



Updates on PXD Offline Calibration

Qingyuan Liu

qingyuan.liu@desy.de

23 Sept. 2019



Outline

- New features in basf2
- The db object PXDPedestalMapPar
- APIs for condition DB and localDAQ (pxdbonndaq3)
- Validation and preliminary analysis of pedestals in exp. 8
- Summary & outlook

New features in basf2

- Two new branches on STASH:
 - feature/BII-4964-update-of-pxd-calibration-code-for-phase-3 (maintained by Maiko)
 - ▶ **Pixel masking**: options to use PXD Digits or fill charge info
 - ▶ **Gain calibration**: using histograms (not TTree), separated code for run independent MC
 - ▶ **Plotting** improvement
 - **feature/pxd-payload-for-pedestal-tracking**
 - ▶ New dbobject **PXDPedestalMapPar**
 - ▶ Related **scripts** to collect and plot calibration results analysed by LocalDAQ Server

The PXDPedestalMapPar

- A modification based on PXDGainMapPar:
 - Using `unordered_map` <sensorID, vector<data> >
 - Using `uint8_t` for pedestals -> 3.8 MB for 20 sensors
- New methods(functions):
 - `SetContent` for a specific sensor using a `python list`
 - `GetContent` to a `python list` of all pedestals from one sensor

New db object is ready, and how to use it?

APIs for condition DB on localDAQ Server

■ PXDLocalCalibrationManager.py

- importPedestalMapFromFiles(fileList, expN, runN)

■ pedsMappingFromFile.py (python2, using lab_framework)

- pedsFileMapping(sensorName='1021', ifile, ofile='tmp.npy')
- Called by the Manager via python subprocess module

■ plotPedestalMaps.py

- Draw mean&std of pedestals as a function of run no.
- Has an option to draw pedestal map for every run
- Performance optimised by using root_numpy, new functions of the dbobject

▶ For one run :

Previous	
real	0m44.619s
user	0m24.664s
sys	0m7.131s

▶

A factor of 2-4

Improved	
real	0m24.401s
user	0m6.642s
sys	0m5.538s

PedestalMap Validation

- The pedestal **difference** between DB and the localDAQ file analysis.npy is **0**.
- Is the **mapping** of pixels (pixel global id) consistent with what's used in **basf2**?

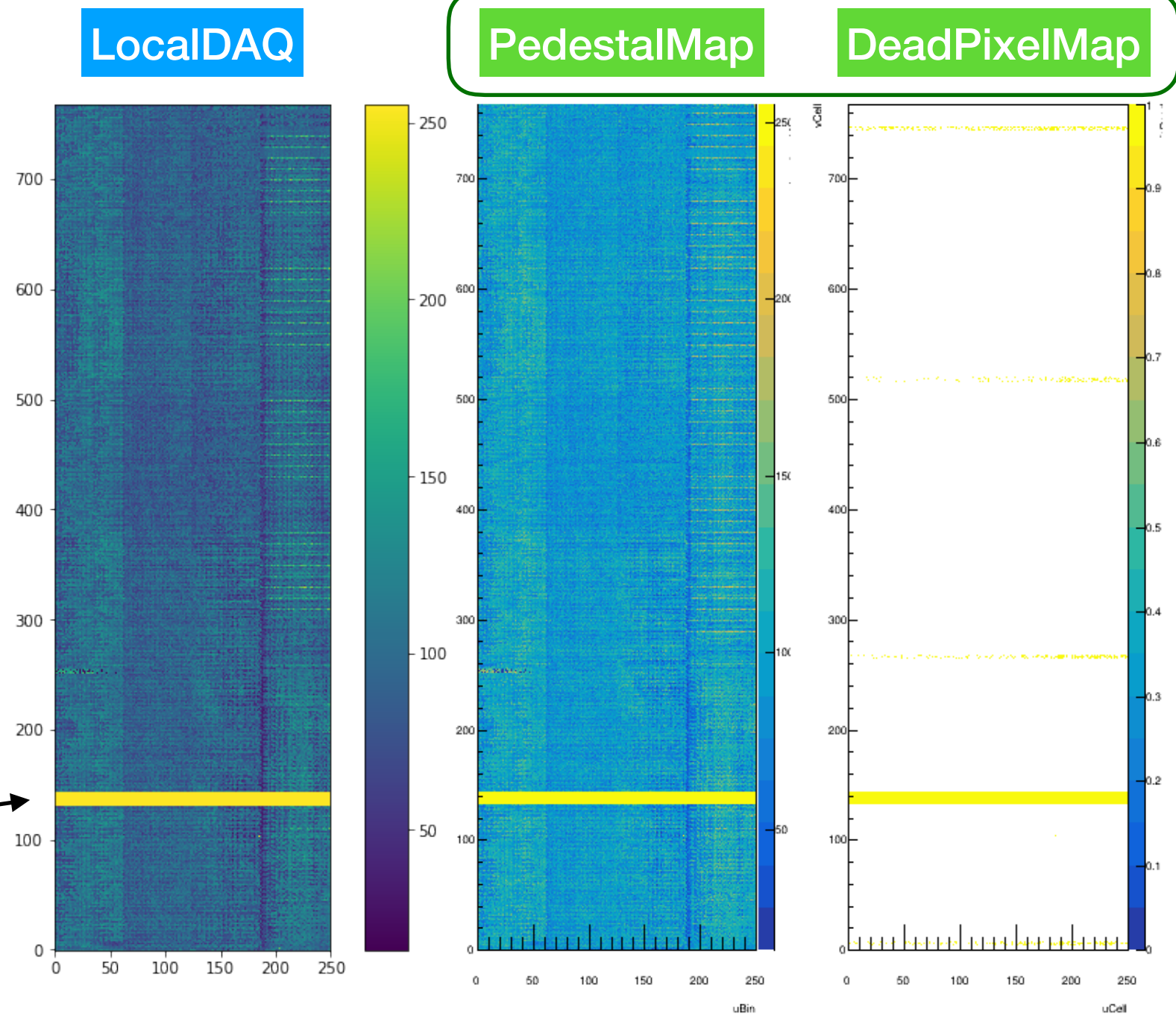
PedestalMap Validation

- Exp = 8, Run = 3047, with modules:

Conditions DB

- IF : 1011
- IB : 1012
- OF: 2051
- OB: 2052

Masked gates



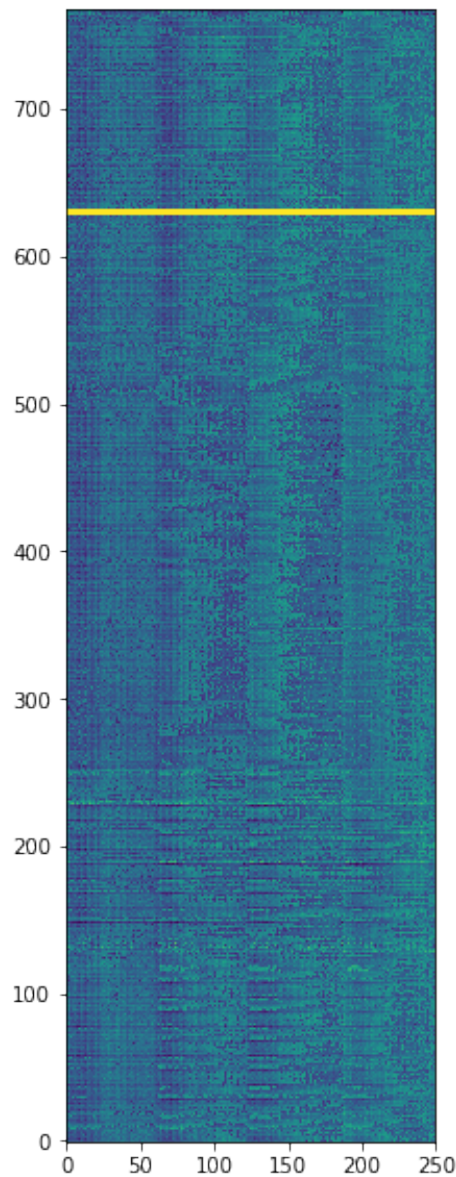
PedestalMap Validation

- Exp = 8, Run = 3047, with modules:

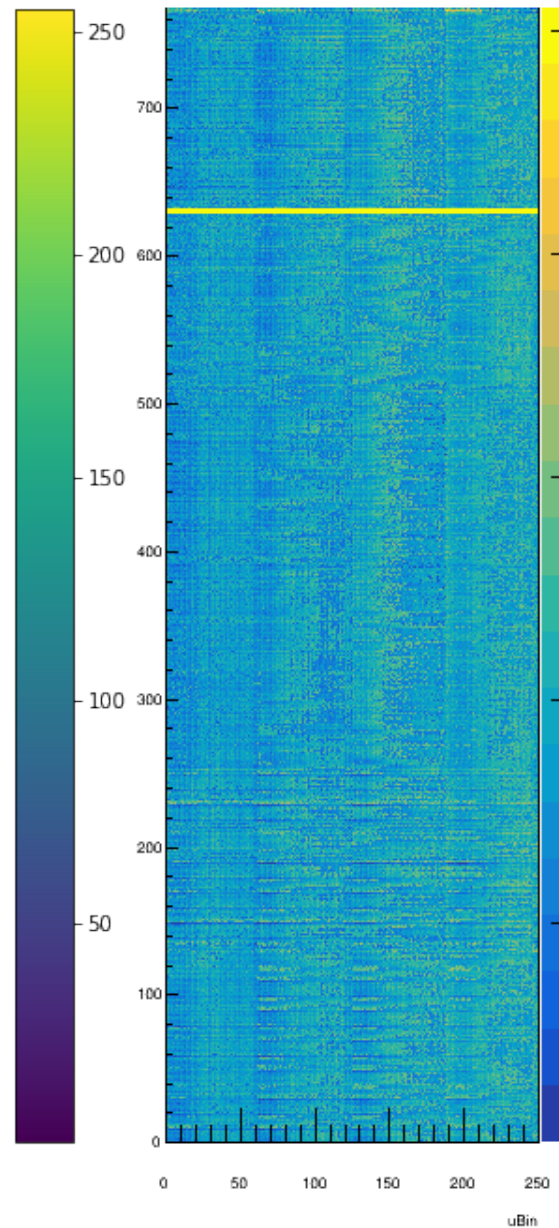
Conditions DB

- IF: 1011
- IB: 1012
- OF: 2051
- OB: 2052

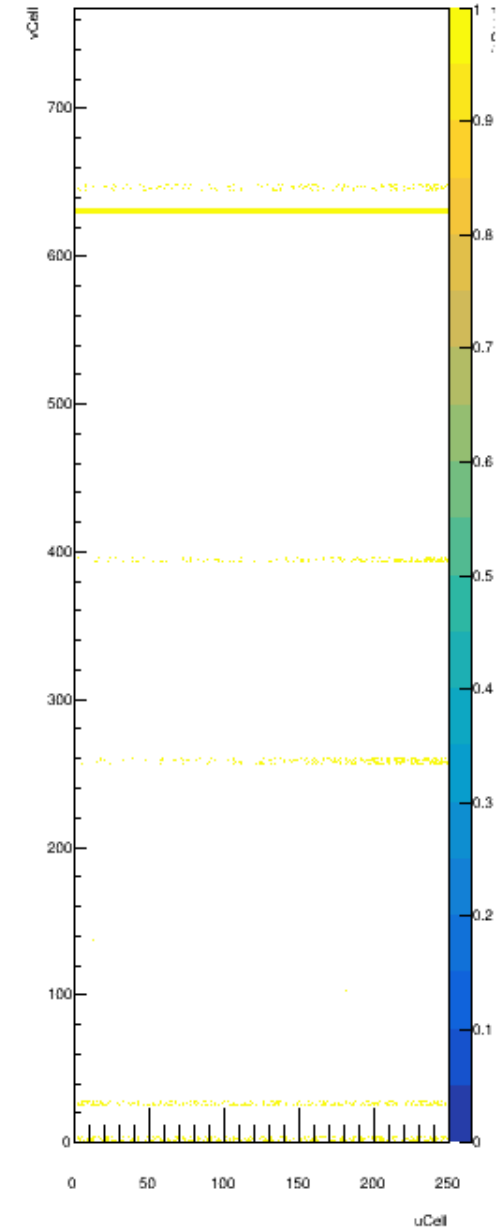
LocalDAQ



PedestalMap



DeadPixelMap



PedestalMap Validation

- Exp = 8, Run = 3047, with modules:

