

Everything you need to know to use the Terabytes

RSAA Mt Stromlo 7 April 2014

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SYSTEM PERFORMANCE

Short Survey

- **Main goal**
 - Bright limits & calibration
- **Depth constraints**
 - Dark/grey time RON-limited $10e^-$
 - 45° off full-moon uv still affected
- **Exposure cadence**
 - Single u-v-g-r-i-z sequence
 - Repeated if interrupted
 - Three independent nights

Filter	Saturation ABmag	5σ limit AB dark	Assuming PSF	5σ limit Short DR1	Exposure DR1/total
u	7.5	19.5 ?	3.0''	20 ?	3/6 x 40s
v	8.3	19.5 ?	2.8''	20 ?	3/6 x 20s
g	9.3	18	2.5''	18.5	3/6 x 5s
r	9.5	18	2.5''	18.5	3/6 x 5s
i	9.7	17	2.3''	17.5	3/6 x 10s
z	9.3	16	2.2''	16.5	3/6 x 20s

Main Survey

- Field scheduling criteria

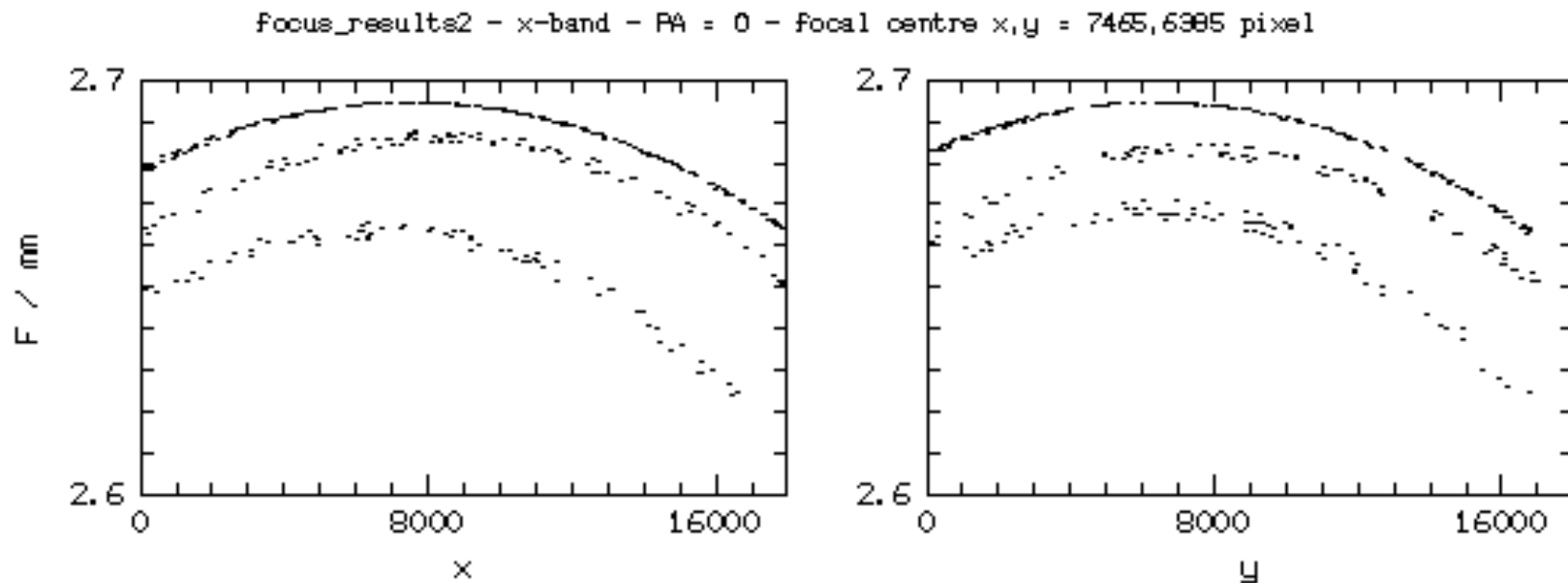
- Airmass
- Moon distance
- Visibility fraction
- Slewing overhead
- Cadence rules, sky brightness

