

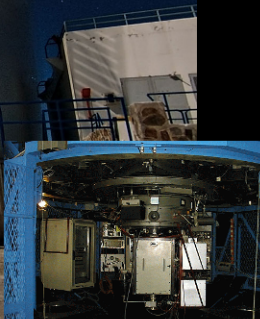
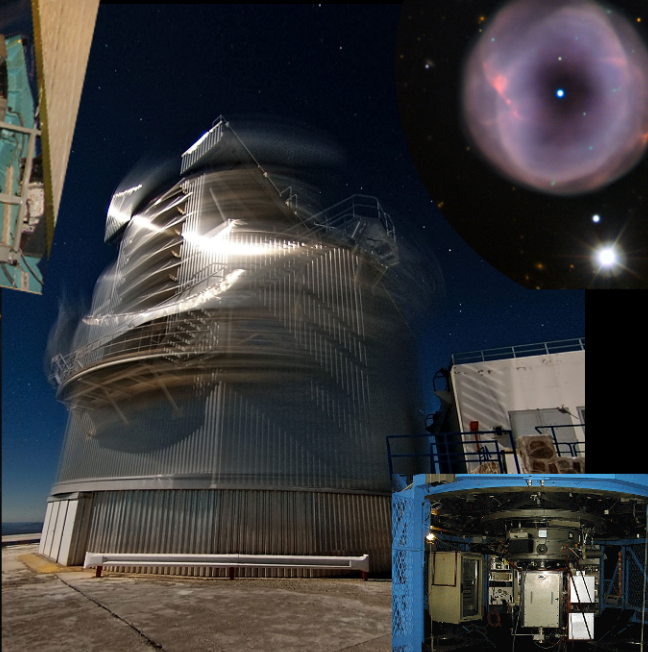
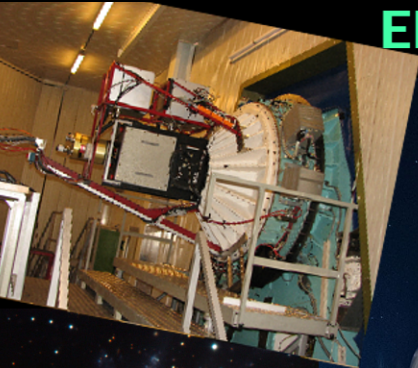


# **EFOSC: Observing and data reduction**

**Linda Schmidtbreick**  
**European Southern Observatory, Chile**

La Silla Observing School 12th- 23rd February 2024

# EFOOSC: An Overview



# EFOSC2: An Overview

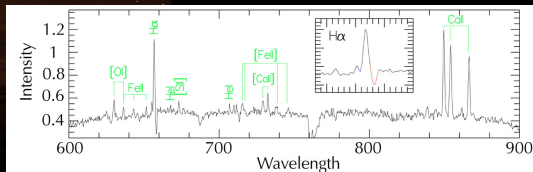
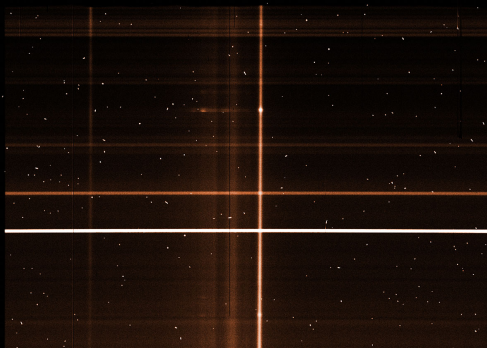
## EFOSC2 observing modes

IMA	imaging
LSS	longslit spectroscopy
MOS	multi-object spectroscopy (masks)
IPOL	imaging polarimetry
SPOL	spectropolarimetry
COR	coronagraphy

