ESO/ Data Products from the VST/ OmegaCAM pipelines. Comparison and discussions

Draft Minutes – Version 0.2: April 20, 2012

Date : 21.03.2012 **Location:** ESO HQ, room L130

Starting 9:00 am **Ending** 6:00 pm

List of participants:
VST DATA CENTERS: AstroWISE: GijisVerdoes Kleijn(GVK). CASU: Mike Irwin (MIR).
VST tube: Aniello Grado (AGR), Massimo Capaccioli
VST team representatives: Tom Shanks (TSH, VST ATLAS), Jelte de Jong (JDJ, KIDs), Robert Greimel (RGR, VPHAS+)
ESO staff: Garching - Magda Arnaboldi (MAR), Dietrich Baade (DBA), Nausicaa Delmotte, Danuta Dobrzycka, Armin Gabasch, Michael Hilker, Mark Neeser (MNE), Monika Petr-Gotzens (MPG), Joerg Retzlaff (JRE), Martino Romaniello (MRO). Paranal – Steffen Mieske (SMI), Fernando Selman, Giovanni Carraro.

AGENDA

09:00 – 09:15 Welcome – Martino/Magda (15 min)
09:15 – 09:50 The ESO QC for OmegaCAM/VST – Mark/Steffen (20 min + 15 min)
09:50 – 11:20 Issues common to wide field imaging surveys data processing

- Astrowise (30 min)
- CASU (30 min)
- VST tube (30 min)

11:20 - 11:40 Coffee break

11: 35 - 12:20 DATA PRODUCTS

- Astrowise (15 min)
- CASU (15 min)
- VST tube (15 min)

12:25 – 12:40 Discussion

12:40 – 13:30 Lunch Break

13: 30 - 14:30 TEST DATA SET

- VST tube (20 min)

14: 30 - 15:15 The VST PS – Requirements for Data products and quality control

- KIDs (15 min)
- VPHAS+ (15 min)
- VST ATLAS (15 min)

15:15 - 15:45 Coffee break

15:45 – 16:00 PHASE3 for VST PS : Policies & Requirements - Joerg

16:00 – 17:00 Discussion

Draft Minutes

Presentation from Archive Science Group – Magda Arnaboldi (MAR)

MAR illustrates the background of the meeting. Following the VST realignment meeting on September 2010, the VST Public Survey Panel (PSP) encouraged some cross evaluation of the results between different pipelines. The goals are to create a forum where open issues concerning data products from VST/OmegaCAM (OCAM for short) can be documented and discussed. Furthermore one wishes to ensure homogeneity of products and quality across data centers. The data centers are Astrowise in Groningen, VST tube in OAC –INAF, and CASU in Cambridge, UK. The agenda lists three sections:
A. Issues common to wide field imaging surveys data processing
B. DATA PRODUCTS
C. TEST DATA SET
In each section, representatives from data centers present their results on the questions circulated on the data reduction issues. The document listed the questions circulated is attached to these minutes.

As a follow up a report to the VST PSP will be produced which documents the outcome of the discussion on the data products. Edited version will become available to support the community access to the VST data products from public surveys via the ESO archive.

Presentation from ESO QC– Mark Neeser (MNE)

MNE shows that currently 10% of science data for each VST/OCAM unique configuration is pipeline reduced. Current QC is implemented in the most automated way. OCAM is producing as much as data as the 14 instruments on VLT telescope, nearly the same data volume as VISTA, roughly 30Gb/night (compressed).

EVALSO link with the Paranal observatory is up and running so file headers arrive in Garching immediately, at latest within an hour from acquisition, and the whole data files arrive within hours from acquisition . In Garching, the QC scientist checks that all calibrations exist and are complete, and results become available on QC public web

pages. Close loop with Paranal SciOps to signal when calibrations are missing. Checks on calibrations are carried out following the OCAM calibration plan. Moving to higher frequency for calibrations, and also update calibration plan as experience builds up.

GVD suggests tohave interactions with data centers to close loop and modify frequency for calibrations.

MNE shows the QC web pages, scoring of parameters, photometric zero point (ZP), FWHM compared with DIMM seeing (modified for filter and airmass). MNE illustrates thresholds, and scoring procedures. These procedures check what falls beyond the thresholds, when compared with reference values. MNE shows results for each detector, their average and trends for bias levels, rms for all 32 detectors. Goal: e.g. is to catch whether the detectors are warming up.

