FLITECAM

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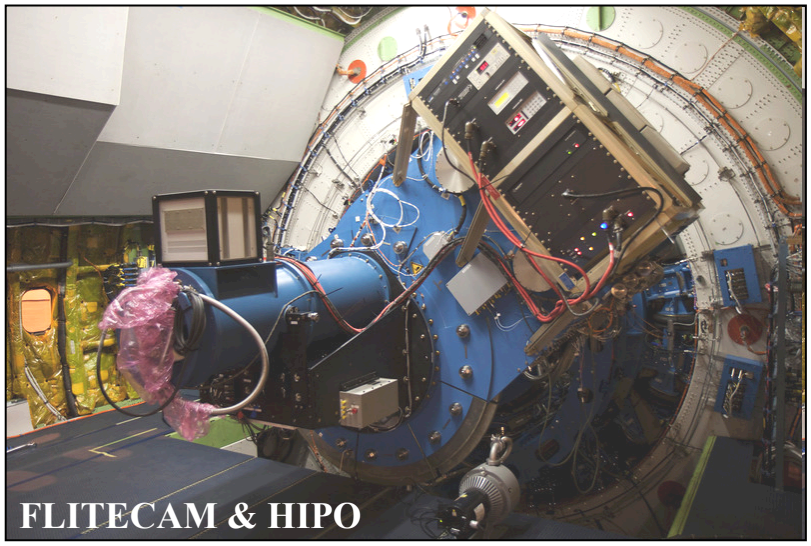
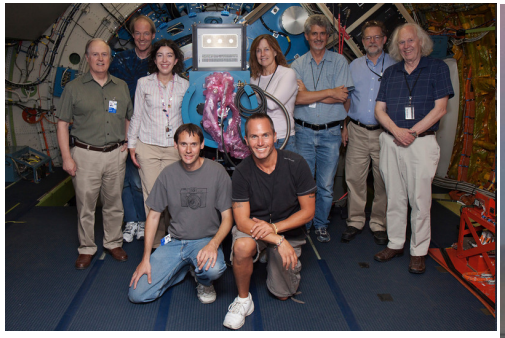
FLITECAM – First Flight

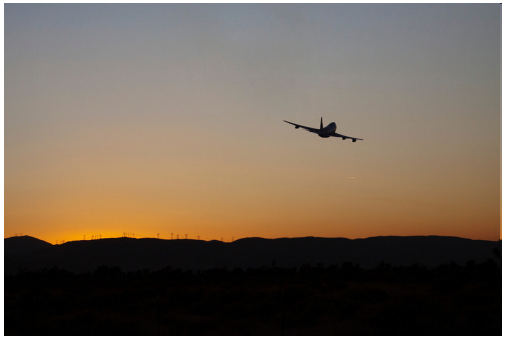
Sunset, Thursday October 13, 2011 – Dryden Aircraft Operations Facility, Palmdale, CA


FLITECAM & HIPO

Ian and Erin ready to board


The Team


LIFT-OFF at 18:20


Photos by Chris Johnson, IRLab

What is FLITECAM?

