ESPaDOnS: from final acceptance tests to first light

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SAC - Nov. 12, 2004

Introduction

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2. Final acceptance tests in Toulouse
3. ESPaDOnS's arrival at the summit
4. ESPaDOnS's installation at CFHT
5. First light and other data from September
6. GUI
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8. Science chip...
9. What's next?

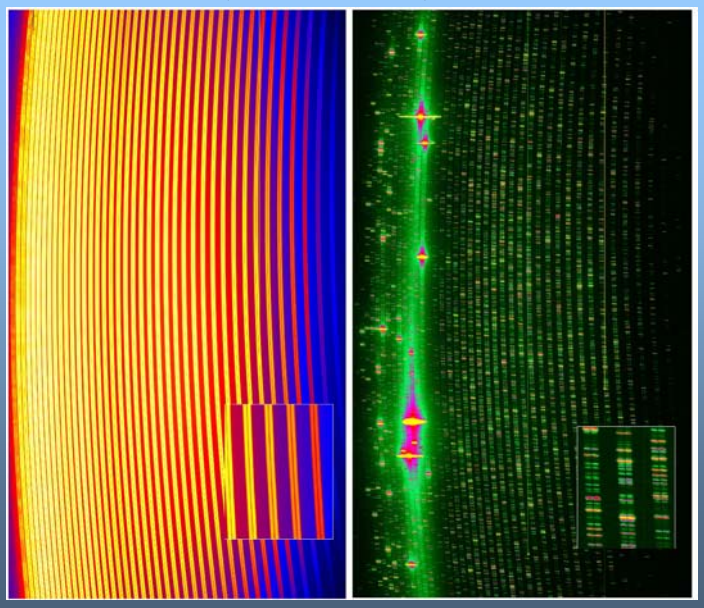
1. ESPaDOnS in one slide

- Cross-dispersed echelle spectropolarimeter
- 40 orders, 369-1048nm, in one single exposure
- 15-20% throughput
- Data reduction software provided, Libre-ESpRIT

- Spectroscopy star only at R=81,000
- Spectroscopy star+sky at R=68,000

- Spectropolarimetry at R=68,000
- Circular and linear polarimetry of lines

(ok, 2 slides)



2. Acceptance tests in Toulouse

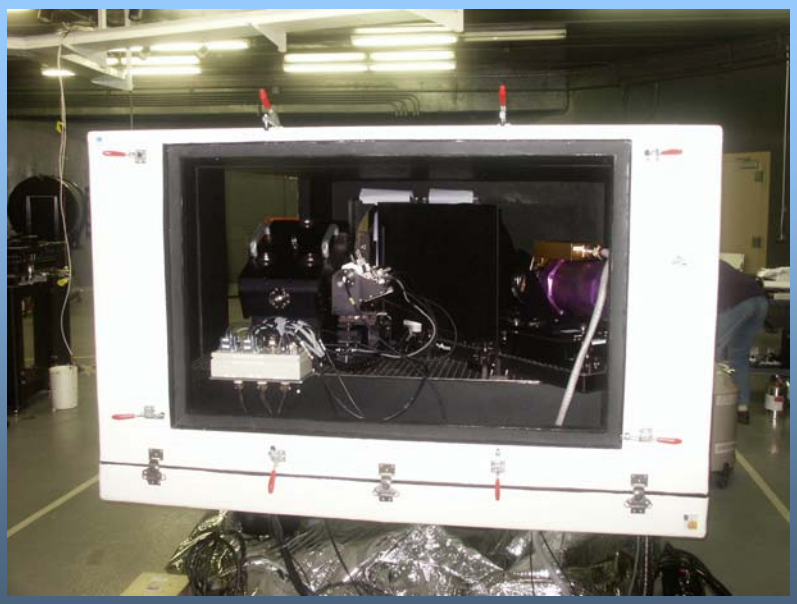
- Test plan written in advance by OMP + CFHT
- Tests: May 24 – June 4, 2004
- Barrick, Szarlan, Vermulen, Manset + OMP
- A lot of work done: more developing, debugging, intensive testing
- Major issues found mostly software + other minor issues
- All issues had to be fixed and demonstrated before allowed to ship instrument – OK on June 23

