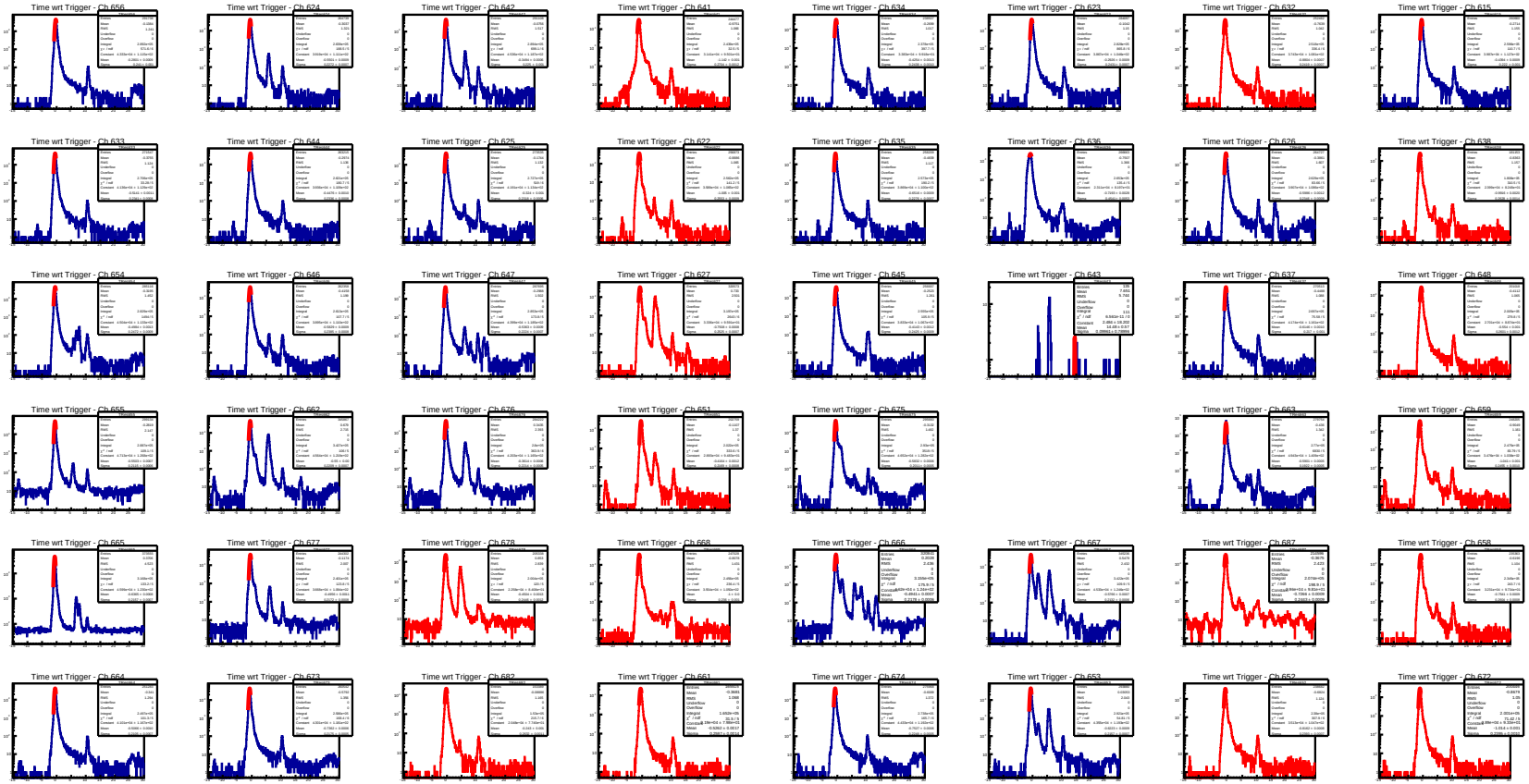
NINO plate



From The Book

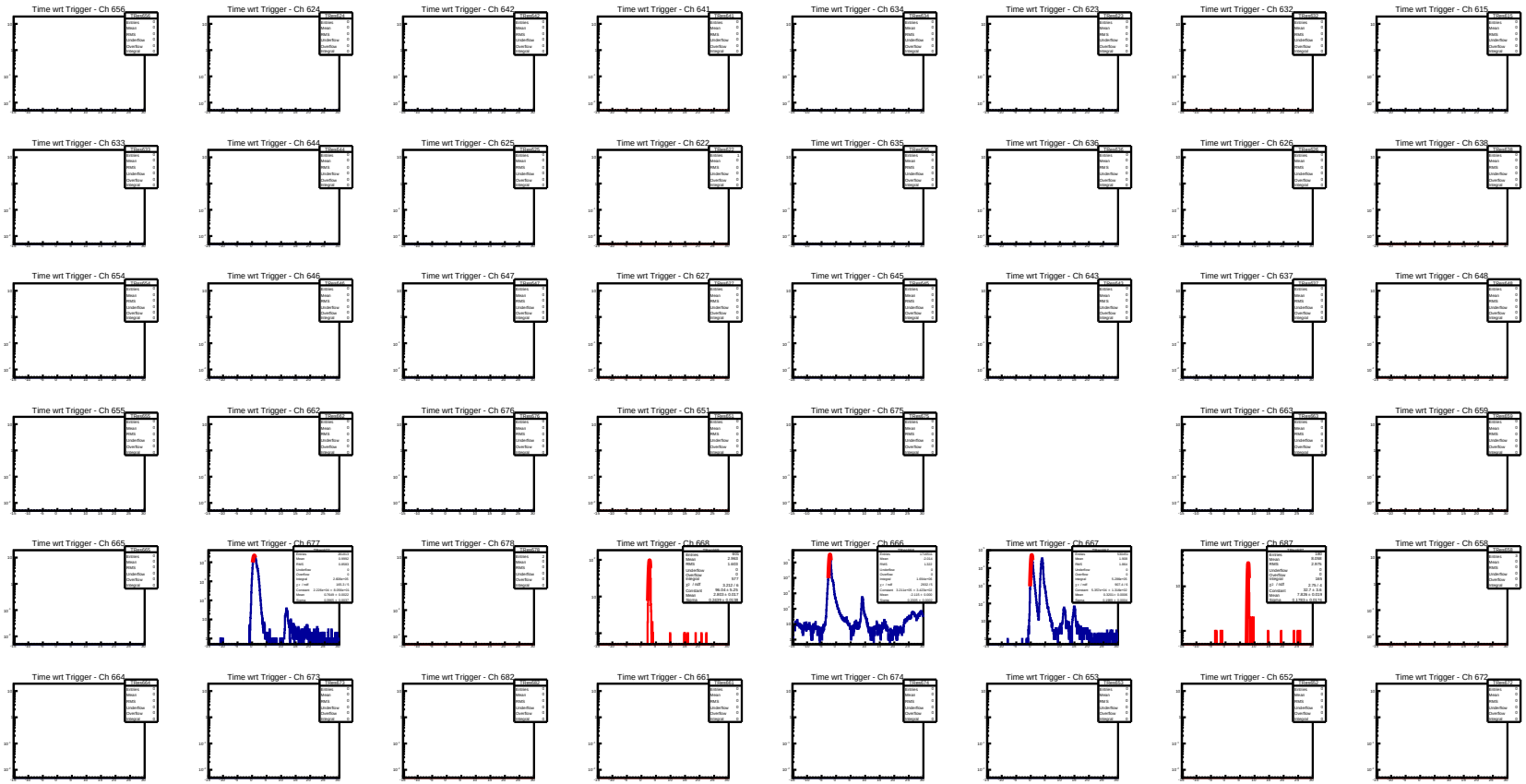


New lightboxes and secondary peaks