QC public page where the health plots for OCAM are available at:

http://www.eso.org/observing/dfo/quality/OMEGACAM/common/score_overview.html

Points of interests – ZP, average and for all detectors, using Landolt and Stetson fields; DR7 Sloan, and secondary standards (delivery from OCAM consortium).

DBA & GVD say that the updated list of secondary standards is going to be published in a year.

MNE reports about the declining efficiency of the system as traced by the decreasing counts in the quick-check dome flats. That this effect is also visible in the zeropoints are indicates a degradation of the optical surfaces. MNE shows comparison with ZP from FORS1: the declining efficiencies are similar for all wave bands except u_SDSS, which appears to be declining more steeply in OmegaCAM. This may indicate both a dusting-up of the mirror and a degradation of the u_SDSS filter. MNE states that if it is dust, it may flatten out.

Developments since beginning of VST/OCAM operations (15.10.2012):

- There has been an improvement with the coverage of the standard star catalogues for the equatorial fields, however, no standard catalogue exists for the polar field.
- Dome flats in the u_SDSS and u_g_r_i_SDSS band are too weak due to a red dome flat lamp. Therefore, the processing of data taken with these filters is done using the twilight flats only.
- A preliminary document of the illumination correction has been received from the consortium, but this needs to be translated into an operation calibration procedure for Paranal.
- There is good news as the position angle jumps of the rotator have essentially disappeared from OmegaCAM STD frames.

Open discussion on QC information. Need to acquire U band standards with ~ 200 sec exp.

Presentation from data center OmegaCEN, pipeline Astrowise – GVD

The data reduction approach in the Astrowise processing is based on individual chip, and the information on the full mosaic is combined later. For example the illumination correction and the global photometry are based on stars that fall in different chips via the dithering sequence.

De-biasing – two subtractions:

1) ramp in overscan, caused by the controller, row average subtraction.
2) master bias.

Overscan removes the variable part, master bias removes the constant part.

Flat- Fielding – combine dome (small-scale) + twilight (large scale) structure. For U band Astrowise uses the twilight flats only. Structures in the flats are caused by scattered light, not just flat field. A movie is shown of the flats residuals as function of rotator angle, the whole pattern is chopped up by chip, and depends on the rotator angle. The residual peak is about 2%, having taken off a large scale pattern.

Summary: < 1% variability in flat-fields, the variability is dominated by rotator angle dependent stray light. Suggestions: acquire flat fields at fixed rotator angle.

Illumination correction: variation of zero point over each chip. In each the zero points variation are mapped, and are corrected by fitting a plane per bin. Residual ZP: there is no large scale structure. Rms for filter in the table below

filter	Rms int	Rms ex
u	0.016	0.027
g	0.010	0.02
r	0.009	0.02
I	0.011	0.02

Q: Do you detect the ZP decline reported by MNE? GVD: not a final answer, will monitor the dome flats. Residuals after the illumination correction: 2% in u, and 1% in g,r,i. Residuals can be better by improving flat fielding at the edges, vignetting from the field, and reduction of stray light.

Q.: are there non linear leftovers, caused by the removal of the large scale structures? Question whether you remove it better by doing a global correction or chip by chip corrections. Questions whether you correct the pixels or the catalogs.

Photometric calibration - standards, SDSS DR8/ Secondary STDs/ Landolt/ Stetson. Aperture mags diam=12 arcsec.

	Stdev zpt	Stdev zpt per chip pair
u	0.011	-0.012/0.01
g	0.010	0.01/0.008
r	0.012	0.017/0.014
i	0.011	0.029/0.028

1% absolute photometry can be achieved. Chip to chip calibration should be improved by using the photometric standards from SDSS.

Astrometry – 2 models: local -> global.

1. Common TAN projection
2. Local : 2nd degree polynomial, per chip solution, no overlapping sources
3. Global: 3rd degree polynomial per dither solution

Q: can you write the WCS on each chip? GVD – yes. There is a small rotation between the chip, and Astrowise deals with it by allowing for a random residual rotation between the ditherings.

rms	u	g	R	i
internal	0.15	0.11	0.10	0.11
External local	0.4	0.4	0.4	0.4
Internal global				
External global				

The absolute rms is dominated by the accuracy of external catalogs.

PSF- end -to- end: per chip basis, no double sources.

Fringing, persistence, cross talk:

De-fringing – only needed for KIDs, baseline nightly fringe maps. ($\geq$ 10 exposures KIDS + some ATLAS).

