VISTA Data Flow System

Document Title: Document Number: Issue: Date: CASU Analysis of RAL VIRCAM data VIS-TRE-IOA-20000-0015 1.0 2006-06-20

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1 Introduction

This is a "quick and dirty" appraisal of the Vircam data taken at RAL on 2006-06-14 and transmitted to Cambridge by 2006-06-19.

1.1 Reference Documents

[RD1] VDFS Requirements for VISTA Data Information, VIS-SPE-QMU-00001-0001, issue 1.0 2006-06-09

2 **Observations**

The observing "log" is included here:

```
From G.B.Dalton@rl.ac.uk Tue Jun 20 12:33:26 2006
Date: Wed, 14 Jun 2006 18:09:34 +0100
From: "Dalton, GB (Gavin)" <G.B.Dalton@rl.ac.uk>
To: psb@ast.cam.ac.uk, Jim Emerson <j.p.emerson@qmul.ac.uk>
Cc: mromanie@eso.org
Subject: Some vista data
```

Hi Folks, I now have some vista 'data' taken with the full-up system and TCS simulator:

```
IMG_BIAS165_0001-0010 - reset frames, dark 1
\mbox{IMG_DARK165_0001-0025} - dark frames, 1 2 5 10 20s, each x5, ndit=1
IMG_DARK165_0026-0050 - dark frames, 1 2 5 10 20s, each x5, ndit=2
IMG_DARK165_0051-0075 - dark frames, 1 2 5 10 20s, each x5, ndit=3
IMG_DARK165_0076-0120 - dark frames, 1 2 5 10 20s, each x5, ndit=1
IMG_FLAT165_0001-0010 - 'flat field', 10x1s, ndit=1, Y band
IMG_FLAT165_0033-0043
                      img_cal_linearity Y band 1,2,4,6,8..20s
IMG_DARK165_0132-0135
                      DARK1 parts of img_cal_noisegain 5 10 15 20s
IMG_FLAT165_0044-0047
                       Y parts of img_cal_noisegain 5 10 15 20s
IMG_0BS165_0001-0004
                       Y band pawprint (4s exp), 3 jitters
IMG_OBS165_0005-0022
                      Y band tile (4s exp), 3 jitters, 18 frames.
IMG_DARK165_0136-0163 DARKs (3600,2400,1200,1)*7
```

Total will be about 50Gb

Pete: I'll start pushing some of this your way tomorrow.... Can you arrange for it to be Somewhere that Martino can get it?

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Cheers,

Gavin

The data were all taken with the TCS simulator "tracking" the default circumpolar acquisition target [flats should have been at the flat screen target, [RD1 3.2.1].

3 Analysis

Referring in turn to sections in [RD1]:

3.1 Resets

Running vircam_reset_combine produced the following results:

| Detector | Median counts | RMS |
|----------|---------------|----------|
| 1 | -3009.118 | 821.0406 |
| 2 | -6011.033 | 825.4673 |
| 3 | -5924.946 | 1402.767 |
| 4 | -5714.874 | 3501.098 |
| 5 | -6254.864 | 626.2802 |
| 6 | -6726.132 | 524.9255 |
| 7 | -4593.483 | 659.8322 |
| 8 | -6297.042 | 639.9749 |
| 9 | -7351.617 | 1193.832 |
| 10 | -6023.024 | 2146.938 |
| 11 | -7346.928 | 536.719 |
| 12 | -4592.333 | 614.0184 |
| 13 | -10027.95 | 1071.991 |
| 14 | -7632.911 | 696.0954 |
| 15 | -5407.7 | 1157.3 |
| 16 | -8736.381 | 1146.528 |

3.2 Darks

Darks comprise the bulk of the dataset (often in support of corresponding flats). The figure shows the median counts of chip2 vs exposure time:

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The trend of counts against time looks well behaved apart from the scatter in the 1-hour darks.

The run of darks is the best set of data here, and in the near future we will use it to investigate the stability or otherwise of reset and dark exposures.