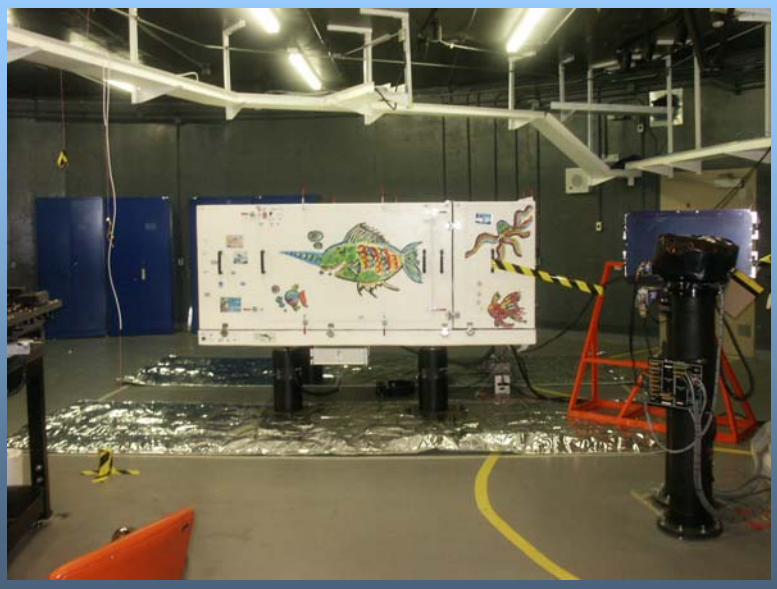
3. ESPaDOnS's arrival at the summit – July 12, 2004

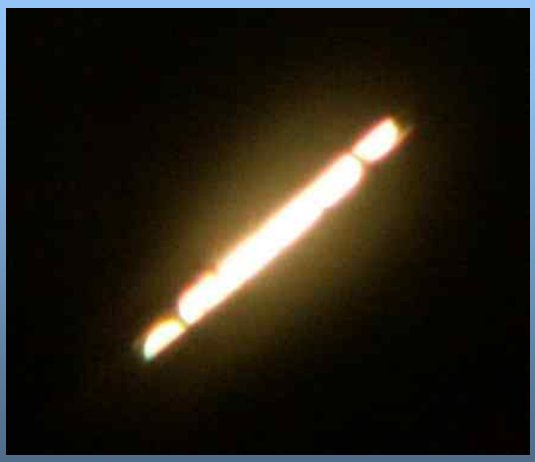

THERMO

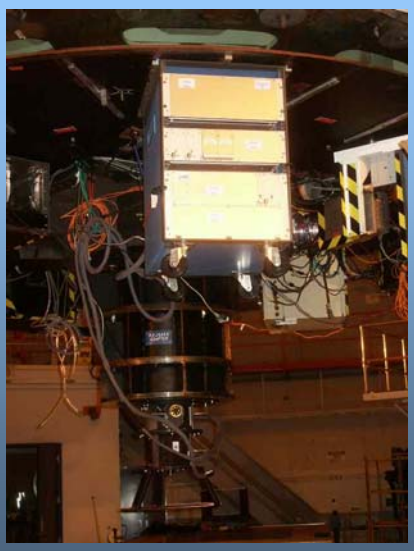
4. ESPaDOnS's installation at the summit

- August 2 – 19, 2004
- JF Donati, S. Baratchart (software), L. Pares (optics), L. Guesdon (electronics)
- G. Barrick, T. Szarlan, Ralph and daycrew, J. Ward, T. Vermulen, N. Manset
- Instrument put back together, integrated into CFHT's network, aligned, tested again





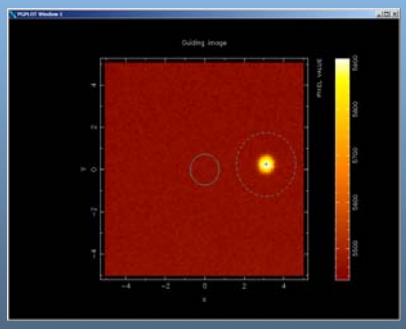
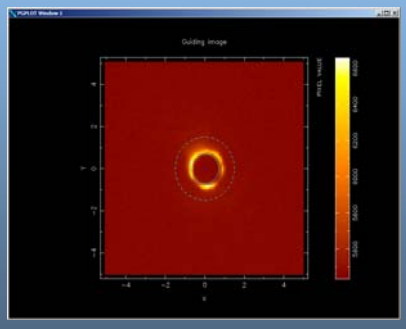




