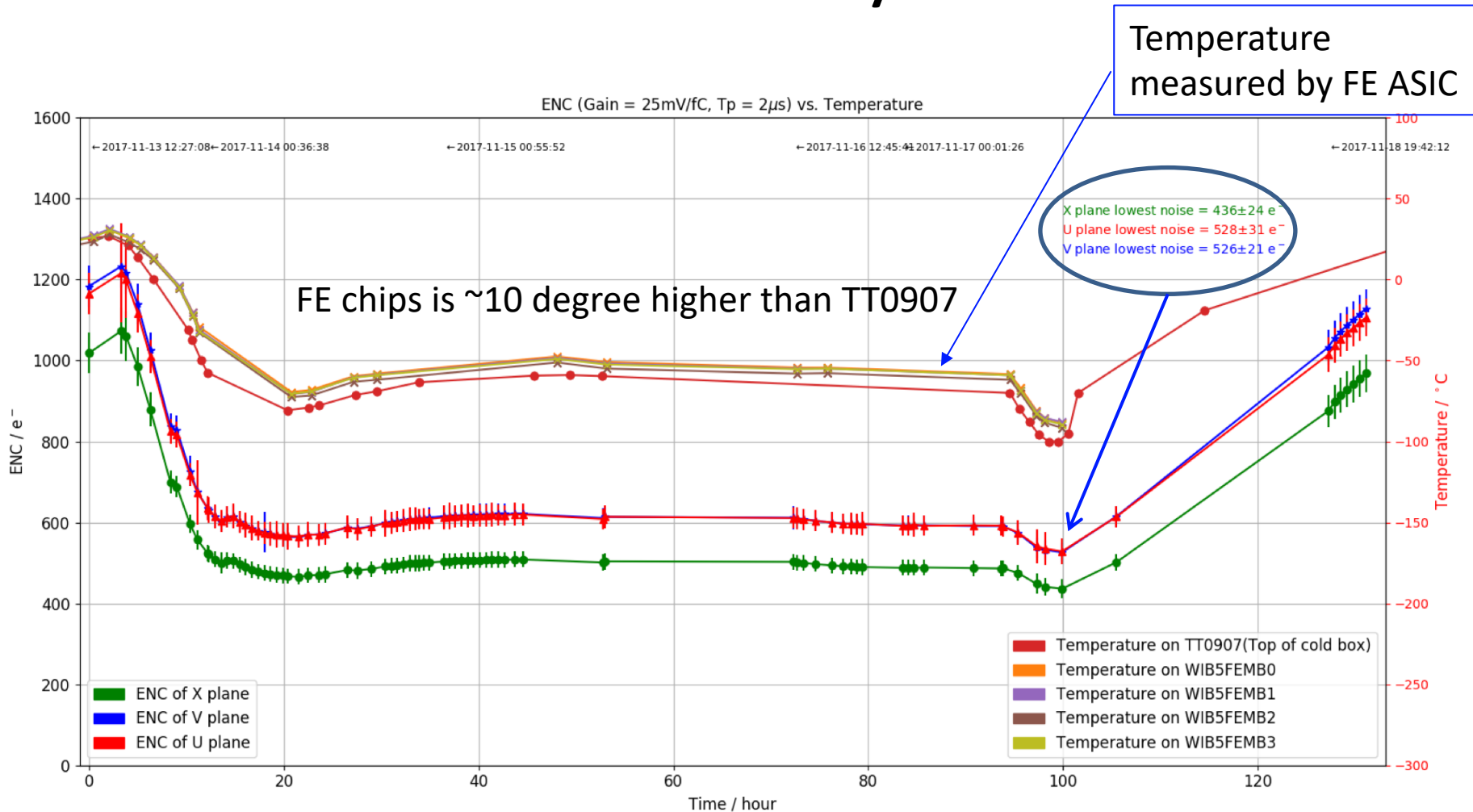


CE Update

Matthew Worcester (BNL)
representing the Cold Electronics team

ProtoDUNE-SP ITI Meeting
February 15, 2017

APA1 Cold Cycle

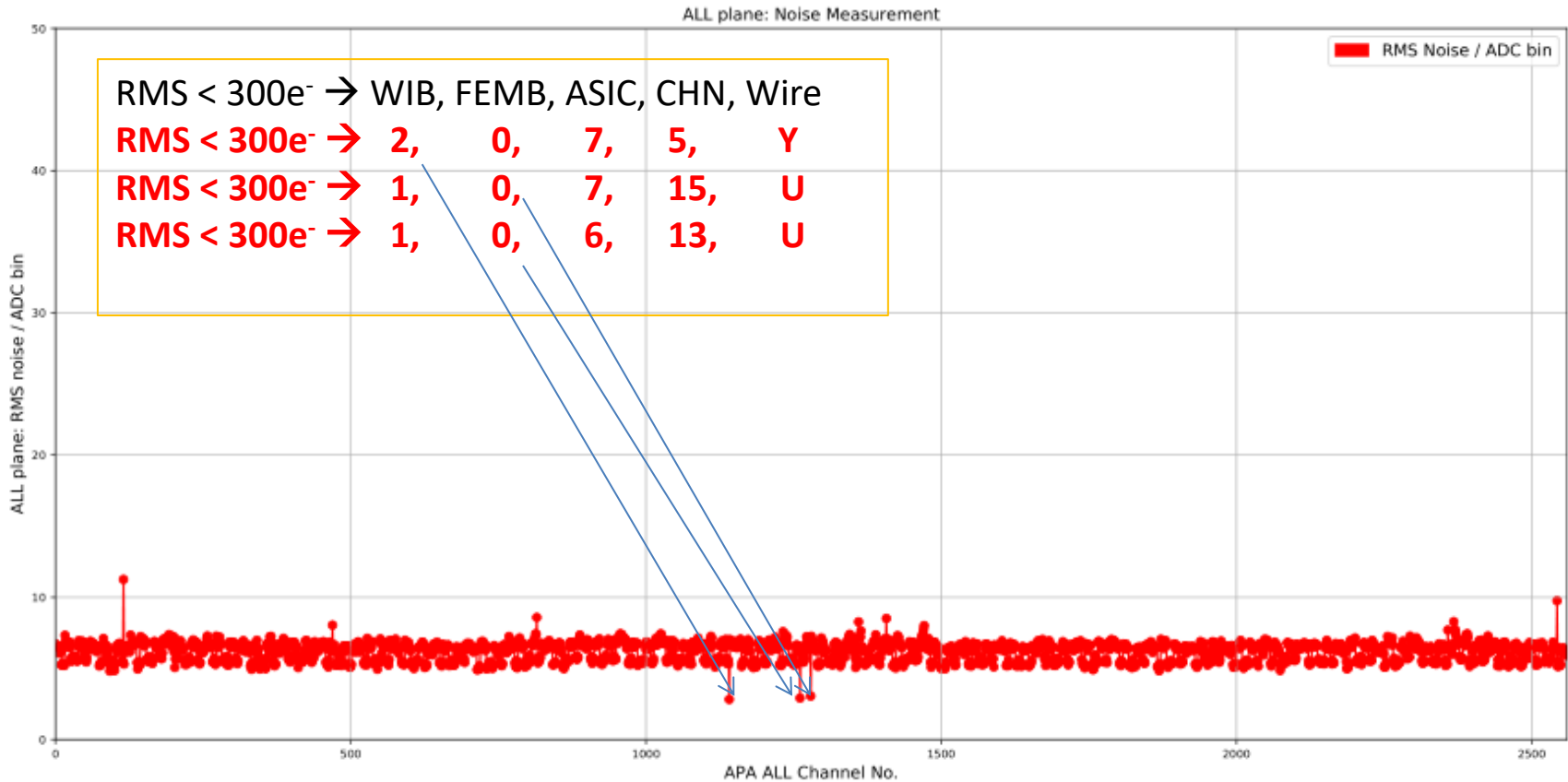


Note: Uniform gain (80 e-/bin) is applied for calculating noise of all channels