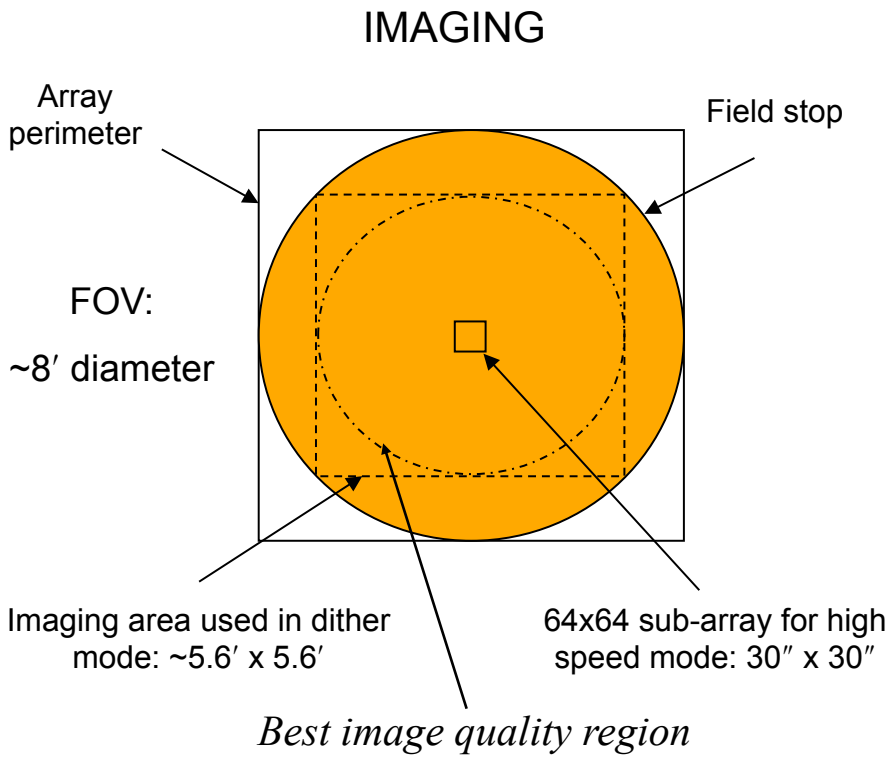
- **FLITECAM is a *camera* and *spectrometer for 1-5 microns.***
- **Detector:** the 1 megapixel (1024x1024) InSb (ALADDIN III).
- **Image Scale**: ~0.475 arcsec per pixel.
- **Filters:** JHKLM broad-band and selected narrow-bands (1%-4%).
- **Spectroscopy:** three direct-ruled KRS5 grisms and an aperture mask with a pair of long slits; either 1″ or 2″ in width and each 60″ in length.
