Observing strategies for the Five UKIDSS surveys

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1 LAS strategy

1. Idea of standard fields is fine.

2. Priority 1: Virgo 100 sq degs YJHK
   Priority 2: Equatorial stripes in YJHK working N. Complete filter set before moving on.
   Priority 3: Northern block J only
   Priority 4: Deeper Y band only observations in completed fields

3. Bands 1 and 2 are acceptable. Band 3 could be used for calibration verification. This is a problem for the calibration working group to think about. Yes exposure time should vary depending on seeing/sky brightness combination.

4. No limits provided scheduler uses sensible algorithm for picking target. However it was pointed out that since calibration needs to cover the airmass range covered by the obs, there needs to be a policy. Imposing a universal airmass limit of 1.7 might work.

5. It is envisaged to have Y+J MSBs, and H+K MSBs. The entire sequence YJHK to be completed on any night. Any MSB might cover, say, 4 tiles, to give good data for sky subtraction. By prioritising each pointing the Y+J and H+K exposures are effectively tied together. Vary exposure time depending on seeing/sky-brightness combination.

6. Only 2x2 is requested. A 5" step was more popular than a 2" step i.e. get well outside the psf wings. But a 10" step is too large, as too much of the overlap region is lost.

7. Not an issue

8. Not an issue

9. Not an issue

10. Every WFCAM scheduled block

11. Fine

12. Northern block, in J only, would be done in non photom condtions

13. To ensure contiguous regions are covered, the LAS will be divided into bands 2h wide, and the MSBs in each band will be ranked.

14. We await quanitifcation on remanence. Then decisions can be made on which regions to cut out.

15. Galaxies in Virgo will be the largest objects. However since the ratonale for sky subtraction is that data from different pointings will be used (not the pointing itself), it's possible to measure SB profiles of galaxies of size up to ~array size i.e. radius of 7 arcmin. Check with Virgo types if something larger is required. It could still be done provided a different macrostepping strategy were used.

16. Need to assess the effect of moon on the Y band. Also if bright moon + cirrus pushes up the background, then increase exposure time i.e. as above, query tool needs to factor in both sky brightness and seeing.

17. Procedure would now be: i) instrument commissioning, ii) science verification, iii) science observations. A stratgey for ii) needs to be drawn up between JAC, WFAU, CASU, UKIDSS. Some of ii) might be done on science targets, but best is first to draw up the tests and then to consider the targets.

18. We really need a breakdown from CASU on the relevant issues regarding flat fielding, sky subtraction, fringing, thermal background, OH variations etc. Essentially what limitations are there on observing strategy (e.g. min. no. of exposures/pointings in a sequence in a single band) to ensure that all obs are limited by random rather than systematic errors?

A breakdown of observing overheads (acquisition, filter change etc.) would be handy.

What is the min. exposure in each band, to avoid read noise being significant?

Effect of moon on the Y band.

19. ESO release: we don't want to have releases as rare as every 6 months.

World release: LAS agrees with the goal that the first 2 years' data is released to the world at start+3. We also feel that the first WFCAM block (i.e. Feb, Mar 2004) should be released to the world at start+1.5.

20. Variable integration time required, dependent on conditions. Integration time will probably be quantised in steps of 5s, by coadding on array. So integration times in a pointing might be 10s, 15s, 20s.

2 GPS strategy

1. Idea of standard fields is fine.

2. Priorities as listed below (Phil please check/update, as my version of 2 year plan (on web) doesn't have priorities).

Priority 1: -2<l<55 |b|<1 JHK
Priority 2: 55<l<107 |b|<1 JHK
Priority 3: XMM-GPS fields 18_20h JHK
Priority 4: ESO bulge and vertical strip JHK
Priority 5: GPS inner galaxy block JHK
Priority 6: GPS outer galaxy block JHK
Priority 7: TAP H2
Priority 7: Inner Galaxy 1<|b|<5 K non photom
Priority 8: Outer Galaxy 1<|b|<5 K non photom

All sky from offset sky (~every 2 hours).
The JHK cycling means that the sky overhead is much larger. PHL to give me numbered list. Break long thin regions, and then impose its contiguous. The H2 should be done same night as GCS K band imaging. Can you do science in your offset fields (e.g. LAS).

3. Inner galaxy (l<107) requires Band 1, and something even better for l<20. Some relaxation may be possible at |b|>1. Relax in winter fields to 1.0" (exact value to be determined by test images). Adjust the integration time dependent on sky brightness.

4. No limits provided scheduler uses sensible algorithm for picking target. However it was pointed out that since calibration needs to cover the airmass range covered by the obs, there needs to be a policy. Imposing a universal airmass limit of 1.7 might work.

5. All JHK obs at any pointing to be completed in the same night. The nominal plan is to tile the fields in JHK, but every 2 hours or so to do offset skies (see comments under 9. below).

To ensure contiguous regions are covered, the GPS will be divided into bands 30 degs long, and the MSBs in each band will be ranked.

