ADC performance in bench tests: Time dependence 2

BNL DUNE

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Introduction

Last few week I have discussed analysis of ADC test data

- See my talks at these meetings

Follow up on a couple issues here

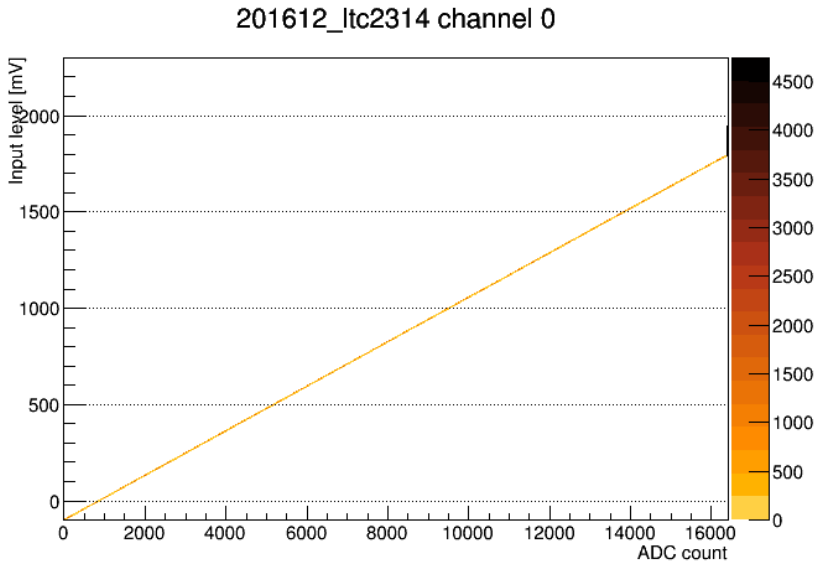
- Response and performance of commercial ADC
- Time dependence without power/thermal cycling

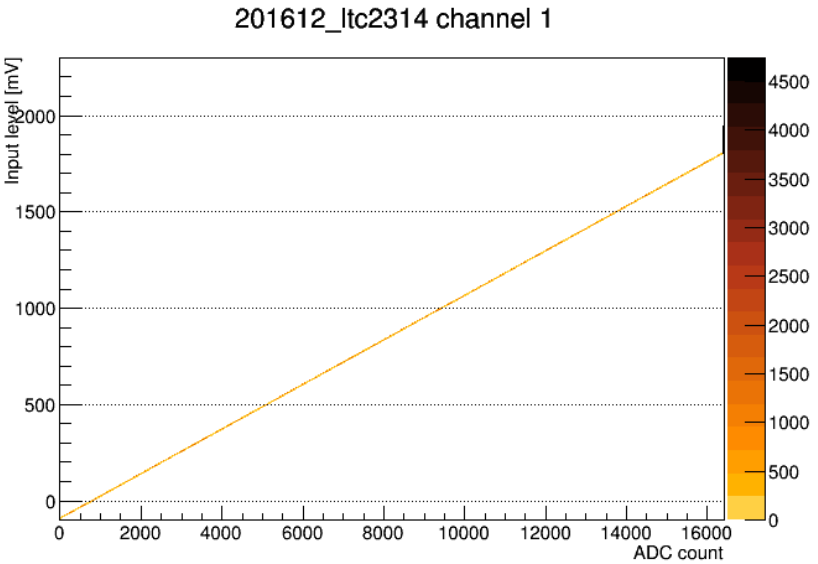
Commercial ADC tests

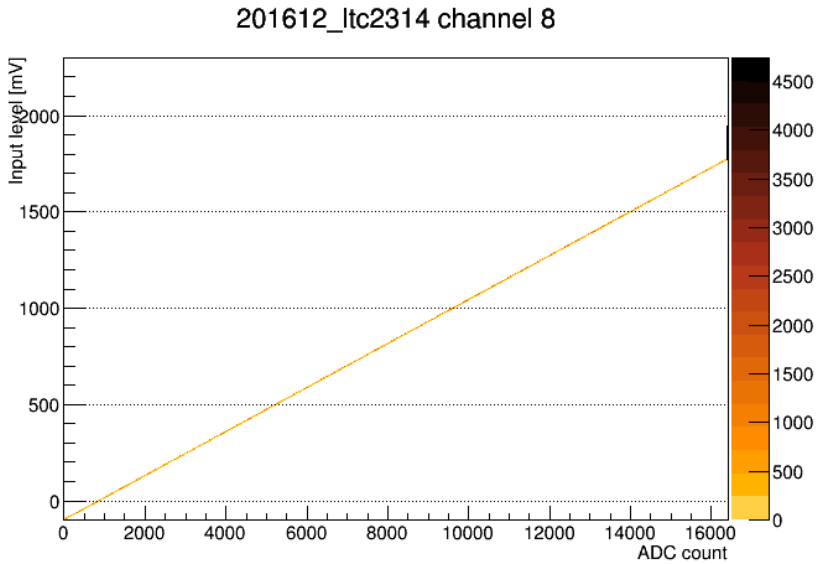
Evaluate response and performance of commercial ADC

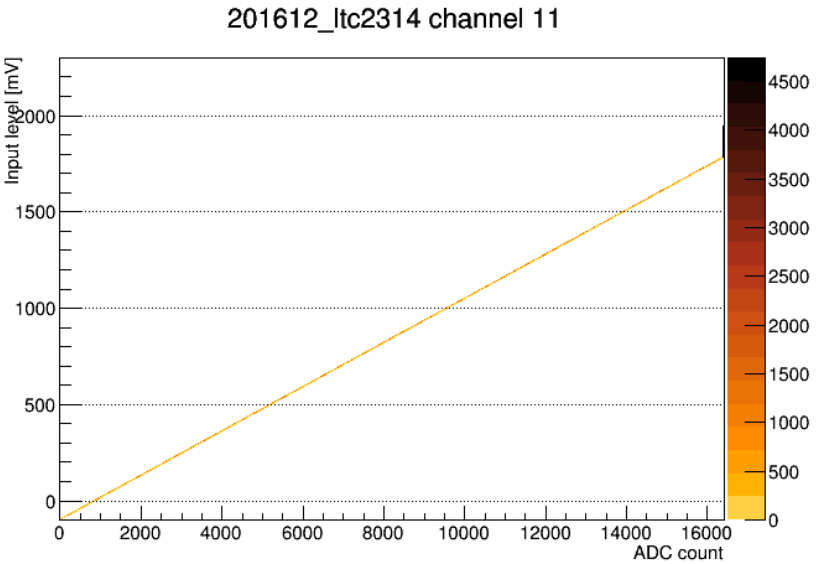
- LTC2314 with data taken for four channels
- Resolution significantly better that that of P1
  - See plots on following pages
  - ➔ P1 performance measurements are not limited by the test environment
- V_{in} calibration is not quite correct
  - ADC response should not start before 0 V (offset)
  - Full range should be 2.048 V (gain)
    - Maybe not at LN2 temp?
  - Still the resolution is clearly much better than P1