- **Resolving power:** R~1,800 for the 1″ slit.
- High-speed "movie mode" for occultations; and pupil-viewing mode.
- *FLITECAM can be stand-alone or co-mounted with HIPO*.
- Astronomical observing requests (scripts) and a real-time data reduction pipeline (DRP) for dithered image patterns demonstrated.

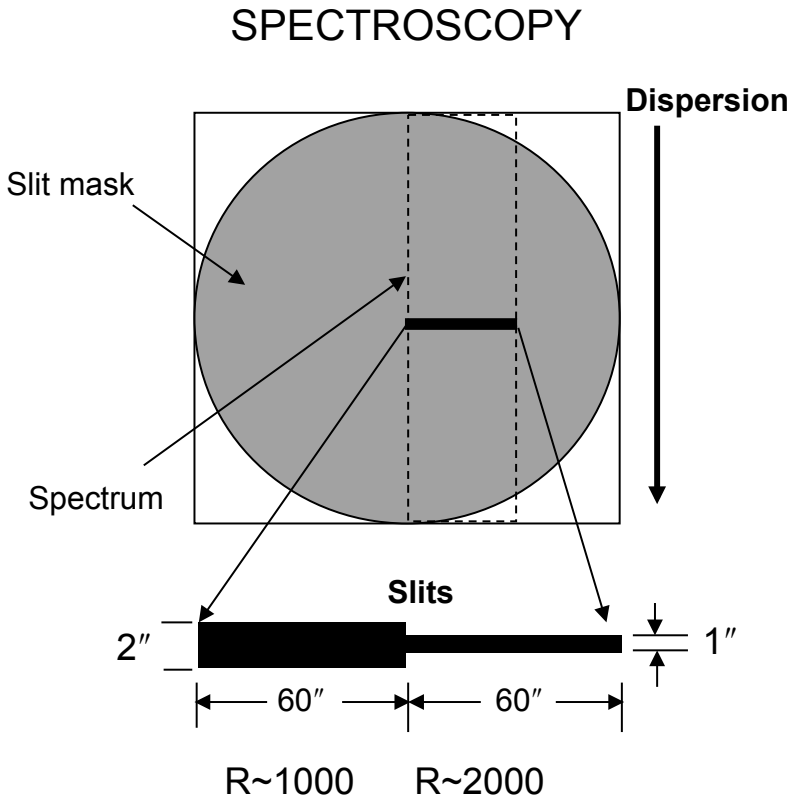
✓ McLean, I. S. *et al*. 2006, Proc. SPIE, 6269, 168.

