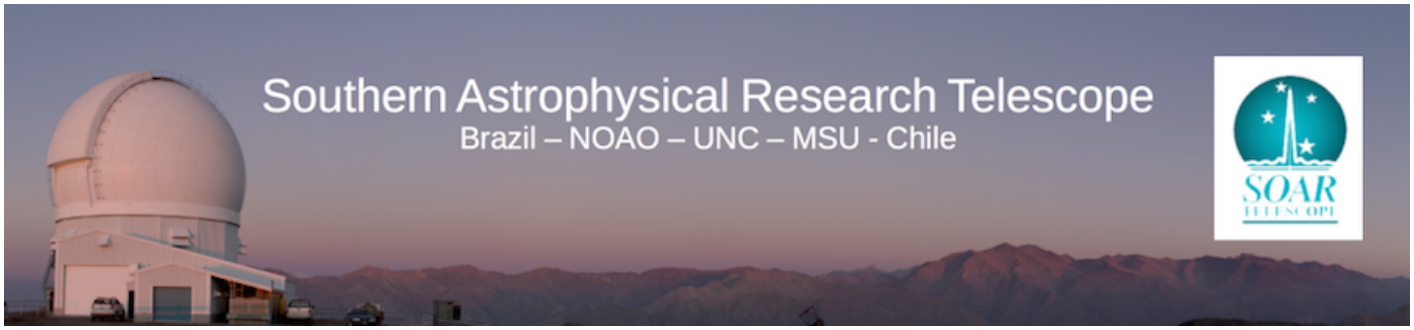

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Goodman Red Camera

The SOAR Goodman Spectrograph Red Camera is equipped with a 4096 x 4112 pixel, back-illuminated, deep-depletion, astro-multi-2 coating, e2v 231-84 CCD. The CCD is read out through 1 amplifier using a Spectral Instruments [1] controller. This CCD has excellent cosmetics. Figure 1 shows a bias frame obtained in Spectroscopic 1x1 ROI mode and with the 344ATTN3 readout (Gain=1.48 e-/ADU, Readout Noise=3.89 e-). Figures 2 and 3 show a dome quartz lamp flat for the 400 l/mm grating in the 400M2 setup (505-905 nm). Note the almost complete lack of fringing at the red end of the image, compared to the Blue Camera CCD [2] (Figure 4).

