Automatic pedestal tuning (after 2-bit offset calibration)

- The idea is to tune the pedestal distribution of a module post offset-calibration so that it sits in a ‘favourable position’.

- We use a current source to shift the pedestal distribution to the left of the right of the dynamic range (0-255). Currently we use VnSubOut to shift pedestals to the right (higher values).

- We use a traditional measure-analysis-update procedure with 3 different scripts for each.

- The measure script performs pedestal scans for different values of the current source.

- The analysis script identifies the ‘optimal values’ of the current source from the pedestal scan.

- The update script then updates the best values to the system/database.

- **‘Optimal pedestals’?**

- We try to avoid ‘bad pedestal region’ and try to minimize the number of pixels in this region, also we try to have the distribution as low as possible so that we have enough room to describe the signal.

- We minimize a figure of merit

  FOM = number of ‘bad pixels’ + (w * center of gravity of pedestal distribution in ADU)

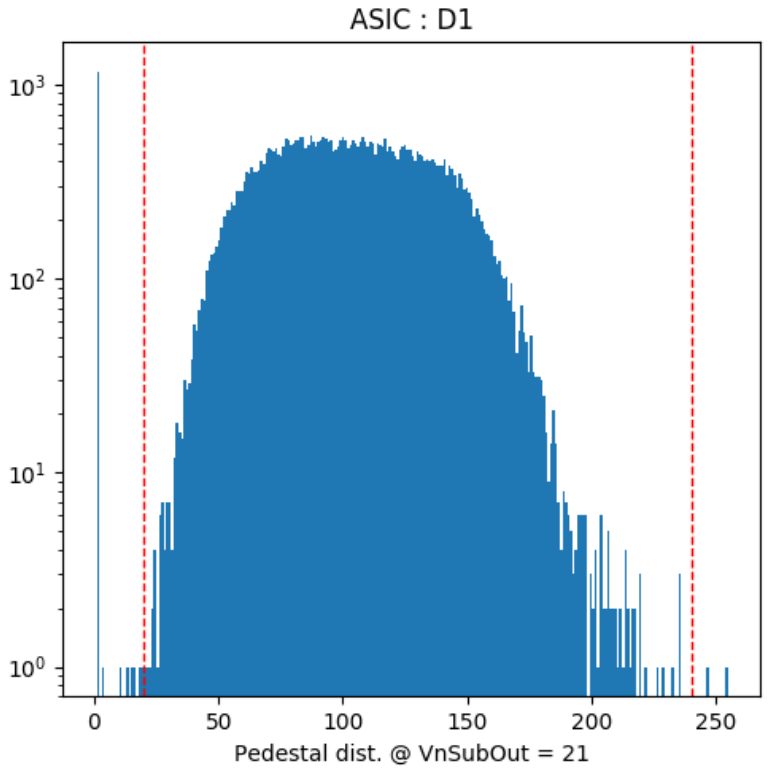
- w is a weight factor we try to get from experience.

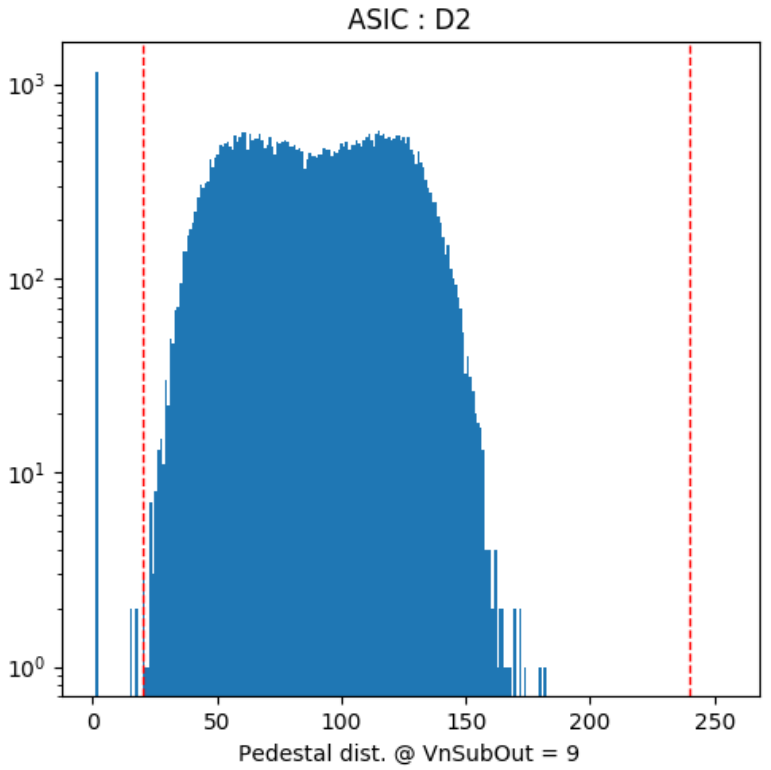
- In the tests at DESY, w was set to 0.1, 1, and 10 and it looks like w = 1 seems to work quite well.