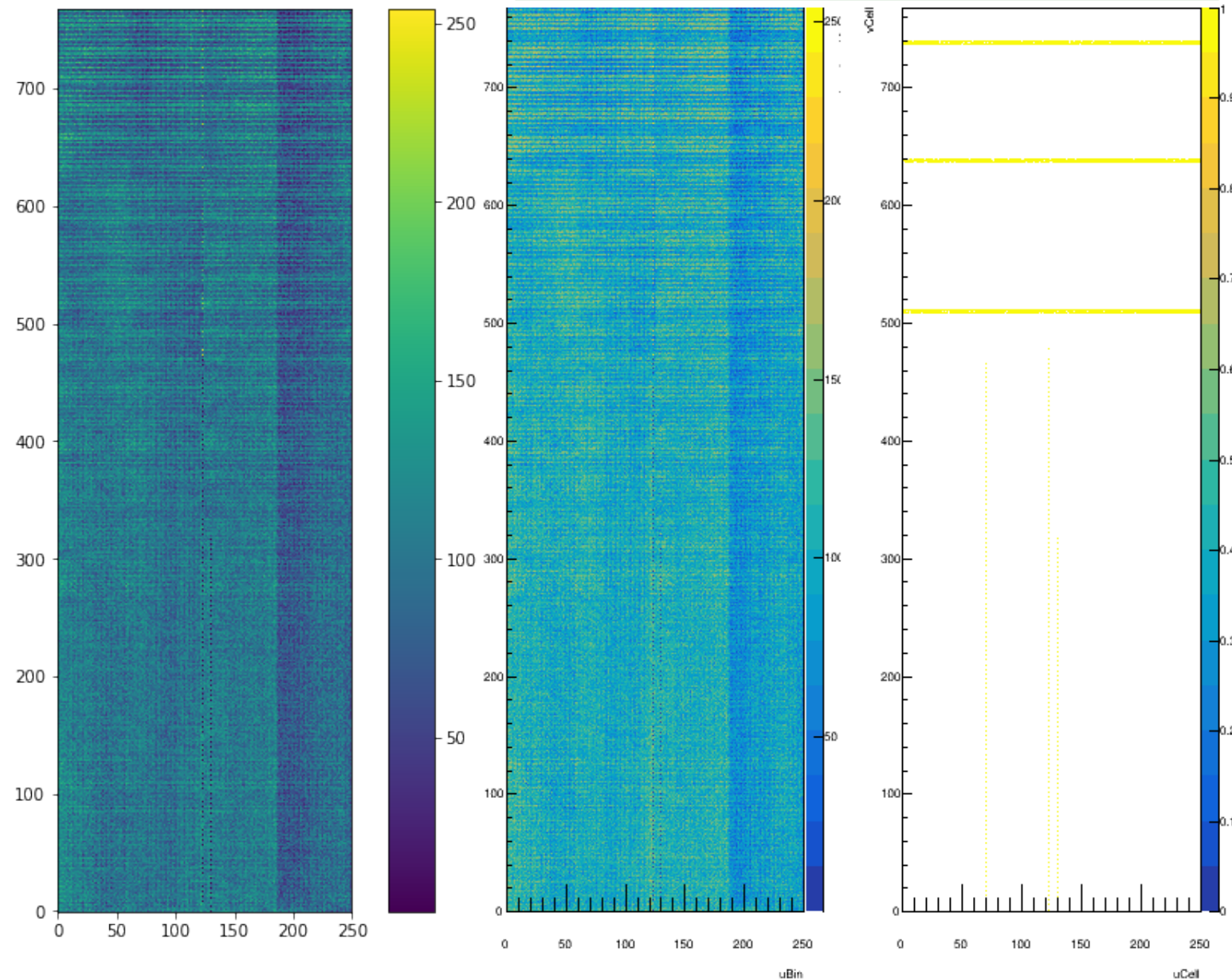
Conditions DB

- IF: 1011
- IB: 1012
- OF: 2051
- OB: 2052

LocalDAQ

PedestalMap

DeadPixelMap



PedestalMap Validation

- Exp = 8, Run = 3047, with modules:

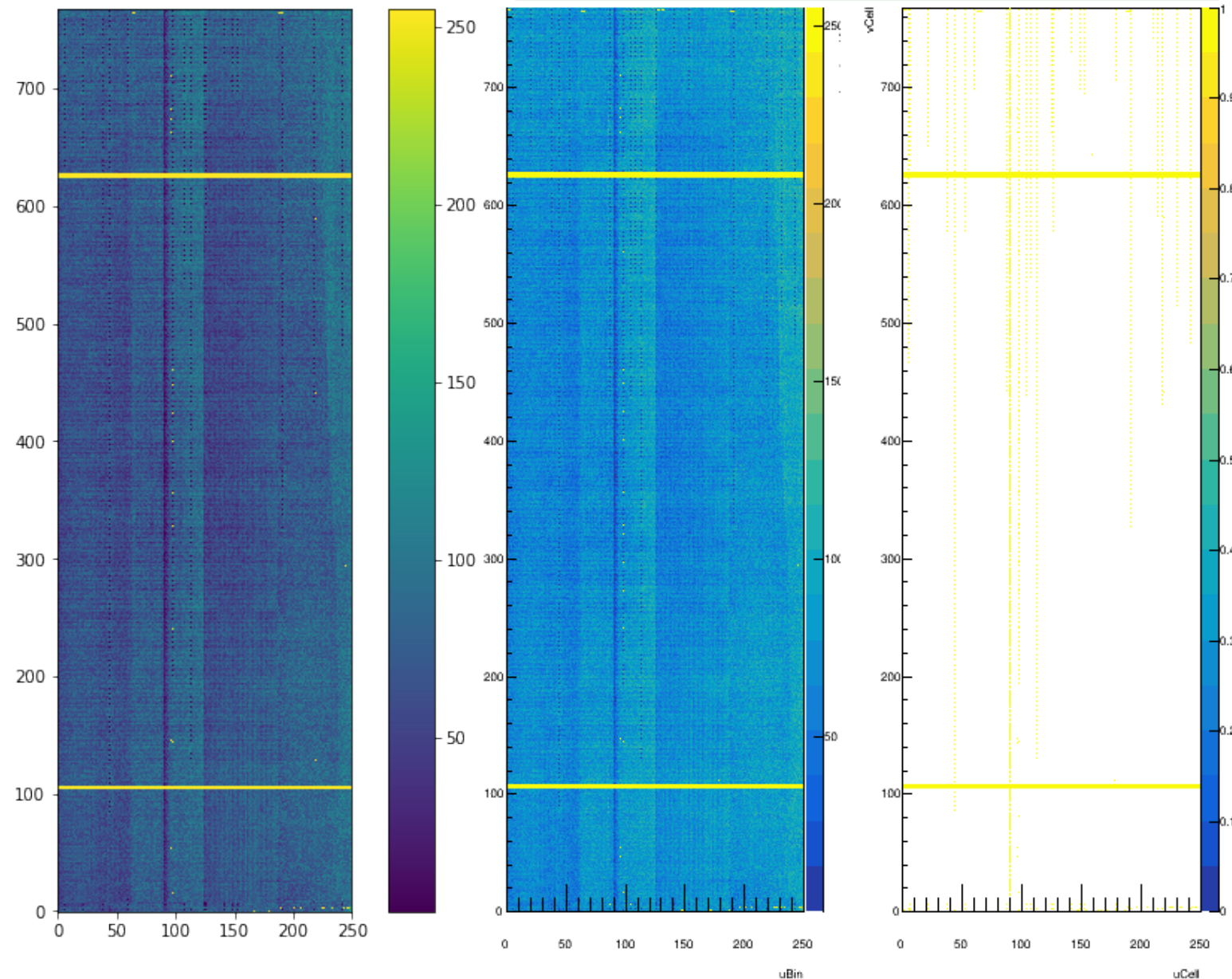
Conditions DB

- IF: 1011
- IB: 1012
- OF: 2051
- OB: 2052

LocalDAQ

PedestalMap

DeadPixelMap

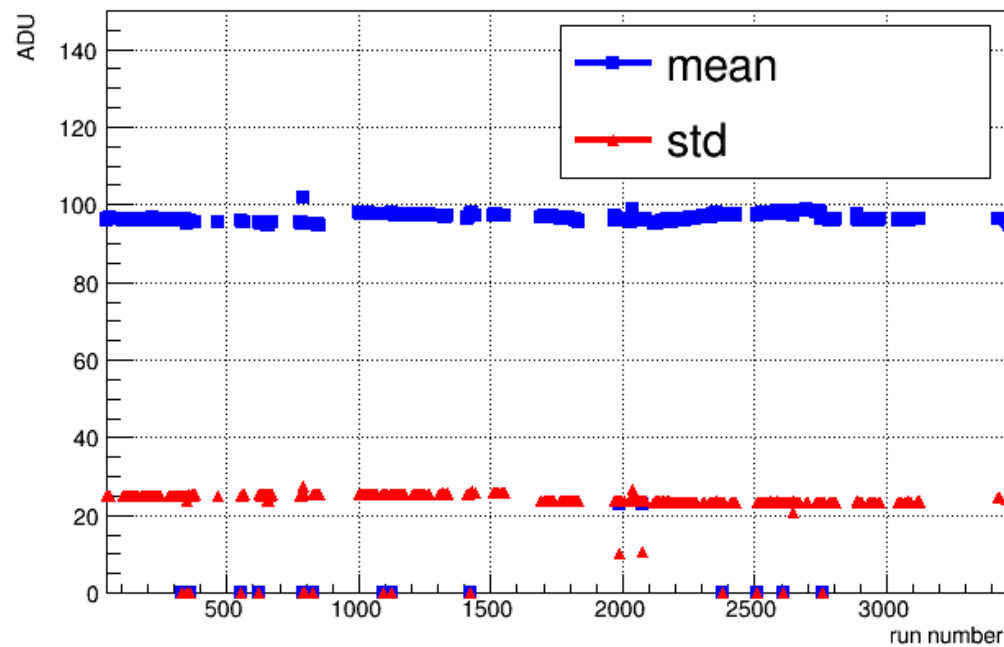


After the validation, we can try some pedestal analyses

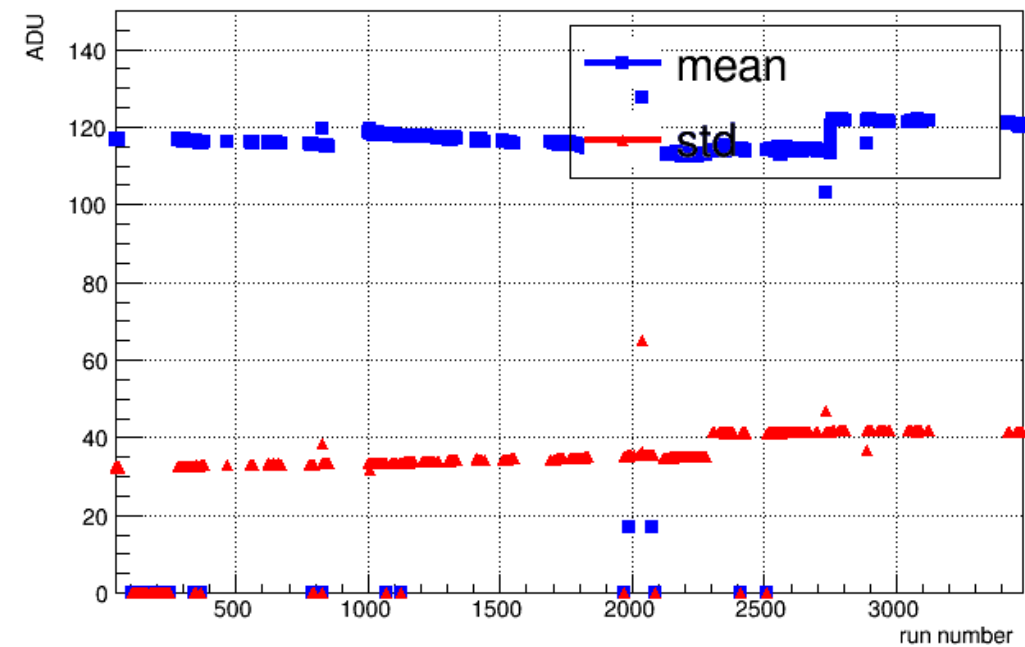
Preliminary analysis of pedestals

- Pedestals in <pxdbonndaq3:/data/commissioning/runs/all/EXP0008/pedestal/>