✓ Smith, E.C.D. & McLean, I. S. 2008, Ap. J., 676, 408.

Layout for Imaging and Spectroscopy

InSb Detector Format: 1024 x 1024 pixels Pixel size on sky: 0.475″ x 0.475″



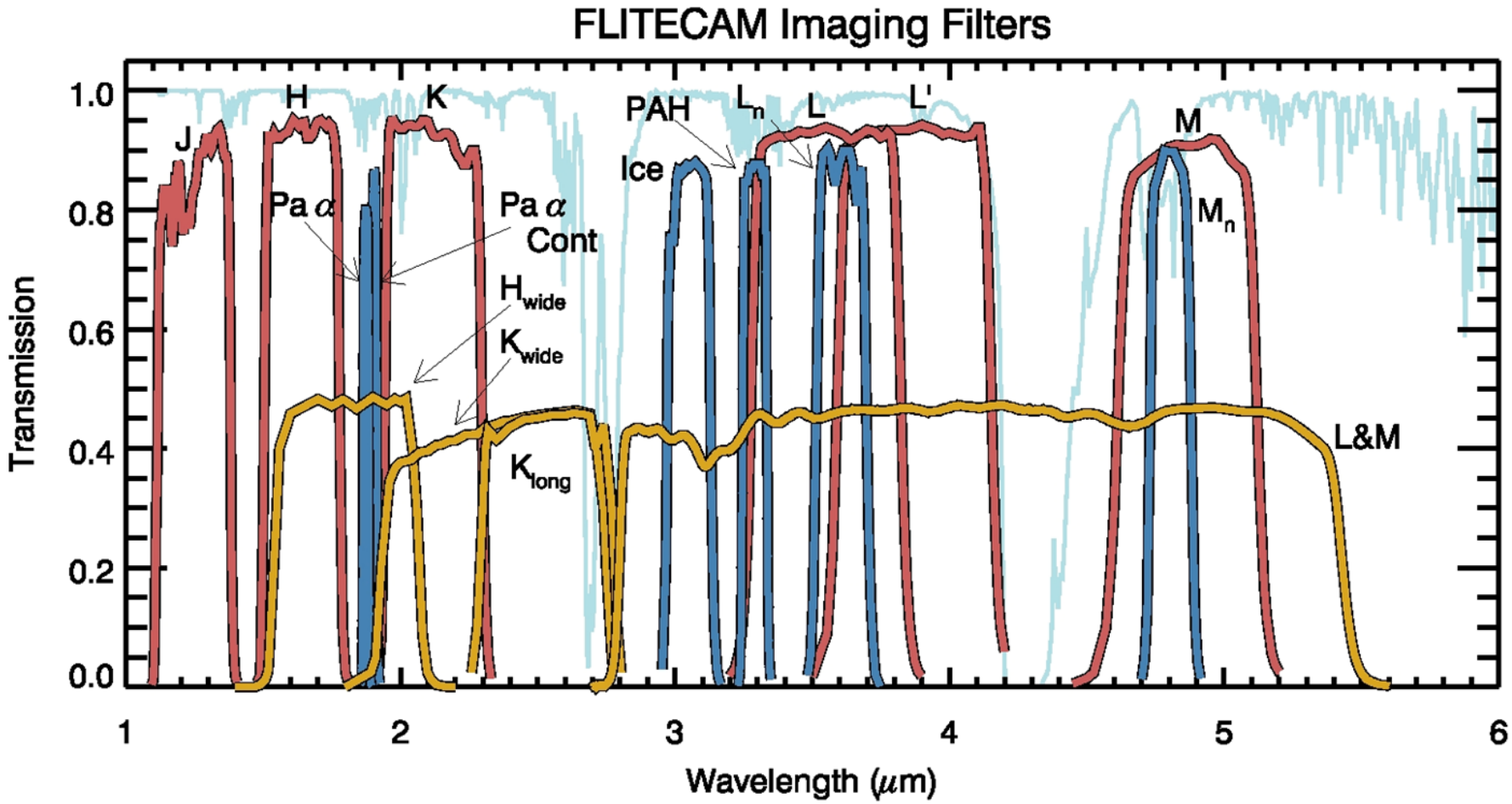


The detector has poor performance in the corners.

FLITECAM FILTER SET

Filter Wheel 1	Filter Wheel 2
blank/dark (77 K)	Pupil Viewing lens
open	Open
J	Paschen-alpha (1.88 μm)
H	A grism – spectroscopy
K	Paschen-alpha (continuum 1.9 μm)
L′	Narrow Band L (3.6 μm)
L	B grism – spectroscopy
M	Ice (3.08 μm)
Hwide	PAH (3.29 μm)
Kwide	Narrow Band M (4.6 μm)
Klong	C grism – spectroscopy
L&M	N/A