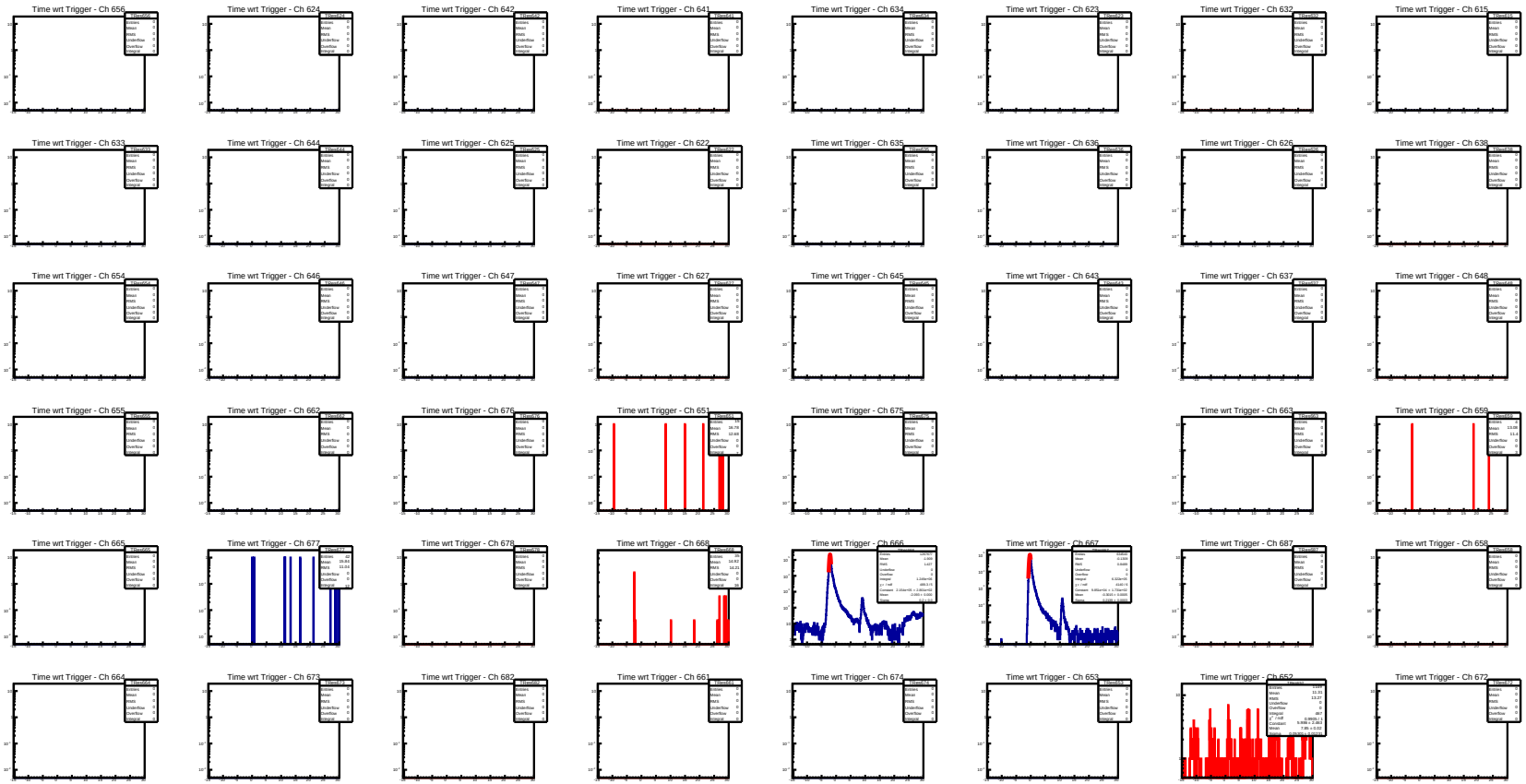
Lightbox 2 with NINO board 10

New lightboxes and secondary peaks



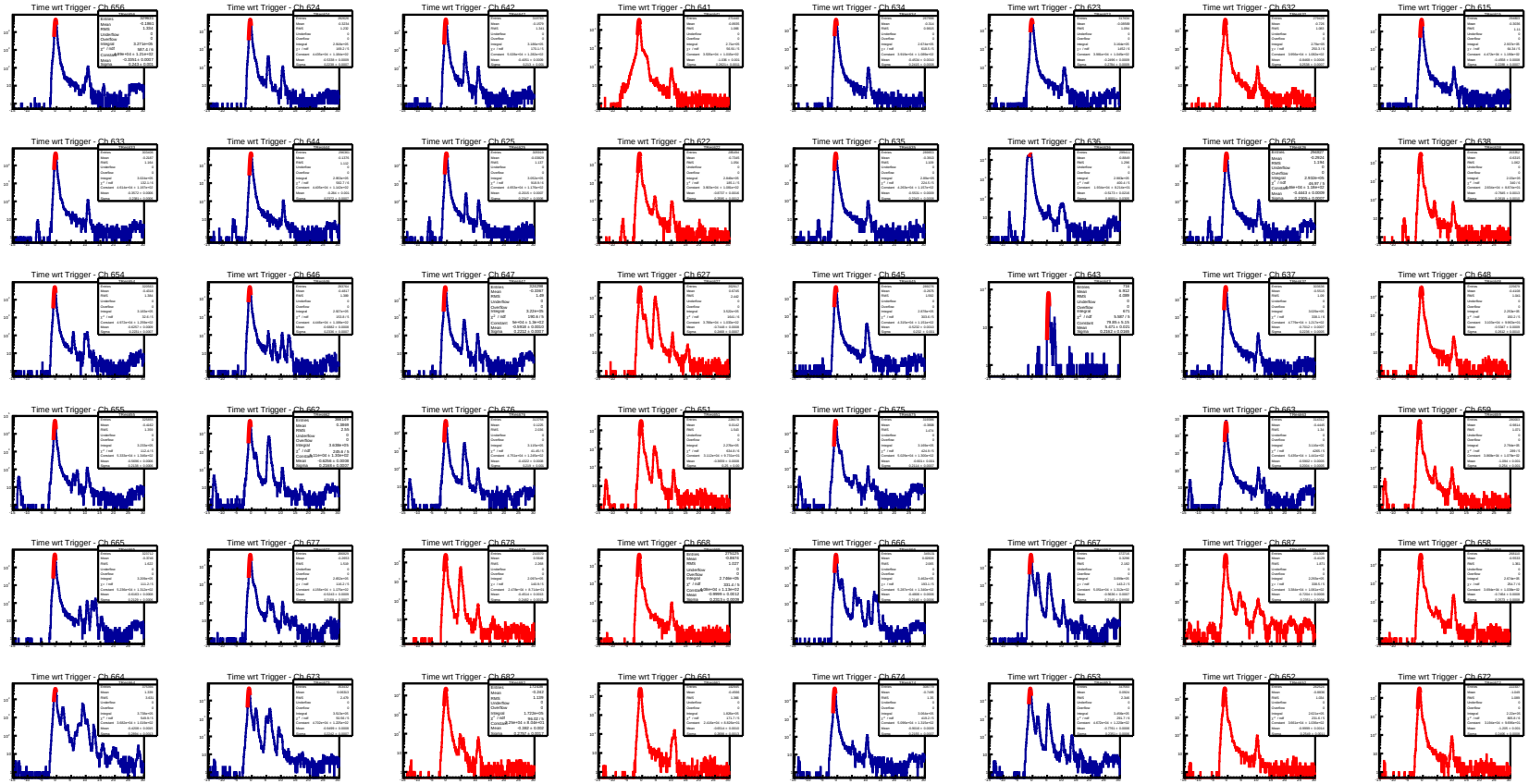
PM66 (J52) extracted from lightbox