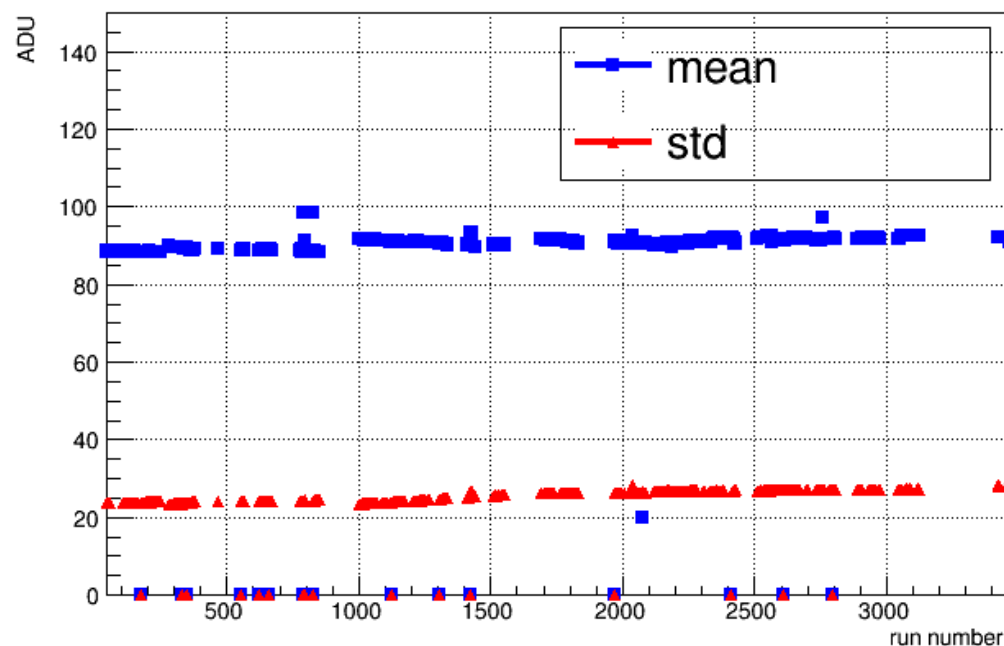
Pedestal evolution H1011



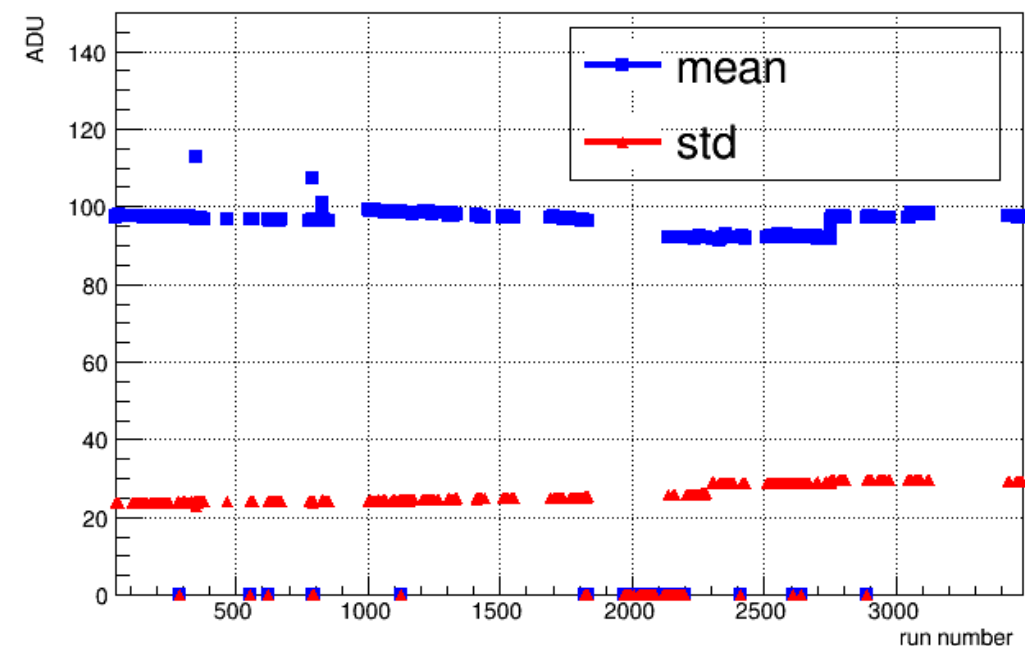
Pedestal evolution H1041



Pedestal evolution H1012



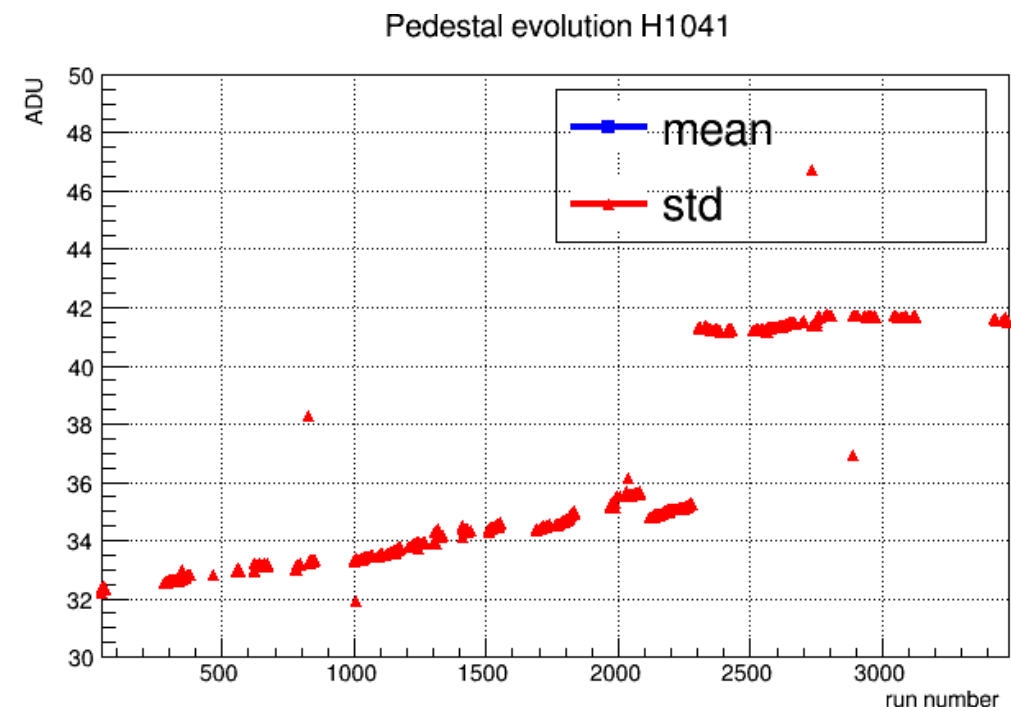
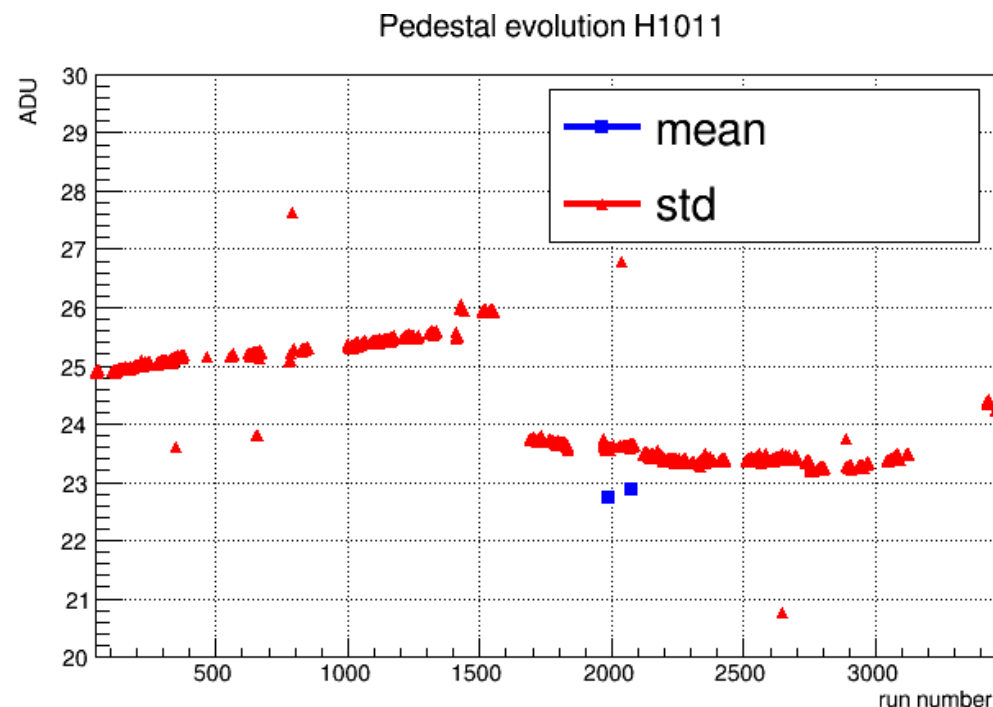
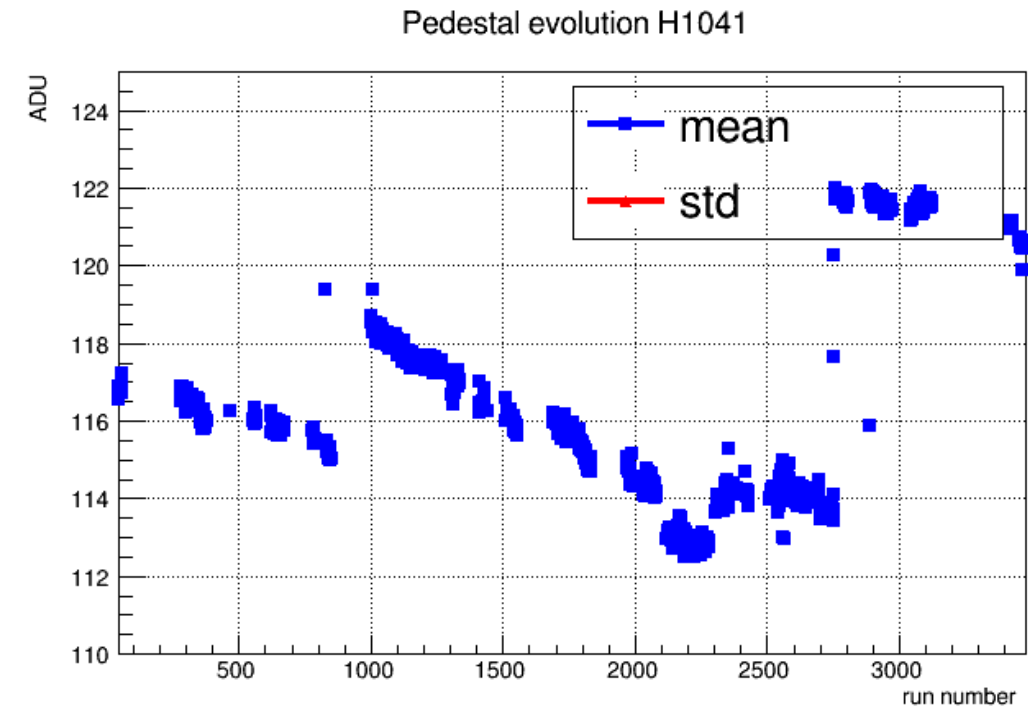
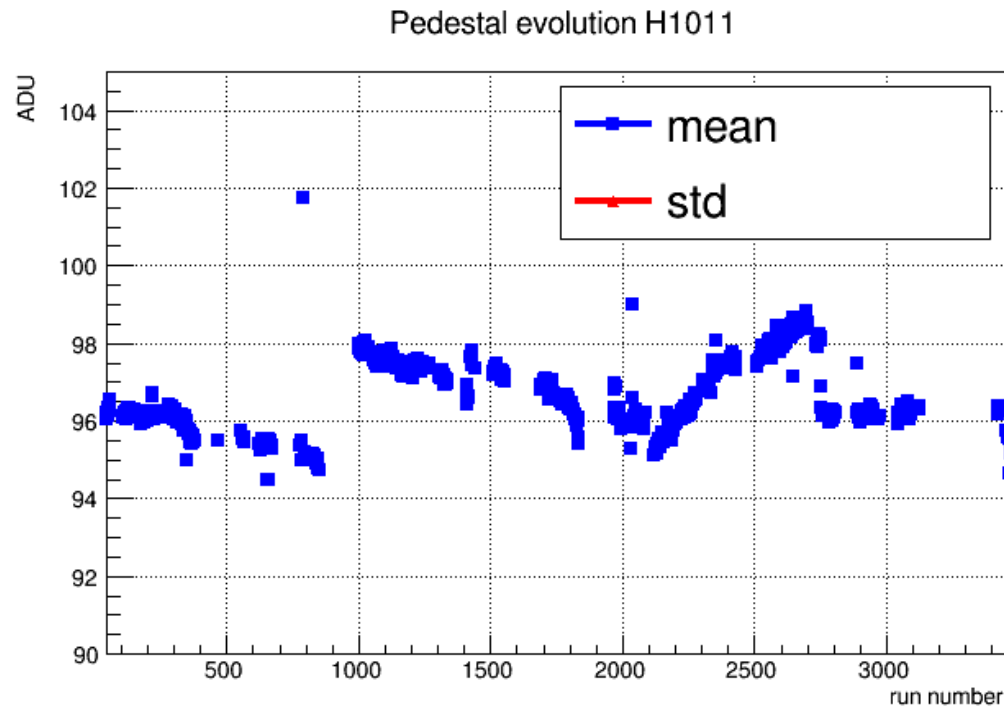
Pedestal evolution H1042