Run27: Quick Test

Temperature:
TT0907: ~173K

FEASICs: ~183K



Reminder: stuck code phenomenon changes according to temperature

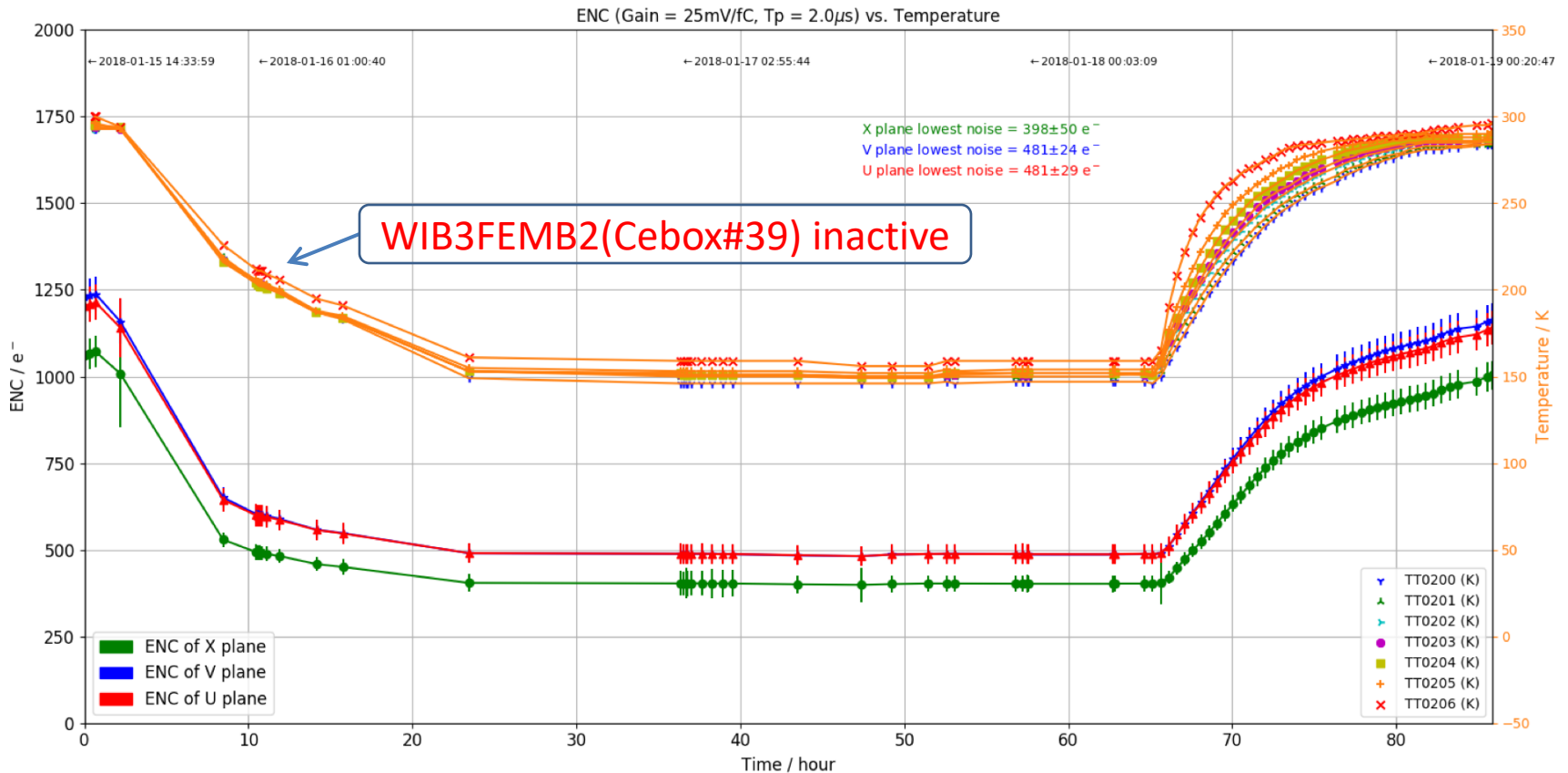
APA2

- CE Installation: 12/06/2017 to 12/15/2017
 - Augie, Bo, Junbin, Maura, Serhan
- APA2 was moved into cold box on 12/15/2017
- Check-out test at 300K shows all 2560 FE channels functioning well
- RTD sensors cause excessive noise
 - Verified on 12/19/17 to 12/20/2017
- APA2 Cool Test from 01/15/2018 to 01/19/2018