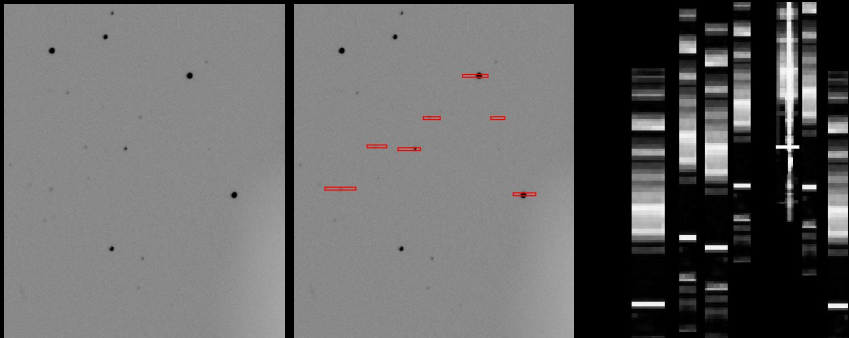
## EFOSC2 observing modes: Imaging



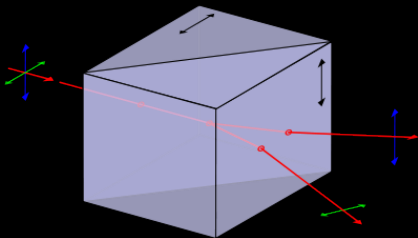
# EFOSC2 observing modes: Spectroscopy



# EFOSC2 observing modes: MOS

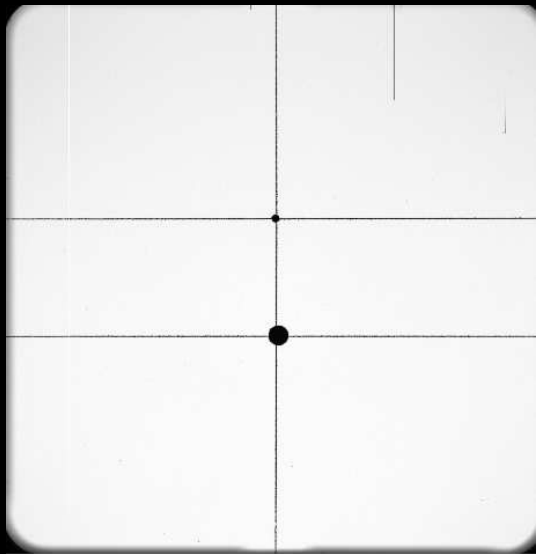


# EFOSC2 observing modes: Polarimetry (IPOL and SPOL)



CHANL: 0	START: 1,0,1,0
FRAME: EFOSC_1waPol066_0020_f1	END: 489,0,275,0
CUTS: 106,0,1083,18225	MIN,MAX: 106,0,1083,18225

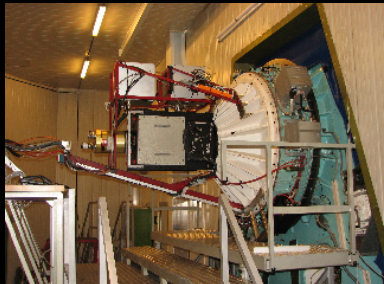
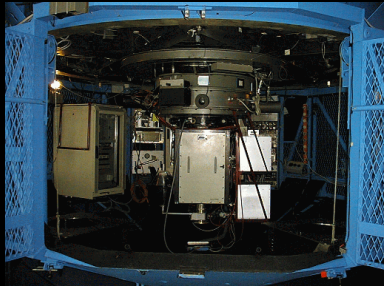
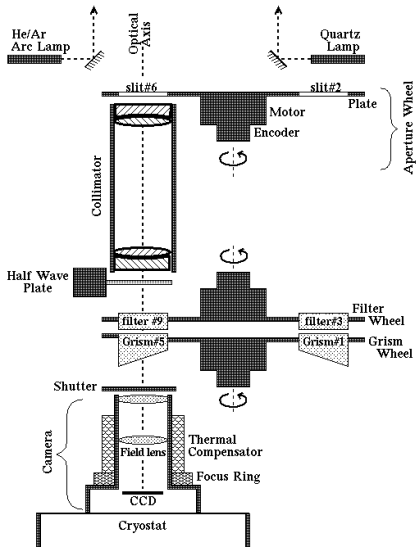
## EFOSC2 observing modes: Coronagraphy





# EFOSC: An Overview

**EFOSC 2** A schematic diagram of the instrument



# Observing with EFOSC: Preparation

Web: www.eso.org/sci/facilities/lasilla/instrumenter/efosc.html

European Southern Observatory

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Science Users information > Observing Facilities > La Silla Facilities > La Silla Instrumentation > EFOSC2

18 Feb 2018

## La Silla Facilities

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- Call for Proposals
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- La Silla Astroclimatology
- La Silla Science Operations

### EFOSC2 : ESO Faint Object Spectrograph and Camera

#### Summary

EFOSC2, or the ESO Faint Object Spectrograph and Camera (v.2) to give its full name, is a very versatile instrument for low resolution spectroscopy and imaging. The instrument has multi mode capability including normal/polarimetric imaging/spectroscopy (several submodes in each), multi-object spectroscopy and coronagraphy. One can easily switch between most modes, even during a single night, with little loss of observing time; this flexibility and the ease of operation make for a very efficient instrument capable of handling most observing programmes in an efficient manner.

Despite its multi mode capability the real forte of EFOSC2 is low resolution spectroscopy - it is a very efficient instrument in terms of both photons and time. A second feature of this instrument is the sensitivity of its CCD to UV photons.

Note that as of April 2008 EFOSC2 is mounted at the Nasmyth B focus of the NTT. These web pages give information about the characteristics of the instrument at the NTT. The old [EFOSC2 at ESO 3.6m](#) information is still available for reference. For a general description of the changes due to the change of telescope, see [Snodgrass et al. 2006, ESO Messenger 132, 18](#).

Publications based on data obtained with the EFOSC2 instrument should reference the following paper: [Buzzi et al. 1984, ESO Messenger 36, 9](#).

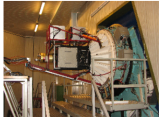
#### Contact Information

- All questions related to observations and proposal preparation should be addressed to the [La Silla Science Operations](#).
- Please [send us](#) your comments, suggestions and report errors and inaccurate statements in the web pages and manuals.

#### Content of these pages

The following items are available on all the EFOSC pages, using the bar on the left.

- [Overview](#): a short description of the instrument
- [News](#): list of changes affecting the instrument and/or its pages.
- [Instrument Description](#): all the important parameters of the instrument



# Observing with EFOSC: Preparation

www.eso.org/sci/facilities/Astia/scops/brvefosc1.cgi

La Silla

La Silla - Science Operation Department

EFOSC Set-Up Form

[HOME](#) [INDEX](#) [SEARCH](#) [HELP](#) [NEWS](#)

Please use the following form to submit your set-up request for EFOSC2. If your setup is special and does not follow the standard setup form, please contact your support astronomer. Note that it is critical that you discuss the set-up with your support astronomer prior to submitting the form.

This set-up form has to be submitted at the latest at 07:00 local on the day you start observing. If you submit it later, it is likely that either your set-up will not be ready in time and/or that you will be waken up early in the morning. It is very helpful to submit this form as far in advance as possible, for forward planning of instrument set-ups. If you know the set up you will use in advance of your run, please submit it early (even before arrival at La Silla).

Please do not overfill this form: select only the optical elements you need. Conversely, it is better to fill in the form once with all the elements you will possibly need than to request changes to the set up during the run. Consider what you need carefully before you submit the form. Please note that changing grisms is particularly time consuming. This form is not performing any verification on the consistency of the set-up you request: be sure to check that you are not requesting duplicates or incompatible elements.

