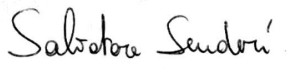


# DOLORES: The Graphical User Interface Manual

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# 1 INTRODUCTION

## 1.1 SCOPE

This document describes the GUI of the DOLORES instrument. The document is intended as a guide for the general observer.

## 1.2 REFERENCE DOCUMENTS

- [RD1]:

## 1.3 ACRONYMS

- ADU – Analog to Digital Units
- CCD – Charge Coupled Device
- DEC - Declination
- FOV – Field of view
- FWHM – Full Width Half Maximum
- GUI – Graphical User Interface
- PA – Position Angle
- RA – Right Ascension
- TBC – To Be Confirmed
- TBD – To Be Done
- TBW – To Be Written
- TNG – Telescopio Nazionale Galileo



## 2 THE DOLORES USER INTERFACE MAIN PANEL

The DOLORES user interface main panel contains all the tools that allow the user to manage the instrument and to assess quickly the quality of the data obtained. When starting an observing session with DOLORES the user interface main window will appear as shown in Figure 1.

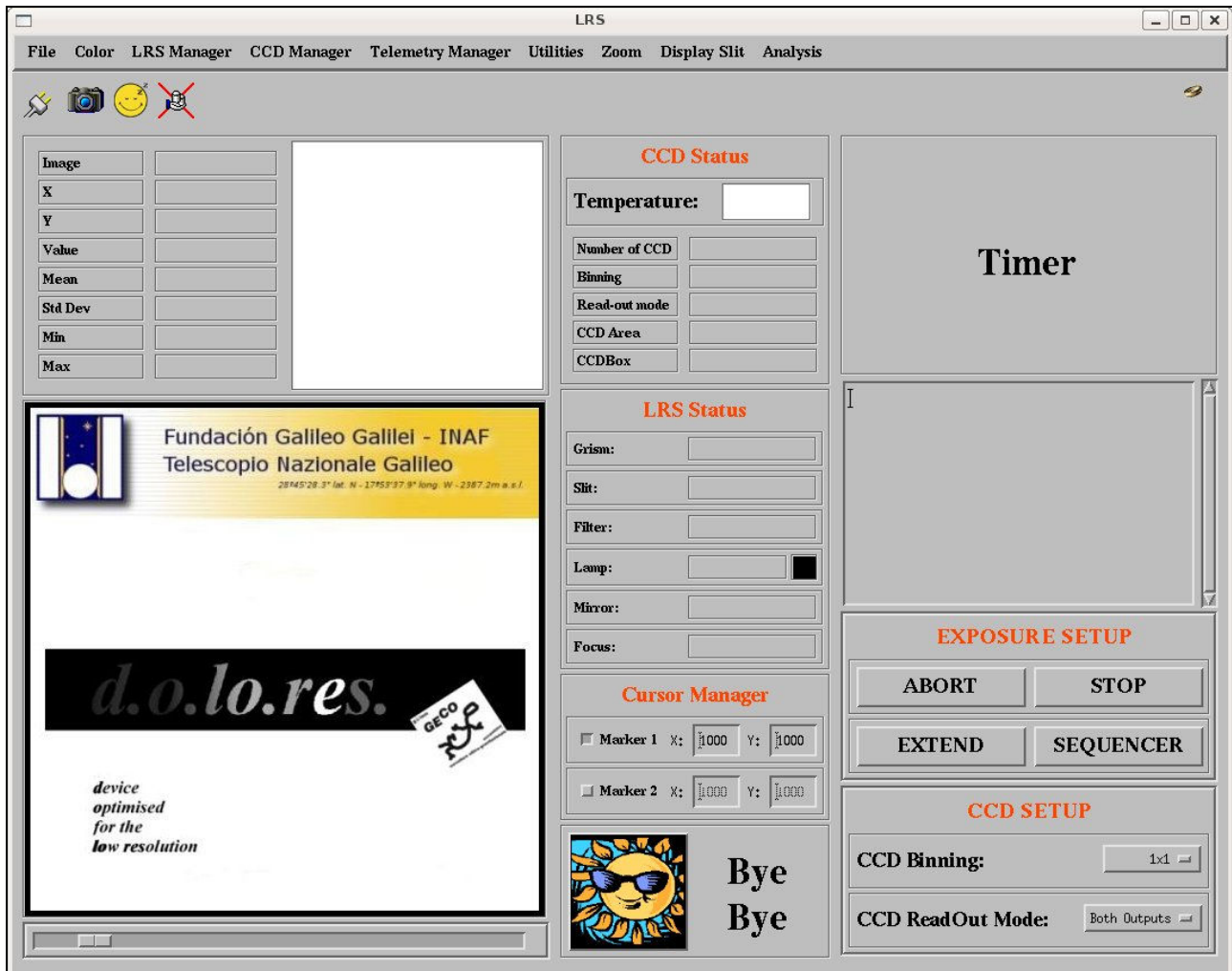


Figure 1. The DOLORES user interface main panel as it appears when starting an observing session

The top part of the window contains several scroll down menu whose function are clearly identified by their label. Below that there is a panel (Utilities Panel) containing information on the observing session and few informative icons. The GUI main window can be divided into three main groups of panels or windows that from left to right are: the **Quick Look Area**, the **Status Area** and the **Exposure Control Area**.

The Quick Look Area allows the user to get information on the last image acquired by the instrument or on the one loaded through the file menu. Several tools are available to analyze the image.

The Status Area contains panels to manage the exposure and to set up different CCD configurations.

Finally the Exposure control area contains buttons and menus that allow the observer to configure the entire instrument and start sequence of exposures.

The description and the functions of the different panels are given in details in the following sections.



## 3 THE SCROLLDOWN MENUS

### 3.1 File Menu

The File menu (Figure 2) allows the user to open a file, to display the FITS header of the image currently displayed and finally to exit from the GUI.

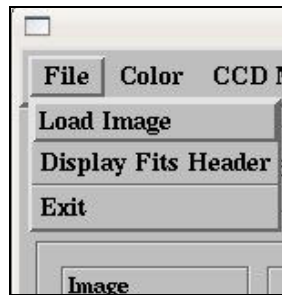


Figure 2. File menu

#### 3.1.1 Load Image

This button opens a dialog window to load a FITS image into the display.

#### 3.1.2 Display fits header

This button opens a window which contains the FITS header of the image shown in the display. The window has on the top left corner a "DONE" button that closes it.

#### 3.1.3 Exit

This button exits the DOLORES observing session. Note that is possible to close the DOLORES observing session also through the window manager and thorough the button in the exit panel (sect. 6.4).

### 3.2 Color Menu

The color menu (Figure 3) allows the user to change the colour table used to display the image.

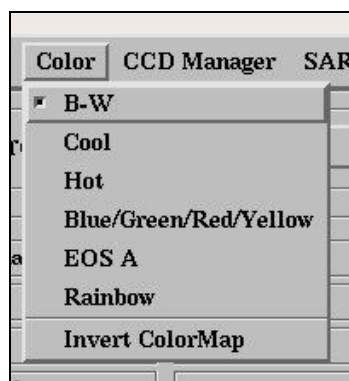


Figure 3. Colour menu

#### 3.2.1 Colour tables

There are five colour tables that can be selected: Black and White, Blue and White, Red Temperature, Rainbow and EOS A. When a particular color table is chosen, aside the corresponding menu entry a highlighted selection box appears. The default colour table is Black and White.

### 3.2.2 Invert colour map

This button allows inverting the selected colour table. When the colour map inversion is applied a highlighted selection box aside the menu entry appears.

### 3.3 LRS Manager Menu

The LRS Manager menu (Figure 4) allows the user to perform the DOLORES control system start up procedure.

The System Start up button performs several operations.

- Open the CCD socket to the computer that controls the CCD detector.
- Open the socket to the WSS bridge
- Check the DOLORES instrument configuration and update the LRS status panel (sect. 6.2)
- Boot and initialize the CCD controller and update the CCD status panel (sect. 6.1).

Any error that occurs during the system start up procedure is intercepted and displayed as text in a pop up window. In few cases limited diagnostic is also given.



Figure 4. LRS Manager Menu

### 3.4 CCD Manager Menu

The CCD Manager Menu (Figure 5) allows modifying some of the CCD working parameters (e.g. temperature, biases, etc.). For this reason this menu is then intended only for maintenance purposes and all the buttons can be activated only when using the GUI in super user mode (sect. 3.4.6).