6. Only 2x2 is requested. A 5" step was more popular than a 2" step i.e. get well outside the psf wings. But a 10" step is too large, as too much of the overlap region is lost.

9. Currently GPS is thinking in terms of doing offset skies, in all bands, in all places, every 2 hours. Two potential problems with the GPS strategy were raised: a) sky variations e.g. fringing at significant level occur on shorter timescales than 2 hours, b) the overheads are larger if all bands are done in a night, for the case where the interval between offset skies is fixed. Can useful science be done in the offset sky fields e.g. observed LAS fields? Note that this may imply doing more than one tile in LAS for offset sky, since the LAS data itself needs to have satisfactory sky subtraction.

10. Every WFCAM scheduled block

11. Fine

12. Fields listed as Priority 7 and 8 in 2., above.

13.See 5., above.

14. We await quanitifcation on remanence. Then decisions can be made on which regions to cut out.

15. Not an issue, because sky comes from offset fields.

16. If bright moon + cirrus pushes up the background, then increase exposure time i.e. as above, query tool needs to factor in both sky brightness and seeing.

17. Procedure would now be: i) instrument commissioning, ii) science verification, iii) science observations. A stratgey for ii) needs to be drawn up between JAC, WFAU, CASU, UKIDSS. Some of ii) might be done on science targets, but best is first to draw up the tests and then to consider the targets.

18. The strategy set out in 9 needs quantifying. General view outside GPS was that 2 hours looked too long.

Still need more data as f(l,b) to check confusion, and hence seeing requirements.

19. GPS agrees with the goal that the first 2 years’ data is released

to the world at start+3. We also feel that the first WFCAM block (i.e. Feb, Mar 2004) should be released to the world at start+1.5.

20. Variable integration time required, dependent on sky brightness conditions. Integration time will probably be quantised in steps of 5s, by coadding on array. So integration times in a pointing might be 10s, 15s, 20s.

3 GCS strategy

1. Idea of standard fields is fine.

2. Priorities exactly as specified in 2 year plan, Table 4, reproduced below. Contiguity will be imposed by ranking the MSBs for each cluster.

Priority 1:	Pleiades	JHK
Priority 2:	Alpha Per	JHK
Priority 3:	Praesepe	JHK
Priority 4:	IC 4665	JHK
Priority 5:	Taurus-Auriga	JHK central 47 sq. degs
Priority 6:	Orion	JHK central 47 sq. degs
Priority 7:	Sco	JHK central 47 sq. degs
Priority 8:	Per-OB2	JHK
Priority 9:	Hyades	JHK central 146 sq. degs
Priority 10:	Hyades	K Only (non. photom) remaining 146 sq. degs
Priority 11:	Coma-Ber	K Only (non. photom)
Priority 12:	Taurus-Auriga	K Only (non. photom) remaining 339 sq. degs
Priority 13:	Sco	K Only (non. photom) remaining 107 sq. degs
Priority 14:	Orion	K Only (non. photom) remaining 267.2 sq. degs

3. Band 1 seeing is required (in all filters) - largely to get accurate proper motions (K band), and then to ensure uniformity of image quality between bands. Adjust the integration time if sky background is excessively bright, but no extra adjustment for seeing since it’s all Band 1.

4. No limits provided scheduler uses sensible algorithm for picking target. However it was pointed out that since calibration needs to cover the airmass range covered by the obs, there needs to be a policy. Imposing a universal airmass limit of 1.7 might work.

5. All JHK obs at any pointing to be completed in the same night. MSB design i.e. length of sequence in any one filter before switching to another filter, will follow currently undefined ’best practise’, as recommended by CASU? Pointings will be ranked, working outwards from each cluster centre, and this will impose contiguity. An example of an MSB might be 2 K pointings, 2 H pointings, 2 J pointings.

6. Only 2x2 is requested. A 5" step was more popular than a 2" step i.e. get well outside the psf wings. But a 10" step is too large, as too much of the overlap region is lost.

7. Not an issue

8. Not an issue

9. Not an issue

10. Every WFCAM scheduled block

11. Fine

12. In non photom conditions K-only obs of low priority fields will be possible

13. See 5 (ranking of MSBs).

14. We await quanitifcation on remanence. Then decisions can be made on which regions to cut out.

15. Not an issue, science is of point sources.

16. If bright moon + cirrus pushes up the background, then increase exposure time i.e. as above, query tool needs to factor in both sky brightness and seeing.

17. Procedure would now be: i) instrument commissioning, ii) science verification, iii) science observations. A stratgey for ii) needs to be drawn up between JAC, WFAU, CASU, UKIDSS. Some of ii) might be done on science targets, but best is first to draw up the tests and then to consider the targets.

18. What happens if part of an MSB gets done - do you chuck it away?

Why is J sky variation larger than H, given that OH is stronger in J?

19. GPS agrees with the goal that the first 2 years' data is released to the world at start+3. We also feel that the first WFCAM block (i.e. Feb, Mar 2004) should be released to the world at start+1.5.