Observer:  First name and name  
Prog.Id:  Format: 075.D-01234(A); see [schedule](#)  
Date of Setup: -- First night of observations. Format: YYYY-MM-DD  
P2PP Password:  Required for identification

Slit Wheel	Filter Wheel	Grism Wheel	Polarimetry Retarder Plates
1 <input type="text"/>	1 <input type="text"/>	1 <input type="text"/>	1 <input type="text"/>
2 <input type="text"/>	2 <input type="text"/>	2 <input type="text"/>	
3 <input type="text"/>	3 <input type="text"/>	3 <input type="text"/>	
4 <input type="text"/>	4 <input type="text"/>	4 <input type="text"/>	
5 <input type="text"/>	5 <input type="text"/>	5 <input type="text"/>	
6 <input type="text"/>	6 <input type="text"/>	6 <input type="text"/>	
7 <input type="text"/>	7 <input type="text"/>	7 <input type="text"/>	
8 <input type="text"/>	8 <input type="text"/>	8 <input type="text"/>	
9 <input type="text"/>	9 <input type="text"/>	9 <input type="text"/>	
10 <input type="text"/>	10 <input type="text"/>	10 <input type="text"/>	
11 <input type="text"/>	11 <input type="text"/>	11 <input type="text"/>	
12 <input type="text"/>	12 <input type="text"/>	12 <input type="text"/>	

Additional Comments:  
In case you selected a special optical element ("Special - see note"), please give the specifications here after.

Submit

# Observing with EFOSC: Preparation



## EFOSC2 Exposure Time Calculator

Optical Spectroscopy Mode [Version 6.0.0](#)

[Description](#) [FAQ](#)

### Target Input Flux Distribution

<input checked="" type="radio"/> <b>Template Spectrum</b>	A0V (Pickles) ▾	Redshift z = 0.00	Target Magnitude and Mag.System: ▽ ▾ = 15.00 <input checked="" type="radio"/> Vega <input type="radio"/> AB <i>Magnitudes are given per arcsec<sup>2</sup> for extended sources</i>
<input type="radio"/> <b>MARCS Stellar Model</b>	Teff=4000 log(g)=-0.5 [Fe/H]= 0 N=1 ▾		
<input type="radio"/> <b>Upload Spectrum</b>	Select: <input type="text"/>		
<input type="radio"/> <b>Blackbody</b>	Temperature: 11000.0 K		
<input type="radio"/> <b>Power Law</b>	Index: 0.00 $F(\lambda) \propto \lambda^{\text{index}}$		
<input type="radio"/> <b>Emission Line</b>	Lambda: 550.000 nm Flux: 50.000 $10^{-16}$ ergs/s/cm <sup>2</sup> (per arcsec <sup>2</sup> for extended sources) FWHM: 1.00 nm		

Spatial Distribution:  Point Source  Extended Source

# Observing with EFOSC: Preparation

## EFOSC2 Exposure Time Calculator

Optical Spectroscopy Mode **Version 6.0.0**

[Description](#)

[FAQ](#)

---

### Sky Conditions

Moon phase:  days from new Moon

Airmass:

Seeing/Image Quality:

*For point sources, the resulting Image Quality FWHM is modeled by the ETC considering the transfer functions of the atmosphere, telescope and instrument. See the [helpfile](#) for details.*

Seeing:  arcsec FWHM in V-band at zenith (**use this value in the proposal**)

*Probability 50% of realising the seeing  $\leq 0.8$  arcsec*

IQ:  arcsec (to be used for the OB constraint set)

---

### Instrumental Setup

Slit width:

Grism:

Detector: CCD#40    Readout mode:     Binning:  (spectral) $\times$ (spatial)

Polarimetry Mode:     No polarimetry     Linear polarisation

# Observing with EFOSC: Preparation



## EFOSC2 Exposure Time Calculator

Optical Spectroscopy Mode [Version 6.0.0](#) [Description](#) [FAQ](#)

---

### Results

S/N:

\* Exposure Time:  s

Plots:  Toggle All / No Plots

- Observed Object+Sky Spectrum
- Observed Object Spectrum
- Sky Radiance Spectrum in physical units (ph/s/m2/micron/arcsec2)
- Observed Sky Spectrum
- Sky Transmission spectrum
- Total Efficiency and Wavelength Range
- Signal-to-noise
- Input spectrum in physical units
- 2D simulated image

# Observing with EFOSC: Preparation



## EFOSC2 Exposure Time Calculator

Optical Spectroscopy Mode **Version 6.0.0**

[Description](#)

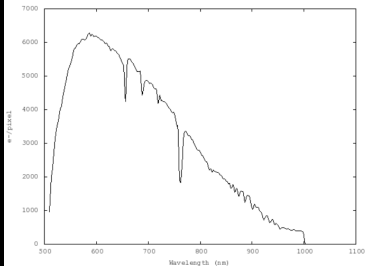
[FAQ](#)

Wavelength Range : **510.000 - 1100.000 nm**  
Central wavelength : **670.000 nm**  
Dispersion : **1.320 nm/pixel**  
Plate scale : **0.260 "/pixel**

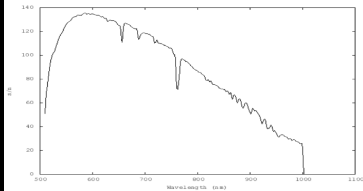
Image Quality FWHM : **2.745 pixels (to be used for OB constraint set)**  
Efficiency at central wavelength (with extinction) : **22.195 %**  
Efficiency at central wavelength (no extinction) : **24.021 %**  
Total object counts at central wavelength : **16175.530 e-**  
Sky background level at central wavelength : **15.674 e-/pixel**  
Max. intensity at central wavelength (object+sky) : **5387.187 e-**  
AD converter saturation : **65196 e-**  
Detector read-out noise level : **8.500 e-/pixel**  
Detector dark current : **1.000 e-/pixel/hour**  
PSF extension (\*) : **5 pixels**  
Signal to Noise (\*) at central wavelength : **125.489**  
Exposure Time (1 exposure) : **100.000 seconds**

(\*) The signal to noise is calculated over 1 pixel along the dispersion and the nearest integer of  $2 \cdot \text{fwhm}(\text{image quality})/\text{plate\_scale} = 5$  pixels along the slit.

Total Spectrum (object+background) at central row



Signal to Noise spectrum



# Observing with EFOSC

The screenshot displays the ESO Observing Tool (EOT) interface. The top navigation bar includes tabs for 'Phase 2 2.2.13', 'Details', 'Overview', 'Schedule', and 'Execution Sequence', along with a help icon and the current date and time: 'MT 11:25:25 - LST: 17:25:17'. The user is identified as 'Lu Silla Observatory'.