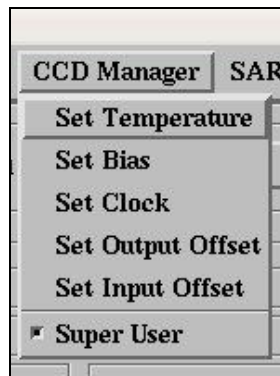


Figure 5. CCD Manager menu with all buttons activated.

#### 3.4.1 Set Temperature

**Disabled in normal user mode.** In super user mode allows to set the CCD temperature. Once selected a dialog box will pop up. Write down the desired temperature and then press OK.

#### 3.4.2 Set Bias

**Disabled in normal user mode.** In super user mode allows to change the values of the CCD biases. Once selected a dialog box will pop up. Write down the number (1 to 8) of the bias voltage you want to change, the new voltage value and then press OK.

#### 3.4.3 Set Clock

**Disabled in normal user mode.** In super user mode allows to change the values of the CCD clock voltages. Once selected a dialog box will pop up. Write down the number (1 to 16) of the clock voltage you want to change, the new voltage value and then press OK.



### 3.4.4 Set Output Offset

**Disabled in normal user mode.** In super user mode allows to change the CCD output offset voltages. Once selected a dialog box will pop up. Write down the number (1 to 4) of the output offset voltage you want to change, the new voltage value and then press OK.

### 3.4.5 Set Input Offset

**Disabled in normal user mode.** In super user mode allows to change the CCD input offset voltages. Once selected a dialog box will pop up. Write down the number (1 to 4) of the input offset voltage you want to change, the new voltage value and then press OK.

### 3.4.6 Super User button

All the buttons listed above are usually inactive. This is because the general observed does not need to change any of the CCD working parameters during an observing session. They can be activated through the Super User button. This button is not active until the system has not gone through the start up procedure (in particular the booting of the CCD controller). When the user press the button after its activation a window will pop up asking for a password. Once the correct password has been given all the other buttons will be activated.

## 3.5 Telemetry Manager Menu

The Telemetry Manager scroll down menu allows the user to check the CCD parameters and the DOLORES instrumental configuration.

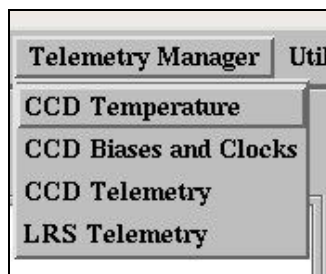


Figure 6. Telemetry manager menu

### 3.5.1 CCD Temperature

The CCD Temperature button updates the temperature measured on the CCD cold finger by a DT470 sensor (TBC). The temperature is displayed in a panel located in the CCD status panel on a coloured background. Green colour indicates that the CCD temperature is within the nominal range. Instead yellow and red colours are used when the temperature is outside that range. In particular the yellow is used either when the CCD is too cold, which usually happens when the CCD temperature controller is not operating, or when the LN2 inside the cryostat is exhausted so the temperature is higher than it should be. Finally the red is also used when the temperature is too high indicating again the exhaustion of LN2. The temperature ranges corresponding to the various colours are  $T_{CCD} > -115^{\circ}\text{C}$  for the red colour,  $-120^{\circ}\text{C} < T_{CCD} \leq -115^{\circ}\text{C}$  and  $T_{CCD} \leq -130^{\circ}\text{C}$  for the yellow colour and  $-130^{\circ}\text{C} < T_{CCD} \leq -120^{\circ}\text{C}$  for the green colour.

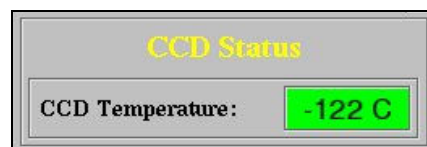
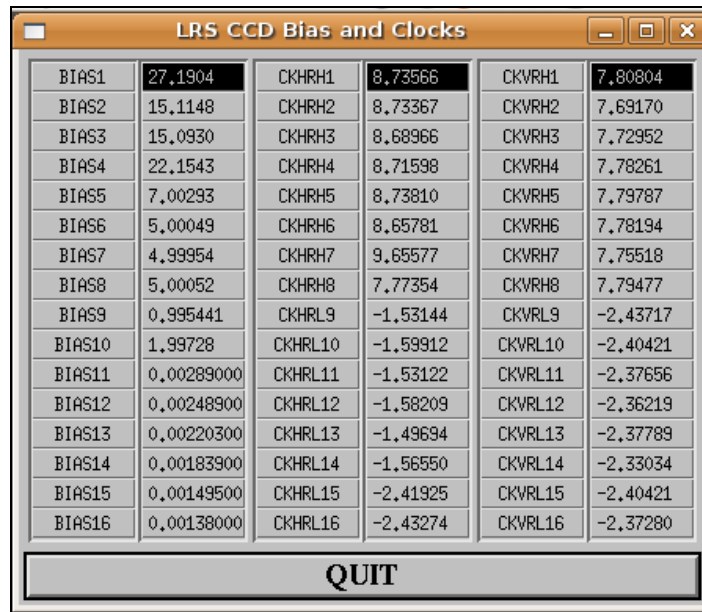


Figure 7. The CCD temperature status panel.

### 3.5.2 CCD Biases and Clocks

The CCD Biases and Clocks button reads the CCD telemetry and open a window where the current values of biases voltages, horizontal and vertical clock voltages are listed. All voltages are in volts.



LRS CCD Bias and Clocks					
BIAS1	27.1904	CKHRH1	8.73566	CKVRH1	7.80804
BIAS2	15.1148	CKHRH2	8.73367	CKVRH2	7.69170
BIAS3	15.0930	CKHRH3	8.68966	CKVRH3	7.72952
BIAS4	22.1543	CKHRH4	8.71598	CKVRH4	7.78261
BIAS5	7.00293	CKHRH5	8.73810	CKVRH5	7.79787
BIAS6	5.00049	CKHRH6	8.65781	CKVRH6	7.78194
BIAS7	4.99954	CKHRH7	9.65577	CKVRH7	7.75518
BIAS8	5.00052	CKHRH8	7.77354	CKVRH8	7.79477
BIAS9	0.995441	CKHRL9	-1.53144	CKVRL9	-2.43717
BIAS10	1.99728	CKHRL10	-1.59912	CKVRL10	-2.40421
BIAS11	0.00289000	CKHRL11	-1.53122	CKVRL11	-2.37656
BIAS12	0.00248900	CKHRL12	-1.58209	CKVRL12	-2.36219
BIAS13	0.00220300	CKHRL13	-1.49694	CKVRL13	-2.37789
BIAS14	0.00183900	CKHRL14	-1.56550	CKVRL14	-2.33034
BIAS15	0.00149500	CKHRL15	-2.41925	CKVRL15	-2.40421
BIAS16	0.00138000	CKHRL16	-2.43274	CKVRL16	-2.37280

QUIT

**Figure 8. The window showing the CCD biases and clocks.**

### 3.5.3 CCD Telemetry

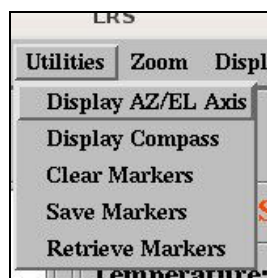
This button updates in the CCD status panel (see Figure 36) some parameters of the CCD. In particular the listed parameters are: the number of CCDs, the current binning and read out mode, the CCD area and the current CCD box.

### 3.5.4 LRS Telemetry

This button reads the LRS instrumental configuration and updates the LRS status panel (Figure 37).

## 3.6 Utilities Menu

The utilities menu allows the user to draw on the display the AZ/EL axes a compass and to make few operation with the cursor markers (see also sect. 6.3)



**Figure 9. Utilities menu**

#### 3.6.1 Display AZ/EL Axes

Once selected draws on the image display two arrows giving the direction (parallactic angle) of the telescope elevation respect to the north-south direction (given by the y-positive axis).

#### 3.6.2 Display Compass

Once selected draws the direction of the North on the image display. East direction is also drawn following the astronomical convention to have it on the left.

#### 3.6.3 Clear Markers

The GUI allows the observer to place on the displayed image some markers with different shape (squares or circles) and colours (red, green or yellow) that will be used by various procedures to put objects in a

specified position (e.g. place a star inside a slit). This item in the menu erases all the markers currently drawn on the displayed image.

### 3.6.4 Save Markers

This item allows the observer to save in a file the position(s) of the marker(s) displayed on the image.