3.3 Linearity

The linearity analysis is the keystone of the VIRCAM pipeline; this is where we generate the bad-pixel map and determine the non-linearity characteristics of the detectors.

The sequence taken was taken with exposures from 1 to 20s. Unfortunately, all but the first two were saturated, as the plot shows:

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Presumably the zig-zag effect on the plateau would be due to resets failing to clear to a consistent level.

Despite an almost total loss of data, it was possible to use just the first two exposures and assume perfect linearity (which is certainly not the actual case) and so generate a mediocre-quality bad-pixel map for use with other recipes. The bad-pixel QC parameters were computed, but almost certainly gave over optimistic answers due to the minimal amount of input data.

The pipeline generates a QC parameter counting the number of bad pixels per chip; turning this into "operability" (i.e. its complement) we can plot this analysis against Naidu:

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One reason again why this is a poor-looking fit is the barely adequate input data, but also Naidu uses a very stringent criterion for an operable pixel and so his figures tend to be more pessimistic than ours.

3.4 Noise and Gain

Unfortunately the noise/gain observations were taken with the default test OB unchanged, rather than the pair of matched exposure required (next version of [RD1] will emphasise this, see also Calibration Plan). All but one of those were saturated as in the linearity frames (see above).

Fortunately, the situation was rescued to a degree by using a pair of frames that were underexposed parts of the "tile" (for the camera in the lab, basically flats). By combining OBS165_20, 21 and DARK165_0109, 0110 we obtain readout noise measures which can be compared with Naidu's determinations:



Despite the low precision of the results from this analysis (low-exposure flats, no linearity corrections, no repeat tests) the correlation is quite satisfactory.

CASU Noise estimate

3.5 Jitter and Tile Observations

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Despite having no real sky, these frames would have been useful to test the science recipes. Using IRAF, we find:

| File | Median (chip 2) |
|--------------------------------|-----------------|
| VIRCAM_IMG_OBS165_0001.fits[2] | 18053. |
| VIRCAM_IMG_OBS165_0002.fits[2] | 14735. |
| VIRCAM_IMG_OBS165_0003.fits[2] | 19482. |
| VIRCAM_IMG_OBS165_0004.fits[2] | 20746. |
| VIRCAM_IMG_OBS165_0005.fits[2] | 20532. |
| VIRCAM_IMG_OBS165_0006.fits[2] | 19263. |
| VIRCAM_IMG_OBS165_0007.fits[2] | 19722. |
| VIRCAM_IMG_OBS165_0008.fits[2] | 19745. |
| VIRCAM_IMG_OBS165_0009.fits[2] | 19061. |
| VIRCAM_IMG_OBS165_0010.fits[2] | 20218. |
| VIRCAM_IMG_OBS165_0011.fits[2] | 23909. |
| VIRCAM_IMG_OBS165_0012.fits[2] | 4110. |
| VIRCAM_IMG_OBS165_0013.fits[2] | 4320. |
| VIRCAM_IMG_OBS165_0014.fits[2] | 4421. |
| VIRCAM_IMG_OBS165_0015.fits[2] | 4643. |
| VIRCAM_IMG_OBS165_0016.fits[2] | 4870. |

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| VIRCAM_IMG_OBS165_0017.fits[2] | 5268. |
|--------------------------------|-------|
| VIRCAM_IMG_OBS165_0018.fits[2] | 5705. |
| VIRCAM_IMG_OBS165_0019.fits[2] | 6070. |
| VIRCAM_IMG_OBS165_0020.fits[2] | 6256. |
| VIRCAM_IMG_OBS165_0021.fits[2] | 6123. |

The first run up to _0011 are near the saturation level previously noted; then someone seemed to switch the lights off. These latter frames could be used for flats but are a little underexposed – but see section on noise/gain where they were useful.

4 Conclusion

The 2006-06-19 data is a tantalising glimpse of VIRCAM data; the analysis that has been possible shows consistency between CASU procedures and those of Naidu. It shows how difficult it is to obtain a run of good data, and how important it is to be doing basic image analysis at the time to ensure quality. We hope to obtain a complete run at RAL before Vircam is shut down for shipping.

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