The main interface is divided into a left sidebar and a main content area. The sidebar shows a tree view of observation sequences, including '60.A-9709(D) - EFOSC2', 'Tests SW Upgrade', 'Gallery', 'OT queues - do not exec', 'Test Technical Template', 'Dennsfeld', and several individual observation entries with IDs like '1000007347 - No Name' and '150000482 - No Name'. At the bottom of the sidebar are buttons for 'OB', 'CB', and 'Fid'.

The main content area shows the configuration for a specific observation: '60.A-9709(D) - EFOSC2 - 1000030594 No Name'. It includes a status bar with 'Exp. Time: 00:00:00 - Exec. Time: 00:00:00' and a note '(Partially Defined)'. A toolbar contains buttons for 'Check', 'Certify', 'Revise', 'Edit', 'Import/Export', 'Delete', and 'Refresh OB'. Below this is a menu with options: 'Obs. Description', 'Target', 'Constraint Set', 'Time Intervals', 'Finding Charts', 'Ephemeris', and 'Target Visibility'.

The main configuration area is titled 'Obs. Description: No name' and includes a 'tpl size' dropdown set to 'normal' and a 'show' dropdown set to '1'. It features two input fields: 'Observing Description Name' (containing 'No name') and 'User Comments'. Below these are two dropdown menus: 'Template Type' (set to 'acquisition') and 'Template' (set to 'EFOSC\_img\_acq\_MOS'). An 'Add Template' button is located to the right of the 'Template' dropdown.



# Observing with EFOSC

Phase 2 7/1/18 | Details | Overview | Schedule | Execution Sequence | Help | UT: 13:27:35 - LST: 17:37:27 | La Silla Observatory

Check | Certify | Revise | Edit | Import/Export | Delete | Refresh OB

60.A-9709(D) - EFOSC2 | 1000030594 | LaSilla-School-test | Exp. Time: 00:05:00 | Exec. Time: 00:10:02 | (Partially Defined)

Observing Description Name: my-first-EFOSC-OB | User Comments:

**EFOSC\_img\_acq\_MoveToPixel**  
#1 acquisition 1000026591

CCD readout speed	fast
Exposure time	20
CCD X binning	2
CCD Y binning	2
X pixel coordinate	1100
Y pixel coordinate	1024
rotator offset angle	0
Perform combined offset	T
Focus flag	F
Preset flag	T
Filter	R4642

Delete

**EFOSC\_img\_obs\_Image**  
#2 science 1000026590

CCD readout speed	normal
Exposure time	300
CCD windowing flag	F
First column of window	1
First row of window	1
Number of columns	2048
Number of rows	2048
CCD X binning	2
CCD Y binning	2
Number of Exposures	1
Filter	R4642
Starplate	Five
Observation type	OBJECT

60.A-9709(D) - EFOSC2 | 1000030582 | No Name | 1500000485 | No Name | 1500000488 | No Name | 1500000491 | No Name | 1500000494 | No Name | 1500000497 | No Name | 1500000500 | No Name | Tech\_night20191112 | Test\_Chaira | 1000030582 | No Name | 1000030585 | No Name | 1000030588 | No Name | 1000030591 | No Name | 1000030594 | LaSilla-School-test | OB | CB | Fld

60.A-9709(E) - SOFI | 60.A-9709(G) - HARPS

# Observing with EFOSC

Phase 2 21.13 Details Overview Schedule Execution Sequence Help UT 13:32:39 -LST: 17:42:32 La Silla Observatory

Check Certify Revise Edit Import/Export Delete Refresh OB

60.A-9709(D) - EFOSC2 1000030594 LaSilla-School-test Exp. Time: 00:05:00 - Exec. Time: 00:10:02 (Partially Defined)

Obs. Description Target Constraint Set Time Intervals Finding Charts Ephemeris Target Visibility

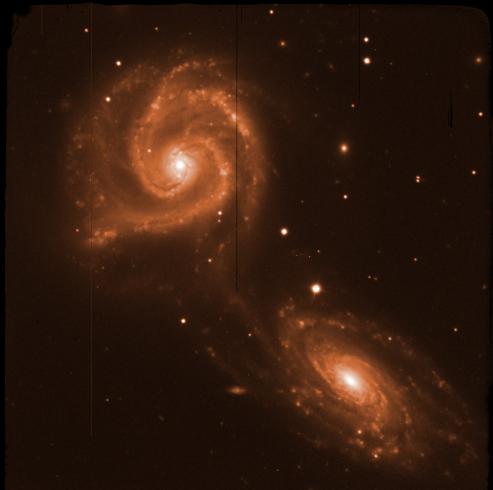
Target Name  
V RRR Pic resolve

Right Ascension	Declination
06:35:36.063	-62:38:24.293
Equinox	Epoch
J2000	2000
Proper Motion Right Ascension	Proper Motion Declination
0.0032990	-0.0034600
Differential Right Ascension	Differential Declination
0	0

OB CB Fid

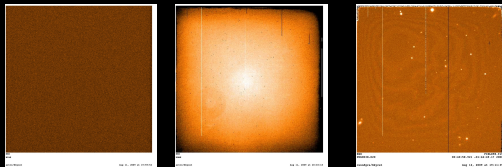
60.A-9709(E) - SOFI 60.A-9709(G) - HARPS

## Observing with EFOSC: Imaging



- FoV:  $4.1' \times 4.1'$
- 4 Bessel filters
- 4 Gunn filters
- 18 Narrow Band filters

# Observing with EFOSC: Imaging

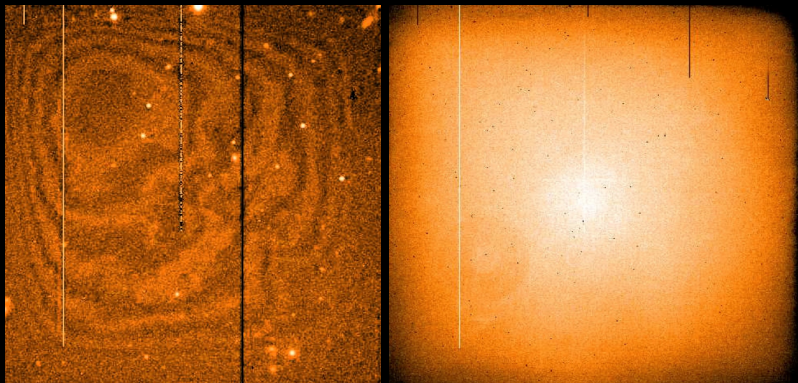


To calibrate, we might need:

- bias (day)
- flats (twilight)
- super-flat for fringes or sky-concentration (night)
- photometric standard stars (night)
- astrometric field (night)

# Observing with EFOSC: Imaging

How to correct for fringing or sky concentration?