### 3.6.5 Retrieve Markers

This item allows the observer to retrieve from a file the position(s) of the marker(s) previously saved through the "Save Markers" button. The markers are drawn on the image currently displayed.

## 3.7 Zoom Menu

This menu allows to do some geometrical transformation on the current displayed image. The menu is divided in three parts. The top part is not yet implemented and will allow the observer to zoom the image displayed. The central part allows to flip the columns, the rows, or both. Finally the bottom part allows to rotate the image 90°, 180°, and 270° respect to the original orientation.

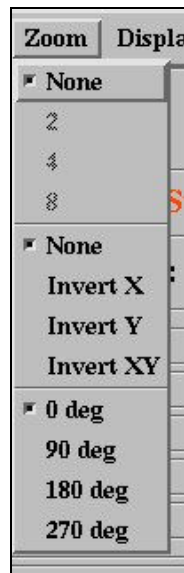


Figure 10. Zoom menu

## 3.8 Display Slit Menu

Selecting one of the items in this menu draws a rectangle in the position and with the correct size of the selected slit on the image current displayed. To erase the slit drawn select "No Slit".

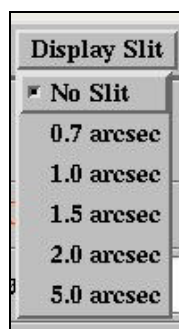


Figure 11. Display Slit menu

## 3.9 Analysis Menu

The Analysis Menu (Figure 12) contains various items that starts different procedures that allows the observer to place objects in predefined positions on the detector and also to focus the telescope.

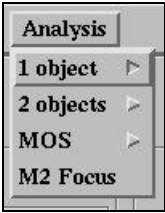


Figure 12. Analysis menu

### 3.9.1 1 Object

The 1 object procedure allows the observer to place an object in a predefined position on the detector. To start the procedure place one of the two markers in the selected position as explained in section 6.3. Then place the object to centre in this position in the zoomed image area (see section 5) clicking on it with the left mouse button in the main display area then select from the "1 object" menu of the three methods you want to use to find the centre of the object.

- Gaussfit: uses a 2D Gaussian fit to compute the centre of the object
- Centroid: uses the CENTROD algorithm from the IDL Astronomical Libraries
- Cursor: take as centre the cursor position

Once the observer selects one of the three methods a window asking to select the object will pop up (TBC). Press OK and then using the right mouse button press on the object displayed in zoomed image area. The "Gaussfit" and "Centroid" methods work also in the main display area.

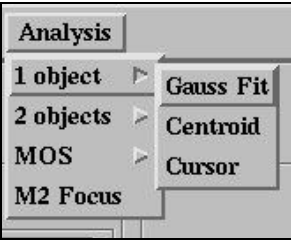


Figure 13. 1 object submenu

The procedure calculates the offsets to be sent to the telescope to have the object in the predefined position. A window displaying these offsets (in RA and DEC) will pop up asking the observer if to send or not those offset. Pressing 'yes' or 'no' will send or not the offsets and quit the procedure.

### 3.9.2 2 Objects

The 2 objects procedure allows the observer to place two objects in two predefined positions on the detector. To start the procedure place one of the two markers in the first of the selected positions and the other in the second one as explained in section 6.3. Then place the first object to centre in the first position in the zoomed image area (see section 5) clicking on it with the left mouse button in the main display area then select from the "2 objects" menu of the two methods you want to use to find the centre of the object.

- Gaussfit: uses a 2D Gaussian fit to compute the centre of the object
- Cursor: take as centre the cursor position

Once the observer selects one of the two methods a window asking to select the first object will pop up. Press OK and then using the right mouse button press on the object displayed in zoomed image area. Then a second window asking to select the second object will pop up. Repeat the operations as before.

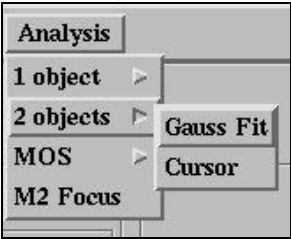


Figure 14. 2 Objects submenu

The "Gaussfit" method works also in the main display area.

The procedure calculates the offset to be sent to the telescope to have the object in the predefined position. A window displaying these offsets (in RA and DEC and PA) will pop up asking the observer if to send or not those offset. Pressing 'yes' or 'no' will send or not the offsets (TBC) and quit the procedure.

### 3.9.3 MOS

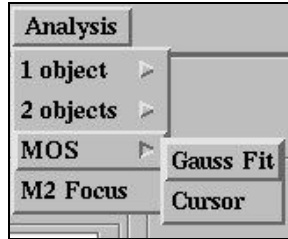


Figure 15. MOS submenu

### 3.9.4 M2 Focus

This item of the analysis menu starts a procedure to focus the M2 mirror of the TNG telescope. Before starting the procedure the observer has to obtain an image of a bright enough star through the pyramid. The image of the star is split by the pyramid in 5 spots, a central one and four placed on the vertices of a square as shown in Figure 16. Once the M2 Focus item (Figure 12) in the menu is selected an Information message window will be created. The message says to select the upper spot using the left mouse button. Four boxes are drawn (Figure 16). Inside each box the centre of the spot is calculated. These data are then used to calculate the amount of the offset to give to M2 to focus it. This result is displayed in another information (warning) message window (TBC).

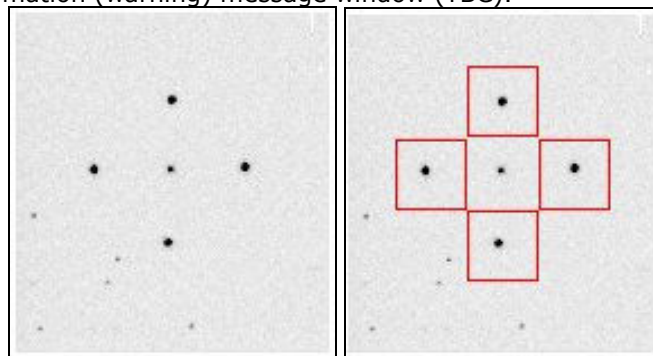


Figure 16. Image of a star through the pyramid.

## 4 THE STATUS ICONS

The status icons are placed just below the scroll down menus area on the top left of the GUI. In this area a number of icons giving a snapshot of the status of the system are displayed. Starting from left to right there is the icon showing the status of the socket connection to the PC managing the CCD, the one showing the status of the CCD camera, and that of the database connection (see Figure 17 – Figure 20).



**Figure 17. The status area as it appears at start of a guiding session.**



**Figure 18. The icons showing the status of the socket connection. Left icon corresponds to no socket connection. Right icon corresponds to socket connected.**



**Figure 19. The icons showing the status of the CCD camera. Left icon is used when the CCD camera is in idle status. Right icon is used when the CCD is exposing.**



**Figure 20. The icons showing the status of the socket connection with the Oracle database. Left icon corresponds to no connection to the database. Right icon is used when the connection to the Oracle database is open.**



## 5 QUICK LOOK PANEL

The Quick Look Panel Area (Figure 21) is used to display the images obtained through the CCD camera and to give the user the possibility to perform a quick look analysis. It can be divided in 4 different subareas. Starting from left to right and from top to bottom:

1. Image statistics area
2. Zoomed image area
3. Main display area
4. Scrollbar



**Figure 21. The Quick Look Panel Area.**

In the *Image Statistics Area* a number of information about the image displayed are shown in form of table. In particular the information displayed is:

1. The name of the image
2. The X coordinate of the cursor



3. The Y coordinate of the cursor
4. The image value below the cursor
5. The average value in a 20x20 box centred on the cursor
6. The standard deviation in a 20x20 box centred on the cursor
7. The minimum value in a 20x20 box centred on the cursor
8. The maximum value in a 20x20 box centred on the cursor

This information is updated by moving the cursor inside the *Main Display Area*.

In the *Main Display Area* the last acquired CCD image or the one loaded through the file menu is displayed. The full image is rescaled to a size of about  $\sim 450 \times 450$  pixels.

In the *Zoomed Image Area* an area of  $100 \times 100$  pixels around the cursor position, magnified by a factor of two, is displayed. The refresh of the displayed zoomed area is done only by clicking with the left mouse button on the main display area.

Limited data analysis is available on line (quick look). A list of the implemented functions is given below. To start the analysis place the cursor on the *Main Display Area* click the left mouse button and then press one of the keys given below. After pressing the key a graphic window is drawn displaying the results of the analysis.

