VIMOS
User's Manual

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Signature	

EVOLUTION PAGE

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1. Introduction

VIMOS is the Visible Multi-Object Spectrograph of the European Southern Observatory Very Large Telescope, telescope unit 3 - Melipal. This instrument has been build to provide the ESO community with a wide field spectrograph with high throughput and multiplex, dedicated to deep surveys.

VIMOS operates in the 0.37-1 microns domain in 3 main observing modes: direct imaging, multi-slit spectroscopy (MOS), and integral field spectroscopy (IFS). The field of view of the 4 channels is $4\times7\times8$ arcmin^2 in imaging and MOS modes with 0.2 arcsec/pix, and 54x54arcsec^2 in IFS mode with 0.67 arcsec/res. element. Each of the 4 channels has a 2048×4096 pixels^2 EEV CCD, with the 4k pixels being used along the dispersion for an increased spectral coverage. Spectral resolutions range from 200 to 2500 for a slit one arcsecond wide.

The MOS mode allows to place ~840 slits 10 arcsec long in the low resolution mode, ~210 slits in high resolution mode. Any slit length can be used, having an impact on the total number of objects. The objet selection is made with the Mask Preparation Software, and masks are cut by the Mask Manufacturing Unit with up to 15 masks being available during observations. The IFS mode allows contiguous spectroscopy of 6400 resolution elements fed by an array of micro-lenses and fibers.

These unprecedented multiplex gains position VIMOS as the leading instrument of this kind in the world.

This manual is organized as follows: Section 2 presents the general characteristics of the instrument, Sections 4 to 7 describe the imaging, MOS and IFS observing modes respectively, Section **Erreur! Source du renvoi introuvable.** provide a description of the observing templates, and Section 8 provides some reference information.

In addition, the user is invited to consult the following documents:

- Call for proposals, Phase I preparation: http://www.eso.org/proposals
- P2PP-Phase II proposal preparation, general information: http://www.eso.org/observing/p2pp
- P2PP-Phase II proposal preparation, VIMOS specific information: TBD

Questions on VIMOS operations should be aked directly to the ESO User Support Group (usg-help@eso.org) in Garching.

2. VIMOS: the Visible Multi-Object Spectrograph

2.1 *VIMOS observing modes overview*

Table 1 : VIMOS Operation Modes

VIMOS OPERATION MODES
Visitor Mode
Service Mode
Maintenance Mode

Table 2 : VIMOS Observing Modes

VIMOS OBSERVING MODES
Direct Imaging
Long slit and Multi Object Spectroscopy
Integral Field Spectroscopy
Calibrations

Direct Imaging

Direct imaging is aimed at providing images suitable for accurate astrometry and photometry. The astrometric and photometric catalogs obtained from these images may be used for Multi-Object Spectroscopy.

Long Slit and Multi-Object Spectroscopy

Slit spectroscopy is aimed at providing spectra of one or a list of objects, selected from user criteria. Multi-object spectroscopy of a list of targets is done with the following sequence:

- Direct imaging
- Astrometry and photometry: produce source catalogs
- Mask preparation: design of mask with slits layout and size
- Mask manufacture and installation at focal plane
- Spectroscopic observations
- Calibrations

Integral Field Spectroscopy

Integral field spectroscopy aims to obtain spectra of a contiguous area of sky. Integral field spectroscopy can be done with or without prior knowledge of the photometry of sources in the field. With the VIMOS IFU, coordinates of objects in the field may be known to only a few arcseconds.

VIMOS Field of View

The VIMOS field of view is outlined in Figure 1. Note the relative position of the integral field and the imaging / MOS field.

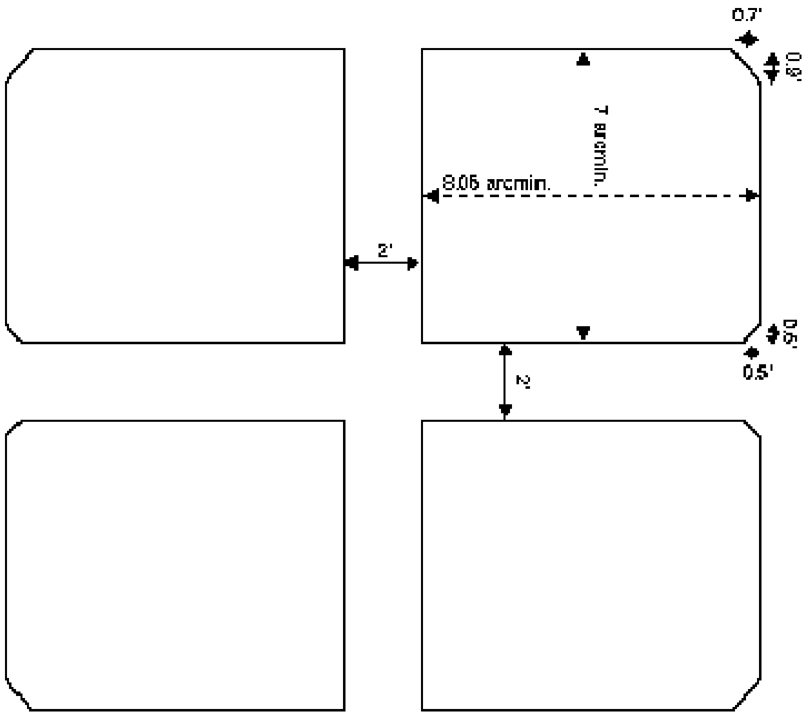

Figure 1: VIMOS field of view

Table 3: VIMOS mechanical and optical characteristics

Location	Nasmyth focus VLT-UT
Opto-mechanical layout	4 beams, each a complete focal-reducer, F/1.88 output
Wavelength coverage	0.37 to 1 µm
Throughput (imaging)	>82%
Field	4x7´x8´ = 224 arcmin² imaging area
Detectors	4x2048x4096, 15µm pixels
Spatial Sampling	0.205 arcsec/pixel
Slit length	28´ at high R, 140´ at low R
Resolutions	R=180 to 2500 (1 arcsec slit), 360-5000 (0.5 arcsec)
Image quality	Better than 2 pixels at 80% encircled energy
Filters	10 max. per channel. U'BVRIz filter set, 170mm diameter
Grisms	6 max. per channel, 160mm diameter
Flexures	- Passive control, motion of ±1 pixel over 360° rotation
Slits	Any position and shape
Multiplex	- 840 simultaneous slits, 10" long, at R~200, 4000Å coverage - 210 simultaneous slits, 10" long at R~2500, 3500Å coverage
Integral Field Spectro.	54x54 arcsec² field, 6400 fibers with 0.675" sampling

2.2 *VIMOS general overview*

VIMOS is installed on the Nasmyth focus of VLT Unit Telescope no.3 (*Melipal*). VIMOS relies on the telescope for focusing, de-rotation with the Nasmyth rotator, and guiding with the Nasmyth guiding probe.

Optics

The optical system is the combination of 4 identical optical channels.

The optical system includes a Focal Plane Adaptation Lens to correct telescope aberrations at the Nasmyth focus and diminish the field curvature to allow the use of flat masks. After the new focal plane, the optical system is a classical focal-reducer type instrument, with a collimator making a parallel beam, in which dispersing elements are inserted, followed by a camera which transforms the input F/15 beam to a F/1.8 beam projected onto 4 large format, 2048x4096 pixels EEV CCDs.

Structure and main mechanical subsystems

VIMOS requires a mechanical structure to attach the various opto-mechanical components to the Nasmyth adaptor. The main property of the structure is minimize image motion in the CCD focal plane due to mechanical flexures under gravity load and temperature variations. Direct access to masks, grisms, filters and shutters is provided.

The main mechanical subsystems are:

- The mask assembly has the function to enable mask positionning at the focal plane. It has provision for the storage of 15 masks per channel.
- A set of 4 mask shutters is installed near the mask focal plane. They allow to block part of the beam coming from a selected area of the mask, and thus allow arc and flat field spectroscopic calibrations without order overlap when several layers of slits are used on the same mask.
- There are 4 filter assemblies to exchange up to 10 filters per channel.
- The 4 grism assemblies allow to select and exchange up to 6 grisms per channel.
- Instrument focussing is performed by moving the first elements of the camera, it is automated and calibrated with temperature
- 3 calibration units provide uniform illumination of the Nasmyth screen for flat field and arc lamp calibrations

Detectors

Each of the 4 channels has its dedicated CCD detector. The detectors are back illuminated 2048x4096 pixels, 15µm pixel EEV CCDs. The 4 shutters allow to control the light arriving on the CCDs.

Integral field unit

The integral field unit is a dedicated opto-mechanical system aimed at producing spectra of a contiguous area of up to 54×54 arcsec²,. The sky image is projected onto a 80×80 micro-lens array with a choice of two magnifications: 0.33 or 0.67 arcsec/micro-lens. Each 2D micro-lens is coupled to an imaging fiber, while the output of the fibers is rearranged on a linear set of micro-lenses to produce an entrance slit to the spectrograph, at the mask focal plane location. Each spectrograph quadrant has a set of 4 fiber-slits, for a total of 6400 fibers.

A shutter is provided in front of the input micro-lens array to allow the exclusive use of the central 1/4th of the field when the IFU is used in high spectral resolution mode with wide wavelength coverage. In this configuration, only 1 fiber-slit per quadrant is used, for a total of 1600 fibers.

Mask manufacturing machine

The mask manufacturing machine (MMU) is dedicated to cut user-defined slits on a thin mask material with a high speed numerically controlled laser-based machine. The MMU includes the following :

- Mask sheets : these are the support upon which the slits are cut, they are in black coated Invar
- Mask cabinets : contain up to 15 mask sheets. There is one mask cabinet per channel. The masks cabinets are installed at the VIMOS focal plane for observations, and removed for mask loading
- Mask loading & identification: a semi-automated process is aided by bar code readers
- Mask laser machine and XY stage: used to cut the slits on the mask sheets

The MMU is located in a dedicated room at the Paranal Observatory base camp.

Instrument software

The instrument software allows the operation and control of the instrument, including detectors , as well as the necessary software support for mask preparation and manufacturing. The instrument software contains the following blocs :

- Observation Preparation Software (OPS)
- Mask Preparation Software (MPS)
- Observation Software (OS)
- Instrument Control Software (ICS)
- Detector Control Software (DCS)
- Data Reduction Software (DRS)

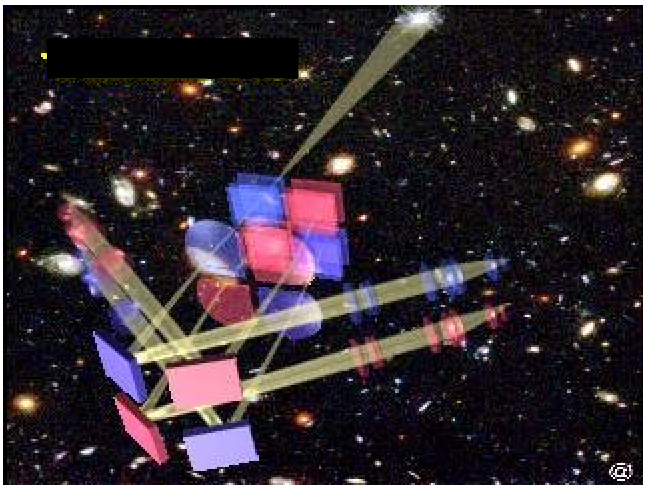

Figure 2

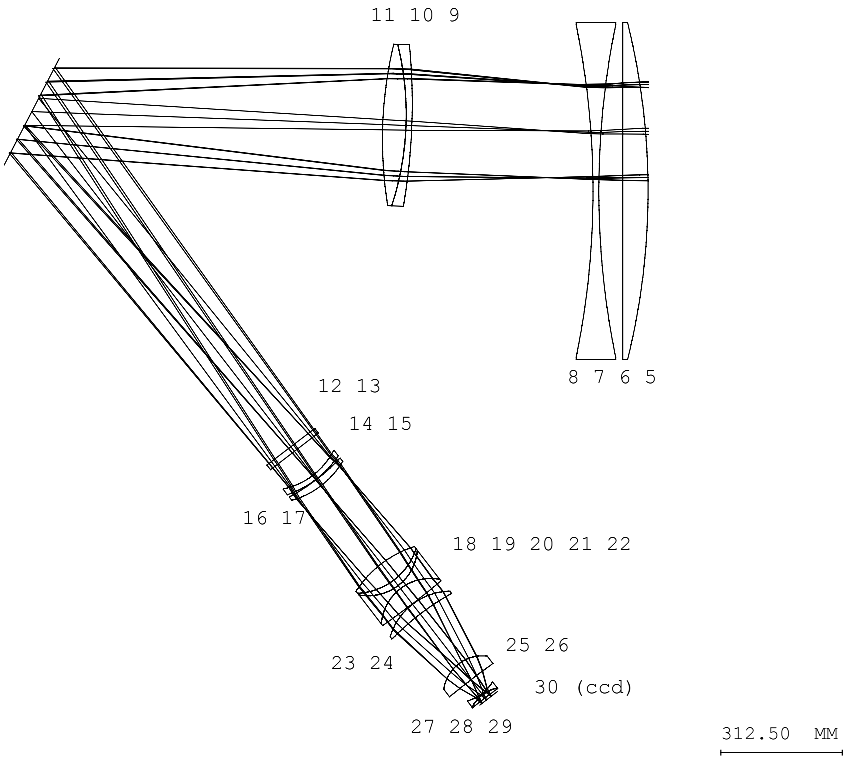

Figure 3: VIMOS optical layout (one channel only)

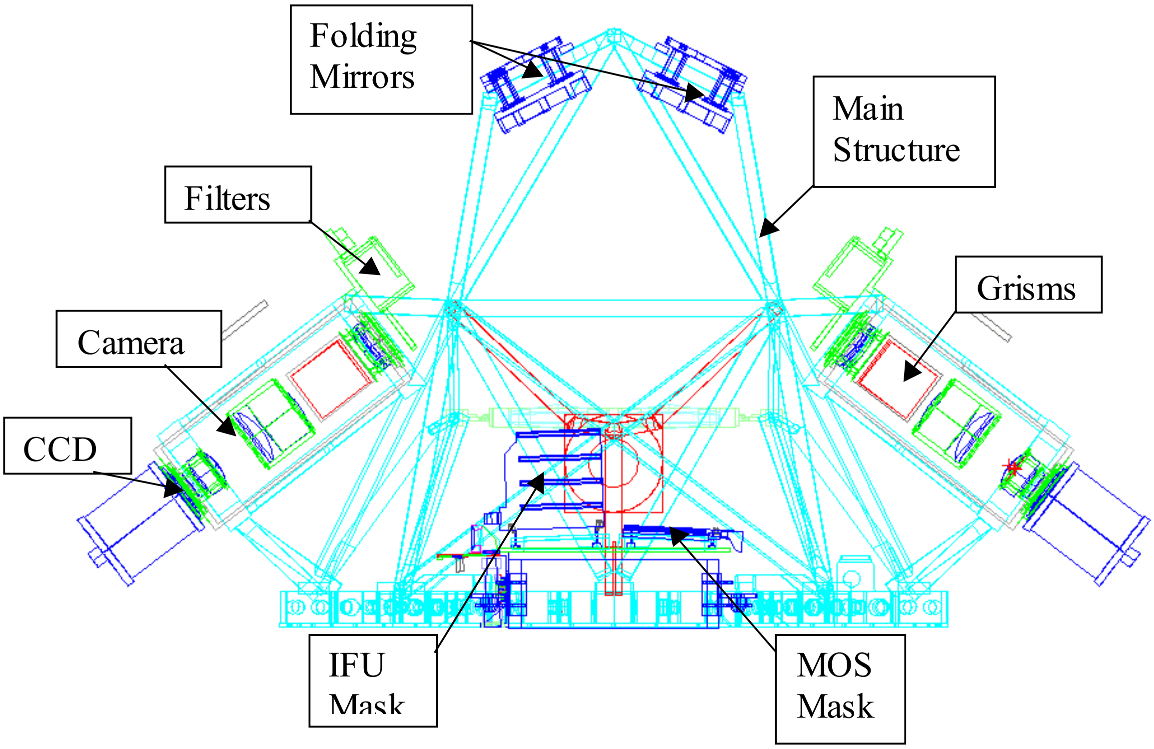

Figure 4: VIMOS opto-mechanical layout, top view

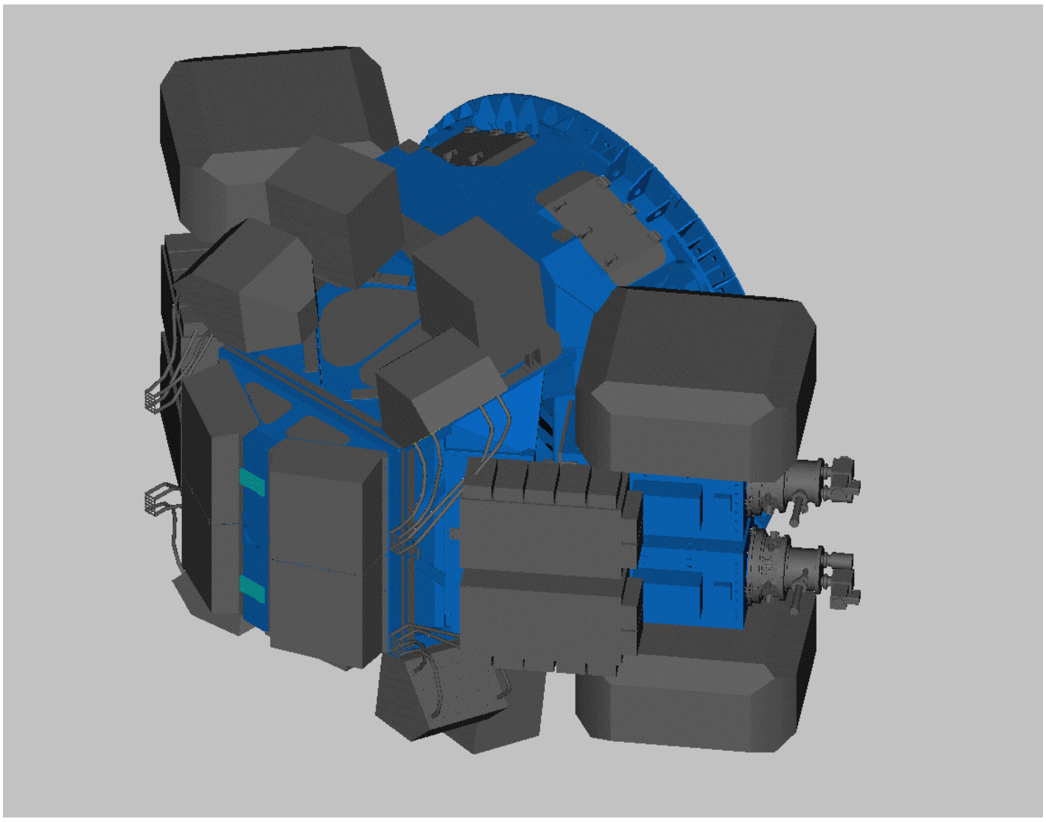

Figure 5: Overall VIMOS view (CAD view)

