1 Title: VST ATLAS

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1.1 Abstract

The area to be surveyed by VST ATLAS will be consistent with the revision approved by the ESO Public Surveys Review Panel at the 28/9/10 meeting and subsequently by the OPC. We have decided on an observing strategy which will accommodate the restriction on binning set by the ESO Surveys Team, the request to restrict filter changes in a single OB and also the speed gain allowed by not requiring guiding for short exposures. We believe the best survey will be achieved by employing a dither pattern with 2 sub-exposures in each band. This will reduce the number of gaps in the ATLAS and also allow efficient removal of cosmic rays. We have also increased the overall exposure times to account for increased read-out noise due to use of $0.''2$ pixels. We have mitigated the increased exposure times by reducing the overlaps in our survey tiles. The survey will now take $\approx$ 140 nights over 2 years or 35 nights per Period. Data reduction will be carried out using the ATLAS Data Flow System (ADFS), following the successful model of the VISTA Data Flow System, with CASU (Cambridge) running a nightly processing pipeline and WFAU (Edinburgh) generating further data products and providing science archiving facilities, complementing and supplementing the ESO SAF (see previously approved SMP). Finally, the survey timeline includes two major public data releases at 1.5 and 2.5 years, plus releases of core data products to the ESO Archive at more frequent intervals.

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2 Survey Observing Strategy

The minimum observations required for this survey are *ugriz* bands to the limits given in Table 1 (taken from Table 2 of the previously approved ATLAS SMP). The seeing is required to be in the range 1-1.4 arcsec. These parameters will allow the VST ATLAS to reach deeper than the SDSS survey in the N Hemisphere, with better average image quality.

Table 1: VST ATLAS 10σ limiting magnitude (from Table 2 of approved SMP).

			Limiting	Mag.
band	λ	$\Delta\lambda$	AB	Vega
u	3550	570	22.0	21.0
g	4750	1390	22.8	22.9
r	6230	1370	22.3	22.1
i	7620	1530	21.8	21.4
z	9130	950	20.7	20.2

The SDSS telescope has a 2.5-m aperture and uses a 55s exposure in the *ugriz* bands. The limiting magnitudes for VST ATLAS are intended to reach at least as deep as SDSS limits in the same bands. But since OmegaCam throughput is $\approx$ 10% higher at all wavelengths and also taking into account average seeing of $1.''2$ FWHM, a nominal exposure of 60s (or equivalent) will make the corresponding VST ATLAS limit $\approx$ 0.3mag fainter in all bands, although the use of grey/bright time to observe i/z may reduce the VST ATLAS advantage there.

We have chosen to work in $1.''0 - 1.''4$ seeing to ensure that, on average, the VST ATLAS will have imaging better than that of SDSS (median seeing $1.''4$). We note that, at Paranal, $1.''0 - 1.''4$ seeing occurs about 30% of the time (see http://www.eso.org/gen-fac/pubs/astclim/paranal/seeing/seewind/).

In terms of survey area we shall be following the recommendations of the ESO Public Survey Panel in revising the area of ATLAS to reduce overlap with DES. The SGC area is thus now defined between $21h30 < RA < 04h00$ and $-40 < Dec < -10$. The NGC area is defined between $10h00 < RA < 15h30$ and $-20 < Dec < -2.5$ plus $10h00 < RA < 15h00$ and $-30 < Dec < -20$. The total area of the survey is 4711 $\deg^2$ with 2087 $\deg^2$ in the Northern Galactic Cap (NGC) and 2624 $\deg^2$ in the Southern Galactic Cap (SGC). Fig. 1(a) shows the revised survey area.