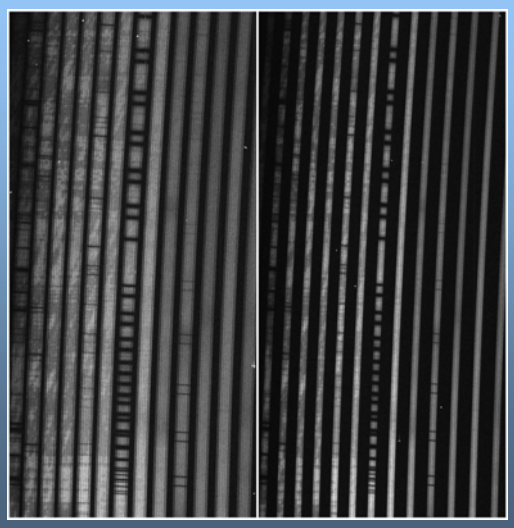
5. First light and Sept. data

- First run E-nights: Sept. 2-3, photometric, very good seeing (0.6-0.8”)
- Second run E-nights: Sept. 23-24, photometric, bad seeing (1.0-1.4”)
- Data for 3 modes (polarimetry, high-res spectro, spectro), hot stars, cool stars, magnetic stars, binaries, stars with planets... Moon, twilight...

5.1 Guider

Offset guiding	Guiding on the target
	

5.2 Spectroscopy of EY Dra



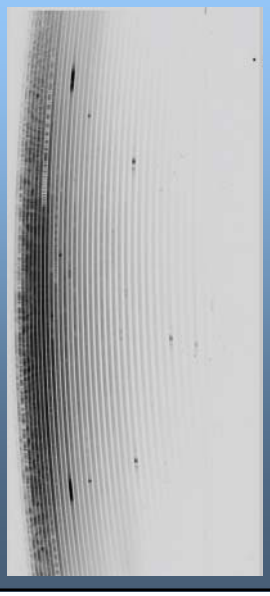
EY Dra:

- M dwarf
- V=11.8
- K5

Spectroscopy:

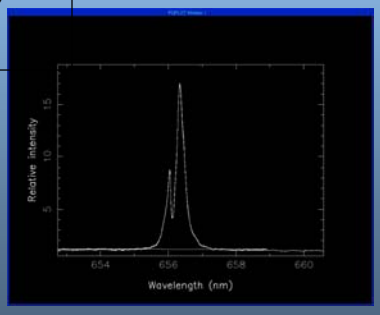
- 6 slices, 24 px
- 4 slices (with sky), 12 px
- 300 sec

5.3 Spectropolarimetry of DF Tau

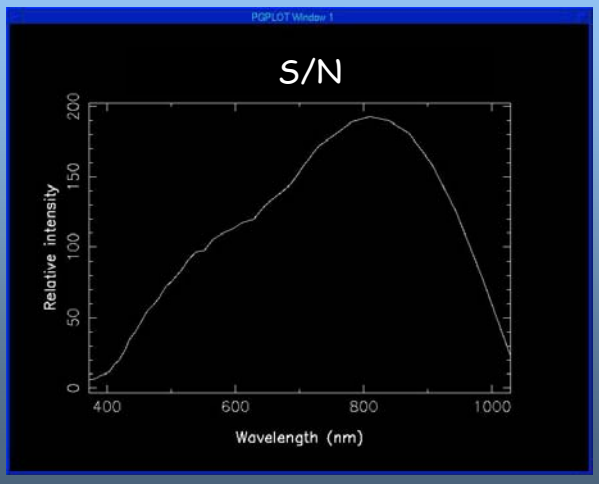


DF Tau:

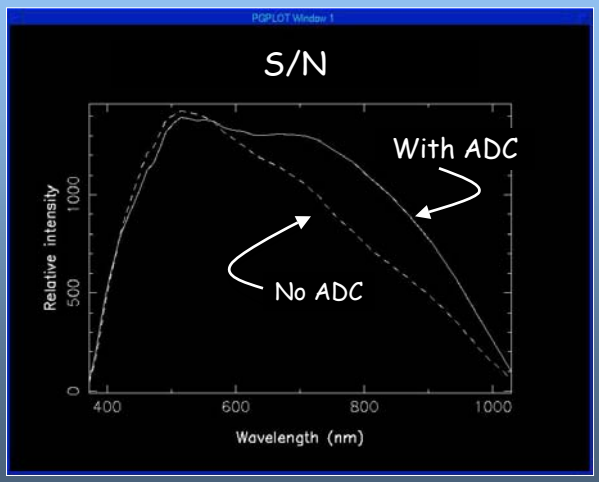
- T Tauri star
- V~11 (var)
- K5



DF Tau 4x600sec



5.4 ADC test



Beta CrB

- spectroscopic bibary
- V=3.7
- 60 sec

5.5 Results from E-nights

- First light on the first night Sept. 2, 10pm!
- Acquisition and guiding (2 modes) work
- Mag~14-15 stars: seen with 0.5s exposures, guiding OK with 3 sec exposures
- Cass guiding also works
- Atmospheric Dispersion Corrector works (stars round, more flux; no spurious polarization, no attenuation)
- Exposure Meter, sensors, TCS, Libre-ESpRIT... work
- Throughput as expected within 0.5mag

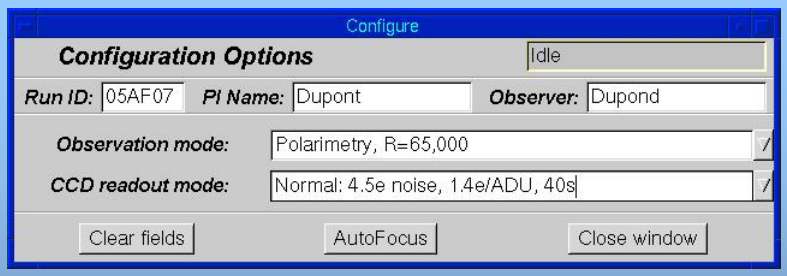
- Guider camera efficiency too low?
- Problem with rhombs: stress birefringence in the cold – re-glued
- Intermittent noise on detector – solved
- detcom/Director crashes
- Retune servos for 3 motors
- Unexpected cross-talk (circular to linear)

6. GUI

- Designed by Donati & Manset, with input from other astros, Barrick
- Implemented by CFHT (Thomas, Vermulen, Lewis, Malan, Matsumoto)
- Uses some of the tools developed by OMP (graphical output)
- Uses scripts developed by OMP, then improved and adapted by CFHT
- Functions:
  1. Status of the instrument
  2. Control of all needed components
  3. Automation of observations (sequences)

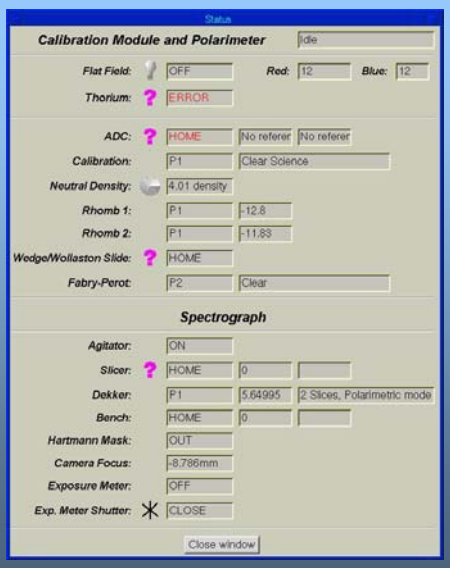
Top Menu Bar

- Buttons presented in an logical, chronological order



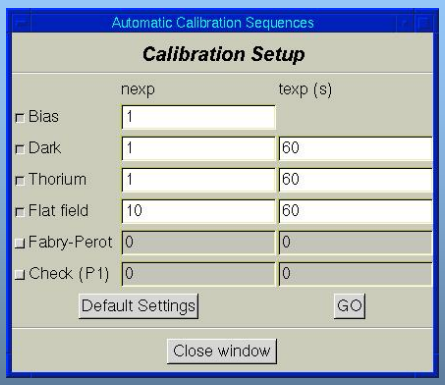
Configure

- Configuration of the instrument is the first thing done during a night
- 3 Observation modes: Polarimetry, Spectroscopy star+sky, Higher Resolution Spectroscopy star only
- 4 CCD readout modes (speed): Fast (25s), Normal (40s), Slow (65s), XSlow (90s)
- AutoFocus capability: take pictures, measure, focus