This is the list of the available keys and their functions:

- c – Plots the image column corresponding to the cursor position
- l – Plots the image line corresponding to the cursor position
- e – Draw a contour plot of an image subarea centred on the current cursor position.
- s – Draws a surface plot of the box centred on the current cursor position.
- h – Draws an histogram plot of the box centred around the current cursor position
- r – Draws a radial plot of the box centred on the current cursor position.
- k – Performs a Gaussian fit along the CCD columns around the current cursor position.
- j – Performs a Gaussian fit along the CCD rows around the current cursor position
- g – Performs a 2D Gaussian fit in a box centred on the current cursor position. Before doing the fit the routine checks if inside the box is present a feature that can be considered a star.
- p – Perform aperture photometry.
- x – Extract a spectrum.
- q – Deletes the graphic window.

Finally the scrollbar below the *Main Display Area* allows to change intensity and contrast of the images displayed.

## 5.1 The Graphic Keys

This section describes use and function of the graphic keys available in the DOLORES user interface. To use the keys click with the mouse in some cases on the image display in other cases on zoomed image display and then press the corresponding letter without moving the mouse. All the keys (except the "q" key) will open a Graphic Window, that will be used afterwards to draw all the graphs created through them. To use the key again just move the mouse in a new position in the same image area and then press the key again (no mouse click necessary).

**All the keys work with the mouse in the Main Display Area.**

**The keys are always disabled during the CCD readout and during the DOLORES setup.**

**C** : The image column corresponding to the current cursor position will be plotted in the Graphic Window. The line plotted will be shown on the top of the graph (Figure 22).

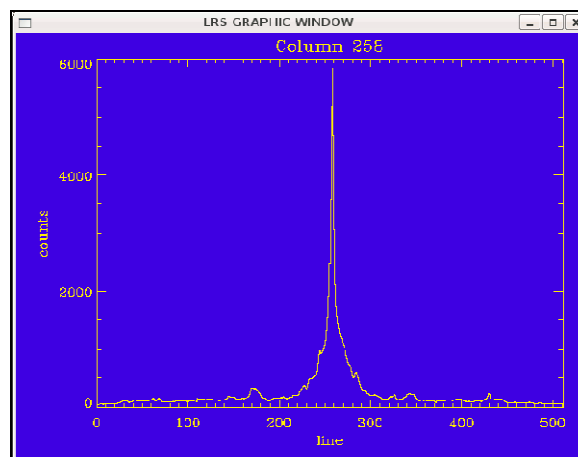
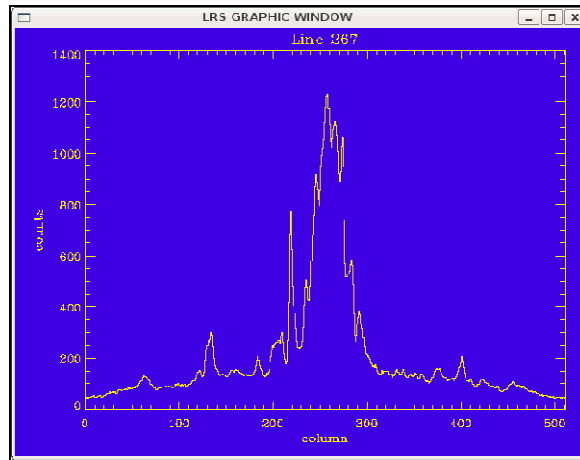


Figure 22. Column plot



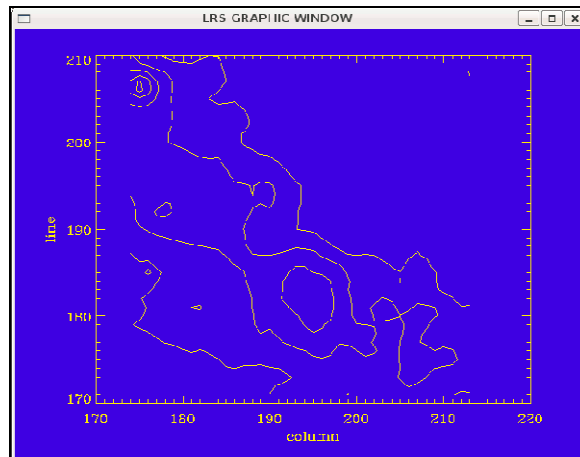


**I** : The image line corresponding to the cursor position will be plotted in the Graphic Window. The line plotted will be shown on the top of the graph (Figure 23).



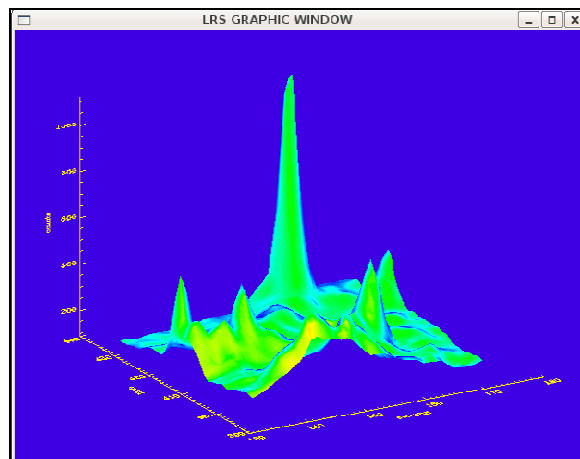
**Figure 23. Line plot**

**e** : A contour plot of the image region centred on the current box cursor position is made in the Graphic Window. The size of the contoured region is 20x20 pixels (Figure 24).



**Figure 24. Contour plot**

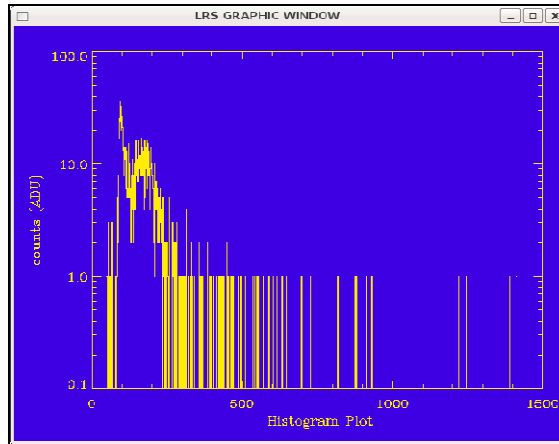
**S** : A surface plot of the image region centred on the current box cursor position is made in the Graphic Window. The size of the surfaced region is 20x20 pixels (Figure 25).



**Figure 25. Surface plot**

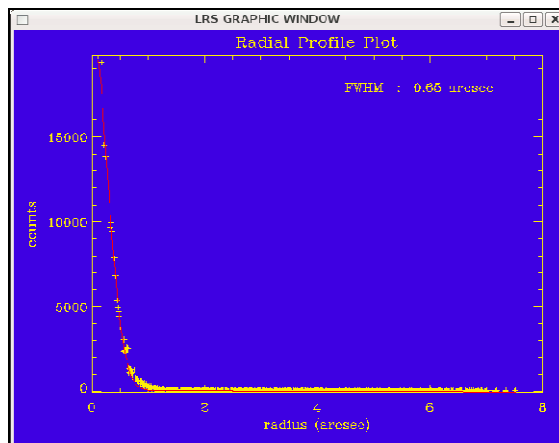


**h** : A histogram plot of the image region centred on the current box cursor position will be drawn in the Graphic Window. The size of the region is 20x20 pixels (Figure 26).



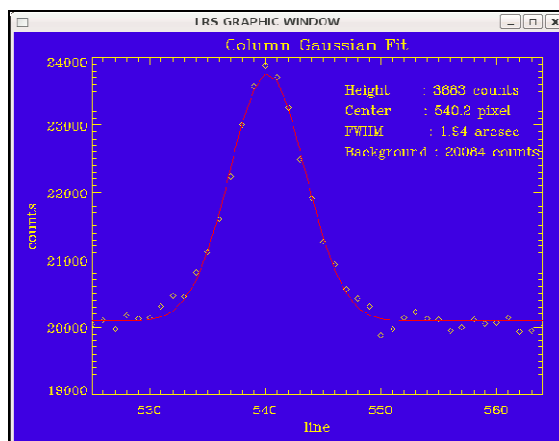
**Figure 26. Histogram plot**

**r** : A radial profile plot of the region centred the current box cursor position is made in the Graphic Window. The radial profile of the star will be plotted with superimposed a Gaussian fit to it. The FWHM of the fitted Gaussian expressed in arcsec will be displayed on the graph (Figure 27).