Q: how is the scale factor computed? GVD: done in pixel scale, a range of scale factors is determined, and the one adopted is that which minimizes the sky background. Global scale factor determined chip by chip. MIR – z filter is more sensitive to OH line variations.

Persistence – not detected.

Cross-talk (KIDS) is present in CCD #96, #95 and #94. Cross-talk can be in positive and negative counts. It is caused also by saturated pixels.

Q (from MIR) - do you use a cross talk matrix? Gjis: no we do not, because it changes, it is not stable: it varies with time and on the PA on the sky. Problem with the wireing of the dwear .

Satellites trails: these are masked, not completely, but work in progress.

Background subtraction: for the deep empty fields it is done with SWARP (TERAPIX software). For crowded fields we use segmented maps and then we carry out interpolations.

Q (from MRO): happy with the raw data transfer? GVD –yes, we request and download data from the ESO archive every hour, via a script.

Q (from TSH): concerning the illumination correction. It seems not to depend on position angle. GVD: not sure, we are still monitoring. Q: Dependence on color? GVD: we do not know yet. Because we do not have a flat field at fixed PA. Difference in illumination correction in each band.

Presentation from data center CASU – Mike Irwin (MIR)

MIR starts with the results for the illumination correction. In the VST/OCAM images there is a radial concentration of scattered light due to the optics, which shows up as detector level zero-point difference. This is a non-uniform non-astronomical scattered light, (N.B scattering light during observations is additive). DBA comments that This is true only if the source of the scattered light is different from the source one wants to measure or the scattering is chromatic.

Q: flat fields depend on rotator angle? MIR: we do average over rotator angle, which in turn averages out the dependence. (MRO: this is what was done for FORS1/FORS2 also). CASU maps it monthly, and corrects for it. CASU updates the illumination correction, and fix the magnitudes of the objects in the catalogues by applying the illumination corrector. This approach is driven by the fact that the rotator angle is not fixed during observations.

Problem with the flats: MIR reports that the filter position is not exactly the same in two series of flats, 10% variations across the image, variations of the gains, and scattered light. CCD#82 and #95 have gain variations, from 5% to few %. Scattered light from VLT nearby domes may also affect the twilight flats.

Comment (from DBA) – additional information about the vignetting caused by the lack of reproducibility of filter position. During commissioning they tested the filter re-positioning many times. DBA thinks it is unlikely that the filter is not positioned precisely. MNE:

there are structures which reside along the CCDs above the detectors, these may be responsible for the scattered/shadowed light. GVD: we see this vignetting being stronger in twilight flats. It is not the filter frame.

Dark sky stacks in r band – different shadowing light, one cannot use dark skies to correct scattered light in the dome flats (MIR do not use dome flats) . NB_659 monthly flats: they have strange complicated patterns due to the reflection from the segmented filter holder. All area affected by the filter joints may be difficult to flux calibrate.

Recommendations for operations: close dome and windshields for twilights flatfields, to avoid scattered light.

Illumination corrections: results are based on data for the VST ATLAS survey. In i,z bands they are derived from 2MASS star calibrations and from APASS catalog for other bands. Scale goes from - 0.12 to 0.1 mags at the left hand edge of the mosaic, typical for all the bands. There are discontinuities though: in z the pattern is different than in the i band. The correction is radially symmetric: ellipticity in all illumination corrections. When the average radial function is accounted for, the corrections at the detector level reduce by a factor or 3.

MIR shows magnitude residuals averaged over x and y. Vignetting and scattering of light. It is difficult to sample it more finely. Pattern caused by the shadowing of the edge features. CASU pipeline attempts to fix these problems at the pointing level, before going to global calibrations, the philosophy is to split the corrections in different steps. CASU uses the APASS calibrations for the optical bands: the illumination corrections u,g,r band show very interesting patterns that change with the filter bands. A lot of scattered light! It is there in all the images.

DBA: the differences in the filters are caused by the fact that they are interference filters. These filters are made of two layers of glass with reflections between them. Therefore, different filters behave differently.

MIR: Flat: is normalized to the same internal gain system, we assume light in the sky is uniform. Work with one ZP for all the detectors, and corrections are updated each month. CASU's approach is to fix the scattered light at the catalogue level, and not to the stacks images/pixels. This approach works because the scientific interests of the surveys VST ATLAS and VPHAS+ are about objects that have dimensions smaller than the detector size. With extended objects over more detectors, this approach does not work. CASU ensures that ZP is uniform in one pointing, while the global calibration is then work for the Public Survey teams.

