

# DO IT YOURSELF: LA SILLA QUICK-LOOK TOOLS

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**D**uring astronomical observations it has always been of great importance to be able to assess the quality of the data being collected at the telescope and the conditions of the night. The way astronomers normally do this is by processing the raw data transmitted from the instrument workstation with some semi-automated software package. The data reduction normally depends on the instrument characteristics, but basically the main divisions are set by the wavelength range covered (optical, infrared, sub-millimetric, radio) and by the way the light is collected (imaging or spectroscopy).

The codes are normally written either by dedicated software engineers, or by the astronomer him(her)self: the first case applies for all Paranal instruments and for some instruments at La Silla, namely FEROS, HARPS and TIMMI2, for which pipelines were written by the consortium that originally built the instrument.

The astronomical community felt that the remaining instruments at La Silla could also benefit from having similar tools. Although the Observatory does not have the resources to develop such extensive software, simple and targeted tools were implemented for the other instruments, in order to perform some specific steps of the data reduction quickly and with almost no interaction from the user, allowing the observer to assess the quality of the data in real time without diverting their attention from the observations. Given their simple structure it was decided to name these codes *quick-look tools*, rather than pipelines, in order to stress the difference from more complete reduction software.

With the exception of the tool developed for CES, which runs automatically as new frames are acquired, these quick-look scripts must be launched by the observer on a selected frame (or set of frames), and may require human interaction. A database of calibrations for most of the standards observing modes has been built (or is in the process of being completed) by the Instrument Scientist for each instrument, with the help of his/her colleagues: the users can choose to use this

or to run the tool using the calibrations taken during the same observing run. Master calibration frames can be created in real time by ancillary scripts.

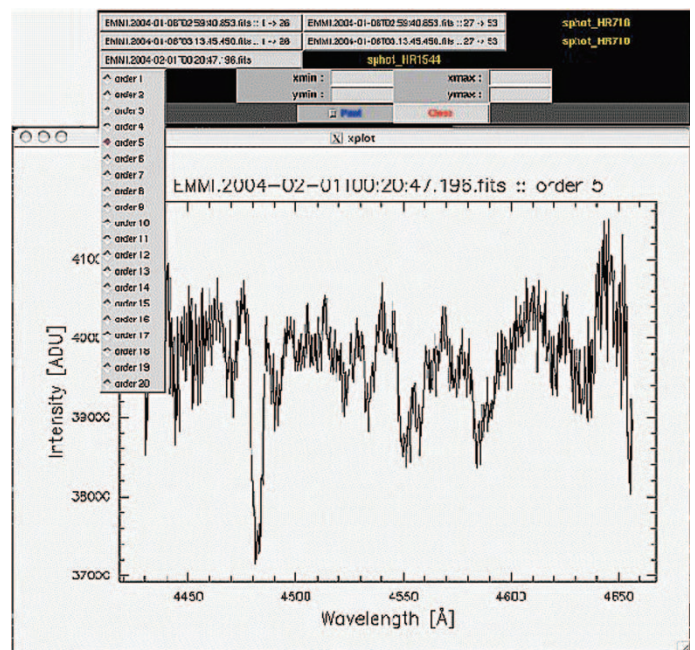
This note briefly describes the quick-look tools now available at La Silla and developed by resident astronomers for optical (CES, EFOSC2, EMMI, SUSI2, WFI) and infrared instruments (SofI), both for imaging and spectroscopic capabilities. All tools are installed on the off-line workstations used by the visitors and also available for download on the respective instrument web pages.