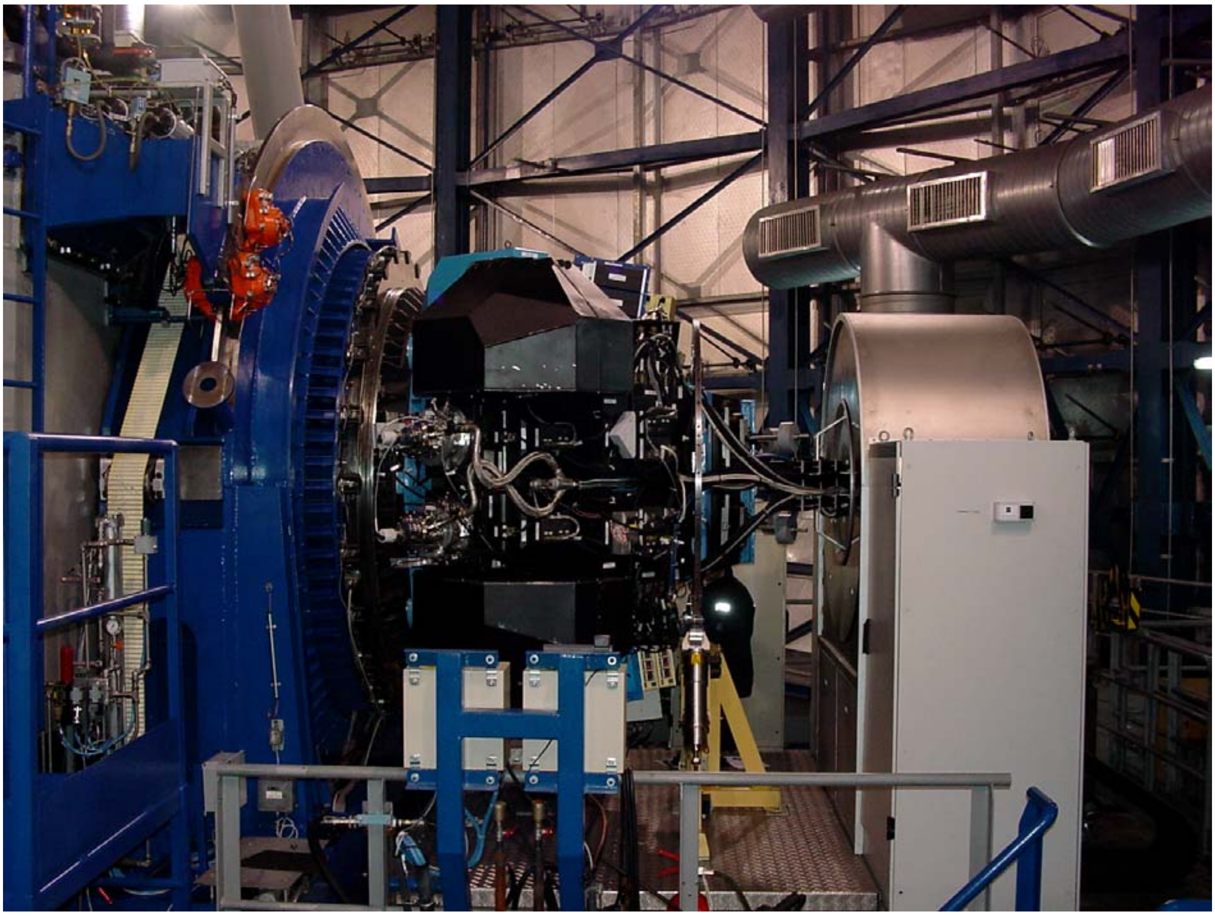

Figure 6: The VIMOS instrument installed on the Nasmyth plateform of UT3-Melipal

2.3 Imaging Mode

The characteristics of the VIMOS imaging mode are summarized in Table 4, and are described in details in Section 4.

Table 4: Imaging characteristics & performances

Configuration	Filters inserted in the beams
Field	4x7'x8' corresponding CCD area: 2048x2350 pix² slight vignetting on the corners out to the 8' field
Sampling	0.205 arcsec /pixel
Filters	U'BVRIz standard set
Limiting magnitudes in 1h (Ag coated UT)	V=27.7, I=26.6, 5σ detection for a point source V=26.5, I=25.4, 5σ detection in 3" for a galaxy

2.4 Multi-slit Spectroscopy Mode

The characteristics of the VIMOS Multi-slit spectroscopy mode are summarized in Table 5, and are described in details in Section 6.

Table 5: Multi-slit spectroscopy characteristics & performances

Configuration	Grisms inserted in the beams
Field	Slit selection is in 4x7'x8' The cameras image spectra on the full 2048x4096 pix² CCD area
Slit length	7' per beam in "single layer" mode = 28' total length 5x7' per beam in 5 spectra layers mode = 140' total length
Slit sampling	4.88 pixels for one arcsec slit
Slit width & length	any length and shape (minimum dimension ~0.2 arcsec)
Grisms	75 to 720 gr/mm rulings
Dispersions	6.3A/pix to 0.53A/pix
Resolutions	R=180 to 2520 (1 arcsec slit)
Limiting magnitudes in 1h (Ag coated UT)	I=24.1, 5σ, R~200, I=22.7, 5σ, R~2500

2.5 Integral Field Spectroscopy Mode

The characteristics of the VIMOS integral field spectroscopy mode are summarized in Table 6, and are described in details in Section 7.

Table 6: Integral field spectroscopy characteristics & performances

Configuration	Input fiber selection, special masks in place
Field	54x54 arcmin², and 27"x27"
Sampling	0.675 arcsec/microlens, and 0.338 arcsec/microlens
Wavelength range	0.37 to 1 µm (Silica microlens array)
Spectral resolution	Same as for MOS with 1" equivalent slit

2.6 Detectors and Acquisition System

The detectors and associated electronics have been assembled by the ESO detector team. The detectors are thinned back side illuminated EEV CCDs ref, with 2048×4096 pixels², each 15×15µm. The FIERA and associated electronics allow various readout modes and windowing. Readout speeds from XX to YY Mpixels/sec allow to read the 4 detectors in parallel in less than XX sec in the most demanding low gain/high resolution mode.

The readout noise properties of each detector is given in Table 7.

Table 7: CCDs readout noise

Detector/Channel	Readout mode	Readout noise e^-	Gain e^- / ADU
Q1	Imaging		
Q2	Imaging		
Q3	Imaging		
Q4	Imaging		
Q1	MOS/IFU		

Q2	MOS/IFU		
Q3	MOS/IFU		
Q4	MOS/IFU		

2.7 Observation Software

OS is the high level software controlling the instrument. It has its own GUI which allows to access all instrument parmeters. Figure 7 shows the VIMOS OS GUI. The users only use templates to control the instrument and have therefore no direct interaction with OS. However, the OS GUI is useful for the visitors as a status display panel, displaying all information for instrument, detectors and telescope.

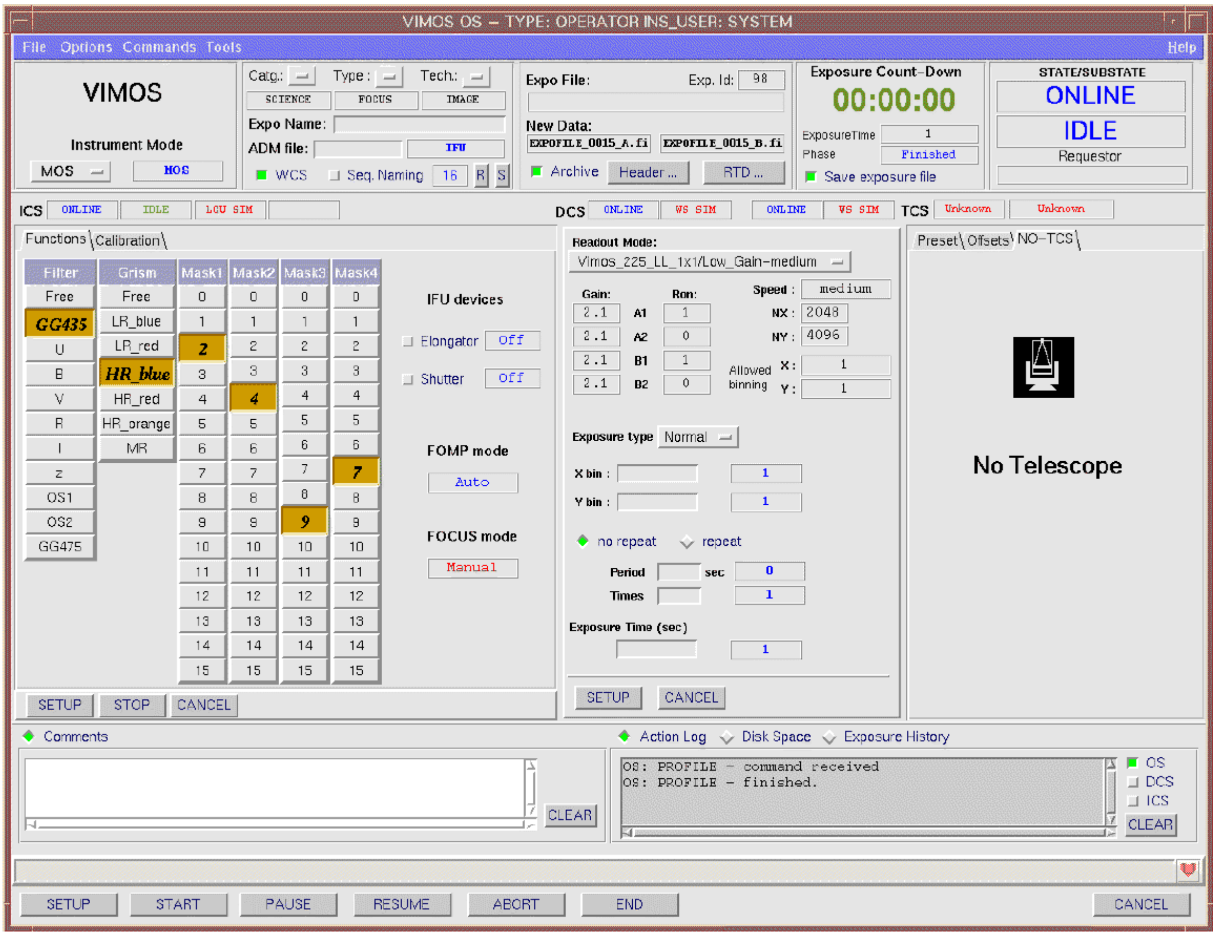

Figure 7: VIMOS OS graphical user interface. Left: instrument control panel, Middle, detector control panel. Right: telescope control panel

2.8 Real Time Display

The RTD allows to interact with images as they are readout by the detectors electronics. The VIMOS RTD is split in 4 panels, each displaying one image provided by one channel. The RTD provides various tools to display and analyse the images: pan/zoom/cut capabilities, cursor readout, FWHM measurements, statistics on selected regions.

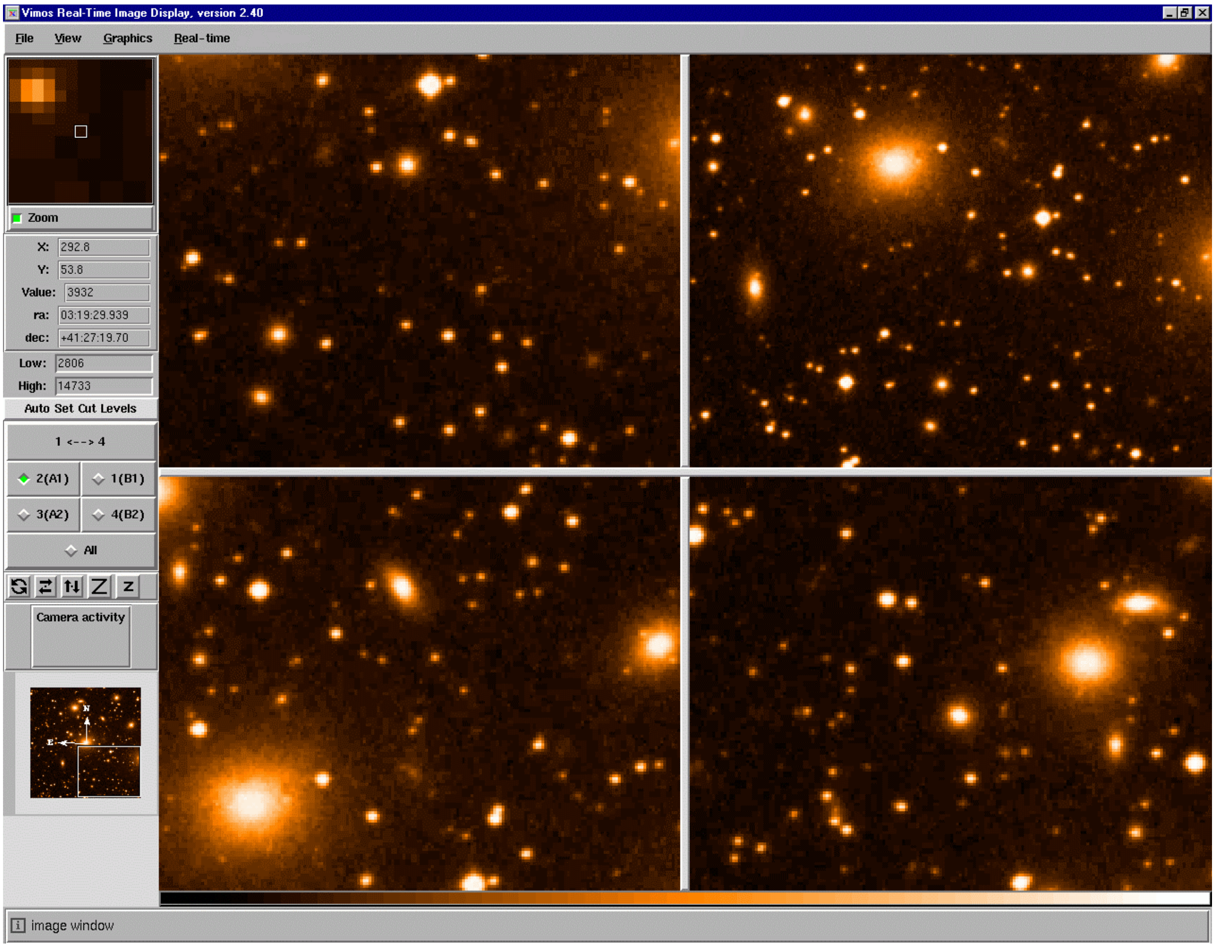

Figure 8: VIMOS Real Time Display

2.9 Calibrations

VIMOS calibrations are of three kinds: flat field calibration (imaging, MOS and IFS), wavelength calibration (MOS and IFS), and photometric (imaging, MOS and IFS). Flat field and wavelength calibrations can be performed using the VIMOS calibration unit: 2 quartz lamps are available for imaging and spectroscopic flats resp., and He, Ne, Ar lamps are available for spectroscopic wavelength calibrations.

2.10 Overheads

The allocated time on VLT instruments does include overheads, in addition to the "open shutter" time. Overheads with VIMOS are mainly:

- Instrument configuration time: this is the time required to change the configuration of the instrument (e.g. from imaging mode to MOS mode), that is to move the respective elements required (mask, filters, grisms, IFU). The configuration time is at maximum 2 min, 2.5 min, 3.5 min for filters, grisms, masks, respectively. Moving filters and grisms will take 2.5 min maximum; moving filters and masks will take 3.5 min maximum. Changing from imaging or MOS mode to IFU mode or back takes 3.5 minutes.

- Detector readout: this is the time required to readout the 4 detectors, to transfer data on disc and to display the images with RTD. This requires at maximum XX sec in the low gain / high resolution mode.

- Telescope set-up: this is the time required to move, point and guide the telescope, as well as to lock the active mirror control loop. Since VIMOS occupies a large fraction of the telescope FOV, the guiding field accessible without vignetting of the VIMOS FOV is restricted. The telescope operator / observer has to exercise great care in visually selecting a guide star with no or minimum vignetting,. This procedure can take up to 5 minutes.

- Mask set-up on sky: this operation is necessary to ensure that the instrument is positioned in such a way that all targets are in the slits as planned. The procedure is to take a through-mask image of the sky and check that reference stars (usually 2 per masks) are located at the center of the reference apertures, or slightly offset the telescope to center them. This procedure (via a dedicated template) requires to configure the instrument in imaging mode with a set of masks in place, take a first exposure, measure the position of reference stars, offset the telescope if necessary, take an image to validate. On average, this procedure takes no more than 5 minutes.

- Night time instrument calibrations: Most instrument calibrations can be performed during the day (MOS/IFU arc and flat field calibration) or during twilight (imaging flats). During the night, the acquisition of photometric or spectrophotometric standard stars is required to accurately flux calibrate.

Examples for overheads computation are given in Table 8.

Table 8: Examples of overheads

	Imaging, no filter change, same field	Imaging, with field change and filter change	MOS observation, new field, one integration	MOS sequence of 5 exposures with telescope offset (shift-in-slit), same field, same mask	IFU observation, new field	IFU observations, same field, new grism
Instrument configuration	0	2 min	• Initial mask+filter setup: 3.5 min • Grism setup after mask setup: 2.5 min	Grism setup: 2.5 min	• 0 if already in IFU mode • 3.5min if starting from MOS or imaging	2.5 min
Telescope set-up	0	Started in parallel with instrument configuration: total time 5 min, added time : 3 min	Started in parallel with instrument configuration: total time 5 min	0	5 min	0
Mask reference aperture check	0	0	5 min	0	0	0
Detector readout	45	45 sec	45 sec	5x45 sec	45	45
Total overhead	0.75 min	5.75 min	8.25 min	5.5 min	5.75 min	3.25 min

2.11 Templates Summary

The instrument, detector and telescope are controlled by observing blocks (OBs), which are made up of templates. Templates are divided into three categories: acquisition, observation, calibration.

Usually, OBs consist of an acquisition template and one or more observation templates for science frames, and one or more calibration templates for calibration frames.

Only one acquisition template is allowed in an OB, and therefore only one preset on sky. It is not possible e.g. to group in the same OB observation templates on the science objects and calibration templates on a standard star.

Table 9 provide a short summary of the templates offered for the next period.

The template parameters are extensively described in Appendix X for the Phase II preparation.