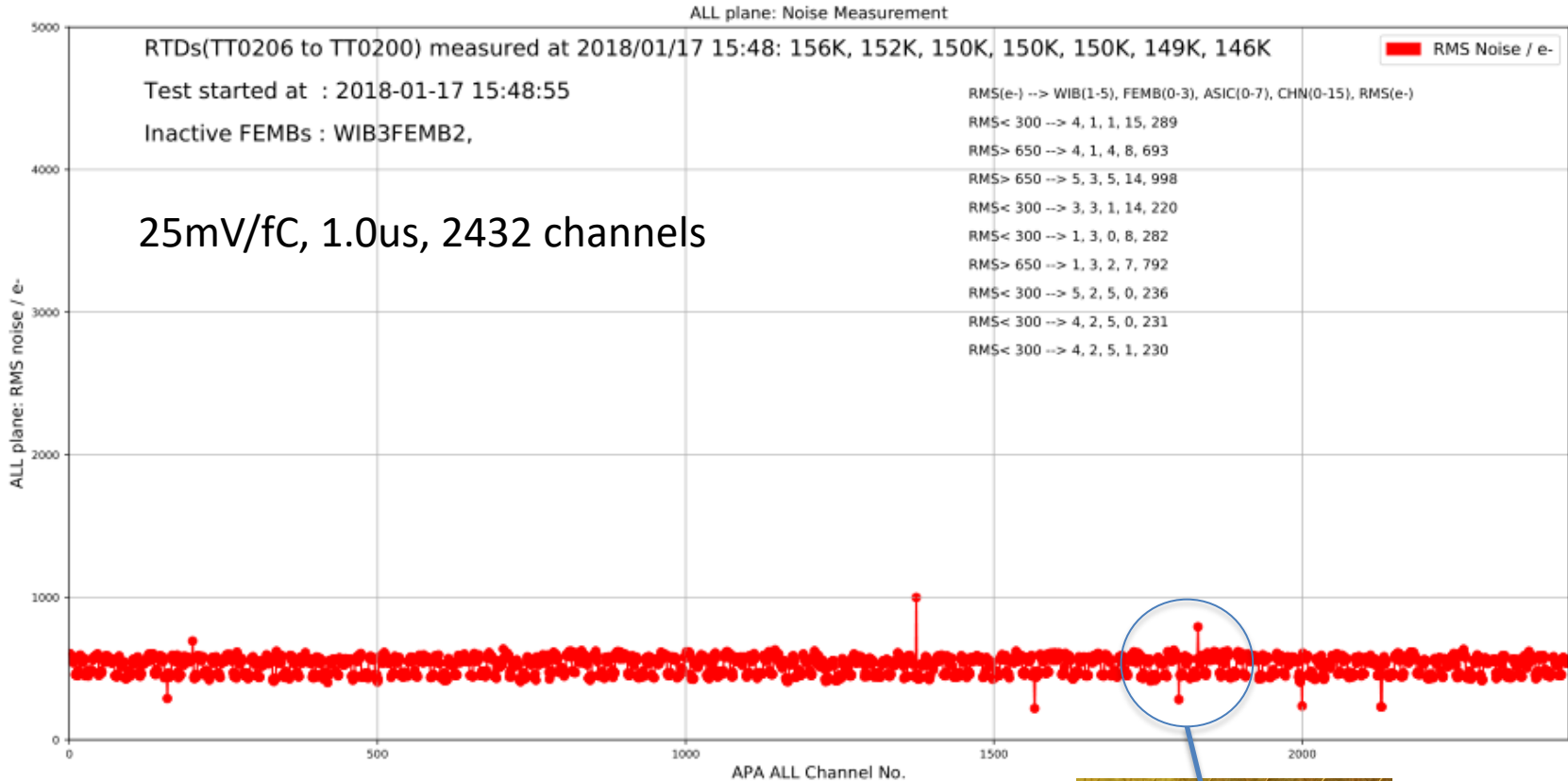
APA2 Cold Cycle

Lowest temperature reached(TT0206): 159K



1. Uniform gain ($77e^-/\text{bin}$) is applied for calculating noise of all channels
2. Bias voltages were off

Noise at 160K