and moved to small box

New lightboxes and secondary peaks



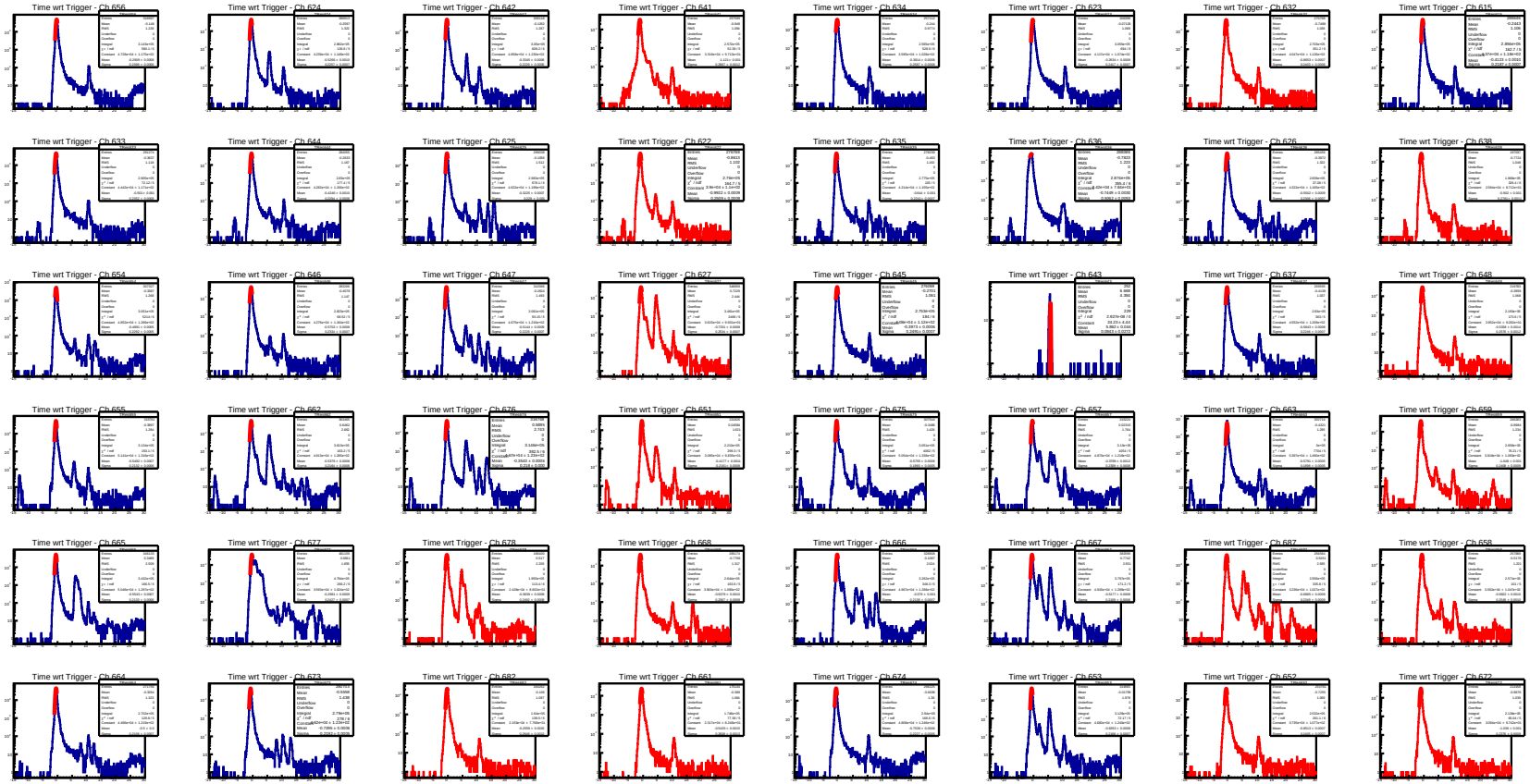
Detached all other cables related to the mezzanine of PM66