Table 9: Templates summary

Action	Template to use
Observe a field in direct imaging mode	VIMOS_img_obs_Stare
Observe a field in direct imaging mode, slightly shifting the pointing from one exposure to the next, in a user defined pattern	VIMOS_img_obs_Jiitter
Observe a field in direct imaging mode, slightly shifting the pointing from one exposure to the next, in a random pattern	VIMOS_img_obs_Autojiitter
observe a field in multi-object spectroscopic mode	VIMOS_mos_obs_Stare
observe a field in MOS mode, slightly shifting the objects along the slit from one exposure to the next	VIMOS_mos_obs_Jitter
observe a field in IFU mode	VIMOS_mos_obs_Stare
observe a field in IFU mode, slightly shifting the pointing from one exposure to the next, in a user defined pattern	VIMOS_ifu_obs_Jitter
observe a field in IFU mode, slightly shifting the pointing from one exposure to the next, in a random pattern	VIMOS_ifu_obs_Autojitter

3. Requesting observing time and preparing observations with VIMOS

3.1 Call for proposals

The observers are referred to the VLT call for proposals (`http://www.eso.org/proposals`) for an up to date status of the observing policies at the VLT (offered instruments and modes, etc).

3.2 Exposure time calculator

The exposure time calculator (ETC) is available at http://www.eso.org/
It allows to compute exposure times for a variety of sources and instrument observing modes.

3.3 Phase II proposal preparation (P2PP)

After observers are awarded telescope time, either in service or visitor mode, they must prepare their Observation blocks with P2PP. In visitor mode, P2PP can be used on Paranal a couple of days before the run. Help will be provided on site by the operation staff.

Service observers must prepare their OBs according to the information provided in this manual (template description, section **Erreur! Source du renvoi introuvable.**), as well as in the P2PP information
(`http://www.eso.org/observing/p2pp`).

3.4 Visitor and service modes

Visitors should arrive on Paranal 2 days ahead of their observing run so as to prepare their OBs. They receive support from the Paranal science operations team. Users are requested to read the P2PP and VIMOS Users Manuals before arriving. During the night, the users do not have direct interaction with the instrument and the telescope. The execution of their OBs is undertaken by the Support Astronomer on duty and / or the Telescope and Instrument Operator.

In service mode, OBs must be prepared in advance, using P2PP. A deadline is set by the VLT operations. Passed this deadline, interaction with P2PP and change of OBs is discouraged. OBs are placed in the OB repository, they are executed when the observations conditions are met, and taking into account the priority ranking set by the OPC.

VIMOS MOS observations require the preliminary acquisition of “pre-images”, images of the fields to be observed. These pre-images are used to identify targets and prepare masks. This cannot be done during the same night as the observations: pre-images are taken either a few weeks ahead of time (service mode), or the night before at the latest (visitor mode).

4. Observing with the VLT and VIMOS

4.1 Telescope and instrument focus

Two types of focussing operations are involved for VIMOS observations, because two focal planes are involved: the entrance or slit mask focal plane located at the telescope focal plane, and the CCD focal plane located at the output focal plane of VIMOS.

Observers should not need to worry about focussing, as this is taken care of at the telescope and instrument levels by dedicated procedures. However, they need to be aware of this specificity to understand standard operations.

The image quality delivered by VIMOS is better than the specification, as shown in Figure 9.
The focal plane of VIMOS is not strictly flat because of the complex optical elements involved. This results in slight focus variations across the field, which translate in a slightly variable PSF from center to edge. This is shown in Figure 10.

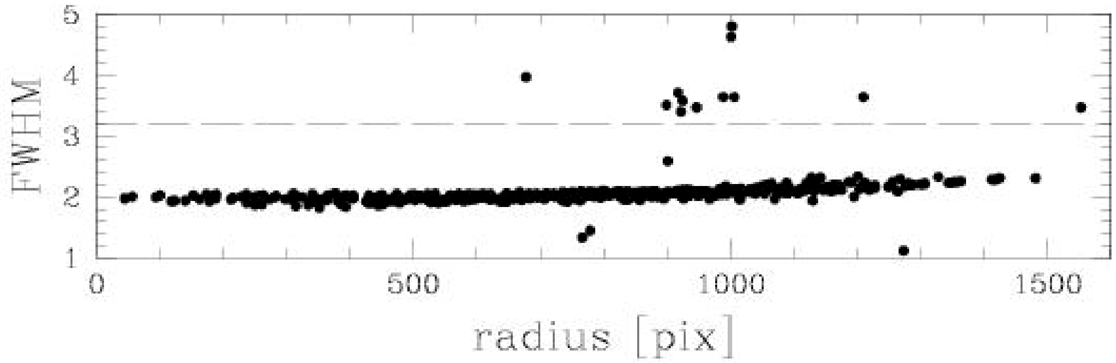

Figure 9: Image quality FWHM vs. distance from the optical center, in pixels (quadrant 4). The FWHM measures the images of pinholes 300 microns in diameter distributed in a grid at the mask focal plane. The specification is shown as a dashed line, as FWHM=3.2pix, the measured image quality is ~2 pixels FWHM over the field.

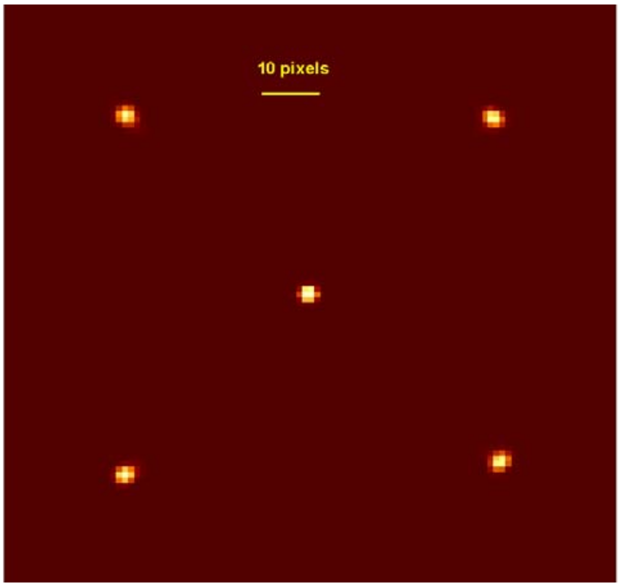

Figure 10: PSF variation accross the VIMOS field at the field center and field edges (images of 300 microns holes)

4.2 Guiding and offsets

Guiding and offsets are executed with the telescope control system. The user can offset the telescope from the OS panel, either as X,Y pixel offsets on the detector, or α, δ values in arcseconds.

4.3 Flexures and tracking stability

Flexures are currently within ±1.2 pixels for channels 1,2,3 (see Figure 11), and ±2 pixels for channel 4.

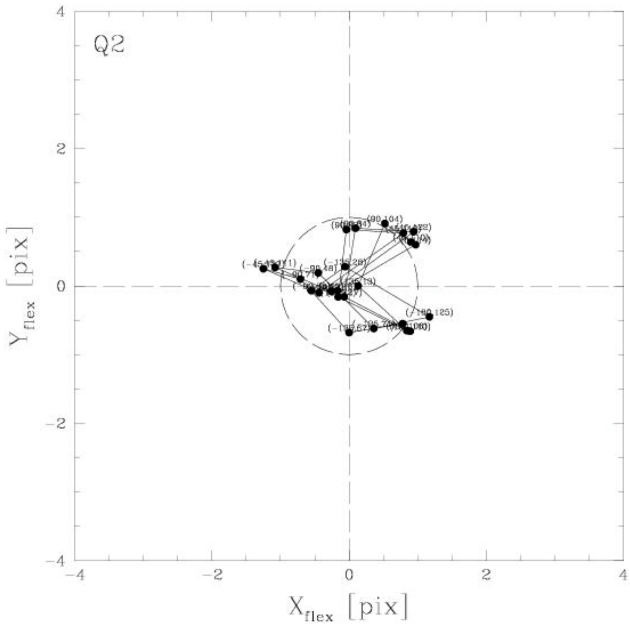

Figure 11: flexures measured for channel 2. The circle represents a motion of 1 pixel from central reference.

5. Direct Imaging

5.1 Overview

Direct imaging is used to produce wide field images (VIMOS is the largest imager on the VLT) using broad band filters or specific user filters. This mode has two functions: produce science images, and produce the preliminary images needed to register the slit masks to the position of targets on the focal plane of the VLT-UT3.

The filters available for imaging are U', B, V, R, I and z. Filters characteristics are given in section 8.1. It is possible to install user filters in each of the 4 filter exchange units. However, this requires to remove one of the filters already in place.

The field of view as projected on the sky is shown in Figure 1.

5.2 Performances

Performances are given in Table 4, section 2.3.

5.3 Observation preparation

The preparation of observations require the following:

- List of equatorial coordinates α,δ , and epoch of reference
- Filters to be used
- Exposure times
- Dithering/jitter pattern: list of differential pointing positions around a central position. Standard imaging techniques are using several short images (exposure times such as the exposures are sky background limited) observed at each position of a dithering pattern, to reconstruct an image with the total exposure time required. This allows to eliminate cosmetic defects on the detectors as well

as cosmic rays, and to produce very accurate flat fielding to correct for detector pixel to pixel variations.

5.4 Observing sequence

The observing sequence as executed by the imaging templates is:

- Preset the telescope to the selected coordinates
- Initiate guiding and active optics control (telescope operator)
- Configure the instrument with the selected filter
- Take a sequence of exposures (jitter or no jitter)

5.5 Calibration

The required calibrations are:

- Flat fields, taken at twighlight
- Photometric calibration standards, distributed in all 4 channels

5.6 Data Processing

6. Multi-Slit Spectroscopy

6.1 Overview

In Multi-slit spectroscopy mode, VIMOS is used to take many spectra simultaneously. Transmission gratings replicated on prisms, *Grisms*, are available to cover the full spectral range with spectral resolutions R=200 to 2500, for a 1 arcsec wide slit. The slit sampling at the detector level has been set by design to 4.88 pixels / arcsec. Depending on the science goals and on the atmospheric seeing, it is therefore possible to narrow the slit to 0.5 arcsec, still allowing a proper sampling of the slit at 2.44 pixels. In this situation, the spectral resolution is obviously doubled to allow R=400-5000.

The grisms properties are summarized in Table 11. Order separating filters are available to eliminate the overlap between orders 1 (the order used for science) and order 2 (always present on the detector), this is done by restricting the wavelength range of a particular grism to less than one octave in wavelength.

The allowed slit placement in a mask is directly related to the wavelength range and the spectral resolution used. This defines a spectrum length on the detector. At low and medium resolutions (LRRED, LRBLUE, MR), the full spectrum range is recorded no matter the slit location on the detector. At high spectral resolution (HIBLUE, HIORA, HIRED), the slit location will define the wavelength range of the spectrum.

6.2 Performances

Performances in MOS mode are given in Table 5, section 2.4.

6.3 Observation preparation

The preparation of observations require the following:

- Central field equatorial coordinates α,δ for telescope pointing
- "Pre-image": image of the field taken with VIMOS
- List of equatorial coordinates α,δ , and epoch of reference: a catalog of targets should contain at least the equatorial coordinates, and any parameter that the user needs to select target within a large catalog (e.g. magnitudes, colors, sizes)

- Grisms/Filters to be used
- Exposure times
- Dithering / "move in slit" pattern: Moving targets along the slit in a series of exposures is the preferred way to observe in MOS. This allows to eliminate the sky contribution, cosmic rays, the CCD fringing particularly in the red, cosmetic defects on the detectors, and to produce very accurate flat fielding to correct for detector pixel to pixel variations. The dithering pattern depends on the mean size of the observed objects: the dithering pattern should be larger than the mean size of objects for the method to work efficiently.

6.4 Mask design and manufacturing

With the object catalog, and the instrument configuration requirements, the user can enter the mask design and manufacturing process.

All the processes below are described in detail in the `vmmps` user's manual (see http://cosmos.mi.iasf.cnr.it/bianca/vimos_sw_doc/vmmps/vmmps_um.html)

6.4.1 Pre-image catalog

The purpose of the "pre-image" is to allow to link the user's catalog coordinates to the VIMOS CCD coordinates and hence to the mask reference frame coordinates via a secure internal VIMOS mask to CCD mapping and transformation matrix.

A detection of objects is required in the pre-image in order to cross-correlate this list of objects with the list of objects in the user catalog. A transformation matrix from user catalog to VIMOS coordinates is then produced. The user can run e.g. `Sextractor` to perform this detection, the output needs to be a FITS table. About 80 detected objects per channel is a good number for a secure mapping. An exposure time of ~3min in the R band on any field should produce enough objects to have a sufficient S/N for 80 of them in each channel.

6.4.2 Case 1: no pre-existing external user catalog

6.4.3 Case 2: cross correlation of pre-image catalog with pre-existing external user catalog

For each channel you have to perform the following steps. From the `vmmps` main panel (Figure 12), select `"VIMOS-MPS/Load ASCII catalog"` (e.g. `file.cat`) to open the cross-correlation panel (Figure 13), load your user catalog with your objects in the field produced from another observation. Enter the FITS pre-image, after loading the `"VIMOS Star Catalog"` is asked for: this is the catalog produced from the pre-image. After running the cross correlation (select `"Cross"`), good output number are `nmatch>80`, and `rms<0.1 arcsec.` It produces a file named `file_vm.cat,` including all objects from your input catalog, with the proper VIMOS coordinates.

6.4.4 SPOC

From the `vmmps` main panel (Figure 12), select `"VIMOS-MPS/Load ASCII catalog".` Load the file e.g. `file_vm.cat.` A new window opens, containing the full catalog of targets available in your field, a yellow circle appears around each available target.

You have to select 1, or better 2 reference objects per quadrant which will be used for mask to sky alignment: click with the cursor on the image of each reference object (stellar is preferred) , and click `"ref"` on the panel: a blue diamond appears around the selected object.

You may then select compulsory target or forbidden some of them, clicking on the image of each and then on the corresponding panel button. You may also draw curved slits on selected objects (see Figure 17).

Then, click on `"SPOC",` select the parameters of the slits, width, sky region, and select the appropriate grism. Select the total number of masks you want to produce at this setting, and the SPOC algorithm: `Max_opt` (takes into account the size of objects if present in your catalog), or `Normal_opt` (standard mode). Click on `"Make ADP"` to run the automated slit / object allocation algorithm. As an output you get the number of objects selected and a file with all slit and object information e.g. `file_vmQ1M1.adp` (for mask 1 of quadrant 1). Close the SPOC window.

6.4.5 Display slit / object selection

This step is to verify that the slit mask design is OK, it is indeed recommended to perform this step. Select `VIMOS-MPS/Load ADP catalog`, load the file e.g. `file_vmQ1M1.adp.` A new window is opened with the catalog containing the slits (see Figure 15), objects selected are identified by a square on the image. To visualize all slits and spectral extent, click on `"Plot Slits"` (see Figure 16).

If everything is fine, your ADP files are ready to be transferred to the mask manufacturing tool.