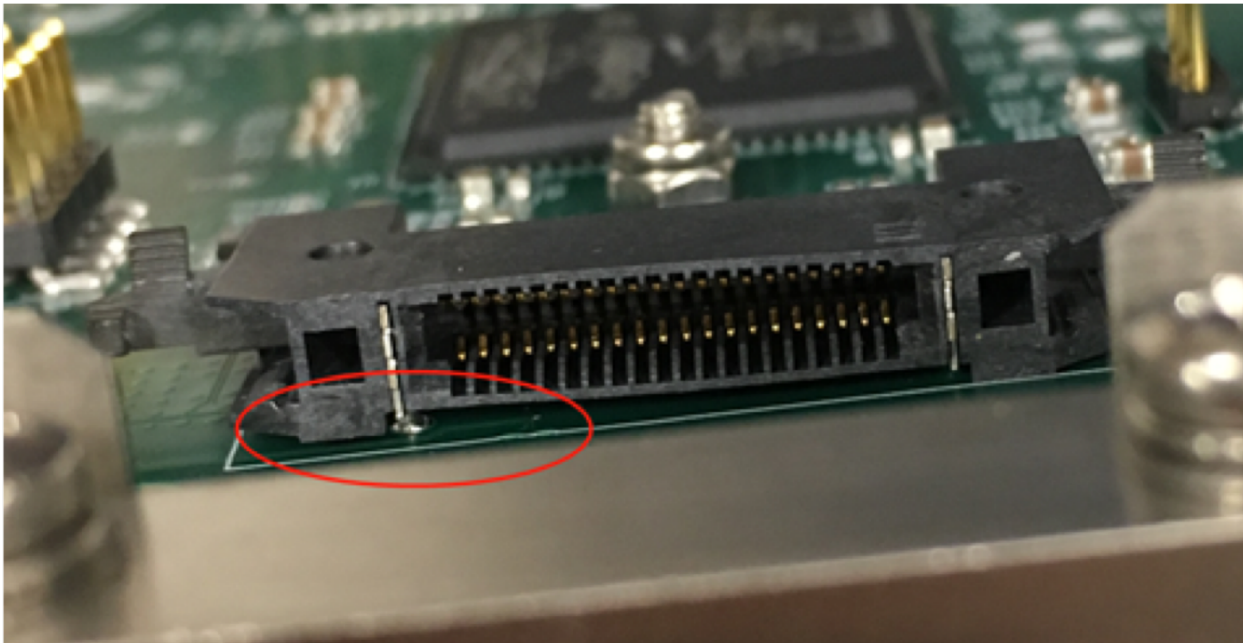


Found 2 abnormal V wires where a wire was cut (low noise) and soldered to its neighbor (high noise)
All electronics channels (aside from 1 FEMB) functioned well after warmup: open channels remain