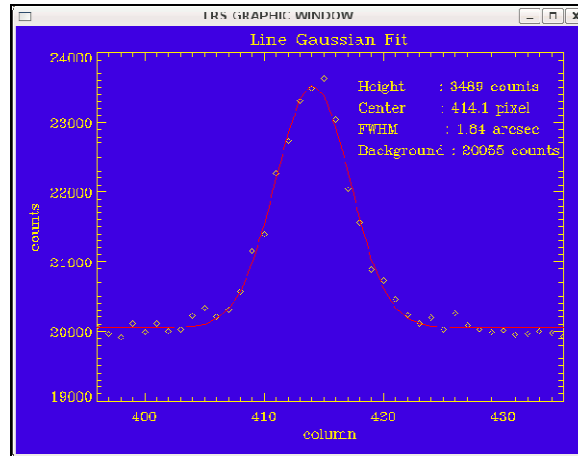
**Figure 27. Radial Profile plot**

**k** : A Gaussian fit along the CCD columns around the current line cursor position will be performed. A cut of the image along the columns 40 pixels long, centred around the current cursor position, will be plotted on the Graphic Window and, superimposed on it the result of the Gaussian fit. On the top left of the graph will be shown also some parameters of the fit. In particular the centre of the Gaussian along the line, its height above the background, its FWHM and the value of the background (Figure 28).



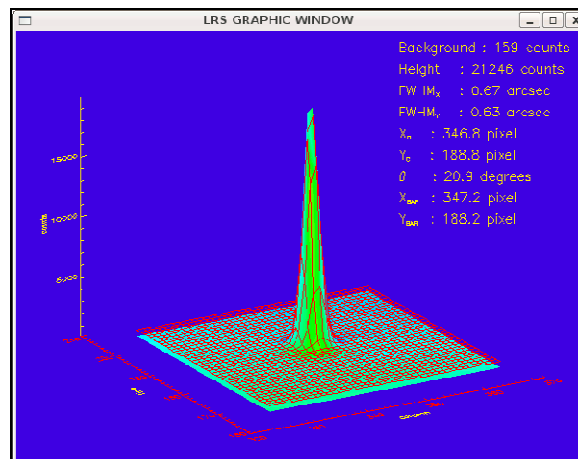
**Figure 28. Gaussian fit along a column**

**j** : A Gaussian fit along the CCD lines around the current column cursor position will be performed. A cut of the image along the columns 40 pixels long, centred around the current cursor position, will be plotted on the Graphic Window and, superimposed on it the result of the Gaussian fit. On the top left of the graph will be shown also some parameters of the fit. In particular the centre of the Gaussian along the selected column, its height above the background, its FWHM and the value of the background (Figure 29).



**Figure 29. Gaussian fit along a line**

**g** : This key performs a 2D Gaussian fit in a image region centred on the current cursor position. Before doing the fit the routine checks if inside the box is present a feature that can be considered a star and if not delivers an error message. In the Graphic Window a surface plot of the image region will be drawn. Superimposed on it the surface plot of the Gaussian fit will be drawn. Finally on the top left corner of the graph the fitted function coefficients will be shown. In particular the background, the height of the Gaussian above it, the FWHM of the fitted Gaussian along the columns and the lines expressed in arcsec, the coordinates of the centre of the fitted Gaussian and the tilt of the Gaussian respect to X axis. The last two numbers in the tables are the coordinates of the barycentre of the region computed using the CENTROD algorithm from the IDL Astronomical Libraries (Figure 30).



**Figure 30. Gaussian 2D fit**

### 5.1.1 Aperture photometry

**p** : This key performs aperture photometry on the star under the current cursor position.

To start the procedure place the cursor close to the star the star on which you want to perform aperture photometry, click on the image with the left mouse button and then press 'p'. After doing this the aperture photometry window will open (Figure 31). In the window the results of the photometry using default values for the parameters of the calculations. These parameters can be changed and the photometry recalculated. The parameters are the radius of the aperture and the inner and outer radius of the annulus where the sky background is calculated. Furthermore it is possible to change the size of the



rectangular box within which the aperture photometry is performed. The parameters can be changed by editing the values shown in the window. To recalculate the photometry simply press Return on the keyboard after editing the parameter or press the button "Re-Calculate Photometry". Once done that all the graphs are updated and the new results displayed. There are two graphs shown in the window. The first one on the top right corner showing an image of the box with the object inside with three circles which, going outwards, correspond the aperture (yellow), the inner and the outer aperture for the sky background calculation. The second graph on the bottom displays a radial profile plot of the region centred on the object together with a Gaussian fit of the profile and four lines indicating the level of the sky background and the position (in pixel) of the radius of the aperture and of the inner and outer radius of the sky annulus. The results of the calculation are shown below the image of the star and are the FWHM in arcsec of the radial profile fit, the level of the sky background in ADU, the flux inside the aperture corrected for the background and the magnitude of the object. The zero point of the photometry is normally put to zero. However there is a file that can be edited adding the name of the filter and the corresponding zero point. The procedure always check this file and if the image has been observed using a filter in the list the correct zero point is used.

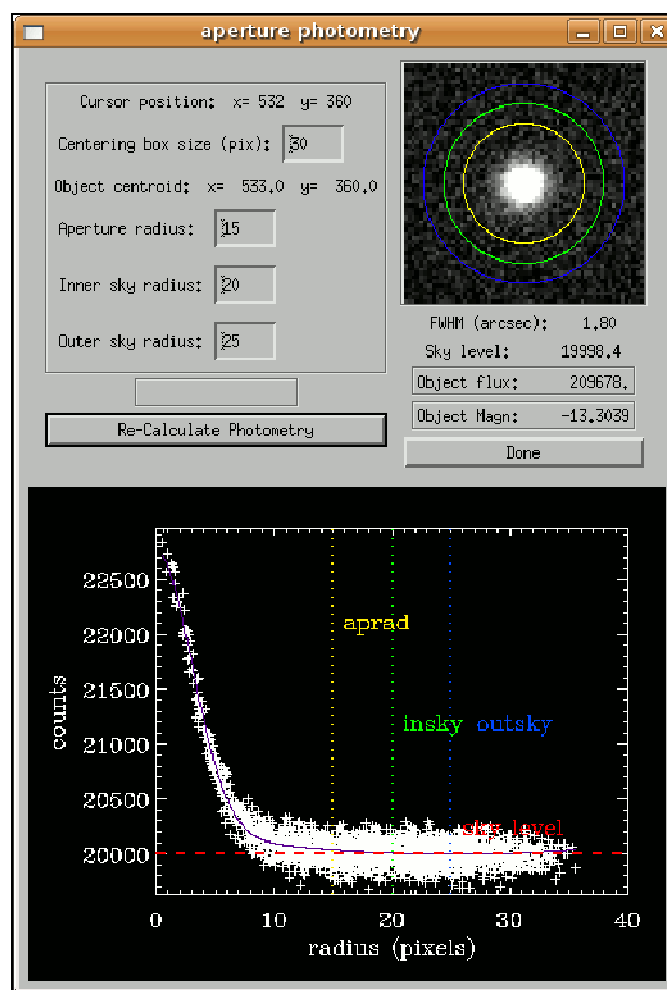
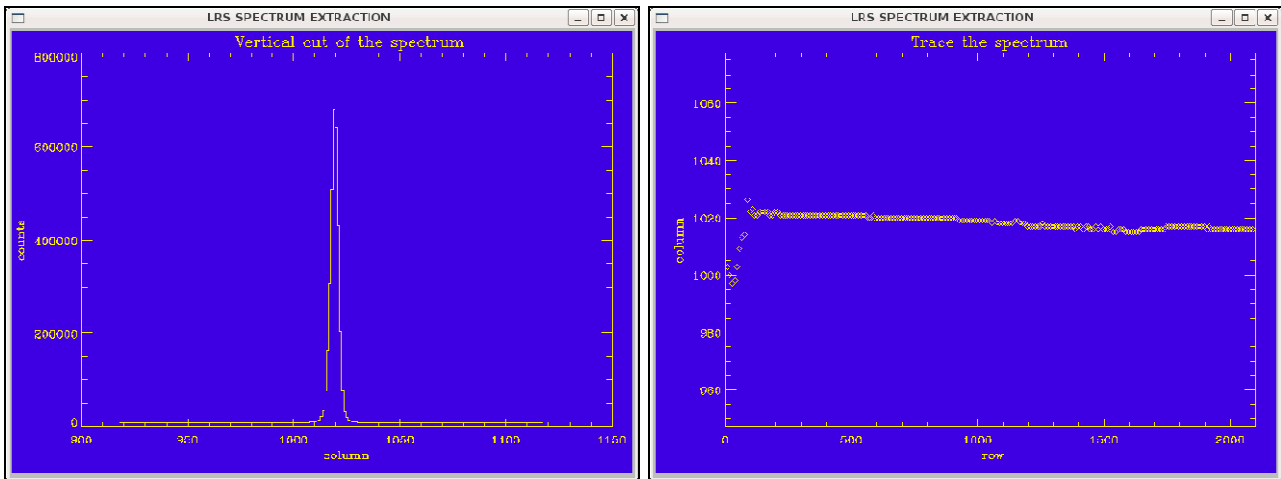


Figure 31. The aperture photometry tool.