6.4.6 Mask manufacturing: mask tracker

TBD

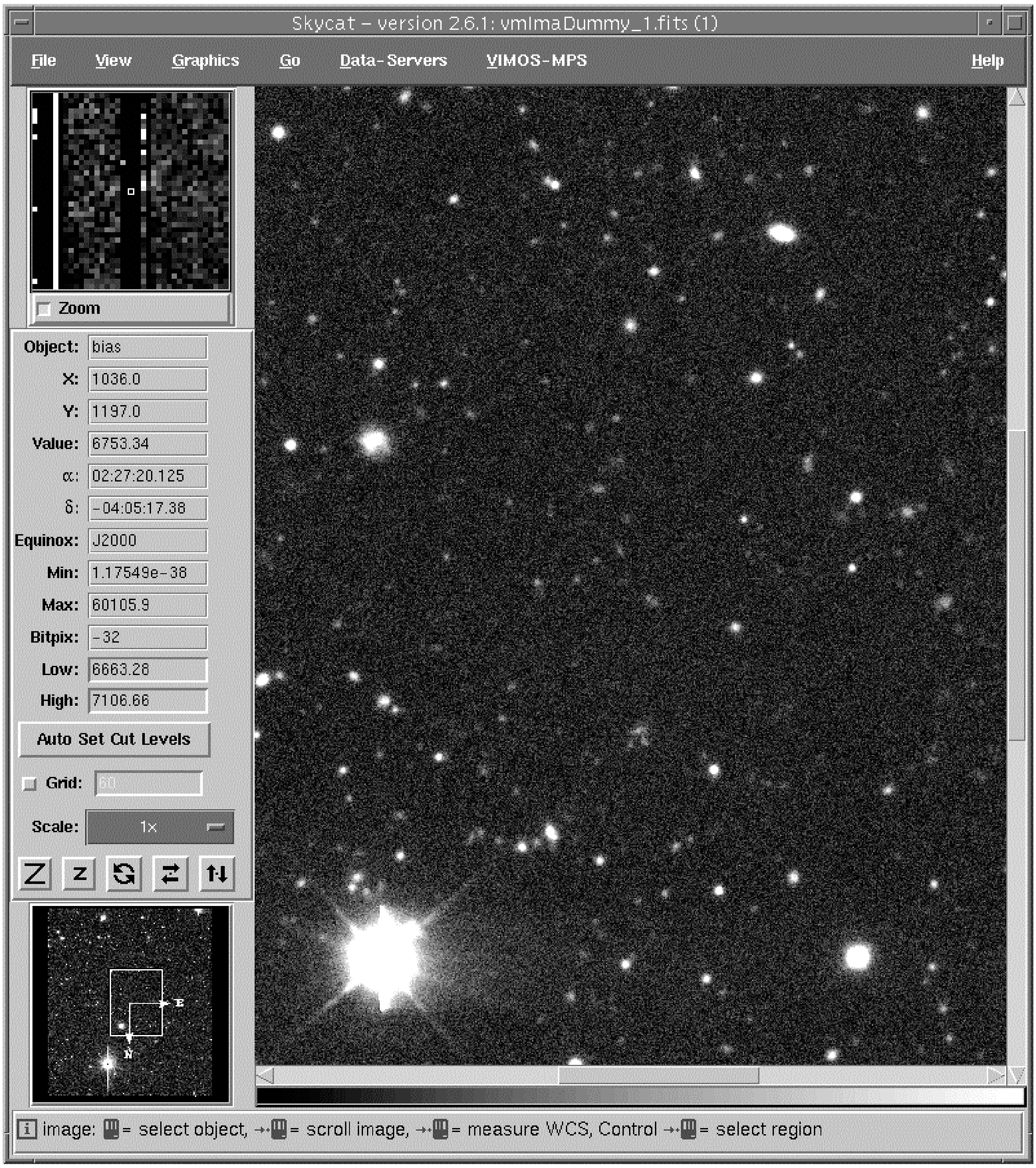

Figure 12: `vmmps` main panel

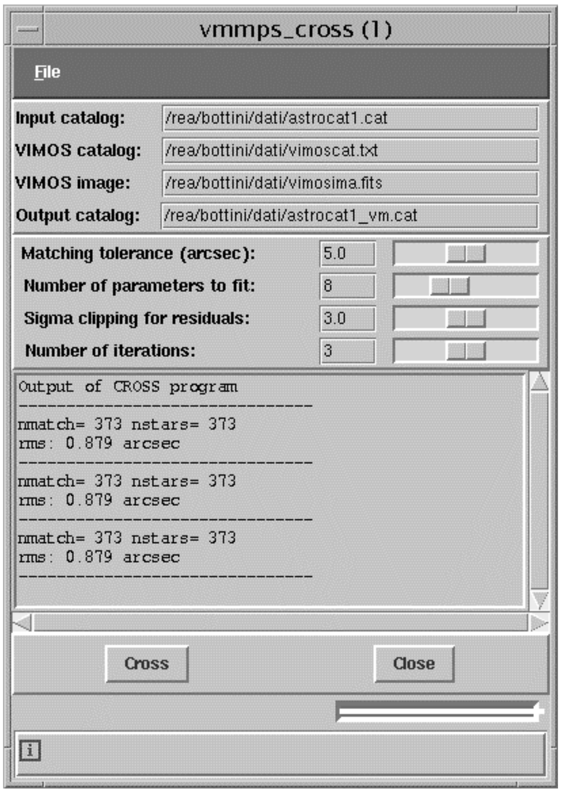

Figure 13: `vmmps / cross correlation` panel

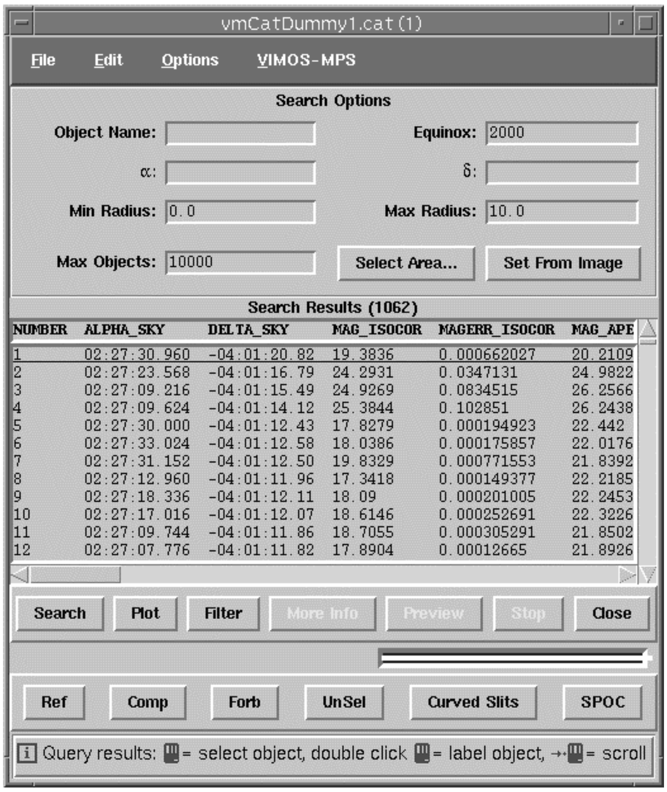

Figure 14: `vmmps / catalog` panel

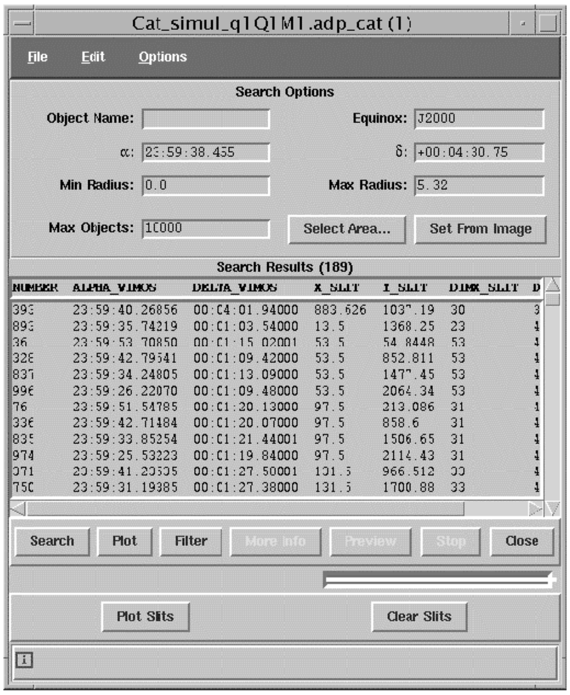

Figure 15: `vmmps / slit` panel

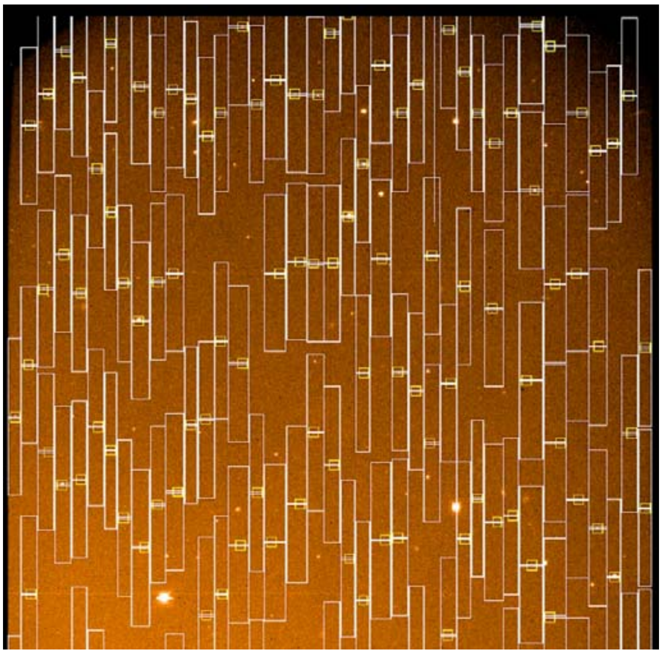

Figure 16: Display of slits selected by `vmmps/SPOC` with objects location and spectra extent

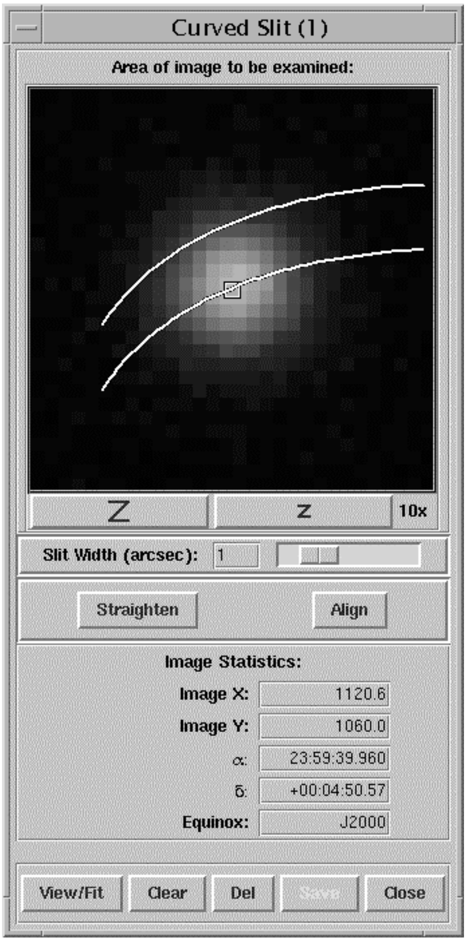

Figure 17: `vmmps / curved slit` panel

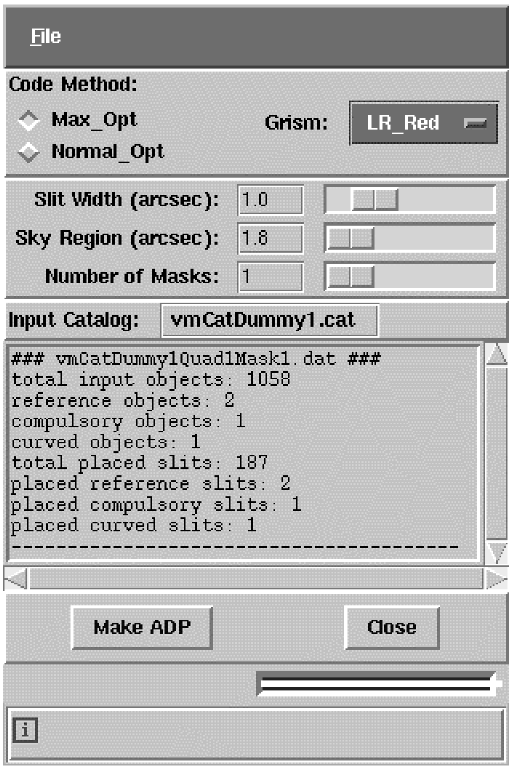

Figure 18: `vmmps / SPOC` panel

Observing sequence

The observing sequence as executed by the MOS templates is:

- Preset the telescope to the selected coordinates
- Setup the masks in the focal plane, and a filter
- Take a through-mask image
- Launch an automated measurement of the position of reference stars in the reference apertures, and compute telescope offset required to center targets in the apertures
- Take a through-mask image to confirm mask-to-sky alignment
- Insert the proper grism / filter
- Take series of MOS exposures, offsetting targets in between each exposure of the sequence if required

6.5 Calibration

The required calibrations are:

- Flat fields, taken at twighlight
- Arc lamps spectra taken during the day

- Spectrophotometric calibration standards

6.6 Data Processing

7. Integral Field Spectroscopy

7.1 Overview

The Integral Field mode of VIMOS is used to obtain spectra of all 6400 resolved spatial elements in a contiguous area 54x54 or 27x27 arcsec². This mode is set by using the integral field unit head located on the side of the MOS and imaging field of view, and inserting 4 special masks at the entrance focal plane of the spectrograph.

The spectral resolutions available are derived from the equivalent slit width for the fibers/micro-lens combination of 0.95 arcsec.

7.2 Performances

In this mode a penalty is paid in terms of overall optical throughput, about 75% that of the MOS mode. However, integral field spectroscopy does not suffer slit losses or overlapping spectra in crowded regions.

7.3 Observation preparation

The preparation of observations require the following:

- List of equatorial coordinates α,δ , and epoch of reference
- Grisms/filters to be used
- Exposure times
- Dithering/jitter pattern: list of differential pointing positions around a central position. With the large field of view of the VIMOS-IFU, techniques equivalent to “shift-and-add” classically used in imaging, can be used with the IFU: this is the preferred mode of operation. Several short images (exposure times such as the exposures are sky background limited) are taken at each position of a dithering pattern, to reconstruct an image with the total exposure time required. This allows to eliminate the sky contribution, cosmic rays, the CCD fringing particularly in the red, cosmetic defects on the detectors, and to produce very accurate flat fielding to correct for detector pixel to pixel variations. The dithering pattern depends on the mean size of the observed objects: the dithering pattern should be larger than the mean size of objects for the method to work efficiently.

7.4 Observing sequence

The observing sequence as executed by the IFU templates is:

- Set the instrument to IFU mode: if not already in this mode, the instrument rotator needs to be setup at 116.6° for the IFU masks to be allowed to deploy by the instrument control software
- Preset the telescope to the selected coordinates
- Initiate guiding and active optics control (telescope operator)
- Configure the instrument with the selected grism/filter
- Take a sequence of exposures (jitter or no jitter)

7.5 Calibration

The required calibrations are:

- Flat fields, taken at twighlight
- Arc lamps spectra taken during the day
- Spectrophotometric calibration standards

7.6 Data Processing

8. Reference Information

8.1 Filters

The filters currently installed in VIMOS are listed in Table 10. The measured transmission curves for each filter are presented in Figure 19 to Figure 28.

Table 10: list of VIMOS filters

Filter	CW and BW
U'	CWL=370 nm, FWHM=50 nm
B	CWL=430 nm, FWHM=97 nm
V	CWL=546 nm, FWHM=89 nm
R	CWL=648.5 nm, FWHM=130 nm
I	CWL=830 nm, FWHM=80 nm
Z	CWL=950 nm, FWHM=160 nm
OS1	Box Filter 370-670 nm
OS2	Box Filter 550-950 nm
GG-435	Glass cut (High pass filter)
GG-475	Glass cut (High pass filter)