Mean and std are calculated for pedestals in the range [1,254]

Preliminary analysis of pedestals

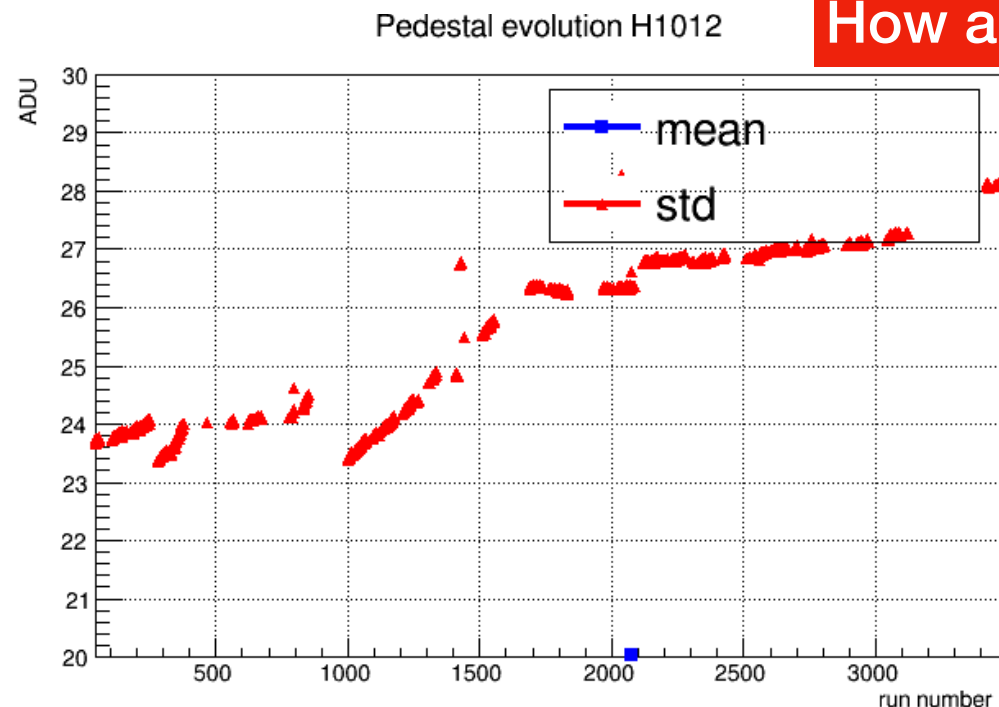
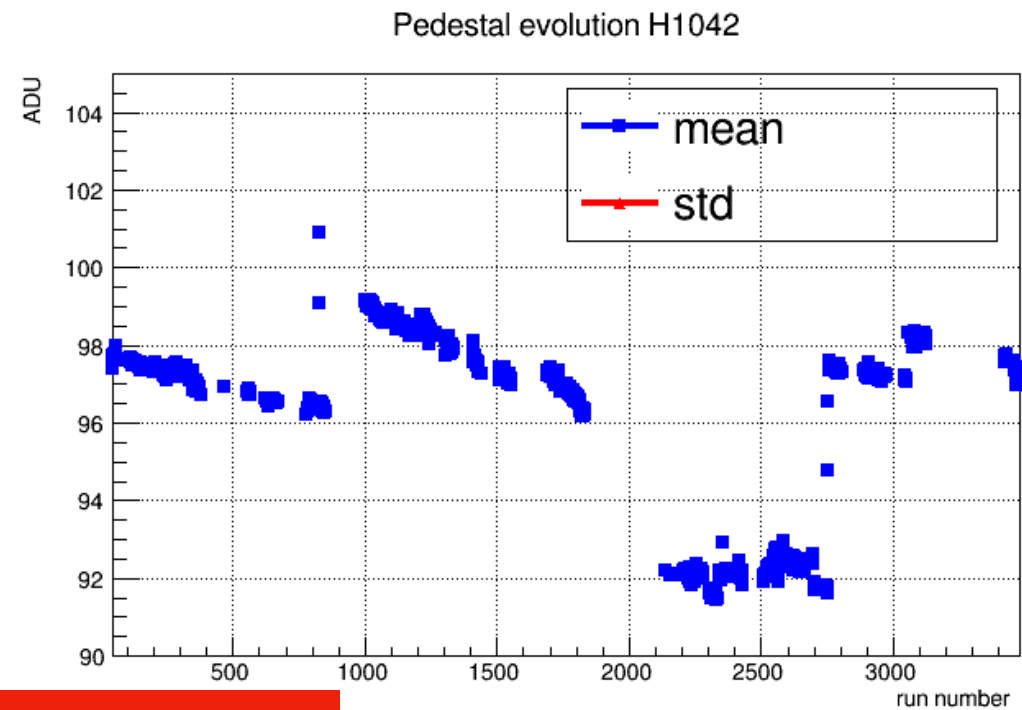
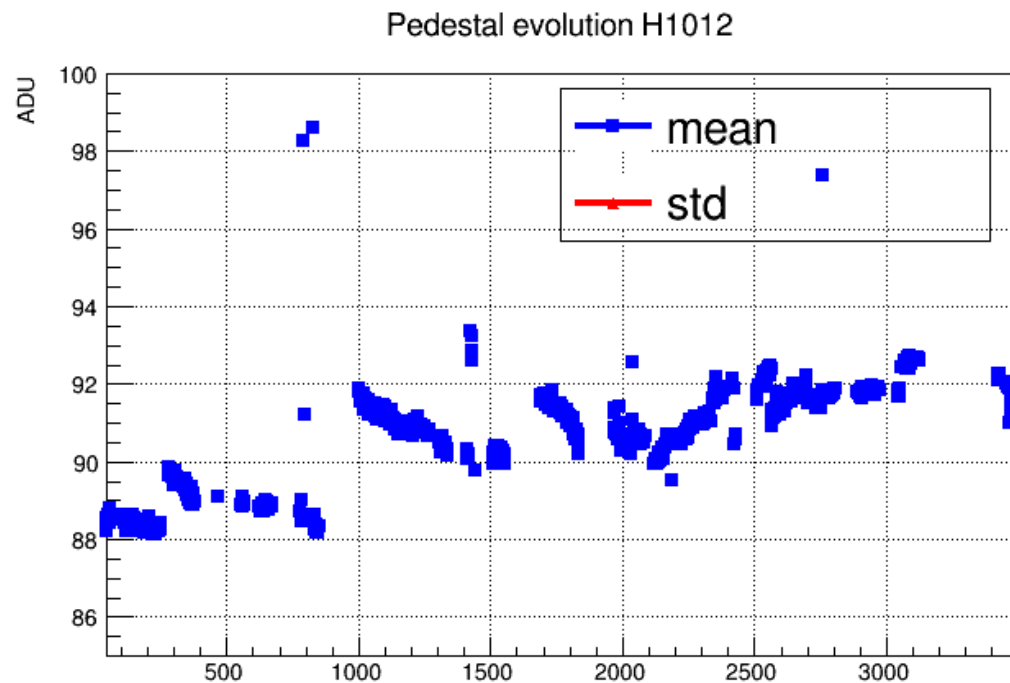
■ Zoom in 1011 and 1041