### 5.1.2 Extraction of a spectrum

**X** : This key performs the extraction of a spectrum.

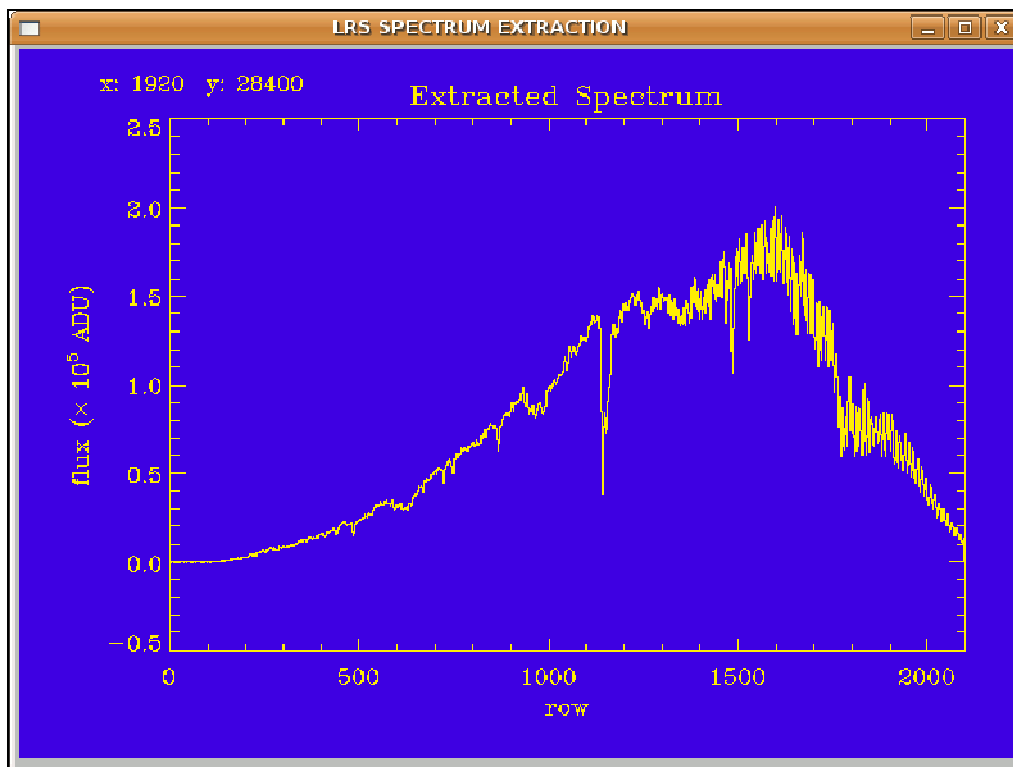
To start the procedure identify the spectrum you want to extract in the main display area then click on the image with the left mouse button on the spectrum you want to extract and press 'x'. After doing this, the extraction procedure starts.



**Figure 32. Left panel: vertical cut of the spectrum. Right panel the trace of the spectrum.**

The steps performed by the procedure to extract the spectrum are the following:

1. Selection of aperture corresponding to the spectrum to extract: a graphic window showing a vertical cut of the spectrum (across the spectral dispersion) is displayed (see Figure 32 left panel). The columns displayed are 200 and the cut is the result of adding 10 rows. The observer has to select the aperture corresponding to the spectrum to extract by clicking first on the left side and the on the right side of it. The two x coordinates define the size of the aperture and the position of two 5 pixels wide aperture to calculate the background.
2. Trace the spectrum: the procedure trace the spectrum throughout the CCD, then it displays the results in a graphic window (see Figure 32 right panel).
3. Fit the traced spectrum: the observer specify the sample of points to use to fit the traced spectrum with a polynomial function.
4. Extraction of the spectrum: the spectrum is extracted and the results are displayed on the graphic window (see Figure 33). Along the x axis rows are displayed while on the y axis the flux in ADU is displayed.

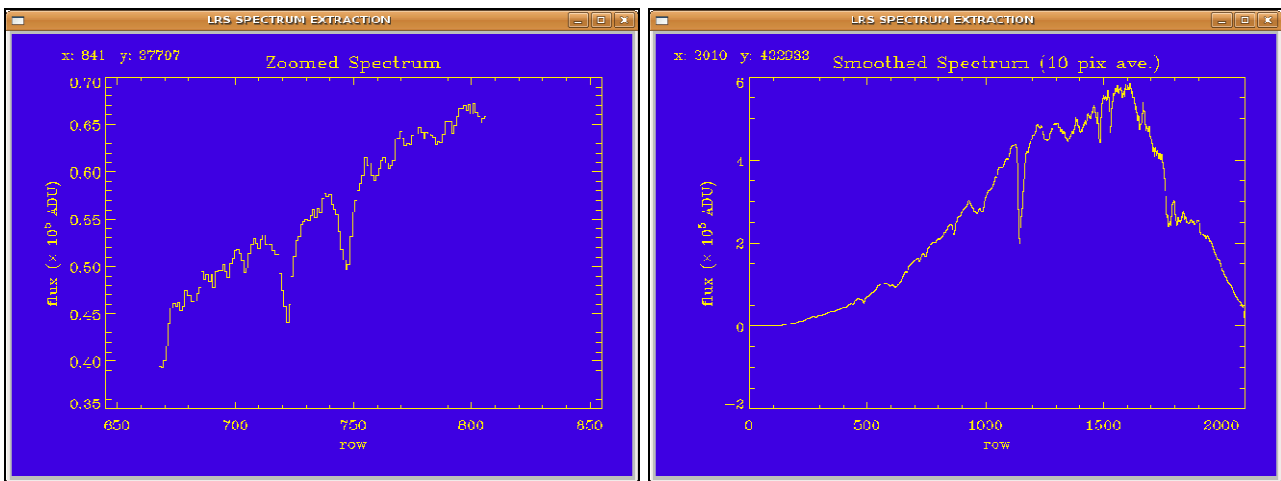


**Figure 33. The extracted spectrum**

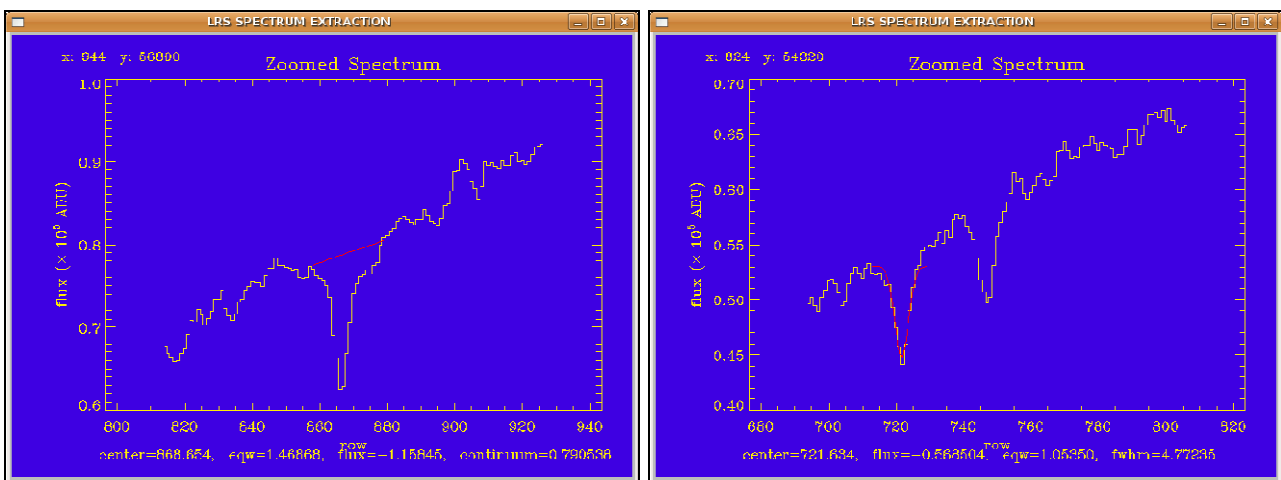


The graphic window where the spectrum is displayed has few functions to extract information from the data. First of all moving the cursor on the window, the values corresponding to the row and the flux are displayed on the upper left corner of the window and updated continuously. Then there are some graphic keys that can be used simply pressing them while inside the window. The list of the keys in alphabetical order and their functions is the following:

- a: allow to zoom the spectrum. Press twice the key along the rows to plot the portion of the spectrum identified by the two extremes (see Figure 34 left panel).
- e: allow to compute the equivalent width of a line. Press twice the key to define two points on the continuum (plotted then in red) to make the calculations. The results of the computation (Line centre, Equivalent width, Position of the continuum, and Flux) are displayed on the bottom of the plot (see Figure 35, left panel).
- k: allow to compute a Gaussian fit of a line. Press twice the key to define the two extremes between which perform the fit. The Gaussian fit is superimposed on the spectrum. The results (Line centre, Flux, Equivalent width, and FWHM) are then displayed on the bottom of the plot (see Figure 35, right panel).
- q: quit the DOLORES spectrum extraction graphic window
- r: redraw the original extracted spectrum, no smoothing, full rows range.
- s: smooth the spectrum making an average with a box ten pixel wide.
- =: print in a PS file the plot shown in the graphic window.



**Figure 34. Left panel: a plot of a portion of the spectrum obtained with the 'a' graphic key. Right panel: a plot of the smoothed spectrum obtained with the 's' graphic key.**



**Figure 35. Left panel: Equivalent width of a line. Right panel: Gaussian fit of a line.**

**q** : When pressed inside the image area this key deletes the Graphic Window.

## 6 THE STATUS AREA

### 6.1 CCD STATUS PANEL

This panel (see Figure 36) shows the current CCD configuration. In particular the listed parameters are: the number of CCDs, the current binning and read out mode, the CCD area and the current CCD box. The panel is updated pressing the CCD Telemetry button in the Telemetry Manager menu (sect. 3.5.3).

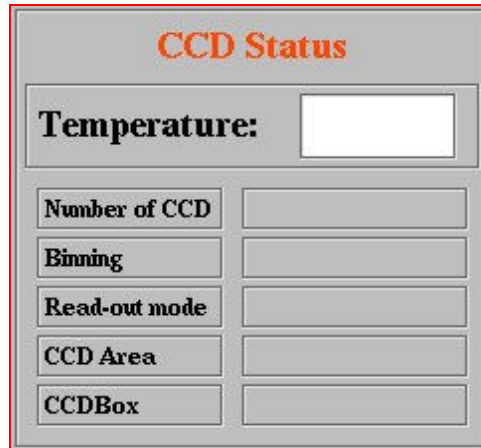


Figure 36. The CCD Status Panel

### 6.2 LRS STATUS PANEL

This panel (Figure 37) shows the current LRS instrumental configuration. In particular the current Grism, Slit, Filter, Lamp are listed, furthermore the position of the LRS calibration mirror and the value of the encoder of the Focus mechanism are shown. The status of the lamp is also shown. In fact, the small square close to the name of the lamp turns green when the lamp is on and black when is off. The panel is updated pressing the LRS Telemetry button in the Telemetry Manager menu (sect. 3.5.4).

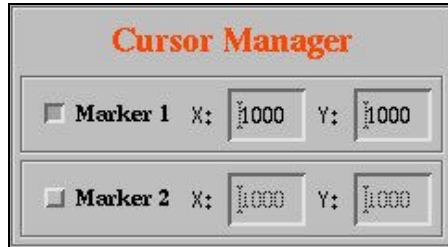


Figure 37. The LRS Status Panel

### 6.3 CURSOR MANAGER PANEL

As noticed in section 3.6.3, the GUI allows the observer to place on the displayed image some markers with different shape and colours. One way to do it is using the cursor manager panel. Two markers are available Marker 1, a yellow square, and Marker 2, a green circle. There are two ways of placing one or both markers on the image. The first method uses directly the cursor, so after having enabled the cursor clicking with the mouse on the box close to the marker name, place the cursor on the desired position on

the image and then press the middle button of the mouse. In case the observer want to place the other marker, the entire procedure has to be repeated. Only one marker at a time is active (TBC). The second method is to write in the two editable text fields close to the marker name the coordinates of the marker the observer wants to place on the screen, again, after having enabled it, and then press Return on the keyboard. The marker will be drawn.



**Figure 38. The Cursor Manager Panel**

## 6.4 EXIT PANEL

The exit panel contains a button to exit the GUI. There are two other ways to exit the interface: one is exit button in the File Menu (sect. 3.1.3), the other one using the window manager.



**Figure 39. The Exit Panel**



## 7 THE EXPOSURE CONTROL AREA

### 7.1 TIMER PANEL

This panel gives information basically on the status of the exposure. When exposing the panel will display "Exposing CCD" together with the number of the active sequence (sect. 7.3.4), the number of the active exposure within the sequence, and a timer giving the time to the end of the exposure. At the end of an exposure during the CCD readout the panel will display "Reading Image" with the time elapsed since the start of this operation. When the sequence(s) are over on the panel will be written "Done".

Also before starting an exposure if the instrument configuration is changing then the panel will display: "LRS Set Up Please Wait..." and the number of the sequence (sect. 7.3.4) to which the information is referred to.

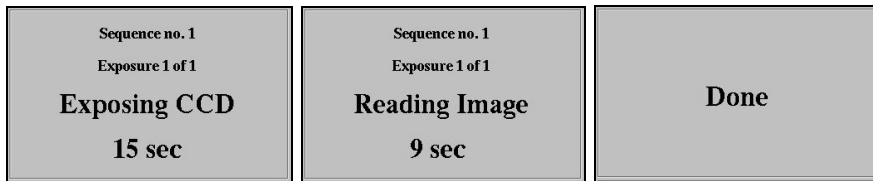


Figure 40. Some of the information displayed in the timer panel

### 7.2 CONSOLE PANEL

Each time a command or a group of commands is issued by the GUI to the CCD or mechanisms service a message, describing the type of command and the time it was started, is written to the console panel. When the command is executed a new line is written to the console stating that the command was completed and the time when that happened. Many other informative, warning, and error messages are displayed in the console has shown, for example, in Figure 41.

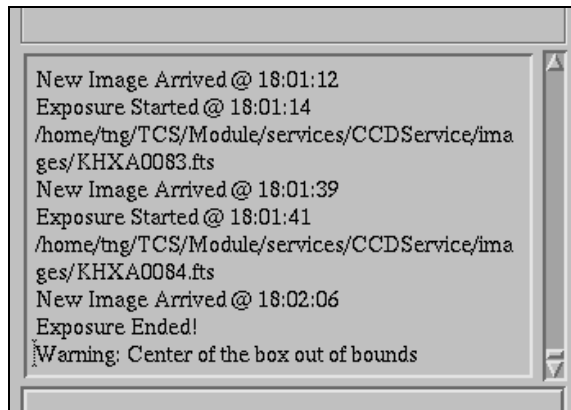


Figure 41. The console panel.

### 7.3 EXPOSURE SETUP PANEL

This panel is used to setup the exposure when the sequencer is not active. The panel contains four buttons.



Figure 42. The Exposure Setup Panel

### 7.3.1 STOP

The *STOP* button immediately stops the current exposure and the CCD image is read out. If the exposure was part of a sequence then the sequence is aborted.

This button is active ALSO when the sequencer panel is open.

### 7.3.2 ABORT

The *ABORT* button immediately abort the current exposure, the image is not read out. If the exposure was part of a sequence then the sequence is aborted.

This button is active ALSO when the sequencer panel is open.

### 7.3.3 EXTEND

The *EXTEND* button allows the user to extend the exposure time of the current observation. When the button is pressed a window will pop up. The observer will have to insert the amount of time in seconds and the press OK. The Timer counter will be updated and the count down will continue.

This button is active ALSO when the sequencer panel is open.

### 7.3.4 The Sequencer Panel

The sequencer button is used to start the sequencer panel. When pressed it opens the window shown in Figure 43.