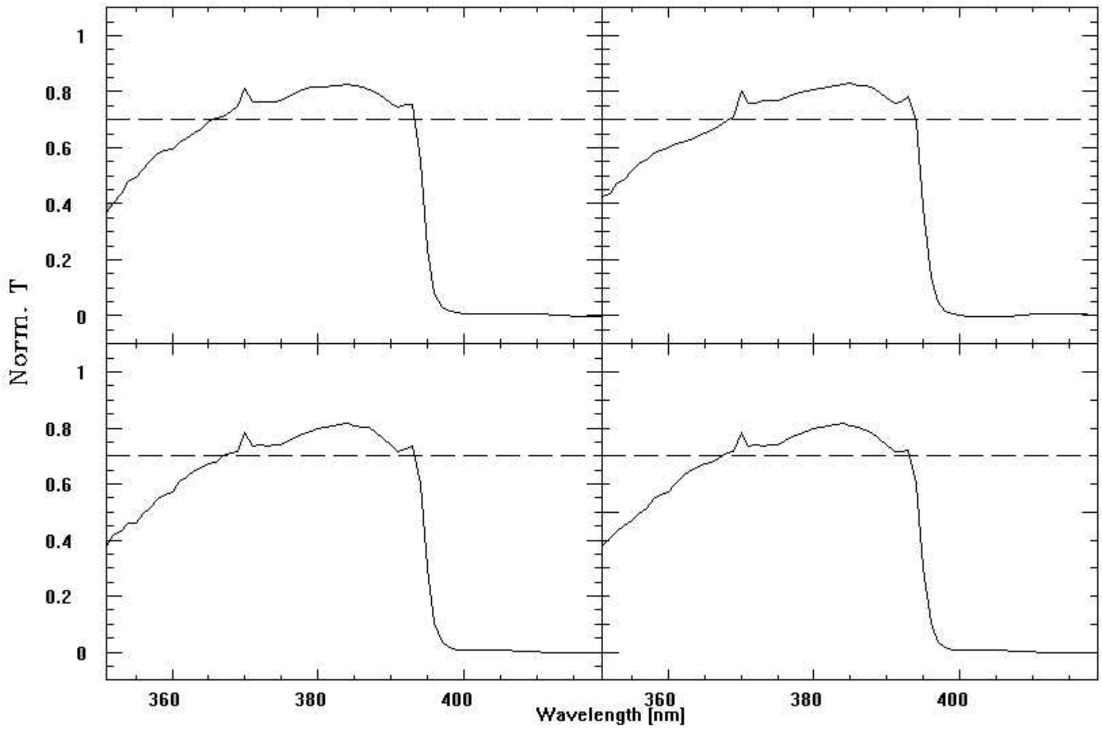

Figure 19: U' band filter transmission curves

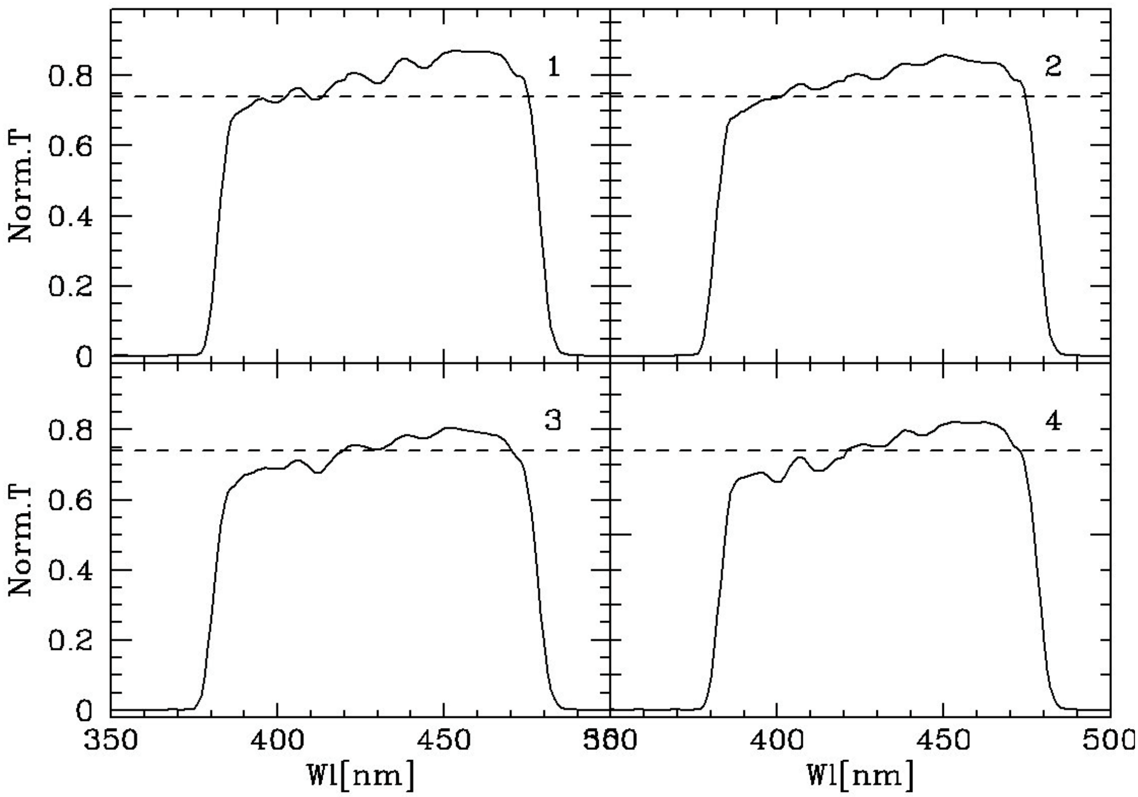

Figure 20: B band filter transmission curves

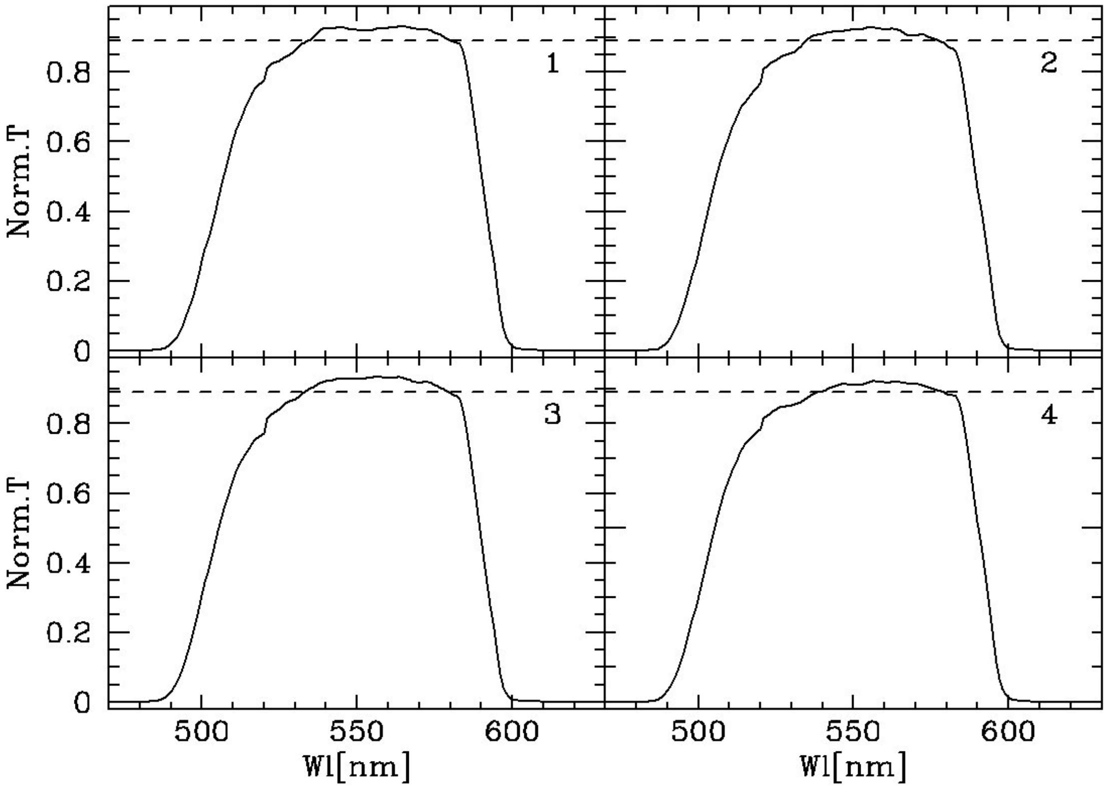

Figure 21: V band filter transmission curves

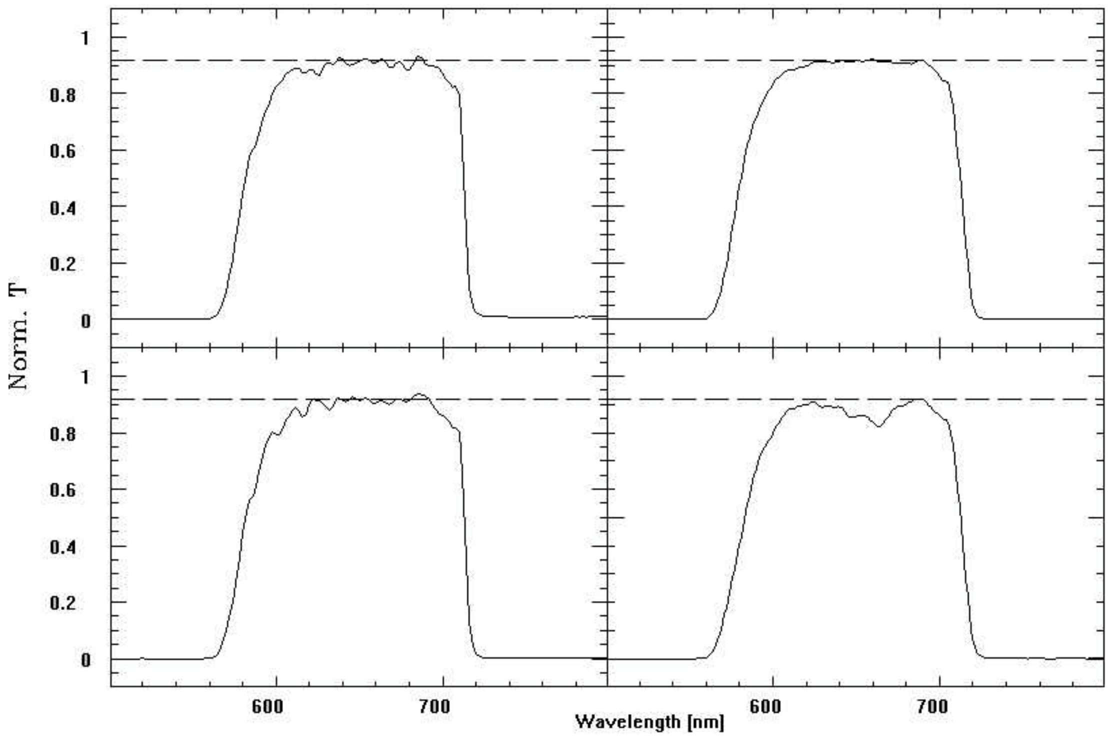

Figure 22: R band filter transmission curves

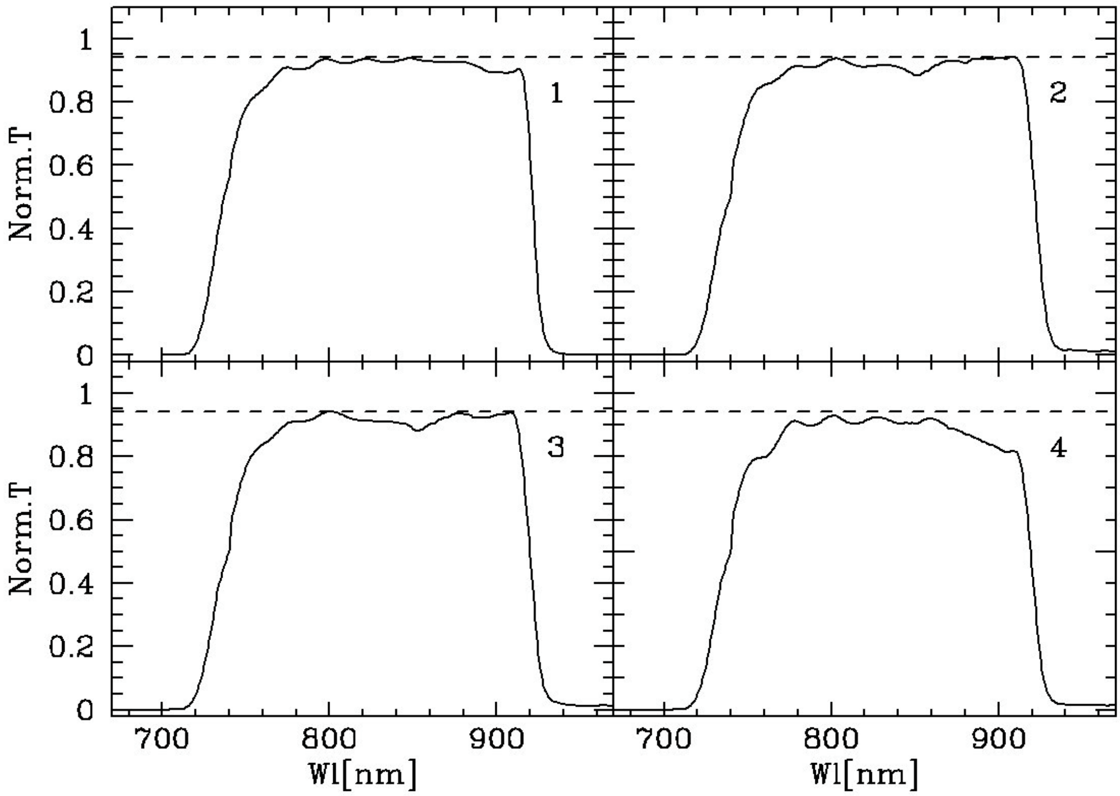

Figure 23: I band filter transmission curves

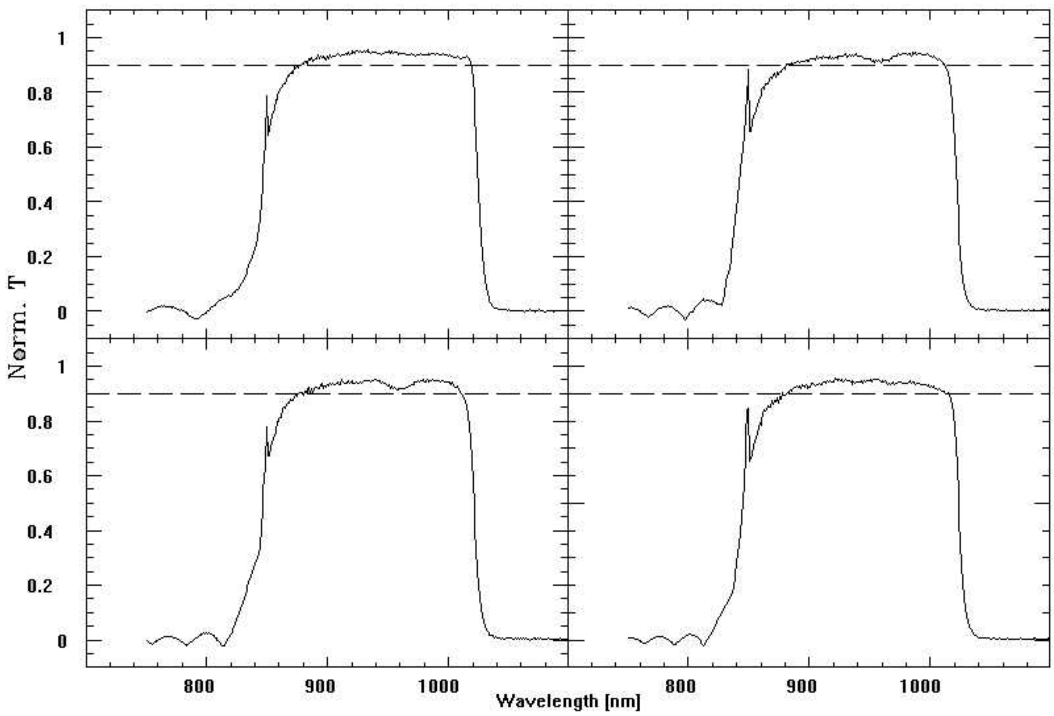

Figure 24: z band filter transmission curves

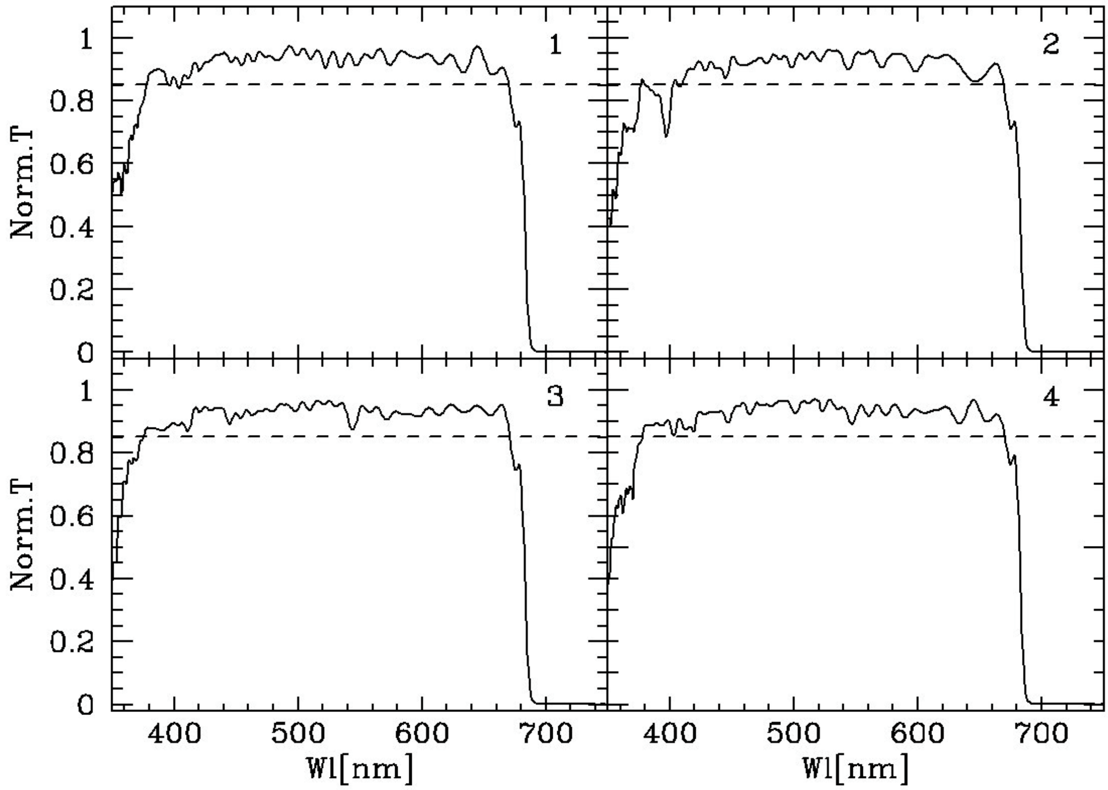

Figure 25: OS1 filter transmission curves

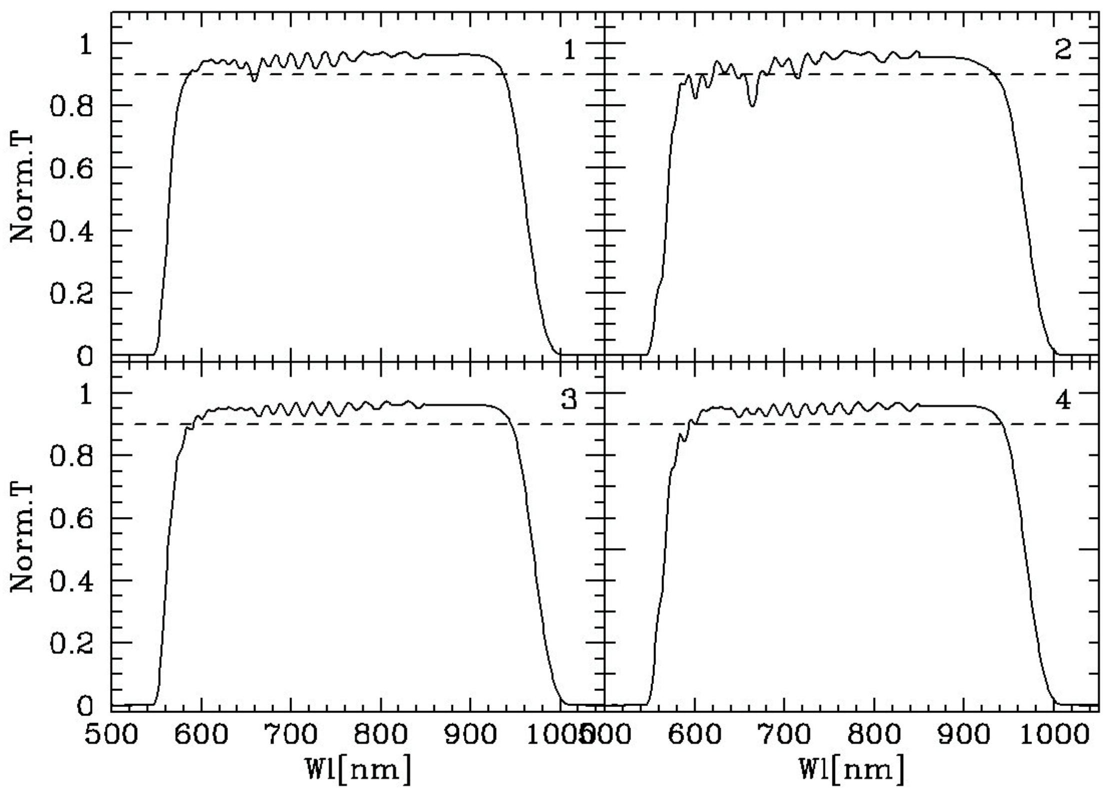

Figure 26: OS2 filter transmission curves

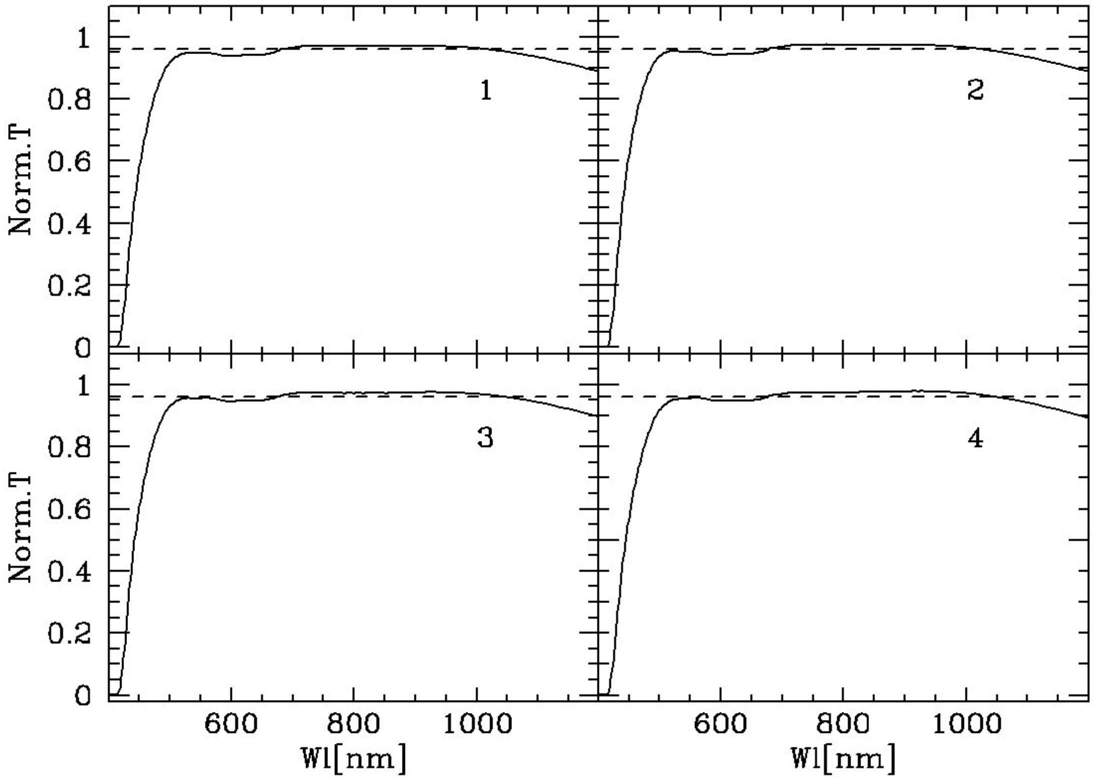

Figure 27: GG435 filter transmission curves

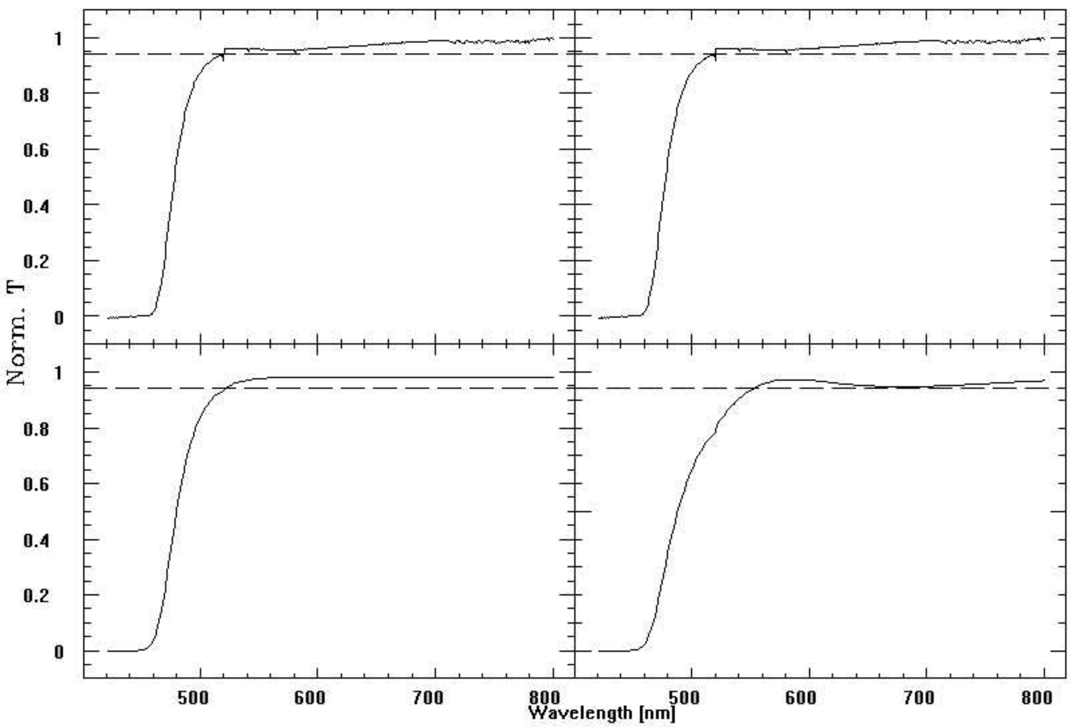

Figure 28: GG475 filter transmission curves

8.2 Grisms

Table 11: Grisms properties

Grism #	**LR1 LowRed**	**LR2 LowBlue**	**HR1 HigRed**	**HR2 HigBlu**	**HR3 HigOra**	**6 Interm**
Dimensions (Cm)	17x16x3	17x16x3	17x16x18	17x16x18	17x16x18	17x16x6
Beam ∅ (Cm)	14	14	14	14	14	14
glass	F2	BK7	F2	BK7	K5	BK7
resin	REG	UV	REG	UV	UV	UV
glass index	1.6103	1.5314	1.610	1.521	1.521	1.514
resin index	1.5812	1.5409	1.582	1.529	1.521	1.524
prism angle	5.3	5.3	46.6	44.8	46.7	16
blaze angle	4.3	4.6	49	43	49	15
grooves/mm	75	100	600	720	600	200
central λ	751	482	740	510	631	708
blaze λ	581	396	732	500	631	680
rec dispers	485	353	40.2	33.9	40.5	171
resol R	211	183	2520	2050	2150	580
MR catalogue	3553750	n.e.	3553570	n.e.	3553570	3563630
central λ range	550-950	370-670	630-870	415-620	520-760	500-1000
right λ range (3.5')	550-950	370-670	570-805	370-566	463-703	500-950
left λ range (3.5')	550-950	370-670	690-930	468-674	577-817	500-1000
Multiplex (number of spectra "layers"	4/5	4/5	1	1	1	2
coating (μ MgF2)	0.110	0.080	0.135	0.080	0.110	0.110
tilt	7.0	7.0	2.4	3.2	2.4	7.0
shadow (Max.)			3%	5%	3%	3%
vignetting grating			0%-0%-1%	0%-0%-0%	0%-0%-1%	
vignetting camera			0%-0%-0%	0%-0%-0%	0%-0%-0%	
order sorting	Barr F. 1	Barr f. 2	GG475	NO	GG435	Barr F.1
Thick. O.S. Fil.	12mm	12mm	12mm		12mm	12mm
Location of O.S.	Feu.	Feu	Feu		Feu	Feu

8.3 Detectors

8.4 OH lines

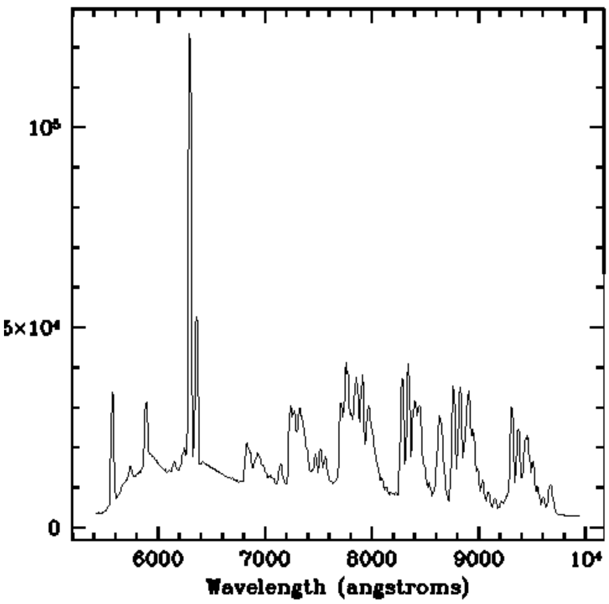

Figure 29: sky spectrum, in CCD counts, 1440 sec integration, 1 arcsec slit, LRRED grism

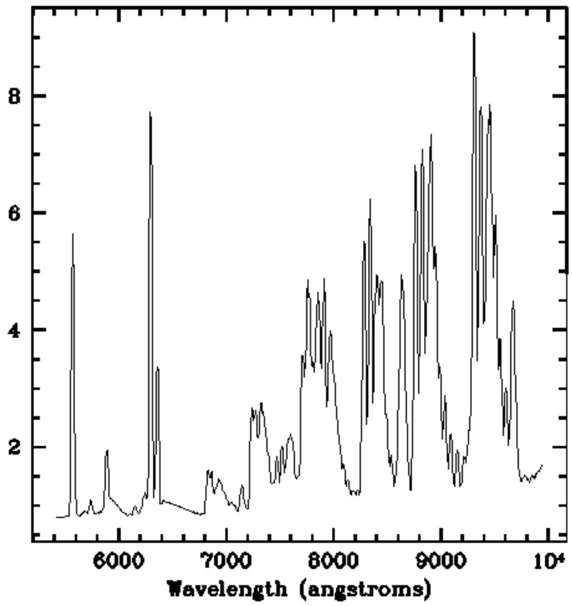

Figure 30: sky spectrum, flux calibrated (Fν)

8.5 Arc Calibration lines

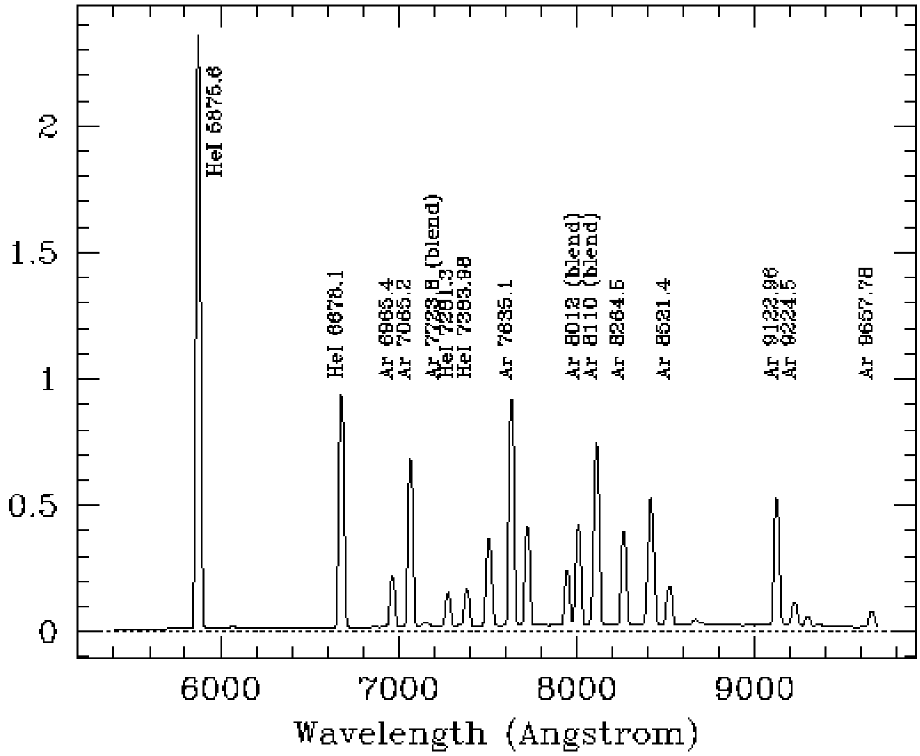

Figure 31: He + Ar arc spectrum with the LRRed grism

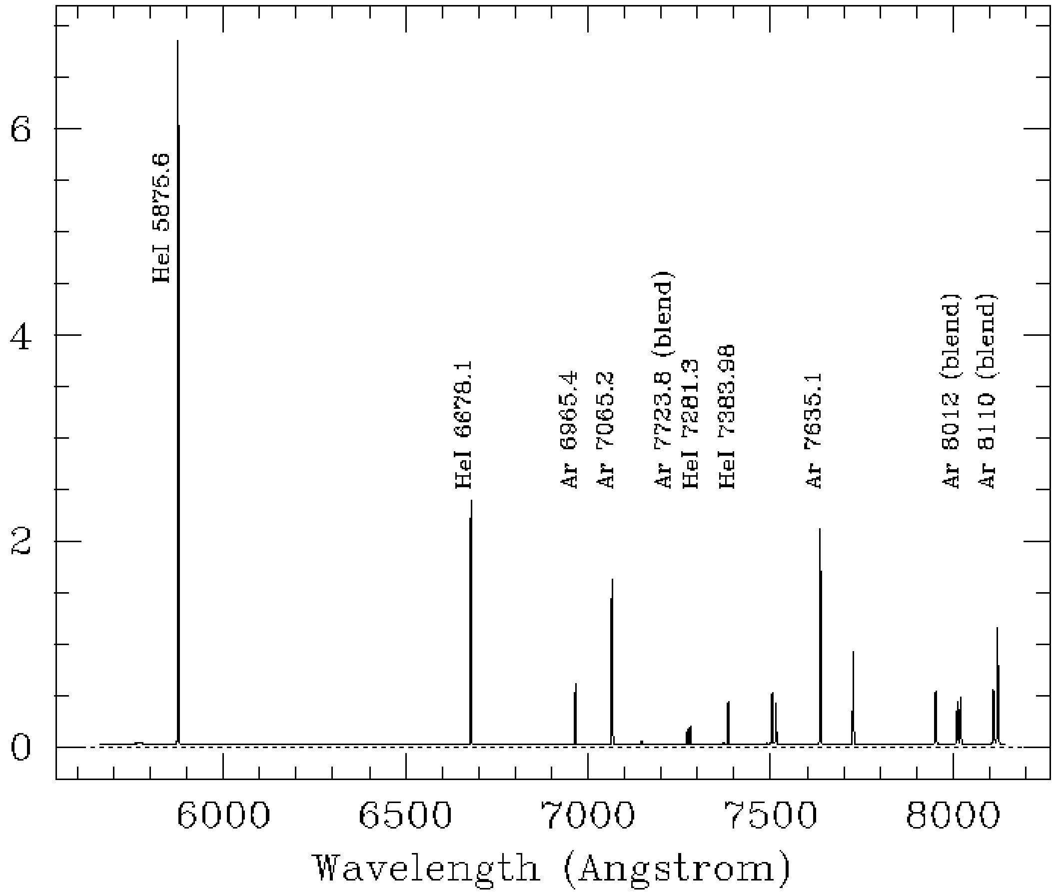

Figure 32: He+Ar spectrum with the HROra grism

9. User's Template description

9.1 Acquisition Templates

Acquisition Templates allow to point the telescope at the desired position. A check image is NOT necessarily acquired in all of them

9.1.1 Imaging Mode

9.1.1.1 VIMOS_img_acq_Preset

This template moves the telescope to the Target position, acquires guiding star and starts Autoguiding. No check image is acquired

Table 12: parameters for VIMOS_img_acq_Preset

Parameter Name	**Description**
Guiding lambda	Wavelength for guiding
Alpha Offset	Additional pointing offset in RA
Delta Offset	Additional pointing offset in Dec

On top of these parameters, the "target description" should be filled in, at least with Right Ascension, Declination, Equinox and Epoch.
Note that the pointing coordinates in the target description will correspond to the center of VIMOS FOV, and the four images will correspond to the four quadrants around this point

9.1.1.2 VIMOS_img_acq_MoveToPixel

This template moves the telescope to the Target position, acquires guiding star and starts Autoguiding, acquires and image, and allows interactive pointing refinement

Table 13: parameters for VIMOS_ img_acq_MoveToPixel

Parameter Name	**Description**
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Guiding lambda	Wavelength for guiding
Alpha Offset	Additional pointing offset in RA
Delta Offset	Additional pointing offset in Dec
Readout Mode	CCD read-out mode (fast, medium, slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Preset Telescope	Move to desired position (Y/N)

On top of these parameters, the "target description" should be filled in, at least with Right Ascension, Declination, Equinox and Epoch.
Note that the pointing coordinates in the target description will correspond to the center of VIMOS FOV, and the four images will correspond to the four quadrants around this point

If the preset option is selected, the acquisition sequence will move the telescope to the pointing position, taking into account any desired additional offset, otherwise it is assumed that the telescope is already at the pointing position. An image of the field is acquired, and the user may offset the telescope interactively (via image display and cursor) to better suit his/her needs. A second image is acquired for checking. The acquisition-offsetting sequence can be iterated at user's wish.

9.1.2 IFU Mode

9.1.2.1 VIMOS_ifu_acq_Preset

This template inserts IFU masks (for this operation, a rotation of the instrument in a pre-determined position is needed), moves the telescope to the Target position, offests to IFU position, acquires guiding star and starts Autoguiding. No check image is acquired.

Note: insertion of IFU masks (with rotation of instrument) is a slow operation which requires about 2 minutes (TBV)

Table 14: parameters for VIMOS_ifu_acq_Preset