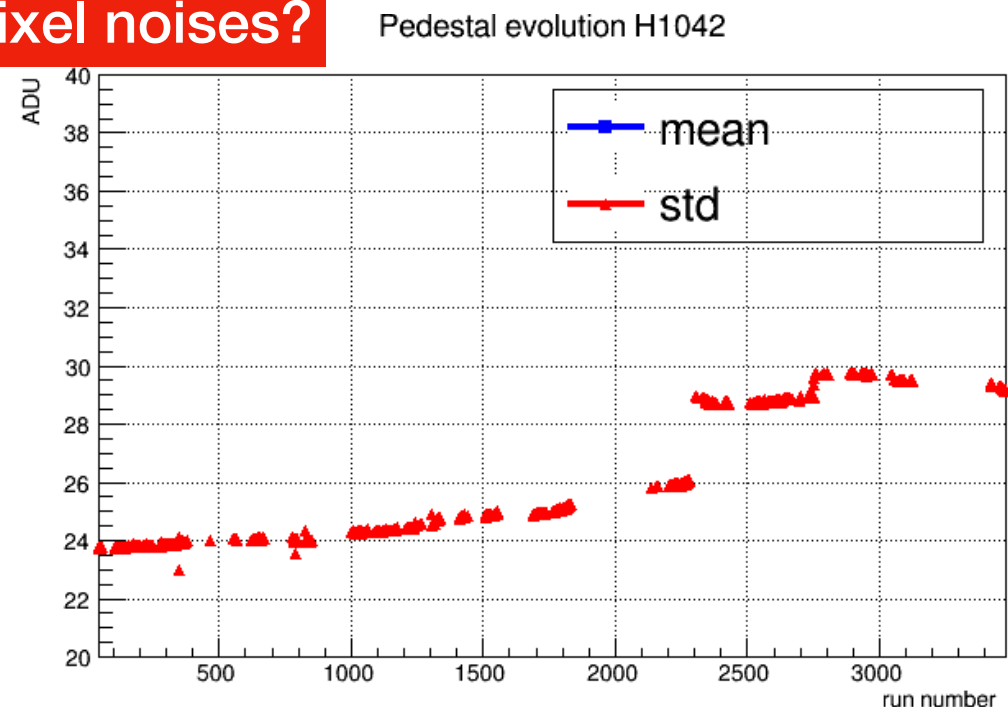
Mean and std are calculated for pedestals in the range [1,254]

Preliminary analysis of pedestals

■ Zoom in 1012 and 1042



How about pixel noises?



Mean and std are calculated for pedestals in the range [1,254]

Summary & outlook

■ Summary

- New basf2 features work well so far
- Pedestals (and noises?) are **evolving**.
 - ▶ Radiation effects, Offset calibration, gain tuning, ...
- The **PXDPedestalMapPar** object could be used to **track dead and masked pixels**

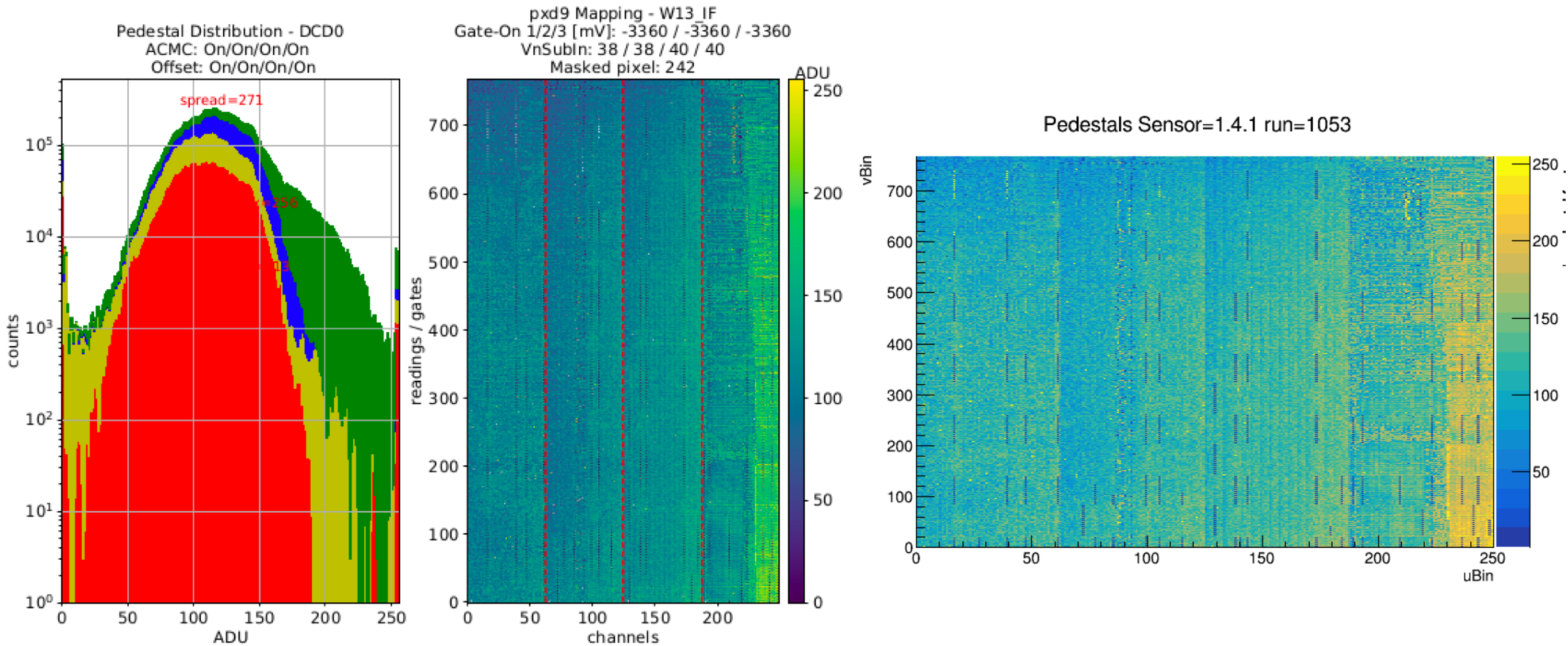
■ Outlook

- **Further validation** of the implementation
- A new **PXDNoiseMapPar** dbobject or adding noise map into PXDPedestalMapPar
- **Automated localDB generation** when a run is started with PXD
 - ▶ Better to have one file containing the NumPy arrays of pedestals and noises for each sensor.
 - ➔ New options in the upload.py script in pxd_lab_framework?