CE Box #39

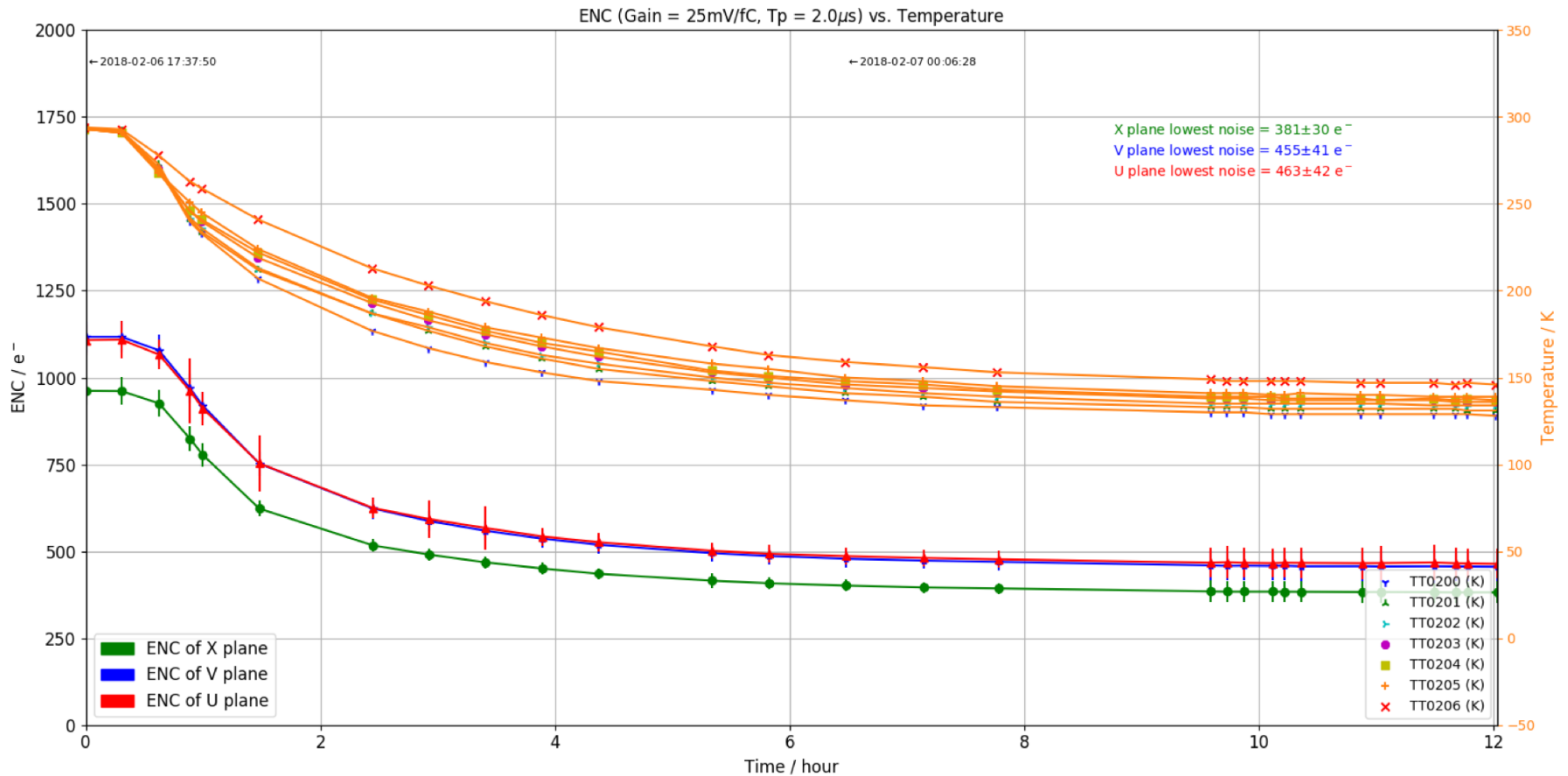
- Did not recover after warm up in the cold box
- Inspection reveals damage to the data cable connector on the mezzanine
- CE Box replaced before APA2 moved into the cryostat