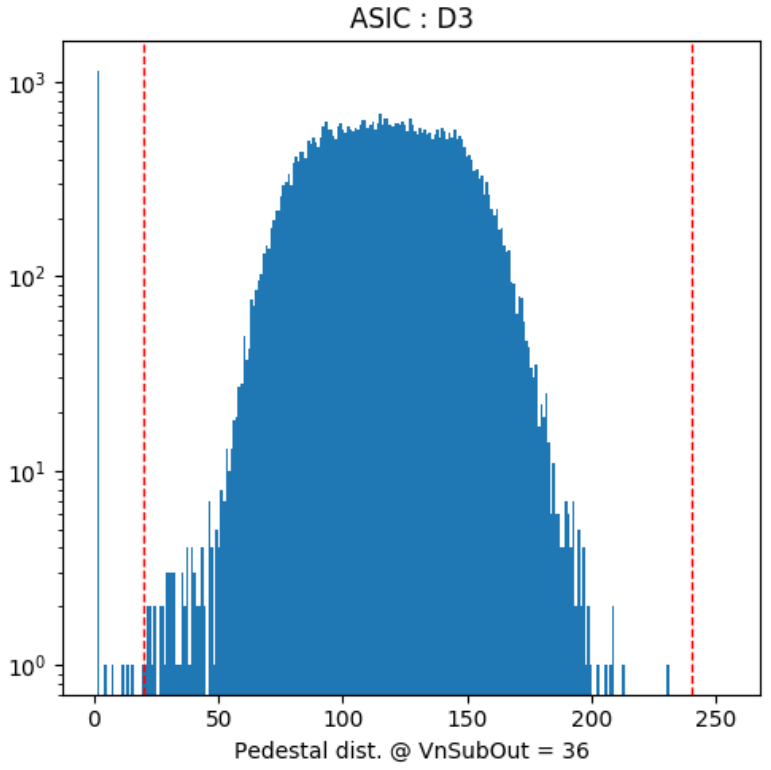
- ‘Bad pixels’ are ones having a pedestal value below 20 ADU and above 240 ADU (for plots in the next two slides)