# Observing with EFOSC: Imaging

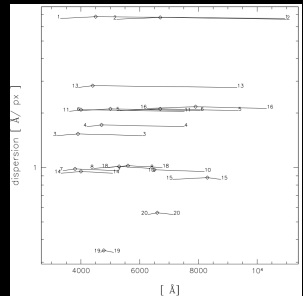
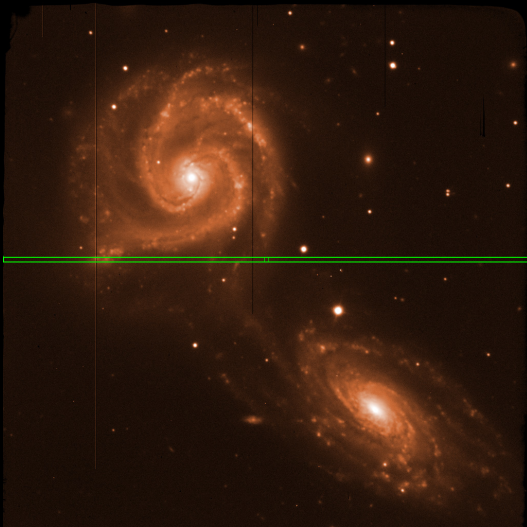
How to correct for fringing or sky concentration?

Fringing and sky concentration are **additive** patterns as they result from light getting scattered in the camera. They have to be **subtracted** from the images after the pattern has been scaled to the actual value in the image.

Note that also the flats show these features, so for proper flat-fielding, the structure has to be subtracted from the flat-image before dividing by the flat. → iteration

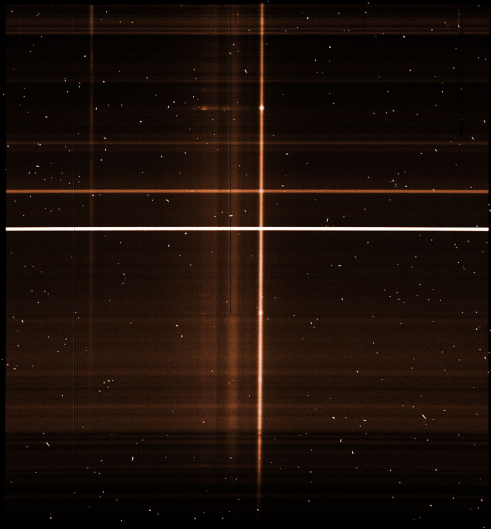
A fringe pattern is available on EFOSC page, it seems to be stable in shape. No analysis is done for sky concentration.

# Observing with EFOSC: Spectroscopy



- 17 grisms
- 9 slit width
- all slits also with offsets to change the wavelength range

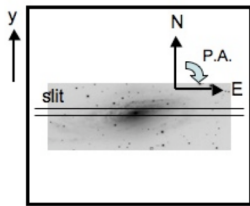
# Observing with EFOSC: Spectroscopy





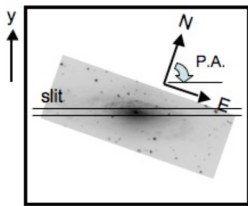
# Observing with EFOSC: Spectroscopy

Rotator offset angle = PA - 90°



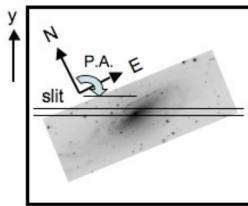
**Default orientation**

Rotator offset angle = 0°  
Slit position angle = 90°



**Rotated: negative offset**

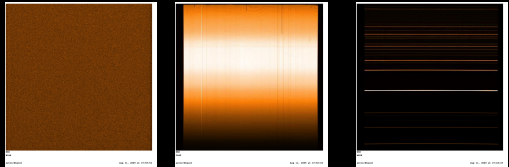
Rotator offset angle = -30°  
Slit position angle = 60°



**Rotated: positive offset**

Rotator offset angle = 30°  
Slit position angle = 120°

# Observing with EFOSC: Spectroscopy

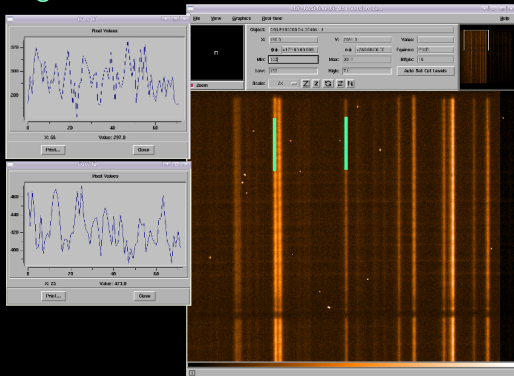


To calibrate, we might need:

- bias (day)
- flats (day)
- arcs lamps (day)
- flat for fringes (night)
- spectro-photometric standard stars (night)

# Observing with EFOSC: Spectroscopy

Fringes:

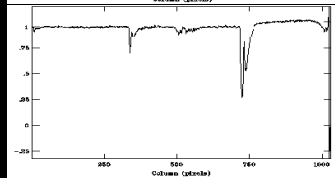
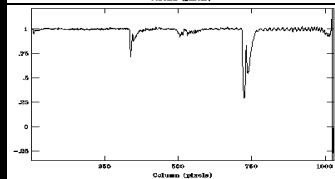
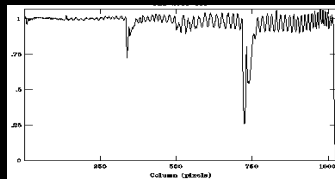
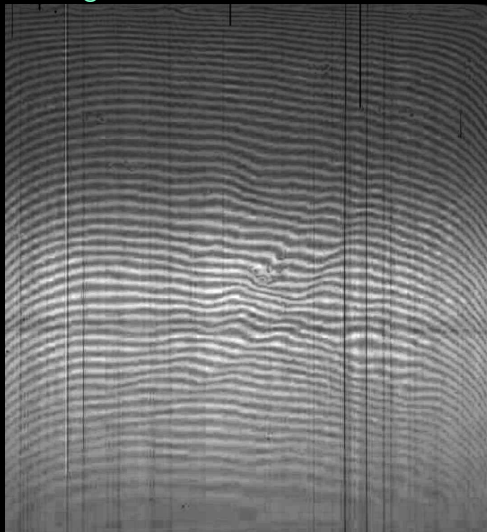


For optimal fringe correction, the flat should be taken close in time and at the same rotator angle as the observations.

Spectroscopic fringes are **multiplicative** and thus part of the flat-field correction.

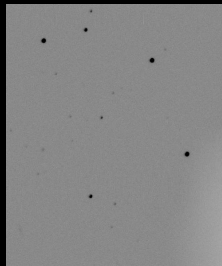
# Observing with EFOSC: Spectroscopy

Fringes:



# Observing with EFOSC: MOS

First, a pre-image has to be taken:



And slits for the observations defined:

Three slit options:

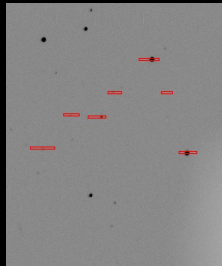
---

1.02" x 8.6" (punch #5)

1.34" x 8.6" (punch #7)

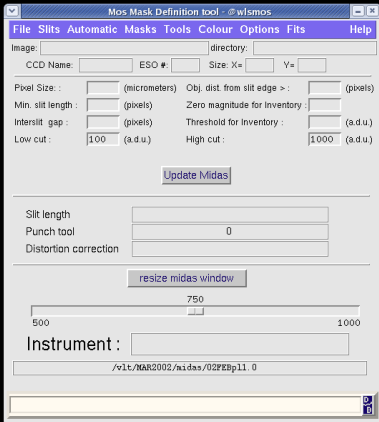
1.87" x 8.5" (punch #3)

---



# Observing with EFOSC: MOS

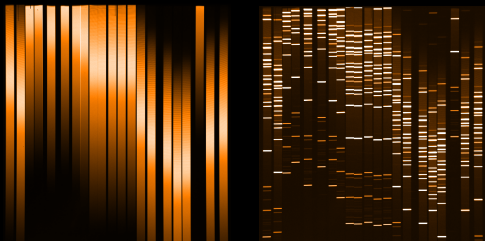
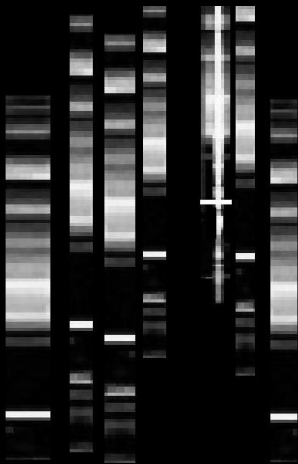
To define the mask with the slits at the right position, a MOS-table needs to be created using a special software on La Silla:



Then, using this table, the mask needs to be punched and then inserted in the Slit-Wheel of EFOSC (during the day).

The acquisition template for the MOS mode allows to align the mask with objects on sky (rotation and translation).

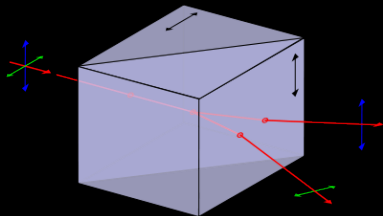
# Observing with EFOSC: MOS



For calibration, we might need:

- bias
- flats
- arc lamps
- flat for fringes
- spectro-photometric standard star

# Observing with EFOSC: Polarimetry

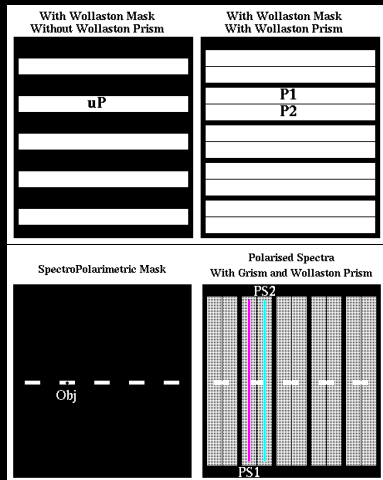


Wollaston prism

Wollaston mask

$\lambda/4$ -plate for circular polarisation

$\lambda/2$ -plate for linear polarisation





# Observing with EFOSC: Polarimetry

To calibrate IPOL data, we might need:

- bias, flats, photometric standard stars
- polarimetric standard stars (night)

To calibrate SPOL data, we might need:

- bias, flats, arc lamps, flat for fringes, spectro-photometric standard stars
- spectro-polarimetric standard star (night)

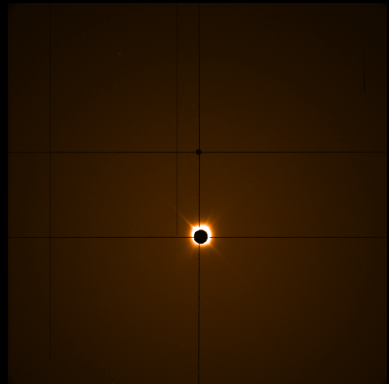
In Cassegrain focus: low and stable contribution to the polarisation by telescope

In Nasmyth focus: higher contribution and changing with rotator angle

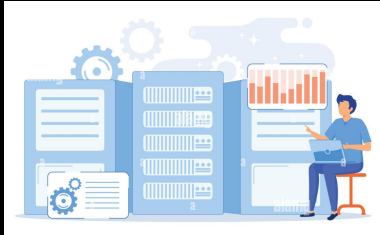
# Observing with EFOSC: Coronagraphy

The Coronagraphic mode is very similar to simple imaging:

- target to be put on right position for the mask
- final adjustment on sky
- same calibrations needed as for imaging



What comes after...