APA3

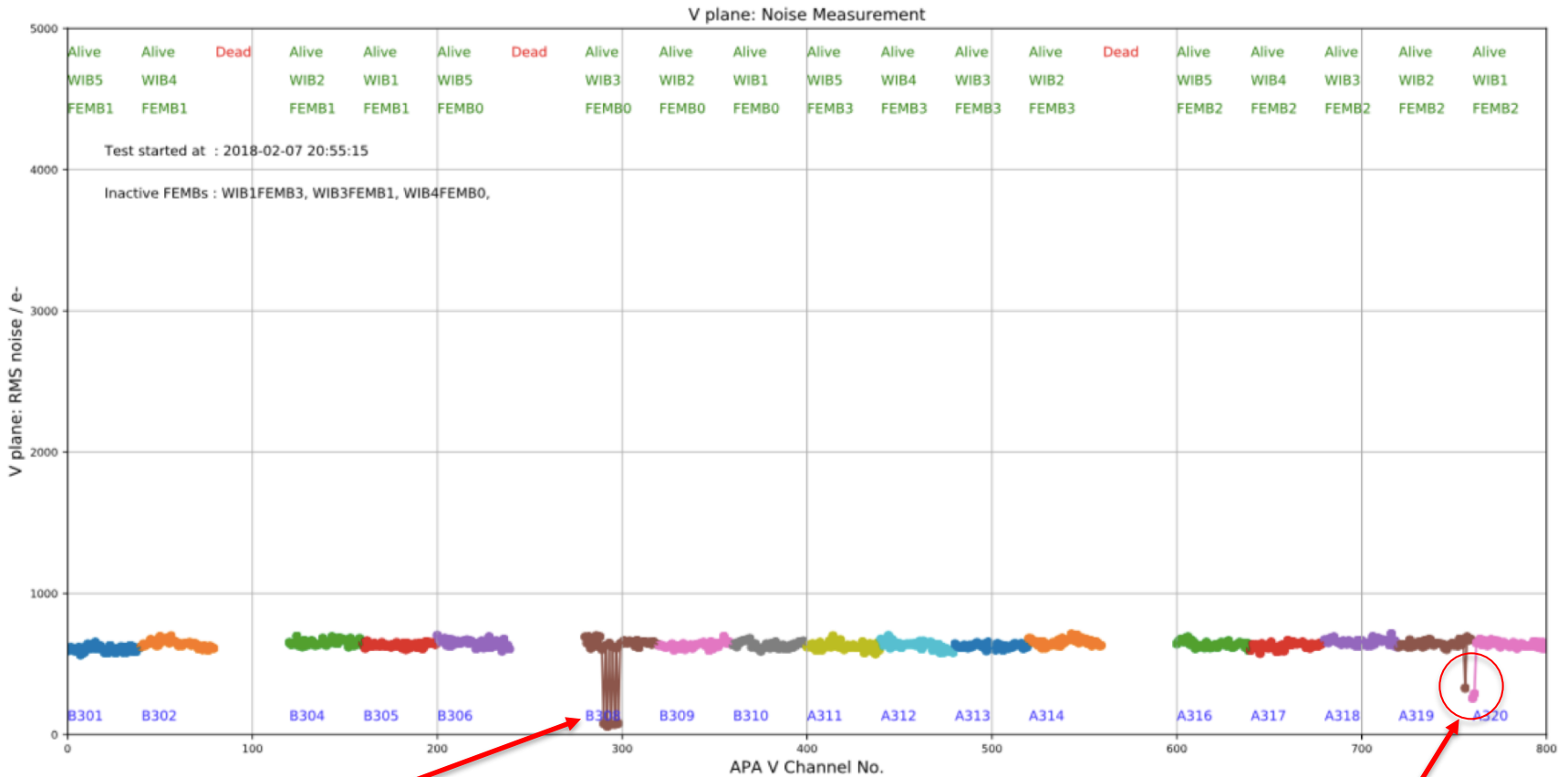
- CE installation 1/25-26
 - Ken, Maura, Junbin
- APA3 moved into cold box on 1/31 and cabled to the flange on 2/1
 - Check-out test at 300K found 2 FEMB not sending data
 - On 2/4 a 3rd FEMB stopped sending data at 300K
- APA3 cool test started on 2/6
 - Remaining 2176 channels verified to be working well before cooldown