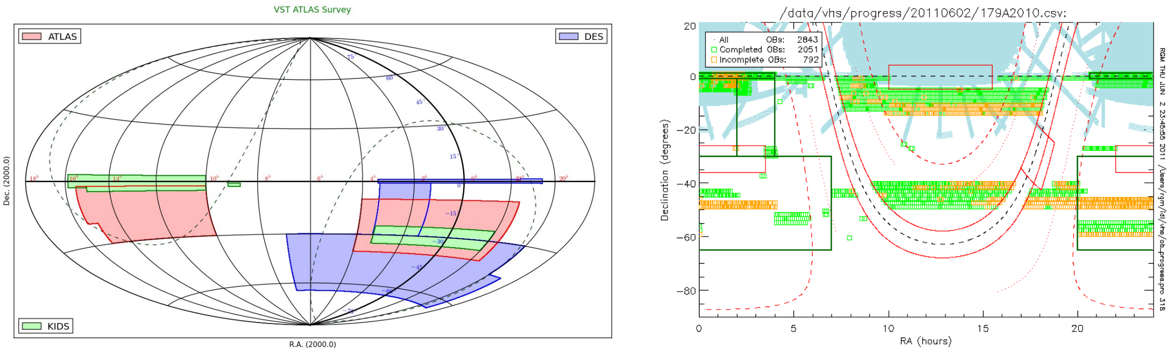

Figure 1: (a) The revised ATLAS footprint approved by the Public Surveys Panel and OPC. The dashed lines mark galactic latitudes $b = 30^\circ$ and $b = -30^\circ$. (b) The current status of the VISTA Hemisphere Survey (VHS).

We also aim to coordinate as fully as possible with the VISTA Hemisphere Survey (VHS). In the Northern Galactic Cap (NGC), VHS intends to cover the sky with YJHK at galactic latitudes, $|b| > 30$deg, and JHK at $|b| < 30$deg. In the SGC, VHS will cover the DES area in JHK, and the remaining $|b| > 30$deg area with YJHK and the remaining $|b| < 30$deg area with JK. Current VHS coverage is shown in Fig. 1(b).

Our basic observing strategy for each VST ATLAS tile is to obtain 2 dithered exposures in each of the *ugr* bands in dark time and then to obtain 2 dithered exposures in each of the *iz* bands in grey/bright time. A 1hr OB will require no filter changes as has been recommended by ESO. We shall be grouping together the 3 'dark' OBs and the 2 'gray/bright' OBs in different filters on a given area so that the 5 filters may be done as close together in time as possible, and preferably within a single lunation to minimise the impact that point-source time variability might otherwise have on derived colours. To some extent, this strategy will also increase the likelihood of equivalent image quality (in terms of PSF, photometric conditions) in each field, simplifying final flux calibration of the data.

Our new observing strategy accommodates the decision of the ESO Survey Team not to allow 2×2 on-chip binning as well as the recommendation to minimise filter changes in a 1hr OB. Our strategy also takes into account the results from VST+OmegaCAM commissioning, that guiding will not be needed for exposures of less than 60s and that the telescope can dither/slew/preset when the CCDs are reading out.

We therefore aim to make 2 sub-exposures per filter on each ATLAS tile. This will allow us to remove cosmic rays effectively (CR rate is 1790 ± 200/CCD/hr) and also help fill in interchip gaps. This leaves us with a plan for each tile as shown in Table 2. Table 3 shows the number of sky electrons per $0.''214$ pixel according to VOCET, assuming the darkest sky. Given the read-out noise of 5.5 electrons, we have therefore increased the overall exposure times from $1 \times 60s$ in $ugriz$ to $2 \times 60s$ in u, 2×50s in g and 2×45s in riz. These new exposure times return almost exactly the same S/N as would have been achieved with $0.''4$ pixels, as used by SDSS or by binning 2×2 with OmegaCAM. These assume the same (VOCET) sky counts as given in Table 3 and 5.5 e^- read-out noise.

The two sub-exposures tiling plan means that the overall efficiency of observation is now 55%, still comparable to 60% with a single exposure, unbinned, strategy.

We also have agreed to make a calibration pass in $ugri(z)$ in the $\approx 700\deg^2$ KiDS-S area. This will comprise

Table 2: Exposure times and overheads for the ATLAS survey.

Filter	u	g	riz	
science frame	60s	50s	45s	
readout	40s	40s	40s	
$25''$X offset, $85''$ Y offset	15s	15s	15s	(absorbed in readout time)
science frame	60s	50s	45s	
readout	40s	50s	40s	
move $58'$ in RA	15s	15s	15s	(absorbed in readout time)
Total	200s	180s	170s(×3)	
Band average	178s ≈ 3mins			

Table 3: Dark sky counts per pixel.

Filter	u	g	r	i	z
dark sky counts per pixel	17/60s	70/50s	150/45s	210/45s	120/45s

standard ATLAS observations in all 5 bands.

2.1 Scheduling requirements

The scheduling requirements are summarised in Table 4. With 140 nights required over 2 years, this corresponds to 35 nights per semester. These split into 62% (22nights) dark and 38% (14 nights) gray/bright. We assume 9hr nights all year round. The SGC has 56% and the NGC has 44% of the total ATLAS area. This is the basis that the number of hours per half Period has been calculated as shown in Table 4. Nights required for August-September have been reduced pro rata. The basic conditions required are clear with ≈ 10% of photometric nights needed for calibration purposes.