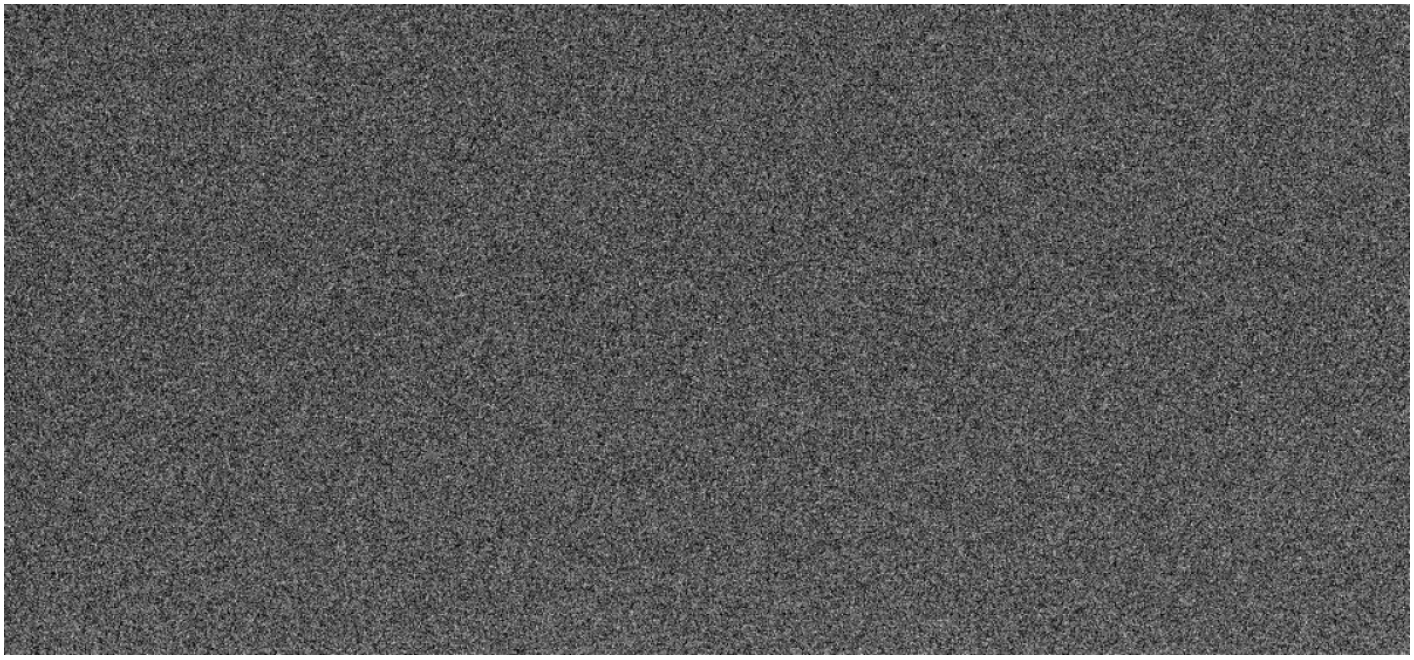


Figure 1. Goodman Red Camera bias frame (ROI: Spectroscopic 1x1; Readout: 344ATTN3)

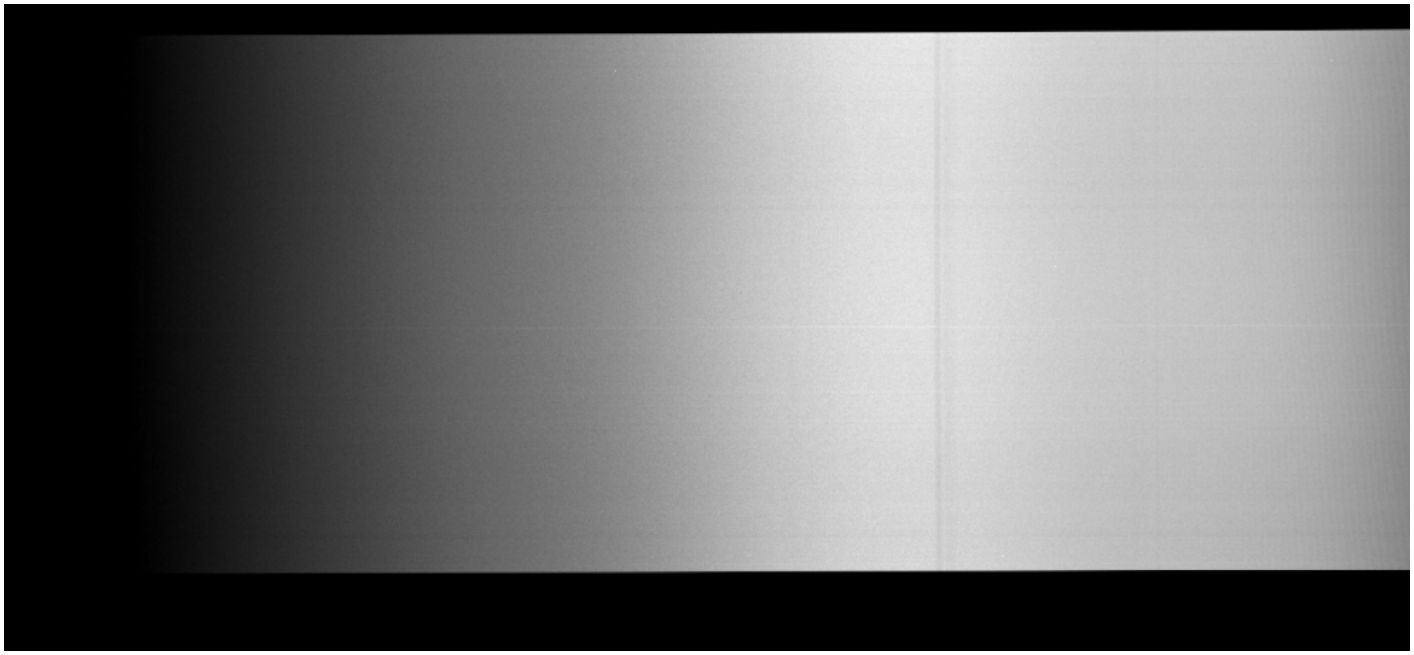


Figure 2. Goodman Red Camera Dome Flat. Grating: 400, Mode: M2 + GG455 filter, ROI: Spectroscopic 1x1, Readout:344ATTN3, Dome lamps at 100%, Texp=20s