DBA comments that the diffraction pattern in the segmented NB_659 filter is caused by the reflection off the vertical edge of the glass of the filter for the NB_659 filter.

CASU/Astrowise/VST tube: agree that they should carry out the reduction of common data set pointing at an empty field. In case of the date set for NGC 253, acquired during

SV, the procedures fail to do the correct illumination correction. Decide to use one of the KIDS data sets to be reduced by CASU/Astrowise/ VST tube.

The CASU pipeline writes all information about calibrations into the headers. Natural units, color equations, and magnitudes are consistent internally. Data are then rice compressed. As carried out previously with the Phase 3 submission of VISTA data products, will have to agree on data standards for the delivery of data products to the ESO science archive.

For the NB_659 images, the zero point is calibrated from the r band images, on equatorial Landolt fields (the CASU pipeline calibrates the NB_659 filter as a broad band filter). Is it possible to calibrate the photometry relative to the g filter? This calibration would then be similar to what is done for the Isaac Newton Telescope Wide Field Imager – (IPHAS survey).

Linearity correction: it is not applied, CCDs turned out to be linear. All in a gain system, one zero point, based on twilight flats (no dome flats are used in the CASU pipeline).

Fringing: changes in z band images when night is not photometric. 10% variation on the i flat. When one looks at the i flats there are no radial features, because the scattered light fills up the vignetting.

Astrometry: CASU pipeline uses 2MASS source catalogue for astrometry, because it has a reliable classification for point sources, better than USNO. Astrometric calibration: WCS TAN projection. The pipeline carries out a linear solution for each detector, such solution is written as WCS plus a simple from CD matrix in the image header. The case of the atmospheric refraction in the U band is not a linear problem, and may source of systematic in this approach.

Q (from DBA): is the WCS solution in the raw data good enough? MIR within 1” is ok. Only few arcsecs off.

Quality control@CASU: CASU carries out the monitoring of the data reduction, but not the monitoring of the survey progress (meaning data acquisition). Archive weather information are available from CASU and can be accessed by the PIs. Postage stamps are also available for the PIs/ survey teams to look at the available data. in general, on the basis of the photometric calibrations the raw data from OBs graded A are photometric. CASU does a monitoring of the PSF via ellipticity plots. The PSF of VST/OCAM is a Moffat profile with B = 2.5, when the system is out of focus the wings show up clearly.

Sky noise monitoring is also available, and so are sky brightness plots for different nights, or during a single night.

Presentation on QC procedure on Paranal - Steffen Mieske (SMI)

SMI illustrates the science operation at VST. QC0 at the telescope is based on only 8 detectors, because of limitation in available computing power.

For the photometric calibration, observations of equatorial fields are carried out twice per night, plus one standard in the user band in addition. A night is declared to be photometric if the ZP is within 5% of the running average.

The seeing statistic between August and December 2011 shows 0.8" mean value outside dome. It seems that 0.7" is hard to get.

The QC0 applied on Paranal leads to the following OB classification:

A: Average ellipticity < 0.1, image quality variation over FoV < 10%.
B: (almost within constraints) 0.1 < average ellipticity < 0.15.
C: anything that violates B.

QC for concatenations: extrapolations of ABC for the average quality over a concatenation. Relevant for VST ATLAS surveys. The idea is to balance the execution of the whole concatenation against single OBs.

SMI, MPG: Less than 1% of A/B graded OBs (which were classified automatically by a QC0 script running on the data) were actually ``C'' grade.

Lunch break.

Presentation from data center VST TUBE – Aniello Grado (AGR)

Question about the bias correction, and overscan: the background level difference between frames which are corrected by overscan and taken close in time still show a large difference.

MIR: CASU set in place an iterative procedure, median + clipping + double pass. It needs to reduce the sigma by a factor 10, to get rid of the structures in the flats/dark skies.

Random cross talk detected also for CCD # 87. Additional stripes are seen in the data, when the auxiliary CCDs are running during readouts. DBA comments that it should not happen, unless there is something done manually.

AGR illustrates issues also about reflections, which are very strong in r band.

Astrometric calibration: VST tube implements the SCAMP(terapix) / AstromC (Radovic), global astrometry, using the 2MASS reference catalog, and a 3rd order polynomial

function. Internal astrometric sigma does not depend on S/N for sources, the residuals are possibly all systematic.

Illumination correction in r band is modeled as a parabola, and it is corrected by adjusting the gains across detectors.

The PSF variations across the fields do not follow a standard pattern. A better evaluation on stacked images, rather than on single exposures.