Choice of fields to observe on any given night need only be governed by seeing ($< 1.''4$), air mass (<1.4) requirements and moonlight restrictions in bright time ($> |3|$ days from full moon).

2.2 Observing requirements

Assuming that the VST pointing is good to $< \pm 2''$, we will not need to acquire a guidestar for either of the two sub-exposures. Under this assumption, a complete ATLAS observation for a given filter in a 1hR OB then comprises: target acquistion; first sub-exposure then a dither of $25''$ offset in X and $85''$ in Y; second sub-exposure; then a $58'$ offset towards higher RA. This sequence takes ≈ 3mins and is therefore repeated on ≈ 20 more field centres to define a single OB. In dark + gray/bright time, a group of 3+2 1hr OB's might be done successively.

The dither pattern will remove the main gaps, leaving 28 $80'' \times 20''$ gaps and 14 $20'' \times 20''$ gaps i.e. less than 0.5% of the total area. This is similar to the unavoidable coverage gaps caused by bright stars. Using more dithers would drastically reduce the observing efficiency.

The overlap in the Declination direction will also be $2'$, the same as in RA. This will provide enough stars in the overlap regions to yield individual overlap *rms* errors ≈ ±0.01mag.

We shall require dark conditions for the *ugr* exposures and gray or bright conditions for the *iz* exposures. In bright time we propose to restrict observations to $> |3|$ days from Full Moon. Our wide range of RA's means that we plan only to observe at airmass < 1.4.

Table 4: ATLAS exposure times

Period	Time (h)	Mean RA	Moon Phase/distance	Seeing	Transparency
P87 Aug - Sept	77	23h	dark	$< 1.''4$	clear(+some phot.)
P87 Aug - Sept	48	23h	gray/bright	$< 1.''4$	clear(+some phot.)
P88 Oct - Dec	115	2h	dark	$< 1.''4$	clear(+some phot.)
P88 Oct - Dec	72	2h	gray/bright	$< 1.''4$	clear(+some phot.)
P88 Jan - Mar	90	11h	dark	$< 1.''4$	clear(+some phot.)
P88 Jan - Mar	54	11h	gray/bright	$< 1.''4$	clear(+some phot.)
P89 Apr - Jun	90	14h	dark	$< 1.''4$	clear(+some phot.)
P89 Apr - Jun	54	14h	gray/bright	$< 1.''4$	clear(+some phot.)
P89 Jul - Sept	115	23h	dark	$< 1.''4$	clear(+some phot.)
P89 Jul - Sept	72	23h	gray/bright	$< 1.''4$	clear(+some phot.)
P90 Oct - Dec	115	2h	dark	$< 1.''4$	clear(+some phot.)
P90 Oct - Dec	72	2h	gray/bright	$< 1.''4$	clear(+some phot.)
P90 Jan - Mar	90	11h	dark	$< 1.''4$	clear(+some phot.)
P90 Jan - Mar	54	11h	gray/bright	$< 1.''4$	clear(+some phot.)
P91 Apr - Jun	90	14h	dark	$< 1.''4$	clear(+some phot.)
P91 Apr - Jun	54	14h	gray/bright	$< 1.''4$	clear(+some phot.)

As well as clear conditions, a small amount of photometric conditions will also be needed to observe photometry standard areas (see Section 3 below). Thus OB's covering RA's containing these sequences will be flagged for photometric conditions.

We shall group the 3 *ugr* and 2 *iz* OBs for a given RA strip, so that filters are done as closely together in time as possible. We should like a strip to be observed in consecutive dark and gray/bright time periods to minimise the effects of QSO and stellar variability as much as possible.

We request that the VST SADT is set up to allow ≈ 20 different pointings/tiles in a single filter in a 1hr OB to ease implementation of our tiling plan.

2.3 Details of survey strategy for Aug - Sept and Oct - Dec

We have also coordinated with the VISTA Hemisphere Survey and VIKING teams to maximise the ATLAS overlap with these surveys. Thus the photometric pass through the KiDS-S area will overlap with the VIKING YJHK data in this region and after that we shall move to survey from Dec=-10 southwards in the SGC, where VHS will also be working (see Fig. 1b). In the NGC we are starting at Dec = -2.5 and moving southwards, similar to the survey strategy of VHS.