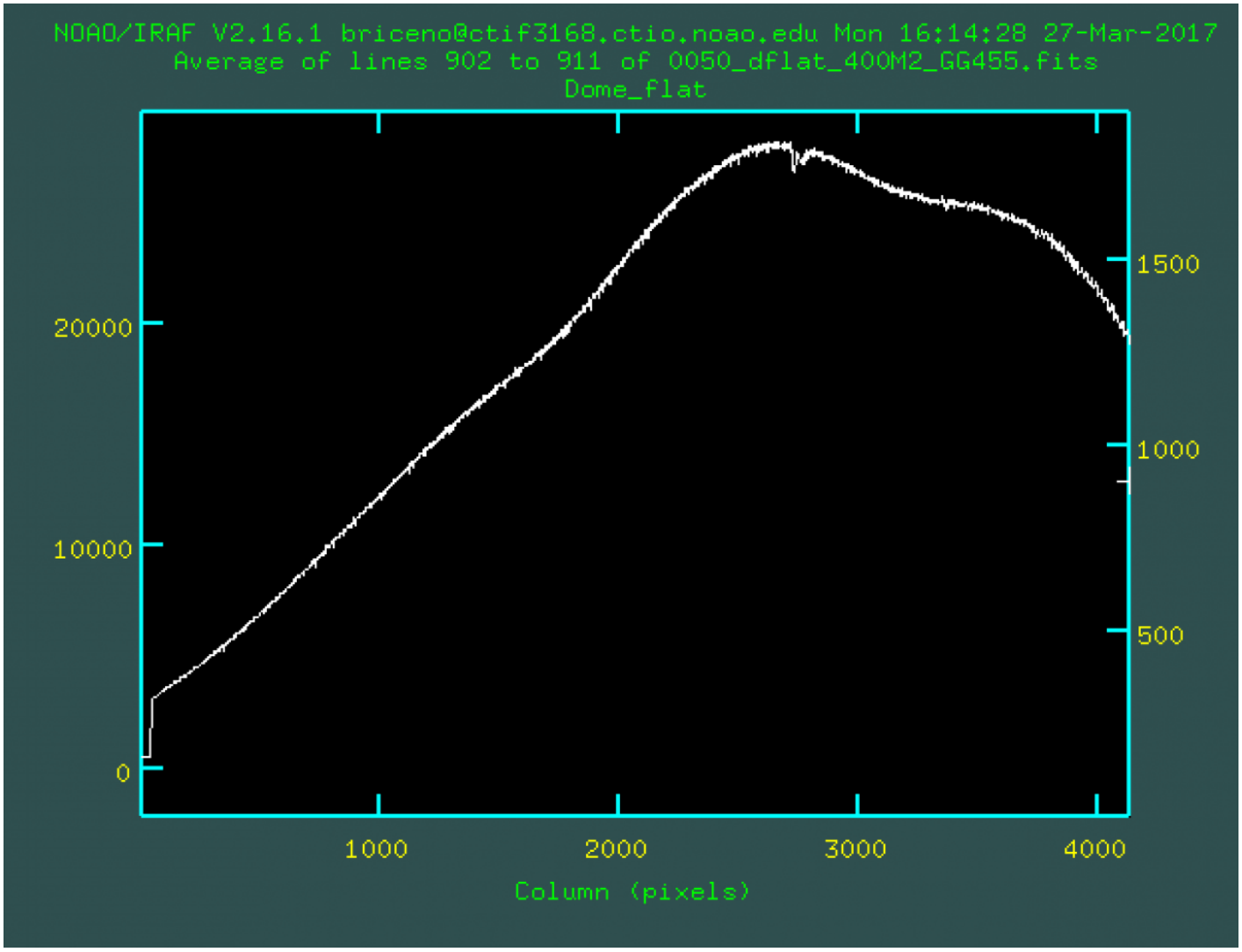


Figure 3. Plot of the above dome flat, along the wavelength direction (averaged 10 pixels across the

spatial direction). Redder wavelengths to the right.