New lightboxes and secondary peaks



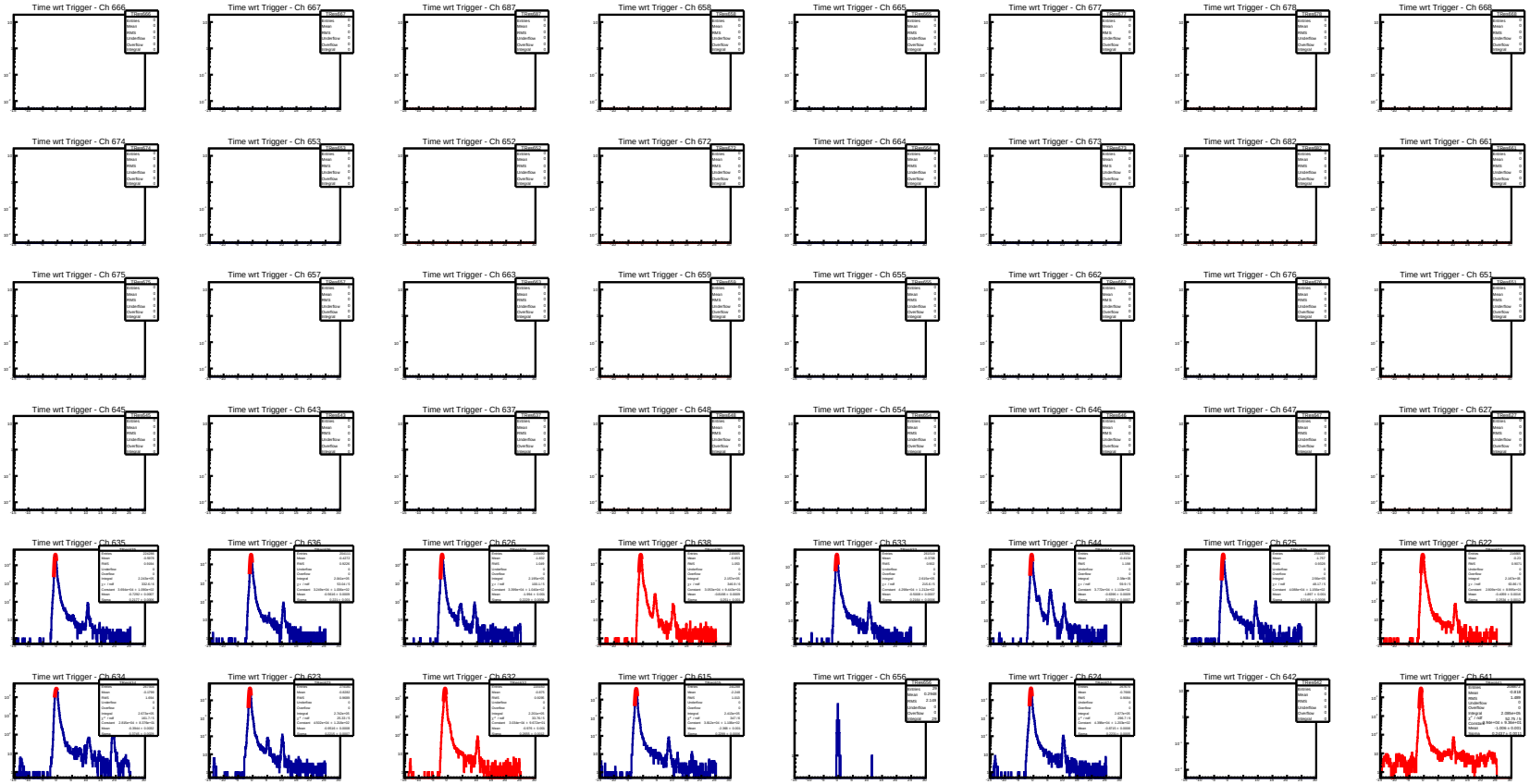
Lightbox 2 after replacing the NINO board (10 → 14)

New lightboxes and secondary peaks



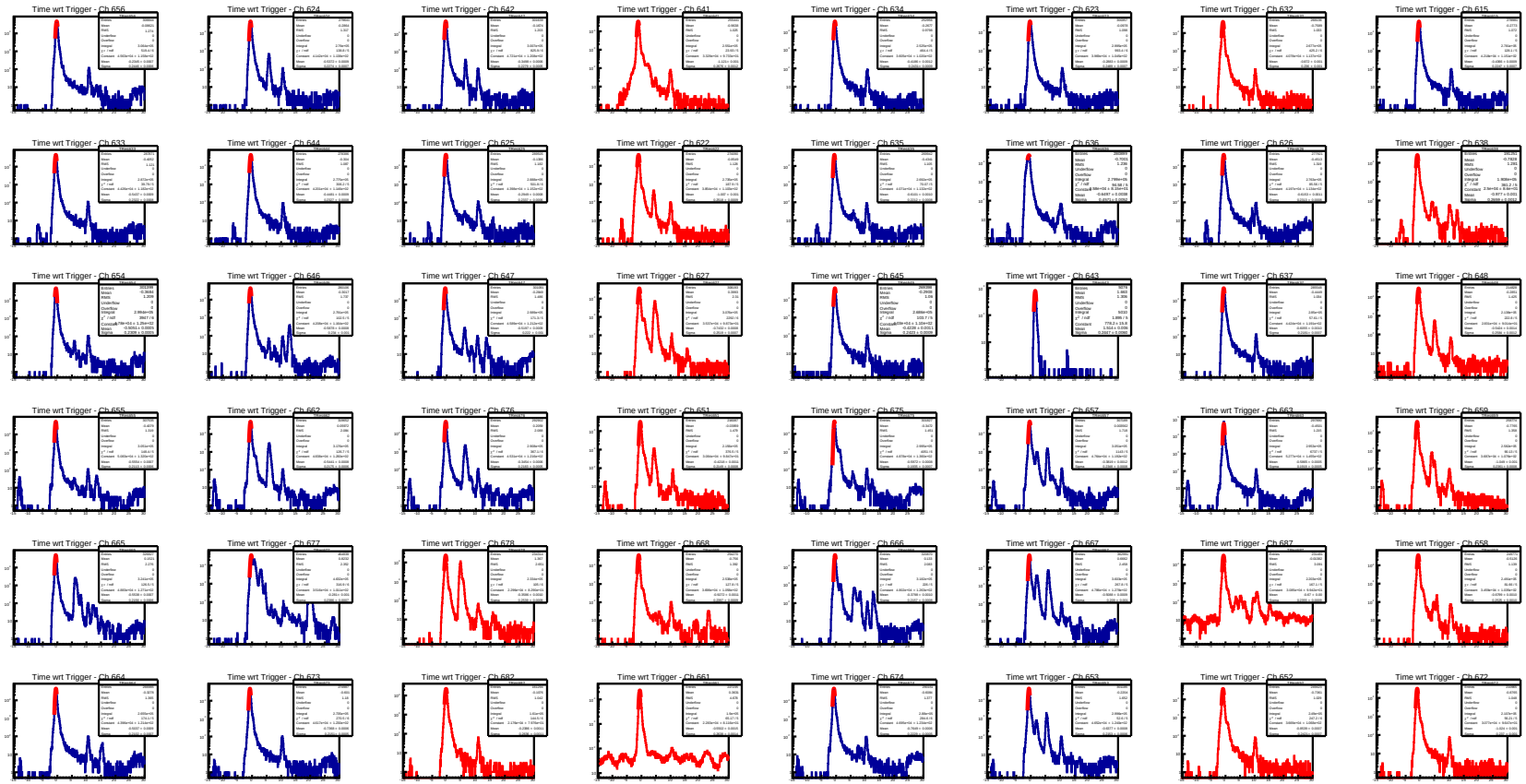
Lightbox 2 after replacing the NINO board (14 $\rightarrow$ 15)