Commercial ADC response plots

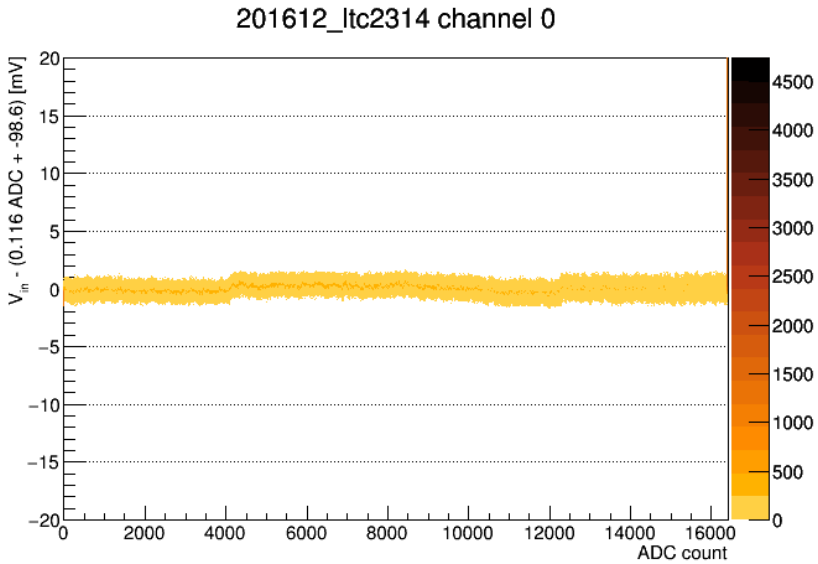


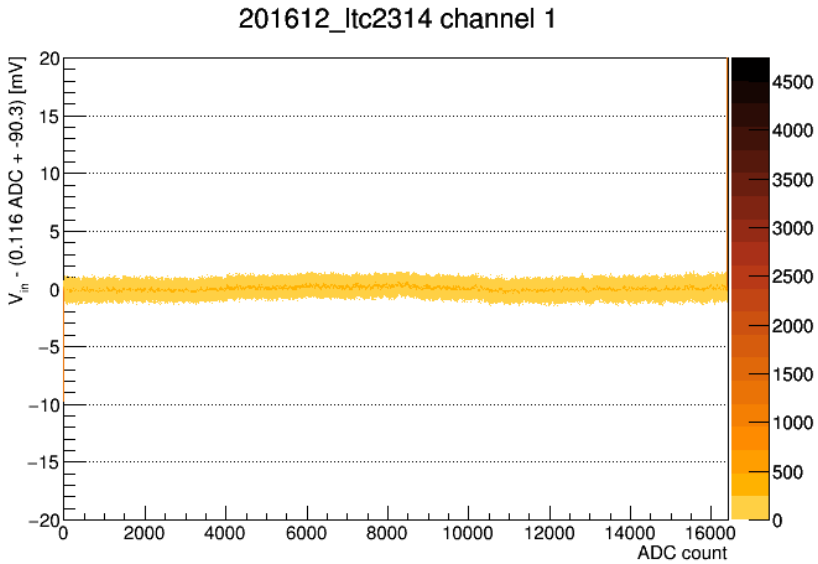


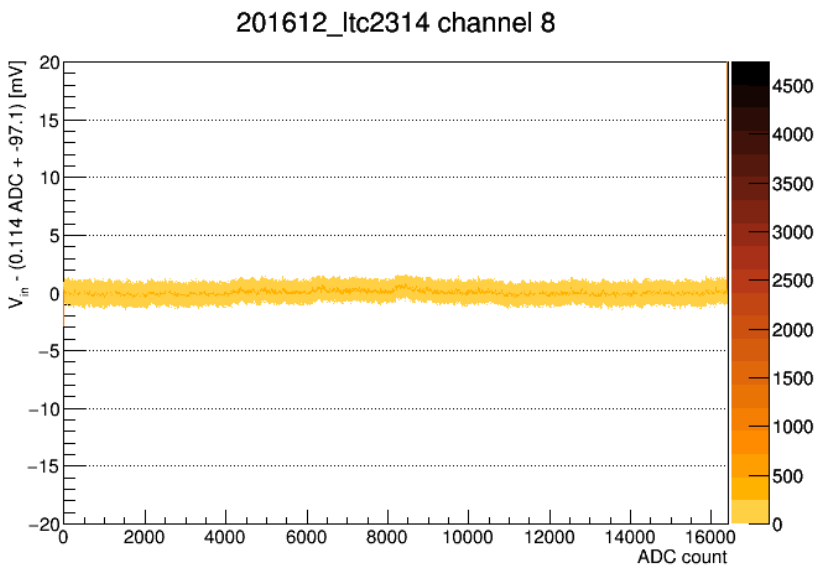


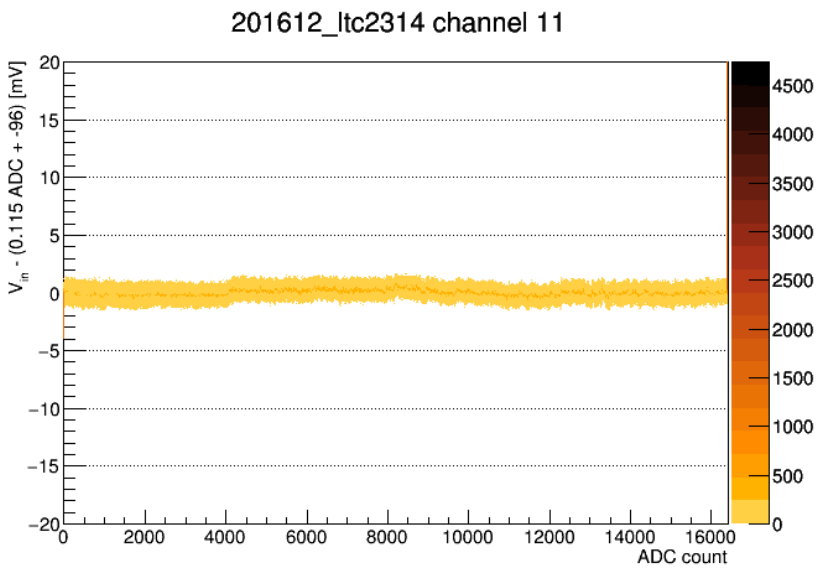


Commercial ADC linearity residuals

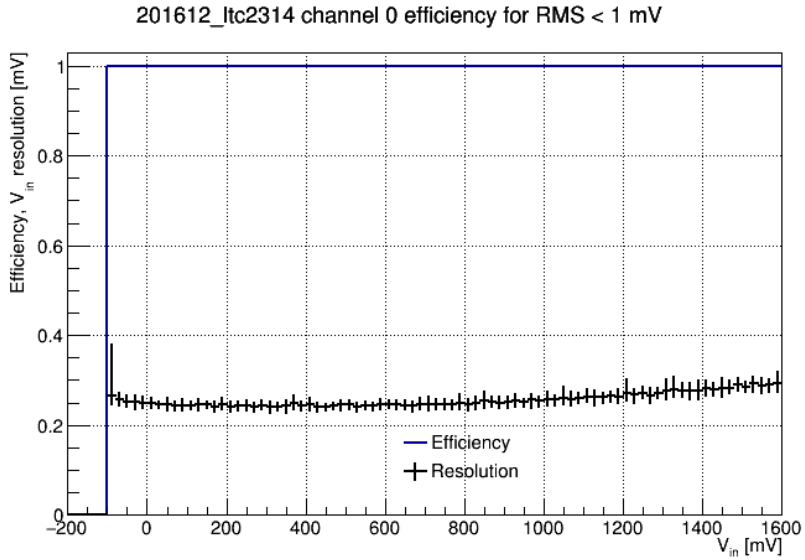