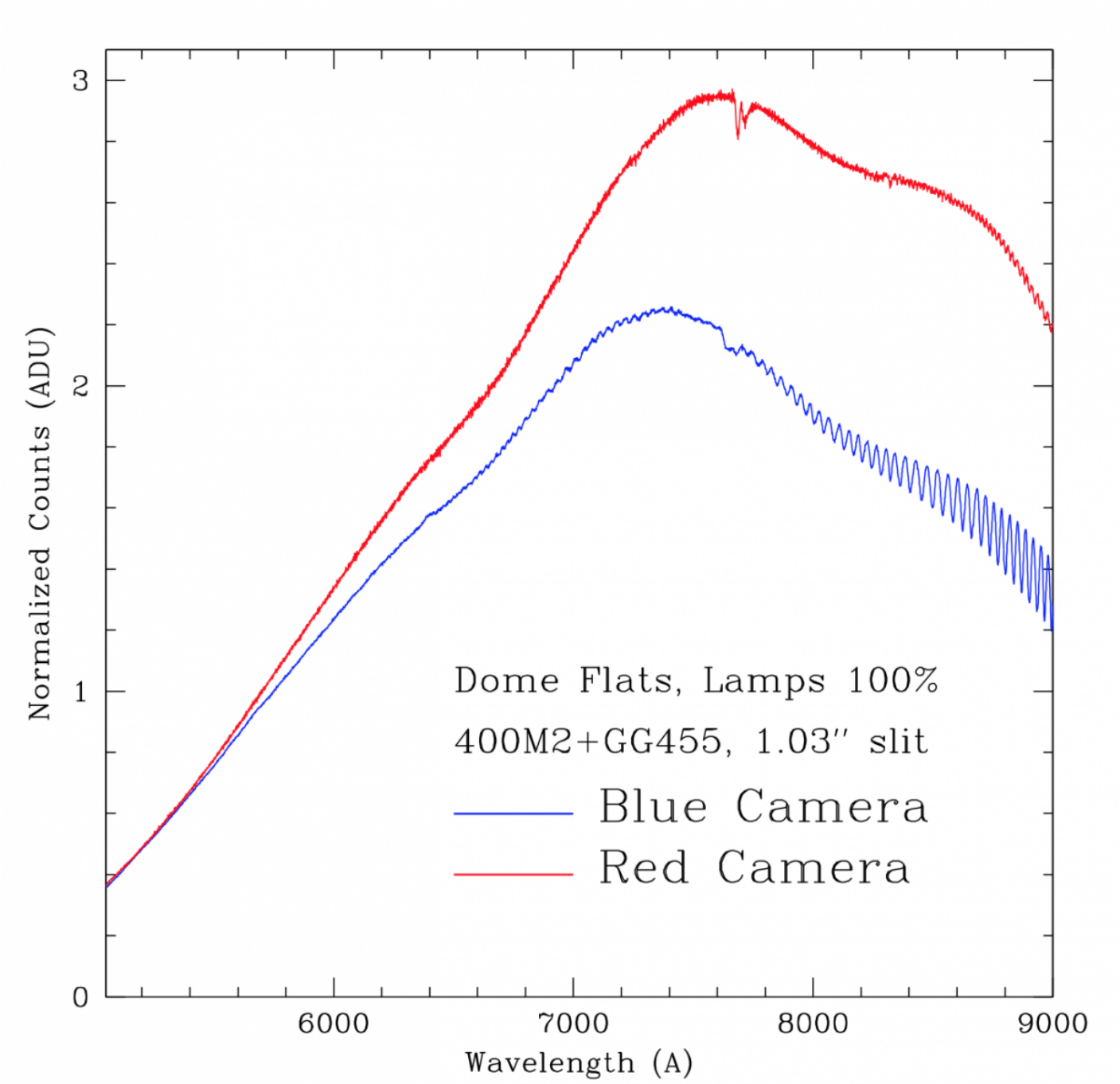


Figure 4. Comparison of dome flats obtained with the Blue and Red cameras, normalized at 5000A, using the 400M2+GG455 grating setup and 1.03 arcsec slit.