Data Reduction

Pipelines, EsoRex

EsoReflex

# EFOSC Workflow For IMG Data (v. 2.3.8)

This is a basic workflow to help with data organisation and execution of the pipeline. The workflow was generated without a review of the quality of the science products.

## Workflow Instructions

To run this workflow on the demo data:  
- Turn on highlighting. Choose "Tools" -> "Animate at Runtime" from top menu and set it to "1".  
- Press the "Run" button OR ctrl-R to start the workflow.  
  
To run on a different data set:  
- Click on RAW\_DATA\_DIR and set as appropriate.  
- All subdirectories of RAW\_DATA\_DIR will be searched for data.  
- **IMPORTANT:** END\_PRODUCTS\_DIR should not be a subdirectory of the RAW\_DATA\_DIR, otherwise it will be searched for raw data.  
- Press the "Run" button OR ctrl-R to start the workflow.  
  
The general concepts of Reflex are described in datone, ActivityReflex, SIS, AIB. Please credit this paper in publications on research that used Reflex.

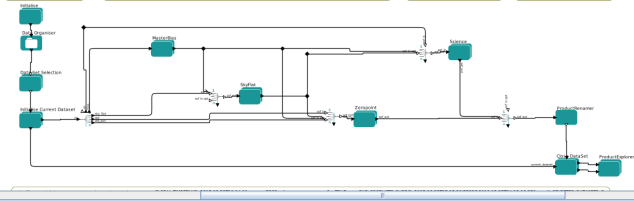
Workflow tutorial and Fern pipeline manual can be found here: [http://www.eso.org/sci/infocentre/info/pipelines/index.html#pipeline\\_table](http://www.eso.org/sci/infocentre/info/pipelines/index.html#pipeline_table)

## Setup Directories

- Input:**
- RAW\_DATA\_DIR: /home/efosc/efosc\_data/
  - RAW\_DATA\_DIR: /usr/share/efosc/efosc\_data/efosc/
- Only change CALL\_DATA\_DIR if you do NOT want to use the calibration data defined with the pipeline.
- CALL\_DATA\_DIR: /usr/share/efosc/efosc\_data/efosc-2.3.8/
- Output:**
- END\_PRODUCTS\_DIR: /root/.efosc\_data/efosc\_imaging\_end/products
- Working Directories:**
- BOOKKEEPING\_DIR: /root/.efosc\_data/efosc\_imaging\_bookkeeping
  - LOGS\_DIR: /root/.efosc\_data/efosc\_imaging\_logs
  - TEMP\_PRODUCTS\_DIR: /root/.efosc\_data/efosc\_imaging\_temp\_products
  - BOOKKEEPING\_DIR: /root/.efosc\_data/efosc\_imaging\_bookkeeping

## Global Parameters

- RecipeFailureMode: Ask  
Global parameter for the behaviour when a recipe fails. 'Ask' means that each time a recipe fails, the choice to continue or stop will be presented. 'Continue' means that the workflow will ignore errors and continue. 'Stop' means the workflow will stop.
- ErrorHandler: Ask  
Change 'TraceDir' to 'true' to enable BOOKKEEPING\_DIR\_TEMP\_PRODUCTS\_DIR and LOGS\_DIR each time the workflow is run (Lazy Mode will not work anymore)
- HTS\_VIEWER: tv  
Program to use for the inspection of input/output products. Use full path name if it is not in the standard path.
- Interactively: false  
Set to 'false' to disable interactive GUIs for the whole workflow. Each interactive actor can specify its own setting, which overrides the choice given here. This workflow has no interactive actors.
- SelectDefaultMethod: Interactive  
Specify how datasets for processing are selected ('ASK' = never tried before, 'Reduced' = successfully run before, 'Skip' = unsuccessfully run before), or set to 'Interactive' for interactive selection.
- ProductDisplayMode: Triggered  
Specify when you want to see the ProductDisplay GUI ('Triggered' = show it after all data sets have been reduced, 'Enabled' = show it after each dataset, 'Disabled' = never show it)



results found.

Component	Version	Location
efosc-2.3.8	2.3.8	/usr/share/efosc/efosc_data/efosc-2.3.8/
efosc-2.3.8	2.3.8	/usr/share/efosc/efosc_data/efosc-2.3.8/
efosc-2.3.8	2.3.8	/usr/share/efosc/efosc_data/efosc-2.3.8/

## EFOSC Workflow For MOS Data (v. 2.3.8)

This is a basic workflow to help with data organisation and execution of the pipeline. The workflow was generated without a review of the quality of the science products.