## OPTICAL INSTRUMENTS: CES, EFOSC2, EMMI, SUSI2, WFI

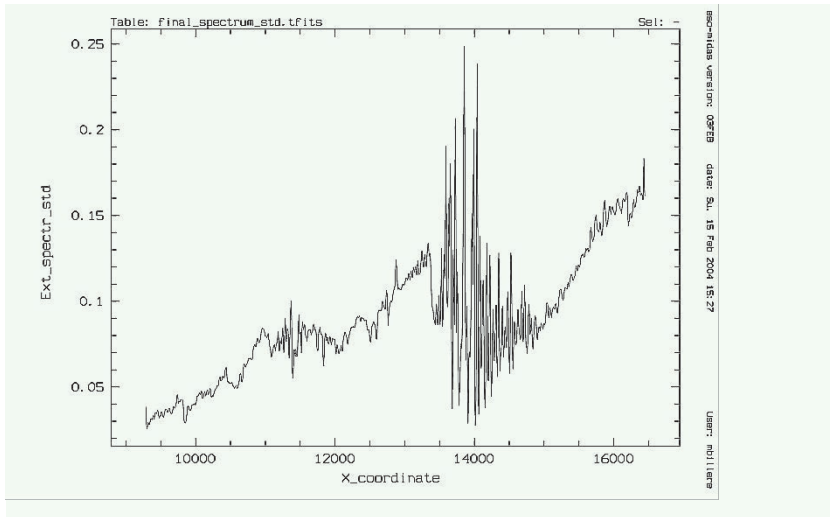
The CES (Coudé Echelle Spectrograph) is a very high resolution ( $R \sim 220,000$ ) spectrograph mounted at the 3.6m telescope: given its unique characteristics, it required a dedicated quick-look tool to examine the data.

EMMI (the ESO Multi Mode Instrument) and EFOSC2 (the ESO Faint Object Spectrograph and Camera 2) are both imaging and spectrographs at low resolution, while EMMI also has medium ( $R \sim 5,000$ ) and high (up to 70,000) resolution modes. In addition to this, EMMI has the additional complication of having two detectors, one optimized for the blue and another for the red. SUSI2 (SUperb Seeing Imager 2) and WFI (Wide Field Camera) are imaging cameras, the first optimized for high spatial resolution, while the second was optimized to cover a large field of view ( $30'$ ). In total, five quick look packages were developed, four for spectroscopy and one for imaging.

For imaging, a specific package is available to obtain a complete photometric calibration of the images on the Landolt system for all La Silla optical instruments with imaging capability – EFOSC2, EMMI, SUSI2, WFI (see <http://www.sc.eso.org/~ohainaut/bin/tmag.cgi>).



**Figure 1:** Visualization of one order of an echelle spectrum reduced by the EMMI echelle quick-look. The order is bias subtracted, flat fielded, de-blazed and dressed up for the occasion.



**Figure 2 :** Example of red spectrum obtained with the quick-tool. The science object is divided by a standard star. The region around 14,000 Å cannot be perfectly corrected due to the presence of an absorption band of the atmosphere.

For spectroscopy, several packages have been developed:

(1) for the CES, a quick-look tool for data quality and signal-to-noise evaluation. The output is a one dimensional spectrum, plotted in term of S/N ratio vs. pixel (see <http://www.lis.eso.org/lasilla/sciops/3p6/ces/>).

(2) for EMMI, a low and medium dispersion spectroscopy quick-look tool is available: it is possible to obtain good quality data with fine tuning of the parameters of the script and master calibrations derived during the observing run. The output is a bias corrected, flat-fielded, sky subtracted and wavelength calibrated one dimensional spectrum (see [http://www.lis.eso.org/lasilla/sciops/ntt/emmi/quickred/EMMI\\_quickred.html](http://www.lis.eso.org/lasilla/sciops/ntt/emmi/quickred/EMMI_quickred.html)).

(3) for EMMI-echelle spectra, a quick-look tool has been recently completed. The output is a bias corrected, flat-fielded, blaze corrected and wavelength calibrated multi-order or merged one dimensional spectrum (see <http://www.lis.eso.org/lasilla/sciops/ntt/emmi/emmiPyQuick.html>).

(4) And finally, for EFOSC2, a low dispersion spectroscopy quick-look tool: good quality data with fine tuning of the script and up-to-date calibrations. The output is a bias corrected, flat-fielded, sky subtracted and wavelength calibrated one dimensional spectrum (see <http://www.lis.eso.org/lasilla/sciops/efosc/docs/qlook/>).