- Exposure sequence

- Dark/grey sequence: *uvgruvizuv*
- 2 following nights: *gr/gr*
- Any 2 bright nights: *iz/iz*
- Dark/grey sequence: *uvgruvizuv*
- Exposure 100 sec/frame

Filter	Saturation ABmag	5 σ limit AB dark	Assuming PSF	Est Survey 5 σ limit	Exposure total sec
u	8.5	20.5	3.0''	21.5	600
v	10.0	20.5	2.8''	21.5	600
g	12.5	21.5	2.5''	22.2	400
r	12.7	21.2	2.5''	22.0	400
i	12.2	20.3	2.3''	21.0	400
z	11.0	19.5	2.2''	20.2	400

Focal Plane Curvature

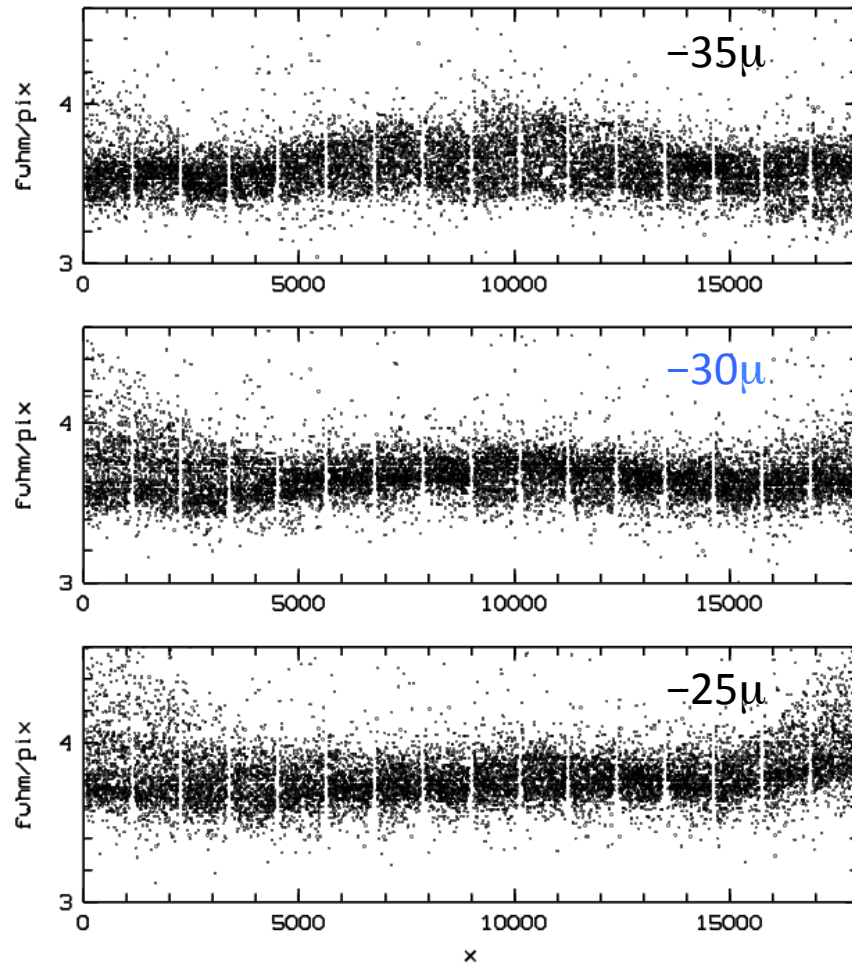


Curvature 25μ per mosaic half-width (9000 pix)