Observing period August - September 2011

In August-September, we are assuming that we shall observe strips in RA between 21h30 - 00h00. In practice, we will probably observe over a wider RA range but for ease of interpreting Tables 4, 5, we will assume this more restricted RA range. We propose to start at Dec = -25 and work Southwards. Each 1hr OB will contain a single filter and cover about 1.5hrs in RA at Dec≈ -30. We will group OBs, five at a time in *ugriz* so that all the bands, dark time and gray/bright time can be done as close together in time as possible and preferably within a single lunation. These SGC areas contain part of the KiDS survey and these data will act as a shorter exposure photometric pass for the KiDS survey. (Note that the asterisk in the 3rd column of Table 5 denotes a change from OBs/tile to tiles/OB).

Observing period October - December 2011

In October-December we are assuming that we shall observe strips in RA between 00h00 - 04h00. Again, we

Table 5: Observing period August - September 2011

RA DEC	No. tiles	No. per 1hr OB*	Filter	Single T_{exp}/ tot. T_{exp}/ incl o'head per filter (s)	Jitter offset	Dither pattern	Dither size	Seeing ($''$)	Transp.	Moon
21h30 - 00h00 -25°00 - -40°00	500	18	u	60/120/200	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	d
21h30 - 00h00 -25°00 - -40°00	500	20	g	50/100/180	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	d
21h30 - 00h00 -25°00 - -40°00	500	21	r	45/90/170	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	d
21h30 - 00h00 -25°00 - -40°00	500	21	i	45/90/170	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	g/b
21h30 - 00h00 -25°00 - -40°00	500	21	z	45/90/170	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	g/b

Table 6: Observing period October - December 2011

RA DEC	No. tiles	No. per 1hr OB*	Filter	Single T_{exp}/ tot. T_{exp}/ incl o'head per filter (s)	Jitter offset	Dither pattern	Dither size	Seeing ($''$)	Transp.	Moon
0h00 - 04h00 -25°00 - -39°00	750	18	u	60/120/200	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	d
00h00 - 04h00 -25°00 - -39°00	750	20	g	50/100/180	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	d
00h00 - 04h00 -25°00 - -39°00	750	21	r	45/90/170	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	d
00h00 - 04h00 -25°00 - -39°00	750	21	i	45/90/170	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	g/b
00h00 - 04h00 -25°00 - -39°00	750	21	z	45/90/170	...	1	$25''$X $85''$Y	< 1.4	clear(+ some phot.)	g/b

will probably observe over a wider RA range but for ease of interpreting Tables 4, 6 we will assume this more restricted RA range. We propose to start at Dec = -25 and work Southwards. Each 1hr OB will contain a single filter and cover about 1.5hrs in RA at Dec≈ -30. We will group OBs, five at a time in *ugriz* so that all the bands, dark time and gray/bright time can be done as close together in time as possible and preferably within a single lunation. These areas contain part of the KiDS survey and again these data will act as a photometric pass for the KiDS survey. Given the larger area in October-December, we can only survey to Dec = -39 rather than Dec = -40. The remaining area will be left for Period 90. (Note that the asterisk in the 3rd column of Table 6 denotes a change from OBs/tile to tiles/OB).

3 Survey data calibration needs

3.1 Detector characteristics

Standard sequences of bias frames, darks and twilight/dome flatfields will be used to remove the gross instrumental signatures. To deal with fringing in the i and z bands and we propose to construct fringe frames using data taken within a single OB as follows. i and z data will be taken within the same 1hr OB and 10-15 independent fields will be observed in each band. We shall construct hourly fringe frames using a robustly combined stacked frame of the i and z data from these images. Illumination corrections are also needed to ensure uniform photometric calibration across the array - these are in addition to flatfields and correct for effects such as scattered light. These can be characterised using dense large area photometric standard fields or from suitable sub-sampling of photometric fields across the array.

3.2 Astrometry

Astrometric calibration will be via the numerous unsaturated 2MASS point sources available in each field. Previous experience for a wide range of telescope systems indicates that a standard ZPN projection with a radially symmetric correction of the form

$$r_{true} = k_1 \times r + k_3 \times r^3 + k_5 \times r^5 + ... \tag{1}$$

where r_{true} is an idealised angular distance from the optical axis, r is the measured distance, and k_1 is the scale at the centre of the field; this will provide a good description of the field distortion. Coupled with a linear “plate” constant solution for each detector of the form

$$\xi = a * x + b * y + c \qquad \eta = d * x + e * y + f \tag{2}$$

we find that this gives astrometric residuals over the whole field of better than 100mas. The global systematics in 2MASS (on the ICRS system) are also below the 100mas level.

