AGA0414
CCD Characterisation

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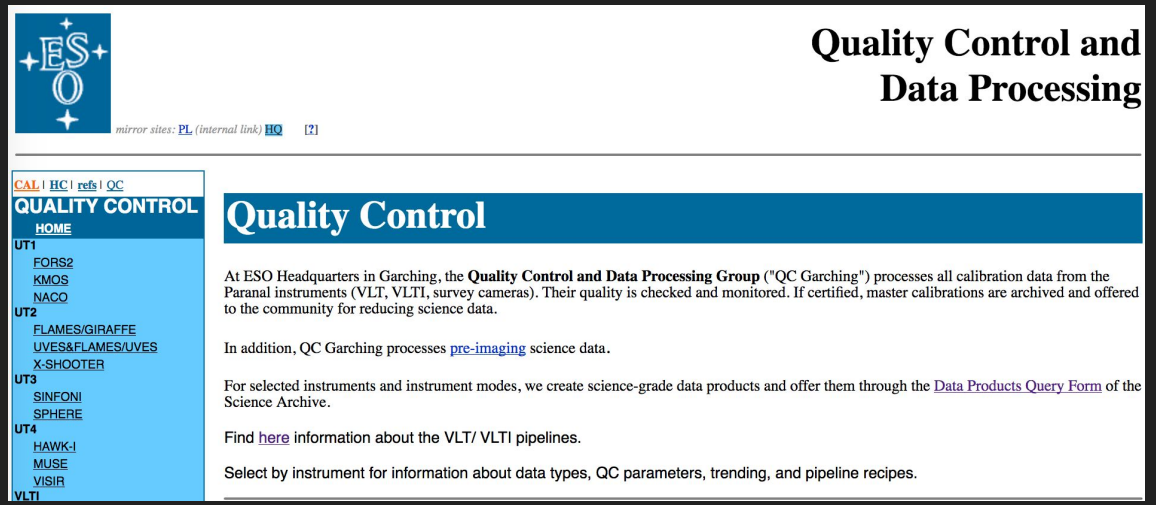
Characterisation, data quality and trends

You want to know your detector.

You want to know the quality of your data.

You want to make sure that your data are ALWAYS good.

We will use the ESO quality control pages (so you see that I am not lying to you)



FORS2

The pages of the “quality control” of FORS2 are here:

http://www.eso.org/observing/dfo/quality/FORS2/qc/qc1.html

FORS2 is an optical imager and spectrograph.

Remember, we spoke about bias? We can check if the level of the bias shows any trend:

http://www.eso.org/observing/dfo/quality/FORS2/reports/HEALTH/trend_report_BIAS_med_master_HC.html

Readout noise

As we commented last time, a “bias” is the noise due to the electronics. If the read-out electronics was perfect, two consecutive bias frames would be identical but they are not! This is due to the presence of the “readout noise” (RON).

http://spiff.rit.edu/classes/phys445/lectures/readout/readout.html

To measure the readout noise, we compare bias frames (x_i) to an average bias frame $\langle x \rangle$:

$$RON = \mathrm{sqrt}\left[\Sigma \left(x_i - \langle x \rangle \right)^2 / N \right]$$

See here how the RON evolves in FORS2:

http://www.eso.org/observing/dfo/quality/FORS2/reports/HEALTH/trend_report_BIAS_ron_raw_HC.html

Gain

We get photons which produce electrons in the CCD. An ADC (analog-to-digital converter), converts electrons in “counts”.

The “gain” makes us “go back” to what we actually measured.

Gain = # electron per pixel / # counts per pixel

You normally measure flats with lots of counts and flats with few counts. The gain is the inverse of the relation between the variance of the image and the average counts of the image (see here http://spiff.rit.edu/classes/phys445/lectures/gain/gain.html)

Let’s check FORS2
http://www.eso.org/observing/dfo/quality/FORS2/reports/HEALTH/trend_report_CONAD_HC.html

Linearity

Linearity is one of the key properties of a CCD.

One can think to measure the counts of a star (see lecture on photometry) with increasing exposure times.

What is normally done is to take (dome) flats with increasing exposure times.

In La Silla, we used to have a special radioactive source for this.

http://www.eso.org/observing/dfo/quality/FORS2/reports/HEALTH/trend_report_DETMON_LIN_HC.html