3000 pix off-centre until recollimation Mar 14

Due to position of corrector lens-array (CLA) or M1-M2-CLA

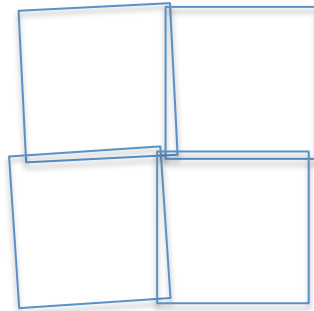
PSF Variation & Statistics



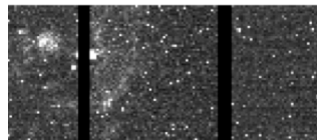
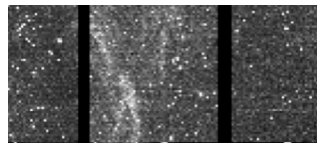
- **Rapidly changing stats**
 - May 13: Vibrations damped
 - Nov 13: Tracking fixed
 - Mar 14: Collimation redone
 - Mar 14: Focus offset applied
 - Apr 14: Elevation flexure compensation tweaked
- **Best hour**
 - 30 Mar 16-17h UT, airmass 1.2
 - FWHM/" 2.3,2.2,1.8,1.8,1.6,1.6
 - DIMM stats: 70% equal or better
- **Best images**
 - 1.3" PSF, i-band, central bump
- **Aim**
 - 2.5" median PSF or 3" uv, 2" iz

Dithers and Overlaps

- Field overlap
 - 2' at edges



- CCD gaps
 - Up to 192''



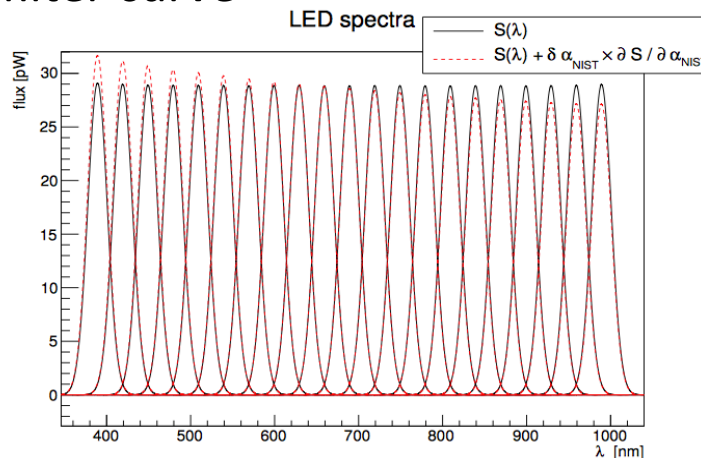
- Lost pixels
 - 9% in gaps, 0.3% twice

- Dither pattern
 - Grid step 1 mrad = 206''

uv	all	all	all	all	uv
					(6)
		2			
				4	
	1				
			3		
(5)					

Flatfields & Illumination Correction

- Current practice
 - Twilight flatfields
 - 5 shots x 6 filters per twilight
- SkyDICE in the future
 - Illumination with 24 LEDs
 - High precision + reproducible
 - Monitor long-term changes in filter curve
- Illumination correction
 - Uses 8 standard fields
 - HST spectrophotometric standard star in each
 - Use log-polar grid of dithers + camera rotation (commencing soon)
 - 4-5 such fields observed every night to monitor and apply corrections



Survey Duration

- Overheads minus 40%
 - Software improvements
 - From 35 sec to 21 sec/frame
- Siding Springs weather
 - 2000 hours/year clear
 - 1500 hours/year survey
 - 1100 hours/year <3" PSF?
- Survey duration
 - Expected 4800 hours
 - 4.5 yr + 0.5 yr contingency
 - Finish observing late 2018
- Long-term 4..5" project?
- Observing Time Breakup
 - Total overheads <25%
 - Main survey 83% exposure

Seconds per field	Short survey	Main survey	Total
Shutter open	600	2800	3400
Overhead	400	600	1000
Total	1000	3400	4400