FLITECAM FILTER PASSBANDS



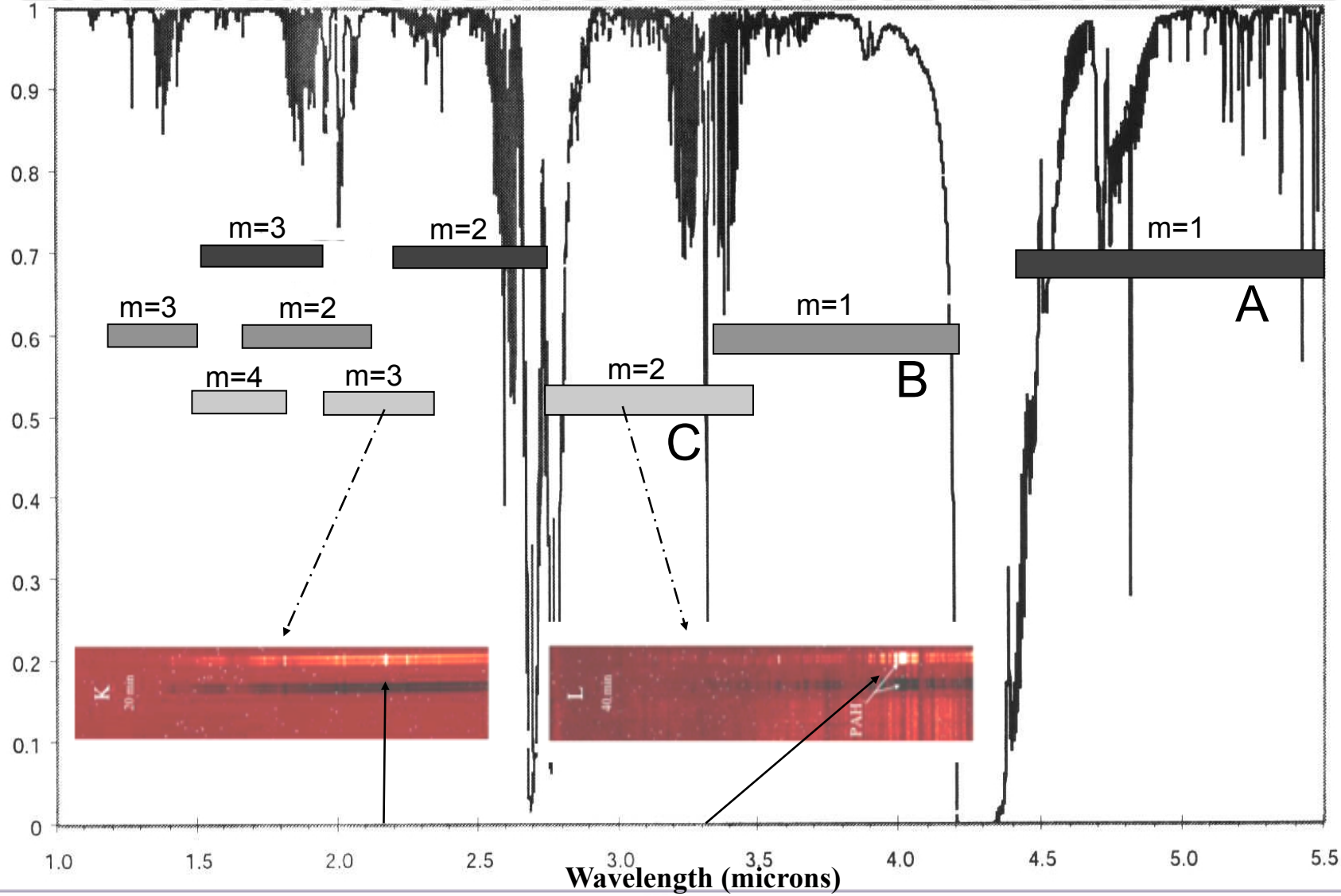
Order-sorting filter (OSF) passbands

Start, Center and End wavelengths for each passband are given in microns

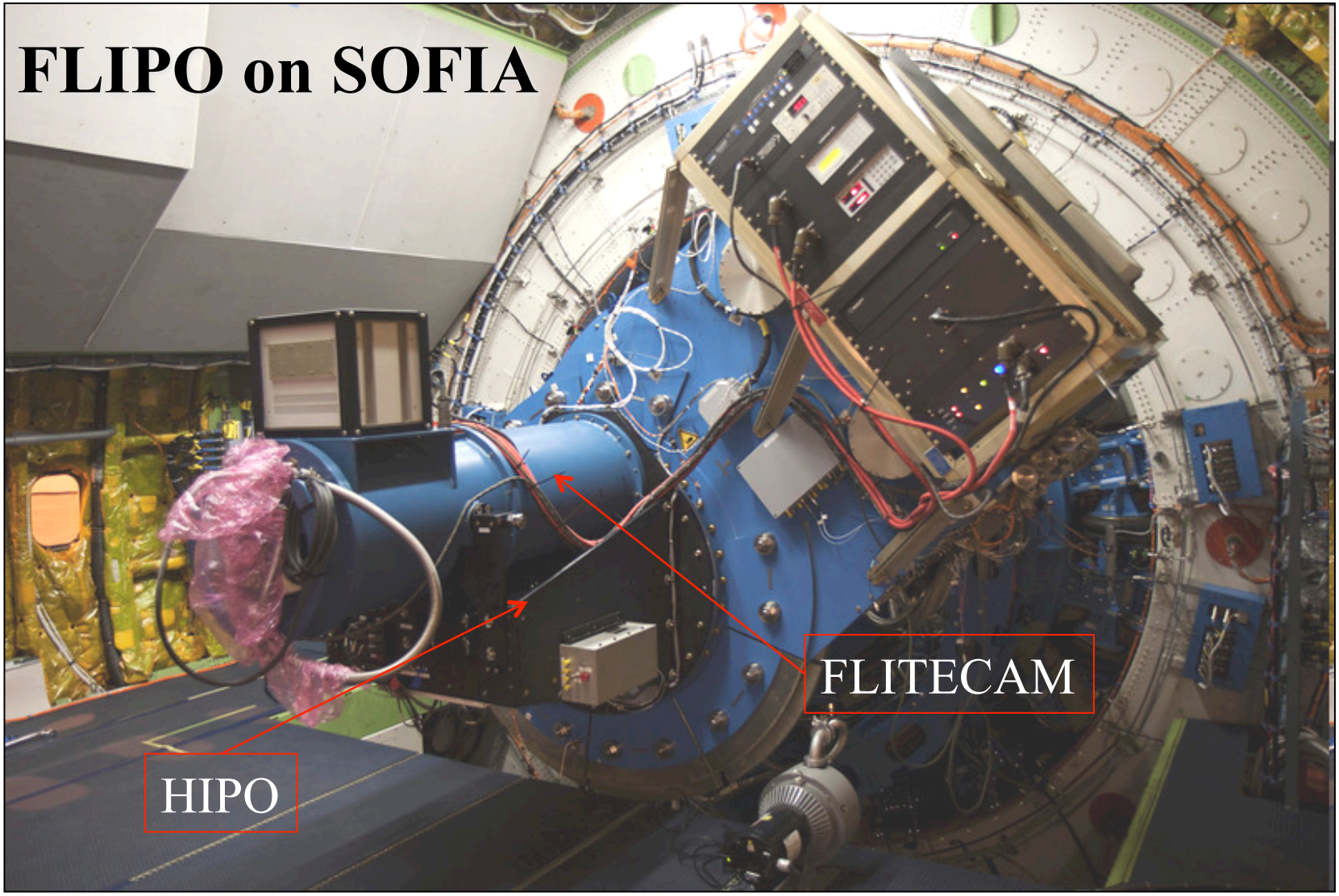
Grism	lines/mm	Order (m)	OSF	Start	Center	End
A	162.75	1	LM	4.395	4.96	5.533
A	162.75	2	Klong	2.216	2.5	2.784
A	162.75	3	Hwide	1.497	1.69	1.877
B	217	1	LM	3.307	3.73	4.16
B	217	2	Hwide	1.649	1.86	2.076
B	217	3	J	1.14	1.28	1.424
C	130.2	2	LM	2.756	3.11	3.467
C	130.2	3	Kwide	1.872	2.11	2.346
C	130.2	4	H	1.445	1.62	1.801