Photometric accuracy: 0.1 mag, jumps caused by flat-fielding near the edge. Narrow band photometric calibrations are done using the spectro-photometric standards.

AGR asks for the following support from operation: it would be good to have frames of standard stars, with short and long exposures to create bad pixel mask images. MNE points out that the linearity sequence, which is taken every 10 days, could be used to generate bad pixel maps.

A general question is related about the problem concerning with correcting for the background. AGR points out that one cannot do reliably surface photometry. Scattered light needs to be reduced. Follow up discussion focus on addressing this issue: the basic radial structure of scattered light is caused by the focal reducer. Pattern should be stable, for scattered light perhaps one can close dome so that there is only a patched of sky on the telescope,, thereby reducing the amount of light.

Discussion on the part of the background which is stable and the part that is variable, whether it is affecting the possibility of carrying out surface photometry of extended objects. Set up a strategy to check how one can test it.

CCD #82, #87, #88 are unstable, they have sudden variation in the gain. AGR states this is not gain variations, there is an offset jump.

DBA comments that one should check whether surface photometry was a science goal in OCAM. If it cannot be done, then it should be stated in the call for proposals/ usermanual. Feedback from DBA: Surface photometry was not a science driver for OmegaCAM.

Q from MIR: Can one fix the scattered light problem? In principle, is possible. If ADC is not used, better to do a baffling to reduce scattered light.

GVD: structures in the background are seen when the moon is up. MIR: correlate structure in the background with the angular distance of the moon. Check whether the background correlates with the moon, and dark vs bright time.

SMI: with the current PS programs and GTOs at the VST, there is idle time, as the observing parameter space is not filled uniformly. For example that are not enough OBs for the bright moon time.

MRO: if we need to carry out observations to establish 1) structure in the background and correlation with moon distance, 2) correction for surface photometry, then these should be clearly described in a proposal, to be submitted to the Director of the observatories for approval and time allocation.

GVD suggests to use standard star fields acquired twice per night, as they may have different moon conditions. These data may be useful also to test the dependency of flat fields from rotator position.

Coffee break.

Presentation on Data products – Astrowise – Jelte de Jong (JDJ)

JDJ illustrates that KIDS uses data products from Astrowise, which is an integral part of the KIDS survey project. Baseline data products are single band source catalogs, multi-color source catalogs, calibration data and products for weak lensing pipeline. Later on => homogenized PSF images, photometric redshifts. Aperture matched color catalogs. KIDS will also provide the 9 band catalogue including VIKING, also some images will be reduced for VIKING.

KIDS relies on some global photometry from VST ATLAS. Astrowise is planning to re-process data when pipeline improves. During current VST operations, 50 OBs are executed each day – about 20 OBs acquired for KIDS. Task group is now set up to decide content for catalogs. Also source detection criteria not decided yet. Depend on science cases.

Request support from operations – the survey progress is lagging behind expectations particularly in the r-band, which has the tighter quality constraints. Time spent on observations which did not fulfill the quality requirements (OB constraints) ~13% in feb 2012.

JDJ asks for more information about technical works and procedures, and whether teleconf of the VST instrument Operation team with the data centers can be set up regularly.

DBA suggests that data centers monitor the ESO news and QC web pages regularly. Operation should also log when the filters are cleaned, as this will introduce a discontinuity in the ZP.

MIR comments on data products and the information provided by CASU on the band merged catalogues for VST ATLAS and VPHAS+. PSF convolution is being worked on. In practice we allow all possible matches for the bands. CASU does process all data, 1 night is done by one CPU.

Q from DBA: do the data centers use all calibrations provided by the OCAM calibration plan? MIR answers that CASU does not use dome flats, but otherwise does use all the rest - twilights flats, std stars, Vega based calibration. Also CASU is currently investigating calibration in AB mags. MIR states that three standard star calibrations each night are really required. APASS will be useful for the global calibration.

Presentation on Data products – VST tube – AGR

VST tube pipeline does not produce source catalogues, only calibrated images and weight maps.

VST PS – requirements for data products and quality control.

Presentation by KIDS – JDJ

KIDS – overview of the surveys. OBs setup. Science drivers. Photometric calibration 1% in all filters (internal, absolute) ugri+ZYJHK. Psf homogenization
Astrometric calibration: at 0.6" image quality, no degradation is introduced. The image quality is very good according to current evaluation by KIDS. Ellipticity over the whole FOV is less than 0.1, better than CFHT and DES. Typical CFHT PSF map shows much more systematic.