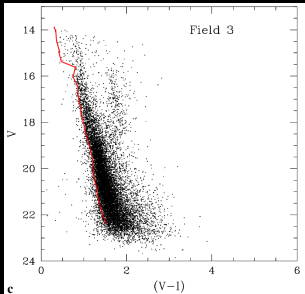
Workflow Instructions	Setup Directories	Global Parameters
<p>To run this workflow on the demo data:</p> <ul style="list-style-type: none"> <li>Turn on highlighting. Choose "Tools" &gt; "Isolate at Runtime" from top menu and set B to "1".</li> <li>Press the "Run" button OR ctrl-R to start the workflow.</li> </ul> <p>To run on a different data set:</p> <ul style="list-style-type: none"> <li>Click on RAW_DATA_DIR and set as appropriate.</li> <li>All subdirectories of RAW_DATA_DIR will be searched for data.</li> <li>If desired, change END_PRODUCTS_DIR.</li> <li>IMPORTANT: END_PRODUCTS_DIR should not be a subdirectory of the RAW_DATA_DIR, otherwise it will be searched for raw data.</li> <li>Press the "Run" button OR ctrl-R to start the workflow.</li> </ul> <p>The general concepts of Reflex are described in Action, Actography, SWS, and. Please credit this paper in publications on research that used Reflex.</p> <p>Workflow tutorial and Para pipeline manual can be found here: <a href="http://www.eso.org/sc/software/pipelines/index.html#pipelines_table">http://www.eso.org/sc/software/pipelines/index.html#pipelines_table</a></p>	<p><b>Input:</b></p> <ul style="list-style-type: none"> <li>ROOT_DATA_DIR: \$HOME/reflex/data/</li> <li>RAW_DATA_DIR: \$usr/share/efosc/efosc_demo/</li> <li>DIR_RAW_DATA: \$usr/share/efosc/efosc_demo/</li> </ul> <p>Only change CALIB_DATA_DIR if you do NOT want to use the calibration data collected with the pipeline:</p> <ul style="list-style-type: none"> <li>CALIB_DATA_DIR: \$usr/share/efosc/efosc_demo/</li> </ul> <p><b>Output:</b></p> <ul style="list-style-type: none"> <li>END_PRODUCTS_DIR: \$ROOT_DATA_DIR/efosc_products</li> </ul> <p><b>Working Directories:</b></p> <ul style="list-style-type: none"> <li>BOOKKEEPING_DIR: \$ROOT_DATA_DIR/efosc_bookkeeping/efosc</li> <li>LOGS_DIR: \$ROOT_DATA_DIR/efosc_logs/efosc</li> <li>TEMP_PRODUCTS_DIR: \$END_PRODUCTS_DIR</li> <li>END_PRODUCTS_DIR: \$ROOT_DATA_DIR/efosc_products/efosc</li> <li>BOOKKEEPING_DIR: \$BOOKKEEPING_DIR</li> </ul>	<p><b>RecipeFailure: Ask</b></p> <p>Global parameter for the behaviour when a recipe fails. 'Ask' means that each time a recipe fails, the choice to continue or stop will be presented. 'Continue' means that the workflow will ignore errors and continue. 'Stop' means the workflow will stop.</p> <p><b>Freeform: false</b></p> <p>Change "Freeform" to "true" to enable BOOKKEEPING_DIR, TEMP_PRODUCTS_DIR and LOGS_DIR each time the workflow is run (Data Mode will not work anymore).</p> <p><b>EXIT_MESSAGE: %s</b></p> <p>Program to use for the inspection of input/output products. Use full path name if it is not in the standard path.</p> <p><b>GlobalInteractivity: false</b></p> <p>Set to "false" to disable interactive GUIs for the whole workflow. Each interactive actor can specify its own setting which overrides the choice given here.</p> <p><b>SelectDatasetMethod: Interactive</b></p> <p>Specify how datasets for processing are selected. "Interactive" = never listed before, "NextActor" = successfully run before, "Failed" = unsuccessfully run before, or set to "Interaction" for interactive selection.</p> <p><b>ProductIgnoreHours: Triggered</b></p> <p>Specify when you want to see the ProductIgnore GUI. "Triggered" = show it after all data sets have been reduced. "Enabled" = show it after each dataset. "Disabled" = never show it.</p>



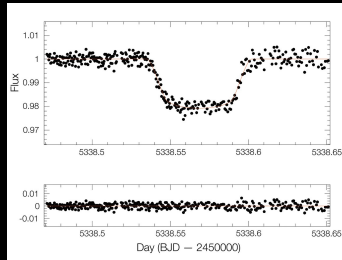
Workflow tutorial and Para pipeline manual can be found here: [http://www.eso.org/sc/software/pipelines/index.html#pipelines\\_table](http://www.eso.org/sc/software/pipelines/index.html#pipelines_table)

Workflow tutorial and Para pipeline manual can be found here: [http://www.eso.org/sc/software/pipelines/index.html#pipelines\\_table](http://www.eso.org/sc/software/pipelines/index.html#pipelines_table)

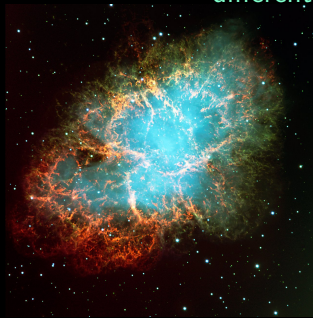
# Imaging



photometry



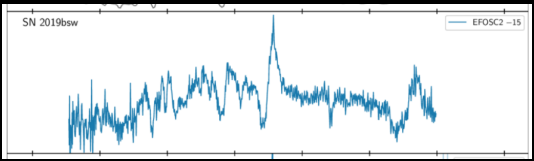
differential photometry



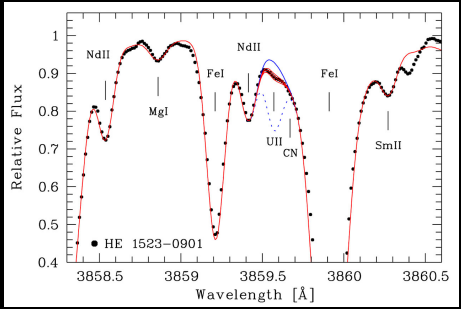
images



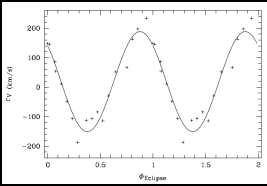
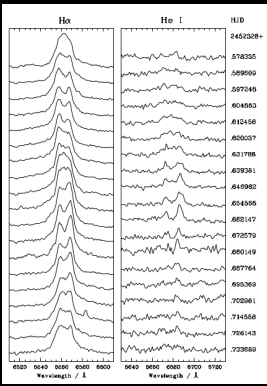
# Spectroscopy



classification



abundances



radial velocities

The image features two prominent spiral galaxies, one in the upper right and one in the lower left, set against a dark cosmic background filled with numerous stars. The galaxies have bright yellowish-white cores and blueish-purple spiral arms. The text "Happy Observing!" is centered in a bright green, bold, italicized font.

***Happy Observing!***