Parameter Name	Description
Guiding lambda	Wavelength for guiding
Alpha Offset	Additional pointing offset in RA
Delta Offset	Additional pointing offset in Dec
IFU Shutter	Shutter for IFU Unit: T/F
IFU Magnificator	Magnification for IFU Unit T/F

On top of these parameters, the "target description" should be filled in, at least with Right Ascension, Declination, Equinox and Epoch.
Note that the pointing coordinates in the target description will correspond to the center of VIMOS IFU Field of view, i.e. the pointing sequence will automatically offset the telescope to the IFU position (which is about 10 arcmin from the VIMOS center). If an additional offset in RA and/or Dec is given, it will also be taken into account.

9.1.3 MOS Mode

9.1.3.1 VIMOS_mos_acq_mask

This template allows to point the telescope to the desired position, and refine pointing with mask alignment on reference objects.

Table 15: parameters for VIMOS_mos_acq_Mask

Parameter Name	Description
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Cabinet 1 Slot Number	Position of mask in Cabinet 1
Cabinet 2 Slot Number	Position of mask in Cabinet 2
Cabinet 3 Slot Number	Position of mask in Cabinet 3
Cabinet 4 Slot Number	Position of mask in Cabinet 4

Guiding lambda	Wavelength for guiding
ADP File 1	Aperture Definition File for quadrant 1
ADP File 2	Aperture Definition File for quadrant 2
ADP File 3	Aperture Definition File for quadrant 3
ADP File 4	Aperture Definition File for quadrant 4
ADM File 1	Name of ADM File for Quadrant 1
ADM File 2	Name of ADM File for Quadrant 2
ADM File 3	Name of ADM File for Quadrant 3
ADM File 4	Name of ADM File for Quadrant 4
Mask 1 ID	Mask ID of Quadrant 1 mask
Mask 2 ID	Mask ID of Quadrant 2 mask
Mask 3 ID	Mask ID of Quadrant 3 mask
Mask 4 ID	Mask ID of Quadrant 4 mask
Readout Mode	CCD read-out mode (fast, medium, slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Preset Telescope	Move to desired position (Y/N)

ADP File 1-4 contain the files for building the masks, as generated by the vmmps software (cf. AD-5).
The parameters indicated as shaded are normally NOT to be filled in by the user, but by the OHS (cf. RD-4) and will not appear in P2PP

Note: the pointing coordinates are NOT taken from the target description, but from the adp files themselves. Nevertheless, target description must be filled with meaningfull Epoch and Equinox at least
If the Preset option is selected, the telescope is preset to pointing coordinates. Autoguide is started in any case. An image with the spectroscopic mask is acquired. By comparing the position of the Reference Objects as from ADP files, with the position of the same objects in the newly acquired image, an offset is computed and applied to the telescope. The procedure is iterated till the difference between the two positions is less than 0.1 arcsec, or when user stops it.
It is recommended to enter a guiding wavelength as near as possible to the central wavelength of the grism to be used for the scientific observation, to minimize the effects of the chromatic atmospheric refraction.

9.1.3.2 VIMOS_mos_acq_photm

This template is intended in conjuction with Calibration Template VIMOS_mos_cal_photom. It ONLY presets the telescope to the Target position and does NOT start guiding, as this task will be done by VIMOS_mos_cal_photom after having offsetted so that target is within calibration slit.

Table 16: parameters for VIMOS_mos_acq_photom

Parameter Name	**Description**
Guiding lambda	Wavelength for guiding
Alpha Offset	Additional pointing offset in RA
Delta Offset	Additional pointing offset in Dec

On top of these parameters, the "target description" should be filled in, at least with Right Ascension, Declination, Equinox and Epoch.
Note that the pointing coordinates in the target description will correspond to the center of VIMOS FOV

9.2 Observation Templates

Observation templates define a restricted set of possible instrument configuration. Observations carried out using these templates, can later on be reduced using VIMOS DRS reduction recipes. Observations which could be done using different instrument settings, are not supported by DRS recipes and Automatic pipeline

9.2.1 Imaging Mode

All imaging mode Observation templates allow usage of PHOTOMETRIC FILTERS ONLY and of Imaging CCD readout mode ONLY (i.e. only the central 2048x2340 pixels are read)

9.2.1.1 VIMOS_img_obs_Stare

Generic purpose template to observe a field in Direct Imaging Mode. If more than one exposure is requested (Numebr of Exposures > 1), each exposure will be *"Exposure time*"seconds long

Table 17: parameters for VIMOS_img_obs_Stare

Parameter Name	**Descritpion**
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (Fast, Medium, Slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Number of exposures	Number of exposures to be made
Exposure Name	Root name for resulting files

9.2.1.2 VIMOS_img_obs_Jitter

Template to observe a field in Direct Imaging Mode, slightly shifting the pointing from one exposure to the next. The offset from one exposure to the next is given by the two parameters "*List of Offset in X*" and "*List of Offset in Y*". Offset can be given either in pixels (if *"Offset Coordinates"*is set to DETECTOR) or in arcseconds(if *"Offset Coordinates"* is set to SKY). Offsets are always incremental from the previous position and are to be read as offsets of THE OBJECT ON THE IMAGE)i.e. the Telescope will move in the other direction.