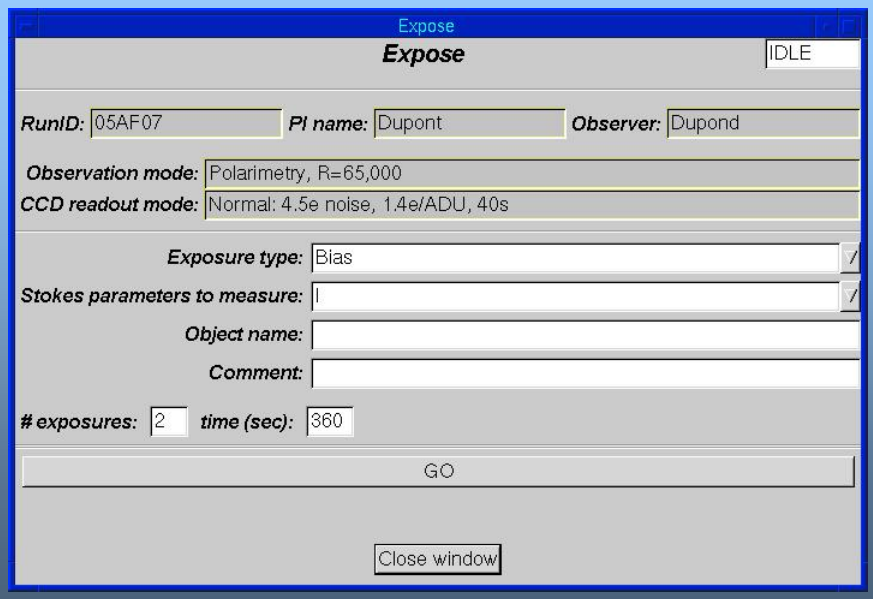
Status

- Status of lamps, polarimeter, spectrograph, guiding camera
- Dynamic icons for visual information
- Feedback on global instrument status: Idle, Moving, Error...



Calibration

- Default settings for typical sequence
- Customizable by user



7. Libre-ESpRIT

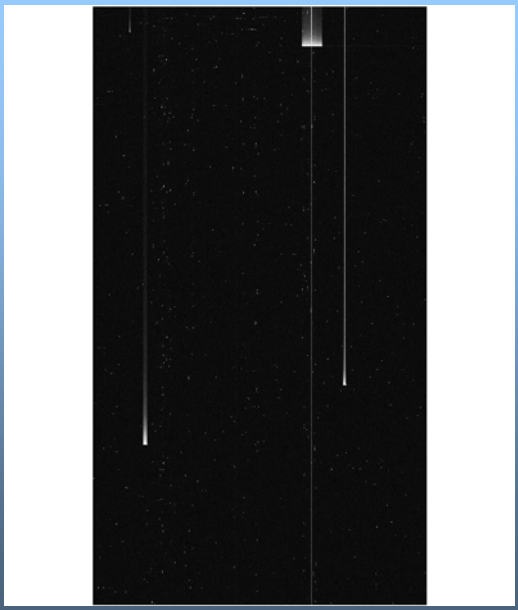
- Data reduction software written and provided by Donati
- CFHT cannot distribute the source nor the executables; users have to reduce their data while at CFHT
- 4 main routines:
  1. `geometry:` locate and fit orders, fit slit
  2. `wcal:` wavelength calibration
  3. `extract:` optimal extraction of spectra
  4. `polar:` exposures combined to get polarization

Libre-ESpRIT

- CFHT will provide a simple display tool for reduced spectra (ascii files) [done]
- CFHT will consolidate existing scripts to extract information from output files (resolution, S/N, etc.) [ongoing]
- CFHT will write User Manual, with help from Donati [ongoing]