Thank you!

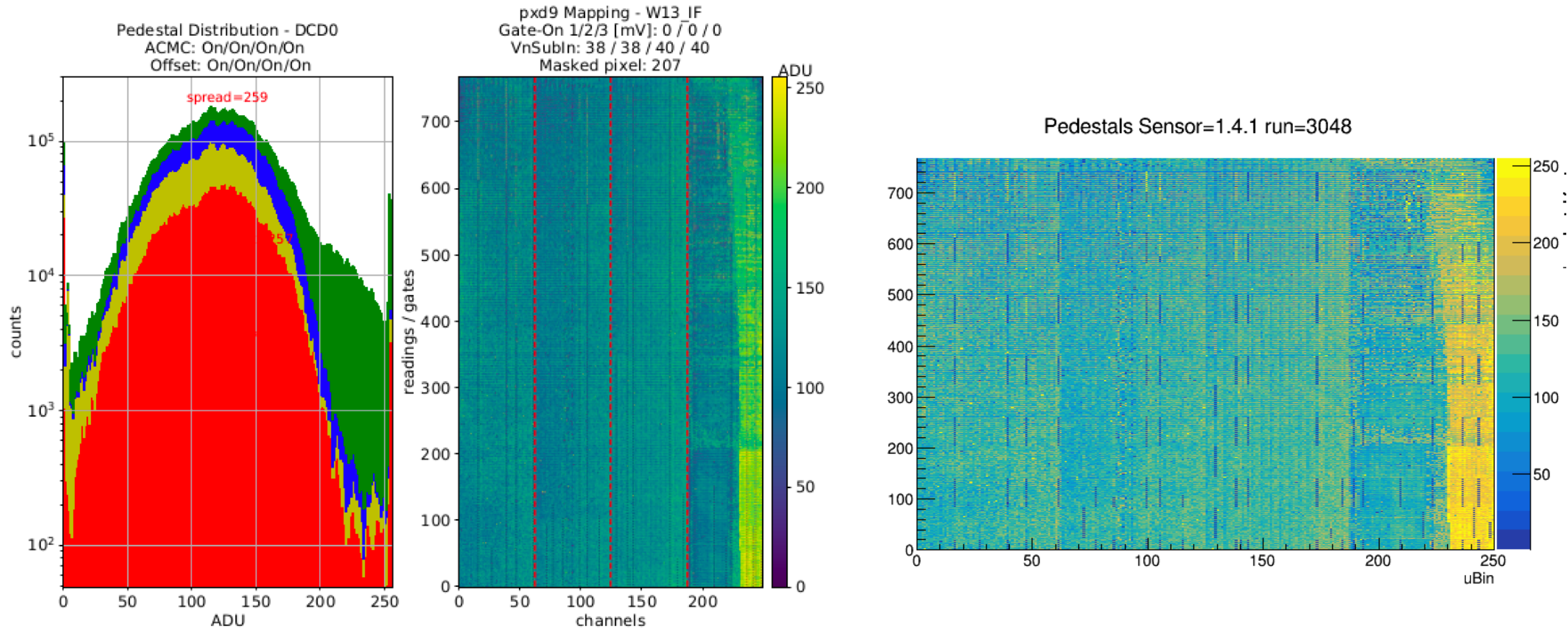
Backup

■ H1041, run 1053



Backup

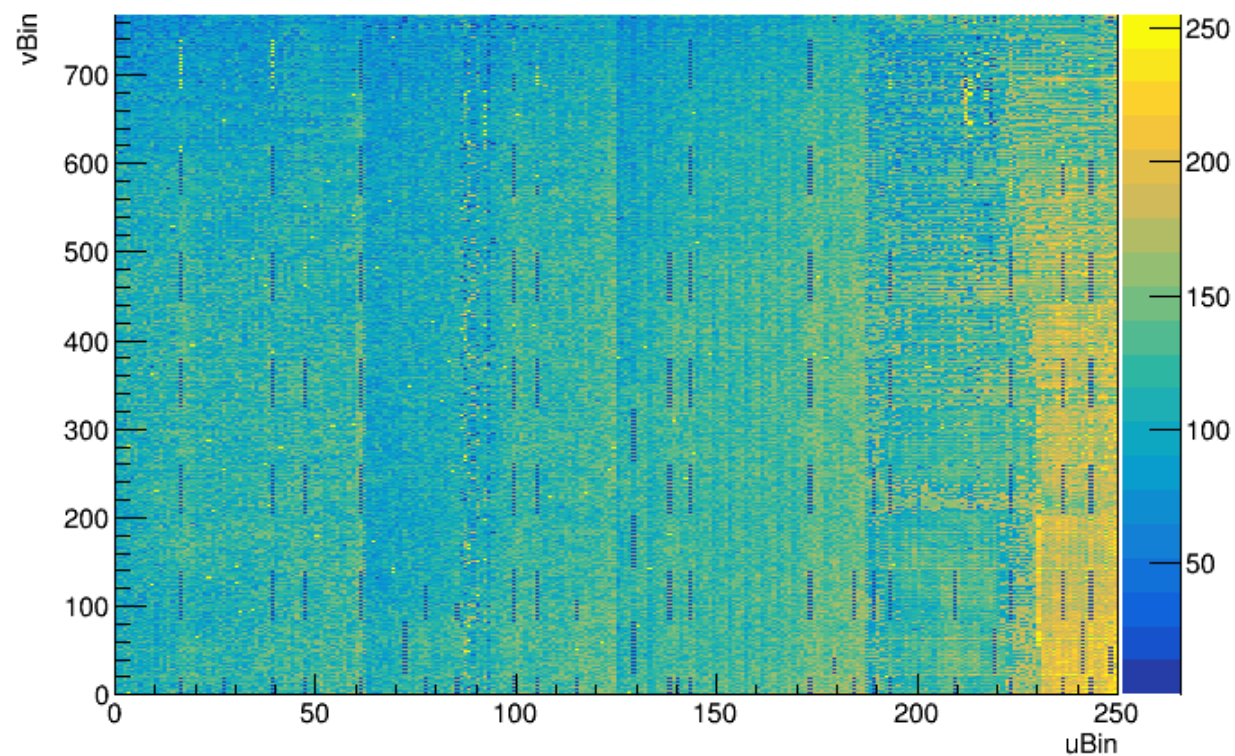
■ H1041, run 3048



Backup

■ H1041, run 1053 vs 3048

Pedestals Sensor=1.4.1 run=1053



Pedestals Sensor=1.4.1 run=3048