An example of a quick-look reduced EMMI echelle spectra is shown in Fig. 1.

### INFRARED INSTRUMENT: SOFI

Sofi (short for *Son of Isaac*) is an infrared imager and spectrograph, both at low and high resolution. Two tools were written, one for imaging and another for spectroscopy. The first returns the zero-point of the night, without correction for colour or airmass, provided that standard stars have been observed, while the second returns a flat-fielded, sky subtracted and wavelength calibrated one-dimensional spectrum. Extensive information on how they work and what assumptions are done can be found on the respective tool web page. For imaging, see [http://www.lis.eso.org/lasilla/sciops/ntt/sofi/reduction/SOFI\\_img\\_quicktool.html](http://www.lis.eso.org/lasilla/sciops/ntt/sofi/reduction/SOFI_img_quicktool.html) and for spectroscopy, see [http://www.lis.eso.org/lasilla/sciops/ntt/sofi/reduction/SOFI\\_spec\\_quicktool.html](http://www.lis.eso.org/lasilla/sciops/ntt/sofi/reduction/SOFI_spec_quicktool.html). In Fig. 2 we show an example of a quick-look reduced spectrum in the NIR. Both tools make extensive use of the *eclipse* package developed by ESO; more information on it can be found at: <http://www.eso.org/projects/aot/eclipse>.

### CONCLUSIONS

All instruments on La Silla Observatory now have a dedicated tool able to return an evaluation of the quality of the data taken by the observers. It should be stressed that, while these tools can certainly be improved, they were not intended to produce publication quality data. Our brief experience with the newly developed tools confirms that they have been very well received by the visiting astronomers.



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### STAFFING MOVES

There's been quite a bit of staff movement at La Silla over the last few months. We have had to bid farewell to Rene Mendez, who has now taken up a position at the Universidad de Chile, and Malvina Billeres who will finish off her last 6 months as an ESO fellow doing 100% research in Vitacura. We still have Fernando Selman with us at La Silla, though his official post is actually VST astronomer at Paranal. He will remain with us for the next 6 months or so (depending on the progress of VST), and has taken over responsibilities as head of the Imaging instrument force. We welcome Valentin Ivanov back to ESO Chile, and this time to La Silla. Valentin was a fellow at Paranal, went to Garching for his third year, and now is back in Chile as a staff member in the Infra-red team at La Silla. In particular, he will be instrument scientist of *Sofi*, taking over from the wonderful job Malvina has done in recent years. Dominique Naef has also joined us from Switzerland. For the next year he will be working from a Swiss National Foundation grant primarily as a support astronomer for *HARPS*. Lastly, with the departure of Rene, John Pritchard has taken over as leader of the astronomers on La Silla – we wish him well and many happy schedules to come!

### MORE UPDATED MANUALS

In December, we bought you news of many upgrades to documentation (both paper and internet) here on La Silla. The latest addition is the new manual and the complete atlas of Echelle wavelength calibrations for *EMMI*. Both are linked to the main *EMMI* webpage. In addition, we now have a variety of quick-look tools, developed in-house by the La Silla support astronomers, for long-slit spectroscopy (*EMMI*, *EFOSC2*), *EMMI* Echelle Spectroscopy, *CES* observations, the optical imagers (*WFI*, *SUSI2*, *EFOSC2*, *EMMI*), and both the spectroscopic and imaging modes for *Sofi*. See the full article in this same edition of *The Messenger*.

### LA SILLA - CERTIFIED!

At the end of March the Quality Management System implemented at La Silla during the past year underwent a thorough audit by SQS (The Swiss Association for Quality and Management System). At the end of the audit La Silla received a certification of compliance with the requirements set by the ISO 9001:2000 standard. La Silla is most likely the first Observatory to achieve this certification. More details to come in the next *Messenger*.