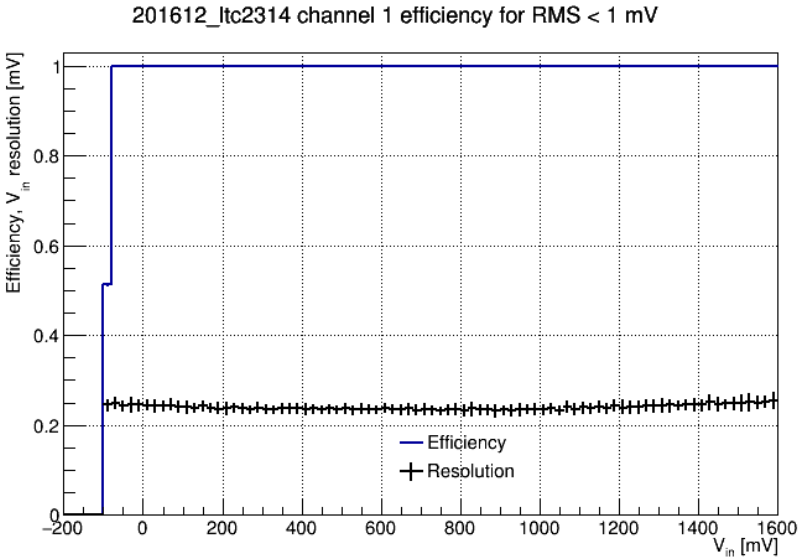


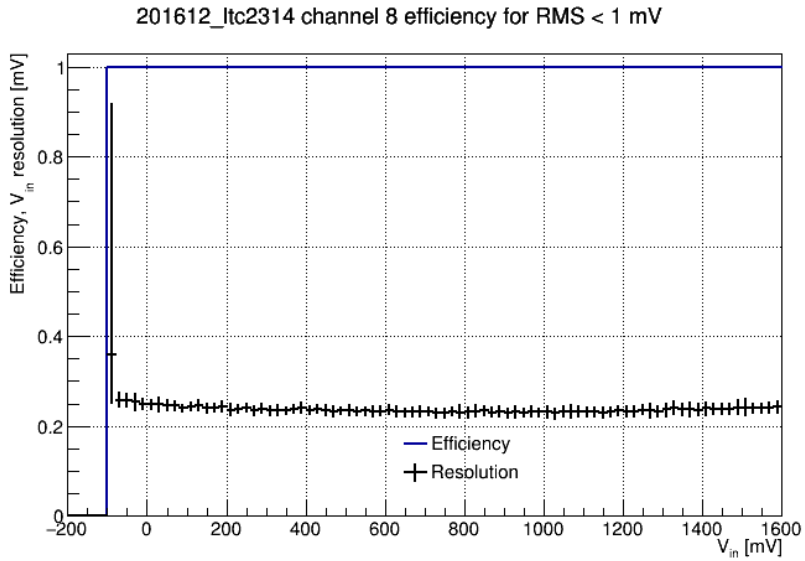


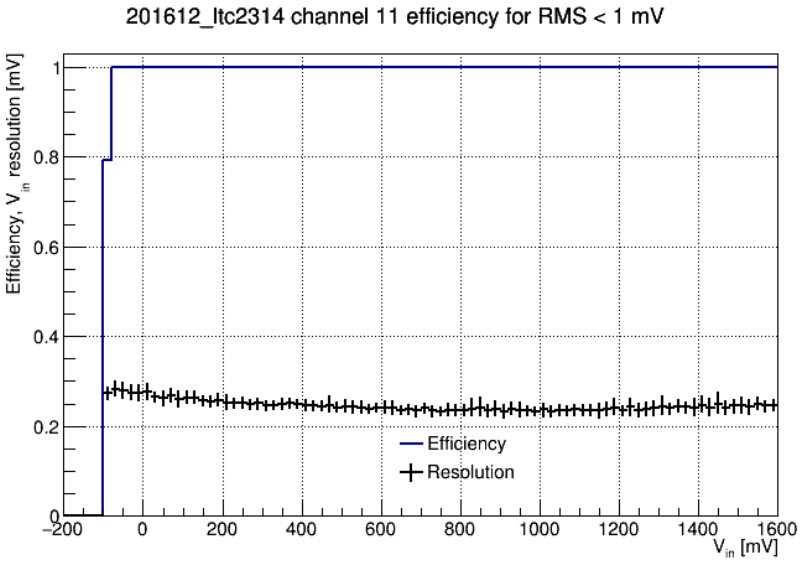


Commercial ADC performance









New P1 time dependence

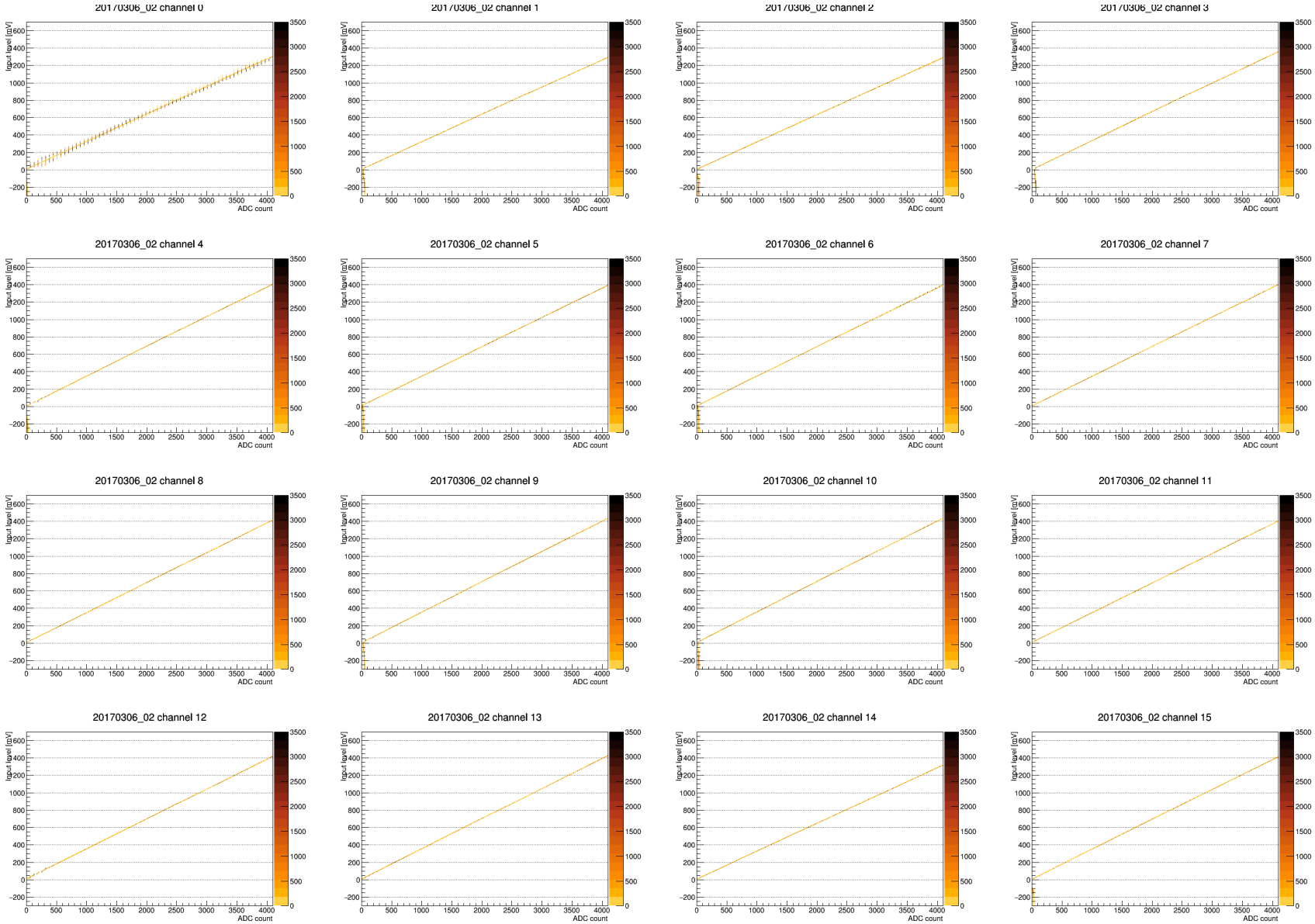
New data taken to evaluate time dependence