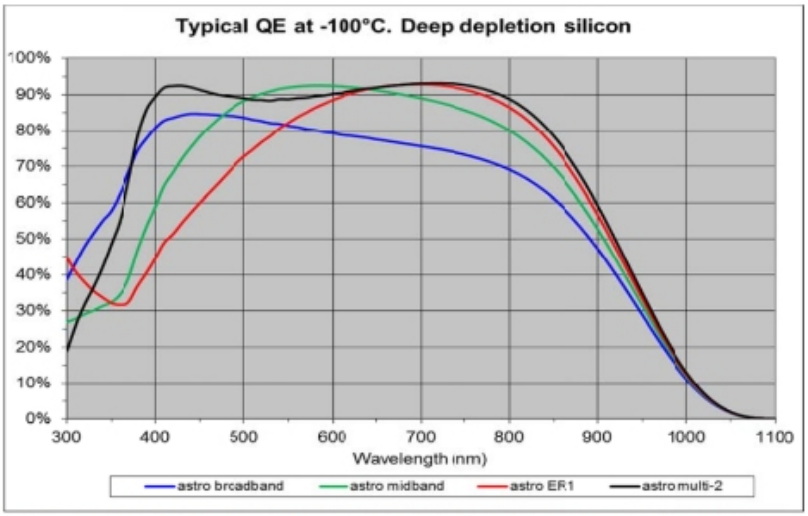
GOODMAN RED CAMERA CHARACTERISTICS

Read Rate	Analog ATTN	Gain (e-/ADU)	Read Noise (e-)	50% Full Well (ADU)
100 kHz	3	1.54	3.45	66,558*
100 kHz	2	3.48	5.88	29,454
344 kHz	3	1.48	3.89	69,257*
344 kHz	0	3.87	7.05	26,486
750 kHz	2	1.47	5.27	69,728*
750 kHz	0	3.77	8.99	27,188

*Digital saturation reached before 50% full well

Digital Saturation: 65,536 e-
Single Pixel Full Well: 205,000 e-
Linearity: 5-80% Full Well
Dark Current: 0.00008 e-/pixel/s
Pixel Size: 15 microns

Full frame readout times		
Readout	**ROI**	**t(s)**
750ATTN0	Imaging 1x1	16.2
750ATTN0	Imaging 2x2	6.5
750ATTN0	Spec 1x1	14.0
750ATTN0	Spec 2x2	6.0
344ATTN0	Imaging 1x1	31.5
344ATTN0	Imaging 2x2	10.3
344ATTN0	Spec 1x1	26.0
344ATTN0	Spec 2x2	9.0
100ATTN0	Imaging 1x1	98.0
100ATTN0	Imaging 2x2	26.7
100ATTN0	Spec 1x1	80.5
100ATTN0	Spec 2x2	22.7



* e2v231-84 deep depletion CCD coated with multi-2 (black line)

Mode	Binning	Serial Origin	Serial Length	Parallel Origin	Parallel Length	Approx. Image Size
Imaging 1x1	1x1	530	3096	388	3096	19 Mb
Imaging 2x2	2x2	530	1548	388	1548	5 Mb
Imaging 3x3	3x3	530	1032	388	1032	2 Mb
Spec 1x1	1x1	0	1896	980	4142	16 Mb
Spec 2x2	2x2	0	948	980	2071	4 Mb
Spec 3x3	3x3	0	632	980	1381	2 Mb
Slit Imaging/Align*	1x1	1100	1100	1300	1500	3 Mb

Note: Origins given in un-binned, absolute pixels, lengths are given in binned pixels
*Subject to change.

Click on this link for a PDF version of this info sheet [3]

We have obtained observations of standard stars in order to determine the system throughput with the Red Camera. Results will be posted soon.

Goodman Red Camera Cold Start page [4]

Source URL: http://www.ctio.noirlab.edu/soar/content/goodman-red-camera

Links
[1] http://www.specinst.com/
[2] http://www.ctio.noirlab.edu/soar/content/goodman-blue-camera
[3] http://www.ctio.noirlab.edu/soar/sites/default/files/GOODMAN/Redcam_cheat_sheet.pdf
[4] http://www.ctio.noirlab.edu/soar/content/goodman-red-camera-cold-start-procedure-soar-support-staff