Spectral coverage is displayed pictorially in the next slide.

FLITECAM GRISM SPECTRAL COVERAGE



FLIPO on SOFIA



FIRST FLIGHT - GOALS

Installed October 2011 on SOFIA in "FLIPO" configuration:

- HIPO and FLITECAM co-mounted; reflected light to FLITECAM
- Warm optics in front of FLITECAM window; dichroic and folding flat
- Mainly for support of SOFIA Characterization And Integration (SCAI)
- Some partial FLITECAM commissioning if time permits
- ***Four flights achieved in October 2011***

Tests:

- Imaging in most filters – full-array and sub-array modes; dither patterns
- Spectroscopy observations – used both low and high resolution slits
- Gyro drift observations
- Emissivity tests
- Engine exhaust tests
- Image size as a function of wavelength
- Throughput and backgrounds

SCAI FLIGHT RESULTS

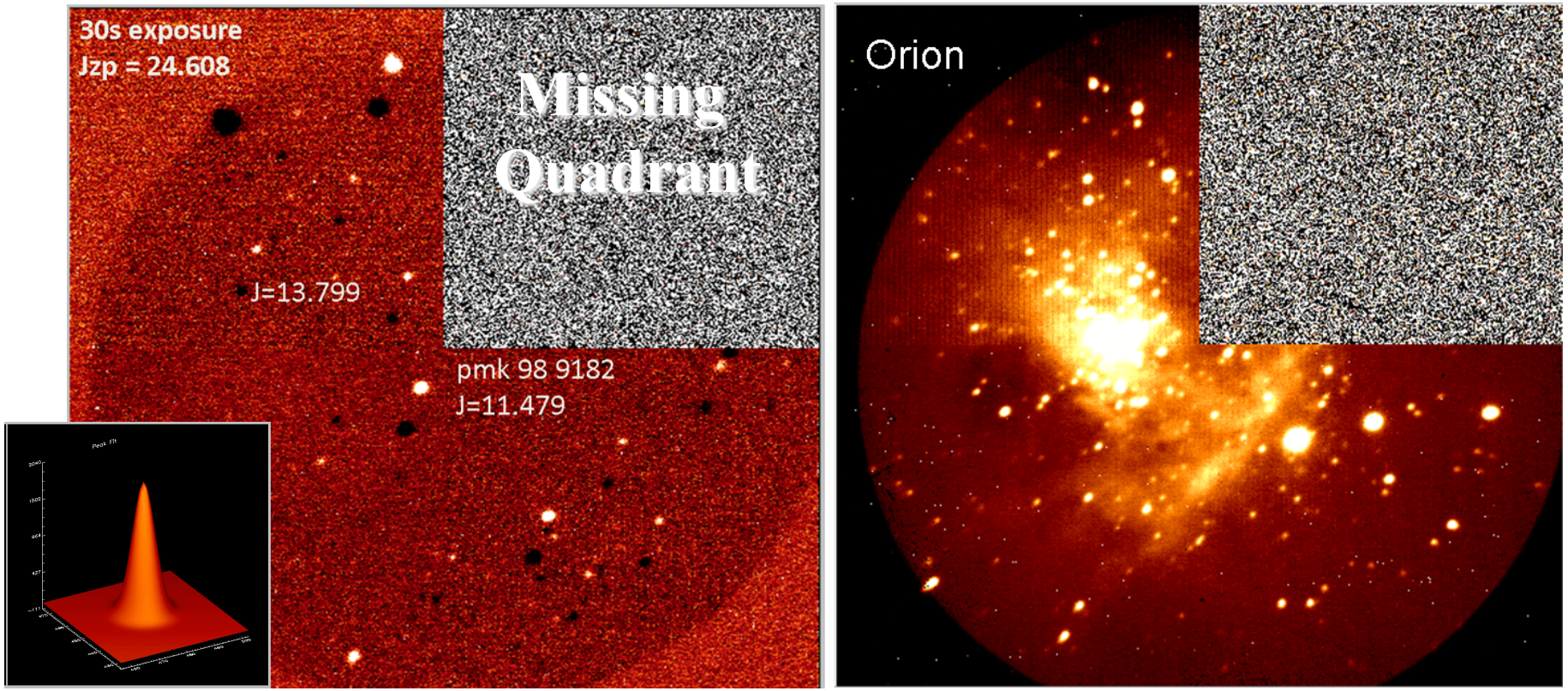
Unable to complete some critical tests because:

- Detector electronics damaged when cabin overheated during aircraft wash; *lost one quadrant of detector for all SCAI flights*.
- Instrument/Observatory interface problems made slit-nodding and dither pattern execution unreliable; sometimes lost pointing during telescope Line-Of-Sight (LOS) Resets.
- Backgrounds higher than expected; partly due to emissivity of FLIPO configuration; also due to internal effects after filter distribution was changed.

- Sensitivity as expected in J, H and K; can't confirm L and M yet.
- Performance at Paschen-alpha very encouraging.
- Best image size as function of wavelength occurred ~3 microns.
- Clear evidence of image jitter in cross-elevation direction.
- Thermal emission due to engine exhaust evident for el < 35°

Throughput and Image Quality Tests

Zeropoints from standard stars consistent with ground-based results for J, H and K bands.