- Taken Mar 6 and 7
- No thermal or power cycling
- Only one sample take (or made available to me) each day

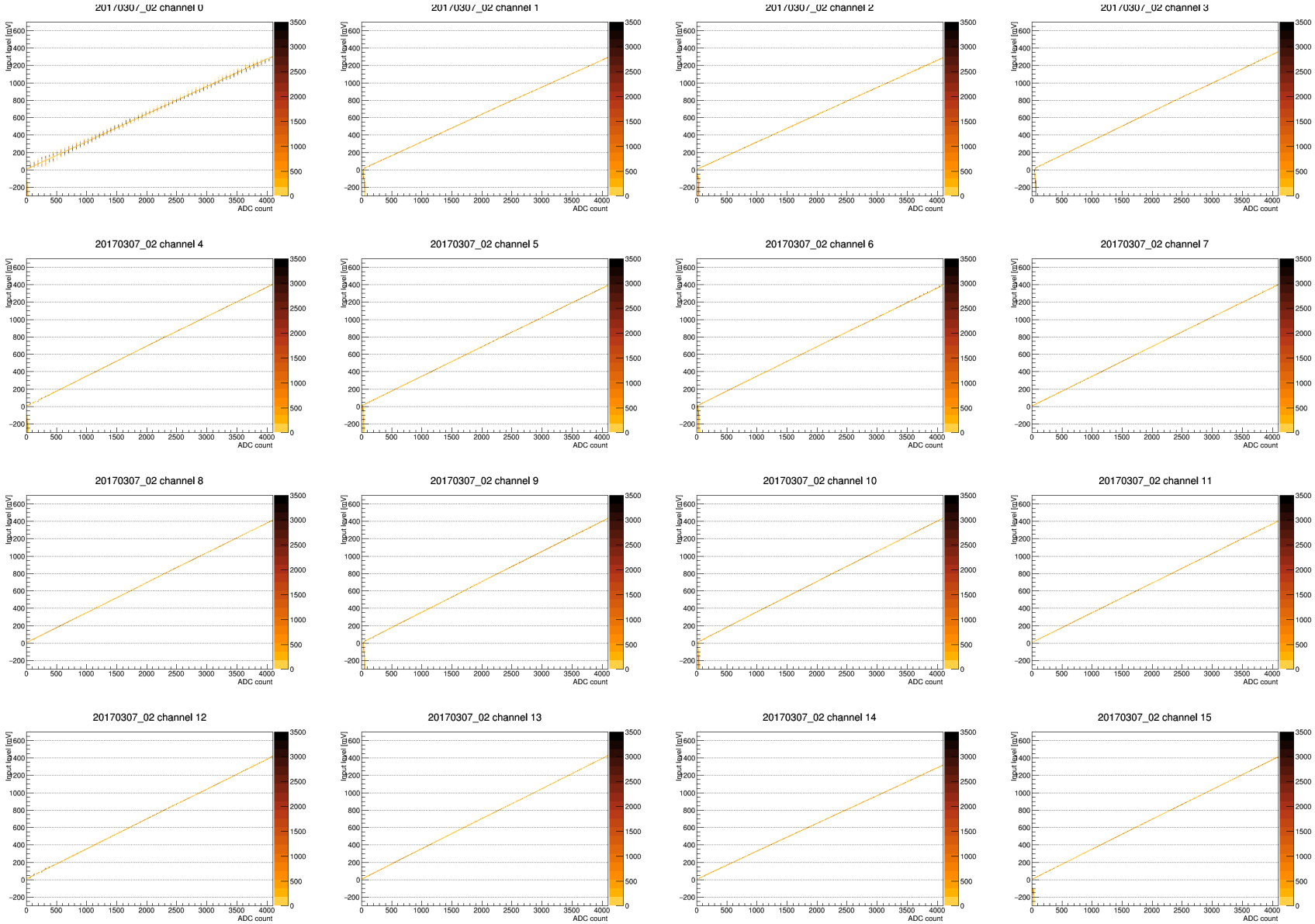
Plots follow

- Response
- Residual after linear fit
- Ultimate resolution vs. bin
- Efficiency and resolution vs. V_{in}
- Residual from calibration
  - Mar 6 data used for calibration