3.3 Photometry

For external photometric calibration VST ATLAS pointings need to be supplemented by standard field observations through all five filters. First pass nightly calibration will make use of the standards observed as part of the VST Calibration Plan. In addition we will supply extra calibration OBs to give an independent photometric calibration of fields within the ATLAS footprint. For example, twelve of the *ugriz* sequences from `http://www-star.fnal.gov/Southern-ugriz/www/Fieldindex.html` lie within the ATLAS region, split evenly between our SGC and NGC areas. In the northernmost parts of the NGC and SGC survey areas there will also be a small but useful overlap with the SDSS survey. Additionally we will also make use of extrapolated 2MASS photometry in the redder bands as a check on both the nightly extinction estimates and the overall uniformity of the calibration.

It is assumed that ESO will provide basic sky quality measures such as photometric quality and extinction measures at zenith.

Internal calibration of observations uses the flatfield and dark sky characteristics of the detectors to place them all on a common gain system.

The internal gain-correction, applied at the flatfielding stage, should place all the detectors on a common zeropoint system (to ≈1-2%): hence given a stable instrumental setup, the apparent variation of zeropoint then directly measures the change in “extinction” without the need to rely solely on extensive standard field coverage over a range in airmass.

Therefore for any given observation of a star in a particular passband

$$m^{cal} = m^{inst} + ZP - k(\kappa - 1) = m^{std} + ce^{std} + \epsilon \tag{3}$$

where ZP is the zeropoint in that passband, κ is the airmass of the observation, ce^{std} is the colour term to convert to the instrumental system and ϵ is an error term. This assumes that the second-order extinction term and colour-dependency of κ are both negligible. By robustly averaging the zeropoints for all the matching stars on the frame an overall zeropoint for the observation can be obtained.

On photometric nights the extinction coefficient κ should be constant in each passband. The extinction κ can be monitored through each night either by assuming the true instrumental zeropoint only varies slowly as a function of time or by making measurements over a range of airmass. Goals for photometric accuracy of individual pointings are <5% in all passbands. Later downstream cross-calibration using the overlaps between fields will be used to improve this by about a factor of 2.

3.4 Artefacts

Saturated stars are automatically flagged in the processing system and most scattered light or ghosts are dealt with automatically by the catalogue background tracking software. In the case where no offset frame pairs are available, strategies to remove CRs and other blemishes will depend on their numbers and characteristics and various methods will be explored during commissioning. Otherwise dual pairs of images will be used to remove both CRs and satellite trails.

4 Data products and VO compliance:

ATLAS data will be calibrated to ESO agreed standards for the survey, thus the data will be photometrically and astrometrically calibrated to better than 0.05 magnitudes and to $0.''1$ rms precision, respectively. The final photometric products will be based on uniform overlap calibration across each contiguous survey region. Full object catalogues will be generated for each image. These will conform to the standards developed for the VDFS and it is anticipated that these catalogues will be hosted eventually at the ESO SAF. Additional archive functionality and full access to (both image and catalogue) data products through the VO will be provided by an archive in Edinburgh, similar to the WFCAM and VISTA Science Archives and capable of supporting the survey science requirements of the community.

The following data products will be available:

- instrumentally corrected frames along with header descriptors propagated from the instrument and processing steps (science frames and calibration frames)
- stacked and/or mosaiced data for dithered observations of single targets
- statistical confidence maps for all image products
- derived object catalogues based on a standard VDFS set of object descriptors including astrometric and photometric measures, and morphological classification
- Data Quality Control database including measurements of seeing, average stellar shape, aperture corrections, sky background noise levels and limiting magnitudes
- homogeneous band-merged catalogues (*ugriz* from single pointing).

We note that these data products are similar in content and format to the Phase III VISTA ESO deliverables.

Although the responsibility to provide a global calibration lies with other ATLAS core team members, CASU will provide metadata as follows to ensure that catalogues from different pointings can be merged:

- Pipeline software version control – version used recorded in FITS header

- Processing history including calibration files used recorded in FITS header
- All catalogue products come with full preservation of FITS header information and full astrometric calibration in the form of a WCS. The header information in conjunction with the WCS can be used to drive merging of information across different bands. One option for doing this, which CASU use already, is to ingest the header information into a database and use the database, with various cuts on QC information, to drive the band-merging.

5 Timeline delivery of data products

Our team anticipate two main product releases resulting from the survey, timed at survey start plus 1.5 yr and survey start plus 2.5 yr. These will be the DR1 and DR2 catalogue releases and will, finally, incorporate globally calibrated *ugriz* photometry on all catalogued sources. DR1 would only be flux-calibrated at the individual pointing level, whereas the aim for DR2 would be to place the entire survey on a uniform photometric scale.