APA3 Cool Down



After CE check out during cooldown, turned cold box over to DAQ for testing

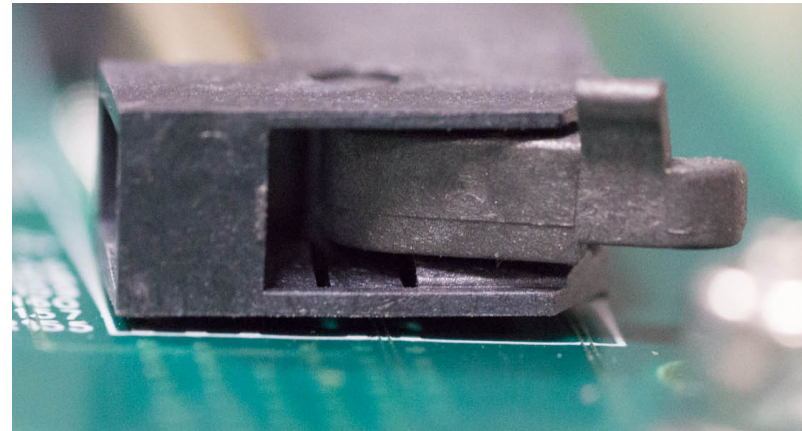
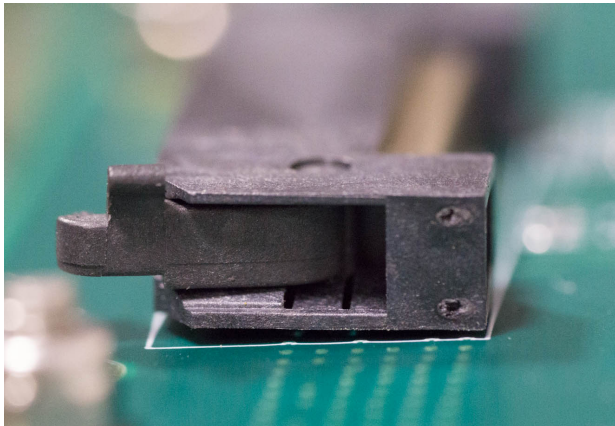
Noise at 150K



3 open connections to the FE found on the V plane
Data from 1 FE ASIC stopped working during the cold cycle

APA3 Return to 300K

- 3 CE Boxes that stopped sending data at room temperature in the cold box remained bad after warmup
 - Verified on the testbench that these boxes are not sending data
 - Replaced all 3, will return to BNL for diagnosis
 - Appears to be a connector issue, similar to #39 on APA2



- 1 abnormal FE ASIC recovered after cold cycle
 - Replaced CE Box with abnormal FE ASIC, will return to BNL for repair

Summary

- Issue with data cable connector is under intense focus
 - Working with team at CERN to understand and fix the problem
- Noise results from all 3 APA in the cold box are very promising
 - Cold box is doing its job: identifying issues before installation in the cryostat
- Preliminary results from DAQ runs with cool APA3 are comparable to the noise measured with the the BNL analysis