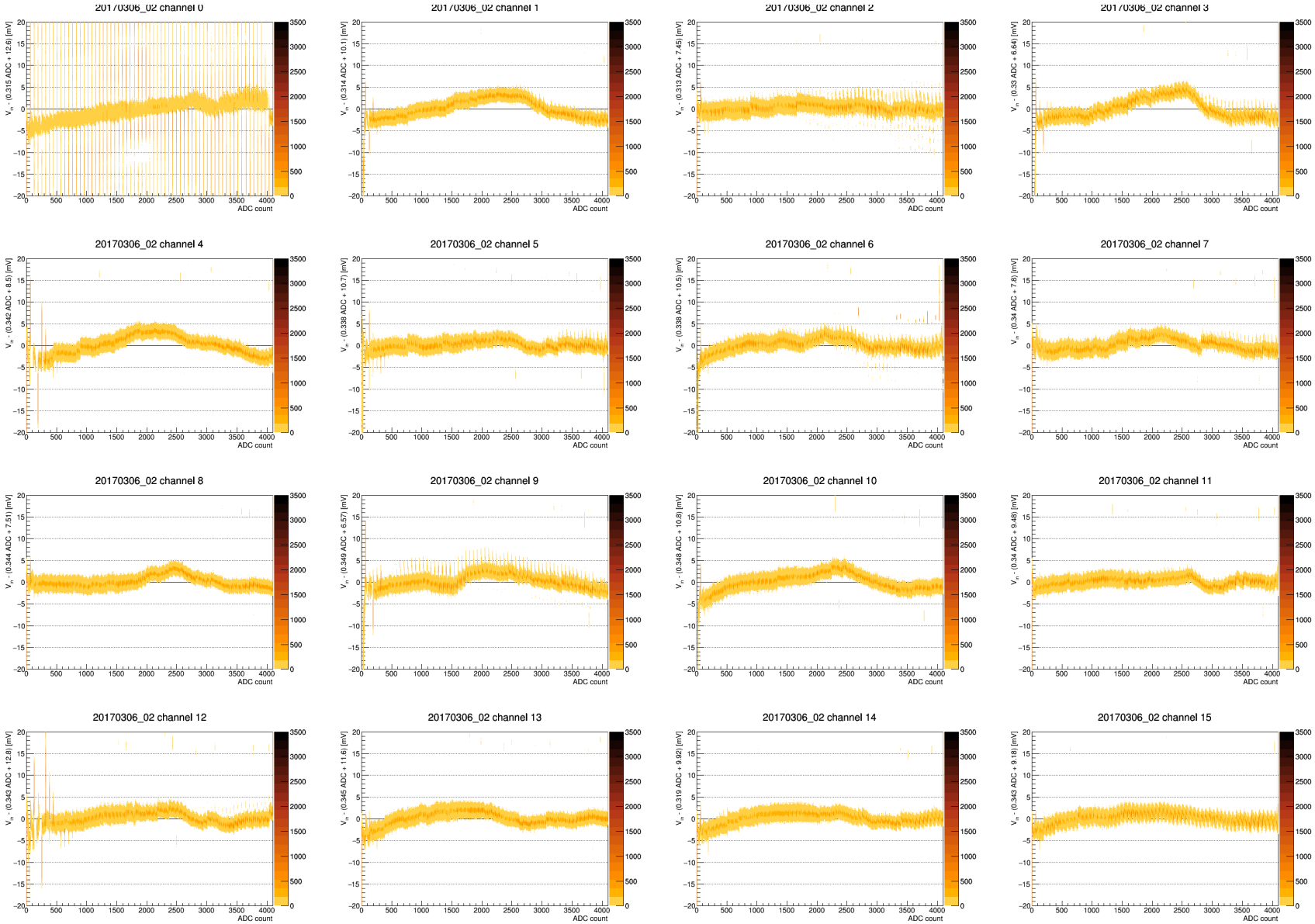
P1 ADC response Mar 6



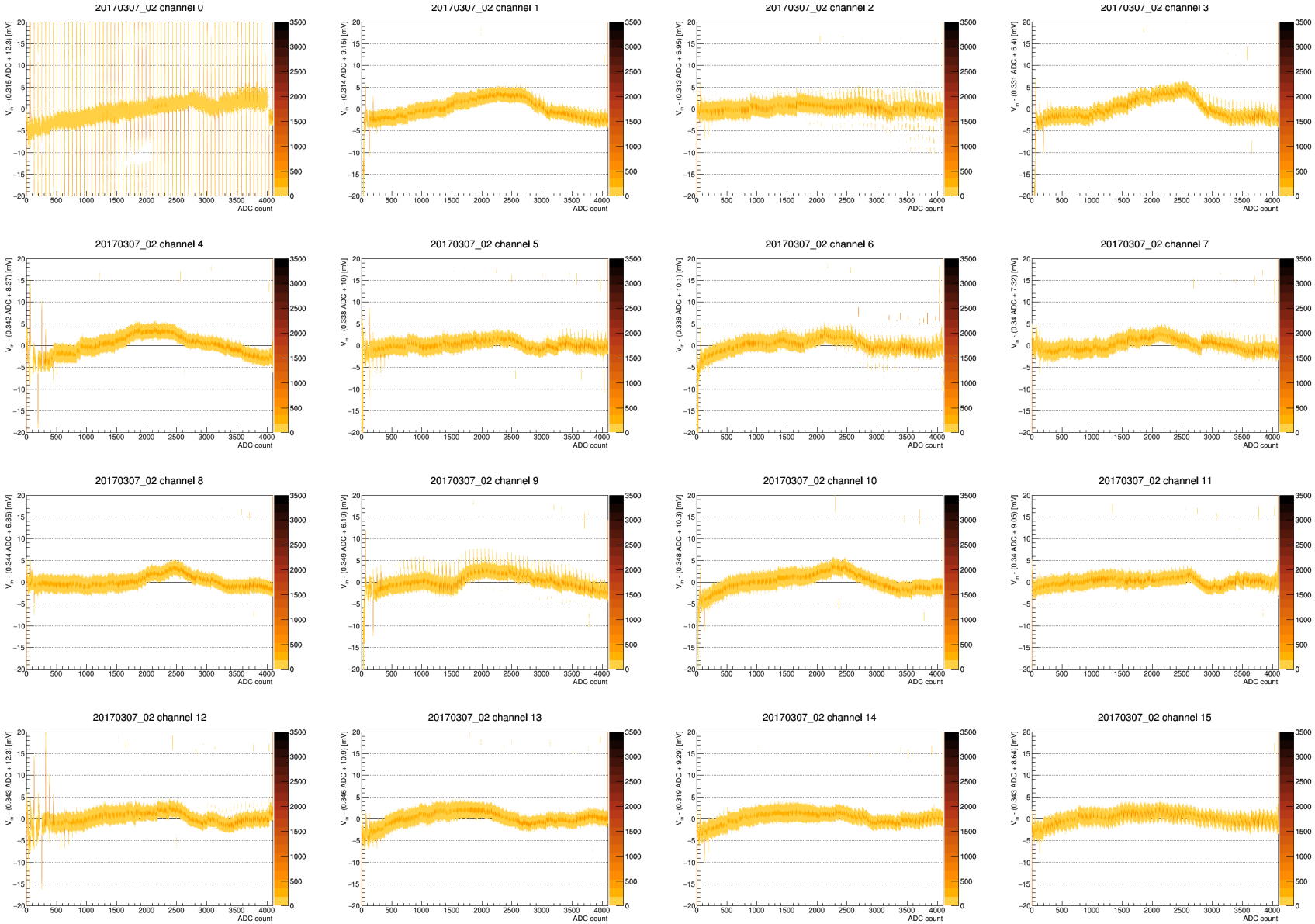
P1 ADC response Mar 7



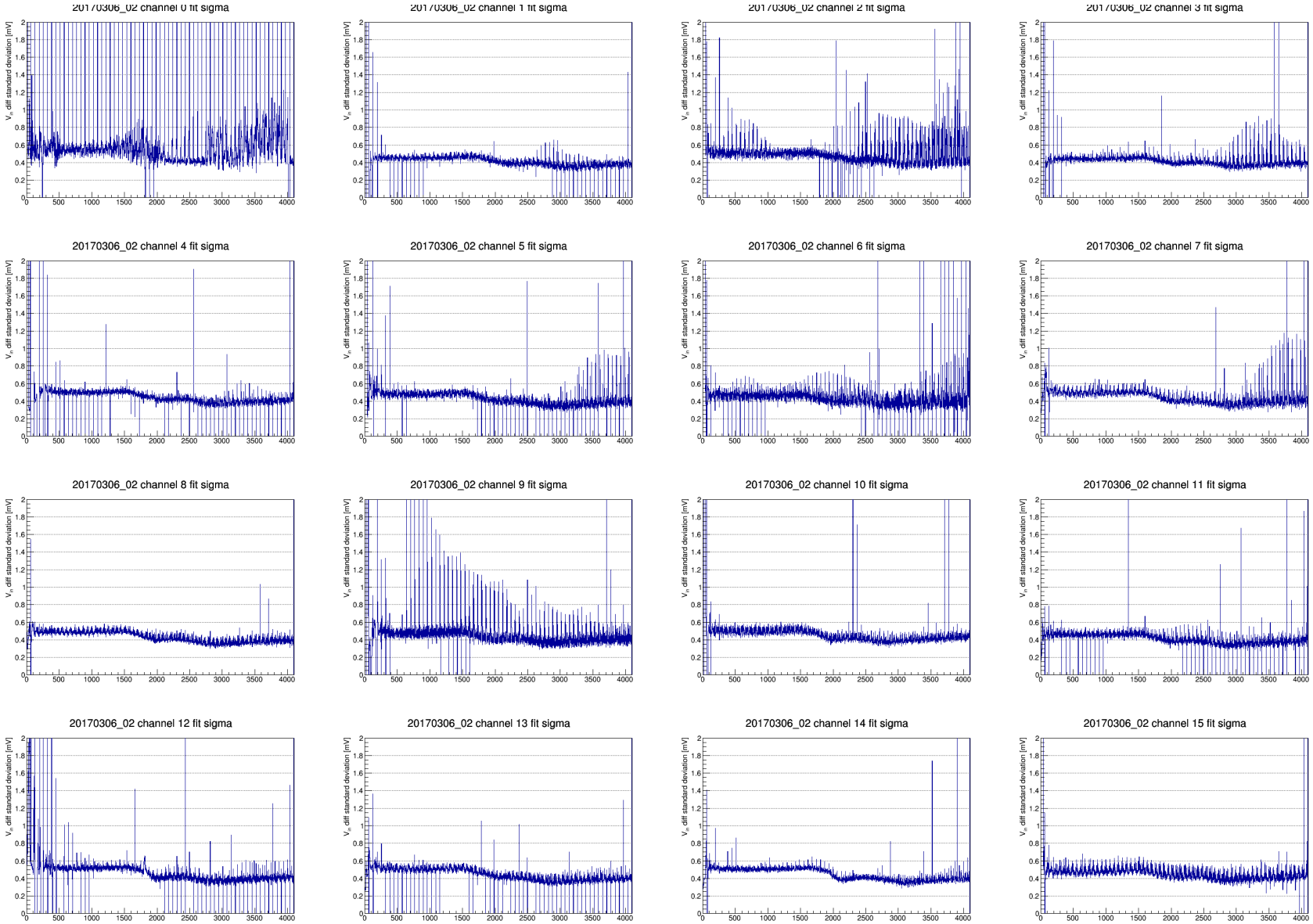
P1 ADC linearity residual Mar 6



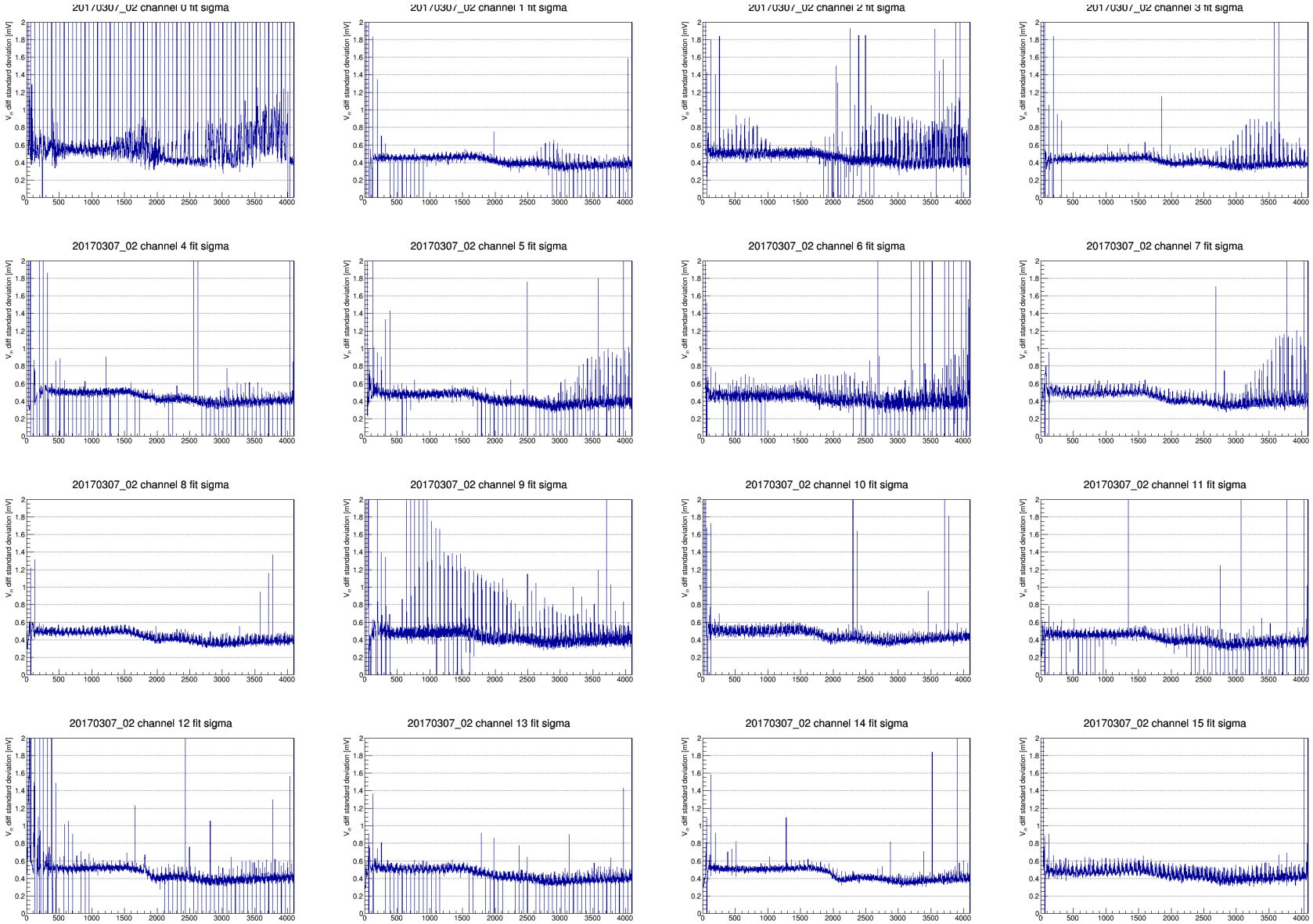
P1 ADC linearity residual Mar 7