Each exposure will be *"Exposure time*"seconds long

Example
Offset Coordinates = SKY
List of Offset in X = 0 1 0 –1 0
List of Offset in Y = 0 0 1 0 –1
Number of exposures = 5

Exposure N.ro	**X shift**	**Y shift**	**Xtotal shift**	**Y total shift**
1	0	0	0	0
2	1	0	1	0
3	0	1	1	1
4	-1	0	0	1

5	0	-1	0	0

At the end, the pointing will have been moved along a square of 2 arcseconds side.
If *Number of exposures* is larger than the number of offsets in X or in Y, the sequence of offsets will be restarted.

Example
List of Offset in X = 0 1
List of Offset in Y = 0 1
Number of exposures = 5
The following offsets will be applied

Exposure N.ro	X shift	Y shift	Xtotal shift	Ytotal shift
1	0	0	0	0
2	1	1	1	1
3	0	0	1	1
4	1	1	2	2
5	0	0	2	2

Table 18: parameters for VIMOS_img_obs_Jiitter

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (Fast, Medium, Slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Return To Origin	Defines wether telescope should go back to the original position ate the end of the sequence of exposures
Number of exposures	Number of exposures to be made
Offset Ccordinates	Offset can be given in pixels or in arcsec
List of Offset in X	List of offsets in X or Dec direction
List of Offset in Y	List of offsets in Y or RA direction
Exposure Name	Root name for resulting files

9.2.1.3 VIMOS_img_obs_Autojitter

Template to observe a field in Direct Imaging Mode, slightly shifting the pointing from one exposure to the next. The offset from one exposure to the next are automatically computed in a random manner, within a box of side "*Jitter Box Width*".
Each exposure will be *"Exposure time*"seconds long

Table 19: parameters for VIMOS_img_obs_Autojiitter

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds

X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Jiitter box width	side of box within which offsetting the pointing
Return To Origin	Defines wether telescope should go back to the original position ate the end of the sequence of exposures
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files

9.2.2 MOS Mode

All MOS mode Observation templates allow usage of Spectroscopic CCD readout mode ONLY (i.e. only the full 2048x4096 CCDs are read). Order Sorting filters are automatically associated to the chosen grism

9.2.2.1 VIMOS_mos_obs_Stare

Generic purpose template to observe a field in Spectroscopic Mode. If more than one exposure is requested (Number of Exposures > 1), each exposure will be *"Exposure time*"seconds long

Table 20: Parameters for VIMOS_mos_obs_Stare

Parameter Name	**Descritpion**
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files

Note: masks related parameters (ADP fle, ADM files, Slot number, etc.) are NEVER defined within the observation template, but ONLY in the acquisition (or calibration) template. It is therefore compulsory to define an OB for each mask set.

9.2.2.2 VIMOS_mos_obs_Jitter

Template to observe a field in Mos Mode, slightly shifting the pointing from one exposure to the next along the slit The offset from one exposure to the next is given by the parameter "*List of Offsets*" Offset are in arcseconds and are always incremental from the previous position. Offsets are to be read as offsets of THE OBJECT ON THE IMAGE, i.e. the Telescope will move in the other direction.

Each exposure will be *"Exposure time*"seconds long

Example
List of Offset = 0 1 –2

Number of exposures = 3

Exposure N.ro	shift	Total shift
1	0	0
2	1	1
3	-2	-1

At the end, the pointing will have been moved along a the slit of 1 arcseconds around the center.
If *Number of exposures* is larger than the number of offsets in X or in Y, the sequence of offsets will be restarted.

Example
List of Offset = 0 1
Number of exposures = 5
The following offsets will be applied

Exposure N.ro	shift	Total shift
1	0	0
2	1	1
3	0	1
4	1	2
5	0	2

Table 21: parameters for VIMOS_mos_obs_Jitter

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
Readout Mode	CCD read-out mode (fast, medium, slow)
Return To Origin	Defines whether telescope should go back to the original position at the end of the sequence of exposures
Number of exposures	Number of exposures to be made
List of Offsets	List of offsets along the slit (in arcseconds)
Exposure Name	Root name for resulting files

9.2.3 IFU Mode

All IFU mode Observation templates allow usage of Spectroscopic CCD readout mode ONLY (i.e. only the full 2048x4096 CCds are read). Order Sorting filters are automatically associated to the chosen grism

9.2.3.1 VIMOS_ifu_obs_Stare

Generic purpose template to observe a field in IFU Mode. If more than one exposure is requested (Numebr of Exposures > 1), each exposure will be *"Exposure time*"seconds long

Table 22: parameters for VIMOS_mos_obs_Stare

Parameter Name	**Descritpion**
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
IFU Shutter	Shutter for IFU Unit: T/F
IFU Magnificator	Magnification for IFU Unit T/F
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files

9.2.3.2 VIMOS_ifu_obs_Jitter

Template to observe a field in IFU, slightly shifting the pointing from one exposure to the next. The offset from one exposure to the next is given by the two parameters "*List of Offset in X*" and "*List of Offset in Y*". Offset can be given either in pixels (if *"Offset Coordinates"*is set to SKY) or in arcseconds(if *"Offset Coordinates"* is set to DETECTOR). NOTE that offset are always incremental from the previous position and are to be read as offsets of THE OBJECT ON THE IMAGE, i.e. the Telescope will move in the other direction.

Each exposure will be *"Exposure time*"seconds long

Example
Offset Coordinates = SKY
List of Offset in X = 0 1 0 –2 0
List of Offset in Y = 0 0 1 0 –2
Number of exposures = 5

Exposure N.ro	**X shift**	**Y shift**	**Xtotal shift**	**Y total shift**
1	0	0	0	0
2	1	0	1	0
3	0	1	1	1
4	-2	0	-1	1
5	0	-2	-1	-1

At the end, the pointing will have been moved along a square of 2 arcseconds side.
If *Number of exposures* is larger than the number of offsets in X or in Y, the sequence of offset will be restarted.

Example
List of Offset in X = 0 1
List of Offset in Y = 0 -1
Number of exposures = 5
The following offsets will be applied

Exposure N.ro	X shift	Y shift	Xtotal shift	Ytotal shift
1	0	0	0	0
2	1	1	1	1
3	0	0	1	1
4	1	1	2	2
5	0	0	2	2

Table 23: parameters for VIMOS_ifu_obs_Jitter

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
IFU Shutter	Shutter for IFU Unit: T/F
IFU Magnificator	Magnification for IFU Unit T/F
Readout Mode	CCD read-out mode (fast, medium, slow)
Return To Origin	Defines whether telescope should go back to the original position at the end of the sequence of exposures
Number of exposures	Number of exposures to be made
Offset Coordinates	Offsets can be given in pixels or in arcsec
List of Offset in X	list of offset in X or Dec direction
List of Offset in Y	List of offset in Y or RA direction
Exposure Name	root name for resulting files

9.2.3.3 VIMOS_ifu_obs_Autojitter

Template to observe a field in IFU Mode, slightly shifting the pointing from one exposure to the next. The offset from one exposure to the next are automatically computed in a random manner, within a box of side "*Jitter Box Width*".
Each exposure will be *"Exposure time*"seconds long

Table 24: parameters for VIMOS_ifu_obs_Autojitter

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution

	Low,Red or orange, Medium Resolution
IFU Shutter	Shutter for IFU Unit: T/F
IFU Magnificator	Magnification for IFU Unit T/F
Readout Mode	CCD read-out mode (fast, medium, slow)
Jiitter box width	side of box within which offsetting the pointing
Return To Origin	Defines whether telescope should go back to the original position at the end of the sequence of exposures
Number of exposures	Number of exposures to be made
Exposure Name	Root name for resulting files

9.3 Calibration Templates

Calibration Templates are those to be used for routinely performed scientific calibrations (like biases, darks, etc).

9.3.1 Imaging Mode

9.3.1.1 VIMOS_img_cal_Dark

Template to acquire a series of darks or biases exposures.

Table 25: parameters for VIMOS_img_cal_Dark

Parameter Name	Descritpion
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of Exposures	Number of exposures to be made
Exposure Name	root name for resulting files
List of exposure times	esposure time for each of the exposures

The "*List of exposure Times"* parameter defines the exposure time for each exposure. If exposure time is zero, a bias is acquired

Example 1
Number of Exposures = 6
List of exposure Times = 0 0 60 300 900 3600
Will perform first a series of 2 biases (exp. time 0) and then a series of 4 darks, lasting 1,5,15,and 60 minutes each.

Example 2
Number of Exposures = 6
List of exposure Times = 0
Will perform a serie of 6 biases (exp. time 0)

Example 3
Number of Exposures = 6
List of exposure Times = 0 10 20
Will acquire two series each consisting of one bias (exp. time 0), and two darks.

9.3.1.2 VIMOS_img_cal_FlatDome

Template to acquire a series of Flat field exposures on the screen in imaging mode

Table 26: parameters for VIMOS_img_cal_FlatDome

Parameter Name	Descritpion
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)

Y binning factor	Binning factor in Y direction (1 or 2)
Calibration Lamp Name	Name of the calibration Lamp to be used
Readout Mode	CCD read-out mode (fast, medium, slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files

9.3.1.3 VIMOS_img_cal_FlatSky

Template to acquire a serie of Flat field exposures in imaging mode

Table 27: parameters for VIMOS_img_cal_FlatSky

Parameter Name	Descritpion
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Number of exposures	Number of exposures to be made
List of offest in DEC	arcsec(DEC) to offest between exposures
List of Offste in RA	arcsec(RA) to offest between exposures
Exposure Name	root name for resulting files
Exposure level	Wished counts in resulting Flat Field

The template gets an image and automatically computes the exposure time needed to obtain the requested counts in each image.
It performs the requested number of exposures, eventually offsetting the telescope between one and the other of the wished amount.

9.3.1.4 VIMOS_img_cal_Zerop

Template to acquire photometric calibration exposures in imaging mode.

Table 28: parameters for VIMOS_img_cal_ZeroP

Parameter Name	Descritpion
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)
Filter Name	Photometric filter to be used: U,B,V,R,I,z
Number of exposures	Number of exposures to be made
4 quadrants flag	Take image with photometric standard in 1 or 4 quadrants
Exposure Name	Root name to be given to resulting files

The template assumes that telescope has been pointed on the calibration field: it will itself take care of shifting the pointing so that the calibration star/field is at the center of quadrant 1.

If the *4 quadrant flag* is set to **True** images are acquired shifting the pointing so that calibration star/field falls in turn on each of the 4 quadrants.

9.3.2 MOS mode

9.3.2.1 VIMOS_mos_cal_Dark

Template to acquire a serie of darks or biases exposures.

Table 29: parameters for VIMOS_mos_cal_Dark

Parameter Name	Descritpion
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of Exposures	Number of exposures to be made
Exposure Name	root name for resulting files
List of exposure times	esposure time for each of the exposures

The "*List of exposure Times"* parameter defines the exposure time for each exposure. If exposure time is zero, a bias is acquired

Example 1
Number of Exposures = 6
List of exposure Times = 0 0 60 300 900 3600
Will perform first a serie of 2 biases (exp. time 0) and then a serie of 4 darks, lasting 1,5,15,and 60 minutes each.

Example 2
Number of Exposures = 6
List of exposure Times = 0
Will perform a serie of 6 biases (exp. time 0)

Example 3
Number of Exposures = 6
List of exposure Times = 0 10 20
Will acquire two series each consisting of one bias (exp. time 0), and two darks.

9.3.2.2 VIMOS_mos_cal_Flat

Template to acquire a series of Flat field exposures in MOS mode. Note that each Flat field must be acquired with the appropriate mask, i.e. that used for the scientific exposure

Table 30: parameters for VIMOS_mos_cal_Flat

Parameter Name	Descritpion
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution

	Low,Red or orange, Medium Resolution
Calibration Lamp Name	Name of the calibration Lamp to be used
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	Root name for resulting files
ADP File 1	Name of ADP File for Quadrant 1
ADP File 2	Name of ADP File for Quadrant 2
ADP File 3	Name of ADP File for Quadrant 3
ADP File 4	Name of ADP File for Quadrant 4
ADM File 1	Name of ADM File for Quadrant 1
ADM File 2	Name of ADM File for Quadrant 2
ADM File 3	Name of ADM File for Quadrant 3
ADM File 4	Name of ADM File for Quadrant 4
Mask 1 ID	Mask ID of Quadrant 1 mask
Mask 2 ID	Mask ID of Quadrant 2 mask
Mask 3 ID	Mask ID of Quadrant 3 mask
Mask 4 ID	Mask ID of Quadrant 4 mask
Cabinet 1 Slot Number	Position of mask in Cabinet 1
Cabinet 2 Slot Number	Position of mask in Cabinet 2
Cabinet 3 Slot Number	Position of mask in Cabinet 3
Cabinet 4 Slot Number	Position of mask in Cabinet 4

ADF File 1-4 contain the files for building the masks, as generated by the vmmps software (cf. AD-5). The parameters indicated as shaded are normally NOT to be filled in by the user, but by the OHS (cf. RD-4) and will not appear in P2PP

Number of exposures images are taken for EACH MASK SHUTTER POSITION as defined in ADP files. So the real number of exposures is given by *Number of exposures * NMaskShu*

9.3.2.3 VIMOS_mos_cal_arc

Template to acquire exposures with Calibration lamps in MOS mode. Note that each calibration lamp exposure must be acquired with the appropriate mask, i.e. that used for the scientific exposure

NOTE: this template is by no means different from the previous one, but for the lamps to be used

Table 31: parameters for VIMOS_mos_cal_arc

Parameter Name	Descritpion
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
Cabinet 1 Slot Number	Position of mask in Cabinet 1
Cabinet 2 Slot Number	Position of mask in Cabinet 2
Cabinet 3 Slot Number	Position of mask in Cabinet 3
Cabinet 4 Slot Number	Position of mask in Cabinet 4
He Exposure time	Seconds of exposure for Helium Lamp (-1=No He lamp)

Ne Exposure time	Seconds of exposure for Helium Lamp (-1=No Ne lamp)
Ar Exposure time	Seconds of exposure for Helium Lamp (-1=No Ar lamp)
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files
ADP File 1	Name of ADP File for Quadrant 1
ADP File 2	Name of ADP File for Quadrant 2
ADP File 3	Name of ADP File for Quadrant 3
ADP File 4	Name of ADP File for Quadrant 4
ADM File 1	Name of ADM File for Quadrant 1
ADM File 2	Name of ADM File for Quadrant 2
ADM File 3	Name of ADM File for Quadrant 3
ADM File 4 Mask 1 ID	Name of ADM File for Quadrant 4 Mask ID of Quadrant 1 mask
Mask 2 ID	Mask ID of Quadrant 2 mask
Mask 3 ID	Mask ID of Quadrant 3 mask
Mask 4 ID	Mask ID of Quadrant 4 mask

ADF File 1-4 contain the files for building the masks, as generated by the vmmps software (cf. AD-5). The parameters indicated as shaded ar normally NOT to be filled in by the user, but by the OHS (cf. RD-4) and will normally not appear in the distributed version of VIMOS templates
Number of exposures images are taken for EACH MASK SHUTTER POSITION as defined in ADP files. So the real number of exposures is given by *Number of exposures * NMaskShu*

For each Shutter position and each exposure, all requested lamps are switched on. Exposure starts, and it is pasued when the shortest lamp exposure given has elapsed. Lamp is switched off and exposition resumed till next lamp exposure time is elapsed, and so on till the end.

Example
Number of Exposures = 3
He Exposure time = 2
Ne Exposure time = 2
Ar Exposure time = 10

For each Shutter position as indicated in ADM file, 3 exposures will be made using the following sequence: switch on He and Ar lamps, expose for 2 seconds, close chutter, switch off He lamp, re-open shutter and continue for the next 8 seconds.

9.3.2.4 VIMOS_mos_cal_photom

Template to acquire spectro-photometric calibration exposures in MOS mode.

Table 32: parameters for VIMOS_mos_cal_photom

Parameter Name	**Descritpion**
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)

Grism Wheel	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files
4 Quadrant Flag	Flag to point calibrator in the 4 quadrants (T/F)
Slit Height	Required Slit height in Arcsec
Fine Alignment	Flag to refine alignment with mask
ADP File 1	Name of ADP File for Quadrant 1
ADP File 2	Name of ADP File for Quadrant 2
ADP File 3	Name of ADP File for Quadrant 3
ADP File 4	Name of ADP File for Quadrant 4
ADM File 1	Name of ADM File for Quadrant 1
ADM File 2	Name of ADM File for Quadrant 2
ADM File 3	Name of ADM File for Quadrant 3
ADM File 4	Name of ADM File for Quadrant 4
Mask 1 ID	Mask ID of Quadrant 1 mask
Mask 2 ID	Mask ID of Quadrant 2 mask
Mask 3 ID	Mask ID of Quadrant 3 mask
Mask 4 ID	Mask ID of Quadrant 4 mask
Cabinet 1 Slot Number	Position of mask in Cabinet 1
Cabinet 2 Slot Number	Position of mask in Cabinet 2
Cabinet 3 Slot Number	Position of mask in Cabinet 3
Cabinet 4 Slot Number	Position of mask in Cabinet 4

The template assumes that telescope has been pointed on the calibration field: it will itself take care of shifting the pointing so that the calibration star falls on the chosen slit (i.e. the one with chosen height) of the first Operative Quadrant 1.
If the *4 quadrant flag* is set to **True,** images are acquired shifting the pointing so that calibration star/field falls in turn on each of the 4 quadrants.
Operator note: The mask required for this template is a dedicated mask, having long (i.e. 50 pixels) slits of different heights (from 0.5 to 2.5 arcsec). The ADP for this mask is to be manually created but normally should never change. When the mask is manufactured, pixels are transformed into millimeters using the CCD to Mask Calibration matrix in the ADP itself. Such matrix can be well out of date, thus the template, when Fine Aligment is set to true, does NOT rely on ADP pixel position of the slit, but searches for the slit around the expected position, spanning a box 3 times the slit length in X and 3 times the slit height in Y.
The procedure is as follows:
pointing is shifted so that chisen star falls in the proximity of the required slit, guiding is started and an image acquired. The user is asked to click on the desired calibration star, and its actual position is stored, and masks are inserted. If the Fine Alignment is requested, another image is acquired, and the required slit is searched for around the expected position. If found, the telescope pointing is offsetted so that the chosen star falls within the slit, another image is acquired, and user is asked for an even finer tuning. If fine Aligment is set to False, the pointing is offsetted so that chosen star falls within the expected location of the requested lit. Finally Grism is inserted and calibration exposures are acquired, shifting from one quadrant to the next operative one if Cal.Flag is set to true.