New lightboxes and secondary peaks



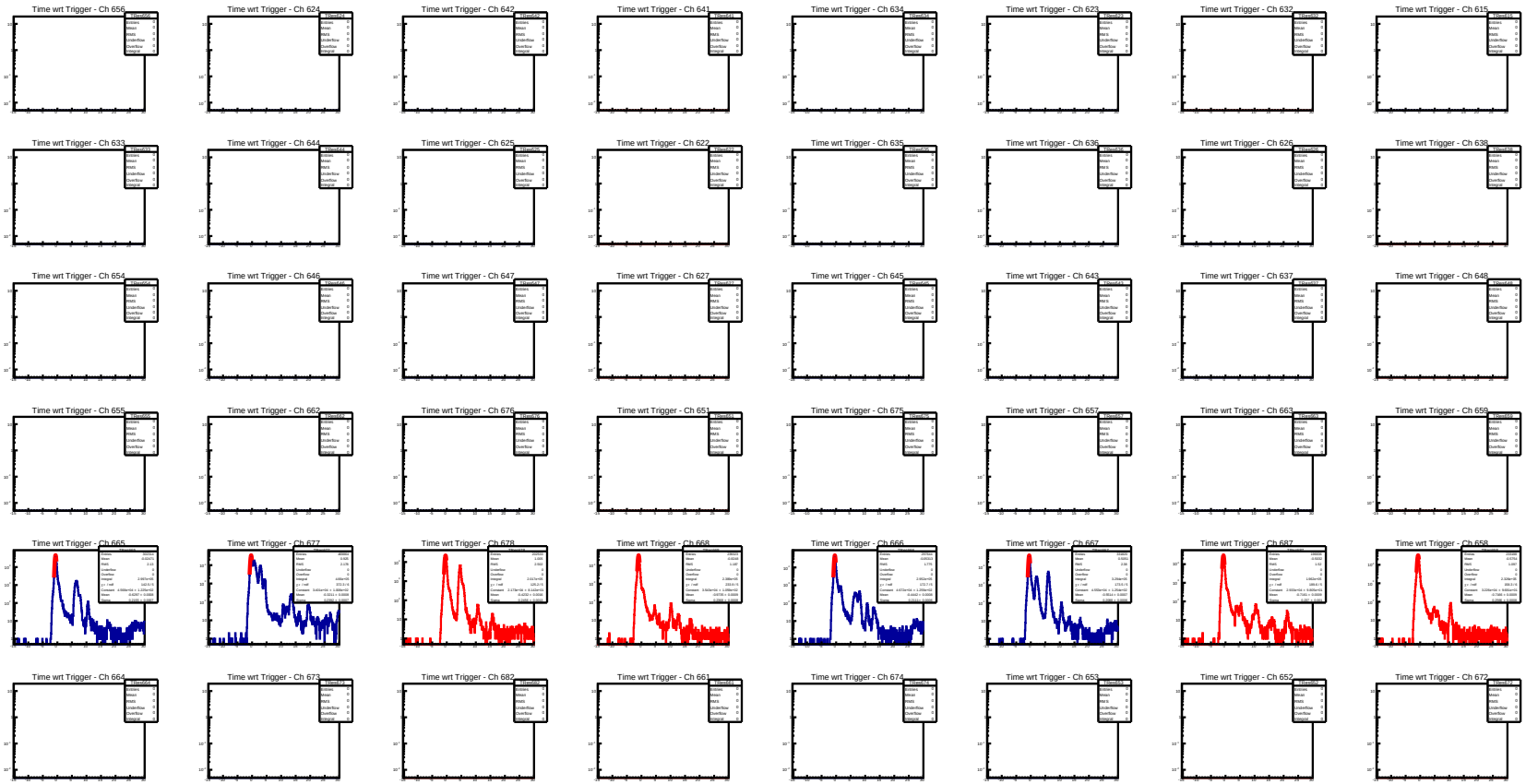
Test of box 7 @115mV with few PMs using box 3 map NINO 14