20. Variable integration time required, dependent on sky brightness conditions. Integration time will probably be quantised in steps of 5s, by coadding on array. So integration times in a pointing might be 10s, 15s, 20s.

4 DXS strategy

1. Idea of standard fields is fine. Plan is to dither up to 30" away
from nominal field centre.

2. [Note that this differs from the web 2-year plan]
   Priority 1: K=21.0 2 adjacent tiles in each of DXS1,2,3,4
   Priority 2: K=21.0 2 further tiles in each of DXS1,2,3,4
   Priority 3: K=21.0 2 further tiles in each of DXS1,2,3,4
   Priority 4: J=22.5 3 tiles in DXS1, to cover COSMOS field (what about H?)
   Priority 5: J=22.5 specific tiles in other fields, depending on
               status of multi-wavelength coverage (e.g. DXS2: SHADES+VLA,
               DXS4: VIRMOS4+Steidel)
   Priority 6: K=21.0 further tiles, much lower priority than above
   Priority 7: J=22.5 further tiles

3. Regimes 1 and 2 are acceptable
   Accept slightly worse average seeing in DXS1 (because of UDS)
   Want better seeing in K

4. No limits provided scheduler uses sensible algorithm for picking target

5. This is dealt with by priorities set in 2 above. Otherwise no restrictions.

6. Only 2x2 is requested

7. Strategy is: - tile, tile, return, dither step, tile, tile, return,
                  dither step, etc.
                - tile is 2x2 pointings, each with 2x2 microstep, 10s (?)
                  integrations
                - dither steps are random points away from the field centre,
                  within a radius of 30", with a carefully chosen
                  'random' sequence to avoid any small steps

8. This is dealt with by priorities set in 2 above.

9. Not an issue

10. Master stack gets produced on a logarithmic spacing (2**N nights),
and at end of each WFCAM block. Then data taken on any single night
gets stacked on its own (check for variables).

11. That would be plenty (it is assumed calib WG will minimise wasted time)

12. Thin cirrus is no problem. Min requirement for any tile pair is

two photometric visits over the sequence, as the depth is built up. These two visits to be separated by at least a week.

13. Not an issue, given goal of doing tiles in pairs, before moving to other tiles.

14. Check 2MASS and see what sort of problem we have

15. Want to be able to measure SB profiles out to 10" radius

16. We want Query Tool to deal with bright solar system objects, incl. moon, planets, bright asteroids. (Do we want Tholen's predictions to go into the header?). Thin cirrus is a general issue.

17. Put K-band MSBs in COSMOS and Lockman/Shades at top priority, and hope some gets done.

18. Want survey definition tool to pick guide stars >30" from CCD edge, to allow general dithering strategy to work on the same guide star.

19. For ESO: releasing chunks of data one per week would be fine. Slower than once a month would be a problem. What about checking for supernovae - check at the telescope?

For World: 2 year plan fields at start + 3 years looks good, but reconsider after a year

20. Would prefer longer integrations to save on overheads, depending on severity of remanence. 10s might be sensible. (Note that bad pixels will not be a problem for the UDS).

5 UDS strategy

1. Idea of standard fields is fine. Plan is to dither up to 30" away from nominal field centre.

2. Priority 1: K=22.5 full area
   Priority 2: J=24.0 full area
   Priority 3: K=23.0 full area

3. K band in best 60%
   J band in best 80%

4. No limits provided scheduler uses sensible algorithm for picking target

5. This is dealt with by priorities set in 2 above. Otherwise no restrictions.

6. 3x3 is requested

7. Strategy is: - tile, dither step, tile, dither step, etc.
   - tile is 2x2 pointings, each with 3x3 microstep, 10s (?) integrations
   - dither steps are random points away from the field centre, within a radius of 30", with a carefully chosen 'random' sequence to avoid any small steps

8. Not an issue

9. Not an issue

10. Master stack gets produced on a logarithmic spacing (2**N nights), and at end of each WFCAM block. Then data taken on any single night gets stacked on its own (check for variables).

11. That would be plenty (it is assumed calib WG will minimise wasted time)

12. Thin cirrus is no problem

13. Not an issue

14. Check 2MASS and see what sort of problem we have

15. Want to be able to measure SB profiles out to 10" radius

16. We want Query Tool to deal with bright solar system objects, incl. moon, planets, bright asteroids. (Do we want Tholen's

predictions to go into the header?). Thin cirrus is a general issue.

17. For Jan, Feb put K-band MSBs in UDS at top priority, and hope some gets done.

18. Quantify fringing.

19. For ESO: releasing chunks of data once per week would be fine. Slower than once a month would be a problem. What about checking for supernovae - check at the telescope?

For World: 2 year plan fields at start + 3 years looks good, but reconsider after a year

20. Would prefer longer integrations to save on overheads, depending on severity of remanence. 10s might be sensible. (Note that bad pixels will not be a problem for the UDS). But this might mean different data reduction steps.