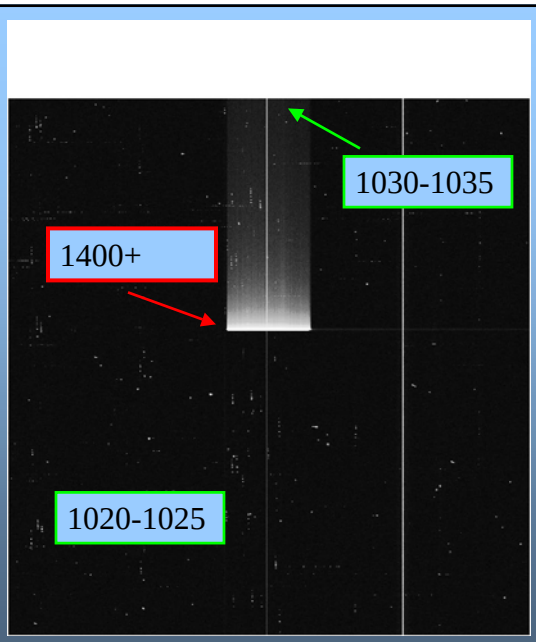
8. Science chip

- EEV1e currently used for tests is a Grade 5 chip with not quite optimal CTE, not quite optimal cosmetics, 33000 masked pixels
- EEV1 that was supposed to be used has degraded and has “hot clusters” that bleed; EEV1 has shown signs of instability too...



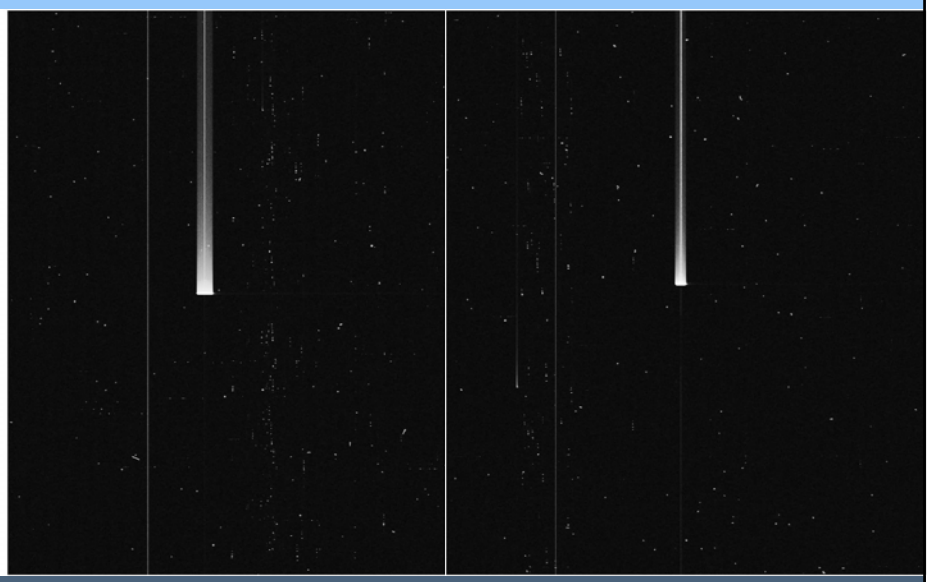
EEV1 30-min dark, top 4/5 of the chip...

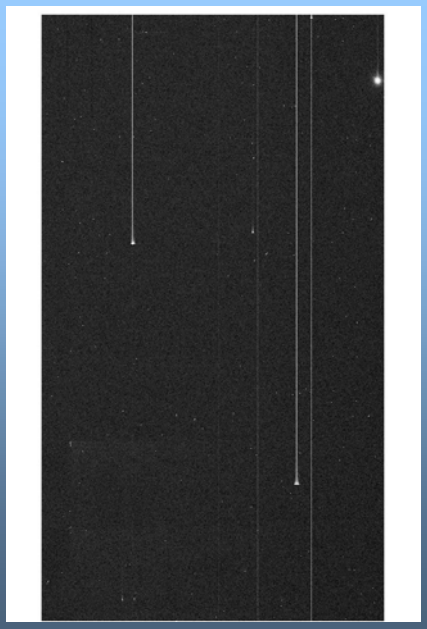
- bad columns
- 3 hot clusters
- hot pixels



EEV1, top cluster

- 125 px wide
- 3 px high
- saturated
- bleeding upward
- bleeding to the right
- known hot pixels





EEV1e, 30-min dark, top 4/5 of the chip...

- ‘star’
- 3 hot clusters
- bad columns
- 33,000 bad pixels currently masked

9. What's next?

1. WANTED: EEV science chip
2. Software: finish GUI, finish session, +...
3. Optics: make sure all rhombs OK
4. Electronics: re-tune 3 motors
5. Finish engineering (Nov. 27-28)
6. Do commissioning (Nov. + Dec.)
7. Documentation: User's Manual (instrument + Libre-ESpRIT), Maintenance Manual (for SAs, and software people)