New lightboxes and secondary peaks



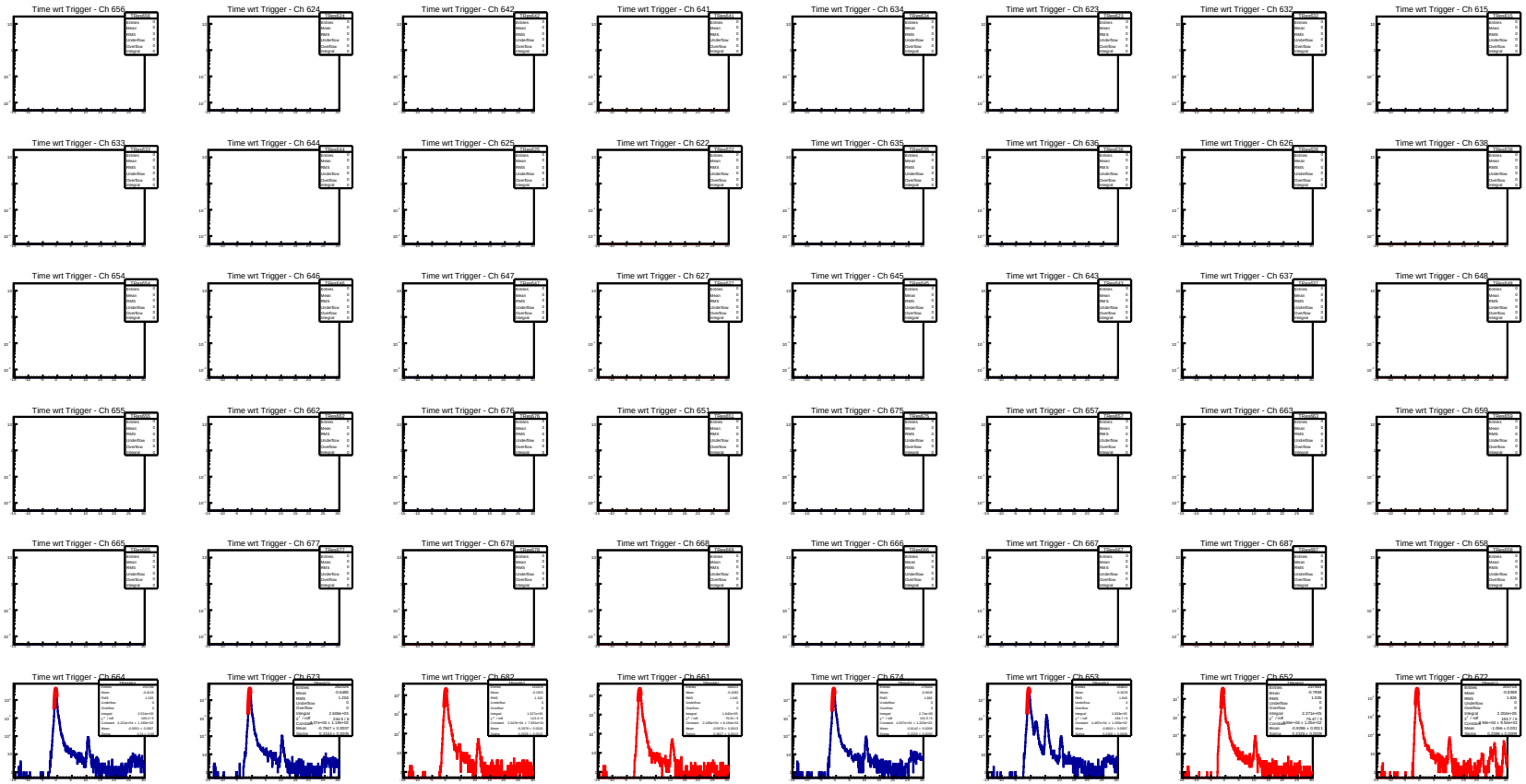
Back to box 2 after disconnecting PM43

New lightboxes and secondary peaks



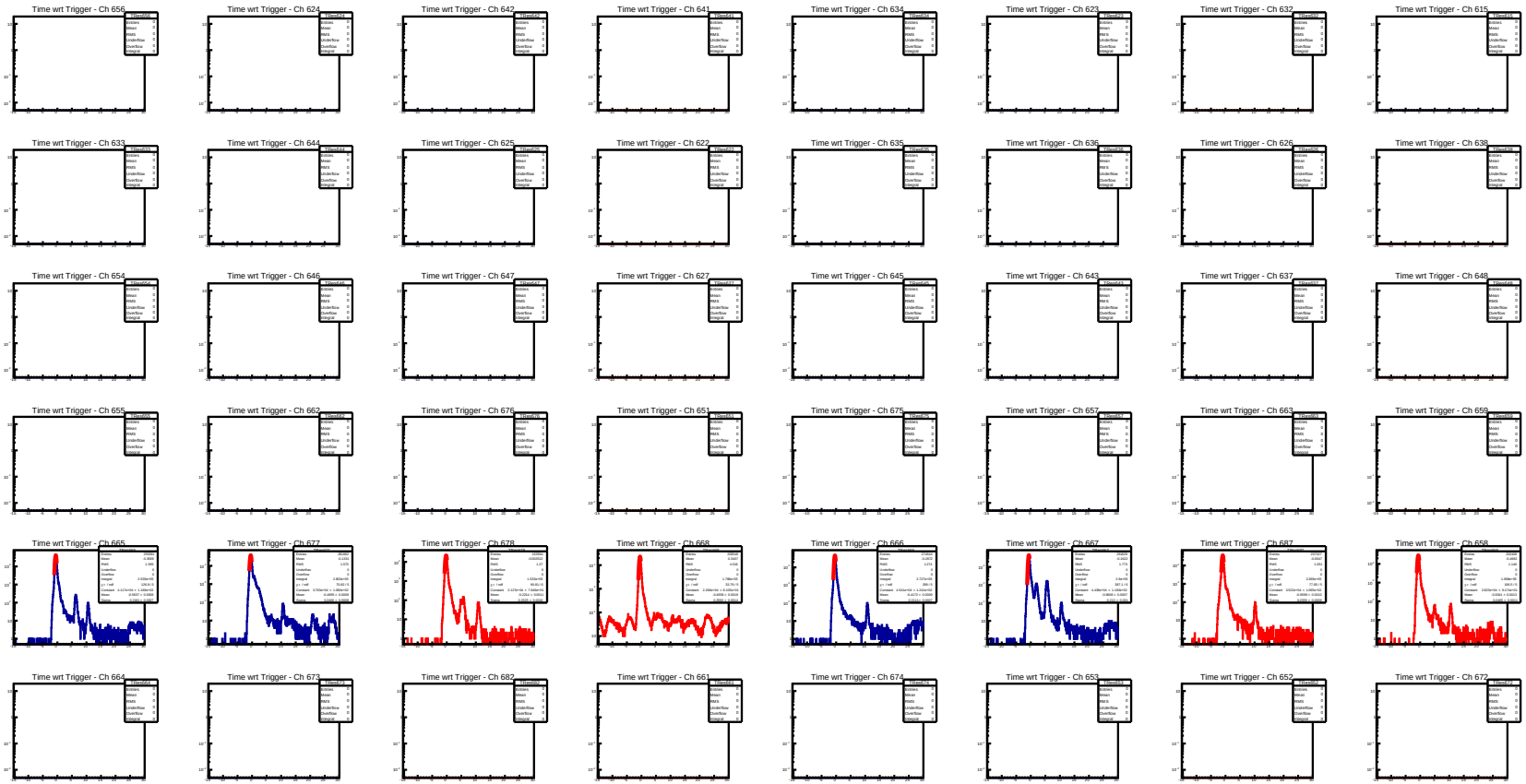
Detached all signal cables but those on mezzanine 6