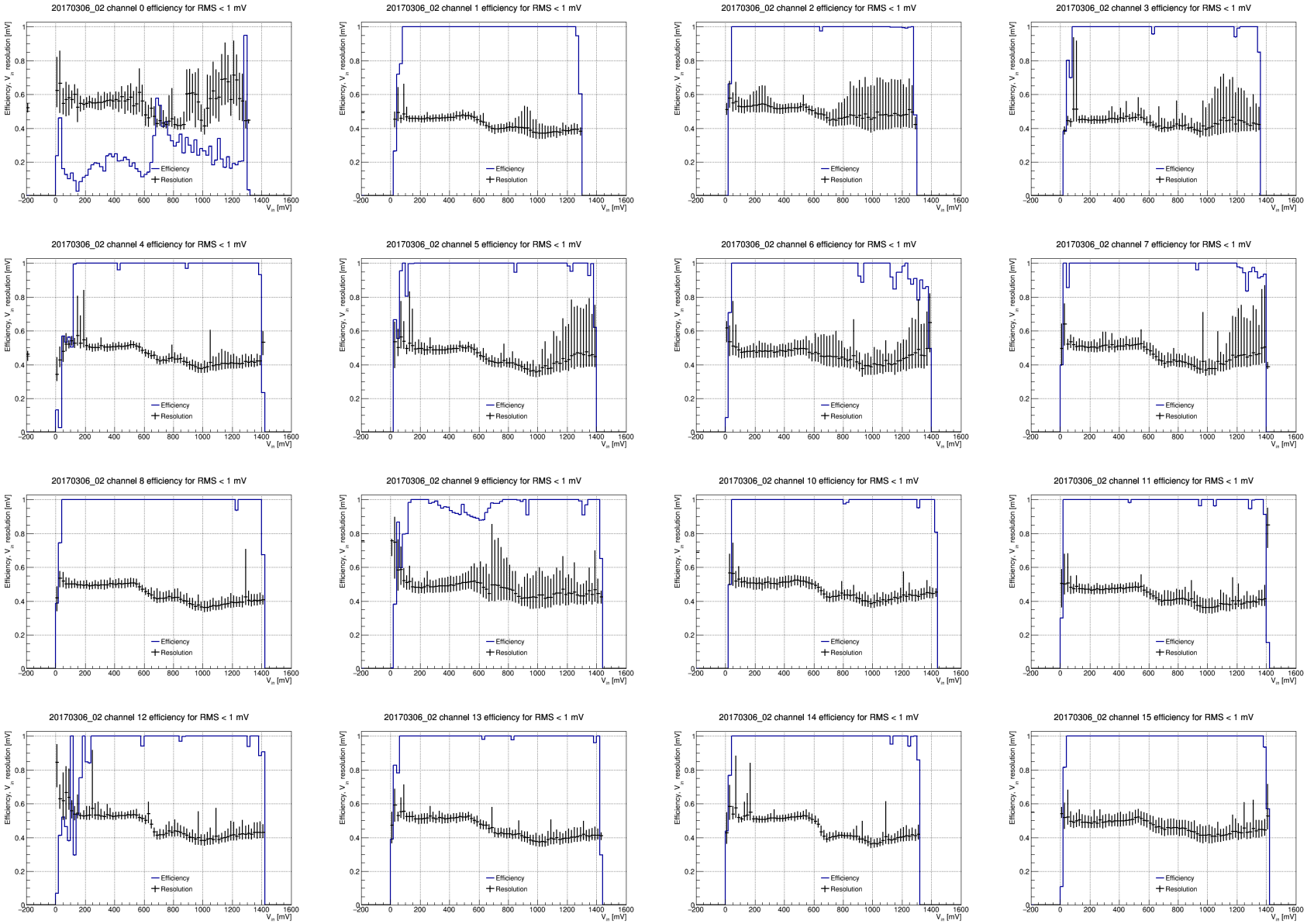
P1 ADC ultimate resolution Mar 6



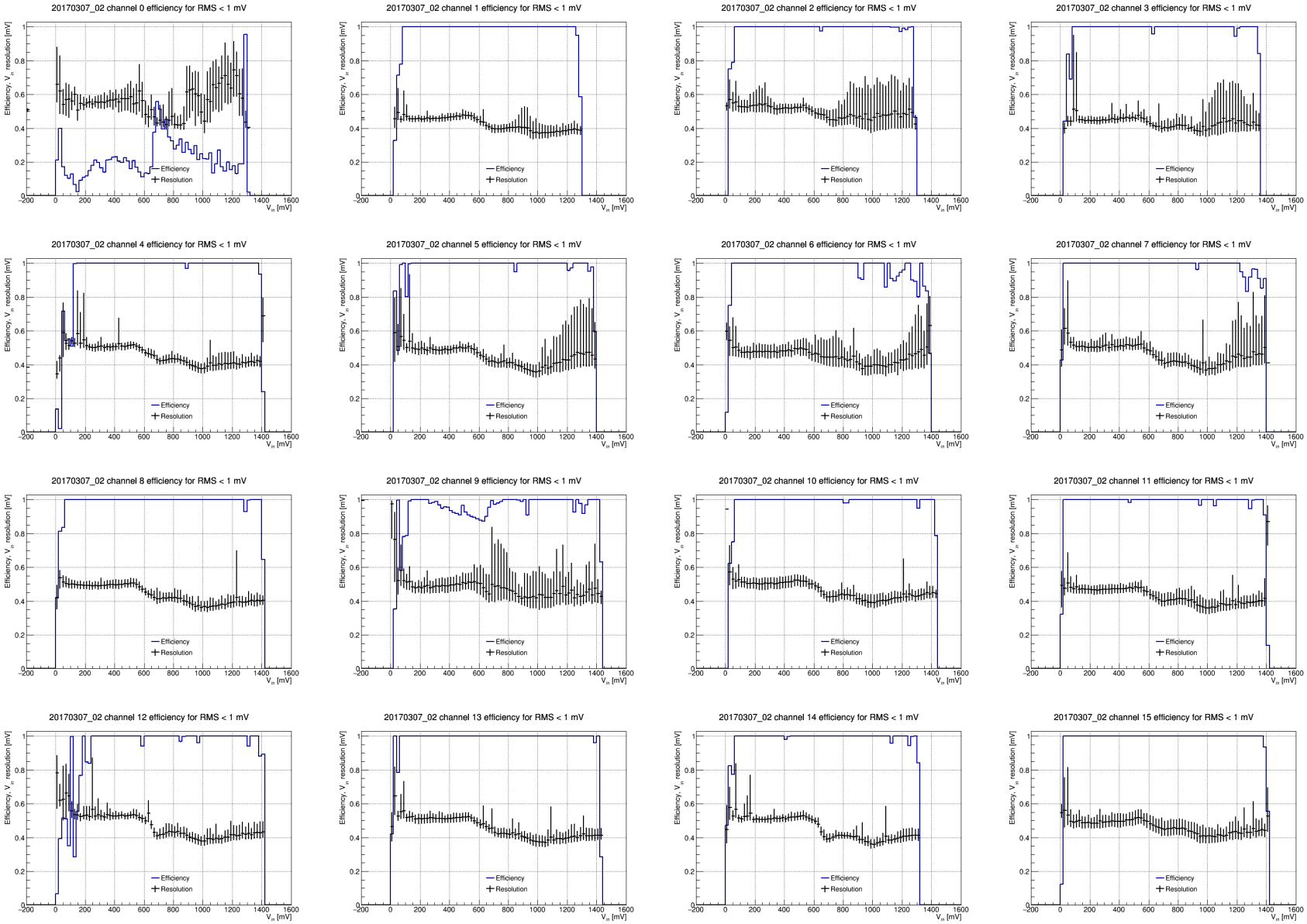
P1 ADC ultimate resolution Mar 7



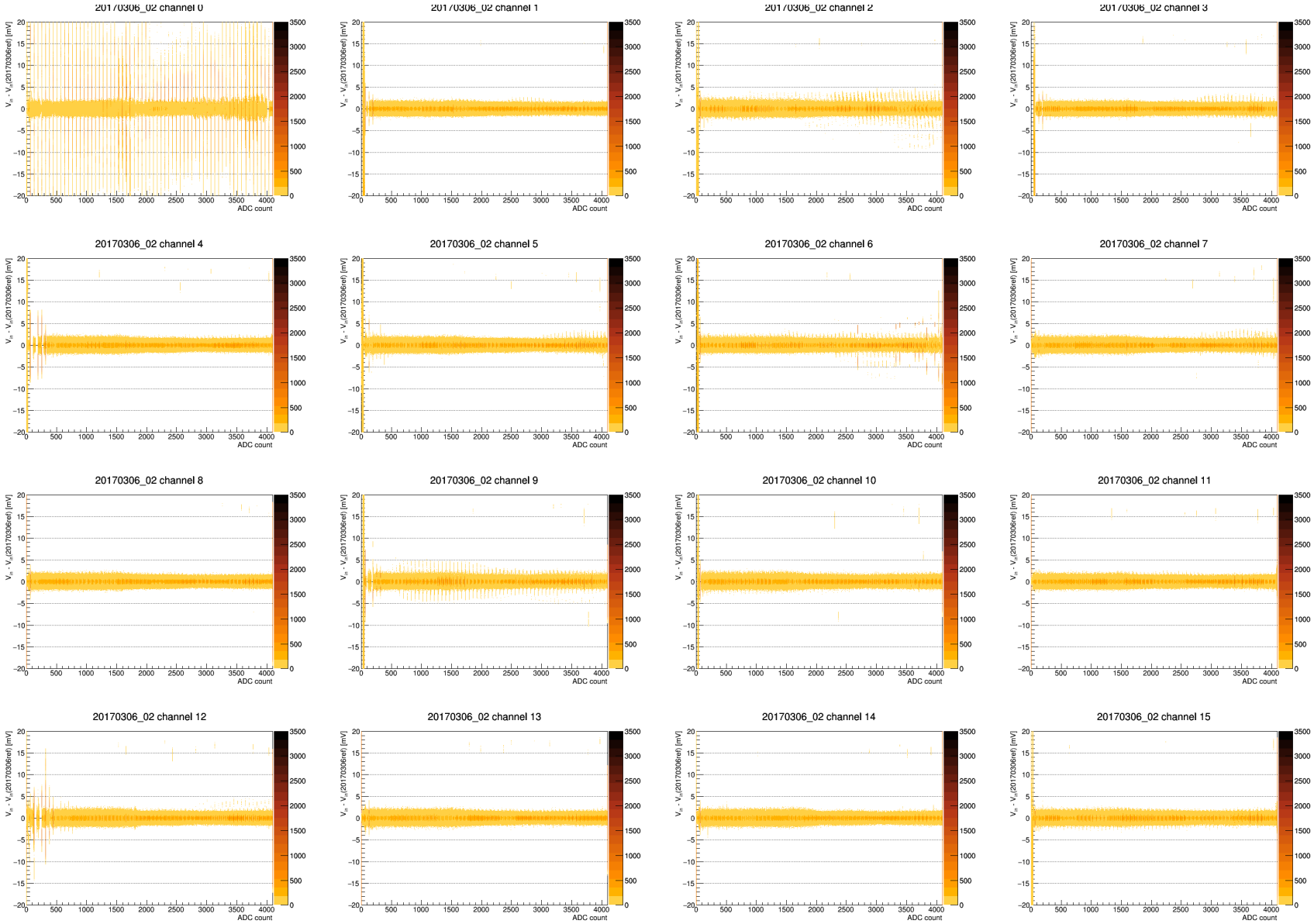
P1 ADC performance Mar 6



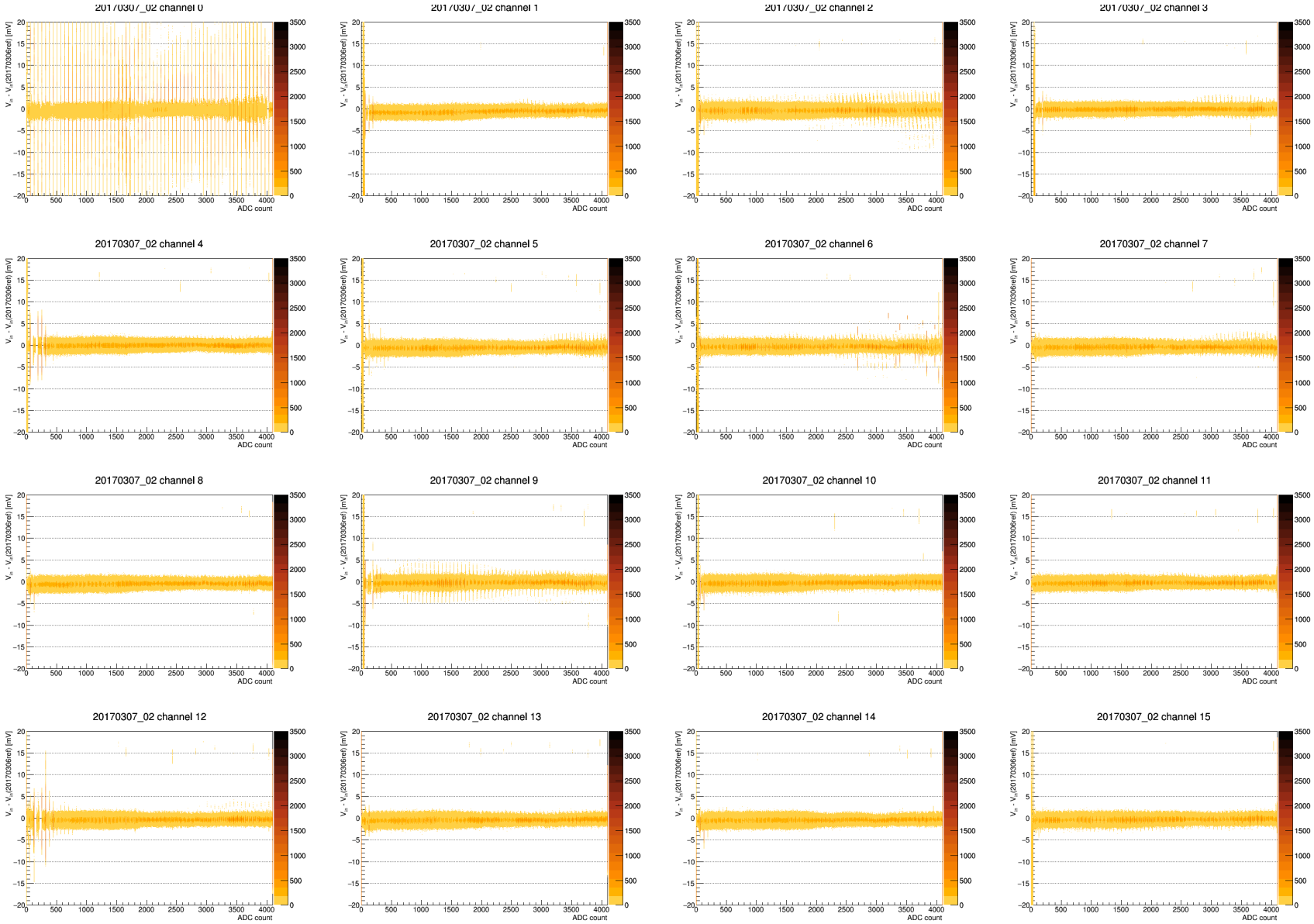
P1 ADC performance Mar 7



P1 ADC calibration residual Mar 6



P1 ADC calibration residual Mar 7



Time dependence comments

Do not see the 2 mV nonlinearity residual jumps reported earlier

- I.e. with thermal/power cycling between measurements
- But only two measurements to compare here

Still see changes in sticky bins

- I.e. the set of bins with poor resolution changed between Mar 6 and 7
- Many/most bad bins are bad for both

See a 1 mV systematic shift between Mar 6 and 7

- Looking at Mar 7 data with Mar 6 calibration
- Artifact of test environment or imprecision in V_{in} calibration?