In addition to the DR1 and DR2 catalogue release indicated above, the ATLAS team will ensure delivery of the following core data products to the ESO SAF:

- astrometrically and photometrically calibrated images, along with their respective weight maps, in all of the project-relevant filters will be provided on a per pointing basis.
- source catalogues based on individual bands. Associated source catalogues linking the parameters of individual objects across all of the observed filter bands will be provided on a pointing by pointing basis.
- these survey products will be supported and characterized by additional 'meta' information providing a full description sufficient for their full scientific exploitation.

We will deliver full, quality controlled products to ESO as part of the Phase III process within 6 months of the end of the period in which the observations were made.

As already noted, full status of all data processing and products, together with quality control info - will be provided by the ATLAS project. Thus ATLAS will be providing sufficient information to ESO to enable it to carry out its regular six-monthly reviews.

A more quantified version of the timeline is shown in Table 7.

6 Important notes from the team on any changes wrt the approved SMP

The revised boundaries of the ATLAS as shown in Fig. 1a are those that were accepted by the ESO Public Surveys Panel and the OPC. These give areas of 2624deg^2 in the SGC and 2087deg^2 in the NGC. The changes made reduced the overlap with the DES survey and increased the area in the NGC and reduced the area in the SGC.

The ESO Public Survey Panel made it clear that the revised ATLAS should, if possible, be completed within 2 years rather than the original 3 years. This implies a 50% increase in the numbers of nights per Period over the approved SMP.

Given the increased numbers of nights required, we have reduced the restriction on observing in bright time from $> |5|$ to $> |3|$ days from Full Moon. In *iz* the sky will only be brighter by ≈ 0.2mag by reducing this restriction, according to VOCET Table 2.

As noted above, our new observing strategy accommodates the decision of the ESO Survey Team not to allow 2×2 on-chip binning and the recommendation to minimise filter changes in a 1hr OB. Our strategy also takes

Period 87+ (125hrs of data taken)	
End of Period 87+1month;	Pipeline processing starts
End of Period 87+2months;	Pipeline processing finishes
1 month gap for contingency	
End of Period 87+3months:	Quality assurance starts
End of Period 87+5months:	Quality assurance finishes
End of Period 87+6months;	Pipeline products delivered to ESO and WFAU + progress review
Period 88+ (331hrs of data taken)	
End of Period 88+1month;	Pipeline processing starts
End of Period 88+2months;	Pipeline processing finishes
1 month gap for contingency	
End of Period 88+3months:	Quality assurance starts
End of Period 88+5months:	Quality assurance finishes
End of Period 88+6months;	Pipeline products delivered to ESO and WFAU + progress review
Period 89+ (331hrs of data taken)	
End of Period 89+1month;	Pipeline processing starts
End of Period 89+2months;	Pipeline processing finishes
1 month gap for contingency	
End of Period 89+3months:	Quality assurance starts
End of Period 89+5months:	Quality assurance finishes
End of Period 89+6months;	Pipeline products delivered to ESO and WFAU + progress review Review of observing plan after 3 Periods
Period 90+ (331hrs of data taken)	
End of Period 90+1month;	Pipeline processing starts
End of Period 90+2months;	Pipeline processing finishes
1 month gap for contingency	
End of Period 90+3months:	Quality assurance starts
End of Period 90+5months:	Quality assurance finishes
End of Period 90+6months;	Pipeline products delivered to ESO and WFAU + progress review DR1 data release at WFAU
Period 91+ (144hrs of data taken)	
End of Period 91+1month;	Pipeline processing starts
End of Period 91+2months;	Pipeline processing finishes
1 month gap for contingency	
End of Period 91+3months:	Quality assurance starts
End of Period 91+5months:	Quality assurance finishes
End of Period 91+6months;	Pipeline products delivered to ESO and WFAU + progress review

Table 7: VST ATLAS timeline for release of data products.

into account the results from VST+OmegaCAM commissioning, that guiding will not be needed for exposures of less than 60s and that the telescope can dither/slew/preset when the CCDs are reading out. This all means that our total exposure time needed has increased by a further ≈25% over what was suggested at the review Panel. The efficiency of the observations is still 55% on-sky as opposed to 60% with a single exposure strategy. It should also be noted that the photometric pass in the ≈ 700deg^2 KiDS-S area is assumed to be charged to ATLAS rather than KiDS.