New lightboxes and secondary peaks



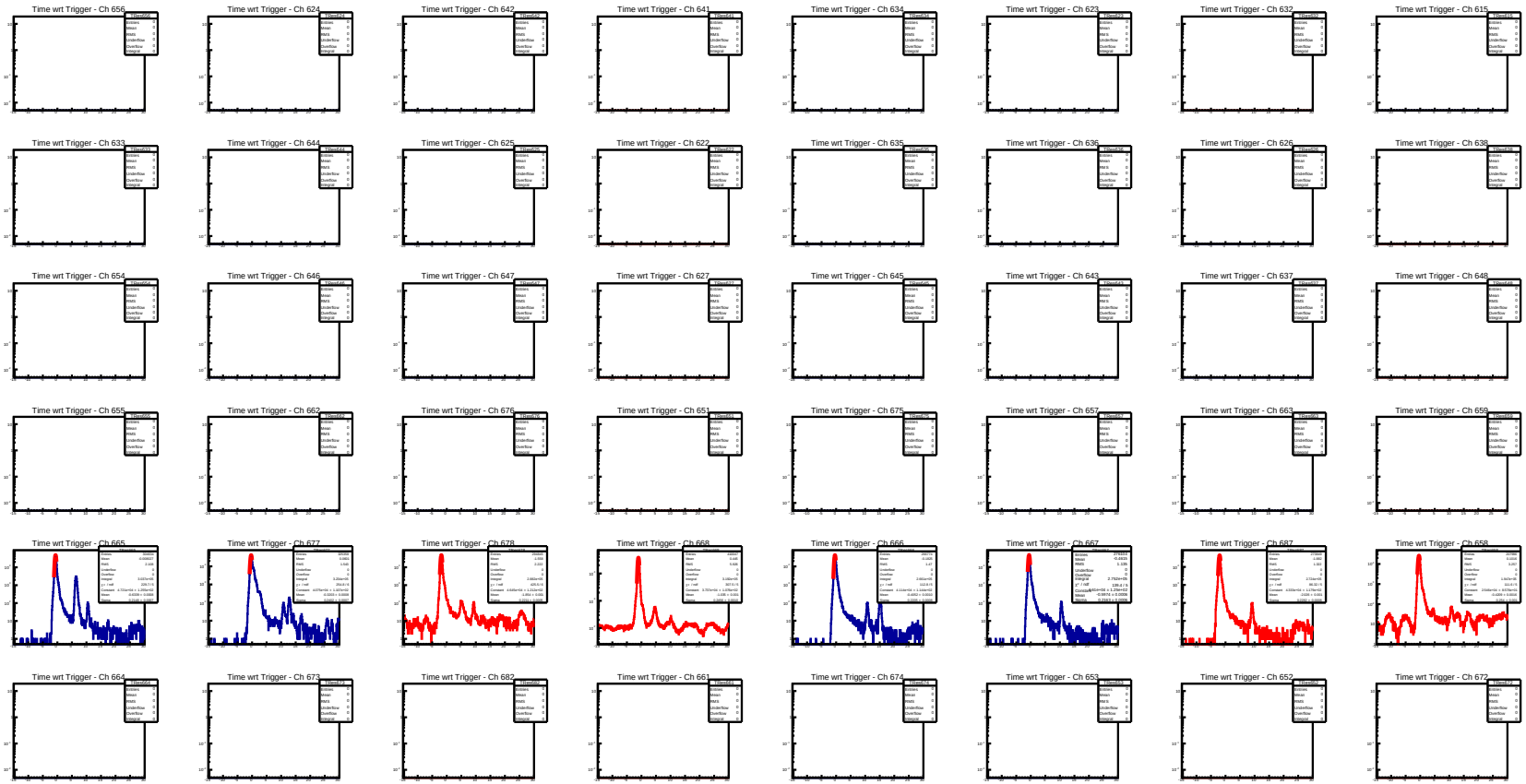
Detached all signal cables but those on mezzanine 7