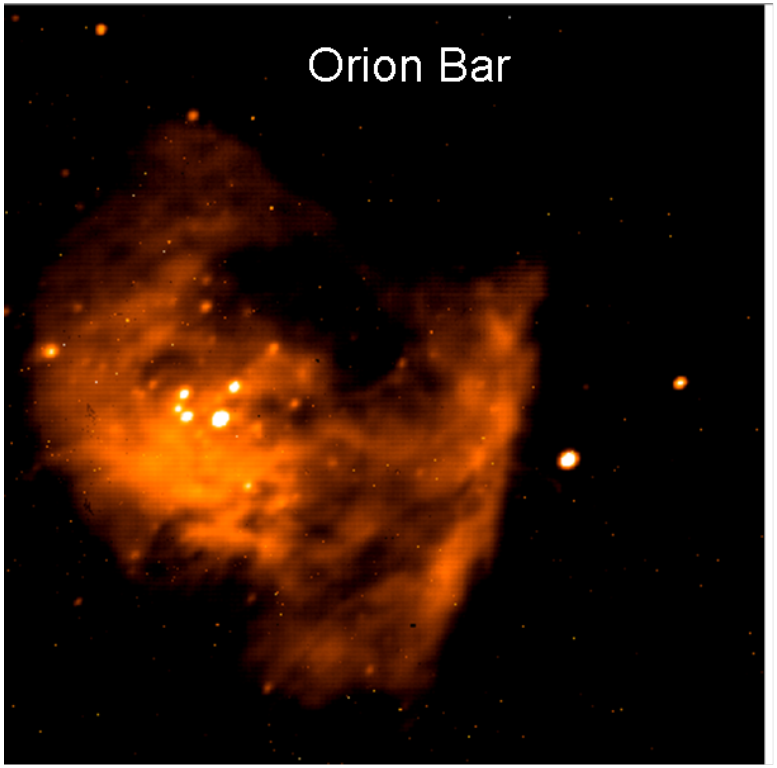
Best images were seen around 3 microns with FWHM ~3.0″

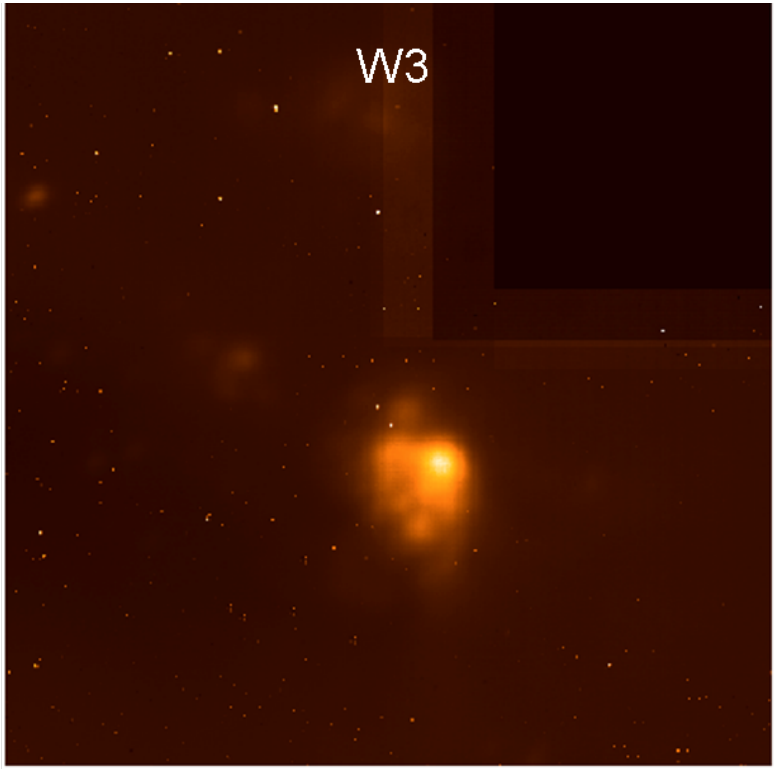
Image elongation seen in cross-elevation direction; mainly secondary mirror motion excited by wind on a “baffle plate”.

STATUS AND PLANS

- FLITECAM is back in the Lab at UCLA for refurbishment.
- *Missing detector quadrant repaired*; protocols now in place to prevent over-heating of aircraft cabin when instruments in use.
- Software enhancements under way; pending new releases of SOFIA MCCS or telescope control software. *Major activity is to improve pointing and software interaction*.
- Baffle plate will be removed for next flights; possibly add an improved beamsplitter and SI blower for cooler fore-optics.
- Experiments under way to track down internal light leaks and eliminate excess thermal background
- FLITECAM (stand-alone) commissioning not scheduled until late 2012 or early 2013. **FLITECAM will be available for shared-risk observing.**

Images using the 1% Paschen-alpha filter





Thank you