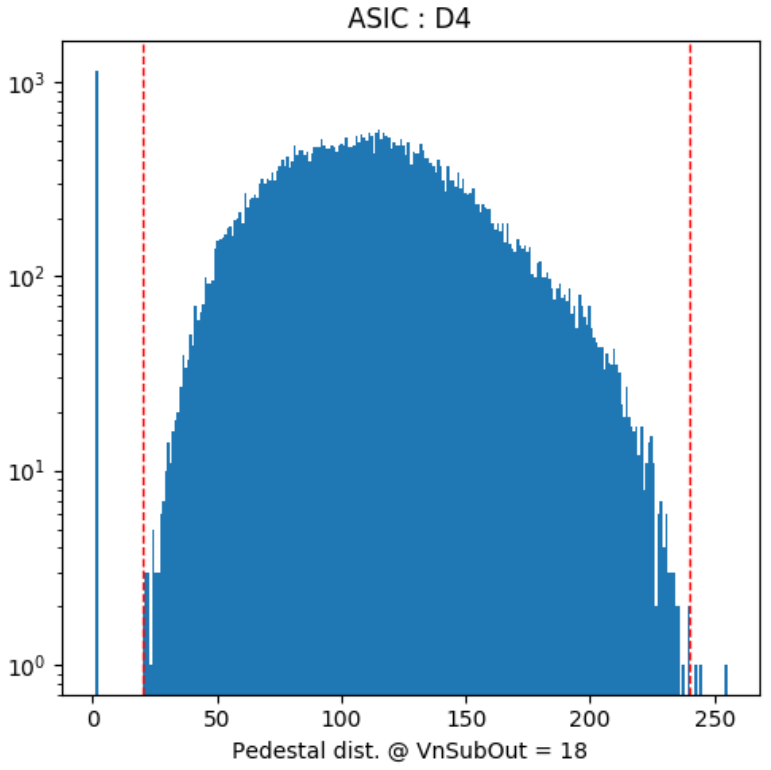
DESY Module 1021

w = 1



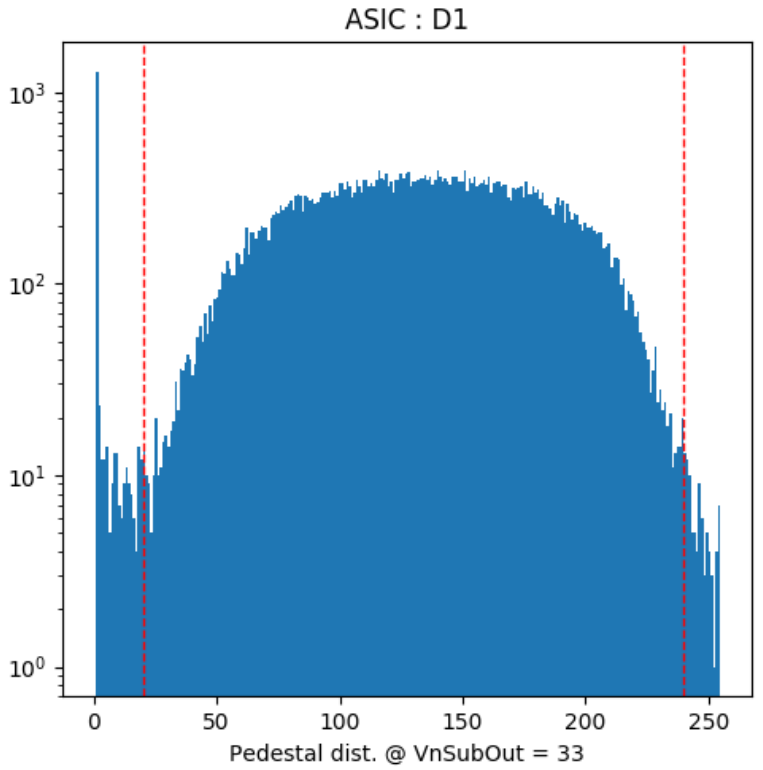


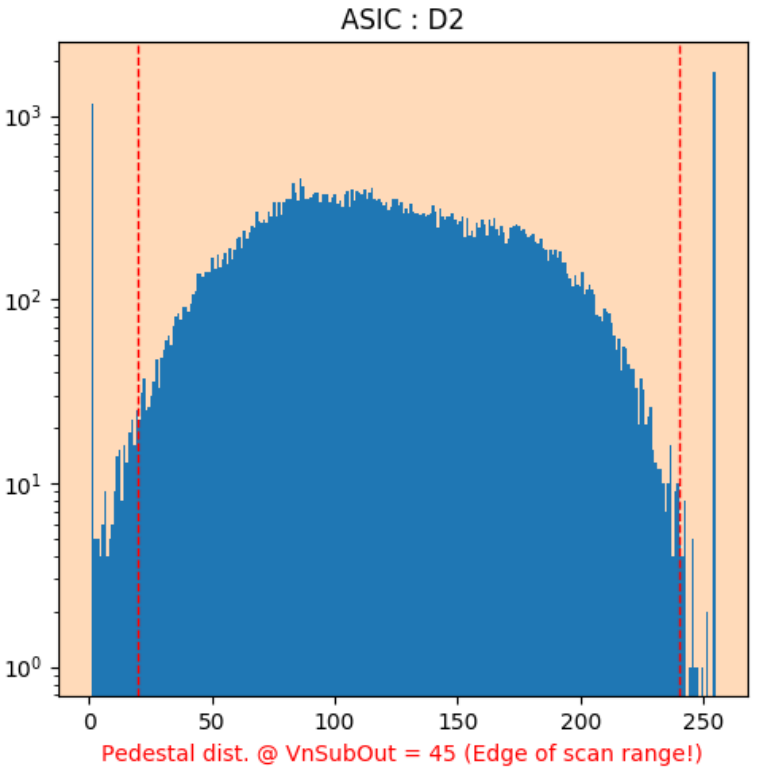


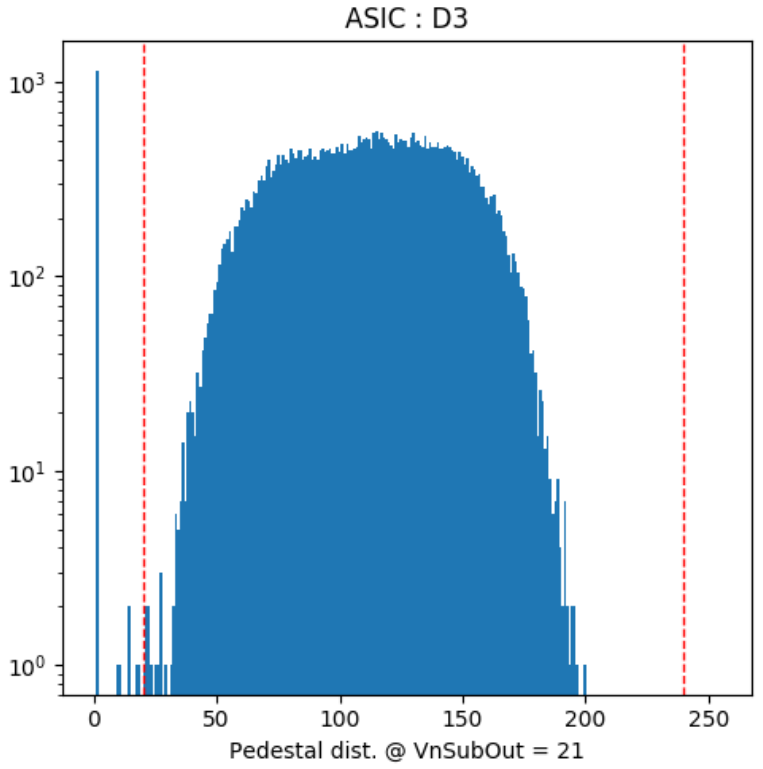


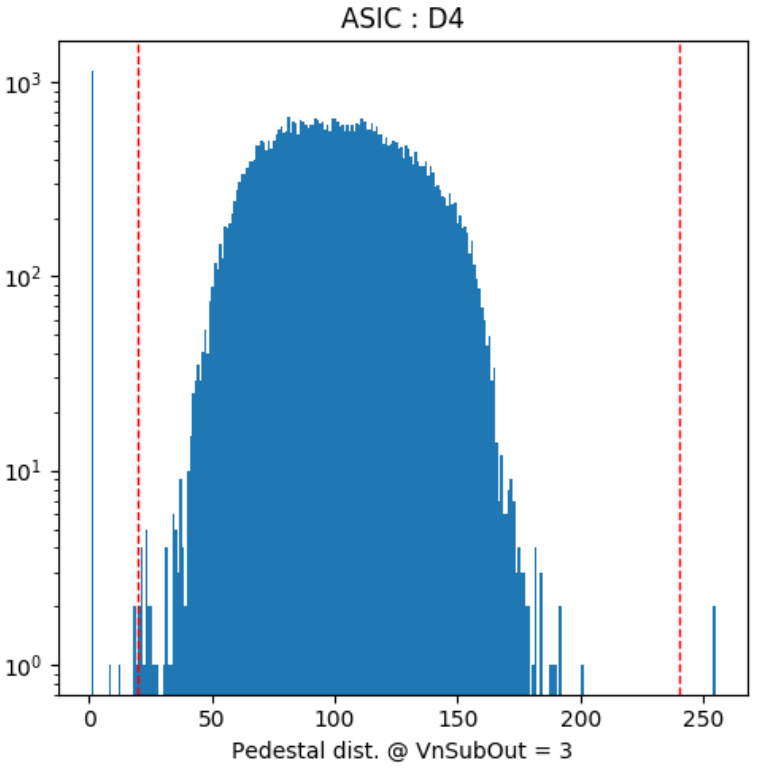
DESY Module 1022

w = 1







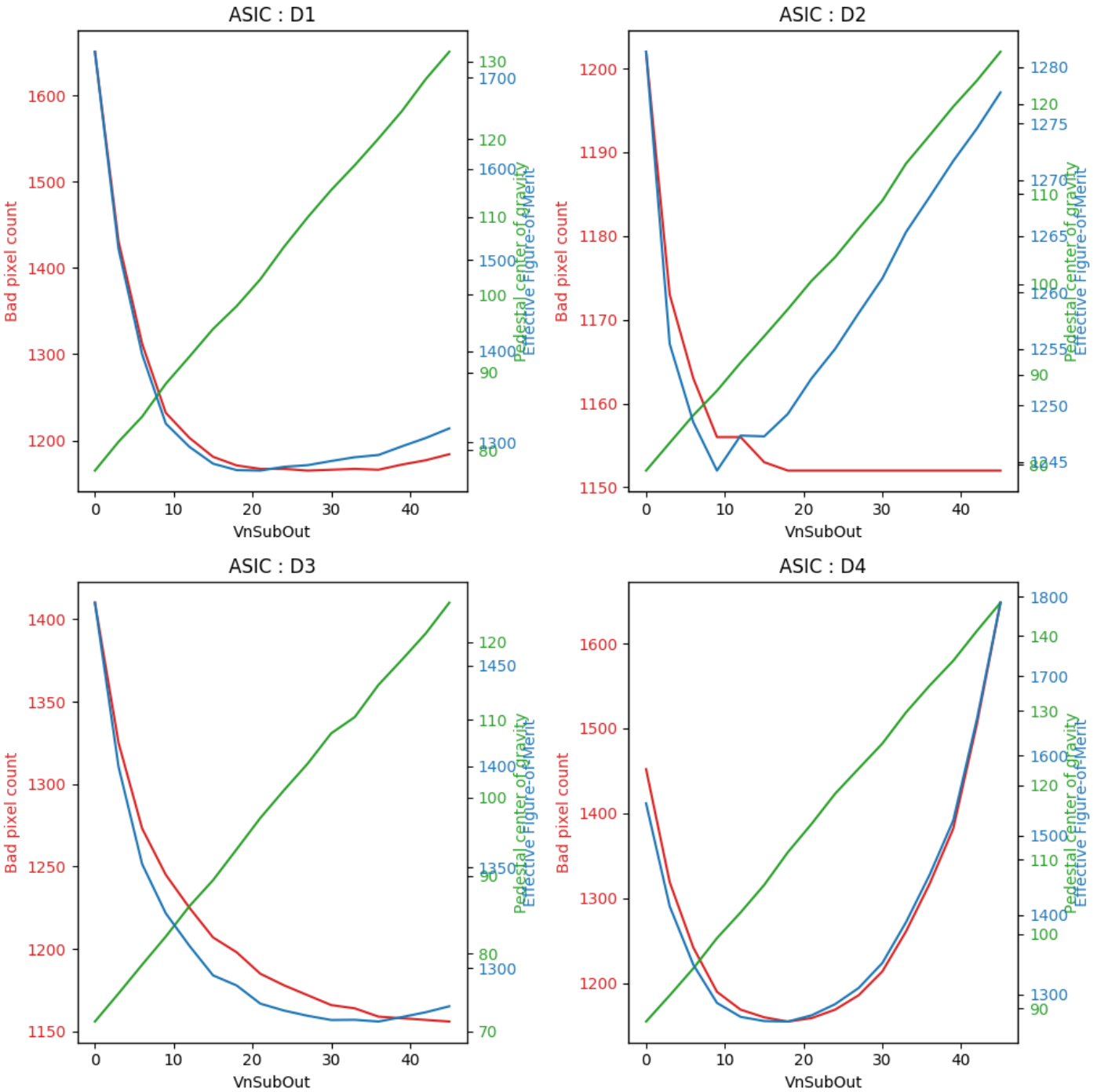


- The lower threshold for ‘bad pixels’ is set to 20 ADU since ADC curve is tuned for a certain minimal code (~20)

- Question: What is an appropriate upper threshold?
- ➔ 255-7(zs-threshold) = 248 is a hard limit as pedestals above it would anyway appear dead.
- ➔ Maybe 240? So that even the ones at 240 can hold zs hits in the range 8-15 ADU...
- ➔ Of course this question only matters for wide pedestal distributions.

- The current code resides in the **feature/auto_pedestal_shifts branch**
- Still needs some work and cleaning up.

Backup (1021 quality plots)



Backup (1022 quality plots)