QC0 PSF size, ellipticity
Photometry on overlap nearby region
Astrometry on overlap nearby region.
Psf measured on the stellar locus

Presentation by VPHAS+ – Robert Greimel (RGR)

VPHAS+ - Adapted observing strategy to the constraints caused by image analysis. Two observing blocks with the blue and red filters. Happy with the data products provided by CASU. RGR reports that there is a CCD with gain change, on a timescale of 1 hr, which is the time lapse of a concatenation of VPHAS+ OBs. And mimic spurious detections in terms of false line emitters.

Presentation by VST ATLAS – Tom Shank (TSH)

VLT ATLAS – reaches 0.05 mag for photometric calibration, and astrometry to 0.02. Flat field/illumination problem, particularly affects global calibration, which is quite important for VST ATLAS. TSH shows comparison SDSS – ATLAS magnitudes: the VST ATLAS magnitudes for objects are too bright at the edges of a pointing. Galaxy number counts show radial dependence, unlike colors. Local sky intensity looks radial in r (but only in the r band).

TSH reports that there is already some spectroscopic follow-up of QSO detected in the VST ATLAS field. 2DF, 200 QSO, 20 of them already have now 2DF spectra. With extra

exposure time expected to detect QSO down to 22.5. Very good feedback from this survey.

Presentation on the VST Phase 3 – Joerg Retzlaff (JRE)

JRE illustrates the Phase 3 policies for the VST public surveys and the Phase 3 workflow. Complete presentation available on line.

DBA asks whether the FITS headers are complete/correct and requested any problems to be reported to usd-help@eso.org.

Summary and inputs for VST/OCAM operations:

Flats: different data centers adopt different procedure for the flats. Astrowise uses dome flats, while CASU and VST tube do not. Flats (Dome flats and twilight flats) show dependency on rotation angle. This dependence is averaged in the CASU pipeline, and not in for Astrowise. Strong signatures in the flats for scattered light.

Requirements to Operations: when doing twilight flats avoid scattered light from VLT domes nearby, also limit opening of the dome to the area of sky above the telescope.

Illumination correction & reflected light: mapping of the illumination correction should improve once secondary standard fields become available. It will not be possible to correct for the vignetting/shadowing of the structures above the CCDs, or the effects of vignetting for the NB_659 segmented filter. About the reflected light, it may be useful to reduce the opening of the dome to the patch of light on the top of the telescope.

Requirements to Operation: if the ADC is not going to be used or set in operations, then some investigation can be carried out to understand whether the space can be used for baffling the camera and hopefully reduce the scattered/reflected light.

Strong variations in the background: this question was posed in relation with the science case of surface photometry of extended astronomical objects (i.e. larger than the detector size). Effects of scattered light from the moon, and also bright vs. dark time could be assessed using standard star fields that have been acquired every night since start of operation. Also investigate different data set acquired at different moon distance to investigate possible structures in the background. The ESO staff suggests that interested data centers should team up, identify strategy and ask for telescope time via a DDT/calibration proposal to constrain this issue further.

Requirements to Operation: verify whether surface photometry was an initial science case for VST/OCAM. Also state in usermanual/CfP/web pages that surface photometry may be affected by scattered light. The amount of this effect is not quantified yet, so users should be aware of this problem when planning their observations.

CCD gain change and cross talk (CCD #82, #87, #88, #94, #95,#96): because these CCD are expensive and the operation of replacing them difficult to carry out, replacing them is not considered a viable option. These CCDs should be monitoring carefully and observing/data reduction strategy should take them into account.

Requirements to Operation: it should be reported in the usermanual/VST/OCAM web pages about the gain variation/cross talk of these CCDs. Illustrate effects and warn users so that they can implement the most adequate observing strategy to minimize effects on their science.

Close the loop between ESO and data centers: it would be beneficial to carry out teleconferences on regular time intervals involving VST IOT and the data centers, so that calibrations plan, their frequencies and feedbacks from data reduction can be effectively folded in the science operations at the telescope.

Requirements to Operation: organize teleconference with CASU/Astrowise/VST tube on regular basis. Frequency TBD.

Comparing data products: CASU /Astrowise/VST tube agree to work on data sets from KIDS observations to compare the quality of the final data products. The SV data for NGC 253 were not reduced by either CASU or Astrowise, because the dimension of the galaxy (and related problems with the Illumination correction) could not be handled by the current implementation of these two pipelines. VST tube has carried out the data reduction, but still is lacking some additional tests to correct for the background of the full FoV.