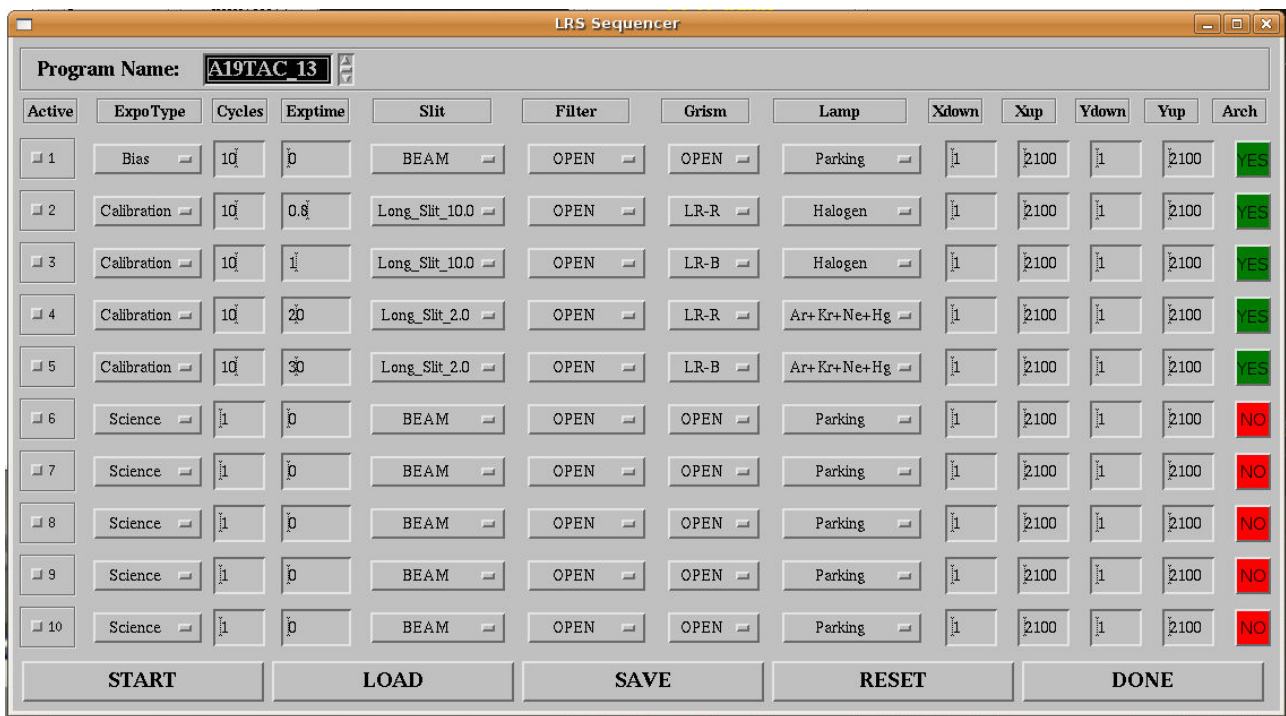


Figure 43. The Sequencer panel

#### 7.3.4.1 START

The *START* button will execute sequentially all the activated line sequences. Before starting the sequences the GUI perform the following operations:

- ...
- ...

As with the *START* button in the main panel in case any incongruence is found, either a warning is issued or automatically the interface corrects it. In case of warning issue, a window displaying a message explaining the reason for the warning pops up. If the observer decides to ignore the warning, then the sequence is started, otherwise the procedure returns to allow the observer to remove the cause of the warning.

### 7.3.4.2 LOAD

The *LOAD* button allows the observer to retrieve a given sequencer configuration.

### 7.3.4.3 SAVE

The *SAVE* button allows the observer to save a given sequencer configuration.

### 7.3.4.4 RESET

The *RESET* button will reset the scroll down menus and editable text fields and the buttons to their default values.

### 7.3.4.5 DONE

The *DONE* button closes the sequencer panel.

## 7.4 CCD SETUP PANEL

This panel is used to manage binning and read out mode of the CCD. This operation can be done only from this panel as the sequencer panel has no tools to do that.

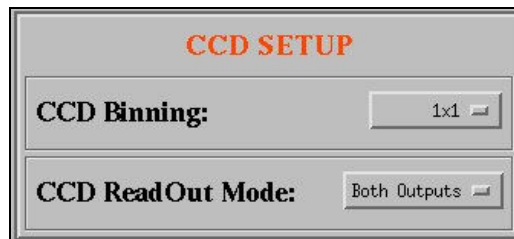


Figure 44. The CCD SETUP Panel

### 7.4.1 CCD Binning

There are 5 different binnings that can be selected using the CCD binning scroll down menu. The available binnings are 1x1, 1x2, 1x4, 2x2, 4x4.

### 7.4.2 CCD Read Out Mode

Three different read out modes are available: left, right and both outputs. They can be selected using the CCD ReadOut Mode scroll down menu.

## 8 GUI MESSAGES

Three kinds of messages will be delivered by the DOLORES GUI: Information messages, warning messages, error messages. These messages will be displayed in pop up windows.

The windows containing info messages are light blue in colour and either will close automatically or using the 'OK' button.

The windows containing warning messages are orange in colour and either have a 'YES' and a 'NO' button or an 'OK'. If the observer press the 'YES' or the 'OK' button the procedure will continue. If the observer press the 'NO' the procedure will return and no further action will be performed allowing the observer to take corrective actions.

The windows containing error messages are red in colour and have an 'OK' button to close them. In this case after pressing the 'OK' button the procedure always stops.

In following the complete (TBC) list of the messages generated by the DOLORES GUI.

### 8.1 Information Messages

- Select first object.
- Select second object.
- Press once with left button on the upper spot.
- Focus correction that will be sent to telescope:  $\Delta x$ .
- LRS SetUp, You are not allowed to do anything else, Please be patient...

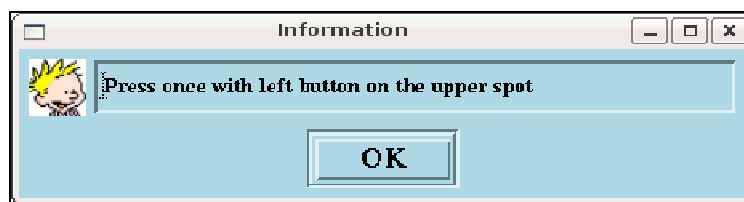


Figure 45. Example of information message window

### 8.2 Warning Messages

- Sending Offsets to Telescope?,  $\Delta\alpha$ ,  $\Delta\delta$ .
- Sending Offset to Derotator?,  $\alpha$ .
- Sequence No. X will not be archived!, Is it OK?

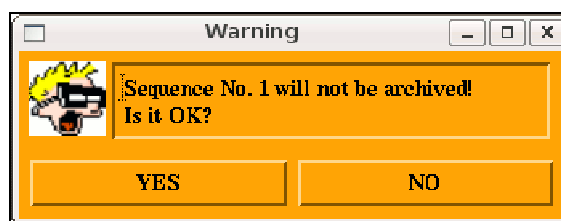
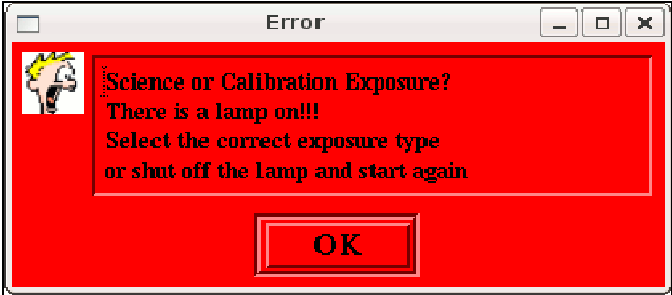


Figure 46. Example of warning message window

### 8.3 Error Messages

- Science or Calibration Exposure?, There is a lamp on!!!, Select the correct exposure type or shut off the lamp and start again.
- Bias or Calibration Exposure?, There is a lamp on!!!, Select the correct exposure type, or shut off the lamp and start again.
- Sky Flat or Calibration Exposure?, There is a lamp on!!!, Select the correct exposure type or shut off the lamp and start again.
- Dark or Calibration Exposure?, There is a lamp on!!!, Select the correct exposure type, or shut off the lamp and start again.
- WSS Bridge Socket Not Opened.
- Error :
- LRS SetUp Failed.
- There is no active sequence selected.



**Figure 47. Example of error message window**