9.3.3 IFU mode

9.3.3.1 VIMOS_ifu_cal_Dark

Template to acquire a series of darks or biases exposures.

Table 33: parameters for VIMOS_ifu_cal_Dark

Parameter Name	Descritpion
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of Exposures	Number of exposures to be made
Exposure Name	root name for resulting files
List of exposure times	esposure time for each of the exposures

The "*List of exposure Times*" parameter defines the exposure time for each exposure. If exposure time is zero, a bias is acquired

Example 1
Number of Exposures = 6
List of exposure Times = 0 0 60 300 900 3600
Will perform first a series of 2 biases (exp. time 0) and then a series of 4 darks, lasting 1,5,15,and 60 minutes each.

Example 2
Number of Exposures = 6
List of exposure Times = 0
Will perform a serie of 6 biases (exp. time 0)

Example 3
Number of Exposures = 6
List of exposure Times = 0 10 20
Will acquire two series of one bias (exp. time 0), and two darks.

9.3.3.2 VIMOS_ifu_cal_Flat

Template to acquire a Flat field (with halogen lamps) in IFU mode

Table 34: parameters for VIMOS_ifu_cal_Flat

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
IFU Shutter	Shutter for IFU Unit: T/F
IFU Magnificator	Magnification for IFU Unit T/F

Calibration Lamp	Name of the calibration Lamp to be used
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files

Mask shutters cannot be used with the instrument in IFU mode. This means that orders superposition will not be cut out from calibration images.

9.3.3.3 VIMOS_ifu_cal_arc

Template to acquire a wavelength calibration image in IFU mode

NOTE: this template is by no means different from the analogous one for MOS case. The sequence of expose-pause-continue based on lamps exposure times applies here also.

Table 35: parameters for VIMOS_ifu_cal_arc

Parameter Name	Descritpion
Exposure time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Name	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
IFU Shutter	Shutter for IFU Unit: T/F
IFU Magnificator	Magnification for IFU Unit T/F
He Exposure time	Seconds of exposure for Helium Lamp (-1=No He lamp)
Ne Exposure time	Seconds of exposure for Helium Lamp (-1=No Ne lamp)
Ar Exposure time	Seconds of exposure for Helium Lamp (-1=No Ar lamp)
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	root name for resulting files

Mask shutters cannot be used with the instrument in IFU mode. This means that orders superposition will not be cut out from calibration images

9.3.3.4 VIMOS_ifu_cal_photom

Template to acquire spectro-photometric calibration exposures in IFU mode.

Table 36: parameters for VIMOS_ifu_cal_photom

Parameter Name	Descritpion
Exposure Time	Exposure time for one observation in seconds
X binning factor	Binning factor in X direction (1 or 2)
Y binning factor	Binning factor in Y direction (1 or 2)
Grism Wheel	Grism to be used:Low resolution Blue or Red, High resolution Low,Red or orange, Medium Resolution
IFU Shutter	Shutter for IFU Unit: T/F

IFU Magnificator	Magnification for IFU Unit T/F
Readout Mode	CCD read-out mode (fast, medium, slow)
Number of exposures	Number of exposures to be made
Exposure Name	Root name to be given to resulting files

The template assumes that telescope has been pointed on the calibration field: it will itself take care of shifting the pointing so that the calibration star falls NEXT to IFU center, and consequently its spectrum in the first operative quadrant.

10. Annex A: Start-up and shut-down procedures

Start-up procedure:

1. *Hardware on platform*

- Power on the 2 LCUs
- Power on the 2 FIERAS and associated electronics
- Verify that detectors have proper temperature and cooling
-

2. *Software on instrument workstation*

- Open session on VIMOS worstation: Login: VIMOS, password: vimos2me
- Run task **`vmmsStart`**: Select "configure" and start all subsystems processes (ICS, DCS1 and DCS2, OS) (see figure A.1)
- OS panel opens up, select "ONLINE" in menu "COMMANDS/STATUS"
- After ~5-7 minutes, the system status should be indicated "ONLINE" and "IDLE" on upper right of the OS panel
- If planning IFU mode from OS rather than templates, the telescope rotator needs to be put at 116° for the IFU masks to deploy
- Check all subsystems "ONLINE" status (see OS panel figure A.2)
- Verify that focusing is "AUTO", if "MANUAL" appear go to the "TOOLS/ICS control panel", the ICS panel opens up, select focus "AUTO". This will adjust the internal camera focus according to temperature
- From OS panel, launch "RTD" the real time display application, in the RTD menu, select "attach SVIGA servers" in menu "REALTIME"
- In another window, run task **`Bob,`** the template broker. The Bob panel opens up with all the default VIRMOS templates
- The instrument is ready to use either from OS or from Bob, refer to the description of these applications in the respective sessions

Shut-down procedure:

1. *Software on instrument workstation*

- If in IFU mode, the telescope rotator needs to be put at 116° for the IFU masks to retract
- In OS Panel, click on menu "File / Quit". To the question "do you want to shut down OS?", Click OK. This will close the panel, and shut down all OS realted processes (vmosServer, vmosFitsMerger and imps)
- From **`vmmsStart`** "configure" panel, select all subsystems, and select "shutdown", this will put the instrument in safe "STANDBY" mode. The report from **`vmmsStart`** should be "OFF" for all subsystems
- After ~5-7 minutes, the system status should be indicated as "STANDBY" and "IDLE"
- Go to the RTD menu, kill the RTD application "FILE/quit", it will automatically detach the SVIGA servers
- Go on BOB, kill the application "FILE/quit"

2. *Hardware on platform*

- If instrument is used the following night(s): leave all systems powered up
- If instrument is to be completely shut down:
  - Power OFF FIERAs and associated electronics
  - Power OFF LCUs

Additional checks :

The normal configuration for user vimos is driven by environment variables. To check current values of environment variables relevant for the usage of vimos s/w and instrument, from the command line just issue the command :

```
vmmcfgShowEnv.sh
```

It will display vimos realted environment variables ONLY, e.g. as follows

```
CURRENT ENVIRONMENT VARIABLES ARE
*******************************
VLTROOT /vlt/MAR2002/CCS
INTROOT /diska/VIMOS/INTROOT
INS_ROOT /diska/VIMOS/INSROOT
INS_USER SYSTEM
DHS_HOST = wu3dhs
DHS_DATA = /diska/VIMOS/INSROOT/SYSTEM/ARCDATA
DHS_LOG = /diska/VIMOS/INSROOT/SYSTEM/ARCDATA
BAD_DIR = /diska/VIMOS/INSROOT/SYSTEMARCDATA/BADDATA
DHS_CONFIG = archeso@wu3dhs:/data/msg
OLAS_ID = VIMOS
INSTRUMENT = Vimos
RTAPENV = wvmos
TCS_ENVNAME = wt3tcs
ICS_LCUENV = lvmics1
ICS_LCU1ENV = lvmics1
ICS_LCU2ENV = lvmics2
CCD1LENV = wvmccda
CCD2LENV = wvmccdb
CCD1NAME = Vimosa
CCD2NAME = Vimosb
FCD_IT_HOST1 = wvmccda
FCD_IT_HOST2 = wvmccdb
LOGFILE = /vltdata/tmp/vmilogFile
DFLOW_ROOT = /vlt/MAR2002/CCS
INS_MAINT = MAINTENANCE
VMI_LOG_TEST = /diska/VIMOS/INSROOT/MAINTENANCE/MISC/ICS/LOGS
VMILCU_LOG_TEST = /diska/VIMOS/INSROOT/MAINTENANCE/MISC/ICS/LOGS
ICS_OPMODE = NORMAL
VLT_VCCBOOTTIME = 900
VLT_VCCTIMEOUT = 90
ICS_CMDTIME = 60
ICS_STARTTIME = 30
ICS_ONLINETIME = 600
ICS_OFFTIME = 360
ICS_STANDBYTIME = 360
ICS_STOPTIME = 30
ICS_SETUPTIME = 600
ICS_STATUSTIME = 60
ICS_SETMODETIME = 30
```

You may want to check in particular that the following variables have the values as indicated

```
CCD1LENV  = wvmccda
CCD2LENV   = wvmccdb
ICS_OPMODE = NORMAL
```

If `ICS_OPMODE = HW_SIM` it means that before putting the instrument ONLINE, you will have to choose MANUALLY which devices will have to be used in simulation or in normal mode.

To do this, once the subsystems are started from OS panel, click on Menu "Tools/ICS Control Panel", then from ICS panel click on menu "Tests / More information on Devices / Simulat/StopSim" and choose via the radio buttons the devices you want to use in normal mode.

Currently known problems and fixes:

1. **Grisms support collision inside the optical box**. When the instrument is close to a "vertical" position, at around positions 116° or –64°, grisms in channels 2 and 4 are colliding with the protruding support of the grism body reference pins. This is due to a tilt of the grism body slightly out of the foreseen mechanical limits needed to align the grism dispersion with the CCD columns. Waiting for a (simple) hardware fix, please use the following workaround.
   Workaround: the most likely situation is that you are setup on a mask, the reference objects are in the holes, and you are ready to take spectroscopy.
   - Make sure that the template is paused after the mask acquisition part, before going to the spectroscopy part
   - Check the rotation angle of the instrument: if within ~+/-30° of 116° or –64°, ask the telescope operator to rotate the instrument to 26°
   - Go to OS panel and move the grisms to the needed position
   - Ask the operator to move back to the correct angle to produce a sky position angle of 0°
   - Continue the template for spectroscopy

   By using the instrument rotation capability, you keep the guider/adapter locked on the correct sky position, and you are guaranteed that rotating back keeps the mask/sky alignment
   Fix: If collision occurs, a pop-up window will appear reporting which grism unit has failed (check also the log monitor). To recover from failure go to and xterm window and type the following series of commands:
   vmiCmd SIMULATE INS.GRIS2 (for grism unit #2)
   vmiCmd OFF INS.GRIS2
   vmiCmd ONLINE INS.GRIS2
   vmiCmd STOPSIM INS.GRIS2
   vmiCmd OFF INS.GRIS2
   vimCmd ONLINE INS.GRIS2
   this reinitializes only the incriminated unit, the first three command clear any software flag in simulation mode, while the last three commands send the unit to hardware limits for re-initialization.
2. **Mask 4 is ~10 pixels off in Y**. You may be in a situation for which you find that reference stars for channels 1,2, and 3 are perfectly in their reference holes, while the reference stars are barely visible or not visible at all in the reference holes of mask 4. We have seen this a couple of time and plan to check the mask blocker limit switches at the next opportunity.
   Fix: go to an xterm and type the following series of commands to reinitialize the unit 4:
   vmiCmd SIMULATE INS.MASK4
   vmiCmd OFF INS.MASK4
   vmiCmd ONLINE INS.MASK4
   vmiCmd STOPSIM INS.MASK4
   vmiCmd OFF INS.MASK4
   vimCmd ONLINE INS.MASK4

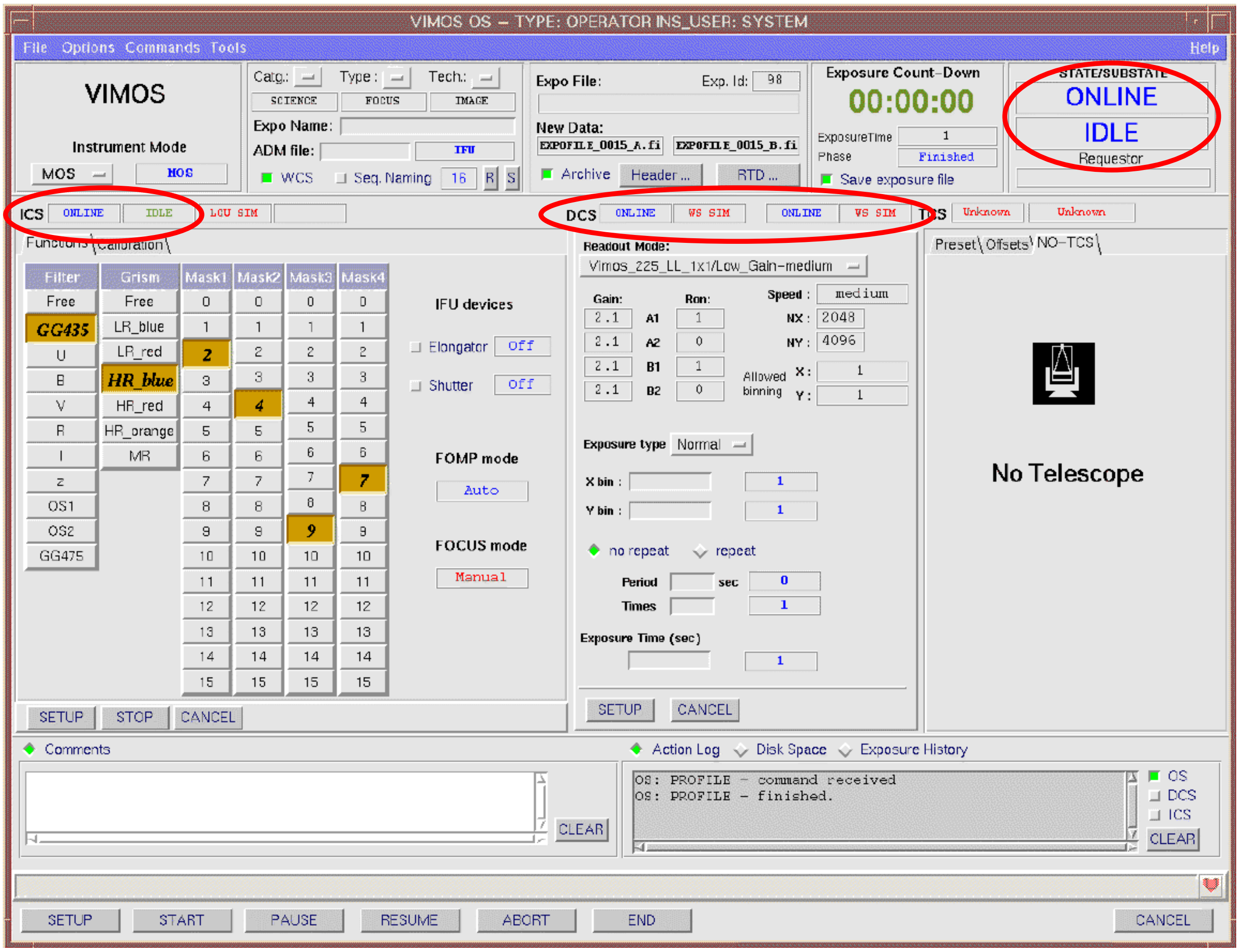

Figure A.1: OS panel. At completion of the vmmsStart procedure, the instrument status should be “ONLINE/IDLE” (upper right), as well as the ICS and the 2 DCS environments (left and middle).

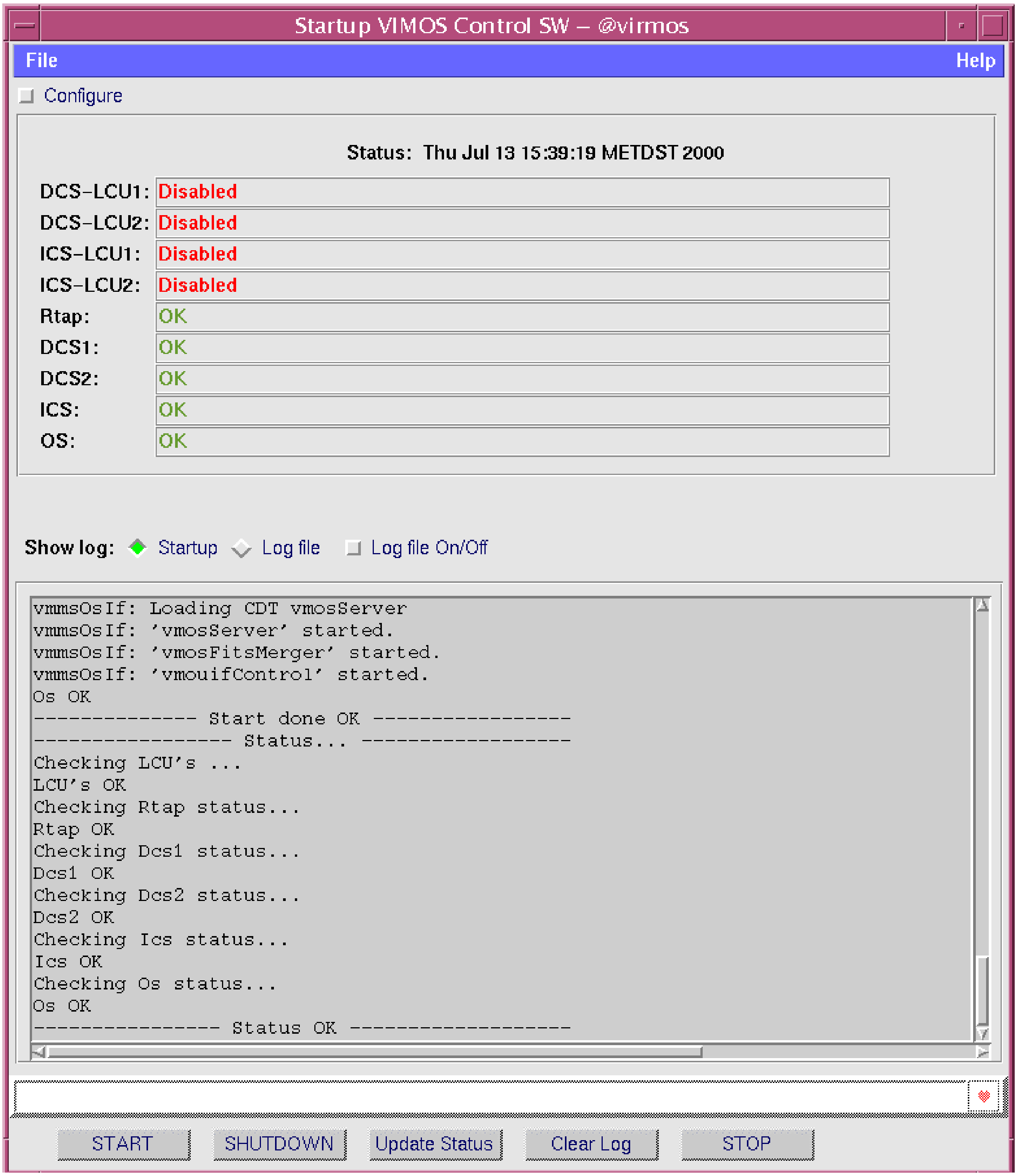

Figure A.2: vmmsStart panel. Selecting the "configure" menu (upper left) allows to select the subsystems to be startup or shutdown.