New lightboxes and secondary peaks



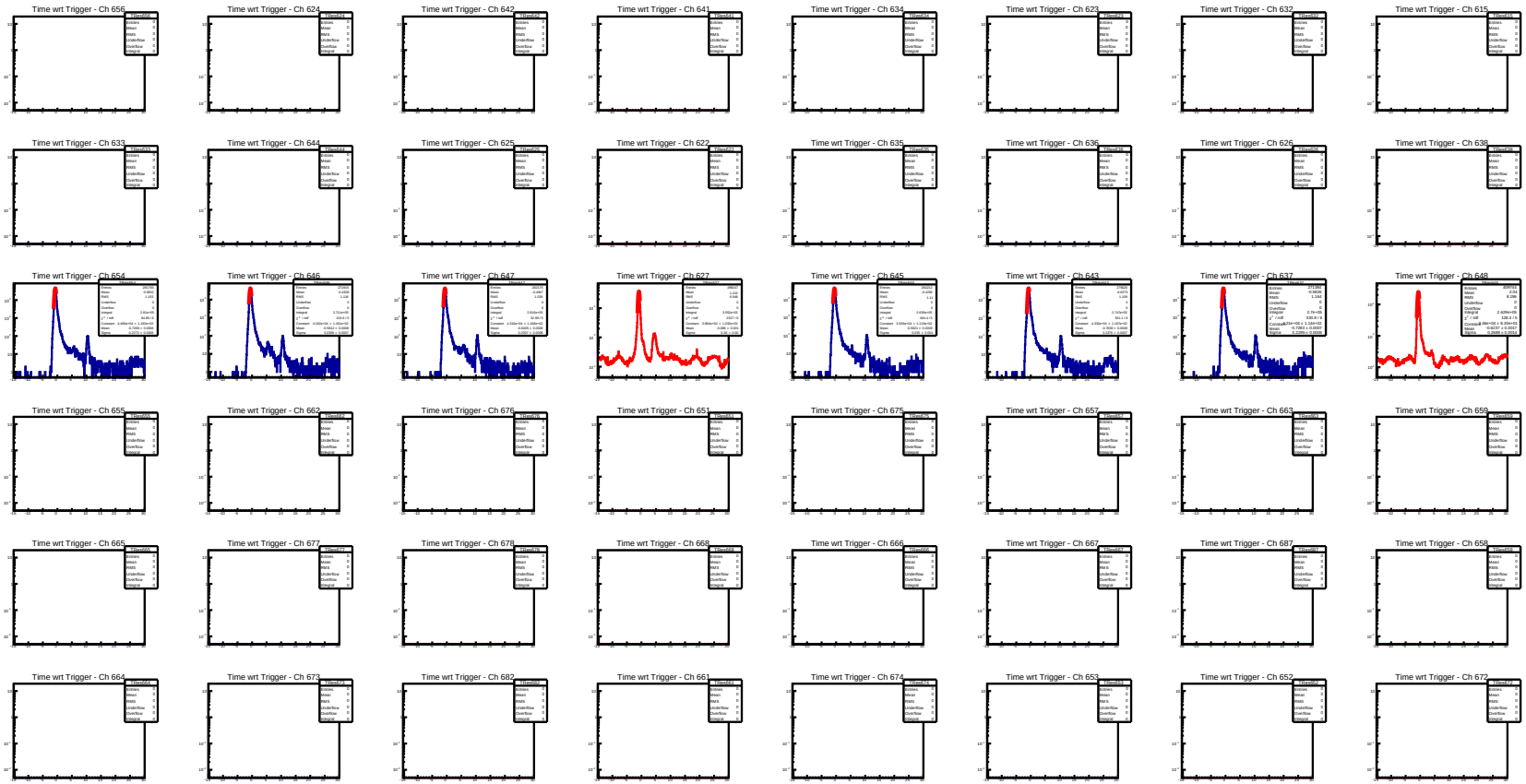
Moved cables from mezzanine 7 to 6

New lightboxes and secondary peaks



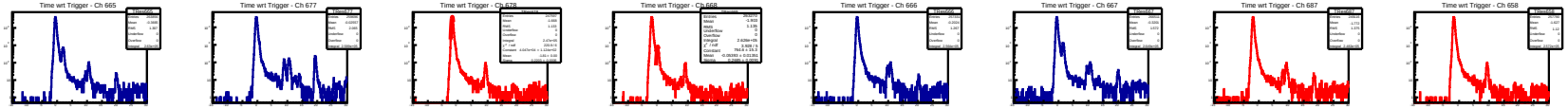
Moved cables from mezzanine 1 to 6

New lightboxes and secondary peaks



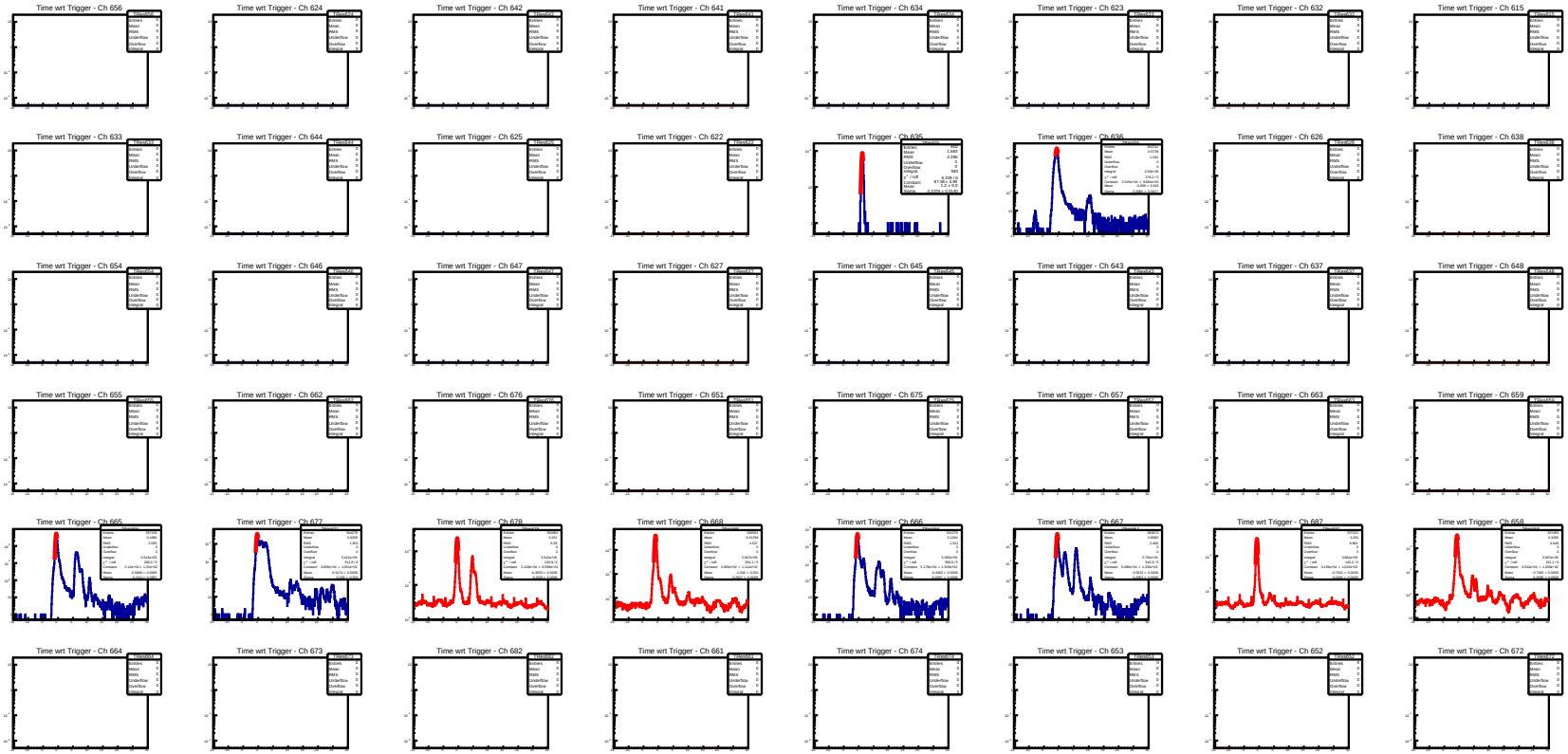
Moved cables from mezzanine 1 to 2

New lightboxes and secondary peaks



Cross talk sum

New lightboxes and secondary peaks



Replaced signal cables for mezzanine 6 with those from 1

Understanding performance

Current interpretation:

- Multiple peaks are triggered by cross-talk on the NINO board or mezzanine
- Peaks at time 0 can be hidden in the regular peak if all PMs are on
- Peaks at time > 0 are the result of cross-talk reflection on the HV divider
- Cross-talk signal seems to be around 1-2% of the primary one
- Visible on NINO board mainly at low threhsold (115mV)
- Apparently too small to be seen on oscilloscope
- Variation among LightBoxes due to a combination of different PM gain and different cross-talk on FE

Future:

- We have a channel by channel scan of currently installed KTAG component (to be analysed)
- If it's more due to PM gain rather than NINO boards/mezzanines, it can be recovered adjusting HV
- It's verified that for R9880 NINO threshold doesn't affect efficiency

Summary and Conclusions

- The installation went again pretty well (a part from the HV accident)
- Some trouble with the TEL62, but trivialities (that took 1 day to solve)
- LightBox 4 is back to Birmingham for post mortem analysis and resurrection
- Splitters are all available and tested (1 noisy channel to check)
- Cross talk can be an issue, but we have ways to define a working point that should be protected
- The option "NINO board out of the box" is tested and available at 0 cost
- One false floor plate to be cut (complaints for wheels)